MARCH 1975 / $1

AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE

СОВЕТСКИЙ АВИАЦИОННО-КОСМИЧЕСКИЙ АЛЬМАНАХ*

*SOVIET AEROSPACE ALMANAC

Beechcraft Super King Air in military trim.

Powered by twin 750-shp turbines, equipped with top-of-the-line avionics and interiors on a par with first-line commercial outfitting—this all-weather, all-go Beechcraft will soon become the Air Force's C-12.

Beech Aircraft Corporation has been awarded a contract to build and support 14 U.S. Air Force C-12's to be used in air attache, military assistance groups and cargo transportation. Options in the contract permit the Air Force to utilize Beechcraft worldwide aircraft servicing, including on-site personnel and facilities for inspecting, maintaining and stocking spare parts at strategic points.

In its personnel transport configuration, the T-tailed Beechcraft accommodates eight passengers and two pilots. Its cabin is easily converted for cargo missions.

The C-12 has a speed of 303 mph at an altitude of 15,000 feet. A pressurization differential of six psi gives the cabin a sea level altitude at 14,330 feet.

Mission reliability and continuous utilization were essential criteria for the C-12, as well as capability of operation from small, unimproved airfields.

Deliveries of the 14 C-12's are scheduled to begin July, 1975, and continue through May, 1976. The aircraft are to be deployed worldwide.

Beechcraft

Beech Aircraft Corporation
Wichita, Kansas 67201

AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

MARCH 1975
VOLUME 58, NUMBER 3

This Month

SOVIET AEROSPACE ALMANAC

ABOUT THE COVER

This first "Soviet Aerospace Almanac" has been designed as a compact, year-round reference work on the USSR's aerospace forces. We would welcome suggestions from readers about additional material that might be included next year.

Departments

AIR FORCE Magazine (including SPACE DIGEST) is published monthly by the Air Force Association, Suite 400, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006. **Phone:** (202) 298-9123. Second-class postage paid at Washington, D.C. **Membership rate:** $10 per year (includes $9 for one-year subscription); $24 for three-year membership (includes $21 for subscription). **Subscription rate:** $10 per year; $2 additional for foreign postage. Single copy $1. Special issues (Spring and Fall Almanac issues and "Military Balance" issue) $2 each. **Change of address** requires four weeks' notice. Please include mailing label. Publisher assumes no responsibility for unsolicited material. Trademark registered by Air Force Association.

BPA **Circulation audited by Business Publication Audit**

THE HIGH COST OF FREEDOM

By John L. Frisbee
EXECUTIVE EDITOR, AIR FORCE MAGAZINE

Washington, D. C., February 5

As THIS is written, President Ford has just announced the biggest federal budget with the largest request for defense funds and the highest projected deficit in the nation's peacetime history. Given the state of our economy and the makeup of the new Ninety-fourth Congress, it's a safe bet that there will be a deafening clamor to expand social programs or reduce the expected deficit by cutting defense.

In these times, no one could condone spending more than is absolutely necessary on *any* budget account. But to decide if the defense budget is larger than need be, hence fair game for a deep cut, one must raise the question of the old-time vaudeville comedian whose line, when asked, "How's your wife?" was, "Compared to what?"

The defense budget is a relative thing—relative most importantly to the military posture of the USSR, the only country that can militarily threaten our security and vital interests. And the Soviet forces that can do that are primarily aerospace forces. Either we deter Soviet military/political moves by matching the capability of their forces, or we accept the consequences.

The survey of Russian air and space forces in this Soviet Aerospace Almanac is convincing evidence that the US *is* being overtaken in the military area where we can least afford to fall behind—aerospace. Holding our present precarious lead will not come cheap. We're not sure that even $104 billion inflated dollars, requested for FY '76, will do it.

The information on Soviet aerospace forces presented here leads to several conclusions that ought to be weighed carefully in considering the FY '76 defense budget:

- The USSR is outspending the US in the military field by considerably more than ten percent. That margin, dangerous in itself, is magnified by the fact that about twenty-five percent of Soviet defense expenditures goes for personnel costs, while similar costs absorb fifty-five percent of the US defense budget. Combined, these two disparities leave the Soviets upward of $25 billion a year more than the US for military R&D and procurement.
- With the exception of surface-to-air missiles and ICBM throw weight, USAF holds a qualitative lead over its Soviet counterpart forces, but if the present gap between Soviet and US R&D and procurement funding continues, we can't count permanently on that crucial advantage.
- In terms of manpower, Soviet aerospace forces are about twice as large as their analogous USAF forces, and larger in both manpower and combat aircraft than the combined air components of the USAF, US Navy, and Marine Corps.
- The Soviet space program is larger than ours, and is weighted in favor of military space missions.
- Soviet strategic nuclear doctrine continues to be based on a preemptive counterforce strike. Such a strike would be feasible only if the US accepts, for economic reasons, a position of marked strategic inferiority.
- There is an "arms race," but it has only one participant—the USSR—running against the clock. Discussing the FY '76 defense budget on February 5, Secretary of Defense James Schlesinger observed that during the past four years ". . . we have been engaged in the rather peculiar process of reducing our defense budget in real terms while the Soviets have been raising theirs."

Tough years lie ahead. The USSR holds some, but by no means all, of the high ground. Its economy is growing at a steady rate of four percent a year while ours is in a period of decline. The Soviets are self-sufficient in nearly all primary commodities, including oil. Their totally controlled economy is relatively immune to inflation. A tightly knit political-military-industrial complex unlike anything in the West can continue indefinitely to extort heavy sacrifices from a people inured to dictatorial rule and austerity.

On our side, the temptation will be great to cut the cost of defense. The USSR's aerospace forces and the military/political threat that they support are not visible, but rising price tags at the supermarket and the gas pump are. So are lines at the unemployment office. These economic anomalies demand effective social programs to ease the hardships that now beset so many.

But we would do well to recall the words of Marshal of the RAF Sir John Slessor. At a time when his country was enduring problems similar to those that now confront us, he wrote:

"It is customary in democratic countries to deplore expenditures on armaments as conflicting with the requirements of the social services. There is a tendency to forget that the most important social service that a government can do for its people is to keep them alive and free." ■

Hercules.
The airlifter whose time keeps coming.

Years ago the world needed an airlifter able to carry cargo such as fully assembled trucks and bulldozers. An airlifter strong enough to land and take off from short dirt, gravel, sand or snowy runways. An airlifter built for quick loading and unloading without ground-handling equipment. An airlifter able to haul 45,000 pound payloads for 2,800 statute miles.

Today the world needs that airlifter more than ever. Which is why ten nations ordered the Lockheed Hercules last year.

Why do countries keep selecting Hercules? Because Lockheed has 20 years experience working with countries that need great airlift, and it keeps making Hercules better and better. To begin with, the Hercules' airframe is classic in its functional simplicity. High wings let the fuselage almost hug the ground for fast loading. A huge rear cargo opening enables tractors to drive on and off. Sturdy landing gear handles the jolts of remote fields.

Inside, Hercules is almost new with avionics systems updated from nose to tail. All basic operating systems have been improved. The 1975 Hercs, for example, will have new radar, air conditioning and auxiliary power systems.

Hercules. The timeless airlifter, chosen by 37 nations.

Lockheed Hercules

THE FIRST 400 DAYS.

A progress report on the RCA Satcom System. America's first operational domestic communications satellite system.

On December 21, 1973, RCA Globcom's Satcom System became operational and substantially reduced the cost of coast-to-coast communications.

Today, the Satcom System's private, voice-grade leased channels are providing a proved, cost-effective alternative to overland cable and microwave circuits.

This is only the beginning.

Later this year, RCA Satcom Phase II will begin with new earth stations, an advanced design, high-capacity satellite (shown below), and extended service to the entire United States. This service will include applications for TV and CATV transmission, full transponder systems and special services for government and industry.

For information on how the RCA Satcom System can benefit your company, contact Satcom Marketing, RCA Global Communications, Inc., 60 Broad Street, New York, New York 10004. Phone: (212) 363-3986.

RCA Global Communications

Airmail

National Defense Poll

Gentlemen: [Claude Witze's] interesting column in the January issue of AIR FORCE Magazine contained five questions which supposedly had been asked of the public by Opinion Research Corporation. Those questions seemed quite familiar to me, and in searching my files I discovered a copy of a poll conducted by The American Security Council containing those same questions plus others, which I answered and returned to them recently. I don't know why there is a discrepancy in the name of the sponsoring organization, but perhaps you will be interested enough to research that.

A point of greater interest even, which I'm surprised you didn't notice and comment on, concerned the high percentage of respondents who seemed to be "for" national defense by the nature of their answers. I may have the answer for that, and, unfortunately, my answer could show that the poll was conducted with a lack of regard for methods which would indicate the true facts.

If The American Security Council in fact did originate this particular poll, the large percentage of answers in favor of national defense may be due to the fact that the Council, according to an article in *The Wall Street Journal*, sends its questionnaires primarily to individuals who would be predisposed in favor of national defense; such persons as retired military people and members of Air Force Association, The Reserve Officers Association, the Navy League, etc.

. . . I am highly in favor of national defense, but I hate to think that you, the United States Congress, or anyone else might be misled into thinking that a majority of the general public is in favor of national defense when in fact it *may not* be.

Jimmie S. Corones
El Segundo, Calif.

• *Reader Corones raises a legitimate and interesting point. The American Security Council says there are two polls. One is conducted among ASC members by ASC itself. The other is conducted on a national sample of citizens over eighteen years of age by the Opinion Research Corporation for ASC. The questions are essentially the same. ASC members were given the details on this procedure in their newsletter of July 1974.*—THE EDITORS

Test of US Will

Gentlemen: I read with great interest Edgar Ulsamer's January '75 issue account of the Strategy Seminar in Shreveport. Aside from the purely military aspects of the conclave, I was particularly heartened to note that Dr. Leon Gouré broached the political aspects of détente during his address.

As a doctoral candidate in political science and author of a book [*China: Rationalizing the Demonic,* Vantage Press] which analyzes Chinese political culture as a function of Marxist ideology, I hasten to agree with Dr. Gouré's account of the Soviet view of negotiations and easings of tension. The fact that the imperative of Communist thought is to gain time by negotiation while "contradictions" between non-Socialist members of the international system grow in intensity is usually overlooked in any examination of Soviet motives for negotiation.

This is not to state that the Soviets are negotiating in inherent bad faith, but rather to say that they are merely expressing what they feel to be the inevitable course of history through their foreign policy of securing socialism at home while easing its external expansion. This must be done at a point short of war in order not to threaten the survival of the base camp for their system, which just coincidentally happens to be located in the Soviet Union. Hence, when the US expresses determination to exercise a particular option or discourage aggression internationally, the Soviets will generally shrink from direct conflict that might threaten their homeland.

This is indicative of not an immoral, but rather an amoral system that reconciles the ultimate good of its ends with its means. As in the days after the Bay of Pigs fiasco, the US will be tested. We have just finished, perhaps to many indecisively, a test of will in Vietnam. This may lead other nations to feel as if the US is a trussed giant, incapable of carrying out its policies.

This attitude may be reinforced by continued embarrassment of the US in the UN and political defeats in dealings with the Arab oil producers. Dr. Kissinger's recent remarks suggesting possible US military intervention in the Middle East, and recent movements of the US fleet in Asian waters, may be blessings in disguise if they deter the testing of US will to react.

In sum, we must leave behind the "good guy-bad guy" theory of Soviet negotiation dynamics, and remember that, unlike the liberal democracies of the West to whom negotiations are often seen as ends in themselves, the Communists see them merely as a necessary course of action to be taken in order to ensure the victory of their system.

Jay H. Ginsburg
Maple Glen, Pa.

Bottoming Out in Space

Gentlemen: It is most encouraging to hear you quote the Chief Scientist of the Air Force ("USAF's R&D Priorities for 1975," January '75 issue) as saying the US "has bottomed out in our dismissal of space as a useful medium."

Hopefully, we are entering an era where the contribution of space systems across the entire range of military activity will be recognized and pursued. The space environment has unique advantages, and, of course, some limitations, just as the land, sea, and air environments.

Space advocates should guard against the loss of credibility that will occur if they oversell their product. For example, the article continues with the assertion that US satellites are inherently safe from attack because "the only conceivable attack on major satellite systems would require full-scale nuclear war."

I suggest the Soviets would con-

Airmail

sider destruction of several US satellites with nonnuclear warheads employed in remote space as an act considerably different and less dangerous than nuclear war. If we expect our satellites to survive, we must employ defensive aids. Even then, the history of offense and defense suggests satellites cannot be made "unsinkable."

Acknowledgment of this situation should not deter use of satellites; after all, survival of naval ships, air force planes, and army tanks cannot be guaranteed despite reasonable protective measures and we have rightfully continued using them. Let's acknowledge the need for some defense in space as part of the overall space game plan.

Col. H. J. Martin
Ent AFB, Colo.

Shin Meiwa's Aircraft

Gentlemen: It appears that the designation system for the Shin Meiwa's current family of seaplanes is more complex than anyone imagined. The designation "US-1," given in the item concerning one of these seaplanes in the February "Jane's Supplement" to AIR FORCE Magazine, has proved to be a company designation and not one allocated by the Japan Maritime Self-Defense Force. The simplest way of explaining the entire designation system is, I think, the listing as received from the Tokyo Sales Office of Shin Meiwa:

	Company Designation	*Military Designation*
Flying Boat	SS-2	—
ASW Flying Boat	—	PS-1
Amphibious Flying Boat	SS-2A	—
Amphibious SAR Aircraft	US-1	PS-1 Mod.

You might like to publish this in your correspondence column as a guide for readers who are interested in this fine and unique family of aircraft.

John W. R. Taylor
Editor, *Jane's All the World's Aircraft*
Surrey, England

Eliminate Duplication

Gentlemen: Your recent articles on the deteriorating state of our defenses are enough to shake any rational man, but surely a practical solution for obtaining "more bang for the buck" must be somewhere at hand? As our most costly item is people, there must be methods of reducing that expense and shifting funds elsewhere as we surely cannot expect more funds from the public trust.

What "people" money? How about medicine? All military hospitals have the same mission—to maintain the health of the fighting man. Why, then, do we need three Surgeon Generals with their staffs extending down from the Pentagon to all levels of command, constantly duplicating each other? Two floors of the Forrestal Building are filled with Army and Air Force people doing, for all practical purposes, the same medical administration job. Why?

How about communications? Why cannot the responsibility for them be consolidated into one service with elimination of the duplicate overhead? Do we really need Air Force's Electronic Systems Division *and* the Navy Electronic Laboratory?

What about logistics? Sure, when the Army was supplying frontier forts and the Navy remote frigates separate supply systems were needed, but with the communications and transport of today do we need all of this duplication? If we have a Defense Supply Agency, why do we need a Logistics Command?

Then there are computers. How many separate centers does DoD have today dedicated to computer programming? How much rare talent (and it is scarce) is wasted in duplicate efforts at the Design Centers of DoD? Why can't they be consolidated? How often do we spend money to buy or enlarge the great God Computer when down the hall or across the base another system is shut down for the night at 1600 hours?

Each of the services possesses major personnel centers. Why not one with joint staffing? Why not the same thing for intelligence?

What about the Pentagon? We ran the entire Second World War from that building. Now, with only a fraction of the number of people on active duty, we no longer have enough space there and are spilling over into new centers like the Forrestal Building all over the D. C. area. Is the solution to all problems limited to hiring new people? Isn't Parkinson's Law at work here and we are just too dense to see it?

Sure, we are in trouble with not enough R&D funds and deteriorating general-purpose forces, but crying for more money isn't the answer. Let's first learn to manage what we have in our pocket. God help us if we someday let our nation go down to defeat because we have more Xerox machines, computers, people, and GSA partitions than we have weapon systems. If it happens, it will be our own fault.

Maj. Franklin L. Greene
Montgomery, Ala.

Erroneous Attribution

Gentlemen: A recent TRW advertisement in your magazine showed an artist's rendering of a black hole accretion disk model of Cygnus X-1. We erroneously attributed the calculations underlying this model to Professor Kip Thorne of the California Institute of Technology.

Professor Thorne informs us that this attribution is incorrect. The key calculations were carried out by research groups in Moscow and Cambridge, England, not by him.

We apologize for this error.

Ken Moritz
Special Projects Manager
TRW Systems Group
Redondo Beach, Calif.

Sharing the "Umbrella"

Gentlemen: "The Wayward Press" column is most informative and interesting. However, you make the same mistake as most other misguided wayward souls by obliquely referring to the electronic news media as "The Press." Since most of the waywardness originates from television, perhaps it would be wise to change the name of the column to "The Wayward Media."

Radio and television newspeople carry press cards, attend press conferences, call themselves reporters and/or editors, and make believe that they are entitled to all the Constitutional guarantees of Freedom of the Press. At first, the real press allowed the little upstart brothers to share the "umbrella," but now they are "Big Brothers," ten feet tall, and the real press is getting something more than wet feet.

It is difficult to imagine the electronic media writers of social/brainwash/propaganda garbage as reporters. It would be difficult to refer to them as editors—the producers of "The Selling of the Pentagon"

Model ML-1. The latest member of IBM's family of militarized computers.

The Advanced System/4 Pi Model ML-1 evolved from the 4 Pi technology base, in place since 1965. The result of this technology has been System/4 Pi computers for a variety of military and space programs such as A-7, F-111, EA6B, A-6, F-15 and Shuttle. It's IBM's solution – here today – for the next generation of avionic processing requirements. Using a typical avionic instruction mix, the Model ML-1 can perform more than 400,000 operations/sec.

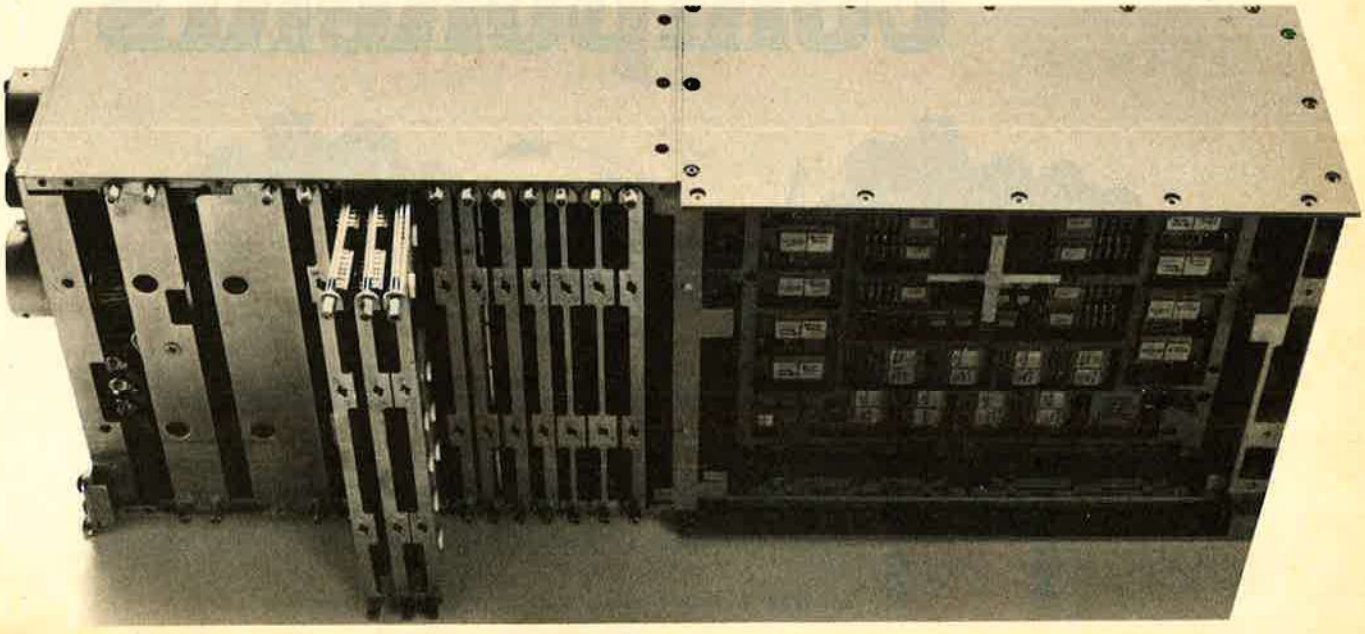
This new general-purpose, stored program, digital computer is a militarized processor that utilizes large scale integration (LSI) circuitry and advanced packaging techniques. Tied to the LSI technology are high volume manufacturing methods that produce low-cost, high-reliability logic circuits and monolithic memories. What's more, microprogrammed control makes the Model ML-1 readily adaptable to a wide variety of applications such as guidance and navigation, weapons delivery, digital flight control and communications.

While the Model ML-1 retains commonality with other System/4 Pi computers, it takes full advantage of the newest technology developments and offers a variety of options. Users can choose hardware floating point, core or monolithic memory, various microprogrammed instruction sets, proven support software packages, and others.

And it's all wrapped up in a compact little package – a half ATR case weighing 28 pounds with up to 32K words of storage. The fact is, the Model ML-1 offers the latest in advanced technology and cost effective computing capability in minimum size, weight and power.

To learn more about this highly sophisticated processor and how it can be personalized for your applications, write or call the Director of Avionics Marketing, IBM, Federal Systems Division, Owego, New York 13827. Telephone: (607) 687-2121.

IBM®
Federal Systems Division,

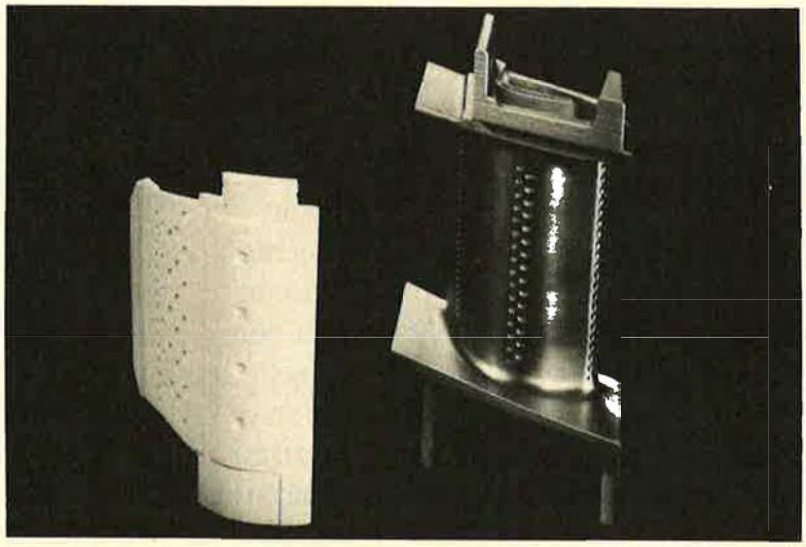


Its unique air-cooled design allows the first stage vane of Pratt & Whitney Aircraft's JT9D-7 engine to operate at *turbine inlet temperatures up to 2450° F.*

Howmet supplies this configuration, cast in MAR-M-509 by our Mono-Shell® process, incorporating:

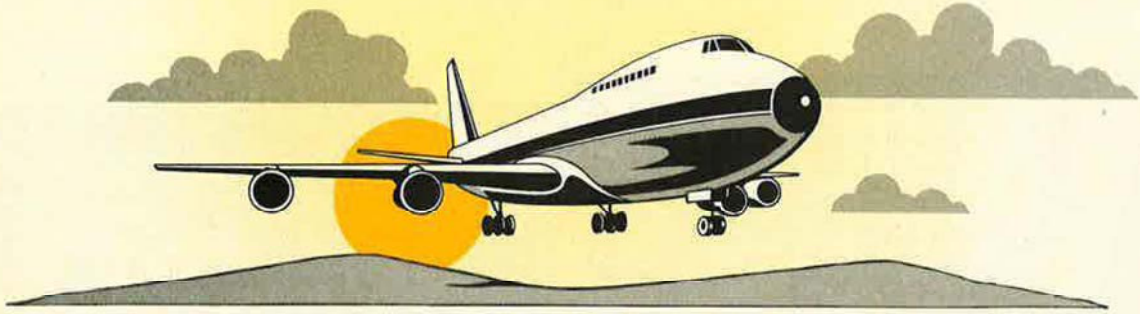
* An intricate ceramic core to provide impingement and convection cooling
* Film cooling via 172 minute holes formed by EDM
* Fabrication by brazing of a stainless insert
* Finish machining of both shroud platforms
* Fully protective chrome aluminum coating.

Howmet...your total source for engineering/ metallurgical expertise in quality turbine components.



Single Source Capability for...

critical gas turbine components



HOWMET

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GAS TURBINE COMPONENTS GROUP

221 West Webster Avenue, Muskegon, Michigan 49440

1073

Airmail

and those who portrayed the enemy as "Good Ol' Ho" while 50,000 American fighting men were being lowered into the grave.

Radio and television are licensed by the federal government. They are not free, and can never be free, because they are not designed to be free. Call them "media" people. Issue them "media" cards. Require them to reveal their sources of information. Make it clear that the media is not the press and is not covered by Freedom of the Press. . . .

There are three kinds of people in the world—those who *make* things happen, those who watch things happen, and those who say "What happened?" It should not be a function of the media or the press to *make* things happen . . . just *tell* us what happened . . . and we'll take it from there.

You are in a position to let us know what's happening. Keep up the good work.

Ray E. Ricketts
Past President, Danville and Richmond, Va., Chapters, AFA
Richmond, Va.

P-39s and P-63s in Alaska

Gentlemen: Would like to hear from Air Transport Command or Ferry pilots who ferried either P-39 Airacobras or P-63 Kingcobras to complete the chapter in my book on the Airacobra in Alaska.

E. F. Furler, Jr.
2831 Jarrard
Houston, Tex. 77005

P-38 Convention

Gentlemen: The Twin City Aero Historians (Minneapolis-St. Paul Chapter of the American Aviation Historical Society) is sponsoring a P-38 convention, to be held in the Twin Cities May 16–18, 1975. P-38s of the Confederate Air Force will be featured in static display and in flyover.

I have accepted responsibility for coordinating contact with P-38 unit personnel who might wish to attend the convention. I am also organizing a reunion of the 474th Fighter Group to be held in conjunction with the AAHS Convention and wish to make contact with anyone from that unit or its squadrons.

Will anyone interested in contacting others relative to attendance at the convention, and, particularly, interested in organizing reunions of their P-38 units (group or squadron, including F-4 or F-5 recon units), please contact me for further information? Also interested in information of any kind about P-38 unit associations or individuals.

Robert D. Hanson
Suite 226
7515 Wayzata Blvd.
Minneapolis, Minn. 55426

KIA

Gentlemen: My father was killed during World War II, and I am trying to contact men who served with him. Would appreciate hearing from anyone who knew 1st Lt. Charles U. Rapp, Jr., 368th Bomb Squadron, 306th Bomb Group (H), June–August 1944.

Ernest C. Rapp
1952 Antietam St.
Pittsburgh, Pa. 15206

UNIT REUNIONS

Kelly Field Grads

A 40th-year reunion of Kelly Field Graduating Class of February 1935 will be held in San Antonio, Tex., in mid-May. If interested in receiving further information contact

Lt. Col. George S. Buchanan, USAF (Ret.)
8939 Glenbrook Rd.
Fairfax, Va. 22030

Ranch Hand-Vietnam Association

The 9th annual Ranch Hand reunion is planned for May 2–4 at Langley, Va. Any reader who was part of Operation Ranch Hand or knows of any former members, please contact

Lt. Col. Charlie Hubbs
Pres., Ranch Hand-Vietnam
2051A Greenhouse Pl., S. E.
Kirtland AFB, N. M. 87118

Correction

In the article "The B-29, the A-Bomb, and the Japanese Surrender," in the February issue of this magazine, one line was left out on p. 61, through an inadvertence. Instead of reading, "On July 26, the Potsdam Declaration was made of the future status of the Emperor," the passage should have read, "On July 26, the Potsdam Declaration was issued, calling for Japan's surrender. No mention was made of the future status of the Emperor." We regret the error.—THE EDITORS

Red River Fighters

The Red River Valley Fighter Pilots Association will hold its 2d annual reunion at the Stardust Hotel, Las Vegas, Nev., April 11–13. Contact

Maj. Thomas J. Coady
TFWC, Box 147
Nellis AFB, Nev. 89191

Stalag Luft III POWs

A 30th-year reunion of former POWs of Stalag Luft III is planned for April 18–19, in Cincinnati, Ohio. Any of the 9,500 Kriegies who were there when the camp was evacuated in January 1945 should get in touch with

David Pollak
P. O. Box 46566
Cincinnati, Ohio 45246

27th Bomb Group, USAAC

There will be a reunion of the old 27th Bomb Group, US Army Air Corps, at the all-new Hotel Hilton DeSoto in Savannah, Ga., April 4–5. Any officer or enlisted man who served in Headquarters Squadron, the 16th, 17th, and 91st Bomb Squadrons, or 48th Materiel, along with all attached units, are invited to attend this one-time reunion. The old 27th is the Air Corps unit that fought as infantry on Bataan and Corregidór, where most were either killed or were POWs of the Japanese. Write

Samuel B. Moody
1012 Pearce Dr., Apt. 211
Clearwater, Fla. 33520

Class 40-A

Flying School Class 40-A Association will hold a 35th reunion in San Antonio, Tex., March 21–23. Please contact

William H. Fandel
102 Cliffside Dr.
San Antonio, Tex. 78231

82d Bomb Sqdn.

A reunion for the 82d Bomb Squadron, 12th Bomb Group, WW II, will be held in Baton Rouge, La., June 26–29. Members who served in the 82d and are not on the mailing list please contact

Camile Beauford
474 College Hill Dr.
Baton Rouge, La. 70808

319th Bomb Group

The 319th Bomb Group (M in the Mediterranean Theater of Operations, 1942–44; Light in Pacific, 1945) will meet in July 1975, in Albuquerque, N. M. For further information contact

Harold E. Oyster
662 Deering Dr.
Akron, Ohio 44313

474th Fighter Group

A reunion of the 474th Fighter Group will be held May 16–18, in conjunction with the Twin City Aero Historians' P-38 Convention, at Minneapolis-St. Paul, Minn. *(see letter, this page).* Contact

Robert D. Hanson
Suite 226
7515 Wayzata Blvd.
Minneapolis, Minn. 55426

Airpower in the News

By Claude Witze
SENIOR EDITOR, AIR FORCE MAGAZINE

The Squeeze Is Coming Soon

Washington, D. C., January 31

It is high time for newspapermen and political speechwriters to stop referring to any member of Congress as "the powerful chairman." Powerful chairmen no longer exist. The power is in the caucus of the majority party.

In the Ninety-fourth Congress, which convened on January 14, there are ninety-two freshmen, almost all of them classified as activists. Most of them, seventy-five, are in the House of Representatives, where they have two years to prove themselves either sages or fools. As reported in this space last month, they already have grabbed control of the Democratic House caucus. In one of their first upsets, they have deposed Rep. F. Edward Hébert as chairman of the House Armed Services Committee. It is the opinion of Mr. Hébert that his unseating forebodes a rough session for national security.

"The antimilitarists have taken over," the ex-chairman from Louisiana told AIR FORCE Magazine. "I don't care what kind of authorization and appropriation bills we offer on the floor—they will be cut."

The opinions on the Senate side are just as glum. Sen. Howard W. Cannon of Nevada, chairman of the Subcommittee on Tactical Airpower of the Senate Armed Services Committee, says that with the defense budget request up over $100 billion for the first time, "plus a mood in Congress to economize in government in order to fight inflation, I would say that the likelihood, as I see it, is for significant cuts in the defense budget again this year."

The budget is scheduled to go to Capitol Hill next week. *(See box, p. 15.)*

Senator Cannon is not reluctant to say that the target for defense cuts "on both sides of the Potomac invariably seems to be the research and development and procurement accounts, even though these items already have suffered the major percentage decline in our defense purchasing power."

Rep. F. Edward Hébert, deposed chairman of the House Armed Services Committee, forecasts a rough session for the defense budget. He believes that any authorization or appropriation bill offered on the floor will be cut.

New chairman of the House Armed Services Committee, seventy-year-old Rep. Melvin Price of Illinois, is considered the House expert on airlift and R&D. A supporter of strong national defense, he has a liberal voting record on domestic issues.

When cuts are made, the Senator points out, the tendency is to slash the investment portion—R&D and procurement—rather than pay and operations.

In the struggle through Congress, it is the changed complexion of the House that is more important than shifts in the Senate. The pattern in the past has been that the Senate cuts recommendations made by the House. In conference, the Defense Department usually recovers to a reasonable degree. This year there will be no recovery, and there may be further reductions, if Mr. Hébert's prognostication is correct.

The Senate Armed Services Committee has lost Harold E. Hughes of Iowa, but other freshman liberals have been added. They are John C. Culver of Iowa, Gary W. Hart of Colorado, and Patrick J. Leahy of Vermont. Two liberal Senators—William D. Hathaway of Maine and Floyd K. Haskell of Colorado—were named to the Finance Committee, where they probably will draw slots on subcommittees dealing with energy, health, and pension plans. These appointments were engineered by Sens. Dick Clark of Iowa and Edward M. Kennedy of Massachusetts.

About ten days ago, there was a significant, and widely ignored, vote in the Senate Democratic caucus. "What happened today," said Sen. Frank Church of Idaho, "was a kind of revolution."

The vote, forty-five to seven, called for a select committee to investigate the Central Intelligence Agency. The setback here was for the venerable chairman of the Armed Services Committee, John C. Stennis of Mississippi, who had reason to view the CIA as part of his fiefdom. He opposed the resolution, got little support.

New chairman of the House Armed Services Committee is a familiar figure and friend of the Air Force—Rep. Melvin Price of Illinois. In his district, the 23d of Illinois, lies Belleville, home of Scott AFB and headquarters of the Military Airlift Command. MAC, already one of the three top operational commands in USAF, is growing larger as it assumes more transport responsibilities formerly held by other commands.

Conversation Pieces

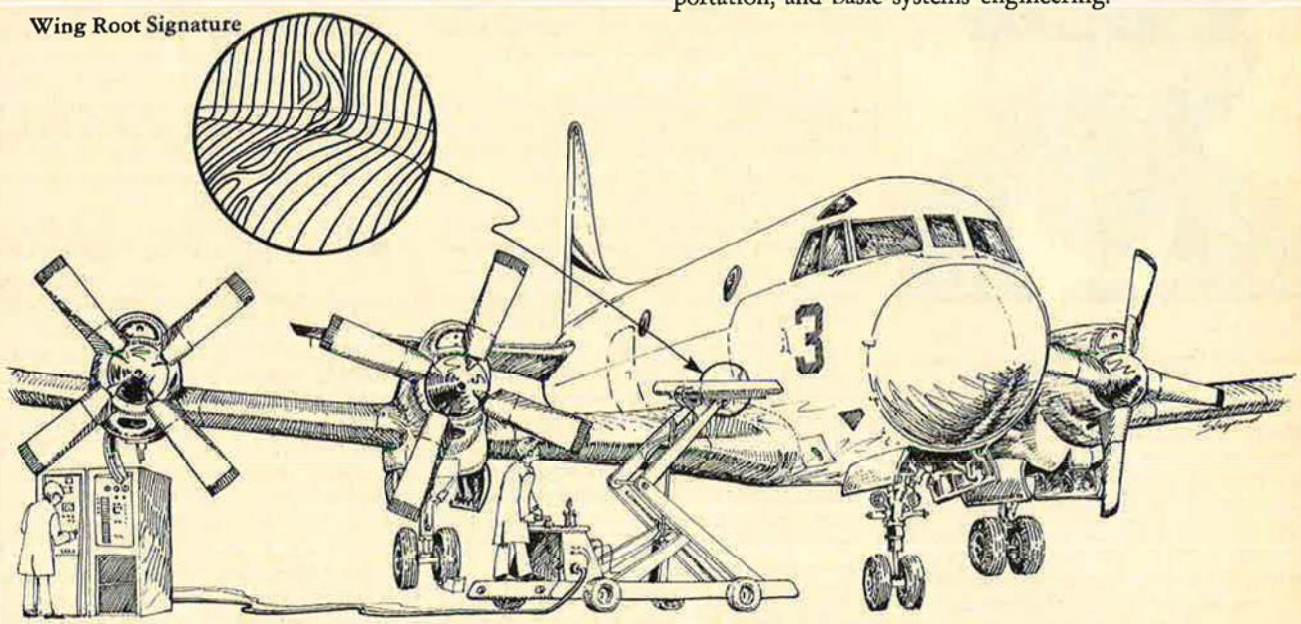
Fault-Finding Without Tears

With today's huge high-speed aircraft, meticulously careful maintenance is essential to safety as well as to efficient operation. A vital element in every maintenance program is the kind of probing inspection that detects even invisible signs of corrosion, fatigue, and other early symptoms of deterioration in highly stressed structures.

This need has given rise to a whole new breed of test engineers. They use magnetism, high-frequency sound, penetrating dyes, and now the coherent light of laser beams to find the subtlest internal flaws before they become dangerous.

Under the innovative leadership of Dr. Pravin Bhuta, a TRW team has developed a system that uses holographic interferometry to reveal potential weaknesses in landing gear, wing panels, turbine blades, and other critical parts of aircraft. With the sponsorship of the U.S. Navy's Analytical Rework Program Office, the system has been successfully used in an ordinary maintenance environment.

Wing Root Signature



The first tests were conducted in a TRW lab, however, where wing panels from a P-3 patrol pane were inspected. The prototype holographic systems not only found every flaw that had been previously located by conventional methods but also found several that had not been detected at all.

The next step was to do the same kind of job under workaday maintenance conditions *without* disassembling parts or removing paints or sealants. The completed system was taken to a Navy facility and the holographic equipment was mounted on a fork lift. It produced clear fringe patterns without external optics, whether it was pointed up, down, or sideways.

With this degree of mobility and flexibility, *in situ* inspection of critical parts becomes a practical reality not just for aircraft but for countless different kinds of structures. Compared with conventional methods, the saving in time alone is estimated to be as high as fifty percent.

When the technique has been fully developed, it will provide a cradle-to-grave record. Technicians will be able to compare the optical signature of the factory-new structure with later signatures, made during routine maintenance. Any significant differences will indicate the need for preventive repairs.

Dozens of promising ideas are under investigation at TRW, where we put the most advanced technology to work on the practical problems of defense, energy, transportation, and basic systems engineering.

For further information on the holographic interferometry system, write on your company letterhead to:

TRW
SYSTEMS GROUP

Attention: Marketing Communications, E2/9043
One Space Park, Redondo Beach, California 90278

As the No. 2 Democrat on House Armed Services, Mr. Price's main responsibilities have been in the areas of airlift and research and development. He is considered the House expert on both. With obvious reference to the machinery that made him chairman, Mr. Price is quoted as promising to "give attention to any position" taken by the Democratic caucus. On the other hand, he said, "the committee will attempt to give the Defense Department whatever is necessary to maintain an adequate defense establishment," a quote that sounds identical to those we heard from the White House in the early days of the Ford Administration.

Congressman Price is one of the few men in the House who has maintained a liberal voting record on domestic issues and still is rated at eighty and ninety percent by the American Security Council, supporters of a strong military posture.

At press time, the Republicans have not yet chosen the men of their party who will serve on subcommittees under Mr. Price. He will retain his chairmanship of the subcommittee on research and development, and Mr. Hébert will continue in charge of investigations, a role in which he distinguished himself for many years. There is no clue to possible subjects he is considering for examination. Mr. Price, like Mr. Hébert, is a former newspaperman, and they both practiced investigative reporting before Woodward and Bernstein knew how to type. The possibilities are limitless.

The Wayward Press

This is Reed J. Irvine, Chairman of the Board and founder of AIM. He has been an economist in the Division of International Finance at the Federal Reserve Board since 1951. Fifty-two years old, he won a Phi Beta Kappa key at the University of Utah in 1942, learned to speak Japanese and served in the US Marine Corps as a Japanese Language officer. This went on through the war in the Pacific and later during the occupation of Japan. He went to Oxford as a Fulbright scholar. He is not, and never has been, a journalist, but he knows how to write articles critical of journalists.

Probably the most prevalent complaint about American newspapers and television is their reluctance to correct errors. There is no tradition for it in the profession, if it is a profession. We hear a lot these days about doctors being sued for malpractice—it has become a new peril in the operating room—but the press, with few exceptions, remains stubbornly in favor of standing on its mistakes. Of course, that is one of the things Freedom of the Press is all about. Nobody challenges the right of the publisher to print lies, except when they provide the basis for libel suits. At the same time, there is an increasingly vocal contingent, in this era of consumer activism, demanding more responsibility in the practice of journalism.

It is time to call attention to the Ralph Nader of this inky business. His name is Reed J. Irvine, and he is Chairman of the Board of Accuracy in Media, Inc. It is a little more than five years ago that Irvine, supported by a few friends, $200, and a post office box number, set out to organize the business of criticizing the press and television news organizations. The natural result has been a minimum of attention for AIM in the public prints—it is not considered cricket to mention AIM in news columns or broadcasts—while this gadfly is becoming increasingly potent.

There no longer is any doubt: newspaper and television network proprietors now are aware of AIM. They have had thousands of letters; a few columnists and congressmen are publicizing the AIM effort; the Federal Communications Commission has been forced to rule on AIM complaints. And, in a few cases, AIM money has been used to buy advertising space, in which complaints against the newspaper are printed after the editors have refused to acknowledge error.

Much of this action involves issues of concern to our national defense effort. Back in 1972, AIM bought a two-column ad in the New York *Times* to charge that *Times* correspondent Anthony Lewis had reported as fact from Hanoi that the US mining of Haiphong harbor was ineffective. The facts indicated otherwise. To AIM, there was no reason to believe Anthony Lewis was anything but an advocate, and it was able to quote Lewis himself in the ad:

"This issue [stopping the war] is now paramount. It comes before other obligations, before personal ambition or comfort. For the ordinary citizen that means participation in some form of political expression, however inconvenient . . . involving one's professional association, school, or other activity in the attempt to stop the war."

AIM knew it had identified an openly advocate journalist.

"We believe that Mr. Lewis has enlisted in a crusade. We believe that he feels his obligation to the crusade comes before his obligation to report the news accurately and objectively. . . . Ardent advocacy which leads to misleading reporting should not be tolerated by any responsible newspaper."

Mr. Lewis, of course, still works for the *Times*.

Irvine, meanwhile, has acquired a bit of nonvoting stock in the *Times* company and last spring appeared at a stockholders' meeting. He offered a resolution proposing that the newspaper should adopt a code of professional ethics, including a clause to the effect that criticism of news coverage must be reported and heeded. He even quoted the *Times* Chairman and President, Arthur Ochs Sulzberger, who had said publicly that the press must earn respect. The Irvine resolution was ruled out of order. By Mr. Sulzberger.

One major victory for AIM involved an ABC broadcast in September of 1972, in which the network admitted it made several mistakes in a documentary called "Arms and Security: How Much Is Enough?" Here is Irvine's own account of what AIM achieved on the air:

The House Appropriations Committee, as pointed out last month, also owes its basic political allegiance to the caucus. This has impaired the power of veteran Chairman George Mahon of Texas, but the challenges to subcommittee chairmen have not been serious. The man most threatened was Jamie L. Whitten of Mississippi, whose domain was Agriculture, Environmental, and Consumer Protection. Mr. Whitten avoided the showdown that would have doomed him. He retreated, with the plea that he really is interested only in agriculture. He surrendered jurisdiction over the two areas in which the liberals have been unhappy with his conduct.

There is no requirement to review the arithmetic of defense spending. The defense budget amounts to less than six percent of the Gross National Product, the lowest point it has reached in more than ten years. The Pentagon is convinced it has been trimmed to the bone. But the critics are paying no heed. There is talk that they will try to kill or curtail specific projects, such as the B-1 bomber, AWACS, SAM-D, and new strategic weapons. If they do, there will be prolonged fights and compromises. If, on the other hand, their approach is to promote an across-the-board percentage cut, the bloodletting can be swift and decisive.

The first big argument is under way. It involves an extension of more aid to South Vietnam. The liberals already have rolled out the rhetoric. So far, there is no evidence of a close examination of the Nixon-Laird effort to Vietnamize the war. If it was a success and is in danger of foundering for lack of hardware, Defense Secretary James Schlesinger is right in his contention that aid is needed to maintain our credibility. If Vietnamization failed, no amount of hardware can help. There has been little effort in the press or in Congress to answer the simple question: Was Vietnamization of the war a success or failure? ■

"It [ABC] admitted it had erred in saying that sixty percent of the American tax dollar goes for defense, amending the figure to forty percent. It admitted that it had been incorrect when it said that the President's blue ribbon defense panel had characterized our defense policies as sufficient. It acknowledged that the panel had not made such a judgment and that seven of the sixteen members of the panel had signed a supplemental report which said that the strategic military balance was running against the United States.

"ABC conceded that it had erred in saying that the American Security Council had criticized the blue ribbon defense panel, and informed its audience that the Council had circulated the supplemental statement to the panel's report. ABC also conceded error in saying that the B-52 was a supersonic bomber."

Another AIM challenge to network television was made in 1971. The case was that of the CBS documentary, "The Selling of the Pentagon." This was a TV show designed to expose the Defense Department's *public-relations* activities, but was turned into a diatribe by skillful cutting and rearranging of the film. The result was both inaccurate and vicious.

AIM challenged CBS to reply to the many questions raised about the accuracy and editing procedures used in "The Selling of the Pentagon." CBS gave the same reply to all critics, including the editors of AIR FORCE Magazine. Answers would be prepared and sent to all critics. They never were, but AIM persisted in its demand. About ten months after the initial broadcast the answers were quietly inserted in the *Congressional Record*, by Rep. Ogden R. Reid, who happens to be a former President and Editor of the New York *Herald Tribune*. As Irvine has pointed out, the lack of fanfare and publicity for this CBS document is due to the fact that CBS had to admit to the errors and questionable editing. AIM prepared an analysis of the CBS reply, and used the CBS method. It was inserted in the *Congressional Record* under the headline: "CBS Digs a Deeper Hole," by Rep. F. Edward Hébert, then Armed Services chairman.

NBC's most prolific pontificator, David Brinkley, has felt the sting of AIM. Irvine says AIM caught Brinkley using false statistics to try to prove that the US today is more militaristic than Prussia was in its heyday. NBC refused to make a retraction. AIM bought advertising space again, this time in the Washington *Post*, and exposed the Brinkley fraud.

Most recently, AIM has challenged a New York *Times* account of the ecological impact of the use of herbicides in the Vietnam War. Again, persistence was necessary. It took two months, but the newspaper finally ran another article with accurate information. To experienced observers, it appears that the first account, called "incomplete, slanted, and erroneous," was leaked to the paper by disgruntled and unidentified members of the National Academy of Science.

Currently, AIM is involved in what has become a court battle with NBC over a television documentary called "Pensions: The Broken Promise." The film was an exposé of failings in privately administered pension plans. There was minimum suggestion of the fact that there are many successful private pension plans. AIM went to the Federal Communications Commission and filed a complaint, charging this was not fair. The FCC ruled against NBC, saying it had not complied with the fairness doctrine. The network immediately went to the US Court of Appeals and won a ruling that the FCC had erred in this case. The vote in court was two to one. AIM has asked for a rehearing.

For support, AIM depends on contributions from hundreds of supporters all across the country. The organization describes itself as nonpartisan, nonprofit, and educational. Gifts are tax-deductible. The small staff in Washington analyzes news coverage and follows up on complaints from friends and supporters. If the media do not correct errors spotted by AIM, the organization will publicize the fact. A monthly newsletter, *AIM Report*, is available by subscription and sent to patrons. AIM is not a lobby.

AIM's leadership is diverse. The first advisory board included Dean Acheson. Today, Morris L. Ernst, the liberal attorney and author, is a member of the board, along with Dr. William Y. Elliott of Harvard, Dr. Harry Gideonse, Clare Boothe Luce, Eugene Lyons, and Walter W. Seifert, Professor of Journalism at Ohio State University. The President is Francis G. Wilson, of the University of Illinois.

AIM is doing to advocacy journalism what Ralph Nader did to General Motors. It may also be true that AIM has a better case, with more public support, than Ralph Nader could achieve. On the basis of the record, it has better documentation. What it needs is greater public support for a more worthy cause.

If you are interested in more information about AIM (Accuracy in Media), or in supporting its work, address your query to:

John R. Van Evera
Executive Secretary
Accuracy in Media
777 14th Street, N. W.
Washington, D. C., 20005

The telephone number is 202-783-4407.

Some "Wayward Press" readers have asked about publications specializing in critiques of the press. There are many. One of the oldest and best, published six times a year, is the *Columbia Journalism Review*. To subscribe, send $12 to:

Columbia Journalism Review
700 Journalism Building
Columbia University
New York, N. Y. 10027

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GRUMMAN AEROSPACE CORPORATION
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By William P. Schlitz

ASSISTANT MANAGING EDITOR, AIR FORCE MAGAZINE

Washington, D. C., Jan. 31

In a milestone decision on January 13, the Air Force officially designated General Dynamics Corp.'s YF-16 Air Combat Fighter as winner in the lightweight fighter competition.

Thus, with the award to the company of an initial $418 million contract for full-scale development of the YF-16, USAF cranked up what could be the biggest weapon program in history in terms of world market.

In announcing the choice of the single-engine YF-16 over Northrop Corp.'s twin-engine YF-17, Air Force Secretary John L. McLucas said that the aircraft had the edge over its competitor in many areas of performance, including "agility, acceleration, turn rate, and endurance." Other advantages, he said, are better tolerance to G forces because of the tilt-back seat, better visibility, better deceleration, and lower drag.

Selection of the YF-16 was not based on results of the recent prototype program alone, Secretary McLucas said, but also on the accompanying technical proposals and consideration of such items as operational factors, life-cycle costs, and the ease of transition from prototype to production configuration aircraft. (In a related statement, Defense Secretary James R. Schlesinger quoted a thirty-six percent fuel saving per flying hour by the YF-16 over the YF-17. He said that, even at current fuel prices, this would generate some $300 million in savings over a fifteen-year period. "This aspect we believe will be of considerable interest to our European allies, who also have problems funding fuel costs," he declared.)

Regarding allied interest in a lightweight fighter for the 1980s, a consortium of the Netherlands, Belgium, Denmark, and Norway is expected to decide soon whether to buy the YF-16. In purely military terms, greater standardization within NATO would go a long way toward improving combat effectiveness, US officials believe. If the four select the YF-16, production lines will be set up in both Holland and Belgium, Secretary McLucas said. Among other potential purchasers of the aircraft are West Germany and Iran.

As for economic benefits to General Dynamics and its suppliers, Secretary McLucas estimated that there is a prospective market for between 2,500 and 3,000 YF-16s, worth more than $15 billion. This does not include the possibility of the Navy's buying 800 YF-16s. The Navy participated fully in the lightweight fighter prototype program and carefully monitored USAF's evaluation of the competing aircraft. At this writing, Navy's decision was awaited on whether or not the YF-16 could meet its needs, especially for carrier operations.

In response to a question, Secretary Schlesinger said that DoD would not try to "discourage" Northrop from selling the YF-17 abroad or to the Navy.

Again, the European consortium, as well as other would-be purchasers, might consider the Northrop plane, or perhaps the single-engine Mirage F.1 being developed in France.

In any event, the current Air Force plan calls for a minimum buy of 650 YF-16s, at a fly-away cost of $4.6 million per copy. These air-

DEFENSE BUDGET FOR FY 1976

At press time, the Department of Defense announced what in terms of current dollars is a record defense budget. In actual purchasing power, reflecting inflation, the FY '76 budget is some $400 million less than that of the preceding year. For 1976, Total Obligational Authority is set at $104.7 billion, with actual outlays estimated at $92.8 billion. Following is a year-to-year comparison (AIR FORCE Magazine will examine the FY '76 Defense budget in greater detail in the April issue):

DEFENSE BUDGET TOTALS

($ in billions)

	FY '73 Actual	FY '74 Actual	FY '75 Estimate	FY '76 Estimate	Increase FY '75–'76
Total Obligational Authority	80.2	85.0	89.0	104.7	15.7
Outlays	73.8	78.4	84.8	92.8	8.0

General Dynamics' YF-16, chosen recently as USAF's new Air Combat Fighter, could generate a large number of sales abroad (see item).

craft, according to USAF, will be armed with a 20-mm gun and AIM-7 Sidewinder missiles. While the planes will be equipped to carry the AIM-9 Sparrow missile, no final decision has been made to include this weapon.

Choice of the YF-16 has another ramification involving its powerplant, Secretary McLucas said. The F100 engine, built by United Aircraft Corp.'s Pratt & Whitney division, was previously developed for the Air Force's new F-15 Eagle. Thus, savings accrue to both programs through extended engine production and in other areas of engine development, he said. Secretary McLucas estimated that the larger buy of the F100 engine would save about $100 million in the procurement phase, with an equal amount additionally "in the support phase of life-cycle cost . . ." of the F-15 program. No change has been made in the plan to purchase 729 F-15s, but beyond that it may be "that we would decide to buy some more lightweight fighters instead of some more F-15s," Secretary McLucas said.

☆

General Dynamics will start this summer to fabricate the first of fifteen developmental F-16s ordered by the Air Force. These will consist of eleven single-seat and four two-seat versions for evaluation under operational conditions prior to full-scale production, the company said.

Flight of the first of these aircraft is expected late in 1976.

Company officials said that F-16 production needs could mean from 55,000 to 65,000 jobs around the country, with 7,000 alone at General Dynamics' Fort Worth, Tex., plant.

For its part, Northrop Corp. said that it "is naturally disappointed" that its YF-17 wasn't selected as USAF's Air Combat Fighter, but will continue support of the program "as a follow-on to our highly successful F-5 family of twin-engine aircraft." Flight tests have demonstrated that this airframe/engine combination is truly outstanding and has met all of its design goals, the company said.

"With the remarkable progress made in this flight-test program, we can proceed with confidence in our offering of this aircraft to other customers," Northrop declared.

Undergoing certification flight tests, the Fairchild Republic A-10 close-support aircraft recently hit its stride with a maximum load of twenty-eight bombs and a takeoff weight of 45,521 pounds. During flight, the plane withstood four Gs.

☆

In another matter concerning new aircraft, at this writing officials declined to estimate how long the Navy plans to ground its force of more than 110 new F-14 Tomcat fighters.

The planes were ordered to stand down in January, following the second crash of a Tomcat in twelve days. All routine training and test flights were suspended at that time, but Navy officials assured that combat readiness was unimpaired and that missions could be flown in an emergency.

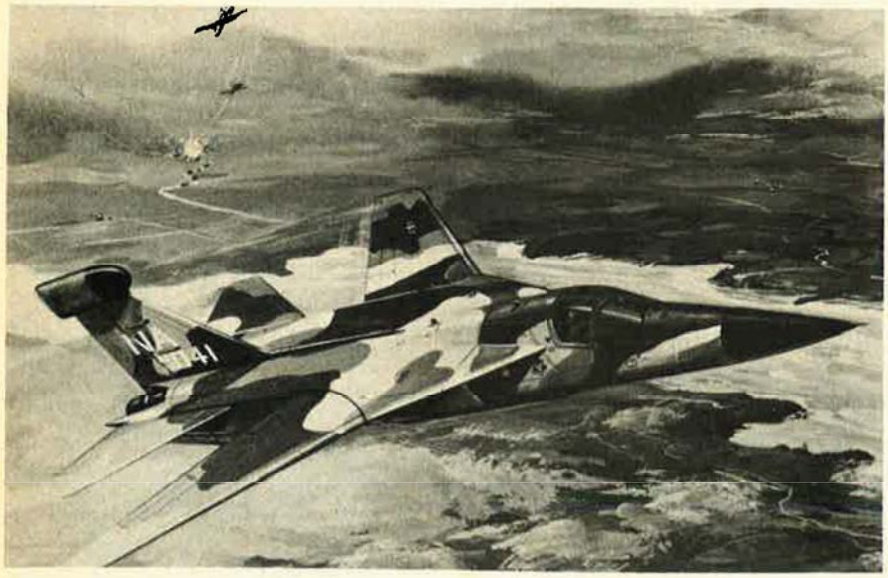
The first Tomcat, assigned to the carrier *Enterprise,* but flying out of Cubi Point airfield while the ship was in port, crashed into the Philippine Sea on January 2. Its two-man crew was reported safe, US Navy said. The aircraft was the first operational F-14 lost. The second F-14 crashed January 14 while flying off the *Enterprise* at sea in the Indian Ocean. Its crew also was reported safe.

Not so lucky the previous day was the crew of an EA-6B Prowler that crashed on takeoff from the *Enterprise*. A pilot was killed and another crewman seriously injured.

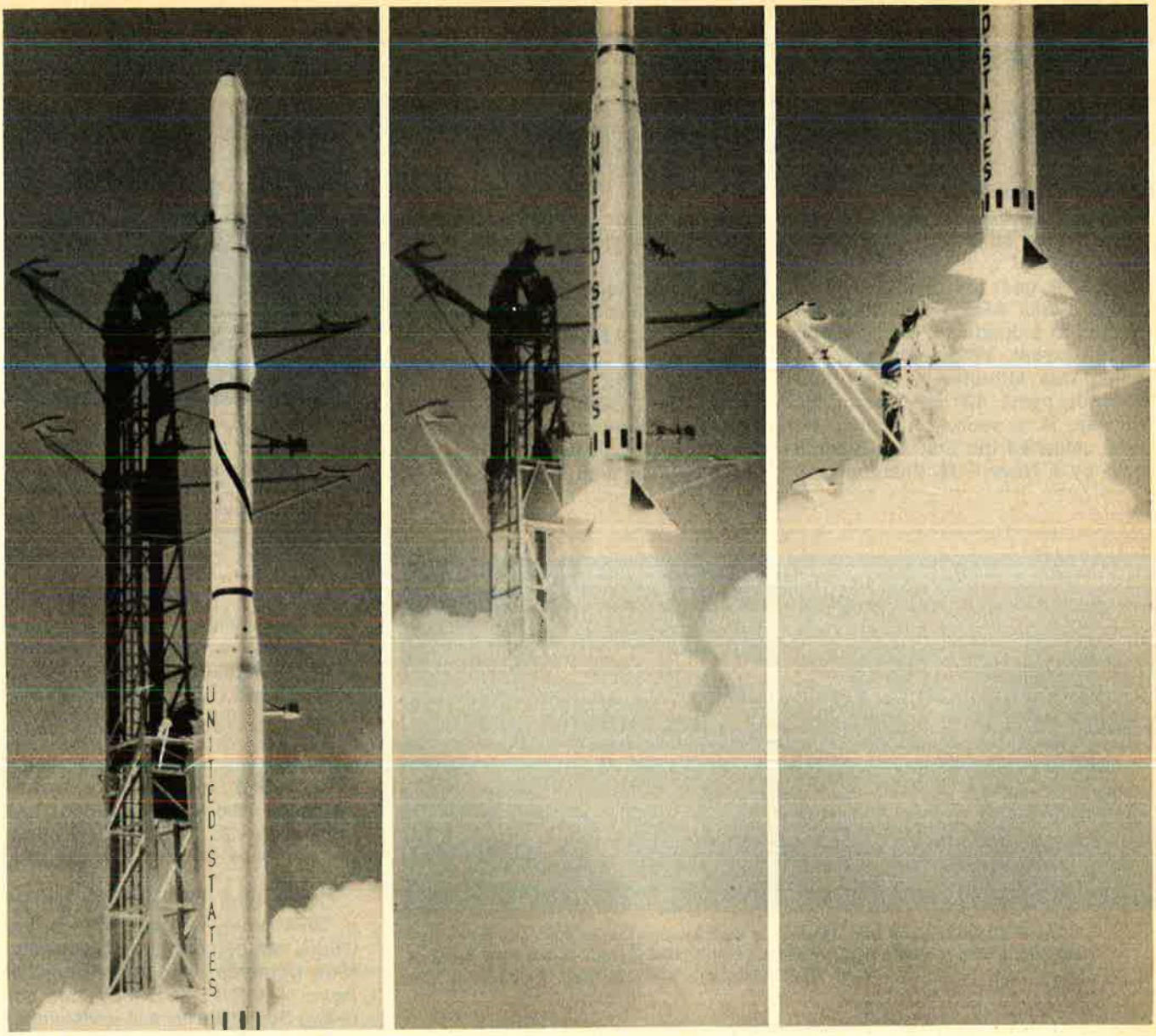
The Navy is investigating the spate of crashes.

☆

The Air Force has been active of late in putting the new F-15 Eagle through its paces. In fact, if the ex-



Artist's concept of the USAF/Grumman Aerospace Corp. EF-111A Tactical Jamming System aircraft. Grumman was picked over General Dynamics to qualify and test two prototypes. The plane is a high-performance replacement for the EB-66 in ECM support of tactical air forces.



The trustworthy Scout. Another successful launch would hardly be a long shot.

The Scout launch vehicle holds the NASA record for dependability.

It's certainly no surprise when another Scout is launched successfully.

Because since 1963, the four-stage, solid-propellant Scout has achieved an operational success rate of over 95 percent.

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These missions have supplied scientists with a potpourri of valuable information: From testing radioisotope thermoelectric generators to measuring ion densities to pinpointing the sources of X-rays and ultra-violet radiation in the atmosphere, the Scout continues to help get the job done.

This kind of proven dependability is why the Scout also serves France, Germany, Great Britain, Italy, the Netherlands and the 10-nation European Space Research Organization.

The stakes are too high to risk using anything else.

VOUGHT
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DALLAS, TEXAS

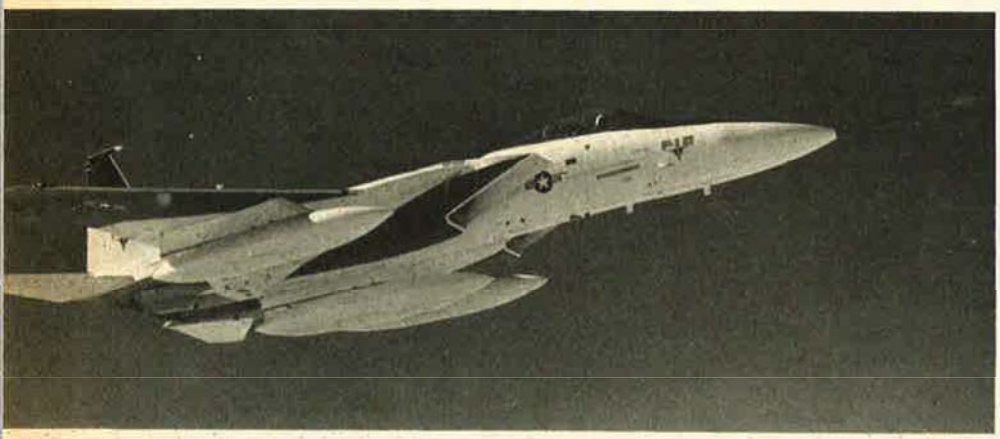
pected official recognition is forthcoming, an F-15 in January will have broken all eight time-to-climb flight records.

Special gear on the runway at Grand Forks AFB, N. D., held the aircraft at a dead stop until brought to full power. When released, the Eagle was airborne in about four seconds some 400 feet down the runway. In a series of flights, the F-15 smashed the first five records held by a Navy F-4B *Phantom* and about 4,000 pounds lighter than usual. Fuel was carefully rationed to provide just enough to fly the missions, which were planned exactly through computer analysis. No modification was done to the plane's two Pratt & Whitney engines.

☆

A hot fighter, the F-15, and almost every fighter pilot in the Air Force has requested it as his next assignment, USAF personnel managers report. This means fierce competition for the first available cockpits, they indicated.

The first TAC unit to receive the Eagle, the 555th Tactical Fighter Training Squadron, Luke AFB, Ariz., is to be responsible for F-15 pilot training. The first operational F-15 wing, set for activation at Langley AFB, Va., this July, will be equipped with Eagles beginning in January 1976.



The F-15, an aircraft that showed its stuff recently when it broke eight, count 'em, eight time-to-climb flight records. It hit 15,000 meters in just 77.5 seconds, vs. Navy Phantom's previous mark of 114.5 seconds.

the last three set previously by a Soviet MiG-25 Foxbat:

- To an altitude of 3,000 meters (9,843 feet), the old record was 34.5 seconds, broken by the F-15's 27.6 seconds.
- 6,000 meters (19,685 feet), 48.8 seconds, 39.35 seconds.
- 9,000 meters (29,529 feet), 61.7 seconds, 48.9 seconds.
- 12,000 meters (39,370 feet), 77.1 seconds, 59.4 seconds.
- 15,000 meters (49,213 feet), 114.5 seconds, 77.5 seconds.
- 20,000 meters (65,617 feet), 169.8 seconds, 122.5 seconds.
- 25,000 meters (82,021 feet), 192.4 seconds, 160.95 seconds.
- 30,000 meters (98,425 feet), 243.4 seconds, 207.6 seconds.

To set these new records, the McDonnell Douglas-built aircraft flew without such military gear as fire-control equipment and cannon. With paint also removed, the F-15 was

What are the chances of winning an F-15 assignment? Slim, at this point, according to Capt. Tom McKay, TAC career development officer. "The first thing to have is an up-to-date Air Force Form 90 showing choice of duty specialty as 1115M, code for the F-15," he said. Chances improve if a man currently in undergraduate pilot training is lucky enough to get an assignment in a tactical fighter weapon system, Captain McKay said. "Performance in fighter lead-in training will be especially important since it is there the new pilot training graduate will be identified for entry into F-15 training," he declared.

For other fighter pilots, experience and performance will make the difference, Captain McKay said.

The President's pilot, Air Force One's Lt. Col. Lester C. McClelland, moves over from the copilot spot to replace retiring Col. Ralph Albertazzi. Colonel McClelland is with the 89th Military Airlift Wing, Andrews AFB, Md.

FAC flying time will count. Extremely competitive will be the selection of senior fighter pilots as squadron commanders and operations officers.

☆

According to NORAD's space watchers, the Soviet Union has topped the US in successful satellite launches for the seventh year in a row.

Of the total 122 payloads put up in 1974, ninety-one belonged to the USSR, compared to the US's twenty. *(See Contents page of this special issue of* AIR FORCE *Magazine detailing Soviet aerospace endeavors.)*

The other satellites launched in 1974 were those of Great Britain, West Germany, Japan, Italy, the Netherlands, and Spain. Symphonie-A, a telecommunications vehicle, was sponsored jointly by France and West Germany.

NORAD's Space Defense Center, Cheyenne Mountain, Colo., noted that, since Sputnik-1 in 1957, the USSR has launched 885 space payloads, while the US has lofted 799 since its first launch in 1958.

The Soviet Union flew three manned orbital missions in 1974: Soyuz-14, -15, and -16. In February 1974, the US brought back the last crew to man the Skylab space station. They were launched in November 1973. Late in January 1975, the USSR activated the retrorockets aboard its orbiting Salyut-3 space station, causing its destruction as it entered the atmosphere above the Western Pacific Ocean.

Meanwhile, two Soyuz-17 cosmo-

This is what all the talk is about: the new Dataspeed®40 service from the Bell System.

Lots of people have been talking about our Dataspeed 40 data terminal. That's because one integrated design now includes a visual-display unit, a keyboard and a line-at-a-time impact printer.

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Dataspeed 40 service combines high-speed transmission with easy preparation and editing of data.

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Who built the high performance, compact radar for advance bases?

Israel Aircraft Industries did.

Today, most companies make most products as big and as powerful as possible. Which also tends to make them as costly as possible.

This leaves an urgent requirement for some other company to build smaller, adequately powered, highly reliable products to fill the gap. This is precisely what we do.

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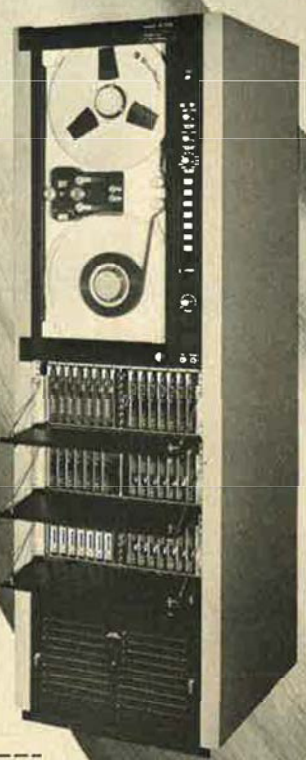

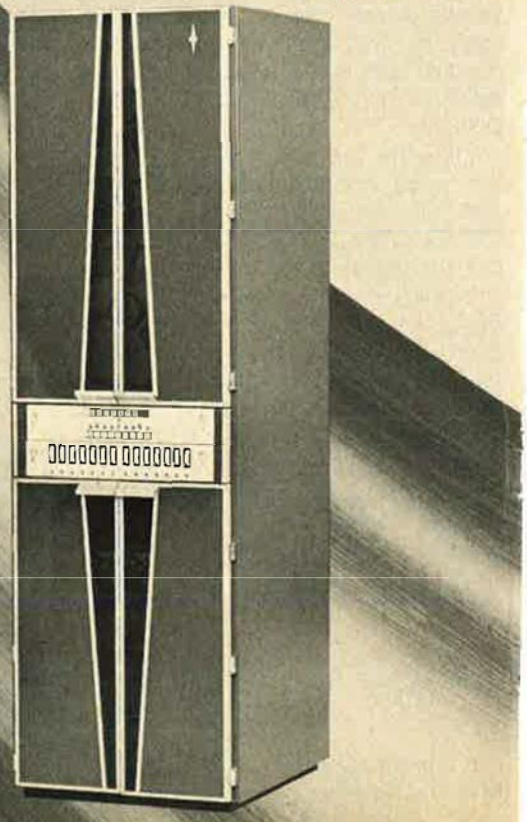

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nauts were busy with research aboard their Salyut-4 space station. There was speculation that Soviet Air Force Lt. Col. Aleksei Gubarev and Georgi Grechko, a civilian engineer, might try to best the record eighty-four days in earth orbit set by a US crew aboard Skylab-3 last year.

☆

The principal successor to the Atomic Energy Commission, the Energy Research and Development Administration, came into being on January 19, 1975. It is headed by former Air Force Secretary Dr. Robert C. Seamans, Jr.

ERDA has taken over federal energy research and development programs previously run by the Atomic Energy Commission, the Department of Interior, National Science Foundation, and Environmental Protection Agency.

These programs involve fossil energy, nuclear energy (including weapons development), solar, geothermal, and advanced energy sources, environment and safety, and conservation.

Funding for nuclear weapons development in the coming year is at about $1 billion, according to Dr. Seamans. He said that nuclear weapons development "came up for a great deal of discussion with the Congress and it was decided that it should be transferred to ERDA with the stipulation that the Secretary of Defense and the Administrator of ERDA would review this during the coming year and make recommendations for its final disposition."

ERDA will work closely with industry and the nation's universities, Dr. Seamans said, to advance the state of energy technology as well as devise techniques to more efficiently use energy sources currently available.

☆

The Air Force Avionics Lab, Wright-Patterson AFB, Ohio, has been experimenting with an airborne device that automatically detects man-made objects on the ground.

If the device proves out, it may add greatly to ground target acquisition capability and to reconnaissance photo interpretation.

The autoscreener, built by Honeywell, Inc., around an infrared line scanner, has demonstrated its ability to pick out more than ninety percent of the areas containing valid targets. An unaided photo interpreter is about one-third as effective, according to Air Force sources.

Tasks visualized for the new device:

- Helping ground-based photo interpreters quickly assess recce film by flagging areas containing man-made objects. (In fact, the autoscreener can be programmed to indicate specific types of target if necessary.)
- Allowing airborne operators to conserve high-resolution film by photographing only those areas containing likely targets.
- Turning a reconnaissance drone's camera system on and off as target areas dictate. (More advanced versions may be able to "help" drones find certain classes of targets such as vehicles without ground instructions.)

The autoscreener is relatively insensitive to changes in viewing conditions, officials said, and to variations in target and background. These are key factors in developing operational systems, they said. Though the current system is being tested with an infrared scanner, others using line scan or TV roster format in the IR or visible light regions are feasible, they said.

1908 A. Paul Fonda 1975

The victim of an auto mishap, Anthony Paul Fonda died in Washington, D. C., on January 31. He was sixty-six.

A Charter and Life Member of AFA, Mr. Fonda joined the Association in 1946 and held many posts through the years. He served sixteen terms on the Board of Directors, of which he became a permanent member. Mr. Fonda also was Regional Vice President, Central East Region, for four terms. He was a member of the Aerospace Education Foundation's Board of Trustees since the inception of the AFA affiliate in 1956. Mr. Fonda was awarded AFA's Medal of Merit in 1959 and its Exceptional Service Award for 1970.

Chief of Pilot Training at Army Air Forces Headquarters in the Pentagon during World War II, Mr. Fonda retired as a Reserve colonel in 1969. His military decorations included the Legion of Merit and Great Britain's Order of the British Empire.

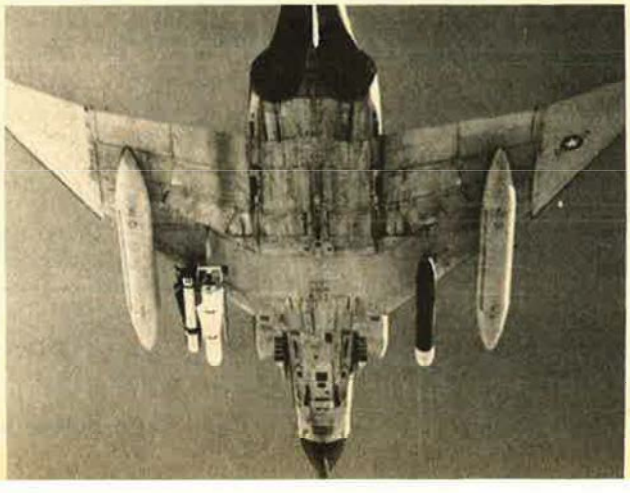
At his death, Mr. Fonda was a consultant for Northrop Corp., from which he retired in 1973 as Senior International Representative.

☆

NASA has begun testing the use of television as "eyes" for future aircraft and space vehicles.

One reason, the space agency said, is that "pilots of advanced performance aircraft, possibly with reduced window area and approaching at high angles of attack, may have their view of runways reduced during landing operations."

Also, TV may augment instrumentation for precise control of RPVs during flight, and may make



An F-4 carries the Scene Magnification Maverick (outboard missile under left wing) in flight test at Eglin AFB, Fla. Designated AGM-65B, a new optics system gives it increased range. Like basic Maverick, it is a TV-guided, rocket-powered, air-to-ground weapon.

Aerospace World

conventional landings of the unmanned craft possible, thereby "eliminating the need for parachute recovery or costly midair-recovery techniques," NASA said.

NASA's Flight Research Center, Edwards AFB, Calif., has put a TV camera atop a light aircraft and installed a television screen in the instrument panel, with a curtain rigged to restrict the test pilot's view through the windshield. Another pilot mans the right seat to provide a safety factor. The objective: to prove the feasibility of TV-only landings.

☆

In late January, a second Earth Resources Technology Satellite called Landsat-2 was put into earth orbit from Vandenberg AFB, Calif.

In the two and a half years Landsat-2's predecessor, ERTS-1, has been in orbit, it has returned more than 100,000 photos of earth's resources. Landsat-2 is also designed to help scientists study the earth and its crops, minerals, and environment, NASA said.

One job for the new satellite will be to survey wheat crop acreage in North America. This data, combined with that derived from weather satellites and ground stations, will indicate relationships between climatic patterns and crop yields over a period of time, the space agency said. The coverage eventually will be extended to other areas and other crops.

Some ninety-three research teams from the US and forty-eight other countries are to be involved in Landsat-2 experiments. Several nations will even build their own ground stations to monitor the resource satellites more conveniently.

Hughes Aircraft Co. and RCA Corp. built the imaging equipment aboard Landsat-2, which circles the globe fourteen times daily, and provides a new set of photographs of the entire earth every eighteen days.

☆

Two MAC pilots and a civilian balloonist recently in the news were named Harmon Trophy recipients.

Lt. Col. Edgar L. Allison, Jr., now retired, was selected in the 1973 Harmon Aviator Category. In 1972, he piloted an HC-130 Hercules from Taiwan to Scott AFB, Ill., nonstop and without refueling. The distance of 8,732 miles set a record for the longest flight by a turboprop aircraft in a straight line without landing.

Col. Edward J. Nash, recipient of the 1974 Harmon Aviation Trophy, at the controls of a C-141 StarLifter. Colonel Nash, currently Commander of the 62d Military Airlift Wing, was awarded a Harmon Trophy for airlift operations during the 1973 Mideast war, when 22,000 tons of supplies were flown to Israel in C-141 and C-5 transports.

Col. Edward J. Nash, currently Commander of the 62d Military Airlift Wing, McChord AFB, Wash., was winner of the 1974 Harmon Aviator Category. He served as mission pilot and prime airlift director in Operation Nickel Grass, during which 150 C-5 and 417 C-141 missions flew 22,000 tons of supplies from the US to Israel in the autumn of 1973.

Also named to a Harmon International Aviation Trophy was **Malcolm S. Forbes,** for his 1973 balloon crossing of the US. Mr. Forbes, along with Dr. Thomas Heinsheimer, was to attempt a transatlantic balloon crossing in early January 1975, but a malfunction aborted the flight. They plan to try again next December, when the jet stream is optimum.

☆

NEWS NOTES—While results of a three-year study now show that the SSTs are not weakening the high-altitude protective **ozone shield,** future expansion of stratospheric jet fleets should be carefully monitored, Transportation Department officials said. The US at this point **does not plan** to revive its SST, scrapped in 1971.

Capt. Lee R. **Scherer,** USN (Ret.), has been named **Director** of NASA's **Kennedy Space Center,** Fla., succeeding Dr. Kurt H. **Debus,** who retired. Captain Scherer previously was Director of NASA's Flight Research Center, Edwards AFB, Calif. ■

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AIR FORCE
MARCH 1975 MAGAZINE

Force modernization, new approaches to training, and closer coordination with the tactical commands of the other services are being stressed by the Tactical Air Command to boost tac air's effectiveness . . .

TAC'S FOCUS IS ON 'LEAN AND LETHAL'

BY EDGAR ULSAMER
SENIOR EDITOR, AIR FORCE MAGAZINE

'NATIONS, as they determine arms policies, should be viewed organizationally—as sluggish organisms, dominated by doctrines of contending bureaucracies that create major obstacles to the instituting of serious change."

This observation by Defense Secretary James R. Schlesinger has become the philosophical guideline of the Tactical Air Command under its Commander, Gen. Robert J. Dixon, who "discourages orthodoxy for its own sake and encourages creative, useful innovators and mavericks." His only caveat is that "my kind of maverick has to understand the system and bring about change without either wrecking it or himself."

TAC's emphasis on innovation, flexibility, and unreserved commitment to the Total Force policy, General Dixon told this reporter, is dictated by threats that are increasing and resources that are decreasing. It is imperative, therefore, to increase to the utmost the combat readiness and effectiveness of the command while holding operating costs and manpower to the lowest possible levels.

TAC's approach centers on two management tasks to meet the command's worldwide responsibilities. The first of these tasks, according to General Dixon, is to organize, equip, and train TAC's own or attached forces within the continental US and to maintain a reserve of combat-ready forces capable of rapid worldwide deployment and operations.

The second task is to create tactical capabilities—global in scope—that may be required in the future, and to do so both within TAC and in concert with other services and Air Force commands.

(The Commander of TAC serves also as the Commander in Chief of US Air Forces in both the Readiness and the Atlantic Commands. TAC's mission is to prepare forces for tactical

The versatile F-4, the mainstay of TAC's inventory, provides air-to-air as well as air-to-ground capabilities.

air operations, serving when so directed as the main force in the case of Atlantic Command and as a reinforcement agency in the case of Readiness Command.)

TAC people harbor no doubt that these two tasks are paramount. Secretary Schlesinger said recently that a strong conventional capability "is more than ever necessary [as strategic parity between the US and the USSR makes full-scale nuclear war unlikely], not because we wish to wage conventional war, but because we do not wish to wage *any* war."

General Dixon believes that a principal first step toward fulfilling the command's mission is to review all its tactics, concepts, and requirements "and take them apart, examine them closely, decide what's right and what isn't, and reassemble them to get the right priorities, goals, and standards." Joint operations with other services, modernization, force mix, and training and combat readiness are "our foremost worries," according to the TAC Commander.

In its primary aspect, the importance of training to combat readiness is obvious and well understood; what is less well understood is that the efficiency, speed, and nature of the training process decisively affect the size of the combat-ready forces.

Not counting the combat forces of PACAF, which TAC is to absorb, the command is made up of the equivalent of 14⅓ wings of aircraft. Because of post-Vietnam adjustments and the necessity to absorb and train younger pilots, the equivalent of 7⅓ of these wings is committed to training the constant flow of new aircrews into the combat-ready units of TAC, PACAF, and USAFE. Three of these training wings, categorized as replacement training units, can be restored to fully combat-ready status in a short time if the aircrew replacement task permits. All of these units have the ancillary mission of air defense against a direct attack on the United States.

Training Innovations

The command is placing great emphasis on increasing the ratio of combat-ready forces to training units, General Dixon said. (This concern with reducing training units not immediately available for combat and boosting the military "teeth-to-tail" ratio is one of DoD's and USAF's most pressing concerns.) The resultant challenge is enormous. TAC is using three principal tools to "reduce course length and flying hours while maintaining or increasing our training quality," according to General Dixon.

The first step, in a chronological sense, is to emphasize self-paced, computer-controlled, classroom instructions. The second tool is the ground-based simulator, which is being used more extensively and with greater sophistication than in the past. The third element is "lead-in training" of fighter pilots, which can compress training by between fifteen and twenty percent.

Lead-in training provides graduates of the Undergraduate Pilot Training program initial instruction in fighter-attack tactics using T-38 trainers rather than in F-4s, F-111s, or A-7s

USAF recently placed an order for seventy-one F-5E Tiger II aircraft (above) that are to be used for dissimilar air combat training. TAC's Aggressor Squadron currently uses T-38s (left) to simulate Soviet fighter aircraft.

(or A-10s, F-15s, or ACFs in the future). The training includes both air-to-air and air-to-ground tactics. Its basic advantage, according to General Dixon, is that the trainees learn the fundamentals of combat flying in an aircraft with which they are already thoroughly familiar. In the past, all tactical flight training involved combat aircraft, with the result that the student had to learn to fly a new airplane and fighter tactics at the same time.

Planned improvements in flight simulators combined with other changes in aircrew training, according to the TAC Commander, could result in a twenty-five percent reduction in flying time by FY 1981—a DoD goal—without impairing proficiency. (TAC's flying time in the current fiscal year totals more than 696,000 hours, of which about sixty-five percent is allocated to initial training and the balance to continuation training.)

In the past, simulator training was handicapped because these systems lacked the ability to duplicate contact flying. As a temporary mea-

TAC Commander Gen. Robert J. Dixon stresses that USAF must "offset our numerical inferiority [by] higher kill ratios, greater sortie rates . . . and more efficient command and control."

sure, TAC is renting time on simulators developed by aircraft manufacturers to simulate air combat for aircraft design purposes, but by mid-1975, TAC will have sophisticated, air-to-air and air-to-ground visual simulators in operation. As an example, the TAC Commander pointed out that the comprehensive use of simulators could eventually cut the A-10 training program by about 57,000 flight hours annually, save about 25,000,000 gallons of jet fuel, and increase airplane life expectancy by about eight years.

Streamlined Continuation Training

General Dixon told AIR FORCE Magazine that to enhance current capabilities, TAC is shifting emphasis in its unit training programs. The command is moving from generalized toward specialized training by focusing more on NATO requirements than in the past. The change, General Dixon explained, focuses on the need to do better with less flying time. Part of the force has, because of aircraft design, concentrated on the air-to-ground task. In the past, however, training in the F-4 had been about evenly divided between air-to-air and air-to-ground training. But now, F-4 wings are designated as either primary air-to-air or air-to-ground. In these units, some sixty-five percent of the training is directed to the primary mission.

A key influence in reshaping TAC force employment and training is the lessons learned by the Israeli Air Force during the October 1973 war—lessons that are generally applicable to high-threat environments. TAC's assessment of the Yom Kippur War led to several independent conclusions:

- Tactical air forces must devote significant resources to suppression of enemy air defenses to avoid high losses in sustained tactical air operations.
- Innovative tactics and deployment are the keys to success and survival in a high-threat environment and are predicated on flexible, clever use of command and control, ECM support jamming, integrated drone operations, deception, and early use of antiradiation missiles against enemy radars.
- The overriding requirement is for highly trained and experienced aircrews without whom innovative tactics can't be implemented.

An additional factor, peculiar to Europe, is the increased emphasis the Soviets and the Warsaw Pact nations put on aircraft shelters, dispersal, decoys, and camouflage, as well as the development of intensive air defense networks. As a result, it will be more difficult to destroy large numbers of enemy aircraft on the ground. These developments contribute to TAC's increasing emphasis on air-to-air combat training.

A key to air-superiority training is DACT, or dissimilar air combat training, a program that was conceived late in the Southeast Asia war when USAF kill ratios dropped off alarmingly. DACT's basic purpose is to train aircrews against types of aircraft whose performance characteristics resemble those of enemy fighters. For this purpose, the Tactical Air Command two years ago formed a so-called Aggressor Squadron flying T-38s (*see "Teaching Tactics in TAC's 'MiGs,'" March '74 issue*).

While the T-38 with its small size and tight turning radius provides useful simulation of MiG tactics, increased performance is needed to better simulate Soviet fighter aircraft. Beginning early next year, therefore, TAC plans to upgrade its DACT program to two squadrons of F-5Es, to provide more effective simulation of MiG-21s. The F-5Es will have inert AIM-9 missiles and gunsight recording equipment to permit realistic engagements and assessments.

Comprehensive use of simulators, TAC planners believe, could eventually cut the A-10 training program by about 57,000 flight hours annually and, at the same time, reduce USAF's fuel consumption and prolong the airplane's life.

TAC's training exercises often involve crews and aircraft from other Air Force commands, such as the Aerospace Defense Command, and from the US Navy. "We conduct dogfights between Air Force and Navy aircraft and are able to learn from each other," General Dixon said.

A fundamental element of TAC training is electronic warfare, which is vital to all air operations. The command operates three Electronic Warfare Range complexes: Nellis in Nevada, Luke in Arizona, and Avon Park in Florida. The Nellis EW range is used for aircrew training in Wild Weasel aircraft, whose mission is to detect, identify, locate, and destroy enemy air defense systems. (Wild Weasel aircraft at present are the F-105 and the F-4C, but a follow-on system is being developed utilizing the F-4E.) Other EW training includes tactics against surface-to-air missiles, AAA, acquisition radars, and ground-based jammers. TAC's EW ranges can simulate realistic, flexible, high-threat EW environments.

The Changing TAC Structure

On December 1, 1974, the Air Force consolidated all airlift functions under the Military Airlift Command, transferring some 14,000 personnel and 231 C-130 aircraft from TAC to MAC. At the same time, that command also gained control over the Air Reserve Forces' tactical airlift, involving about 24,000 people and 314 C-130s, C-7s, and C-123s. While MAC exercises command and day-to-day operational control over tactical airlift, TAC continues to be responsible for tactical air doctrine and, through the Readiness Command, will exercise operational control over tactical airlift, as will theater air commanders, when appropriate.

Last December, the Department of Defense also announced its approval of Air Force recommendations to revamp the organizational structure in the Pacific, subject to congressional approval after review this spring. In this plan, Hq. PACAF would be disbanded and replaced with an air component organization. TAC would exercise command, but not operational control, of Pacific tactical air forces through the Air Component Commander. The Air Component Commander would continue to be responsible to CINCPAC for operational matters and would have operational control of the tactical air forces in the Pacific.

TAC's responsibilities would include maintaining bases and facilities, training, and reinforcing tactical air forces in the Pacific during crises. Under this structure, no basic changes in the mission of the tactical air forces in the Pacific are planned. When the recommended disestablishment of PACAF occurs, TAC's total manpower is expected to increase from about 78,000 to some 118,000.

TAC Goes to Sea

In consonance with DoD's emphasis on total force, TAC is increasing its ability to support the other services. In the case of the Navy, TAC is intensifying sea surveillance operations and, in concert with the Air Staff, developing doctrines for monitoring maritime activities for the National Command Authorities and tactical commanders, and for support of Navy offensive and defensive operations. Individual TAC units

Central element of all TAC planning is force modernization oriented toward both greater effectiveness and lower operating costs. The F-15, shown above, along with such aircraft as the Air Combat Fighter and the A-10, meets these criteria.

are flying training sorties in sea surveillance, covering the East, West, and Gulf Coasts of the US, using side-looking radar, conventional radar, infrared systems, and a number of optical devices.

In addition, General Dixon explained, sea surveillance-related training and requirements concerning NATO are being reviewed by the command with the Navy, USAFE, the RAF, and other agencies. TAC's ability to intercept, identify, and photograph naval vessels, using F-111 and RF-4 aircraft, was again demonstrated late in 1974.

In an effort to extend wartime cooperation to peacetime readiness training and planning for future operations, TAC and the Army's tactical components are engaged in continuing cooperative efforts. A milestone in joint operating procedures between the Air Force and the Army was reached with the formulation and promulgation of joint airspace management rules, published as a manual in mid-1974 and to be tested for the first time in this year's Gallant Shield and Reforger joint exercises. These rules were agreed upon between TAC and the Army's two tactical components—the Training and Doctrines Command (TRADOC) and Forces Command (FORSCOM)—then reviewed by the chiefs of both services and presented to the Chairman, JCS, and the Secretary of Defense.

Joint working groups, drawn from TAC and its US Army counterpart, TRADOC, are rewriting tactical doctrines, including the operation of remotely piloted vehicles (RPVs).

The manual stipulates that the Air Force component commander (AFCC), as executive agent for the Joint Force Commander in a given theater of operations, acts as the area air defense commander and area airspace management authority. Utilizing the facilities of both services, the AFCC will operate a single airspace management system to enhance the combat capabilities of theater forces. The joint accord specifies the communications requirements to tie all air defense weapons, including the Army's hand-carried Redeye, into an integrated system, and coordinates operating altitudes to reduce interference between rotary-wing and fixed-wing aircraft through the establishment of so-called minimum risk routes (MRRs), which will help low-flying tactical aircraft avoid artillery fire.

Other areas affecting joint operations with the US Army are still being probed by joint TAC-TRADOC working groups. They include coordination of tactical air reconnaissance, electronic warfare forces, air logistics (which now includes the Military Airlift Command), and the operation of remotely piloted vehicles (RPVs) by the two services.

Force Modernization

Central to all TAC's planning, General Dixon pointed out, is force modernization. Rather than trying to match the Soviet aircraft inventory numerically, "We must offset our numerical inferiority with technology expressed in a higher kill ratio, greater sortie rate, improved survivability, and more efficient command and control." The challenge becomes more difficult as the sophistication of Soviet weapon systems—demonstrated so dramatically during the Yom Kippur War—increases at a rapid rate.

The Commander enumerated key tenets that guide TAC's force modernization plans:

- All-weather, multimission-capable aircraft are needed, together with numbers of specialized aircraft in a judicious hi-lo cost mix.
- Training specialized aircrews provides a maximum return on limited training resources.
- Constant attention to the threat and the force structure is required to ensure that "we establish effectiveness in the future. TAC's approach is to take advantage of user and test experience, analytical efforts, and technological opportunities. These inputs are used to formulate employment concepts for integration of both current and future systems to provide a better view of future needs and to formulate a clear rationale to support development and production decisions."
- In force planning, there is the imperative need to look "far ahead, ten years or more, because our vision must extend beyond the long lead times of weapon system development." At the same time, during this era of limited budgets, "We simply can't afford to make costly mistakes or overlook any opportunities."

"Technology," General Dixon stressed, "controlled to assure reliability and simplicity, offers the best way to reduce cost and increase effectiveness. In building tomorrow's tac air capabilities, we at TAC plan to act as members of the corporation, as team players of the Total Force Policy, involving not only all other agencies and commands, including the Guard and Reserves of the Air Force, but the other services and allied forces." ■

The magnitude of Soviet aerospace forces is blurred by organizational arrangements that differ considerably from those of most Western nations. Soviet aerospace doctrine, explicit in the employment of nuclear weapons, is little appreciated by most Westerners. The author, a former US Air Attaché in Moscow, describes both in this discussion of . . .

SOVIET AEROSPACE FORCES AND DOCTRINE

THE SOVIET Union's aerospace forces are manned and organized completely differently from their counterpart forces in the United States. Just as important, they operate on different doctrinal concepts.

Instead of the customary land, sea, and air organizational pattern, the Soviet Ministry of Defense has five services: Strategic Rocket Forces, Ground Forces, Troops of National Air Defense (PVO), Air Forces, and Navy. The United States Air Force performs the same role as do two and one-half of these Soviet services—the Strategic Rocket Forces, Air Forces, and the fighter-interceptor and radar portion of the Troops of National PVO. Therefore, a simple comparison of the USAF and Soviet Air Forces would have little meaning.

The Soviet Armed Forces

To place the Soviet aerospace forces in perspective, something first must be said about the Soviet Armed Forces as a whole.

In addition to the five services noted above, the Soviet Armed Forces also include the Troops of Civil Defense, Troops of the Committee of State Security (KGB), and Troops of the Ministry of Internal Affairs (MVD). The five services receive logistical support from the Tyl (rear services), which operate directly under the Ministry of Defense. There are also other Ministry of Defense forces, such as construction troops who build airfields and the like.

The total number of military personnel comprising the Soviet Armed Forces is between 4,500,000 and 6,000,000.

The Troops of the KGB and MVD are not a part of Marshal Grechko's Ministry of Defense. Rather they are subordinate to their respective headquarters. One segment of the KGB troops is very important to the Soviet aerospace forces. Special troops of this organization guard and control the Soviet stockpiles of nuclear weapons. KGB troops also provide high-level communications between the Party leadership and the military forces, as well as certain communications within the Ministry of Defense. Hence, when one considers the release of nuclear weapons to Soviet aerospace forces, as well as other aspects of command and control, the KGB troops are a significant factor.

Identification of the various services and supporting troops of the Soviet Armed Forces often is difficult, and at times completely impossible. Personnel in the Air Forces, Navy, and Ground Forces have distinctive uniforms. Airborne troops wear the same color uniforms as the Air Forces; only the insignia are different. Troops of National PVO, if in surface-to-air missile units, wear the same color uniform and insignia as rocket troops and artillery of the Ground Forces. If such troops are in the flying elements of PVO, they wear the same uniform as the Air Forces. General officers in the Strategic Rocket Forces come from all services and apparently continue to wear the same uniform and insignia as of their previous service. The Soviet uniform policy appears designed in part to conceal the identity of individuals assigned to a particular service.

Tasks and Roles

According to Soviet military doctrine, the nation's Armed Forces have four major tasks. They must be prepared to conduct:

- Nuclear rocket strikes;
- Military operations in land theaters;
- Defense of the country from nuclear rocket strikes;
- Military actions in naval theaters.

Nuclear rocket strikes: The rapid and continuous growth of the Soviet strategic forces is consistent with the fact that this task always is listed first in Soviet literature. Soviet writers refer to the strategic nuclear forces as consisting of "the Strategic Rocket Forces; long-range, rocket-carrying aviation; and atomic submarines carrying ballistic nuclear-armed missiles." Planning nuclear rocket strikes is considered the primary task of Soviet military strategy.

Military operations in land theaters: This is listed as the second-priority task, accomplished primarily by the Ground Forces and frontal aviation elements of the Air Forces. Naval units provide support in coastal areas. Operations in land theaters can be either nuclear or non-

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

—Tass Photo

Soviet military pilots, photographed at Moscow on Air Fleet Day, August 18, 1974. From left to right they are Senior Lt. A. Gunko, Majs. G. Zadvinski and V. Markin, Capt. V. Pluzhnik, Lt. Col. G. Lalaev, and Capt. A. Kundryavtsov.

nuclear. All personnel are trained, and equipments are designed, for a nuclear war environment.

Defense of the country from nuclear rocket strikes: Failure of the Soviet ABM in the latter part of the 1960s apparently did not change the priority listing of this task. Instead, even greater emphasis was given to the massive civil defense program. The chief of Civil Defense became a Deputy Minister of Defense. Help from the Strategic Rocket Forces in "frustrating" a nuclear attack would supplement civil defense measures. That portion of PVO providing protection against attack by manned aircraft continues to receive high priority.

Military actions in naval theaters: This is the task of the Soviet Navy's surface fleet, submarines other than those carrying ballistic missiles, and naval bomber and reconnaissance aircraft. Until the latter part of the 1960s, Soviet naval strategists emphasized the importance of denying sea communications to an opponent. As the strategic nuclear balance shifts toward the Soviet side, providing a nuclear umbrella for foreign adventures, increased attention is given to the use of sea lanes for establishing a Soviet military presence abroad.

The Soviet Ministry of Defense and the General Staff

It is apparent that this assignment of tasks, which does not necessarily follow service lines, demands a centralized command structure. This is provided by the Ministry of Defense and the General Staff.

Marshal A. A. Grechko, the present Soviet Minister of Defense, occupies a position that, in rough approximation, combines the responsibilities of the US Secretary of Defense and the Chairman of the US Joint Chiefs of Staff. He achieved additional status in April 1973, when he was promoted to full membership in the sixteen-man Politburo, the supreme Soviet decision-making body.

Second in the Soviet military hierarchy is the Chief of the Warsaw Pact Forces. This office has no counterpart in the United States. The nearest equivalent perhaps would be the Supreme Allied Commander of the NATO Forces (SACEUR).

Ranking number three in precedence is the Chief of the General Staff. Some of the functions of this office resemble those of the Joint Staff in the Pentagon, but with major differences. The Joint Staff, essentially, considers views of the three US services and seeks a compromise. The Soviet General Staff, on the other hand, is a general staff of the type found in pre-World War I and II Germany. Major military decisions in the Soviet Union are made by the General Staff, with the staffs of the five Soviet services having less authority than do the services in the United States.

Interaction of the Party, Industry, and the Military

The Soviet Armed Forces are the military arm of the Communist Party of the Soviet Union (CPSU). Senior military leaders are members of the Party's Central Committee, creating an intermarriage between the Party and military hierarchies. There is no evidence of major policy conflicts on military matters between these two intertwined groups.

How has the Soviet Union, an underdeveloped nation in many respects, produced the sophisticated weaponry of the aerospace age? The military sector of the Soviet economy absorbs the best scientific, technical, and management brains in the Soviet Union, and receives first priority on resources. The Soviet Party-military-industrial complex has no counterpart in Western nations. Senior aircraft designers, such as the late General Colonels Tupolev and Mikoyan, or the present General Colonels Yakovlev and Ilyushin—designers of aircraft such as the Tu-16, MiG-25, Yak-40, and Il-62—are not only aircraft designers, but industrialists and general officers as well. They produce both military and commercial aircraft. They also have served as Deputies of the Supreme Soviet.

Emphasis on the development of nuclear weapons, missiles, and other advanced weaponry probably comes from top Party leaders as well as from military leaders and the aerospace industries. For example, the Party's General Secretary, Leonid Brezhnev, is a graduate engineer. He was on active duty as a general lieutenant in 1954, serving as Chief of the Political Administration of the Navy. Later in the year, he was sent to Kasakhstan, and became the First Secretary of the Communist Party in that area. In 1957, he was charged by the Central Committee to apply himself to the questions of developing heavy industry and supplying the Armed Forces of the country with new combat equipments and for developments in space.

Another Party expert in military affairs is D. Ustinov, Candidate Member of the Politburo and Secretariat member. Known as a production genius and the munitions czar of World War II, he currently is concerned with armaments production. It is not known whether or not his rank of general colonel is still active.

This centralization of Party, industrial, and military leadership provides for the rapid development of new weaponry and changes in commitment of forces. Only

during World Wars I and II have the Western nations had such a concentration of political-military-industrial power. The Soviet peacetime structure is in considerable contrast to the decision-making bodies that are found in the United States and in other NATO nations.

With this brief overview of the Soviet Armed Forces as a whole, the Soviet aerospace forces—roughly the equivalents of the USAF—will be examined in somewhat greater detail.

The Strategic Rocket Forces

The Strategic Rocket Forces—literally, the Rocket Troops of Strategic Designation (*Raketnyye Voyska Strategicheskovo Naznacheniya*)—are widely publicized in the Soviet news media. In the press, radio, and on television, this force is listed first, ahead of the other four services. The commander in chief of the Strategic Rocket Forces always takes precedence over the other service commanders in chief, regardless of actual rank. It is seldom, however, that so much has been written about a subject, and so little actually revealed to the outside world. Even some of the Soviet negotiators during the SALT discussions are reported as not knowing the characteristics, designations, or numbers of their own strategic missiles.

Once each year, the Soviet leadership parades certain of its missiles through Red Square, to be viewed by foreign diplomats, military attachés, foreign newsmen, and selected Soviet citizens. The photographs of Soviet missiles appearing in the foreign press generally are taken during the annual parades. Security with respect to the Strategic Rocket Forces is so tight that even the identification of its personnel is kept secret, except for a few members of the senior staff.

It already has been noted that personnel of the Strategic Rocket Forces do not have distinctive uniforms. To the civilian, or even another member of the Soviet Armed Forces, they cannot be distinguished from the members of the Soviet Ground Forces or the Troops of National PVO.

The author, Col. William F. Scott, USAF (Ret.), has twice been US Air Attaché in Moscow, a position from which he retired in late 1972. He has since visited the USSR and met with leading Soviet theorists. Colonel Scott is a West Point graduate and was a bomber pilot in World War II. He has served at the Air University, on exchange duty with the Department of State, and in planning assignments at Hq. USAF. Colonel Scott holds a doctorate in Soviet studies and since his retirement has been a consultant on Soviet military affairs.

—Tass Photo

This An-22 heavy transport crew had just set a record for flights with a load of 30,000 kg. The aircraft commander, S. Dedukh, is in the center.

Camouflage and National Technical Means of Inspection

Both the Soviet press and TV coverage show how rocket units are concealed so that any chance observer would never suspect that intercontinental ballistic rockets are placed in an area. Soviet books that one would normally consider authoritative and fairly responsible, at least factually, emphasize this theme. For example, the 1971 *Soviet Officer's Handbook* states: "It is easy to disperse and camouflage them [ICBMs] on the terrain. Large launch areas are not necessary for their launch. They also can be mounted on mobile launchers."

SALT I agreements are verified only by "national technical means of inspection," to use the language of this agreement, and without on-site inspections of any kind. Soviet claims of the security and secrecy of their missile force make for disquieting reading.

> In our press it has be noted that we place our rocket equipment so that double and triple duplication was ensured. The territory of our country is huge, and we are capable of dispersing rocket equipment and concealing it well. We create such a system that if some means intended for striking a counterblow are taken out of commission it is always possible to place into operation duplicative equipment and to strike the target from reserve positions.

Strategic Rocket Forces in an Aerospace Defense Role

The third task of the Soviet Armed Forces is to provide for the "defense of the country against nuclear rocket strikes." According to Soviet military doctrine, the Strategic Rocket Forces have a significant role to play in protecting their country from such nuclear attack. Soviet spokesmen assert that in "repulsing the strikes of the enemy . . . the Strategic Rocket Forces will render significant help to the Troops of National PVO."

Other Soviet authors express a somewhat similar view. For example, one spokesman asserts that "the Strategic Rocket Forces are able to frustrate a surprise nuclear attack by the enemy." Another writes that in war, "the central place now is occupied by the destruction of means of nuclear attack and weakening the nuclear power of the defenders. This is achieved by forestalling the enemy in carrying out nuclear and firepower strikes." And according to the famed Marshal of the Soviet Union V. D. Sokolovskiy, editor of *Military Strategy*:

> Along with the increased possibilities for surprise attack, the possibilities are growing for the timely detection not only for the beginning of an attack *but also of the beginning of the direct preparations by the enemy* of an attack, that is, there are possibilities of *preventing a surprise attack.*
>
> The beginning period of nuclear rocket war, in our opinion, consists of the segment of time from the moment of the breaking out of war to the fulfillment of the basic military, political, and strategic tasks. Making a retaliatory nuclear strike is its main content, one which might be *directed at frustrating a nuclear attack,* disorganizing government and military administration, and destroying the economy and armed forces of the aggressor. [Emphasis added.]

It sometimes is argued in the West that statements

National Air Defense (PVO) troops with an SA-2 surface-to-air missile. The PVO is believed to have about 9,800 SAM launchers at some 1,650 sites.

such as these are for external consumption only, to impress other nations with Soviet nuclear-rocket capability. This view does not stand close scrutiny. The books and journals in which these statements appear are on sale throughout the Soviet Union. They can be found from Leningrad to Nakhodka, from Murmansk to Alma Ata—in railroad stations, bookstores, and street kiosks. These same views also are reflected in television programs throughout the Soviet Union. In actual fact, a close study of these writings—in publications intended for various levels of the Soviet Armed Forces and the Soviet civilian community—indicates that they are for internal consumption, to help prepare the nation for the possibility of a nuclear-rocket war.

The Revolution in Military Affairs

The Strategic Rocket Forces were formed in 1959. Veiled references to the existence of this force were made in 1960 by Khrushchev, but it was not certain that a new service had been created. In October 1961, in his address to the XXII Party Congress, Marshal Malinovskiy, then Soviet Minister of Defense, made specific references to the Strategic Rocket Forces as a new service. Soviet spokesmen assert that the formation of this force was demanded by the revolution in military affairs, a revolution brought about by the introduction of nuclear weapons and ballistic missiles. As a result of this revolution in military affairs, the very nature of war was changed:

Shown above is the heavy concentration of Soviet aviation units around the periphery of the country. The USSR also has about 3,000 combat aircraft deployed in the territory of the Warsaw Pact countries, adjacent to NATO.

Strategic maneuver in the last war occurred when troops and equipments for one strategic direction or theater of combat operations transferred to another by train or automotive transport. . . . But a decisive means of war, strategic maneuver, today . . . can be defined as moving forces from one strategic direction or objective to another, mainly by means of retargeting nuclear rocket strikes.

Weapons and Personnel

Land-based ballistic missiles with ranges greater than 1,000 kilometers are assigned to the Strategic Rocket Forces. Those surface-to-surface missiles with lesser ranges are under the rocket troops and artillery arm of the Soviet Ground Forces. Weapons of the Strategic Rocket Forces such as the SS-9, SS-11, and SS-13 are well known, and newer rockets such as the SS-16, SS-17, SS-18, and SS-19 are reported to be in the testing or deployment phase.

Strength of the Strategic Rocket Forces is reported to be approximately 350,000 men. These troops are the elite of the Soviet Armed Forces. Before being assigned to a Strategic Rocket Forces school, officer recruits must be endorsed by the local military commissariat, a screening process not required by the other services. Both officer and enlisted personnel who have been specifically identified with the Strategic Rocket Forces appear to have been selected more carefully than those personnel observed in the other services of the Soviet Armed Forces.

In the words of Soviet Party-military spokesmen, "the military power of a nation now is determined by the quantity and quality of their nuclear weaponry and the means of their delivery." This basic tenet of Soviet military thought is reflected in the position the Strategic Rocket Forces of the Soviet Union holds within the Armed Forces of that nation.

Troops of National PVO

As previously noted, the Troops of National PVO rank number three in precedence among the Soviet services, following the Strategic Rocket Troops and the Ground Forces. This may seem incongruous in the United States, in view of the declining support given to NORAD and the Aerospace Defense Command. Aerospace defense in the Soviet Union, despite the age and reduced numbers of SAC's aircraft and the temporary failure of the Soviet ABM system, has not diminished in scope over the past two decades.

Troops of National PVO were separated from the Ground Forces in 1948, with a commander in chief first designated in 1954. By 1949, hundreds of MiG-15 aircraft were reported to be in operational units, exceeding in numbers the F-86, a comparable USAF aircraft. In the mid-1950s, the first ground-to-air (SAM) missile system, the SA-1, was deployed around Moscow. Sites for these missiles, in two concentric rings, can be seen easily even today by tourists flying in and out of the Soviet capital. In the 1957–58 period, an improved SAM system, the SA-2, was deployed throughout the Soviet Union, in greater numbers than anticipated by the United States.

Two new components of PVO were mentioned with increasing frequency in the mid-1960s. One, PKO—*protivo kosmicheskaya oborona* (anticosmic defense force)—is described as "a component part of air defense (PVO), designed for destroying the enemy's cos-

The sixteen military districts shown above are roughly comparable to US joint commands. Soviet frontal aviation units (comparable to US tac air units) are assigned to the military districts. In addition to the military districts, there are four "groups of forces" based in the Warsaw Pact area. The two primary Air Defense Districts are at Moscow and Baku.

mic means of fighting which are being used for military purposes [in the capacity of a carrier of nuclear weapons, for carrying out reconnaissance, and so forth] in their flight orbits." The second, PRO—*protivo raketnaya oborona* (antirocket defense force)—also is considered "a component part of PVO, designated for detecting, intercepting, and destroying enemy ballistic rockets in the trajectory of their flight and creating jamming for them."

Space and Missile Defense

As NORAD's Aerospace Defense Command maintains BMEWS and other detection and warning networks, PVO has huge radars for the same purpose. By 1964, such radars could be seen by tourists driving either from Moscow to Leningrad, or from Moscow to Warsaw.

In 1965, after an agreement was reached with the United States that bombs would not be placed in orbit, references to PKO were quietly dropped. Also, after 1968, references to PRO became less frequent. It was about this time that the Soviets were preparing to enter into SALT negotiations, a circumstance probably influenced by the fact that any ABM system, based on the then-current state of the art in the USSR, would be ineffective against SAC's reentry vehicles.

Antiaircraft Defenses

PVO's antiaircraft element is divided into three major components: surface-to-air rocket troops, interceptor aviation, and radar. The interceptor-aviation and radar portion roughly corresponds in mission to the USAF segments of NORAD.

There are two known primary PVO districts—Moscow and Baku. These are major headquarters, with elaborate facilities. Vague references have been made to other PVO areas, but headquarters and subordination are unknown. Generally, PVO units in the remainder of the country are called "formations" or "larger formations."

Since at least 1969, the PVO forces of the Eastern European nations have been included as a part of the Soviet Troops of National PVO, under command of Marshal of the Soviet Union P. F. Batitskiy.

Interceptor aviation in PVO has kept pace with SAM developments. The MiG-21 initially was developed as an interceptor. The MiG-25 (Foxbat) was developed as a defense against any possible bomber force of China or the NATO nations.

Great stress is placed by the Soviet leadership on the antiaircraft component of PVO. Many Soviet cities are within flying range even of tactical aircraft that could carry nuclear bombs. Bomber forces of the United States and Great Britain have the capability of covering the entire Soviet Union.

Despite rhetoric on the part of the Soviet leadership about the military threat posed by "the imperialist nations, headed by the United States," China is a major concern to the Troops of National PVO. Even should agreements be reached with the "capitalistic powers" on numbers of bomber aircraft, the Soviet Union still would require a sizable defense against manned aircraft along her eastern and southern borders.

Civil Defense

Failure of the Soviet Union to deploy an effective ABM in the late 1960s and early 1970s had major repercussions. To compensate for the lack of an ABM, increased attention is being paid to civil defense. One might well argue that the ABM failure was a major event that induced the Soviets to join in discussions on limitations on nuclear weaponry, and to support the current "détente."

This *third role* of the Soviet Armed Forces—defense of the country from nuclear rocket strikes—has not diminished in importance as a result of SALT or other international negotiations. Security of the homeland lies at the base of Soviet foreign and military policies. Marshal Grechko emphasized in mid-1974 that civil defense is a factor of strategic significance. Antiaircraft defense, with interceptor aircraft and SAM missiles, offers protection against any air-breathing threat. Until an effective ABM is developed, defense against the missile threat must be dependent upon the Strategic Rocket Forces' ability to "frustrate" a nuclear attack before it is launched, and upon a viable civil defense program to reduce casualties.

The Soviet Air Forces

What is now the Soviet Air Forces began in 1917. Over the years, its airmen acquired combat experience in many parts of the world. In the 1930s, the Soviet Air Forces provided "volunteer" pilots to fight in Spain and China. The largest air battle to take place between World Wars I and II was fought in Outer Mongolia in August and September 1939, only weeks before Hitler's invasion of Poland started World War II. More than 1,000 Soviet and Japanese aircraft took part in this battle—a battle almost completely unknown to the Western world at the time.

In the post-World War II period, the use of Soviet pilots abroad has been somewhat more circumspect. Soviet aircraft, however, flown by pilots of many nationalities, have been in frequent combat with United States fighters. In Korea, the F-86 and MiG-15 fought above the Yalu River. The F-4 fought the MiG-21 in Southeast Asia, and again in the Middle East. Regardless of the nationalities of the pilots, a certain amount of national prestige, both of the Soviet Union and the United States, is at stake when such battles occur.

Despite the fact that the Soviet Air Forces do not include strategic missiles or air defense aircraft, as does the USAF, it still remains a major Soviet service. There are many misconceptions in the United States about its role and subordination, however. In great part, this is due to confusion about the Soviet use of the word "Army." When the expression "Soviet Army" is used, it generally refers to all five of the Soviet services (even the Navy!). Since the Air Forces at times are discussed in conjunction with the "Soviet Army," many Westerners assume that the Soviet Air Forces are subordinate to the "Army." But in the Soviet military lexicon, the word "army" is not synonymous with "ground forces."

The Soviet Air Forces consist of three primary components—frontal aviation, long-range aviation, and air transport. It once again should be noted that interceptor aircraft of the Troops of National PVO are not a part of the Soviet Air Forces. Also the Soviet Navy possesses

several hundred strike and reconnaissance aircraft, such as the Tu-16, Tu-95, and Tu-22 aircraft.

Frontal Aviation

This segment of the Soviet Air Forces is roughly equivalent to USAF's Tactical Air Command. Aircraft of frontal aviation are assigned to the sixteen military districts in the Soviet Union, and to the four "groups of forces" in Eastern Europe. Military districts and "groups of forces" are somewhat similar to joint commands.

There are four groups of forces in Eastern Europe: Northern, Central, Southern, and Germany. As the Commander in Chief of USAFE is subordinate to USEUCOM, the commanders of aviation of all four of the Soviet groups of forces in Eastern Europe are subordinate to their joint commanders.

At first glance, frontal aviation appears fragmented, assigned piecemeal to military district and "group of forces" commanders, thereby invalidating the unity of airpower. It should be recognized, first, that these are not Soviet Ground Force commanders, but the equivalent of joint commands in the US Armed Forces. Operational control over these joint commands is maintained by the General Staff. The Commander in Chief, Air Forces, has major responsibilities for that portion of his force assigned as frontal aviation. In time of war, Stavka (Headquarters, Supreme High Command) would directly control a battle to a degree unknown in Washington. Stavka, in conjunction with Headquarters, Soviet Air Forces, probably could switch units of frontal aviation from one area to another more rapidly than the Commander in Chief of USAFE could switch his own forces.

Aircraft assigned to frontal aviation do not have the range and bomb-carrying capacity, or the sophisticated "smart" bombs used by our tactical aircraft. On the other hand, Soviet aircraft are rugged, many are designed to operate off sod fields, and maintenance is relatively simple. Aircraft such as the MiG-21, with its speed, climb, and rate of roll, would be formidable adversaries in the battle for air superiority. Once air superiority is achieved, there are enough Soviet aircraft (about 4,500 tactical fighters and light bombers) to give massive direct support to forces fighting on the ground.

Frontal aviation does not have the capability to perform interdiction tasks on the same scale as the USAF. Interdiction deep in an opponent's rear probably would be performed by Soviet long-range aviation or by surface-to-surface missiles such as the FROG or SCUD under control of the Soviet Ground Forces.

Long-Range Aviation

Soviet long-range aviation has a dual mission. First, it comprises one element of the Troika of strategic nuclear forces, the other two elements being the Strategic Rocket Forces and the nuclear-armed submarines of the Navy. Secondly, like the bomber force of SAC, Soviet long-range aircraft can participate in any nonnuclear conflict.

In the Soviet Union, the rocket has a special mystique. Bomber aircraft are not simply bombers; they are referred to as "long-range carriers of nuclear-armed rockets." Soviet spokesmen stress that these aircraft can release their rockets outside the range of ground-to-air missiles.

In a number of ways, deployments of long-range aviation are similar to the deployments of SAC's bomber force. Permanent bases are maintained throughout the nation, with staging bases in the Arctic areas. Some bases in the Arctic, such as the huge base south of Murmansk, have immense permanent facilities, similar to US bases in Alaska. Other bases near the Arctic coastline could be expected to be similarly equipped.

The Soviet long-range bomber force has an air-refueling capability. However, unlike SAC, it does not have a special tanker fleet. Instead, one bomber acts as a tanker and another as the receiver. The probe-and-drogue method of refueling is used.

Exact targeting priorities for long-range aviation are not known, but the following listing is typical and may represent an approximation of the order:

- Intercontinental rocket sites;
- Nuclear arsenals;
- Naval bases;
- Strategic bomber bases;
- Groups of war industries, comprising the military potential of the enemy.

It should be noted that the first task of long-range aviation, as of all Soviet forces, is the destruction of the "nuclear means" of the opponent. This same listing holds regardless of whether or not the war is in a nonnuclear or nuclear stage. That is, should a European war begin *without* the use of the nuclear weapon, the first task of the Soviet forces would be to destroy the nuclear capability of the NATO forces.

Is Soviet long-range aviation targeted against the continental United States? Obviously, this question is important with respect to NORAD's future. Against this possibility, two arguments generally are given. First, Soviet bombers do not have sufficient range to strike the United States and return to their Soviet bases. Second, the Strategic Rocket Forces and the nuclear-armed submarine fleet have such a delivery capability that manned aircraft would not be required.

Neither of these arguments is completely valid. There is nothing unusual about one-way missions, and Soviet pilots could use Cuba as a post-strike base for refueling. Our own B-29s and B-50s in the 1950s often had post-strike bases that would have been more difficult to reach than Cuba is for Soviet aircraft. There is no reason, from a technical or operational point of view, why Soviet bombers would not be targeted against the United States.

Bomber development in the Soviet Union has been continuous, without the many starts and stops so often

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Information on organization of the Soviet Armed Forces is considered classified by the Soviet government; hence official organization charts are not available. The charts that follow have been constructed by Harriet Fast Scott from information found in current Soviet military journals, newspapers, and books on military affairs. The functional responsibilities of some deputy commanders are uncertain, and in a few cases, the name or rank of an incumbent has been deduced from a number of related but nonspecific sources. Command and staff positions and the name or rank of incumbents that have not been definitely established are indicated by asterisks.—THE EDITORS

MINISTRY OF DEFENSE

Minister of Defense
Marshal of the Soviet Union
A. A. Grechko

Chief, Warsaw Pact Forces and 1st Deputy Minister
Marshal of the Soviet Union
I. I. Yakubovskiy

Chief of General Staff and 1st Deputy Minister
General of the Army
V. G. Kulikov

1st Deputy Minister
General of the Army
S. L. Sokolov

Chief of Main Political Administration
General of the Army
A. A. Yepishev

SERVICES OF THE ARMED FORCES
(Headed by Deputy Ministers of Defense)

Strategic Rocket Forces
Commander in Chief
General of the Army
V. F. Tolubko

Ground Forces
Commander in Chief
General of the Army
I. G. Pavlovskiy

National Air Defense
Commander in Chief
Marshal of the Soviet Union
P. F. Batitskiy

Air Forces
Commander in Chief
Air Chief Marshal
P. S. Kutakhov

Navy
Commander in Chief
Admiral of the Fleet of the Soviet Union
S. G. Gorshkov

OTHER SECTIONS
(Headed by Deputy Ministers of Defense)

Civil Defense
Chief
General Colonel
A. T. Altunin

Rear Services
Chief
General of the Army
S. K. Kurkotkin

Inspector General
Marshal of the Soviet Union
K. S. Moskalenko

Armaments
Chief
General Colonel Engineer
N. N. Alekseyev

Construction Troops
Chief
General Colonel Engineer
A. V. Gelovani

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

Commander in Chief
General of the Army
V. F. Tolubko

Chief of Main Staff
General Colonel
A. G. Shevtsov

1st Deputy Commander in Chief
General Colonel
M. G. Grigoryev

Chief of the Political Administration
General Colonel
P. A. Gorchakov

Deputy Commander in Chief*
General Colonel Engineer
N. P. Yegorov*

Deputy Commander in Chief
General Lieutenant Artillery
A. G. Karas

Deputy Commander in Chief*
General Major Engineer
M. K. Derevyankin*

Deputy Commander in Chief*
N. N. Smirnitskiy*

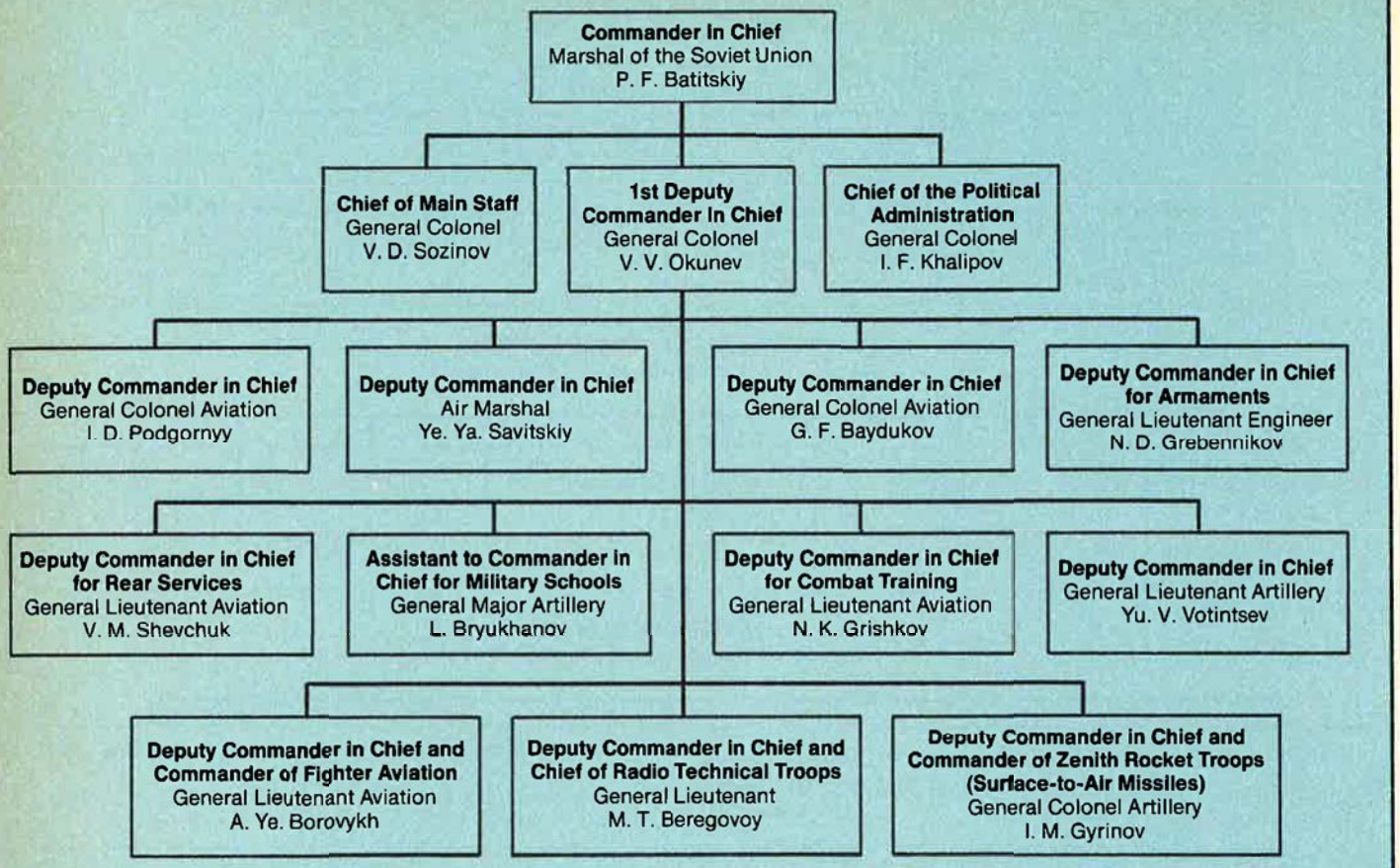
Deputy Commander in Chief for Rear Services
General Major D. P. Petrov

Deputy Commander in Chief for Combat Training
General Colonel
P. B. Dankevich

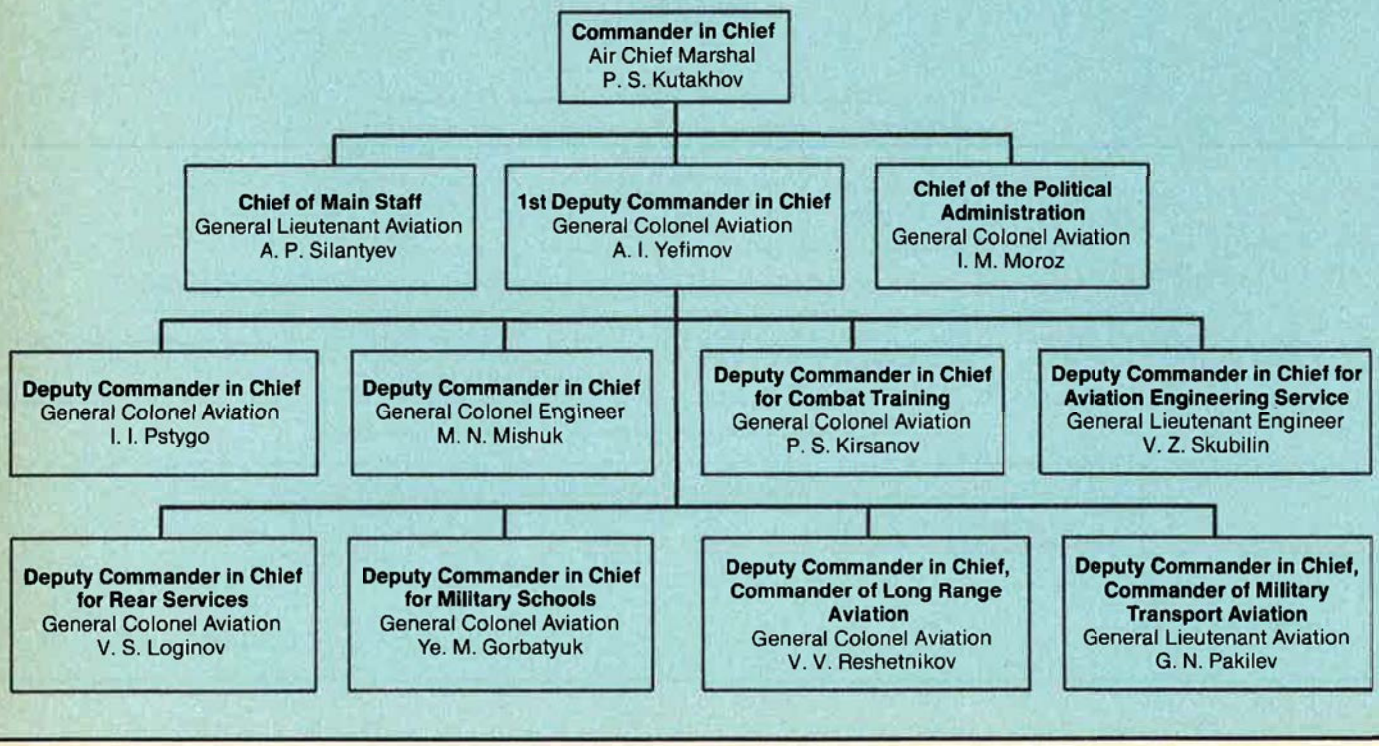
Deputy Commander in Chief for Military Schools
General Lieutenant Artillery
N. G. Ageyev

*Not definitely established

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



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



found in the West. Some models, such as the Bounder, constructed at Moscow's Fili plant, flew but rarely. However, when the projected "plan" calls for a bomber replacement, a new system is introduced. As the Backfire enters operational service, its replacement already is at a prototype stage. The Soviet Union, having accepted the nuclear age, is not likely to neglect any single portion of the Troika.

Transport Aviation

Transport aviation has played a major role in the extension of Soviet power and influence beyond the territorial boundaries of the USSR. Unmarked military transport aircraft have taken supplies to many areas of the world. During the 1973 Middle East war, a major airlift was maintained to provide Soviet clients with high-priority supplies.

When considering the Soviet military airlift, the aircraft of Aeroflot must be taken into account. The Soviet Minister of Civil Aviation, who directs the activities of Aeroflot, is an Air Force officer, as are many members of his staff. During the Soviet invasion of Czechoslovakia in 1968, Aeroflot personnel and aircraft spearheaded the attack, with the Aeroflot manager in Prague reportedly providing landing instructions for the invading aircraft.

Visitors to the Soviet Union may wonder about the numbers of commercial planes on the ground at major airfields such as Kiev, Leningrad, Alma Ata, Irkutsk, Khabarovsk, and the three civilian airfields around Moscow: Sheremetyevo, Vnukovo, and Domodedovo. This underused aircraft capacity would bankrupt any commercial aviation company in the United States. The Soviet excess of civilian commercial aircraft could serve as a military airlift reserve, with assigned crews from Aeroflot's flying personnel.

Although some helicopters are assigned to the Soviet Navy, the bulk are under the Air Forces, as a part of transport aviation. (Soviet Ground Forces do not have either aircraft or helicopters organically assigned.) Soviet military writers stress the capability of the helicopter in a variety of military tasks, such as an antitank role or airlifting troops to seize nuclear stockpiles in the enemy's rear.

Considerable numbers of helicopters are deployed along the Sino-Soviet border. It appears, however, that these are assigned to the KGB Border Guard rather than to the Soviet Air Forces.

At present, Soviet military air transport does not have an airlift capability approaching that of the USAF. Their An-22, while an impressive aircraft, does not have the reliability of such aircraft as the C-141 and is simply not in the same generation as the C-5. The Il-76, first noted on Moscow's Central Airfield in the early 1970s, has not yet appeared in quantity. In all probability, the Soviet aerospace leaders will depend upon Aeroflot's aircraft to supplement their military transport, while they seek to produce contemporary wide-body aircraft of their own.

The Manned Space Program

The Soviet space program is not officially listed as a part of the Air Forces' responsibility. However, the Soviet Air Forces have a role in the training and direction of Soviet cosmonauts to a far greater degree than that played by the USAF in the US astronaut program. Soviet military cosmonauts normally wear their uniforms and are accepted as active-duty Air Force officers. Launch boosters are provided by the Strategic Rocket Forces. The Soviet Academy of Sciences alone deals with NASA in space matters of mutual concern to both nations.

Capabilities and Limitations

Effectiveness of the Strategic Rocket Forces is dependent primarily on the reliability and performance of its weapons. Many in the United States assume that our missiles have greater accuracy and reliability, while the Soviets have greater payload. Based on Soviet technological performance in the past, there is no reason to believe that any Soviet lag cannot be corrected, and probably more rapidly than our estimates now show. Those in the USAF who remember our surprise when the Soviets first exploded an atomic bomb, dropped a hydrogen bomb from an aircraft before the United States did, put into space the world's first Sputnik, and tested the world's first ICBM should not be under any illusion about the Soviets' ability to achieve a high degree of accuracy and reliability with their missiles.

Troops of National Air Defense (PVO) still maintain a major force for combating manned aircraft. Most of PVO's equipment has been tested in Southeast Asia and the Middle East. Presently, the Soviet Union is without an ABM defense, except for the one site permitted by the SALT I agreement. To compensate for this defense deficiency, a massive civil defense program is in being, and the entire Soviet population is both trained and indoctrinated for the possibility of nuclear rocket war.

The Soviet Air Forces have excellent, advanced equipment. The supersonic Backfire bomber has been flying for at least half a decade, and probably now is operationally deployed. Equally advanced aircraft are found in frontal aviation. The USAF probably leads in sophisticated electronics and weaponry, such as the "smart" bombs. USAF aircraft also possess greater range and bomb-carrying capacity than their Soviet counterparts. And without question the United States leads in transport aircraft.

How do the combat capabilities of the Soviet aerospace forces compare with the USAF?

In the event of a strategic nuclear exchange, the Soviet Union has a definite advantage. This is due not to Soviet weaponry, but to the fact that, besides having greater population control, a nationwide civil defense program is in being, and the entire population has been prepared for the possibility of a nuclear war. The civil defense program and training probably would permit the Soviet Union to absorb, and to quickly recover from, a limited number of nuclear strikes.

With respect to combat with manned aircraft, the USAF has an edge at present. This is not due primarily to either quantitative or qualitative superiority in aircraft. Rather, it reflects the fact that practically all pilots in the USAF have had recent combat experience. In air-to-air combat, during the first few weeks of any conflict, Soviet pilots would be at a definite disadvantage. ■

Soviet Aerospace Almanac: R&D

The USSR invests about twice as much in military R&D as does the US. Major Soviet emphasis appears to be on creating a superior ICBM force, but their R&D efforts range across the entire military spectrum and include ultrasophisticated work in high-energy physics as part of . . .

THE SOVIET DRIVE FOR AEROSPACE SUPERIORITY

In an assessment of the US-Soviet strategic weapons understanding reached at Vladivostok late in 1974, Defense Secretary James R. Schlesinger recently pointed out that "arms agreements are no panacea" because they can't assure "retention of arms balance" if the Soviets persist in using advancing technology to change the composition of their forces. The issue is, if anything, perhaps murkier than limned by Dr. Schlesinger; not only are arms agreements with the Soviet Union problematical in terms of strategic balance, but they also fail to provide reliable clues about Soviet intentions.

Many defense planners view the latter condition as grievous; the inordinately high and mounting level of Soviet military R&D, especially in the area of strategic systems, can't be reconciled with the Kremlin's professed commitment to peaceful coexistence. As a senior defense planner put it, "Our fundamental strategic objectives and the force levels associated with them are an open book to the Soviets, but our reading of the Russian tea leaves is inconclusive except for the unavoidable inference that their goal is broad military superiority."

Some political analysts find no discrepancy between the Soviet Union's accelerating arms development and "the political expediency of peaceful coexistence" because they view the latter as a charade fully in step with "the ideology of the world's foremost totalitarian regime."

While the long-term political intent of the USSR can't be predicted reliably—assuming that any detailed long-range policies other than basic Leninist dialectics can long endure the vicissitudes of the Soviet political process—the scope of military deployment and development programs is easily visible. Soviet investment in ICBMs, measured by test firings, production facilities, or any other standard available to the US intelligence community, is at least five times that of this country, or twice what it was ten years ago. All available evidence points to large-scale operational deployment of four new Soviet ICBMs—beginning this year—as well as a very active development program involving at least ten additional strategic systems that have not yet reached flight test.

Secretary Schlesinger reported on January 14, 1975, that the United States has "confirmed evidence" that the Soviet Union has begun the operational deployment of its huge new SS-18 missiles. This ICBM is larger and has greater throw weight than the SS-9, which it apparently is meant to replace. The Soviets have designed this system for cold launch, meaning that the SS-18 can be "popped out" of its silo with gas or air pressure and its rocket engines ignited after the missile is clear of the silo. Since the silo is not damaged by the searing heat of the rocket engine's exhaust flame, it can be "reloaded" without extensive repairs.

Another Soviet first associated with the SS-18 is that it has been test fired with eight large MIRVs (multiple independently targetable reentry vehicles). Because of this established MIRV capability, the US will treat the SS-18 as a MIRVed system, according to Dr. Scheslinger. Under terms of the Vladivostok understanding, each side is limited to 1,320 MIRVed weapons out of a permitted total of 2,400 bombers and ballistic missiles. (Theoretically, the Soviets could deploy a total of about 310 SS-18s in addition to some 1,300 other, smaller ICBMs. The latter figure decreases somewhat, however, if the Soviets opt for increasing the size of their SLBM force. The Interim Agreement of SALT I allows the Soviets to replace their 209 older SS-7 and SS-8 missiles with new SLBM launchers although, in the US view, this requires that they report such a conversion in advance through the *joint Standing Consultative Commission.*)

A Similar Logic

It stands to reason, therefore, that the United States will count the Soviet Union's 310 silos capable of accommodating the SS-18 as MIRVed launchers. The same logic, presumably, will be applied to two other missile systems whose operational deployment appears imminent: the cold-launched SS-17, which has flown with up to four MIRVs, and the hot-launched SS-19, which has carried up to six MIRVs. A fourth new system that has been observed by the US in extensive testing during the past two years is the SS-16, which so far has carried only single RVs and is apparently meant for both mobile and fixed basing.

According to Secretary Schlesinger, the US, at this

BY EDGAR ULSAMER
SENIOR EDITOR, AIR FORCE MAGAZINE

writing, sees "indications" that the operational deployment of the SS-19 "has already commenced," but this is not yet as certain as the deployment of the SS-18. According to other DoD and Air Force officials, there also is evidence that deployment of the SS-16 and SS-17 is about to start. What is not yet clear is how many of these new weapons—and how soon—the Soviets plan to bring into their inventory. Equally murky is the position the US would take if the Soviets converted all their SS-9 and SS-11 silos—numbering about 1,340—for use by SS-18, SS-17, and SS-19 missiles, and, at the same time, continued development of MIRVed SLBMs.

(Defense analysts find grounds for assuming that the Soviets are developing a MIRV capability for both their new long-range SS-N-8, deployed on Delta-class, nuclear-powered Soviet submarines, and a new, longer-range variant of the SS-N-6, deployed on Yankee-class subs. These conclusions are not firm, however, with some analysts suggesting that the SS-N-6 is more likely to be confined to three MRV warheads that are not individually guided and function on the order of buckshot.)

Under such conditions, the Soviets might claim that only a portion of their new ballistic missiles are MIRVed, leaving the burden of disproving this statement to the US.

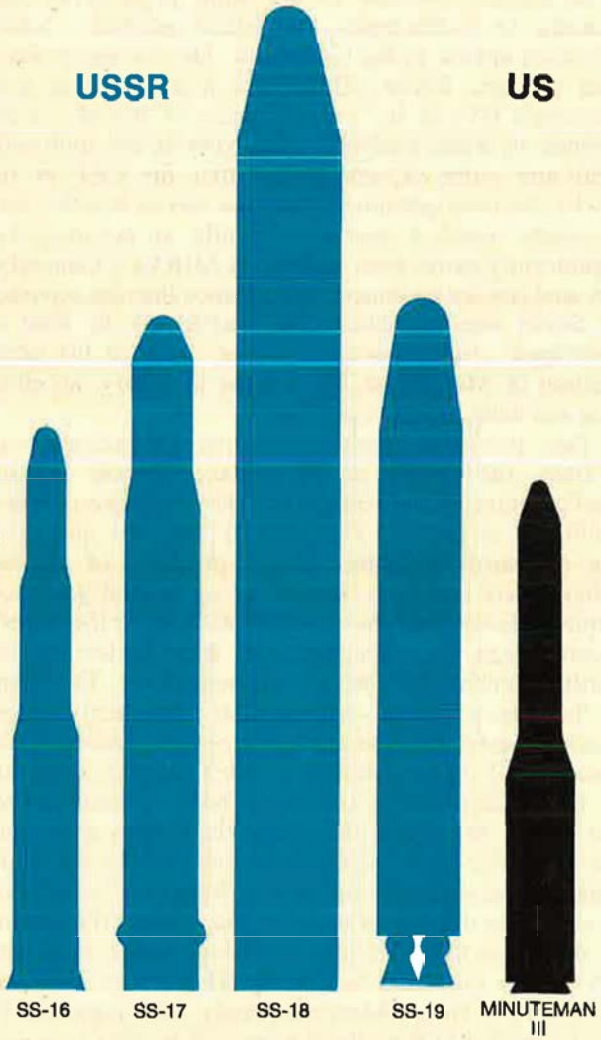
Dr. Schlesinger admitted recently that "there are inherent problems" in verifying the MIRV limits of the Vladivostok understanding, but was sanguine that "by the time this agreement is prepared for final signature . . . we [will] have a verification procedure that gives us the requisite degree of confidence that any significant violation will be detected. Of course, the possibility of a small numerical violation may exist, but it would not be significant."

Even if the US detected significant violations, we might be hesitant to call the USSR to task. Moscow conceivably could counter by claiming that its national means of verification, *i.e.*, satellites, can't tell silos housing the single-RV Minuteman II from those of the MIRVed Minuteman III and thus attempt to treat these 1,000 weapons as well as the US SLBMs as MIRVed. This would create the impression that the US is in violation of the 1,320 MIRV limit agreed to at Vladivostok.

If the Soviets take this position, the US can be expected to point out that national means of verification include open literature on the basis of which Minuteman IIs can be differentiated easily from Minuteman III. There is also the option of permitting the USSR unilateral on-site inspection. This should not pose major security problems because US missile silos have been accessible to the public for some time and photographed frequently. The wisdom of such an offer, without some *quid pro quo,* obviously would be more dubious in the political than the military arena.

Short-Term Responses

The meaning of the present tidal wave of Soviet strategic weapons development and deployment to US deterrence capabilities, for the time being, is not catastrophic. The reason is an imbalance in Soviet technological capabilities. The size and throw weight of the new Soviet ICBMs dwarf their US counterparts. The SS-18 is thought to have a throw weight of about 15,000 pounds, with the SS-19 lofting about half that weight.



A GUIDE TO NEW SOVIET INTERCONTINENTAL BALLISTIC MISSILES

	SS-16	SS-17	SS-18	SS-19
Is follow-on to	SS-13	SS-11	SS-9	SS-11
Range (nautical miles)	5,000+	5,500+	5,500+	5,500+
MIRV warhead?	probable	yes	yes	yes
Estimated number of MIRVs	(unknown)	4	5 to 8	4 to 6

Throw weights of Minuteman II and III are classified, but estimated to be only a fraction that of the SS-19. The question that arises is how important is throw weight in a practical sense?

The first consideration here obviously is warhead yield, next to accuracy the most important determinant of a weapon's lethality, or ability to destroy hardened military targets. But throw weight can't be translated directly into yield because of MIRV technology. The so-called bus that directs each RV to its target uses up throw weight and so do the computer and associated avionics that furnish the necessary guidance. An even greater amount of throw weight is used up by the propellant needed to change and adjust the bus's trajectory, although this is variable and dependent on target location. The wider the footprint—that is, the more "flying" the bus has to do in a lateral direction—the more propellant is used up. Combined, these MIRV requirements use up far more throw weight than the warheads even if the most sophisticated guidance computers and associated avionics are used.

There is no evidence that the vast US lead in computer and electronics technology is diminishing. This country presumably will continue to enjoy a considerable advantage in "throw weight productivity" for some time to come. (By contrast, there is no strong evidence that the yield-to-weight ratio of the USSR's nuclear warheads is significantly below that of the US. For convenience's sake, yield is usually computed on the basis of one kiloton per pound of fissionable material. Both the US and the USSR are engaged in intensive development and test of new families of advanced warheads to beat next year's deadline, tentatively agreed to, on testing weapons with a yield of more than 150 kilotons.)

Another consideration with even greater bearing on the question of whether the Soviet lead in throw weight needs immediate redress is how much yield per individual warhead is enough. The answer boils down to enough to reliably destroy a potential adversary's hardened targets. This, too, sounds simpler than it is, because warhead lethality is primarily dependent on accuracy and only secondarily on yield, the ratio of the two being about four to one in favor of accuracy.

Most defense planners believe that, given the high rate of US advance in accuracy, there is no military value to increasing the yield of the families of warheads currently in being or under development. This is not to say that US nuclear technology can afford to stand still, because reducing warhead size and weight while retaining present yields will, of course, always be advantageous.

Far more important is technological advance in accuracy. Here, the outlook is optimistic, with some Pentagon planners claiming that the *ne plus ultra,* zero CEP, is coming within reach. Recent tests of the so-called TERCOM system (terrain contour matching), originally developed under the Air Force-managed ABRES (Advanced Ballistic Reentry System) program and now being refined for USAF's and the Navy's proposed cruise missiles, have exceeded the fondest hopes of its developers. Not only has the system demonstrated revolutionary precision, but it also proved that it could work in relatively flat terrain. (TERCOM uses very precise radar altimetry combined with computers to guide itself to the target on the basis of specific terrain contours.)

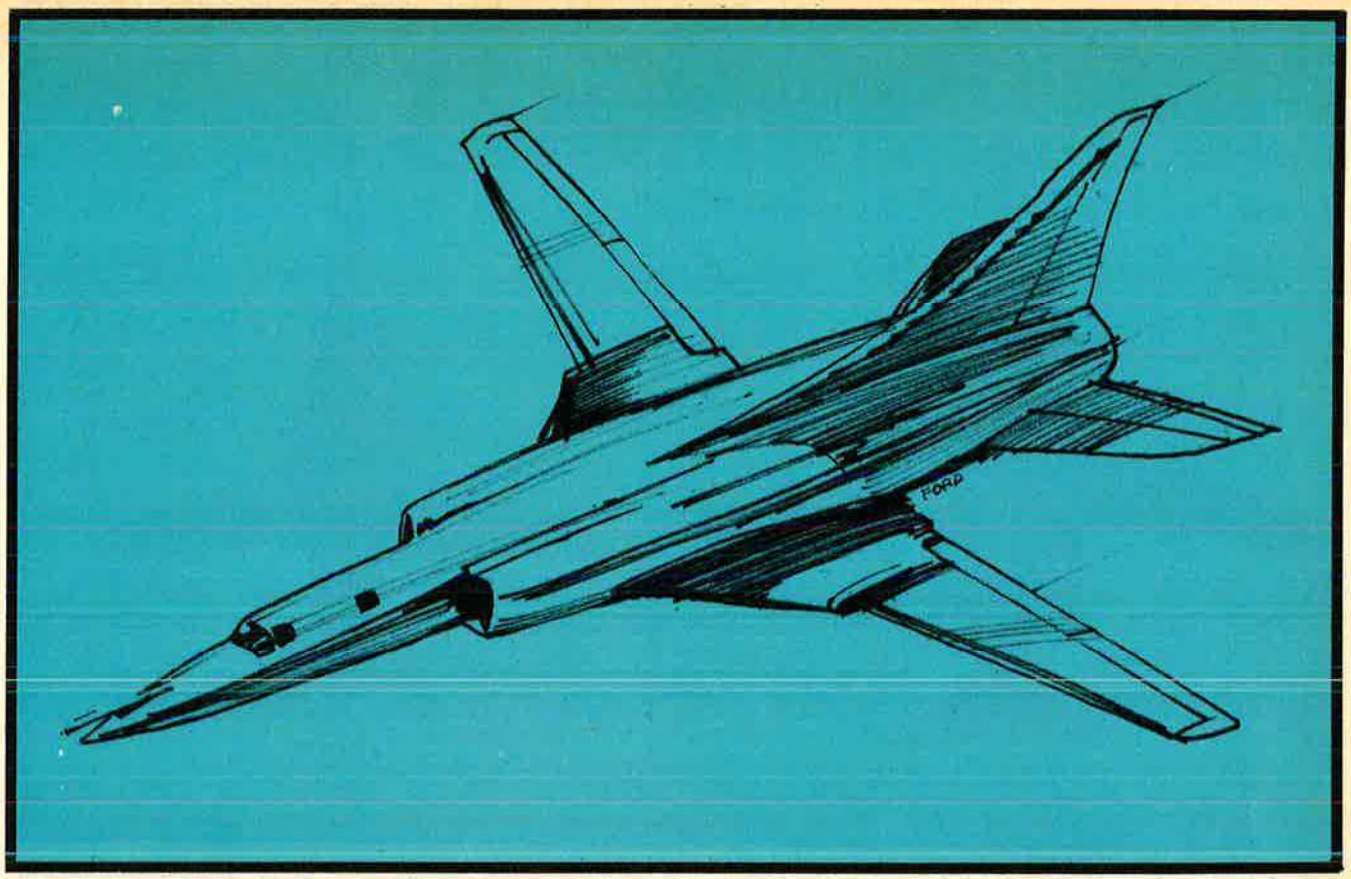
Accuracy Gains

Presumably it is TERCOM, and other innovative terminal guidance schemes, that prompted Dr. Malcolm R. Currie, Director of Defense Research and Engineering, to state recently that the "constant surge of technology is leading to entirely new guidance concepts, one of which could lead to very precise accuracy for strategic systems." Confidence in projected accuracy gains is so high that thought is being given to nonnuclear warheads, which, in the fashion of the Air Force's so-called Hard-Structures Munitions (HSM) program, would use high explosives detonated after deep penetration into enemy missile silos to disable them.

In marked contrast to the rapid progress by this country in technologies that affect accuracy, Soviet advances appear to lag far behind. There is no evidence that the new Soviet MIRVs are more accurate than the single RVs of the present family of ICBMs, in the opinion of some analysts. (This view is not uniformly held and other experts predict that the CEP of the SS-19, the most accurate of the new Soviet ICBMs, may eventually reach a quarter of a mile, an accuracy still significantly worse than that of US MIRVs.) Generally, US analysts see no conclusive evidence that the accuracy of Soviet reentry vehicles has started on the kind of prolonged, steep growth curve that preceded the introduction of Minuteman III into the inventory, an effort that extended over several years.

Two principal factors determine the accuracy of ICBMs—the quality of the guidance system and the configuration of the reentry vehicle. Guidance covers a multitude of factors. They extend from the quality of the on-board computers to the precision of the accelerometers and gyros that make up inertial guidance. Equally decisive are the exactness with which the target's location can be calculated and irregularities of the earth's gravitational forces compensated for. The shape of the reentry vehicle—and the ability to retain it during searing reentry into the atmosphere—combined with the reentry angle, determine the so-called ballistic coefficient, or beta factor, of the reentering body. Oversimplified, the blunter the shape, the slower the reentry speed and the worse the accuracy. But achieving pencil point, high-beta shapes, especially for smaller RVs such as MIRVs, is extremely difficult in terms of nucleonics (the placing of the stages to initiate thermonuclear burst) and many US nuclear physicists believe the Soviets have not been able to solve the problem adequately. Still, there can be no doubt that in time the Soviets will be able to match present US levels of guidance technology and nucleonics. Future US progress, on the other hand, is bound to slow down as the physical limits of current approaches are reached.

But as long as Soviet accuracy continues to lag behind that of the United States, the advantage Russia derives from her greater throw weight remains largely political and psychological. At worst, the SS-18's large warheads represent a limited threat to the US ICBM. They do not appear capable of destroying a large enough percentage of this nation's Minuteman force to realistically warrant the fear of a first strike, even if such factors as



The variable-sweepwing Backfire strategic bomber, powered by two advanced-technology engines, has titanium surfaces for sustained supersonic performance. More than thirty of the aircraft are believed to exist.

fratricidal effects and the synergism of the US strategic Triad are disregarded.

For this reason the US has not yet seen fit to begin engineering development and deployment of a new ICBM, although evolutionary improvements are being added to Minuteman continually. At the same time, the Air Force maintains an energetic research program called M-X *(see November '74 issue, "USAF's R&D Riddle: How To Do More With Less")* that offers the option of developing follow-on ICBMs at low technological risk. As Air Force Chief of Staff Gen. David C. Jones recently told Washington newsmen, "What I think we should do is continue working . . . on a new missile [in a preliminary research sense], not in the sense of a deployment but in [the context of] development." Because of the continuing relative invulnerability of Minuteman, he added, there is no pressing need to "deploy an air-mobile system or a system with a larger throw weight, but we ought to certainly provide the money in preliminary development efforts to assure that the option for deployment sometime in the future" remains open.

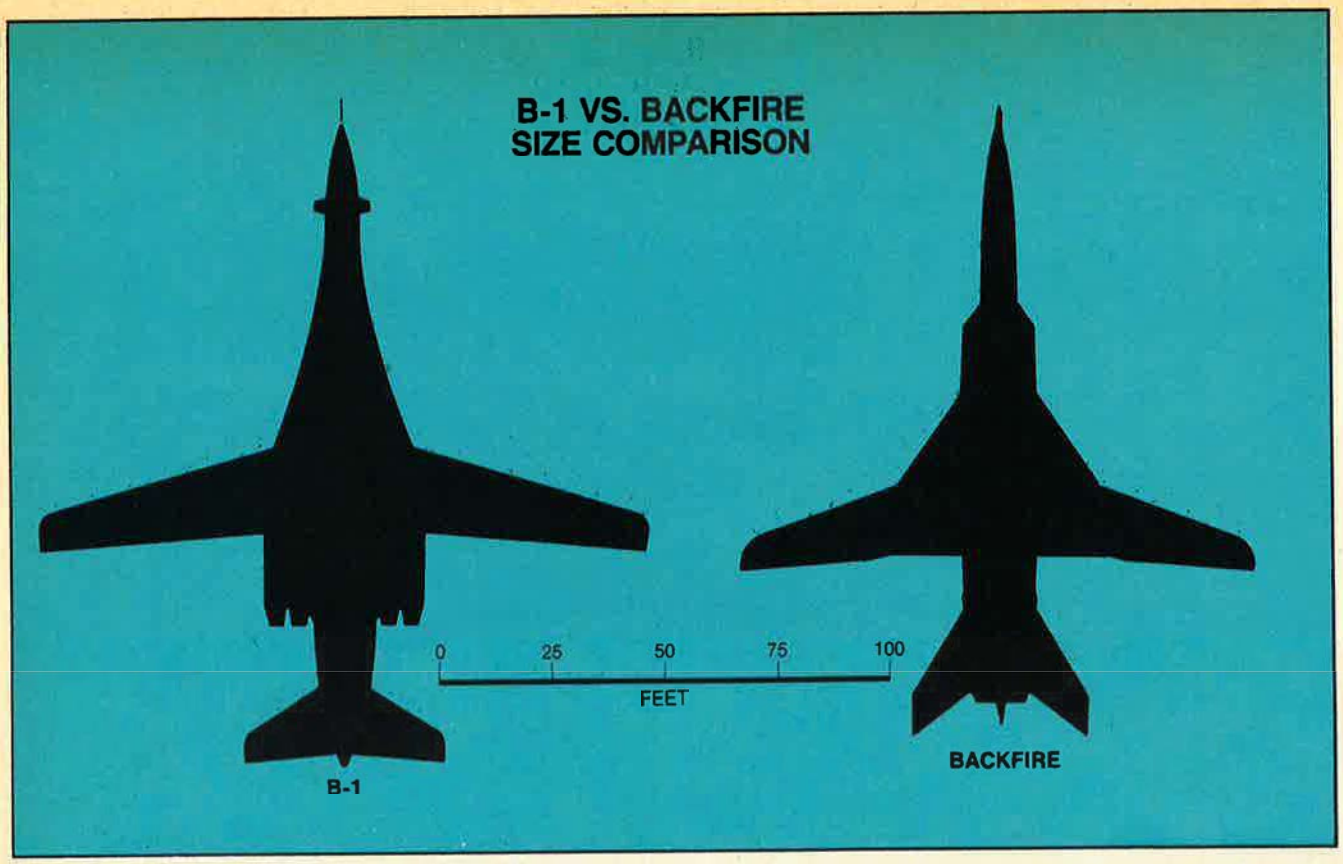
Neither SALT I nor the Vladivostok understanding prohibits increases in US ICBM throw weight, although matching the Soviets does not appear possible, because the dimensions of the two sides' existing missile silos can't be increased appreciably. But the existing silos are considered adequate to accommodate even the largest ICBMs deemed necessary by Pentagon planners.

The Long-Term ICBM Picture

The relatively sanguine position taken by most defense analysts regarding US vs. Soviet ICBM forces in the near term is in contrast to the long-term prospects, beginning perhaps a decade from now. By then, the far greater level of the Soviet R&D effort is expected to pay off in the form of destabilizing Russian advantages. The ten or more Soviet strategic systems known to be in early "but very active development," AIR FORCE Magazine learned, are directed toward the objective of "more and better." This means, according to US observations, new propellants with significantly improved specific impulse (greater thrust from a given amount of fuel), broad design and materials improvements, and advanced MIRV technology.

A central goal, obviously, is greater accuracy. US intelligence experts see a direct connection between this Soviet objective and frantic Russian attempts to gain overt and covert access to US guidance, solid-state electronics, and computer technology. The extent to which they succeed in acquiring US design techniques and manufacturing processes may well determine how soon the USSR can achieve weapons accuracies that seriously threaten US strategic deterrence forces.

Coupled with these efforts are massive Soviet programs for increasing by a factor of at least three the hardening of their ICBM forces and command and control systems. (Soviet interest in nuclear hardening extends to tactical weapons. Soviet-built mobile air-defense systems, among others, that fell into the hands of the Israelis during the 1973 Yom Kippur War were found to incorporate in their transporters effective nuclear hardening.)



Same-scale comparison of USAF's B-1 prototype and the now operational Soviet Backfire brings out similarity in size of these two intercontinental strategic bombers. Backfire has been modified to boost its range.

A third component of the Soviet military R&D program affecting the US ICBM force is "the extremely high level of ABM research," AIR FORCE Magazine has learned. While the Soviets may have slowed or even halted efforts to develop and deploy a mobile ABM system—evidence of which was first spotted by the US about two years ago—they continue intensive research programs involving advanced ABM technologies, but not in violation of the bilateral ABM limitation agreements with this country. All new radar sites associated with ABM programs appear "to be fixed in concrete," rather than mobile, AIR FORCE Magazine has learned.

Soviet ASW Efforts

The Defense Department recently confirmed that the R&D contest between the SLBM forces of the United States and of the Soviet Union "continues at a fast pace" and that the Soviet Union is "making major strides in its efforts to conceal its missile submarines and to counter ours."

While there is no evidence that the USSR is ahead of this nation's ASW technology, there is "considerable evidence to question popular assumptions about the alleged invulnerability of the sea-based deterrent," a senior defense analyst pointed out. The gallery of Soviet ASW weapons runs the gamut from special nuclear-tipped missiles to SUBROC-type weapons (from underwater to air to underwater), and sophisticated sonar ships. The level of the R&D effort involving sophisticated new detection techniques is both "massive and mounting."

A Soviet surveillance technique in being, this reporter was told, "includes around-the-clock deployment of Soviet intelligence-gathering trawlers near US submarine support bases and assures that their killer submarines shadow our subs on a one-on-one basis twenty-four hours a day." There is concern among Pentagon analysts about the tendency "to postulate serenely" the invulnerability of the SLBM forces without allowance for the fact that "the enormous Soviet investment in the detection and destruction of our subs is beginning to pay off in an alarming way. This is not to say that the US SLBM forces are becoming obsolete, but only means that nuclear subs, from now on, will have to fight for their lives just as every bomber and fighter airplane has to."

Backfire Becomes Operational

The Soviet Union's new strategic bomber, code-named Backfire, is now said to be operational, with more than thirty produced so far. The aircraft resembles the B-1 bomber but is five feet shorter, powered by two instead of four engines, and is equipped with two large air-to-surface missiles. These missiles are aerodynamic cruise missiles, but they could be replaced by missiles that fly ballistic trajectories like the Air Force's short-range attack missile, SRAM. (Ballistic missiles with a range of more than 320 nautical miles count against the Vladivostok understanding's overall launcher limit of 2,400, but cruise missiles, regardless of range, do not.)

Backfire, since first observed by Western intelligence, has undergone some changes, with the now operational aircraft, called the "B" model, having undergone a four-foot wingtip extension as well as gaining aerodynamically refined landing gear pods. These modifications enhance the aircraft's lift-to-drag ratio and, according to

US estimates, should extend its range by between five and eight percent. The supersonic Backfire has adequate range to attack the US, but appears to be designed also for extensive use in anti-naval missions.

Soviet Tactical Air Emphasis

Soviet efforts to boost tac air capabilities continue to grow with factory floor space allocated to fighter production increasing at an annual rate of about seven percent. During the past twenty years, the Soviet Union developed, tested, and deployed twelve new fighter aircraft designs; all evidence suggests that this high level of effort will continue in the foreseeable future.

Soviet achievements in fighter aircraft are more impressive in terms of quantity than quality, but do reflect a belated recognition of the importance of the fighter-bomber. The MiG-23, which is entering the inventory of the USSR and its allies in large numbers, is the first long-range fighter-bomber developed by the Soviets. With a range twice that of the MiG-21, its widespread deployment indicates a trend away from the point air-defense concept.

Complementing Soviet tac air is a burgeoning arsenal of ground-based air-defense weapons, most of which are mobile or at least transportable. Five new SAM systems have entered the Soviet inventory during the past ten years, according to US observations, with the mobile SA-8 and SA-9 systems representing the most recent and advanced designs.

The Mach 3 MiG-25, in the view of USAF analysts, does not represent an air-superiority vehicle, but is confined to high-altitude, supersonic cruise missions, principally intercept and reconnaissance. Its high speed enables the USSR to overfly any part of Europe with relative impunity.

There is no evidence that the Soviets have as yet developed and deployed tactical reconnaissance satellites for tac air use comparable to their radar satellites used for sea surveillance. Apparently the MiG-25 is deemed adequate for this mission. Soviet space programs, in the main, appear to be intensive and oriented toward strategic surveillance, command control and communications, and related missions. There has been no recent evidence of tests of the Soviet space interceptor capability. That system, apparently, reached sufficient maturity some time ago to require no further tests. US space experts believe that the Soviet space interceptor system is on a par with this country's technologies and confined to near-earth orbit operation.

High-energy laser weapons and even more advanced charged-particle beam weapons technology are among the most lavishly funded areas of Soviet military R&D. According to some judgments, the USSR has already invested upward of $10 billion in these fields. While there are no indications that the USSR is ahead of this country's very active and promising laser weapons research, there is voluminous evidence that Russia leads by a wide margin in the exploration of charged-particle (high-energy physics) technology.

US scientists, at this time, do not know how this arcane field of physics can be harnessed for weapons development, but, at the same time, can give no assurance that the increasing momentum of pertinent Soviet research is not based on a breakthrough or knowledge that has eluded researchers in this country. Pentagon planners believe that even if Soviet research in this field turns out to be successful, it is years away from military utility.

Soviet Aircraft Design and Construction Institutions

In 1913, Imperial Russia built the world's first multiengine airplane, the "Ilya Muromets." Its constructor, Igor I. Sikorsky, later fled to the United States, where he was to build and fly the first practical helicopter and become even more famous as an aircraft designer.

In Moscow, a small group of aeronautics students and their instructor at Moscow Higher Technical School, Professor N. Ye. Zhukovskiy, established TsAGI—the Central Aerodynamics Institute—in 1918. It was to become the largest center of aviation science in the Soviet Union.

Zhukovskiy set up an Aviation Technical School in 1919, and, three years later, it was renamed the Academy of the Air Fleet. In September 1920, the Zhukovskiy Institute of the Engineers of the Red Air Fleet, now known as the Zhukovskiy Air Engineering Academy, was organized. Until 1935, it was the only institute graduating engineers for industry, construction bureaus, and military and civil aviation. Moscow State University added aerodynamics to its mechanical engineering course, and in 1930 the Moscow Aviation Institute, or MAI, was formed from this beginning.

The All-Union Institute of Aviation Materials, or BIAM, came into being to develop special research techniques required for aircraft materials, and the Central Institute of Aviation Motor Construction, or TsIAM, was created for research on engines.

These centers—TsAGI, MAI, BIAM, and TsIAM—carry on basic research in combination with related study programs.

—H. F. S.

Broad-Front R&D Effort

In general, Soviet military R&D efforts differ from those of the United States in more than just sheer size, in the view of US defense analysts. The benefits that accrue to the Soviets from vastly greater investments—at least fifty percent greater than those of the US but possibly three times as high—are diluted on the one hand by the Soviet penchant for rarely halting a technology program even though it may be clearly dead-ended and, on the other, covering a broad spectrum of both basic and applied research. Coupled with the much lower efficiency and responsiveness of a totally state-controlled system, the net gains from the USSR's enormous military R&D budget are significantly below the productivity the US could extract from such an investment.

As a result, US estimates of the USSR's present military strength lean toward awe tempered with caution. "There is," as one senior Pentagon analyst told this reporter, "the tendency to think the Soviets are ten feet tall. That's an exaggeration. They really are only eight feet tall, but they keep growing." ■

Soviet Aerospace Almanac: Space Operations

The USSR is now conducting more than three times as many space launches as the US, the bulk of them apparently operational military missions. An authority on Soviet space activities examines . . .

THE SOVIET SPACE PROGRAM

EACH year that passes discloses more of the Soviet space program as hindsight analysis becomes easier and as the Russians gradually open their closed operations a crack more. But each year also adds new programs and new refinements whose immediate purpose cannot be discerned from open sources, so that the best of current judgments must constantly be revised and refined. This summary account of the Soviet space program is, of necessity, built upon a study of Soviet announcements and Western tracking data with a heavy dollop of inferences based on logic and American parallels. It should be viewed as tentative, but probably broadly reflective of realities.

Facilities

Very little has been seen firsthand of Soviet space manufacturing and test facilities. By now, NASA personnel and newsmen have visited Star City outside Moscow to see where Soviet cosmonauts live and train. They have even seen at close hand a replica of a Soviet Salyut space station at this location. All the activities associated with launch sites remain unvisited at this writing, but a first American visit to the Baikonur Cosmodrome has been promised for the spring of 1975.

There are three launch sites. Baikonur is near the town of Tyuratam in Kazakhstan, and is the Soviet equivalent of the Kennedy Space Center at Cape Canaveral. US ERTS satellite pictures show it to be spread over at least eighty kilometers in length, with many launch complexes, connecting roads, and railways. Even more satellites are launched at the unacknowledged site in European Russia near Plesetsk, which corresponds in function to the Vandenberg AFB complex in California. The third site is near Kapustin Yar on the lower Volga River and is sometimes referred to by the Russians as the Volga Station. It is busier than Wallops Island, Va., but is roughly comparable in purposes *(see map, p. 37)*.

Soviet tracking and control stations have not been specifically identified in all cases by the Russians. The large size of the country makes it possible to get considerable coverage within national boundaries. The most important deep-space station is in the Crimea. Minimal additional stations lie in other countries including African nations and Cuba, with some attempts to negotiate such privileges in places like Australia and Chile. Big tracking ships cover other parts of the world.

Even today not enough is known about the organization of the Soviet space effort, with the identities of key officials a guessing game. Top-level policy direction probably comes from the Central Committee of the Communist Party. Various ministries with cover names prepare hardware. Actual launchings are the responsibility of the Soviet Strategic Rocket Forces. Cosmonauts, whether career military men or civilians, are trained by the Red Air Force. The Soviet Academy of Sciences and its many associated institutes play a more active and operational role than does the corresponding National Academy of Sciences in the United States.

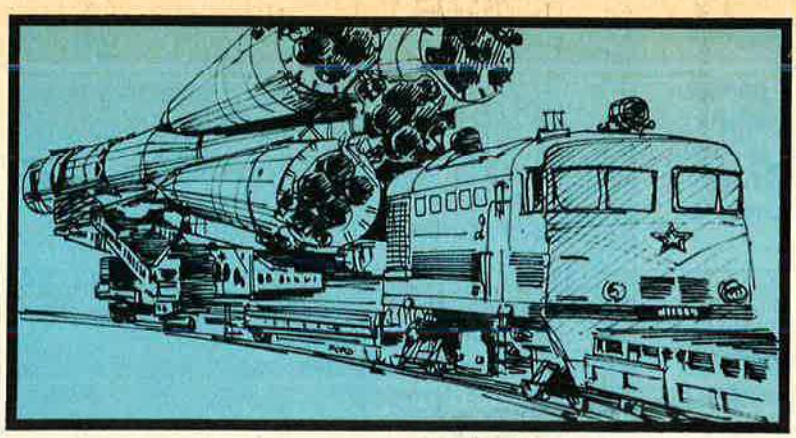
Launch Vehicles

The mainstay of the Soviet space program is still the 1957 Soviet ICBM, the SS-6 Sapwood, with one or more upper stages added. The first stage is all-liquid fueled, burning LOX and kerosene. A core rocket has four strap-ons, and each of these five sets of tanks has a set of turbo pumps to feed four main combustion chambers and nozzles. The first three Sputniks went into orbit accompanied by the core vehicle, as long as a Pullman sleeper. An extra stage was added for the first three Luna flights, for the Vostok program, and for the earlier Kosmos military observation flights. Later, this stage was replaced by a more powerful, heavier stage, which has supported the manned program up through Soyuz. When still another stage was added to this combination, the resulting launch vehicle has supported the intermediate series of Luna flights, flights to Venus, some Mars flights, and the Molniya communications satellite series as well as some lesser programs. This rocket will carry about 6,500 kg to low orbit, 1,600 kg to the moon, 1,100 kg to Venus, and about 1,250 kg to a Molniya-type orbit.

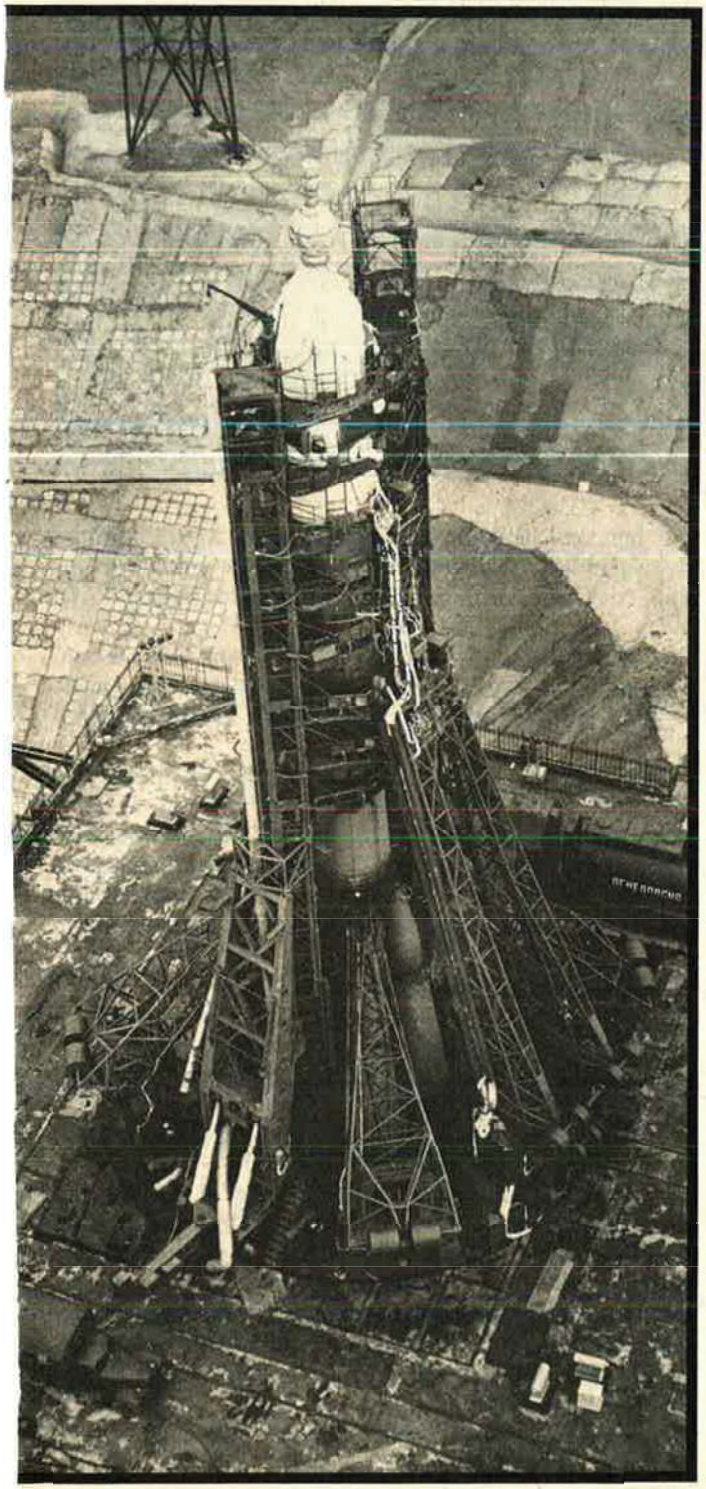
In 1962, to provide greater economy for minor scientific satellites, and for some single-purpose military missions, the Russians added an upper stage to the SS-4, Sandal MRBM, which is able to put about 400 kg into an eccentric orbit ranging out to 2,000 km, though typically only 500 km.

In 1965, to provide both greater lifting capacity and multiple burn operation for circularizing orbits at different altitudes, the Russians added a heavier upper stage to their SS-5 IRBM, the Skean. It can put about 900 kg into a 550-km circular orbit, or perhaps 320 kg into a 1,500-km circular orbit (eight small satellites at a time), with proportionate weights between these extremes.

Also in 1965, the Russians made first use of a nonmilitary launch vehicle not shown completely in either still or motion pictures. It has about three times the capabilities of the original standard vehicle. This has been used for the Proton high-energy studies and the several Salyut space stations of about 18,600 kg in low earth orbit. With added staging, it has carried circum-



BY CHARLES S. SHELDON II



Above left, the Soyuz launcher, workhorse of the Soviet military and civilian space programs, mounted on special railway equipment. Left, the Soyuz-10 manned spacecraft on the pad prior to launch in April 1971. Above (left to right), Soyuz-10 Cosmonauts Rukavishnikov, Shatalov, and Yeliseyev during a training session in the Soyuz-10 capsule.

lunar precursors of manned flights of the Zond series, and the more recent Luna orbiters, scoopers, and Lunokhod roving moon explorers. These run about 5,500 kg in the vicinity of the moon. Used for the bulk of Mars flights, they carry 4,650 kg. For the new twenty-four-hour synchronous equatorial earth-orbit flights, they probably can lift about 3,000 kg of payload.

The last operational launch vehicle was introduced in 1966 and is based on the SS-9 Scarp ICBM. It probably can carry about 4,500 kg to low orbit, and perhaps only half that to the highest orbits flown so far with this vehicle. It has carried only military type payloads to date, such as FOBS (fractional orbital bombardment systems), inspector/destructor payloads, and probably a mission that the press speculates is used for ocean surveillance.

Impatiently awaited is the giant of the Soviet series, hinted at by the Russians and testified to by US officials. This is a vehicle with perhaps twice the first-stage thrust of the American Saturn V. The trade press says it has flown three times since 1969, each time ending in failure. Such a vehicle, without high-energy fuels, would carry about 50,000 kg to the moon or place a 150,000-kg station in earth orbit.

Evidence of introduction of high-energy fuels is lack-

ing. This does not mean that experimental development is not under way, however.

Evidence of a reusable Space Shuttle program, nuclear reactor rockets, and other exotic systems is not available. All have received some Soviet comment, but in very general terms of interest and importance. If such programs exist, they are not likely to manifest themselves much before actual flights begin.

Manned Programs

The Russians gained an early lead with the six Vostok flights of 1961–63. The Voskhod-1 flight of 1964 was the first to carry three men to orbit, while the Voskhod-2 flight of 1965 included the first demonstration of human EVA (extravehicular activity). After that, the American Gemini program ran away with all the advances in many modes of maneuver, rendezvous and docking, and propulsion to an altitude as high as 1,369 km. Then, the United States moved to the even more versatile and capable Apollo series, after the setback of the pad fire in January 1967, which killed three astronauts.

The Russian program for manned flight in the 1967 period and subsequent years has not been completely unveiled, but its general outlines can be discerned. It was built around the Soyuz craft of about 6,575 kg. This consists of a command and reentry module seating up to three men, a service module with consumables, maneuvering engine, two gull-like solar panels, and finally an orbital work compartment that is roughly spherical, with one airlock connecting it to the command module, and the other for docking with other craft. The command and reentry module is bell-shaped.

Soyuz is designed as a multipurpose ship. It flies missions on its own, in one case up to eighteen days with two men. It also serves as the ferry to the Salyut space station, and earlier was tested in both unmanned and manned modes with two Soyuz docking with each other. Four cosmonauts have been killed on Soyuz missions.

A variant of the Soyuz, without the orbital work compartment and with a high-gain antenna, has been sent around the moon a number of times under the Zond label, starting in 1968, and identified as capable of carrying a human crew. These flights ended in 1970, suggesting that American progress and uncertainties over the reliability of the Proton launch vehicle led to program cancellation.

The Salyut space station program was announced in 1969 and flew in 1971. More recently, analysis of the frequencies used by Salyut, and of Soviet crew selection, make a strong inferential case that there are two station programs under way. Salyut-1, Kosmos-557 (a Salyut failure), and Salyut-4 are most civilian-oriented, although the large camera system in Salyut-1 may have had military uses for earth observation. Salyut-2 and -3 were largely military in nature. After the Soyuz-15 crew was unable to dock with Salyut-3 in the summer of 1974, the station continued to function, and in late September returned a data capsule to earth.

Another element of the Soviet manned program is most elusive and debatable. Some analysts doubt that it existed, but there are many signs that up to some unknown point there was a program to land Soviet cosmonauts on the moon. This would have entailed use of the big vehicle whose successful flight is still awaited five years later. It might have involved some joint operation with one or more Proton-launched payloads. In 1969, Cosmonauts Leonov and Shatalov were still predicting that Russians would beat Americans to the moon, and that men would return lunar samples to the USSR in time to be displayed at the Osaka World's Fair of 1970.

Until 1968, one could make a long list of missing ingredients for any Soviet manned lunar landing program. With the exception of the big launch vehicle, many of those capabilities have been demonstrated and still more of them have lacked the degree of consistent reliability that would encourage a go-ahead for the total program. In any case, Dr. Keldysh, President of the Soviet Academy of Sciences, and Academician Boris N. Petrov stated in the fall of 1969 that plans for a Soviet manned lunar landing had been put aside indefinitely, but not permanently, in order to concentrate on the Salyut station program in earth orbit.

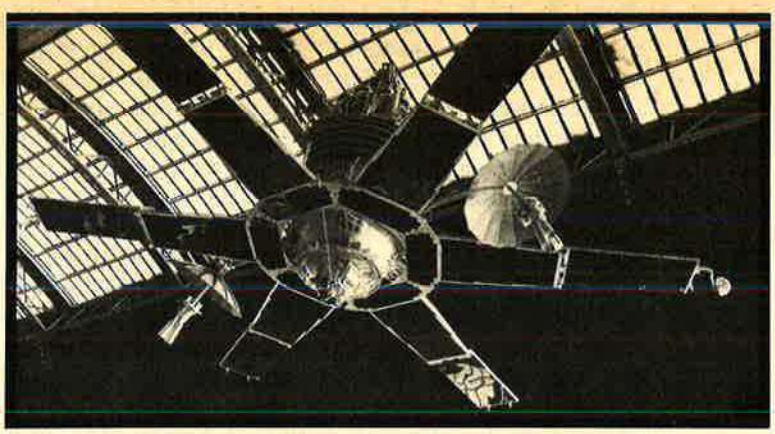
DISTRIBUTION OF SOVIET SPACE PAYLOADS BY PUTATIVE PROGRAM 1957–1974

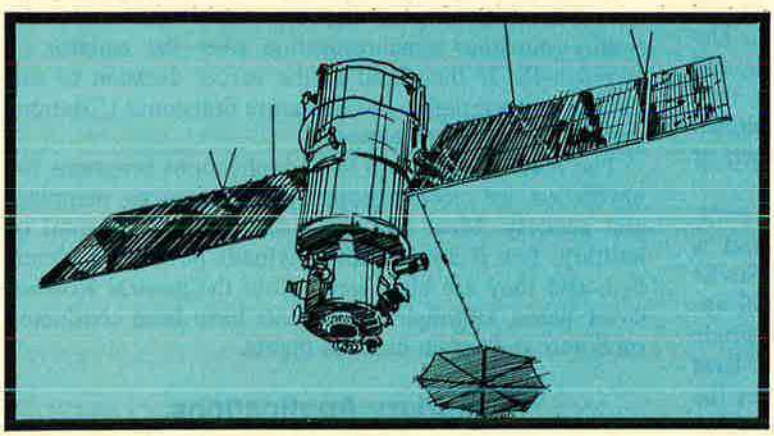
Possible Mission	*No. of Payloads*
Military Recoverable Observation	295
Communications	145
Earth Orbital Science	101
Minor Military Mission (which could include some environmental measuring, radar calibration, or electronic ferreting)	88
Navigation and Geodesy	40
Electronic Ferreting	35
Weather Reporting	34
Unmanned Lunar Related	32
Earth Orbital, Man- or Biology-Related	30
Earth Orbital, Manned	26
Venus Related	19
Fractional Orbital Bombardment	18
Mars Related	16
Ocean Surveillance	10
Inspection/Destruction	10
Lunar, Man- or Biology-Related	8
Targets for Inspection	6
Early Warning	5
Engineering Test	5
Orbiting Launch Platforms	119
TOTAL	1,042

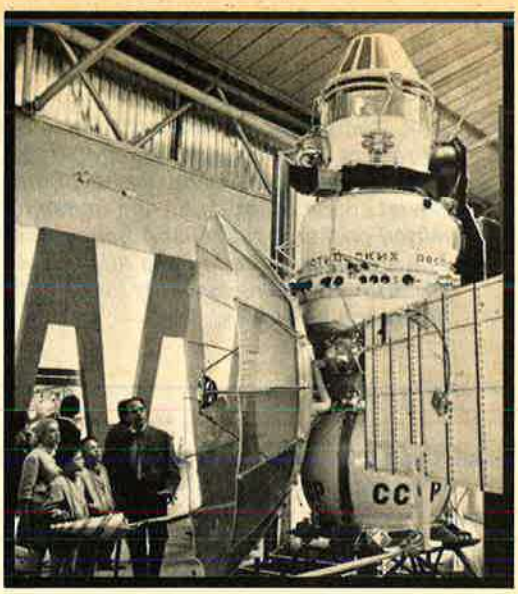
Science Programs

A review of the Soviet literature and of reports presented at meetings of the international Committee on Space Research (COSPAR) shows a fairly extensive program for expanding basic knowledge of solar energy, cosmic rays, geomagnetism, the ionosphere, and atmospheric components. The programs seem less well developed than those of NASA, but their total size should not be minimized.

For the last several years, a major segment has consisted of twelve Interkosmos flights with participants







Upper left, a Molniya-1 communications satellite and below it, a drawing of a Soviet meteorological satellite. Both satellites are on display at the "Kosmos" Pavilion of the USSR Exhibition of Economic Achievement, Moscow. Directly above, a Soviet Venus space probe.

from the German Democratic Republic, Czechoslovakia, Hungary, Bulgaria, and Outer Mongolia. Some minor part of the regular Kosmos program is also devoted to science.

There have been four Proton flights of 12.2 to seventeen metric tons each, which measured very high-energy cosmic rays. A similar but smaller payload, Interkosmos-6, was recovered. Three Prognoz satellites have ranged out to 200,000 km to measure the space environment. Two exclusive French Oreol (Aureole) payloads also have been launched.

Unmanned Lunar and Planetary Programs

The pioneering Luna flights of 1959 flew by the moon, struck the moon, and returned the first crude facsimile photos of the far side of the moon. A long series of improved payloads met with repeated failures until 1966, when Luna-9 was the first to make a survivable landing and returned a series of panoramic views of the lunar surface. Luna-13 repeated the mission with additional soil strength impact tests. Luna-10 was the first to orbit the moon and return data, while Luna-11 also went into orbit and Luna-12 returned a few facsimile photos from orbit. Luna-14 was like Luna-10.

A whole new, larger generation of flights began with Luna-15 in 1969. These used a standardized bus and landing platform (when called for). Luna-15 crashed during the Apollo-11 mission. Luna-16 and Luna-20 were successful in returning to earth small samples that had been drilled from the lunar surface. Luna-18 and -23 were sample-return missions that failed. Luna-17 landed Lunokhod-1 of 756 kg, which operated on the lunar surface for eleven months, gaining a large amount of data as it roamed around, returning thousands of pictures, and making chemical analyses. Luna-21 carried Lunokhod-2 of 840 kg. It operated a lesser number of months, but ran at double the speed and had more cameras and instrumentation. Luna-19 and -22 were advanced lunar orbiters taking pictures and returning other data over a period intended to exceed a year.

Although the results have not been in proportion, the Soviet planetary program has committed ten or more times the weight of hardware than has the US program. With two exceptions, every "window" opportunity for launching space vehicles to Mars and Venus since 1960 has had multiple payloads committed by the Russians. More payloads have failed than have succeeded, but still the commitment has gone on. Mars-3 was the first payload to survive a landing on that planet, while Mars-2 and -3 were the first put into orbit around Mars. The television camera on the lander failed before the first complete picture was received. Venera-4, -5, and -6 were the first to return direct readings of the atmosphere of Venus. Venera-7 and -8 both broadcast temperature and pressure data from the surface of Venus, while the latter also sent back a soil analysis.

Civil Applications

The Soviet weather satellite program began under the Kosmos label, first with component testing in 1963, and full-scale work in late 1965. The system went routinely operational in 1969 under the name Meteor, and twenty such payloads have been named to date. They have provided higher resolution pictures than the US Tiros series, but coverage was not as synoptic and complete as with the American flights. However, the Russians added

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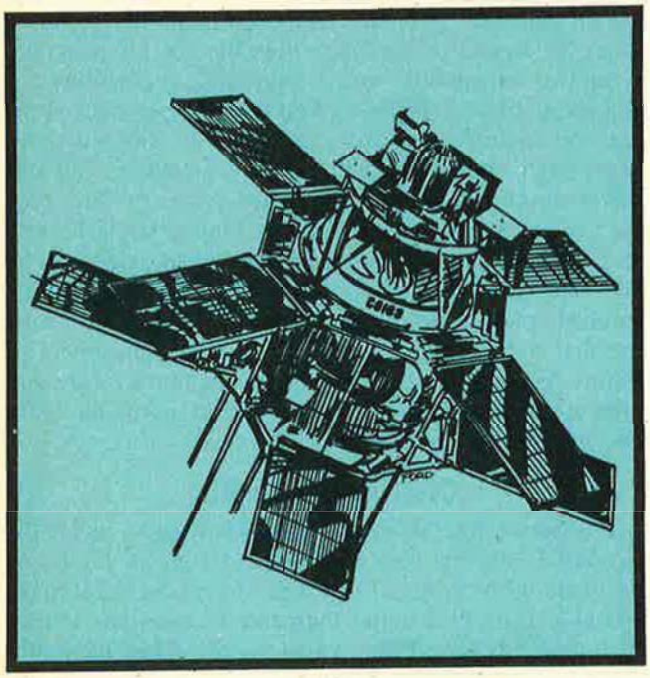
about the same range of sensors to their flights as the US was testing experimentally in the Nimbus series. The Russian payloads were also three-axis stabilized, and probably weighed more than 2,000 kg, considering they were put up by the Vostok type of standard launch vehicle. Television tests from 40,000 km were flown as extra experiments on communications satellites.

The communications satellite program is more complex. The civil part carries the label Molniya, and is used to link the Orbita system of ground stations. Soviet design philosophy was quite different from the US approach. Being a huge, underdeveloped northern latitude country, they settled on flying a large payload of at least 1,000 kg (possibly more now) with about ten times the power output of the US Early Bird satellite of the same period. Instead of trying for a twenty-four-hour equatorial synchronous orbit, the Russian payloads are in twelve-hour inclined orbit with a perigee of about 500 km in the southern hemisphere and a 40,000-km apogee, once each day over Eurasia and once over North America. By putting up three payloads 120 degrees apart in plane, each provides about nine hours a day coverage over the home territory.



One of the Kosmos series of weather satellites that have been operational since 1969. It is possible that some of these satellites also do electronic ferreting.

While the ground stations do have to track the satellites and have a handover problem, the passage is at a relatively slow speed. High signal strength from the satellite means a more economical ground station is possible, and the Russians were able to establish an extensive domestic distribution system for television, telephone, and other data purposes. The Molniya-1 series (twenty-eight to date) began in 1965. Operating in parallel, starting in 1971, was Molniya-2 (eleven to date), using a higher frequency. Late in 1974 came Molniya-3, better able to transmit color television on a routine basis.

Several years ago, the Russians announced they would also use the kind of twenty-four-hour satellites most typical of the current US programs. In 1974, Kosmos-637 was the first Russian satellite to be placed in such an orbit, and, later in the year, they announced the twenty-four-hour synchronization over the equator of Molniya-1S. If they hold to the earlier decision to call the operational flights of this nature Statsionar ["Stationary"], this has yet to happen.

The Russians claim to have applications programs for navigation, ice reconnaissance, earth resources, mapping, and geodesy. Most of these either are experimental or military; few if any specific payloads have been identified, and they are blanketed within the general Kosmos cover name, although experiments have been conducted on Soyuz and Salyut manned flights.

Military Applications

In the most explicit sense, the Russians have not announced any military applications. Indirectly and informally, responsible Soviet officials have referred to a variety of capabilities. The joint US/Soviet references to "national technical means" for policing arms agreements is a pretty good, though nonspecific, indication of such functions. Beyond that, the inferential case that develops from a close study of repetitive Soviet flights establishes without a doubt that the bulk of the Soviet program, on which no scientific findings are ever published, is made up of a series of operational military missions. They must be important to the Russians, and by tacit agreement and actual behavior, both the US and the USSR have decided on a policy of noninterference with the rather passive military support missions that characterize the flights about which one can make inferences. There are two exceptions to this passivity and these will be described presently.

The largest single element in the Soviet military space program are flights that give world-ranging coverage most days of the year. These vehicles fly in relatively low, nearly circular orbit, and now with improvements stay up for about twelve to fourteen days before being called to earth. Geoffrey E. Perry, an English observer, has made a science of the unofficial study of these flights, identifying different classes by their telemetry systems and whether they maneuver to bring higher resolution camera systems to bear on obvious targets. He has reported on the concentration of attention given the war for Bangladesh, and the several Mideast crises, and coverage of French nuclear tests in the South Pacific. He also has noted the various recovery beacon signals, and regularly logs when retrofire occurs, when parachutes open, and when ground crews reach the payload to turn off the radio beacon.

HISTORICAL TABLE OF SUCCESSFUL LAUNCHES TO EARTH ORBIT OR ESCAPE

Year	United States	Soviet Union
1957	—	2
1958	5	1
1959	10	3
1960	16	3
1961	29	6
1962	52	20
1963	38	17
1964	57	30
1965	63	48
1966	73	44
1967	57	66
1968	45	74
1969	40	70
1970	29	81
1971	31	83
1972	31	74
1973	23	86
1974	22	81
TOTALS	*621	789

* US launches include three by Italy for the United States

These studies give a very good insight into the operational status and the varieties of photographic coverage undertaken. It is possible that these same Kosmos craft do some electronic ferreting as well. Although they describe them in earth resources terms, the Russians have also identified some as doing multispectral work, including passive microwave, which has military as well as civilian implications. If there is a mapping program, as one would expect, it would be contained somewhere in these series. Payloads probably run on the order of 5,000 to 6,000 kg and if essentially the Vostok/Voskhod technology is used, then the entire instrumentation and camera systems are recovered, rather than just a film cassette.

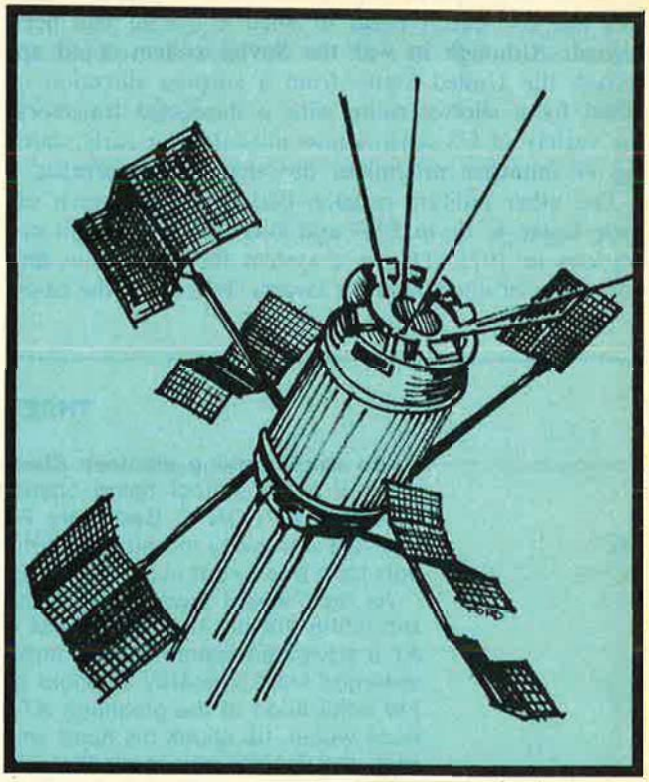
A second moderately large category of flights in low to intermediate orbit, sometimes circularized and sometimes eccentric, are harder to categorize from open sources as specifically as the photographic missions. Some of these payloads are put up by the smallest launch vehicle, some by the intermediate vehicle, and some by the large standard vehicle. One can postulate as both within Soviet capabilities and within reasonable needs such missions as electronic ferreting, radar calibration, navigation, military communications, and data relaying. By inference, some signal detection, and elimination, most of them can be sorted out tentatively, and Mr. Perry has done about as well as anyone in this regard. The Russians have advertised that they have a navigation system and also do geodetic work. Some of the slightly higher circulated orbits are placed in relation to each other and use frequencies like those of the US Navy navigation system so that the inference is very strong that these are the flights most likely dedicated to these missions.

As long ago as 1964, there were four payloads called Elektron that were put into more extreme eccentric orbit, and more recently the four Prognoz flights referred to earlier also fly markedly eccentric orbits. While these may be primarily civilian, some calculations of their announced scientific experiments do not account for all of their payload weight, and these may be military experiments. Also, about once a year there are flights that look like Molniya communications satellites, but are given Kosmos numbers. Since it is more likely than not that many Molniya payloads already carry military traffic in the single Soviet space effort, then one must ask whether these extra flights, labeled Kosmos, are Molniya failures or are unadmitted military missions. By studying the placement patterns of the Molniyas, the stronger likelihood is that these Kosmos flights do not fit the regular pattern, and, based on US parallels, are probably doing early warning work on missile launchings and nuclear tests.

Reference was made earlier to a possible ocean surveillance mission for the maneuverable payloads. The existence of such a system was reported in testimony to Congress. This is not surprising since for many years the Russians have used long-range aircraft to seek out US naval forces, and this is difficult either when weather is bad or when radio silence is practiced. Hence, it is understandable when on both sides of the Atlantic, almost simultaneously, the hypothesis was advanced that the maneuverable flights served this purpose, and that the sudden shift of a part of the payload to a long-life, 1,000-km circular orbit at the end of the missions, weeks or months after launch, was the way to get rid of a nuclear power source that an all-weather detection system could use.

FOBS and Satellite Inspectors

All of the missions described above represent generally nonoffensive operations that by practice have



Electron-1 and Electron-3, both launched in 1964 to study the Van Allen radiation belts, looked like this. They may also have had a nuclear-detection function.

come to be accepted by the two space powers as routine and up to now left alone, so far as one can tell. Each side admits to a capability to interdict and neutralize spaceflights from fixed earth installations. Our work at Johnston Island and Kwajalein has been identified as having such a capability. Perhaps the Soviet Galosh ABM gives them a corresponding limited capability. Obviously, such systems are limited and can reach payloads only on orbits which have ground traces within range of these sites. Also, relations between the two powers have not been strained by practicing on each other's payloads.

There are two other Soviet military space systems that go beyond the generally passive payloads described to this point, and they also rely on the maneuverable system launched by the SS-9-related launch vehicle. It is quite possible that both are now operational in the sense of having been carried through development, but possibly as a result of the SALT negotiations, neither category is now being flight-tested.

The first of these systems began to fly about 1966, when unannounced debris was found in orbit on two occasions. The pattern became more clear in 1967, and by 1971, when the eighteenth and last such flight that reached orbit occurred, the nature of the flight was clearly that of a fractional orbital bombardment system. The Soviet announcement each time gave a Kosmos number and very low circular orbit, but no orbital period because the payload portion must have been retrofired to strike a target area in the Soviet Union. The accompanying carrier rocket and launch platform would generally stay in orbit extra hours before undergoing natural decay. When these flights occurred, the initial orbit did not cross the mainland United States, instead coming down through the Pacific, across Patagonia, and up over Africa to the home territory.

There is no parallel program in the United States, and the cost-effectiveness of such a system has been argued. Although in war the Soviet system could approach the United States from a surprise direction or could fly a shorter route with a depressed trajectory, the variety of US sensors now available for early warning of launches minimizes the element of surprise.

The other military mission that uses this launch vehicle began to fly in 1967 and also suspended flight operations in 1971. This is a system for rendezvous and inspection of uncooperative targets. In each of the cases, a target craft has been put up first, and later the maneuverable inspector has been sent to approach the target at a variety of altitudes common to military payloads. In all but one case, the inspector has been exploded. Such explosions close to a target could neutralize it with shrapnel. Explosions further away may be only the Soviet practice, used in several classes of missions, of blowing up payloads that might fall into the hands of other nations, revealing their purpose or technical secrets.

Policy Directions for the Future

There is no doubt about the USSR's serious commitment to an on-going, broadly based space program. Its total size is comparable to the US program at its peak, and now puts up about three times as many missions as does the US. The Soviet program has been beset by several setbacks apparently caused by lack of good quality control, and as a result some ambitions either have been set aside or foregone. But, even so, the program, in a not too spectacular way, year in and year out, puts up a steady series of operational flights, some for civil needs, more for military purposes. Just enough spectacular work to the moon or planets is continued to keep the image of scientific commitment and to demonstrate that advanced technology is available to them for a variety of space purposes. The cosmonaut corps is now larger than ours, and visitors to Star City speak of expanding facilities.

The long-term Soviet commitment is to improve the civil applications of space, and the evidence shows an equal or larger commitment to military uses. Further, though without a definite timetable, the Russians have consistently talked about long-duration, multiple-purpose space stations with complements of up to 100 people. They also say they plan to carry manned explorations to the moon and to any visitable planets, although permanent stations may not come until the next century.

Meanwhile the spirit of détente and cooperation could receive its biggest advance with the joint Apollo/Soyuz mission of 1975, adding to the unmanned work that already involves the Bloc countries, France, and India.

The Soviet program bears continued watching. While it may not generate the emotion in the West that Sputnik and Vostok once brought, the substantive products of flight are likely to be of growing importance. ■

THREE POINTER

We were ferrying eighteen Stearman PT-17s from Randolph to the new primary flying school being opened at Sikeston, Mo., and had landed en route for an RON at Barksdale Field, La. After making arrangements for quarters and early morning departure, some of us went into nearby Shreveport for a bite to eat and a look around.

As luck would have it, the United States Army Air Corps had set up a recruiting display right in front of City Hall, complete with a new and shiny AT-6 advanced trainer. As we strolled into the area, one of our ferry pilots emerged from a nearby taproom and wandered toward us. Gazing in studied admiration at the gleaming AT-6 sitting atop three oil drums, one under each wheel, he shook his head and muttered thickly, "I thought I was a hot rock, but the guy who made that landing is really a PRO!"

—Contributed by Col. Fred E. Bamberger, Jr., USAFR (Ret.)

(AIR FORCE *Magazine will pay $10 for each anecdote accepted for publication.)*

Soviet Aerospace Almanac: Military Education and Training

By Western standards, the scope of Soviet officer education and training, and the number of institutions involved, is staggering. Selection for the senior service colleges is highly competitive, based on examinations that require months of preparatory study. A leading Sovietologist describes the USSR's complex system for . . .

EDUCATING THE SOVIET OFFICER CORPS

THE Soviet Armed Forces consist of the Strategic Rocket Forces, Ground Forces, Troops of National Air Defense (PVO Strany), Air Forces, Navy, Civil Defense, Troops of the KGB, and Troops of the MVD. In addition, special support troops, such as the construction troops, operate directly under the Ministry of Defense.

A large part of the massive Soviet military structure is a product of the nuclear-aerospace age. In this category are Strategic Rocket Forces; Troops of National Air Defense; Air Forces; the flying, air defense, and SLBM components of the Navy; and the missile and air defense components of the Ground Forces.

Leadership of this complex and highly technical force demands a high order of officer preparation, training, and education. The Soviets meet this need through a system of officer training and education on a scale much greater than, and much different from, anything found in the United States.

Training of Soviet officers, at the undergraduate and subsequent career levels, is accomplished through a vast network of military schools located in more than eighty major cities spread across two continents. The 163 schools, academies, and institutes comprising this massive structure require the services of enough military personnel—students, faculties, and support people—to make it the equivalent in size of a major service. These numbers do not include the military faculties attached to civilian institutions, similar to ROTC in the United States.

In the United States, the three service academies—West Point, Annapolis and the Air Force Academy—are a primary source of officer inputs. The Soviet Union has some twenty-four secondary military schools and 118 higher military schools that have been identified and which offer three-year to five-year courses of officer training for the same age groups as do the three service academies in the United States. The size of this Soviet officer training program is almost incomprehensible by Western standards.

Further training and education during the career of the Soviet officer is provided through seventeen "academies," which correspond roughly to the war colleges and staff colleges in the United States. Postgraduate courses are offered by all of the academies and by most of the higher engineering schools.

Each service of the Soviet Armed Forces has its own military schools and academies, but certain academies may admit officers from more than one service.

Only the Soviet schools and academies of the Strategic Rocket Forces, Troops of National Air Defense, and the Air Forces will be considered here, with brief mention of those academies that admit officers from all services.

Strategic Rocket Forces

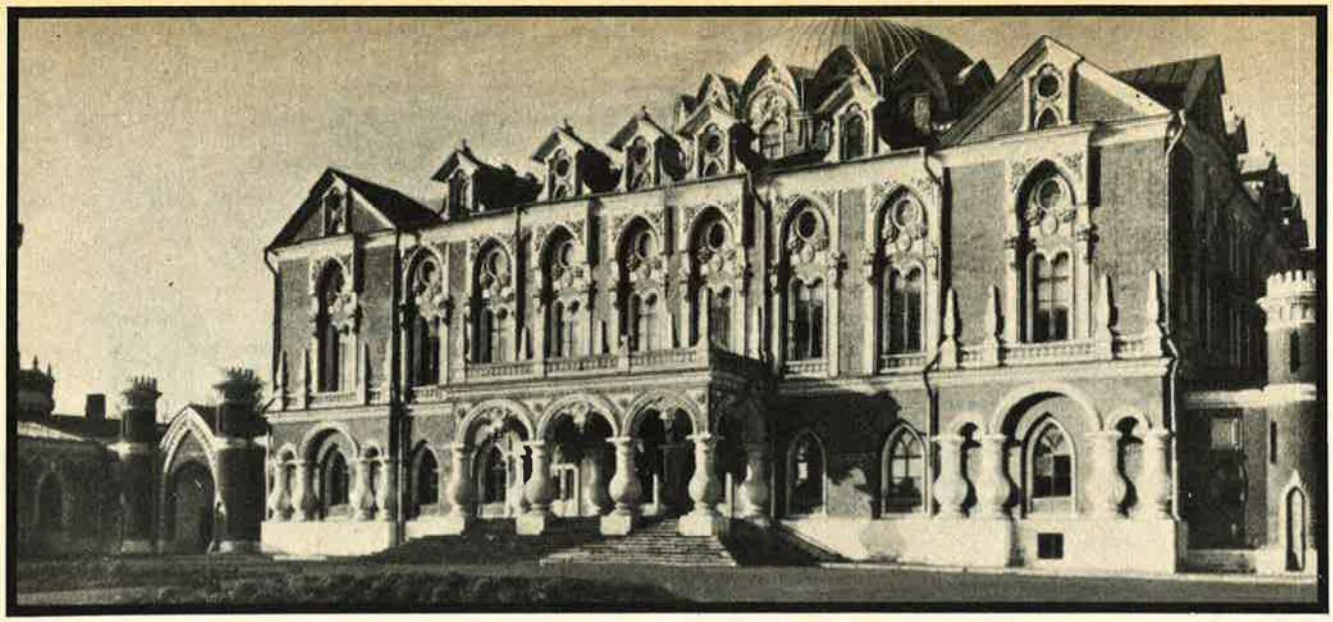
Each year, usually in February, advertisements appear in certain Soviet military newspapers and journals, advising aspirants how to apply for admission to military schools. Those schools that prepare officers for the Soviet Rocket Forces are never identified. It can only be inferred that the schools named for former commanders in chief of the Strategic Rocket Troops—Nedelin, Biryuzov, and Krylov, for example—are now training officers for this particular service.

In the 1960s, the schools training cadets to become officers in the Strategic Rocket Forces were called "Higher Command-Engineering Schools." In 1973, they were simply "Higher Military Schools." But by 1974, the name changed to "Higher Military Command School," with the school at Kazan called a "Higher Military Engineering School." These schools offer five-year courses leading to qualification as military mechanical engineer, military electrical engineer, military engineer in electronics, and so on. In addition, the school at Rostov also has a four-year course that trains political officers for the Strategic Rocket Forces.

Higher Military Command Schools, responsible for training and educating cadets to become officers in the Strategic Rocket Forces, are listed in the box *(p. 59)*.

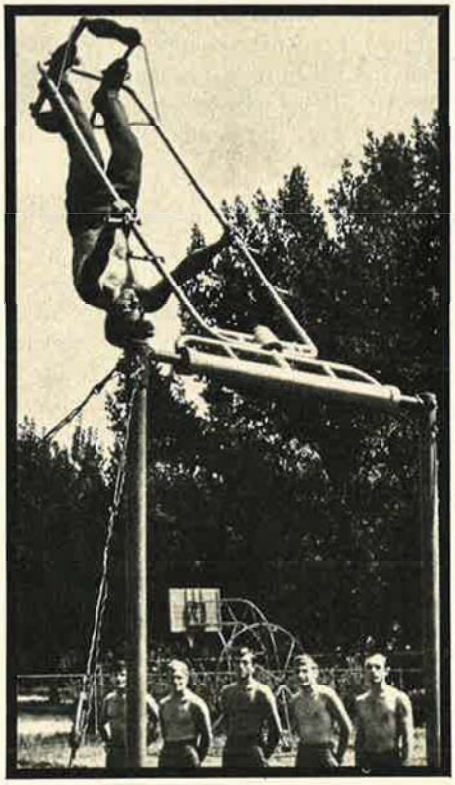
After an officer has served a number of years in the Strategic Rocket Forces, he may be selected to attend the Military Academy named for F. E. Dzerzhinskiy, commanded by General Colonel F. P. Tonkikh. The

BY HARRIET FAST SCOTT



Above is the Zhukovskiy Military Air Engineering Academy in Moscow. The Frunze Military Academy (right) emphasizes tactics and trains officers of the USSR and of Bloc and friendly nations.

These young men are in training at one of the higher military command schools for pilots.



length of this course probably is three years, in considerable contrast to the one academic year at similar level institutions in the United States.

This "Rocket Academy," as it is nicknamed, is located in Moscow, only a short walk from the Kremlin. If a Western tourist stays in Moscow's new Rossiya Hotel, considered the largest hotel in Europe, he may see these officers hurrying to class in the large yellow building along the Moscow River bank next to his hotel.

One well-known graduate of an early, short, nine-month course at the Academy was Col. Oleg Penkovskiy, arrested in 1962 by the Soviets as a spy. In the book, *The Penkovskiy Papers,* the school is described as it existed in the 1950s.

National Air Defense

Cadets aspiring to be officers in the Troops of National Air Defense (PVO) may attend one of fourteen different military and higher military schools. The length of courses varies from three to five years. Cadets may prepare for any one of the three components of National Air Defense—fighter aviation, radio-technical, or zenith (surface-to-air) rocket troops. The list of schools for the PVO forces may be found in the accompanying box.

Troops of National Air Defense have two academies. One is located in Kalinin and recently was named for Marshal Zhukov. The second, the Military Engineering Radiotechnical Academy in Kharkov, is named for the first Commander in Chief of National Air Defense, Marshal Govorov.

Air Forces

The Soviet Air Forces have twenty-four schools with courses varying from three to five years. Aviation engineers, pilots, navigators, and aviation technicians come to the Soviet Air Forces from these schools. A listing of the schools may be found in the accompanying box.

The Air Force has two academies, the Gagarin Military Air Academy in Monino, near Moscow, and the Zhukovskiy Military Air Engineering Academy on Leningrad Prospect in Moscow. The latter is housed in the

OFFICER EDUCATION AND TRAINING SCHOOLS FOR SOVIET AEROSPACE FORCES

SCHOOLS OF THE STRATEGIC ROCKET FORCES

Kharkov Higher Military Command School
(Named for Marshal of the Soviet Union N. I. Krylov)
310056. Kharkov, 56.

Perm Higher Military Command School
614015. Perm, 2. Ulitsa Ordzhonikidze, 12.

Riga Higher Military Command School
(Named for Marshal of the Soviet Union S. S. Biryuzov)
226028. Riga, 28. Boulevard Padomuy, 5.

Rostov Higher Military Command School
(Named for Chief Marshal of Artillery M. I. Nedelin)
344027. Rostov-on-the-Don, 27.
(Also political faculty offering a 4-year course.)

Saratov Higher Military Command School
(Named for Hero of the Soviet Union General Major A. I. Lizyukov)
410010. Saratov, 10.

Serpukhov Higher Military Command School
(Named for Lenin's Komsomols)
142202. Serpukhov, 2. Moscow Oblast.

Kazan Higher Military Engineering School
420025. Kazan, 25. Oktyabrskiy Gorodok.

SCHOOLS OF THE TROOPS OF NATIONAL AIR DEFENSE (PVO)

(Surface-to-Air Missile Troops)

Minsk Higher Engineering Zenith Rocket School of Air Defense
220057. Minsk, 57.
(Higher Engineering School—5 years)

Engels Higher Zenith Rocket Command School of Air Defense
413190. Engels, 9. Saratov Oblast.
(Higher Command School—4 years)

Gorkiy Higher Zenith Rocket Command School of Air Defense
603023. Gorkiy, P-23.
(Higher Command School—4 years)

Ordzhonikidze Higher Zenith Rocket Command School of Air Defense
362012. Ordzhonikidze, 12. North Ocetin ASSR.
(Higher Command School—4 years)

Yaroslavl Higher Zenith Rocket Command School of Air Defense
150016, Yaroslavl, Yaroslavl Oblast, 16.
(Higher Command School—4 years)

Opochka Zenith Rocket School of Air Defense
182330. Opochka, Pskov Oblast.
(Zenith Rocket School—3 years)

(Fighter Aviation)

Armavir Higher Military Aviation School for Pilots of Air Defense
352900. Armavir, Krasnodar Kray.
(Higher Aviation School—4 years)

Stavropol Higher Military Aviation School for Pilots and Navigators of Air Defense
355021. Stavropol, 21. Kray.
(Higher Aviation School—4 years)

Daugavpils Aviation-Technical School of Air Defense
(Named for Ya. Fabritsius)
228402. Daugavpils, 2. Latvian SSR.
(Aviation Technical School—3 years)

(Radio-Technical Troops)

Kiev Higher Engineering Radioelectronic School of Air Defense
252064. Kiev, 64. Ulitsa Melnikov, 81.
(Higher Engineering School—5 years)

Krasnoyarsk Higher Command School of Radioelectronics of Air Defense
660053. Krasnoyarsk, 53.
(Higher Command School—4 years)

Pushkin Higher Command School of Radioelectronics of Air Defense
188620. Pushkin, 1. Leningrad Oblast.
(Higher Command School—4 years)

Vilnius Higher Command School of Radioelectronics of Air Defense
232003. Vilnius, 3. Lithuanian SSR.
(Higher Command School—4 years)

Zhitomir Higher Command School of Radioelectronics of Air Defense
(Named for Lenin's Komsomols)
262023. Zhitomir, 23.
(Higher Command School—4 years)

SCHOOLS OF THE SOVIET AIR FORCES

(Aviation Engineering—5 years)

Kiev Higher Aviation Engineering Military School of the Air Forces
252043. Kiev, 43. Vozdukhoflotskiy Prospect, 54.

Riga Higher Military Aviation Engineering School
(Named for Ya. Alksnis)
226031. Riga, 31. Ulitsa Ezermalas, 2.

(Higher Flying Schools—4 years)

Balashov Higher Military Aviation School for Pilots
412340. Balashov, 3. Saratov Oblast.

Barnaul Higher Military Aviation School for Pilots
656018. Barnaul, 18. Altay Kray.

Borisoglebsk Higher Military Aviation School for Pilots
397140. Borisoglebsk, 2. Voronezh Oblast.

Chernigov Higher Military Aviation School for Pilots
(Named for Lenin's Komsomols)
250003. Chernigov, 3.

Kacha Higher Military Aviation School for Pilots
(Named for A. F. Myasnikov)
400010. Volgograd, 10.

Kharkov Higher Military Aviation School for Pilots
(Named for S. I. Gritsevets)
310028. Kharkov, 28.

Orenburg Higher Military Aviation School for Pilots
(Named for I. S. Polbin)
460014. Orenburg, 14.

Saratov Higher Military Aviation School for Pilots
413001. Saratov, Saratov Oblast. p/o Sokol.

Syzran Higher Military Aviation School for Pilots
446007. Syzran, 7. Kuybyshev Oblast.

Tambov Higher Military Aviation School for Pilots
(Named for M. M. Raskova)
392004. Tambov, 4.

Yeysk Higher Military Aviation School for Pilots
(Named for Cosmonaut V. M. Komarov)
353660. Yeysk, 1. Krasnodar Kray.

Chelyabinsk Higher Military Aviation School for Navigators
(Named for the 50th Anniversary of the Komsomols)
454015. Chelyabinsk, 15.

Voroshilovgrad Higher Military Aviation School for Navigators
(Named for the Proletariat of the Donbas)
348004. Voroshilovgrad, 4.

(Aviation-Technical Schools—3 years)

Achinsk Military Aviation-Technical School
662100. Achinsk, 1. Krasnoyarsk Kray.

Irkutsk Military Aviation-Technical School
(Named for the 50th Anniversary of the Komsomols)
664036. Irkutsk, 36.

Kaliningrad Military Aviation-Technical School
236023. Kaliningrad, 23. Kaliningrad Oblast.

1st Kharkov Military Aviation-Technical School
310048. Kharkov, 48.

2d Kharkov Military Aviation-Technical School
(Named for Lenin's Komsomols of the Ukraine)
310045. Kharkov, 45.

Perm Military Aviation-Technical School
(Named for Lenin's Komsomols)
614049. Perm, 49.

Tambov Military Aviation-Technical School
(Named for F. E. Dzerzhinskiy)
392006. Tambov, 6.

Vasilkov Military Aviation-Technical School
(Named for the 50th Anniversary of Lenin's Komsomols of the Ukraine)
255130. Vasilkov, 3. Kiev Oblast.

Voronezh Military Aviation-Technical School
394042. Voronezh, 42.

During two tours in the USSR while her husband was US Air Attaché in Moscow and on later visits to Russia, the author, Harriet Fast Scott, has traveled widely in that country and met with Soviet defense intellectuals and officials. She is coauthor of The Nuclear Revolution in Soviet Military Affairs *and has been a senior staff member of the Stanford Research Institute. Her translation and analysis of Marshal Sokolovskiy's* Military Strategy, 3d Edition, *will be published this spring by Crane and Russak.*

old Petrovskiy Palace, one of the historical landmarks of Moscow. (Valentina Nikolayeva-Tereshkova, the first woman in space, is a graduate of the Zhukovskiy Military Air Engineering Academy.)

Political Schools

Each of the aerospace components has its own four-year school to train political officers. As noted earlier, the Strategic Rocket Forces have a political faculty attached to the Rostov Higher Military Command School. The National Air Defense and Air Forces schools are the Leningrad Higher Military Political School of Air Defense, 188620, Leningrad, p/o Gorelovo; and the Kurgan Higher Military Political Aviation School, 640025, Kurgan, 25, Oblast.

The political administration of the Armed Forces also has its own Academy, the Lenin Military-Political Academy, Moscow, K-107, Great Sadovaya, 14. This school is just off Gorkiy Street on the inner ring road opposite the statue of the famous poet Mayakovskiy. Political officers from all of the Soviet services can be observed in its student body.

Other Academies

A number of officers in the Soviet aerospace forces may attend the Frunze Military Academy, a school of combined-arms warfare. Named for M. V. Frunze, its address is 119255, Moscow, G-255, Proyezd Devichyevo Polya, 4.

Still other officers may be selected for the Soviet Union's highest military school—the Academy of the General Staff. This school is at approximately the same level as the National War College in the US. It probably is a two-year course. Named for K. Ye. Voroshilov, this Academy is located in Moscow at Kholzunova Pere., 4.

Both of these academies are housed in impressive buildings near the Novodevichiy Monastery in Moscow.

Age Limits and Preparation for Schooling

In the aerospace field, the age limits for military schools range from seventeen to twenty-one for cadets entering from civilian life, and to age twenty-three for military personnel on extended service. Warrant officers may be admitted to such schools up to age twenty-five.

At the next educational level, the military academies, the age limit is twenty-eight for those studying engineering, while the command and staff schools admit students to age thirty-two.

There are, however, a number of exceptions. The Dzerzhinskiy (Rocket) Academy accepts division commanders to age thirty-six and the Gagarin Air Academy admits staff officers to age thirty-four. The average age of officers graduating from the Academy of the General Staff appears to be about thirty-seven.

Soviet officers are advised to begin preparation for the entrance examinations to military academies two to three years ahead of time. Two to three thousand hours of preparatory study are recommended. Articles by Soviet officers advise the prospective student to devote twenty to thirty hours to preparatory study each week, in addition to his normal military duties. Soviet officers may also complete Academy courses by correspondence.

Prestige of the Aerospace Educational Institutions

Commandants of the Soviet military academies—the counterparts of our war and command and staff colleges—are, by law, the equivalents of military district commanders. For example, Air Marshal Zimin heads the Zhukov Military Academy of Air Defense. General Colonel of Aviation Skomorokhov is the commandant of the Gagarin Air Academy, while General Lieutenant-Engineer V. V. Filippov directs the Zhukovskiy Military Air Engineering Academy. General Colonel Tonkikh runs the Dzerzhinskiy (Rocket) Military Academy.

Faculty heads at the academies, also by Soviet law, equate to corps commanders, and therefore have one or two stars.

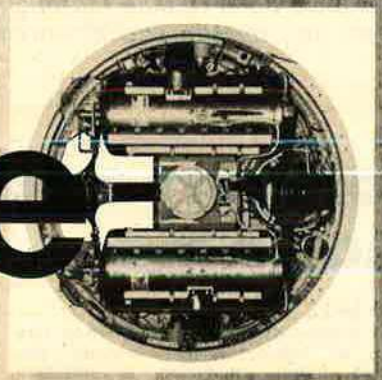
The backgrounds of many academy commandants are impressive. Marshal of the Soviet Union M. V. Zakharov, one of the most influential Soviet officers in the post-World War II period, served twice as commandant of the General Staff Academy. Air Marshal Zimin is a Doctor of Military Science. General of Aviation Skomorokhov is a two-time Hero of the Soviet Union, and a graduate of both the Frunze Military Academy and the Academy of the General Staff.

Almost without exception, the higher military schools, which are comparable to our service academies, are headed by general majors. Thus, there are more than 100 general officers assigned to the equivalent of our cadet education in the three US service academies.

For a peacetime military force, the magnitude of education and training provided for the Soviet Armed Forces is staggering. It might be argued that the specialized nature of the secondary and higher military schools, which seemingly provide the bulk of the Soviet officer corps, produces officers with narrow professional backgrounds. How the graduates of the Soviet schools compare with their counterparts from West Point, Annapolis, or the Air Force Academy is a matter of conjecture.

But one thing is certain. The Soviet Union emphasizes officer training and education. Each year, newly graduated officers from the military academies are invited to a reception in the Kremlin's Palace of Congresses. Military schools and academies are well constructed and maintained, often in contrast to the somewhat shoddy construction and appearance of nearby civilian buildings. And education in the Soviet military, as in civilian life, is one of the best assurances the individual has of success in his or her profession. ■

When reliability & total cost come first...



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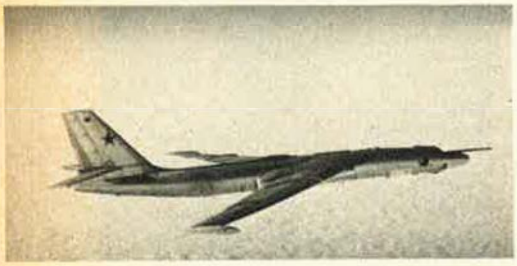
GALLERY AEROSPACE

BY JOHN W. R. TAYLOR
Editor, *Jane's All The World's Aircraft*

John W. R. Taylor, the British aerospace authority who prepared this Gallery for AIR FORCE Magazine, is generally acknowledged as the leading expert in aircraft of all nations. His Jane's Supplement *appears regularly in this magazine. British spelling, punctuation, and usage have been retained throughout the Gallery. Of necessity, some aircraft and missile specifications are estimated or approximate.*

—Tass Photo

Beriev M-12 (NATO 'Mail')



Myasishchev Mya-4 (NATO 'Bison-B')

—Tass Photo

Myasishchev Mya-4 (NATO 'Bison-C')

Bombers and Maritime

Beriev M-12 (NATO 'Mail')

First displayed in the 1961 Aviation Day fly-past at Tushino Airport, Moscow, this maritime patrol amphibian is standard equipment in shore-based units of the Soviet Naval Air Force, notably in support of the Northern and Black Sea Fleets. About 100 are thought to have been built to replace the piston-engined Be-6 (NATO 'Madge') flying-boats of 1947 vintage. They hold all 16 records for turboprop amphibians currently recognised by the FAI, as well as all 10 records for turboprop seaplanes. Operational equipment includes radar in a nose 'thimble' and an MAD tail-sting.

Power Plant: two Ivchenko AI-20D turboprop engines; each 4,000 shp.

Dimensions: span 97 ft 6 in, length 99 ft 0 in, height 22 ft 11½ in.

Weight: gross 65,035 lb.

Performance: max speed 379 mph, max range 2,485 miles.

Armament: variety of weapons and stores for maritime search and attack carried in internal bay aft of step in bottom of hull, and on four underwing pylons.

Ilyushin Il-38 (NATO 'May')

This anti-submarine/maritime patrol aircraft was evolved from the Il-18 turboprop airliner in the same way as the US Navy developed the P-3 Orion from the Lockheed Electra transport. The fuselage has been lengthened, and the disposition of specialised internal equipment affected the CG position so much that the wing had to be moved forward a considerable distance. The airliner's passenger windows are no longer needed. Additions include an MAD tail-sting, a large radome under the forward fuselage, and an internal weapon-bay. Il-38s operate widely over the Atlantic and Mediterranean, as the principal shore-based patrol aircraft of the Soviet Naval Air Force. Those encountered over the Mediterranean bearing Egyptian insignia are believed to be operated by Soviet aircrews from North African bases.

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.

Myasishchev Mya-4 (NATO 'Bison')

Soviet counterpart of the USAF's B-52, the Mya-4 continues to equip part of the Dalnaya Aviatsiya (Long-Range Aviation) force of 145 intercontinental bombers. It operates also as a flight refuelling tanker for this force, carrying a hose-reel unit in its bomb-bay, and has been developed for maritime patrol duties with the Soviet Naval Air Force. The Mya-4 was first displayed publicly in 1954, when a single example took part in a May Day fly-past over Moscow. It was manufactured subsequently in three major versions, which were allocated the following NATO reporting names:

Bison-A. Long-range strategic bomber, with internal bomb-bays for free-fall nuclear or conventional weapons. Armed with ten 23 mm guns. Up to 50 modified into flight refuelling tankers.

Bison-B. Maritime reconnaissance version, reported in 1964. Glazed nose of 'Bison-A' replaced by 'solid' nose with large superimposed flight refuelling probe. Forward portion of centre bomb-bay doors bulged. Underfuselage blister fairings over electronic equipment. Armament reduced by removal of aft gun turrets above and below fuselage.

Bison-C. Similar to 'Bison-B' in configuration, except for large search radar faired into longer nose, aft of centrally-mounted flight refuelling probe. An example of this version, designated 201-M and powered by four 28,660 lb st D-15 turbojet engines, set up seven payload-to-height records in 1959, including a weight of 121,480 lb lifted to a height of 2,000 m (6,560 ft). *(Data for 'Bison-A' follow.)*

Power Plant: four Mikulin AM-3D turbojet engines; each 19,180 lb st.

OF SOVIET WEAPONS

Dimensions: span 165 ft 7½ in, length 154 ft 10 in.
Weight: gross 350,000 lb.
Performance: max speed 560 mph at 36,000 ft, range 7,000 miles at 520 mph with 10,000 lb of bombs.
Armament: ten 23 mm guns in twin-gun turrets above fuselage fore and aft of wing, under fuselage fore and aft of weapon-bays, and in tail. Three weapon-bays in centre fuselage.

Tupolev Tu-16 (NATO 'Badger')

Although the twin-jet Tu-16 has been in service more than twenty years, about one-quarter of the 2,000 production models thought to have been built still fly with the medium-range squadrons of the Dalnaya Aviatsiya. The Soviet Naval Air Force also has about 400 for maritime reconnaissance and attack, supported by Tu-16 flight refuelling tankers. Others operate in small numbers with the Iraqi and Egyptian Air Forces, possibly manned by Soviet aircrews. Of seven versions identifiable by NATO reporting names, six remain in first-line service, as follows:

Badger-A. The Soviet Air Force's first strategic jet bomber, to which the specification details below apply. Glazed nose. Radome fairing under front fuselage in line with flight deck. Armed with seven 23 mm guns.

Badger-C. Anti-shipping version, first displayed in 1961 Soviet Aviation Day fly-past, with 'Kipper' air-to-surface winged missile carried under centre-fuselage. Wide nose radome, in place of normal glazing and nose gun.

Badger-D. Maritime/electronic reconnaissance version, with nose like that of 'Badger-C'. Larger undernose radar fairing. Three more blister fairings in tandem under centre fuselage.

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

Badger-F. Similar to 'Badger-E' but with pylon for an electronic intelligence pod under each wing.

Badger-G. Similar to 'Badger-A' but fitted with underwing pylons to carry two rocket-powered air-to-surface missiles (NATO 'Kelt'). About 275 reported in service with anti-shipping squadrons of Soviet Naval Air Force, replacing earlier 'Badger-Bs' which carried turbojet-powered missiles (NATO 'Kennel') of similar configuration. A few delivered to Egypt launched 25 'Kelts' against Israeli targets during the October 1973 war. Five penetrated the defences to hit two radar sites and a supply dump in Sinai. *(Data for 'Badger-A' follow.)*

Power Plant: two Mikulin AM-3M turbojet engines; each 20,950 lb st.
Dimensions: span 110 ft 0 in, length 120 ft 0 in, height 35 ft 6 in.
Weight: gross 150,000 lb.
Performance: max speed 587 mph at 35,000 ft, service ceiling 42,650 ft, range 3,975 miles at 480 mph with 6,600 lb of bombs.
Accommodation: crew of seven.
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 weapon-bay.

Tupolev Tu-22 (NATO 'Blinder')

This supersonic bomber caused considerable dismay in the West when it put in a surprise appearance at the 1961 Aviation Day display. Retraction of the main landing gear into pods on the wing trailing-edges identified it clearly as a Tupolev design, and it was viewed as a formidable replacement for existing Soviet long-range strategic bombers. In fact, its range was disappointing and the Dalnaya Aviatsiya is believed to have taken delivery of no more than 200 Tu-22s to supplement its Tu-16s. About 60 were transferred to the Naval Air Force, for reconnaissance and to help protect the sea approaches to the Soviet Union, from bases in the Southern Ukraine and Estonia. An electronic intelligence gathering version has also been reported.

Blinder-A. Basic medium-range reconnaissance bomber, with fuselage weapon-bay for free-fall bombs.

Blinder-B. Similar to 'Blinder-A' but capability increased by ability to carry an air-to-surface missile (NATO 'Kitchen') with a 460-mile range, recessed into the weapon-bay. Large radar and partially-retractable flight refuelling probe in nose. Most of 22 Tu-22s in 1967 Aviation Day display at Domodedovo Airport were of this model.

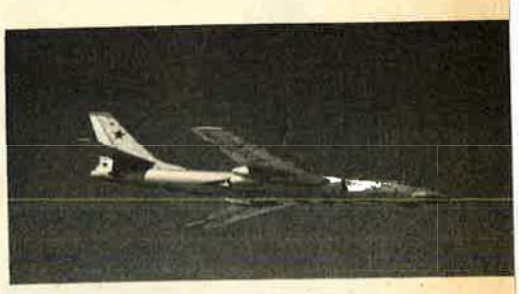
Blinder-C. Maritime reconnaissance version, with windows for six cameras in weapon-bay doors. New dielectric panels, modifications to nosecone, etc., observed on some aircraft suggest added equipment for ECM and electronic intelligence roles.

Blinder-D. Training version. Cockpit for second pilot in raised position aft of normal 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 26,000 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 17 ft 0 in.
Weight: gross 185,000 lb.
Performance: max speed Mach 1.4 at 40,000 ft, service ceiling 60,000 ft, range 1,400 miles.
Accommodation: three, in tandem.
Armament: single gun in radar-directed tail mounting. Other weapons as described for individual versions.

Tupolev Tu-95 (NATO 'Bear')

First flown in the late Summer of 1954, the Tu-95 quickly proved itself a better combat aircraft than the contemporary four-jet Mya-4, despite its unique turboprop power plant. In the mid-seventies, it not



Tupolev Tu-16 (NATO 'Badger-D')

Tupolev Tu-22 (NATO 'Blinder-C')

Tupolev Tu-95 (NATO 'Bear-C') (with US Navy F-4B Phantom)

Tupolev Tu-95 (NATO 'Bear-F')

Tupolev bomber (NATO 'Backfire') (artist's conception)

MiG-17 (NATO 'Fresco') Soviet AF day fighter

MiG-19 (NATO 'Farmer') Soviet AF day fighter

–Tass Photo

only remains primary equipment of the Soviet intercontinental strategic bombing force, but has duties that are probably even more important with the Soviet Naval Air Force. All six major versions identified by NATO reporting names continue in service:

Bear-A. Basic long-range strategic bomber, with internal stowage for free-fall nuclear or conventional weapons. Armed with six 23 mm guns. Total of about 100 of this version and 'Bear-B' operational.

Bear-B. As 'Bear-A' but equipped to carry large air-to-surface missile (NATO 'Kangaroo') under fuselage, with associated radar in wide undernose radome replacing glazed nose. Displayed first in 1961 Aviation Day fly-past. Now fitted with large flight refuelling nose-probe and used mainly for maritime patrol.

Bear-C. First observed near NATO naval forces in 1964. Differs from 'Bear-B' in having a streamlined blister fairing on the port side of its rear fuselage as well as on the starboard side.

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.

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

Bear-F. Much-refined maritime version, identified in 1973. Smaller X-band radar fairing, further forward than that of 'Bear-D'. Large blister fairings absent from rear fuselage. Lengthened fuselage forward of wings, with shallow undernose radome on some aircraft only. Enlarged fairings aft of inboard engine nacelles to improve aerodynamics. Armament reduced to two guns, in tail mounting. Two stores bays in rear fuselage, one replacing ventral gun turret. Bulged nosewheel doors, over larger or low-pressure tyres. *(Data for 'Bear-A' follow.)*

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

Dimensions: span 159 ft 0 in, length 155 ft 10 in, height 39 ft 9 in.

Weight: gross 340,000 lb.

Performance: max speed 500 mph at 41,000 ft, range 7,800 miles with 25,000 lb of bombs.

Armament: six 23 mm guns in pairs in remotely-controlled forward dorsal and rear ventral turrets, and manned tail turret.

Tupolev variable-geometry bomber (NATO 'Backfire')

The existence of this twin-jet variable-geometry strategic bomber has been known for more than five years. One of the prototypes was observed on the ground near the Tupolev works at Kazan, in Central Asia, in July 1970. Up to twelve pre-production models were tested subsequently, and at least one squadron was expected to become operational with the Dalnaya Aviatsiya during 1974. It is intended to replace some of the earlier long-range and medium-range bombers, and, according to US Secretary of Defense James R. Schlesinger, its non-refuelled maximum combat radius of about 3,570 miles, 'coupled with its known flight refuelling capability, would seem to indicate that "Backfire" could be used as an intercontinental as well as a peripheral bomber, the role for which it appears best suited'. Admiral Thomas H. Moorer added: 'When deployed with a compatible tanker force [it] constitutes a potential threat to the continental United States. . . . It weighs two and one-half times as much as an FB-111 and is about four-fifths as large as the B-1'.

It is believed that 'Backfire' was developed when the shortcomings of the Tu-22 became apparent. Probable design parameters included an over-target speed of Mach 2.25 to Mach 2.5, a maximum unrefuelled range of 5,500–6,000 miles at high altitude, and a low-level penetration capability at supersonic speed. The original version (NATO **'Backfire-A'**) is thought to have failed to meet the range requirement. Redesign to produce the initial operational **'Backfire-B'** is said to include increased wing span and reduction in the size of the typically-Tupolev main landing gear pods, so that the retracted wheels are now housed at least partially within the wing envelope above the pods. Use of the pods has restricted the variable geometry to the outer wings, as on the Sukhoi Su-20. The large square-section engine ducts, built on to the sides of the fuselage, are fitted with splitter plates and must embody complex internal variable geometry. The engines are reported to be uprated versions of the 44,090 lb st Kuznetsov NK-144 afterburning turbofans used in the Tu-144 supersonic airliner.

Gross weight of 'Backfire' is believed to be in the region of 272,000 lb. It can be expected to carry the full range of Soviet free-fall weapons and an air-to-surface missile at least as advanced as 'Kitchen'. A new missile, referred to in the west as ASM-6, is said to have been designed for 'Backfire', with a solid-propellant rocket motor and range of 460 miles. The Soviet Union is also thought to be perfecting counterparts to the USAF's SRAM, and decoys to assist penetration of advanced defence systems.

Fighters

MiG-17 (NATO 'Fresco')

The Soviet designation 'MiG' reflects the fact that early piston-engined and jet fighters from this design bureau were evolved under the partnership of Colonel-General Artem I. Mikoyan and a mathematician named Mikhail I. Gurevich. From the MiG-21 onward, Gurevich played no part in design. Mikoyan died in December 1970, but the MiG designation is being perpetuated for all current designs of the bureau he headed.

The MiG-17 was developed from the pioneer Soviet sweptwing MiG-15 in an unsuccessful effort to achieve supersonic performance. A thinner wing section was used; sweep was increased to 47° inboard and 43° outboard; the rear fuselage was lengthened, and a more powerful engine was fitted. Although subsonic, the new fighter was sufficient of an advance over the MiG-15 to begin superseding it in production in 1953. Many thousands were built subsequently. An estimated 800 MiG-17F (NATO 'Fresco-C') day fighter-bombers still serve with the Frontovaia Aviatsiya tactical support units. Several hundred MiG-17PF ('Fresco-D') limited all-weather interceptors, with radar in a central bullet in the air intake, continue to fly with the PVO-Strany air defence forces. Others are deployed widely with the air forces of Russia's allies and friends in eastern Europe, the Middle East, Africa, and Asia. *(Data for MiG-17F follow.)*

Power Plant: one Klimov VK-1A turbojet engine; 6,990 lb st with afterburning.

Dimensions: span 31 ft 0 in, length 36 ft 4 in, height 11 ft 0 in.

Weight: gross 14,750 lb.

Performance: max speed 700 mph at sea level, service ceiling 57,500 ft, combat radius 360 miles with two 550 lb bombs and two drop-tanks.

Accommodation: pilot only.

Armament: three 23 mm NR-23 guns. Four eight-rocket pods or two 550 lb bombs. (MiG-17PF can carry four 'Alkali' missiles.)

MiG-19 (NATO 'Farmer')

When this twin-jet fighter entered service in 1955, it was the first Soviet combat aircraft able to exceed Mach 1 in level flight.

It has now almost disappeared from service with the PVO-Strany, although examples supplied to other air forces continue to fly with first-line squadrons. In addition, both day and all-weather fighter versions were in large-scale production in China quite recently, under the designation F-6, and form the basis of the new Chinese F-9 design. Main current Soviet-built versions are as follows:

MiG-19SF ('Farmer-C'). Day fighter-bomber, to which details below apply.

MiG-19PM ('Farmer-D'). Limited all-weather fighter, able to carry four 'Alkali' missiles. Guns deleted. Radar in bullet in centre of air intake and lip fairing.

MiG-19PF ('Farmer-D'). As MiG-19PM, but armed with two wing-root guns and no provision for 'Alkali' missiles.

Power Plant: two Klimov RD-9B turbojet engines; each 7,165 lb st with afterburning.

Dimensions: span 29 ft 6½ in, length 48 ft 10½ in, height 13 ft 2¼ in.

Weights: empty 12,700 lb, gross 19,180 lb.

Performance: max speed 902 mph at 32,800 ft, service ceiling 58,725 ft, combat radius 426 miles with external tanks.

Accommodation: pilot only.

Armament: three 30 mm NR-30 guns, two 550 lb bombs, 212 mm air-to-surface rockets, or eight-rocket pods.

MiG-21 (NATO 'Fishbed')

Smaller and lighter in weight than either of the US types built for the ACF programme, the MiG-21 is the most widely-used fighter in the world. Manufactured in India and China (as the F-8), as well as in the Soviet Union, it is standard equipment in more than twenty air forces and is listed by *Jane's* in twenty different versions. The initial production model (NATO 'Fishbed-A') was built in only small numbers, with an 11,240 lb st Tumansky RD-11 afterburning turbojet and installed armament of two 30 mm guns. It was generally regarded as being short on range, search capability, and punch, although it was, from the start, a true 'pilot's aeroplane' in terms of handling qualities. Development has concentrated mainly on overcoming these shortcomings.

The E-5 prototype of the MiG-21 flew for the first time in 1955. Major versions now serving with the Soviet tactical air forces (more than 1,350 aircraft) are as follows:

MiG-21F ('Fishbed-C'). Short-range clear-weather fighter, with 12,676 lb st RD-11 engine, internal fuel capacity of 618 gallons, and radar ranging equipment in small air intake centrebody, of movable three-shock type. Able to carry underbelly 130 gallon tank. Armed with one 30 mm gun and two K-13 (NATO 'Atoll') air-to-air missiles or sixteen-round pods of 57 mm rockets. 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 new series, with R1L search/track radar in enlarged intake centrebody to enhance all-weather capability. RD-11 uprated to 13,120 lb st with afterburning. Internal fuel capacity increased to 753 gallons. Guns deleted. Late production aircraft 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. Type R2L radar with reported lock-on range of under 8 miles and ineffective below 3,000 ft because of ground clutter. Max permissible speed at low altitude 683 mph.

MiG-21PFMA ('Fishbed-J'). Multi-role development of PFM, with four underwing pylons instead of two. Armament can include GP-9 underbelly pack, housing GSh-23 twin-barrel 23 mm gun, instead of external fuel tank. Deepened dorsal spine fairing above fuselage contains some tankage, but internal fuel capacity totals only 687 gallons. Two additional pylons can carry either 130 gallon fuel tanks or radar-homing 'Advanced Atoll' missiles to supplement infra-red K-13As on inboard pylons. Pitot boom above nose, but 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 carriage of centre-line tank.

MiG-21MF ('Fishbed-J'). Basically as PFMA, but with lighter-weight, higher-rated Tumansky RD-13-300 turbojet. Rearview mirror above canopy. Debris deflector beneath each suction relief door forward of wing root. Entered service with Soviet AF in 1970.

'Fishbed-K'. As MiG-21MF, but with ECM equipment in small wingtip pods. Deep dorsal spine extends rearward as far as parachute brake housing to provide maximum fuel tankage and optimum aerodynamic form.

'Fishbed-L'. Improvements in this version not yet releasable. Can be distinguished from 'Fishbed-J' by absence of deflectors under suction relief doors. *(Data for MiG-21MF follow.)*

Power Plant: one Tumansky RD-13-300 turbojet engine; 14,550 lb st with afterburning.

Dimensions: span 23 ft 5½ in, length 51 ft 8½ in, height 14 ft 9 in.

Weight: gross 20,725 lb.

Performance: max speed Mach 2.1 above 36,000 ft and Mach 1.06 at low altitude, service ceiling 59,050 ft, range 683 miles on internal fuel or 1,118 miles with three external tanks.

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun, with 200 rounds. Typical loads on underwing pylons 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 air-to-surface missiles.

MiG-23 (NATO 'Flogger')

Last year's news that about 75 MiG-23s were flying with two Soviet fighter regiments based in East Germany should have caused no surprise. The prototype participated in the 1967 Aviation Day fly-past at Domodedovo, and deployment seems to have been delayed by problems which led to major design changes in the production versions. The MiG-23 is said to have become fully operational during 1972, since when several hundred have equipped tactical fighter units of the Soviet Air Force, with others going to its Warsaw Pact allies and, according to unsubstantiated reports, the air forces of Syria and Libya. Wing sweep is variable from approximately 21° to 71°. The bottom half of the ventral tail-fin is hinged so that it can fold to starboard to provide ground clearance during take-off and landing. Two versions are operational:

MiG-23B ('Flogger-B'). Basic single-seat tactical fighter, to which details below apply.

MiG-23U ('Flogger-C'). Tandem two-seater for both operational training and combat use. Changes limited to provision of second cockpit and modified fairing aft of canopy.

Power Plant: one unidentified turbojet engine; estimated at 20,500 lb st with afterburning.

Dimensions: span 46 ft 9 in spread, 26 ft 9½ in swept, length 55 ft 1½ in.

Weight: gross 28,000–33,050 lb.

Performance: max speed Mach 2.3 at height, Mach 1.1 at sea level, service ceiling 59,000 ft, combat radius 600 miles.

Accommodation: pilot only.

Armament: one 23 mm GSh-23 twin-barrel gun; four pylons under fuselage and fixed wing panels for unidentified external stores. Former US Air Force Secretary Dr. Robert C. Seamans described radar and missile systems as comparable with those of the USAF's F-4.

MiG-25 (NATO 'Foxbat')

Fastest weapon-carrying aircraft in service with any air force in the world, the MiG-25 has become the standard against which the efficiency of western defence systems must be evaluated. Its existence was revealed in

MiG-21F (NATO 'Fishbed-C') of Indian AF

MiG-21MF (NATO 'Fishbed-J') of Soviet AF

MiG-23 (NATO 'Flogger')

MiG-25 (NATO 'Foxbat-B')

—Tass Photo

Sukhoi Su-9 (NATO 'Fishpot')

Sukhoi Su-15 (NATO 'Flagon-A')

Tupolev Tu-28P (NATO 'Fiddler')

Yakovlev Yak-28P (NATO 'Firebar')

1965, when the Soviet Union requested FAI approval for a speed record of 1,441.5 mph set up by an aircraft designated E-266 around a 1,000 km closed circuit, carrying a two-ton payload. Other records followed, including an absolute height record of 118,898 ft, and speed of 1,852.61 mph over a 500 km circuit, which have not been beaten. Identification of the E-266 as the MiG-25 did not come until early 1973, when Dr. Robert C. Seamans, then US Secretary of the Air Force, described it as 'probably the best interceptor in production in the world today', adding, 'This Mach 3 aircraft performs both interceptor and reconnaissance missions, can operate at 80,000 ft, and has a highly capable avionics and missile system'. During the previous two years, MiG-25s had performed high-speed reconnaissance flights off the Israeli coastline and over Sinai, without hindrance. Subsequently, similar missions have been flown over Iran. Two versions of the MiG-25 have been identified by unclassified NATO reporting names:

Foxbat-A. Basic interceptor, armed with four new air-to-air missiles.

Foxbat-B. Basic reconnaissance aircraft, with cameras aft of small dielectric nosecone.

In his FY 1975 Defense Department Report, Secretary Schlesinger commented, 'Should the Soviet Union develop and deploy an AWACS-Foxbat "look-down, shoot-down" air defence system, we would have to counter it with new penetration devices and techniques such as the cruise missile, bomber defence missiles, and improved ECM'.

Power Plant: two turbojet engines, probably of Tumansky design; each 24,250 lb st with afterburning.
Dimensions: span 40 ft 0 in, length 69 ft 0 in.
Weight: gross 64,200 lb.
Performance: max speed Mach 3.2 at height, service ceiling 80,000 ft, combat radius 700 miles.

Sukhoi Su-9 (NATO 'Fishpot')

When the prototype of this single-seat all-weather fighter ('Fishpot-A') appeared in the 1956 Soviet Aviation Day fly-past, it had a small conical radome above its engine air intake. This was replaced by a conical centrebody radome on the production Su-9 ('Fishpot-B'), which has been operational since 1959 and, with the improved Su-11, continues to equip 25% of the PVO-Strany's force of more than 2,500 interceptors. Although similar in general configuration to the contemporary MiG-21, the Su-9 is a larger and more powerful aircraft of rather cleaner design. An unusual feature is that it normally carries two external fuel tanks side by side under its belly.

Power Plant: one Lyulka AL-7F turbojet engine; 19,840 lb st with afterburning.
Dimensions: span 26 ft 0 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 of 'Fishpot-C' implies, the Su-11 is an improved version of the Su-9. First displayed publicly at Domodedovo in 1967, it has a lengthened nose of less tapered form, with an enlarged centrebody, and two slim duct fairings along the top of the fuselage, as on the Su-7B. Its armament is also much improved, and an uprated version of the AL-7F turbojet is fitted.

Power Plant: one Lyulka AL-7F turbojet engine; 22,046 lb st with afterburning.
Dimensions: span 26 ft 0 in, length 56 ft 0 in.
Performance: max speed Mach 1.8 at 36,000 ft.
Accommodation: pilot only.
Armament: no guns; two missiles (NATO 'Anab') under wings, one radar homing, one infra-red homing.

Sukhoi Su-15 (NATO 'Flagon')

This formidable twin-jet all-weather interceptor was another newcomer at the last big Soviet Aviation Day display in 1967. One prototype and nine standard single-seat fighters took part, together with a purely experimental STOL version with wings of compound sweep and three lift-jet engines mounted vertically in the centre fuselage. Other versions have followed, and Su-15s, Tu-28Ps, Yak-28Ps, and MiG-25s now equip about 50% of the PVO-Strany domestic air defence units. Variants identified by NATO reporting names are as follows:

Flagon-A. Basic single-seater, with simple delta wings identical in form to those of Su-11.

Flagon-B. Experimental STOL version, for R&D only.

Flagon-C. Two-seat training version, with probable combat capability.

Flagon-D and **Flagon-E.** Similar to 'Flagon-A' but with wings of compound sweep, produced by reducing the sweepback at the tips without increasing the span.

Power Plant: two unidentified afterburning turbojets.
Dimensions: span 30 ft 0 in, length 68 ft 0 in.
Weight: gross 35,275 lb.
Performance: max speed Mach 2.5 above 36,000 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 (NATO 'Fiddler')

When displayed for the first time at Tushino in 1961, this large two-seat twin-jet supersonic interceptor was armed with only two missiles, carried a large blister fairing under its fuselage, and was fitted with two ventral fins. The three production Tu-28Ps which took part in the 1967 fly-past at Domodedovo dispensed with the fairing and ventral fins, but carried double the armament of the 1961 aircraft. Design features include half-cone shock-bodies in the engine air intakes, and streamlined pods on the wing trailing-edges into which the main landing gear units retract.

Power Plant: two unidentified afterburning turbojet engines; each estimated at 27,000 lb st.
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.
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')

The designation Yak-28 is applied to a series of aircraft employing the same basic airframe and power plant but intended for a variety of military tasks, as replacements for the earlier Yak-25, 26, and 27. Similarity to their predecessors is superficial. As a start, all members of the Yak-28 family are of shoulder-wing layout, whereas the Yak-25/26/27 were mid-wing. Other major changes include the switch to a completely new landing gear, comprising two twin-wheel main units in tandem under the fuselage, with small balancer wheels inset from the wingtips. The pointed fairings forward of the balancer wheel housings are lead-filled for aerodynamic reasons.

The version of the design equipped as a transonic all-weather interceptor is the Yak-28P. Since entering service, it has been fitted retrospectively with a much longer dielectric nosecone, but this does not indicate any increase in radar capability or aircraft performance.

Power Plant: two turbojet engines, believed to be related to the Tumansky RD-11 fitted in the MiG-21; each 13,120 lb st with afterburning.
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 radar homing heads.

Attack Aircraft

Sukhoi Su-7 (NATO 'Fitter-A')

Developed in parallel with the Su-9/Su-11 all-weather interceptors, this ground attack fighter differs from them primarily in having a swept wing instead of a delta wing. It made its debut at the same time as the Su-9 prototype, at Tushino in 1956. By 1961, it was able to fly past spectators at the same airport in formations of up to 21 aircraft. Today, about 500 Su-7s are believed to serve with tactical units of the Soviet Air Force. Others have been exported to at least ten countries, and were used in action during the last Indo-Pakistan war and in the Middle East, by India and the Arab combatants respectively. Standard versions are the Su-7B and BM, the latter with a low-pressure nosewheel tyre, necessitating bulged doors to enclose it when retracted.

Power Plant: one Lyulka AL-7F turbojet engine; 22,046 lb st with afterburning.
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 at 36,000 ft, or 530 mph at sea level without afterburning, service ceiling 49,700 ft, combat radius 200–300 miles.
Accommodation: pilot only.
Armament: two 30 mm NR-30 guns in wing roots, each with 70 rounds; underwing attachments for two 1,650 lb and two 1,100 lb bombs, or rocket pods.

Sukhoi Su-20 (NATO 'Fitter-B')

Among the experimental aircraft displayed at Domodedovo on Soviet Aviation Day in 1967 was a variable-geometry adaptation of the Su-7. Only some 13 ft of each wing was pivoted, outboard of a very large fence; the remainder of the airframe was virtually unchanged. Attachments for an external store were built into each wing fence, but there seemed no reason to expect the variable-geometry Su-7 to enter production in view of the comparatively small improvement in performance offered by such modification. Discovery of at least one or two squadrons of the aircraft in service with the Soviet Air Force in 1972 came as a surprise, but can be explained by the minimal endurance of the standard Su-7 with full afterburning in use. Even a small improvement in range and endurance is worthwhile.

The Su-20 designation quoted for production aircraft is not yet confirmed. Deliveries have been made to several air forces, and photographs of those serving with the Polish Air Force reveal that they are fitted with a second nose-probe, a deepened dorsal spine fairing between the cockpit canopy and the fin, and two additional weapon attachments under the fixed portions of the wings. The wing-root guns and underfuselage pylons of the Su-7 are retained; but, instead of the familiar twin centreline external fuel tanks, the Polish aircraft seem to fly normally with two large jettisonable tanks on the outboard wing attachments.

Sukhoi variable-geometry attack aircraft (NATO 'Fencer')

Although the new combat aircraft known to NATO as 'Fencer' is operational, few details have yet been published, and no photographs have appeared in the press. Admiral Thomas H. Moorer, former Chairman of the US Joint Chiefs of Staff, has described it as 'the first modern Soviet fighter to be developed specifically as a fighter-bomber for the ground attack mission'. It is believed to be a Sukhoi design, in much the same class as the USAF's F-111.

Yakovlev Yak-28 (NATO 'Brewer-A, B, and C')

The two-seat tactical attack Yak-28 was produced in several versions, known by the NATO reporting names of 'Brewer-A, B, and C'. The basic airframe and power plant are similar to those described for the Yak-28P ('Firebar'), the main differences being in crew accommodation and operational equipment. There is a single cockpit for the pilot, under a small blister canopy, with a glazed nose position for the navigator/bomb-aimer. An internal weapon-bay is located in the centre fuselage, and most Yak-28s have a small radome forward of this. Some have a gun semi-submerged in each side of the fuselage; others have a single gun, on the starboard side. The length of the engine nacelles varies on different versions. All can carry a pointed slipper-type fuel tank under the leading-edge of each outer wing. The number remaining in service with the Soviet tactical air forces is probably small.

Sukhoi Su-7BM (NATO 'Fitter-A') —Tass Photo

Reconnaissance and Early Warning Aircraft

MiG-21 (NATO 'Fishbed')

Two versions of this supersonic single-seat fighter are equipped as specialised tactical reconnaissance aircraft. The **MiG-21R** ('Fishbed-H') is basically similar to the MiG-21PFMA but has a pod containing forward-facing or oblique cameras, infra-red sensors or ECM devices, and fuel, mounted on its fuselage centreline pylon. There is a suppressed antenna at mid-fuselage; optional wingtip fairings house further ECM equipment. The **MiG-21RF** ('Fishbed-H') carries similar equipment but is based on the MiG-21MF.

MiG-25 (NATO 'Foxbat-B'): *see page 65.*

Tupolev AWACS aircraft (NATO 'Moss')

In 1968, two years before Boeing received an initial contract as prime contractor and systems integrator under the USAF's AWACS (Airborne Warning And Control System) programme, the Soviet Union revealed that it had already flown a counterpart of the projected American AWACS. Allocated the reporting name 'Moss' by NATO, the Soviet aircraft was clearly based on the airframe of the Tu-114 airliner, which had itself been evolved from the Tu-95 strategic bomber. This was logical, as the larger-diameter fuselage of the transport offered maximum space for all the electronic equipment and crew stations needed by a long-endurance AWACS aircraft. The number of cabin windows was reduced to a minimum; additions included a flight refuelling nose-probe, ventral fin, lengthened tailcone, and numerous antennae and blisters for electronic equipment, as well as the early warning radar in a 36 ft rotating 'saucer' above the fuselage. At least ten or twelve aircraft of this type are now operational with the PVO-Strany air defence forces. Their primary task is to provide early warning of approaching enemy aircraft, at any height down to sea level, and direct interceptors towards the intruders. 'Moss' might also assist Soviet attack aircraft to elude enemy interceptors picked up by its radar. It is said to operate most effectively over water, with limited 'look-down' capability over land.

Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp.
Dimensions: span 167 ft 8 in, length 188 ft 0 in.
Armament: none.

Yakovlev Yak-28 (NATO 'Brewer')

Evidence suggests that Yak-28s are being

Tupolev Tu-114 AWACS (NATO 'Moss')

progressively switched from first-line attack to support roles, with the emphasis on electronic countermeasures (ECM), reconnaissance, and training. The version known to NATO as **'Brewer-D'** differs from the original two-seat tactical attack models primarily in having cameras in its weapon-bay. **'Brewer-E'**, identified during the past year, has an active ECM pack built into its bomb-bay, from which the pack projects in cylindrical form. There is no radome under the front fuselage, but numerous 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.

Transports

Antonov An-12 (NATO 'Cub')

Aeroflot has retired its An-10 turboprop airliners, but the An-12 freight-carrying counterpart of this aircraft continues to be the mainstay of the Soviet military air transport force (A-VDV). About half of the A-VDV's 1,700 aircraft are An-12s; together they could carry two army divisions, totalling 14,000 men and equipment, over a radius of 750 miles. Layout is conventional for a freighter, with access to the hold via a ramp-door which forms the bottom of the upswept rear fuselage when closed. This ramp-door is made in two longitudinal halves, which can be hinged upward inside the cabin to permit direct loading from trucks on the ground, or air-dropping of supplies and equipment. A full load of 100 paratroops can be despatched via this exit in under one minute.

Power Plant: four Ivchenko AI-20K turboprop engines; each 4,000 ehp.

Dimensions: span 124 ft 8 in, length 121 ft 4½ in, height 32 ft 3 in.

Weights: empty 61,730 lb, gross 121,475 lb.

Performance: max speed 482 mph, service ceiling 33,500 ft, range 2,236 miles with max payload.

Accommodation: crew of six; 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.

—Tass Photo

Antonov An-12 (NATO 'Cub')

Antonov An-14 (NATO 'Clod')

First flown on March 15, 1958, this twin-engined light general-purpose aircraft underwent considerable development before entering commercial and military service. Engine power and payload were increased, wing span was extended, and the tail unit was redesigned. The military model was first displayed at Domodedovo in July 1967, and has since been observed in service with the Soviet, East German, and Guinea Air Forces. Passenger access and freight loading are via clamshell doors which close to form the underside of the upswept rear fuselage. Simplicity of servicing and handling were prime objectives of the design, and the An-14 is described as being suitable for operation by pilots of average skill. It is equipped for all-weather operation, will take off from concrete in 328 ft and land in 230 ft with full (1,590 lb) payload.

Power Plant: two Ivchenko AI-14RF piston engines; each 300 hp.

Dimensions: span 72 ft 2 in, length 37 ft 6½ in, height 15 ft 2½ in.

Weights: empty 4,409 lb, gross 7,935 lb.

Performance: max speed 138 mph at 3,280 ft, service ceiling 17,060 ft, range 404 miles with max payload.

Accommodation: pilot and one passenger on flight deck; six or seven passengers, or equivalent freight, in main cabin.

Armament: none.

Antonov An-22 (NATO 'Cock')

Antonov An-22 (NATO 'Cock')

The prototype of this huge turboprop freighter made a surprise first public appearance at the 1965 Paris Air Show. It had completed its maiden flight only four months earlier, on February 27. By mid-1967 a total of six An-22s were flying, including the first production model. Three of them participated in the Aviation Day display at Domodedovo in July, demonstrating their military potential by landing batteries of 'Frog-3' rockets and SA-4 ('Ganef') surface-to-air missiles on tracked launchers. Layout follows typical Antonov practice, with anhedral on the outer panels of the high wing, and loading via a rear ramp under the upswept fuselage. Estimates of the number of production An-22s delivered to the Soviet Air Force vary from twelve to thirty. During officially-confirmed record attempts, one of them lifted a 100-ton payload to 25,748 ft after a take-off run of only 3,500 ft.

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.

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.

—Tass Photo

Antonov An-24 (NATO 'Coke')

Antonov An-24 (NATO 'Coke')

More than 50 million passengers and half a million tons of cargo had been carried by Aeroflot An-24s by 1971, eight years after the type entered commercial service. The Soviet Air Force operates An-24s as short-range transports; others have been delivered in small quantities to at least a dozen Air Forces throughout the world. The **An-24T** freighter differs from the basic passenger-carrying **An-24V** in having a belly freight door at the rear, instead of the port-side passenger door, and two ventral fins instead of one. The belly door can be opened in flight for air-dropping payload or parachutists. The **An-24RV** and **An-24RT** versions differ in having a 1,985 lb st RU 19-300 auxiliary turbojet in the rear of the starboard engine nacelle, for turboprop starting and to provide additional power for take-off, climb, and cruising flight, as required. (*Data for An-24V follow.*)

Power Plant: two Ivchenko AI-24A turboprop engines; each 2,550 ehp.

Dimensions: span 95 ft 9½ in, length 77 ft 2½ in, height 27 ft 3½ in.

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 44–50 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')

Displayed for the first time at the 1969 Paris Air Show, the An-26 is basically an An-24T with more powerful engines and a completely redesigned rear fuselage. The latter embodies a large loading ramp, which forms the underside of the rear fuselage when retracted, and can be slid forward under the rear of the cabin to facilitate direct loading on to the floor of the hold, or when the cargo is to be air-dropped. Conversion of the standard freighter to carry troops or litters takes 20 to 30 minutes in the field. Optional equipment includes an OPB-1R sight for pinpoint dropping of freight. Max payload is 12,125 lb.

Power Plant: two Ivchenko AI-24T turboprop engines; each 2,820 ehp. One 1,985 lb st RU 19-300 auxiliary turbojet in starboard nacelle (*see An-24 entry*).

Dimensions: span 95 ft 9½ in, length 78 ft 1 in, height 28 ft 1½ in.

Weights: empty 33,113 lb, gross 52,911 lb.

Performance: cruising speed 264–270 mph

at 19,675 ft, service ceiling 24,600 ft, range 559 miles with normal 9,920 lb payload, 1,398 miles with 4,687 lb.
Accommodation: crew of five, plus station for load supervisor or despatcher. Electrically-powered mobile hoist, capacity 3,300 lb, and conveyor to facilitate loading and air-dropping. Provision for carrying 40 paratroops or 24 litters.
Armament: none.

Ilyushin Il-18 (NATO 'Coot')

The Il-18 is another transport that is more familiar as a widely-used commercial airliner than as a military type. The number delivered to the A-VDV is not known; but the seven other air forces in whose insignia Il-18s have been seen operate the aircraft primarily as VIP transports. Equipment can include a Polosa automatic landing system, which meets ICAO Cat III standards.
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')

The prototype of this chunky four-turbofan heavy freighter flew for the first time on March 25, 1971, and was displayed at the Paris Air Show two months later. Design features include rear loading ramp-doors, a T-tail, full-span leading-edge slots and double-slotted flaps for good field performance, a navigator's station in the glazed nose, with ground-mapping radar in a large undernose fairing, and a unique and complex landing gear. The nose unit is fitted with two pairs of wheels, side by side. Each main unit comprises four pairs of wheels in two rows, and retracts in such a way that the wheels remain vertical but at 90° to the direction of flight. Four long fairings are required, to enclose the wheels and actuating gear on each side. The entire accommodation is pressurised. Advanced mechanical handling systems are fitted for containerised and other freight. Equipment for all-weather operation includes a computer for automatic flight control and automatic landing approach.
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.
Weight: gross 346,125 lb.
Performance: normal cruising speed 528 mph at 42,650 ft, nominal range 3,100 miles with maximum payload of 88,185 lb.
Accommodation: crew of three to five.
Armament: none.

Tupolev Tu-124 (NATO 'Cookpot')

Virtually all types of transport aircraft built in the Soviet Union for commercial operation have been reported also in Soviet military service, including the four-turboprop An-10 (NATO 'Cat') and Tu-114 ('Cleat'), twin-turbojet Tu-104 ('Camel'), twin-turbofan Tu-124 ('Cookpot') and rear-engined Tu-134 ('Crusty'), three-turbofan Yak-40 ('Codling'), and four-turbofan Il-62 ('Classic'). Of these, the Tu-124 has been delivered also to the Air Forces of East Germany, Iraq, and India; the Tu-134 to the Bulgarian Air Force; and the Yak-40 to the Yugoslav Air Force, all in small numbers. Data for the Tu-124 are as follows:
Power Plant: two Soloviev D-20P turbofan engines; each 11,905 lb st.
Dimensions: span 83 ft 9½ in, length 100 ft 4 in, height 26 ft 6 in.
Weights: empty 49,600 lb, gross 83,775 lb.
Performance: max speed 603 mph, range 1,305 miles with max fuel, 760 miles with max payload.
Accommodation: crew of four; standard seating for 56 passengers.
Armament: none.

Ilyushin Il-18 (NATO 'Coot') of Polish AF

Ilyushin Il-76 (NATO 'Candid') —Tass Photo

Trainers

Aero L-29 Delfin (NATO 'Maya')

For many years it has been the policy of the Soviet Union to acquire certain categories of small fixed-wing aircraft, helicopters and sailplanes from the aircraft industries of other members of the Warsaw Pact group of nations. Agricultural and general-purpose aircraft like the Yak-12 and An-2, and helicopters such as the Mi-2—all designed in the Soviet Union—were built under licence, exclusively, in Poland for long periods. Similarly, the L-29 two-seat jet basic and advanced trainer, designed and built in Czechoslovakia, was adopted as standard equipment for all Warsaw Pact Air Forces except that of Poland. More than 3,000 have been built and, with exports to nations outside eastern Europe, now fly with about a dozen air forces. The basic version, first flown on April 5, 1959, is the **L-29.** A counter-insurgency version, designated **L-29R,** is available with nose cameras and underwing stores.
Power Plant: one M 701c 500 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

First flown on November 4, 1968, the L-39 was developed by an all-Czechoslovakian team as a successor to the L-29 Delfin. Five flying prototypes were built. Testing of these led to design changes such as lengthening of the engine air intake trunks. By the time the ten pre-production L-39s began to join the test programme, it had been decided to order the type as the next standard basic and advanced trainer for all Warsaw Pact nations except Poland, which continues to satisfy its own requirements. The details below apply to the standard **L-39.** The fourth prototype has been tested with underwing rocket pods and air-to-air missiles to prove the effectiveness of a light ground attack version, designated **L-39Z.** This, too, is in production, customers including Iraq.
Power Plant: one Ivchenko AI-25 turbofan engine; 3,792 lb st.
Dimensions: span 31 ft 0½ in, length 40 ft 5 in, height 15 ft 5½ in.
Weights: empty 7,055 lb, gross 9,998 lb.
Performance: max speed 466 mph at 16,400 ft, service ceiling 37,075 ft, range 565 miles with tip-tanks empty.
Accommodation: crew of two, in tandem.
Armament: provision for underwing bombs and rockets.

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. The 37 mm N-37 gun is also deleted from the starboard side of the nose on the trainer, which continues in service with more than twenty air forces. Next stage of training after the MiG-15UTI is normally on

Aero L-29 Delfin (NATO 'Maya')

Aero L-39 (in markings of Czech AF)

one of the two-seat adaptations of current operational aircraft described after this entry.

Power Plant: one Klimov RD-45FA turbojet engine; 5,952 lb st.
Dimensions: span 35 ft 5¼ in, length 36 ft 1 in, height 12 ft 10 in.
Weight: 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: two 23 mm NR-23 guns.

MiG-21U (NATO 'Mongol')

MiG-21U (NATO 'Mongol')

About ten of the air forces equipped with MiG-21 single-seat fighters also fly this two-seat training version of the same type. The basic **MiG-21U** is generally similar to the MiG-21F, but has two cockpits in tandem under a sideways-hinged double canopy, larger main wheels and tyres, a one-piece forward airbrake, and repositioned pitot boom, above the air intake. It carries no guns, and exists in two forms, later production models having a wide-chord fin and deeper dorsal spine fairing. A third variant is the **MiG-21US,** which adds SPS flap-blowing and a retractable periscope for the instructor. The latest **MiG-21UM** is a trainer counterpart of the MiG-21MF, with RD-13 turbojet and four underwing stores pylons.

—Tass Photo

Sukhoi Su-7U (NATO 'Moujik')

Sukhoi Su-7U (NATO 'Moujik')

The Soviet and Indian 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 installed with a slightly-raised canopy, from which a prominent dorsal spine extends back to the base of the tail-fin.

Sukhoi Su-9U (NATO 'Maiden')

This operational training version of the Su-9 single-seat all-weather fighter has a tandem cockpit installation identical with that of the Su-7U.

Tupolev Tu-22U (NATO 'Blinder-D')

(See page 63.)

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 nose-cone.

Experimental Aircraft

Sukhoi strategic bomber

According to US sources, a large tandem-delta strategic bomber prototype has been undergoing flight testing at Ramenskoye experimental air base, near Moscow, during the past year. The status of the programme is not known, but the aircraft is believed to be of Sukhoi design with a gross weight in the 300,000 lb class. The rear-mounted delta wings have a leading-edge sweep of 65°; small foreplanes of similar planform are mounted near the nose. Performance is likely to be in the high supersonic range.

Yakovlev Yak-36 (NATO 'Freehand')

Yakovlev Yak-36 (NATO 'Freehand')

Two examples of this experimental V/STOL fighter were shown in the 1967 Soviet Aviation Day display at Domodedovo Airport, Moscow. The fact that they operated from the Airport, instead of simply taking part in the fly-past, and that good photographs were released subsequently, suggests that they were intended mainly as technology demonstrators. This is borne out by the comparative crudeness of the design. However, about twelve Yak-36s are thought to have been built, and one of them is reported to have carried out sea trials from a specially-installed pad on the flight deck of the helicopter cruiser *Moskva*. As the Soviet Navy will need such an aircraft for operation from its new fleet of carriers, and no other counterpart to the operational British V/STOL Harrier is yet known, the Yak-36 at least offers a pointer to Soviet thinking.

Power Plant: two unidentified turbojet engines, mounted side by side in bottom of front fuselage. Each exhausts through a large-diameter louvred and gridded vectored-thrust nozzle, to provide thrust for both vertical flight and cruise. Bleed-air supply to 'puffer-pipe' reaction control nozzles located at the tail, at the end of a nose-probe, and in each wingtip fairing, for control in hovering and low-speed flight.
Dimensions: span 27 ft 0 in, length 57 ft 6 in, height 14 ft 9 in.
Performance: subsonic.
Accommodation: pilot only.
Armament: two 16-round rocket pods on underwing pylons of one of the prototypes demonstrated in 1967.

Yakovlev improved V/STOL aircraft

Unconfirmed reports suggest that the Yakovlev bureau has evolved a more advanced strike/reconnaissance V/STOL aircraft from the Yak-36. The new aircraft is said to utilise a mixture of vectored thrust and direct jet-lift.

Helicopters

Kamov Ka-25 (NATO 'Hormone')

Kamov Ka-25 (NATO 'Hormone')

Several versions of this aircraft are in service, but the only one of which photographs have been published is the important ship-based anti-submarine hunter-killer shown in the accompanying illustration. The prototype, then allocated the NATO reporting name 'Harp', was included in the fly-past of new military aircraft at Tushino Airport, Moscow, in July 1961. It carried a pair of dummy missiles on outriggers. Nothing similar has ever been fitted to production Ka-25s (NATO 'Hormone'), which have an internal weapon-bay under the cabin for their main armament, supplemented by racks for small stores on each side of the fuselage. Equipment varies from one aircraft to another. Some Ka-25s have a streamlined blister fairing at the base of the central tail-fin. Others have a fairing of flower-pot shape, with a transparent top, above the central point of the tailboom. The large undernose search radar also exists in two forms, one needing a larger radome than the other. 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, and a towed magnetic anomaly detector is also carried. Ka-25s, equipped for all-weather operation, fly from cruisers of the *Kresta* and *Kara* classes, and from the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 20 aircraft. They have largely replaced piston-engined Mi-4s in the Soviet Navy's ship and shore based force of around 275 helicopters.

Power Plant: two Glushenkov GTD-3 turboshaft engines; each 900 shp.
Dimensions: rotor diameter (each) 51 ft 8 in, length 32 ft 0 in, height 17 ft 7½ in.
Weight: gross 16,100 lb.
Performance: max speed 137 mph, service ceiling 11,500 ft, range 405 miles.
Accommodation: crew of two on flight deck; other crew members in main cabin, which is large enough to contain 12 folding seats for passengers in transport role.
Armament: ASW torpedoes, nuclear depth charges, and other stores in underfuselage weapon bay.

Mil Mi-2 (NATO 'Hoplite')

An estimated 2,000 modern turbine-powered helicopters provide transport and support with the Soviet Air Force. Smallest of the current types is the Mi-2, designed originally in the Soviet Union as a replacement for the piston-engined Mi-1, but now built exclusively by WSK-Swidnik in Poland. Many hundreds have been delivered since 1965, for commercial use and for service with the Air Forces of the Soviet Union, Bulgaria, Hungary, Poland, and Romania.

Power Plant: two Isotov GTD-350 turboshaft engines; each 437 shp.
Dimensions: rotor diameter 47 ft 6¾ in, length of fuselage 37 ft 4¾ in, height 12 ft 3½ in.
Weights: basic operating 5,213 lb, gross 8,157 lb.
Performance: max speed 130 mph at 1,640 ft, service ceiling 13,755 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: none.

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 off-

These wings are normally removed when the aircraft operates in a flying crane role, carrying external freight. First demonstration of the Mi-6 in its role as a conventional military freighter was given at Tushino in 1961. Two groups of three landed at the Airport, after which one helicopter in each group unloaded two field artillery rockets while the others delivered support equipment. At least 500 production Mi-6s are believed to be in service with the Soviet Air Force; others with the Air Forces of Bulgaria, Egypt, Iraq, and North Vietnam.

Power Plant: two Soloviev D-25V turboshaft engines; each 5,500 shp.
Dimensions: rotor diameter 114 ft 10 in, length of fuselage 108 ft 10½ in, height 32 ft 4 in.
Weights: empty 60,055 lb, gross 93,700 lb.
Performance: max speed 186 mph, service ceiling 14,750 ft, range 404 miles with 13,228 lb payload.
Accommodation: crew of five; up to 65 passengers, 26,450 lb of freight, or 41 litters and two medical attendants.
Armament: some aircraft have a gun of unknown calibre in the nose.

Mil Mi-8 (NATO 'Hip')

By mounting two powerful, lightweight turbine engines above the cabin of the Mi-8, Mil was able to pack up to 28 civilian passengers, or a bulky load of freight or vehicles, into a helicopter dimensionally similar to the 14-seat piston-engined Mi-4. The Soviet armed forces have taken delivery of large numbers of Mi-8s, differing from the airline version in having small circular cabin windows instead of large square panes. Those used as assault transports carry racks for external stores on each side of the cabin. At least thirteen other air forces also operate this aircraft.

Power Plant: two Isotov TV2-117A turboshaft engines; each 1,500 shp.
Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 60 ft 0¾ in, height 18 ft 6½ in.
Weights: empty 16,007 lb, gross 26,455 lb.
Performance: max speed 161 mph at 3,280 ft, service ceiling 14,760 ft, range 264 miles as passenger transport.
Accommodation: crew of two or three; up to 32 passengers, 8,820 lb of freight, or 12 litters and attendant.
Armament: provision for up to eight external stores, including large rocket pods, on cabin-side outriggers.

Mil Mi-10 (NATO 'Harke')

This specialised flying crane 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-12 (NATO 'Homer')

The existence of this heavy-lift helicopter was revealed in early 1969, when a prototype set four payload-to-height records. On August 6 of the same year, the earlier records were far exceeded by an Mi-12 which lifted 88,636 lb to 7,398 ft. To ease development, the designers decided to utilise two power plant/rotor packages almost identical with those of the Mi-6 and Mi-10, mounted at the tips of fixed wings. A requirement was that the cabin should accommodate missiles and other payloads compatible with those carried by the An-22 fixed-wing transport. Although this produced the largest helicopter ever flown, the Mi-12 is claimed to present no problems to pilots accustomed to flying other types of helicopter, and to have an extremely low level of vibration. Loading is via rear clamshell doors. A travelling crane on the cabin roof has a max capacity of 22,000 lb.

Power Plant: four Soloviev D-25VF turboshaft engines; each 6,500 shp.
Dimensions: rotor diameter (each) 114 ft 10 in, length of fuselage 121 ft 4½ in, height 41 ft 0 in.
Weights: gross 231,500 lb, normal payload 66,000 lb (STOL) or 55,000 lb (VTOL).
Performance: max speed 161 mph, service ceiling 11,500 ft, range 310 miles with 78,000 lb payload.
Accommodation: crew of four on flight deck; navigator and radio operator in tandem on upper deck; about 50 folding seats along cabin walls for work crews or troops accompanying freight.

Mil Mi-24 (NATO 'Hind')

A new dimension was added to the mobility and hitting power of the Warsaw Pact forces in eastern Europe in early 1974, when it was known that at least two units, of approximate squadron strength, in East Germany had been equipped with Mi-24 assault helicopters. In much the same class as the new American UTTAS prototypes, the Mi-24 carries eight combat-equipped troops, and is heavily armed to keep down the heads of any enemy in the drop zone. Design features include a fully retractable landing gear and canted tail rotor pylon.

Power Plant: two unidentified turboshaft engines, expected to give the same power

Mil Mi-2 (NATO 'Hoplite') —Tass Photo

Mil Mi-6 (NATO 'Hook')

Mil Mi-8 (NATO 'Hip')

Mil Mi-12 (NATO 'Homer') in Aeroflot markings

as the engines of the Mi-8 although dimensionally smaller.
Dimensions: rotor diameter 55 ft 9 in, length of fuselage 55 ft 9 in, height 14 ft.
Accommodation: crew of two; eight combat-equipped troops.
Armament: one 12.7 mm machine-gun in nose; mountings for four anti-tank missiles (probably 'Swatters') and four other stores, including rocket pods, under stub-wings.

SS-4 (NATO 'Sandal')

SS-5 (NATO 'Skean')

SS-8 (NATO 'Sasin')

—Tass Photo

SS-9 (NATO 'Scarp')

SS-13 (NATO 'Savage')

SS-14 (NATO 'Scamp/Scapegoat')

Strategic Missiles

SS-4 (NATO 'Sandal')

This medium-range ballistic missile (MRBM) is the weapon that precipitated the Cuba crisis in 1962. Its development, via the earlier SS-3 ('Shyster'), drew heavily on wartime German V-2 technology. About 500 are thought to remain operational, mostly near the western borders of the Soviet Union but with a few east of the Urals, targeted on China.
Power Plant: one liquid-propellant sustainer.
Guidance: inertial.
Warhead: alternative nuclear (1 megaton) or high-explosive.
Dimensions: length 68 ft 0 in, diameter 5 ft 3 in.
Launch weight: 60,000 lb.
Performance: max speed Mach 6.5, max range 1,100 miles.

SS-5 (NATO 'Skean')

About 100 of these intermediate-range missiles are believed to supplement SS-4s in the 600-strong Soviet IRBM/MRBM force. The SS-5 is similar in concept to the earlier SS-3/4 series, but larger and without tail-fins. Photographs have shown it inside a silo launcher.
Power Plant: one liquid-propellant sustainer.
Dimensions: length 75 ft 0 in, diameter 8 ft 0 in.
Performance: max range 2,000 miles.

SS-7 (NATO 'Saddler')

Little is published about this oldest ICBM serving with the Soviet Strategic Rocket Forces, except that it burns liquid propellants and is deployed in both hard and soft sites alongside the SS-8. Together, the two missiles make up the total of 209 older ICBMs that are expected to be replaced by submarine-launched ballistic missiles under the terms of the SALT I agreement.

SS-8 (NATO 'Sasin')

This two-stage liquid-propellant ICBM was first displayed in a Moscow military parade in November 1964. Like the contemporary SS-5, it is very much the type of missile that could be expected to follow the crude, first-generation SS-3 and SS-4.
Warhead: nuclear (5 to 10 megatons).
Dimensions: length 80 ft 0 in, diameter of first stage 9 ft 0 in.
Performance: range 6,500 miles.

SS-9 (NATO 'Scarp')

This mighty three-stage liquid-propellant missile is the heavyweight of the Soviet ICBM force. At the time the SALT I agreement was signed, in May 1972, there were 288 operational SS-9s, with 25 new silos under construction in SS-9 complexes. It is anticipated that all 313 launchers will eventually carry new SS-18 missiles. Meanwhile, there are known to be four versions of the SS-9, identified by the Department of Defense as follows:

SS-9 Mod 1. First displayed in Moscow on November 7, 1967. Operational deployment thought to have started in 1965. Only a relatively small number still emplaced, each with a single re-entry vehicle of slightly smaller yield than that of the Mod 2. These versions were, in 1974, the only operational Soviet ICBMs considered to possess the combination of yield and accuracy needed to attack successfully hard targets like America's Minuteman missile silos.

SS-9 Mod 2. This version constitutes the bulk of the SS-9 force. Single re-entry vehicle, with the largest yield of any known ICBM.

SS-9 Mod 3. Under test until 1972 both in a depressed trajectory mode and as a Fractional Orbital Bombardment System (FOBS). Latter technique provides unlimited range and the ability to attack from any direction, by putting the re-entry vehicle into an orbit from which it could be directed down on to any preselected target. Advantages in terms of potential reduced warning time for the defences are offset by some reduction in accuracy. There is no evidence that this version is operational.

SS-9 Mod 4. Test vehicle for Soviet multiple independently-targeted re-entry vehicles (MIRVs). Early tests were terminated in November 1970. A new series started in January 1973, with each missile carrying three re-entry vehicles of much different design, equipped with parachutes to ensure recovery. Despite an improvement in targeting flexibility, the imminence of SS-18 deployment may lead to abandonment of the Mod 4, or its limitation to three-warhead MRV (multiple re-entry vehicle) mode. *(Data for SS-9 Mod 2 follow.)*
Power Plant: three-stage liquid-propellant.
Guidance: inertial.
Warhead: nuclear (25 megatons).
Dimensions: length 113 ft 6 in, diameter 10 ft 0 in.
Performance: range 7,500 miles.

SS-11 (NATO 'Savage')

A total of 970 of these 'light' ICBMs were deployed in May 1972, with 66 new silos under construction. All 1,036 launchers are expected to carry SS-17 and/or SS-19 missiles in due course. No photographs of an SS-11 have ever been identified. It is believed to be of similar length to the SS-13, but to resemble the much larger SS-8 in external shape, with no space between its three liquid-propellant stages. The US Department of Defense has stated that the SS-11 has a slightly higher yield than the comparable American Minuteman, but is considerably less accurate. There are three versions:

SS-11 Mod 1. Operational since 1966. Tested at both intercontinental and reduced ranges, suggesting possible targeting against Europe and China. Single re-entry vehicle.

SS-11 Mod 2. No information available. Not operational.

SS-11 Mod 3. Under test, very successfully, since 1969, with three MRVs. Greater targeting flexibility and accuracy has led to rapid deployment.

SS-13 (NATO 'Savage')

Allocation of the same NATO reporting name to the SS-11 and SS-13 has created much confusion. Both are 'light' ICBMs, in the Minuteman category, possibly with similar performance; but there the likeness ends. The SS-13 is the only solid-propellant ICBM in the Soviet inventory at the present time, and only 60 are deployed. The top two stages are, however, used by themselves in the SS-14 IRBM. It is anticipated that the SS-13 will be replaced by the SS-16.
Power Plant: three-stage solid-propellant.
Guidance: inertial.
Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).

SS-14 (NATO 'Scamp/Scapegoat')

The 'Scapegoat' intermediate-range ballistic missile carried by this mobile weapon system appears to comprise the top two stages of the SS-13, giving it an overall length of about 35 ft. The NATO reporting name 'Scamp' refers to the complete weapon system, based on the JS III heavy tank chassis. The missile, inside its hinged container, is raised to a vertical position for launch, by hydraulic jacks at the rear of the vehicle. The container is then moved

away from the missile and its launch platform before firing. Range of this IRBM is estimated at 2,500 miles. Areas of deployment are reported to include the Chinese frontier near Buir Nor, in Outer Mongolia.

SS- (NATO 'Scrooge')

Sometimes referred to as the SS-15, this mobile ballistic missile system employs the same basic JS III transport/erector/launch vehicle as the SS-14, with a different missile. Nothing is known of the latter, except that it is fired from its launch-tube, which is raised to a vertical position for firing. The launch-tube is about 62 ft long, with a diameter of 6 ft 6 in, suggesting that the missile might have a range of up to 3,500 miles.

SS-16

Only solid-propellant missile among the four new Soviet ICBMs expected to reach a state of initial operational capability during the coming year, the SS-16 is viewed as a replacement for the SS-13. It is described as being about the same size as the latter, with greater range and payload capability. So far, it has been tested with only a single re-entry vehicle, but is intended to employ a post-boost vehicle (PBV, known in the US as a bus-type dispensing system) for MIRVs. The Department of Defense has suggested that the SS-16 is under development for potential deployment in both silo-based and land-based mobile forms. Its range is estimated at more than 5,000 miles.

SS-17

It is expected that either the SS-17 or the SS-19, or a mixture of the two types, will replace the current SS-11, occupying eventually a total of 1,036 silos. Both are liquid-propellant ICBMs with post-boost vehicles. The SS-17, essentially a city destroyer, has been tested with both four large MIRVs and a single large re-entry vehicle. The MIRVs are known to be shaped for high-speed atmospheric re-entry, to ensure greater accuracy, and may also achieve capability against hard targets by the early 1980s. Estimated range is more than 6,300 miles, with three to five times the throw weight of the SS-11.

SS-18

Intended, almost certainly, as a replacement for the SS-9, this extremely formidable two-stage liquid-propellant ICBM has been under test at Tyuratam for some time [illegible] bility. It has about 30% more throw weight than the SS-9, and has been tested with both a single large RV, offering optimum accuracy, and five to eight relatively large MIRVs dispensed by a PBV similar to that employed in the American Minuteman III and Poseidon missiles. Secretary Schlesinger commented one year ago that 'Given the warhead yield and accuracy currently estimated for the MIRVed version of the SS-18 . . . a force of about 300 of these missiles [permitted under the Interim SALT Agreement] could pose a serious threat to our ICBMs in their silos, even after those silos are upgraded'. Range of the SS-18 is believed to be over 6,300 miles.

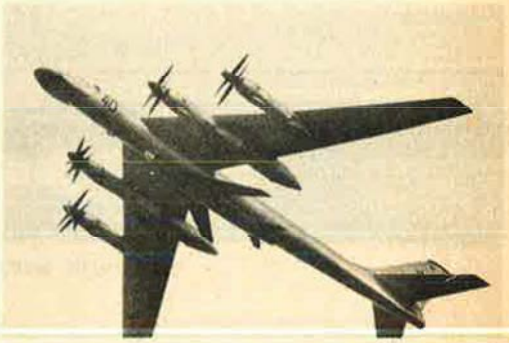
SS-19

The SS-19 is believed to be a replacement for the SS-11. It has been tested only with a MIRVed payload of six re-entry vehicles, twice as many as Minuteman III carries and each twice as big. Although shaped for high-speed atmospheric re-entry, to improve accuracy, these warheads are not expected to offer reasonable hard target kill capability until the 1980s. However, by the time all current ICBMs have been replaced with the SS-16/19 series, the Soviet Union may well deploy around 7,000 one-megaton to two-megaton warheads in their ICBM force alone. The SS-19 is thought to have a range of more than 6,300 miles and to be longer than the SS-11 and SS-17, requiring more extensive modification to existing silos before it could be emplaced. *(See also chart on p. 25, June '74 AIR FORCE Magazine and p. 45 of this issue.)*

(NATO 'Scrooge')

AS-3 (NATO 'Kangaroo')

Resembling a sweptwing jet fighter in size and configuration, this air-to-surface missile was displayed for the first time under its Tu-95 carrier aircraft on Soviet Aviation Day, 1961. Little has been seen of it since that time, except for a launch sequence in an officially released Soviet film.
Dimensions: span 30 ft 0 in, length 48 ft 11 in.
Performance: max speed Mach 2, range 400 miles.



AS-3 (NATO 'Kangaroo') missile carried by 'Bear' bomber

AS-4 (NATO 'Kitchen')

Developed as a stand-off weapon for the Tu-22 supersonic strategic bomber, the AS-4 is the most advanced air-to-surface missile yet displayed publicly in the Soviet Union. It 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. Like all known air-to-surface missiles carried by Soviet fixed-wing aircraft, it has an aeroplane configuration, with stubby delta wings and cruciform tail surfaces. Propulsion is believed to be by liquid-propellant rocket motor; a nuclear warhead can be assumed.
Dimensions: length 37 ft 0 in.
Performance: range 460 miles.

AS-6

Nothing is known for certain about this new missile, reported to be carried by the Tupolev variable-geometry supersonic strategic bomber (NATO 'Backfire'). It is said to have an inertial guidance system, and range of up to 350 miles at Mach 3.

Airborne Tactical and Defence Missiles

Helicopter missile (NATO 'Swatter')

The Mil Mi-24 assault helicopter ('Hind-A') has wingtip launchers for four anti-tank missiles. No photograph has yet appeared showing external armament on the aircraft. However, the weapon carriers appear to have no provision for wire guidance, and 'Swatter' is the only one of three standard Soviet anti-tank missiles known to operate without wires. It is steered in flight via elevons on the trailing-edges of its rear-mounted cruciform wings. Its blunt nose suggests the likelihood of a terminal homing system, with control by means of the small foreplanes.
Dimensions: span 2 ft 2 in, length 3 ft 8 in.

AS-2 (NATO 'Kipper')

This is another of the aeroplane-configuration air-to-surface missiles displayed under carrier aircraft at the 1961 Aviation Day display, but hardly mentioned since that time. Described by the commentator at Tushino as an anti-shipping weapon, the AS-2 is similar in configuration to the larger and more refined US Hound Dog, with swept wings and underslung turbojet engine. Radar is carried in the nose of the Tu-16 launch aircraft.
Dimensions: span 16 ft 0 in, length 31 ft 0 in.
Performance: max speed Mach 1.2, range 130 miles.

AS-5 (NATO 'Kelt')

This is the only Soviet air-to-surface missile known to have been used operationally. During the October 1973 war between Israel and the Arab states, some 25 'Kelts' were

AS-5 (NATO 'Kelt') missiles with 'Badger-G'

launched against Israeli targets by Tu-16s from Egypt. Only five eluded the air and ground defences, to hit a supply depot and two radar sites in Sinai.

The AS-5 has a similar aeroplane-type configuration to that of the turbojet-powered AS-1 ('Kennel') which it superseded. The switch to rocket propulsion eliminated the need for a ram air intake, and permitted the use of a larger radar inside the hemispherical nose fairing.

Dimensions: span 15 ft 0 in, length 31 ft 0 in.
Performance: range 200 miles.

—Tass Photo (NATO 'Alkali')

NATO 'Alkali'

First Soviet air-to-air missile to become operational, 'Alkali' continues to equip the older generation of PVO-Strany interceptors, such as the Su-9 and all-weather versions of the MiG-19. It has a solid-propellant rocket motor and semi-active radar guidance system.

Dimensions: length 6 ft 2 in, body diameter 7 in, wing span 1 ft 10¾ in.
Performance: range 3.7 to 5 miles.

NATO 'Anab'

This solid-propellant air-to-air missile was first observed as armament of the Yak-28P all-weather fighters which took part in the 1961 Aviation Day display at Tushino. It has since become standard also on the Sukhoi Su-11 and Su-15 interceptors. Each aircraft normally carries one 'Anab' with a semi-active radar seeker and one with an infra-red homing head.

(NATO 'Atoll')

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 5 to 6.2 miles.

NATO 'Ash'

Largest air-to-air missile yet put into service in the Soviet Union, 'Ash' is standard armament on the Tu-28P. The version with infra-red homing head is normally carried on the inboard pylon under each wing, with a semi-active radar homing version on each outboard pylon.

Dimensions: length 18 ft 0 in (IR) or 17 ft 0 in (SAR).

NATO 'Atoll'

'Atoll' is the Soviet counterpart to the US Sidewinder 1A (AIM-9B), to which it is almost identical in size, configuration, and infra-red guidance system. It has long been standard armament on home and export versions of the MiG-21. The motor is a solid-propellant rocket.

Dimensions: length 9 ft 2 in, body diameter 4.72 in, fin span 1 ft 8¾ in.
Performance: range 3 to 4 miles.

'Advanced Atoll'

The latest multi-role versions of the MiG-21 (NATO 'Fishbed-J, K, and L') can carry a radar homing version of 'Atoll' on the outer stores pylon under each wing, in addition to a standard infra-red homing 'Atoll' on the inboard pylon. The radar version is known at present as 'Advanced Atoll'.

Surface-to-Air Missiles

—Tass Photo SA-5 (NATO 'Griffon')

SA-1 (NATO 'Guild')

This dual-thrust solid-propellant missile was first displayed publicly in a Moscow military parade on November 7, 1960. Although it was 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 again appeared on May Day. The SA-1 is not thought to have been supplied to any country outside the Soviet Union.

Dimensions: length 39 ft 0 in, body diameter 2 ft 3½ in.

—Tass Photo SA-6 (NATO 'Gainful')

SA-2 (NATO 'Guideline')

Unlike the SA-1, this missile has been supplied to most of the Soviet Union's allies and friends, and is a standard anti-aircraft weapon in about 30 countries. It has been 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. Data for the standard export version:

Power Plant: liquid-propellant sustainer, burning nitric acid and hydrocarbon propellants; solid-propellant booster.
Guidance: automatic radio command, with radar tracking of target.
Warhead: normally high-explosive, weight 288 lb.
Dimensions: length 34 ft 9 in, body diameter 1 ft 8 in, wing span 5 ft 7 in.
Launching weight: 5,000 lb.
Performance: max speed Mach 3.5, slant range 25 miles; effective ceiling 60,000 ft.

SA-3 (NATO 'Goa')

Soviet counterpart of the American Hawk, the SA-3 is deployed in the Soviet Union, by other Warsaw Pact nations, and in the Middle East and North Vietnam 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.
Dimensions: length 22 ft 0 in, body diameter 1 ft 6 in, wing span 4 ft 0 in.
Performance: slant range 18.5 miles, effective ceiling 40,000 ft.

SA-4 (NATO 'Ganef')

Ramjet propulsion gives this anti-aircraft missile a very long range. Its usefulness is further enhanced by its mobility, as it is carried on a twin-round tracked launch vehicle which is itself air-transportable in the An-22 military freighter. The SA-4 was first displayed publicly in 1964, and is now a standard Soviet weapon.

Power Plant: ramjet sustainer; four wrap-round solid-propellant boosters.
Guidance: radio command.
Warhead: high-explosive.
Dimensions: length 30 ft 0 in, body diameter 2 ft 8 in, wing span 7 ft 6 in.
Launching weight: 2,200 lb.
Performance: slant range 43 miles, effective ceiling 80,000 ft.

SA-5 (NATO 'Griffon')

There is reckoned to be a total of 9,800 surface-to-air missile launchers operational at 1,650 sites throughout the Soviet Union, with SA-2s on some 4,500 launchers. 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. When first displayed publicly in Moscow, in 1963, it was said to have anti-missile capability. This must be limited, even if the warhead section separates after second-stage burnout and is able to use an inbuilt rocket motor during the final stages of interception.

Power Plant: two-stage solid-propellant, possibly with terminal propulsion for warhead.
Guidance: radar homing.
Dimensions: length 54 ft 0 in, body diameter 2 ft 10 in, wing span 12 ft 0 in.
Performance: 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 rocket/ramjet propulsion system is a decade in advance of comparable western technology, and the US-supplied ECM equipment which enabled Israeli aircraft to survive attacks 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.

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.
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 37 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 its use by infantry, the SA-7 is carried by vehicles in batteries of four, six, and eight, for both offensive and defensive employment, with radar aiming.

Power Plant: solid-propellant boost/sustainer.
Guidance: infra-red homing.
Warhead: high-explosive, weight 5.5 lb.
Dimensions: length 4 ft 5 in, body diameter 2.75 in.
Performance: max speed Mach 1.5, slant range 1.8 to 2.5 miles, effective ceiling 5,000 ft.

SA-N-3 (NATO 'Goblet')

The twin-round surface-to-air missile launchers fitted to many of the latest Soviet naval vessels, including the helicopter cruisers *Moskva* and *Leningrad* and *Kresta II* cruisers, carry a new and more effective missile than the SA-N-1 ('Goa'). Known as the SA-N-3, this could be similar to the SA-6.

NATO 'Galosh'

The SALT I agreement permitted each nation a total of 100 ABMs (anti-ballistic missiles) on launchers for defence of the national capital and 100 more for defence of an ICBM launch area. ABM deployment was further reduced to one site for each country at the Moscow Summit meeting of late June and early July 1974. The Soviet 'Galosh' ABM system deployed around Moscow consists at present of 64 operational launchers and eight 'Try Add' engagement radar sites. New construction is expected to add 36 launchers and six radar complexes during the next few years. 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. Soviet ABM test firings have continued, and two new systems are thought to be under development.

(NATO 'Galosh')

Launch Vehicles

Cosmos launchers

Two categories of launch vehicles appear to be used for Cosmos and Intercosmos satellites, and other Soviet spacecraft. One category is based on the structures and power plants of standard missiles, such as the SS-4 ('Sandal'), SS-5 ('Skean'), and SS-9 ('Scarp'), with additional upper stages as required. The other combines the basic core vehicle developed originally for the Vostok manned spacecraft with a variety of upper stages. Examples are as follows:

SS-4 + Cosmos stage. First stage powered by 158,800 lb st RD-214 four-chamber [illegible] tric acid and kerosene. Second stage powered by RD-119 single-chamber engine, burning liquid oxygen and dimethyl-hydrazine, and giving 24,250 lb st in vacuum. Typical launch, on June 26, 1974, orbited Cosmos 662, a 900 lb ellipsoid, 6 ft long with a diameter of 4 ft, intended for scientific research.

SS-5 + Restart stage. A typical application for the SS-5 is to orbit satellites like Cosmos 655 and 661. Shaped as cylinders, 6 ft long and 3 ft in diameter, with paddle-type solar panels, these are thought to have navigation and/or electronic intelligence missions.

SS-9 + FOBS stage. Frequent launches of this vehicle are expected to contribute to continued development of Fractional Orbital Bombardment System techniques and/or to ocean surveillance missions. Satellites like Cosmos 651 and 654 normally remain in low parking orbit for two months, then split and move into a 104-min orbit.

Vostok core + Venus stage. This standard launch vehicle has many applications. It is used with an escape stage to orbit the 2,750 lb uprated Molniya 2 communications satellites. Typical military payloads were Cosmos 639, a manoeuvrable reconnaissance satellite intended probably to study the breakup of Arctic pack ice; and Cosmos 658, a reconnaissance satellite in the form of a four-ton sphere-cylinder, 16½ ft long, which remained in orbit for 12 days.

Soyuz launcher

This vehicle is an uprated version of that used to orbit Yuri Gagarin's Vostok 1 spacecraft on April 12, 1961, with some 36 ft of additional upper staging and structures. During launch it is surmounted by an escape tower with three rows of rocket nozzles. It is not possible to identify the current engines, or give their individual ratings. However, official Soviet reports have stated that the vehicle has a total thrust of around 60 million horsepower, which is three times the power quoted for the original Vostok launcher. The basic configuration has not changed. Thus, the first stage consists of a central core, powered by an engine with four primary nozzles and four verniers. This is surrounded by four wrap-round boosters, each with four primary nozzles and two verniers, so that 32 rocket chambers are fired simultaneously during lift-off. Weight of the Soyuz spacecraft is about 13,000 lb.

—Tass Photo

Cosmos launcher ('Sandal' + Cosmos stage)

—Tass Photo

Soyuz launcher

(NATO 'Mandrake')

RPVs and Targets

Little is known about the remotely piloted vehicles and target drones that are operated by the Soviet armed forces. It is known that RPVs are utilised for reconnaissance, in the manner of the USAF's Teledyne Ryan AQM-34 (Model 147) family. One type is said to resemble the AS-5 (NATO 'Kelt') air-to-surface missile carried by Tu-16 bombers. It is also believed that a number of Soviet RPVs, despatched on reconnaissance flights over peripheral countries such as Sweden, have been shot down by the defences.

The only target of which photographs have been released by the Soviet authorities is that shown in an accompanying illustration. It appeared in an official film sequence, which showed the aircraft being shot down by an SA-2 surface-to-air missile, and seems to be related to the Yakovlev high-altitude reconnaissance aircraft known to NATO as 'Mandrake'. Counterpart to the USAF's Lockheed U-2, this was a single-seat development of the Yak-25, with the existing fuselage married to a new straight wing of extended span. This made possible good high-altitude performance with a minimum of redesign. It is possible that 'Mandrakes' are now considered obsolete for their original task and are being utilised as expendable targets.

SOVIET ARMED FORCES—FACTS AND FIGURES

The "Facts and Figures" on these pages should help readers evaluate the relative capabilities of US and Soviet aerospace forces, and recent trends in defense funding on both sides. The tables on pages 76–77 were prepared by the staff of AIR FORCE Magazine from data found in the most authoritative open sources. Information on comparative military ranks, Soviet military leaders, aces, and awards was furnished by Harriet Fast Scott, and the selected bibliography by Col. William F. Scott, USAF (Ret.).

ESTIMATED SOVIET DEFENSE EXPENDITURES 1965–74 (BILLIONS OF 1973 US $)

	Total	% of GNP	Military R&D	% of Defense Expenditures
1965	74	15.8	8.0	10.8
1966	76	15.4	8.7	11.4
1967	78	14.8	9.4	12.6
1968	82	14.7	10.1	12.3
1969	85	14.5	10.8	13.0
1970	85	13.8	11.5	13.5
1971	85	13.3	12.2	14.4
1972	87	13.2	12.8	14.7
1973	89	12.7	13.6	15.3
1974	91	12.5	14.0	15.4

Military retirement, civil defense, and military assistance are not included in the above estimate of Soviet defense expenditures. In FY '74, these three items totaled about $8.5 billion in the US defense budget. US total obligational authority for defense in FY '74, excluding military retirement, civil defense, and military assistance, was approximately $76 billion, or 5.7 percent of the US GNP. (It is generally agreed that the Soviet GNP is about half that of the US.) The US defense budget for FY '74 included $8.2 billion for military RDT&E, compared to an estimated $14 billion for the USSR.

Estimates of Soviet defense *expenditures* are controversial because of the lack of official Soviet figures and the difficulty of converting rubles to dollars. The figures in the table above are from a well-informed source. While other estimates that are both higher and lower may be found, there is agreement among most analysts that the USSR is outspending the US by at least ten percent. A DoD spokesman said in early February that it would cost the US $117 billion to duplicate Soviet forces.

PERSONNEL STRENGTH OF SOVIET ARMED FORCES

WW II	11,375,000	1969	3,775,000
1963	3,775,000	1970	3,786,000
1964	3,775,000	1971	3,850,000
1965	3,625,000	1972	3,900,000
1966	3,640,000	1973	3,950,000
1967	3,695,000	1974	4,000,000
1968	3,695,000		

The above figures include Soviet Border Guards (KGB), but do not include Internal Security Forces (MVD).

In 1974, an estimated 1,250,000 Soviet military personnel were assigned to aerospace forces as follows:

Strategic Rocket Forces	350,000
National Air Defense (PVO)	500,000
Air Forces	400,000

During the same year, USAF military strength was approximately 645,000. For a comparison of Soviet and US aerospace forces, some 36,700 US Army personnel assigned to Nike-Hercules surface-to-air (SAM) units and to the Safeguard ABM force must be added to the USAF military personnel strength, giving a grand total of 681,700. (All but one Nike-Hercules unit will be deactivated by mid-1975.)

US military personnel assigned in 1974 to aerospace tasks, on a functional basis, compared to their counterpart Soviet aerospace forces of the same year approximately as follows:

	USSR	US
Long-range missile forces	350,000	9,300 [a]
Aerospace defense	500,000	71,700 [b]
Other air force tasks	400,000	600,700
	1,250,000	681,700

[a] Includes only Strategic Air Command military personnel assigned to missile launch crews and missile maintenance, since many personnel in support functions serve both SAC missile and bomber forces. The total number of military personnel assigned to SAC in 1974 was approximately 143,000.

[b] Includes 35,000 military personnel assigned to the USAF Aerospace Defense Command and 36,700 military personnel of Army air defense units.

SOVIET/US OFFENSIVE STRATEGIC NUCLEAR FORCES, 1967–74

All figures are from *The Military Balance* (1967–68 through 1974–75 editions), published by The International Institute for Strategic Studies, London, England. For information on range and warhead yield of missiles, and range, speed, and weapons load of bombers, see full text of *The Military Balance* in the December issue of AIR FORCE Magazine, and John W. R. Taylor's "Gallery of Soviet Aerospace Weapons," pages 62–75 of this issue.

The year 1967 was selected as the entry point for this chart, since in that year the US ICBM and SLBM forces reached the numbers of ballistic missiles that have been maintained since that time.

It should be noted that the Soviet Tu-16 Badger medium-range bomber is capable of striking targets in the US. Its range is 4,000 miles, compared to 3,800 for the US FB-111. (The Tu-22 Blinder, which has a range of about 1,400 miles, has not been considered by the editors to be an intercontinental system. The Tupolev supersonic Backfire bomber, which is now entering operational units, does have intercontinental capabilities and must be taken into consideration in the future.)

When long-range and medium-range bombers of both sides are considered, the USSR has a larger number of intercontinental-capable bombers than does the US, but the maximum weapon load of the US bomber force is approximately double that of the USSR's long- and medium-range bombers combined.

While an accurate assessment of the relative strength of Soviet and US offensive strategic nuclear forces cannot be made from numbers alone, the figures in this chart demonstrate which side has been "racing" in the so-called arms race.

	ICBM		SLBM		Long-Range Bombers		Medium-Range Bombers	
Year	USSR	US	USSR	US	USSR	US	USSR	US
1967	460	1,054	120	656	200[a]	545	800[b]	75[c]
1968	800	1,054	129	656	200	480	750	40
1969	1,050	1,054	159	656	200	450	600	60
1970	1,300	1,054	280	656	190	405[d]	550[e]	35[f]
1971	1,510	1,054	440	656	190	360	500	70
1972	1,530	1,054	560	656	190	390	500	67
1973	1,527	1,054	628	656	190	397	500	66
1974	1,575	1,054	720[g]	656	190	377	500	66

[a] About 50 bombers are believed to have been in use as tankers throughout the period.
[b] Includes both Tu-16 and Tu-22.
[c] B-58 only, 1967–69.
[d] Number assigned to operational and training units. Additional B-52s are in active storage, ranging from about 100 in 1970 downward to 40 in 1974.
[e] Tu-16 Badger only, 1970–74.
[f] FB-111 only, 1970–74.
[g] Sixty of these missiles, SS-N-4s and SS-N-5s, carried by diesel submarines, are not considered strategic missiles under the terms of the SALT I Interim Agreement.

SOVIET/US STRATEGIC AEROSPACE DEFENSE FORCES, 1972–74

All figures are from *The Military Balance* (1972–73 through 1974–75 editions).

In assessing the overall balance between Soviet and US strategic nuclear capabilities, the bomber forces of each side must be evaluated in relation to the aerospace defense forces of the opponent. Although the US holds a substantial lead in long-range bombers, Soviet aerospace defense forces are several times larger than those of the US.

	Interceptors		Surface-to-Air Missiles		Antiballistic Missile Launchers	
Year	USSR	US[a]	USSR	US[b]	USSR	US
1972	3,000	593	10,000	839[c]	64	0
1973	2,900	585	10,000	481[d]	64	0
1974	2,650	532	9,800	261	64	0

[a] Includes both Regular and Air National Guard units.
[b] Includes both Regular and Army National Guard units.
[c] Includes 21 Nike-Hercules batteries and 5 Bomarc-B batteries.
[d] Nike-Hercules only, 1973 and 1974, with all but one battery to be deactivated by mid-1975.

COMPARATIVE MILITARY RANKS—US AND USSR

UNITED STATES		SOVIET UNION	
		Generalissimus of the Soviet Union *	
General of the Army	Admiral of the Fleet	Marshal of the Soviet Union	Admiral of the Fleet of the Soviet Union
		Chief Marshal of Aviation, Armored Forces, Artillery	
General	Admiral	General of the Army, Marshal of Aviation, Marshal of Armored Forces, Artillery, Engineers, Signals, etc.	Admiral of the Fleet
Lieutenant General	Vice Admiral	General Colonel, General Colonel Aviation, General Colonel Armor, Artillery, Engineers, Justice, General Colonel-Engineer, etc.	Admiral, Engineer Admiral
Major General	Rear Admiral (Upper Half)	General Lieutenant, General Lieutenant Aviation, Armored Forces, Artillery, Engineers, General Lieutenant-Engineer, etc.	Vice Admiral, Engineer-Vice Admiral
Brigadier General	Rear Admiral (Lower Half)	General Major, General Major Aviation, General Major Armored Forces, Artillery, Engineers, Signals, Supply, Technical Troops, General Major-Engineer, etc.	Rear Admiral, Engineer-Rear Admiral
Colonel	Captain	Colonel (Polkovnik)	Captain 1st Rank
Lieutenant Colonel	Commander	Lieutenant Colonel (Podpolkovnik)	Captain 2d Rank
Major	Lieutenant Commander	Major	Captain 3d Rank
Captain	Lieutenant	Captain	Captain-Lieutenant
		Senior Lieutenant	Senior Lieutenant
1st Lieutenant	Lieutenant (Junior Grade)	Lieutenant	Lieutenant
2d Lieutenant	Ensign	Junior Lieutenant	Junior Lieutenant

* Stalin is the only man who has held this rank. Awarded June 1945.

TOP LEADERS OF THE SOVIET ARMED FORCES

Marshal of the Soviet Union Andrey Antonovich Grechko. Born in 1903. Joined the Red Army in 1919, and became Soviet Minister of Defense in 1967 after serving as Commander in Chief of the United Armed Forces of the Warsaw Pact since 1960. Has been a Member of the Central Committee of the Communist Party since 1961, and of the Politburo since 1973. Commander of several numbered armies and the 1st Guards Army in World War II. Took part in liberating the Ukraine, Poland, and Czechoslovakia. Marshal Grechko has been Commander in Chief of Soviet Troops in Germany, and First Deputy Minister of Defense and Commander in Chief of Soviet Ground Troops. Twice "Hero of the Soviet Union."

Marshal of the Soviet Union Ivan Ignatyevich Yakubovskiy. Born in 1912. Has been First Deputy Minister of Defense and Commandor in Chief of the United Armed Forces of the Warsaw Pact since 1967. Is a Member of the Central Committee of the Communist Party, and was a Deputy of the Supreme Soviet 6th through 9th sessions. Has commanded armored forces at all levels, and during World War II participated in the storming of Berlin and the liberation of Prague. Marshal Yakubovskiy has been Commander in Chief of Soviet Troops in Germany, and Commander of the Kiev Military District. Twice "Hero of the Soviet Union."

General of the Army Viktor Georgiyevich Kulikov. Born in 1921. Became Chief of the General Staff and a First Deputy Minister of Defense in 1971. A Member of the Central Committee of the Communist Party since 1971. Was a Deputy of the Supreme Soviet 7th through 9th sessions. During World War II, he rose through various command posts to become chief of staff of a tank brigade, later serving as commander of an army. General Kulikov became Commander of the Kiev Military District in 1967, and Commander in Chief of Soviet Troops in Germany in 1969.

General of the Army Aleksey Alekseyevich Yepishev. Born in 1908. A member of the Soviet Army since 1930, was Russia's Ambassador to Romania and Yugoslavia from 1955–62, and became Chief of the Main Political Administration of the Soviet Army and Navy in 1962. A Member of the Central Committee of the Communist Party. Was engaged in Party work from 1940–43. During World War II, he also served as a Member of the Military Council of the Stalingrad Front and of two field armies. After the war, he was Secretary of the Ukrainian Central Committee, First Party Secretary of Odessa, and Deputy Minister of State Security (MGB). Has been a Deputy of the Supreme Soviet for seven sessions.

General of the Army Sergey Leonidovich Sokolov. Born in 1911. Has been a First Deputy Minister of Defense since 1967, serving as a Member of the Communist Party's Central Committee since 1968, and as a Deputy of the Supreme Soviet 7th through 9th sessions. Before World War II, he progressed to battalion commander, and held command and staff positions on the Western and Karelian Fronts during the war. General Sokolov has commanded regiments, divisions, armies, and the Leningrad Military District (1965–67) since the war.

General of the Army Vladimir Fedorovich Tolubko. Born in 1914. Became Commander in Chief of the Strategic Rocket Forces and Deputy Minister of Defense in 1972. Commanded the Siberian Military District from 1968–69, and the Far Eastern Military District from 1969–72. Rose to become a tank brigade commander in World War II, and after the war progressed to the position of First Deputy Commander in Chief of the Strategic Rocket Forces from 1960–68. A Member of the Communist Party's Central Committee since 1971, General Tolubko was a Deputy of the Supreme Soviet for two sessions.

Marshal of the Soviet Union Pavel Fedorovich Batitskiy. Born in 1910. Has been Commander in Chief, Troops of National Air Defense (PVO Strany), and Deputy Minister of Defense since 1966. Commander of several divisions during World War II. Took part in liberating Prague and capturing Berlin. Since the war, has been commander of the Moscow Air Defense District, Chief of the Main Staff and Deputy Commander in Chief of the Air Forces, and First Deputy Chief of the General Staff. Marshal Batitskiy has been a Member of the Central Committee of the Communist Party since 1966, and a Deputy of the Supreme Soviet 6th through 9th sessions. He is a "Hero of the Soviet Union."

Chief Marshal of Aviation Pavel Stepanovich Kutakhov. Born in 1914. Has been Commander in Chief of the Air Forces and Deputy Minister of Defense since 1969. Commanded a fighter regiment on the Karelian Front, and flew 367 sorties in World War II, shooting down fourteen enemy aircraft. Commanded an aviation formation and the air forces of a military district before becoming First Deputy Commander in Chief of the Air Forces in 1968. A Member of the Communist Party's Central Committee since 1971 and a Deputy of the Supreme Soviet for two sessions, Chief Marshal of Aviation Kutakhov is a "Hero of the Soviet Union."

"HERO OF THE SOVIET UNION"

Created in 1934, the "Hero of the Soviet Union" award is the highest distinction in the USSR for an heroic deed. Recipients are awarded a "Gold Star" medal and an Order of Lenin.

As of February 1, 1975, 12,459 persons had received the award, and of those, 131 have received it more than once. Three persons have received three "Gold Stars" each, and Marshal of the Soviet Union Georgiy K. Zhukov had four of them. Ninety-one recipients have been women.

For heroism during World War II, or the Great Patriotic War, as it is known in Russia, 2,420 aviators were made "Heroes of the Soviet Union" —sixty-five of them two times, and two three times. Prior to the war, only five individuals had become double "Heroes."

More recently, nine cosmonauts have received two "Gold Stars" and twenty-five others one.

It has become the custom to award a "Gold Star" to the most outstanding Marshals on their seventieth, seventy-fifth, or eightieth birthday anniversaries. Marshal Grechko received his second on his seventieth birthday in 1973, and Budennyy was given his third "Gold Star" on his eighty-fifth birthday. Marshal Zakharov received his second when he retired as Chief of the General Staff in 1971.

—H. F. S.

A SELECTED BIBLIOGRAPHY ON DOCTRINE, STRATEGY, AND ORGANIZATION OF THE SOVIET ARMED FORCES

Military Strategy (Third Edition), Marshal of the Soviet Union V. D. Sokolovskiy, Editor. Translated, edited, and with commentary by Harriet Fast Scott. Crane and Russak, New York, N. Y. To be published in 1975.

How Russia Is Ruled, by Merle Fainsod. Harvard University Press, Cambridge, Mass., 1967 (revised edition). $12.

The following books may be purchased from Superintendent of Documents, US Government Printing Office, Washington, D. C. 20402:

The Offensive, by A. A. Sidorenko. Military Publishing House, Moscow, 1970. Translated and published under the auspices of the US Air Force. Stock No. 0870-00329. $1.80.

Marxism-Leninism on War and the Army, Military Publishing House, Moscow, 1968. Translated by Progress Publishers, Moscow, 1972. Published in the US under the auspices of the US Air Force. Stock No. 0870-00338. $2.45.

Scientific-Technical Progress and the Revolution in Military Affairs, General Colonel N. A. Lomov, Editor. Military Publishing House, Moscow, 1973. Translated and published under the auspices of the US Air Force. Stock No. 0870-00340. $2.25.

The Basic Principles of Operational Art and Tactics, by Col. V. Ye. Savkin. Military Publishing House, Moscow, 1972. Translated and published under the auspices of the US Air Force. Stock No. 0870-00342. $2.30.

The Philosophical Heritage of V. I. Lenin and Problems of Contemporary War, General Major A. S. Milovidov, Editor. Military Publishing House, Moscow, 1972. Translated and published under the auspices of the US Air Force. Stock No. 0870-00343. $2.35.

The following books are published by the Center for Advanced International Studies, University of Miami, and may be ordered from the Center's office at 1730 Rhode Island Ave., N. W., Washington, D. C. 20036:

The Role of Nuclear Forces in Current Soviet Strategy, by Leon Gouré, Foy D. Kohler, and Mose L. Harvey, 1974. $4.95 paperback. *(For a review, see p. 80.)*

Soviet Strategy for the Seventies: From Cold War to Peaceful Coexistence, by Foy D. Kohler and Mose L. Harvey, 1973. $4.95 paperback.

Science and Technology as an Instrument of Soviet Policy, by Mose L. Harvey, Leon Gouré, and Vladimir Prokofieff, 1972. $4.95 paperback.

During World War II, Colonel A. I. Pokryshkin, beside his much-decorated P-39, is congratulated on receiving his third "Gold Star" medal as "Hero of the Soviet Union." Today he is a Marshal of Aviation and Chairman of DOSAAF.

SOVIET ACES OF WORLD WAR II

The 172 leading Soviet aces are credited with destroying 4,774 enemy aircraft. Nine Soviet aces (listed below) destroyed more than forty enemy aircraft each. Twenty-five others each destroyed between thirty and forty enemy aircraft, and 137 Soviet aces each destroyed between twenty and thirty.

The top Soviet aces of World War II and the number of aircraft they destroyed are:

I. A. Kozhedub	62	D. B. Glinka	50
A. I. Pokryshkin	59	A. V. Vorozheykin	46
G. A. Rechkalov	56	A. I. Koldunov	46
N. D. Gulayev	53	N. M. Skomorokhov	46
K. A. Yevstigneyev	52		

Kozhedub and Pokryshkin have both been named "Heroes of the Soviet Union" three times, and the other seven aces listed above—plus fifty-eight others—earned the title twice. Another 2,353 Soviet airmen are one-time "Heroes of the Soviet Union."

Kozhedub is now a General Colonel and is seen frequently at social gatherings in Moscow. Pokryshkin is a Marshal of Aviation and presently heads DOSAAF, a nationwide, quasi-military organization for youth.

Airman's Bookshelf

Breakthrough or Bad Bet?

US-Soviet Cooperation in Space, by Dodd L. Harvey and Linda C. Ciccoritti. Center for Advanced International Studies, University of Miami, 1730 Rhode Island Ave., N. W., Washington, D. C. 20036, 1974. 408 pages with index. $8.95.

Discussions in the United States about the value and cost of the joint Apollo-Soyuz Test Project (ASTP) bear out the observation of Foy Kohler at the beginning of this massive documentation of the history of US/USSR space cooperation. "Relations have been plagued," writes the former American ambassador to Moscow, "by the tendency . . . to fluctuate between naïve euphoria and angered disillusionment." Current opinions about next July's cooperative manned space mission range from seeing it as a breakthrough to a united world space program, all the way to considering it "a great wheat deal in the sky." These widely divergent evaluations would benefit from historical perspective.

Perspective and historical documentation is what this book provides. It documents the developments (or lack of them) in the field of space cooperation between Moscow and Washington—reported conversations, letters, diplomatic initiatives, conference proceedings, and presidential proclamations. For ten years, space cooperation was mostly talk; that talk is what the book describes.

Despite the scholarly, often dry, nature of most of this book, two chapters in particular make it worthwhile for general students of Soviet/American relations. Ambassador Kohler's perceptive introduction discusses some basic guidelines for understanding the USSR and the role that science and technology play in the political considerations of the Kremlin. It is a mistake, Kohler argues, ". . . to assume that Soviet policies in one particular area can be dealt with in isolation from Soviet policies in other areas which in Moscow's view help determine the achievement of its objectives. . . . The future of space cooperation with the Soviets depends less on US initiatives, however dramatic or ingenious these might be, than on cold calculations on the part of Soviet authorities themselves. . . ."

Following the ASTP agreements, the authors wrote an additional chapter as a prognosis of the future of US-Soviet space cooperation. The political nature of the ASTP project has by now been fully revealed, and the question arises whether this event will have beneficial political consequences. What will be its effects on US-USSR trade? How will it affect the Soviet drive toward scientific and technological superiority over the United States? Will it provide ". . . an opening into a closed society?" These implications and other examples of repercussions outside the narrow scientific arena are extremely important and too lightly covered elsewhere. This book provides that coverage.

The authors end the book on a cautiously optimistic note, but with a warning that the United States ". . . is taking a gamble: it is risking helping an avowed adversary to strengthen itself in perhaps critical ways, while standing to gain very little of direct value in return." The debate concerning the values and risks must go on, and this book provides excellent ammunition.

—Reviewed by Capt. James E. Oberg, USAF.

Soviet Nuclear Strategy and Détente

The Role of Nuclear Forces in Current Soviet Strategy, by Leon Gouré, Foy D. Kohler, and Mose L. Harvey. Center for Advanced International Studies, University of Miami, 1730 Rhode Island Ave., N. W., Washington, D. C. 20036, 1974. 148 pages with appendices and index. $4.95 paperback.

This monograph, the latest in the Center for Advanced International Studies series on international affairs, focuses on critical aspects of current Soviet thought regarding the nuclear forces of the USSR, as reflected in open-source Soviet publications. The format of the book is conducive to both quick review and detailed study. The book's findings and judgments are well documented.

In his Foreword, former US Ambassador to the USSR Foy Kohler decries the widespread deprecation of documentary research in Soviet affairs that has led to a tendency to perceive Soviet leaders as thinking and seeing things as we do, hence projecting into Soviet affairs a mirror-image of ourselves and our concepts. This, he believes, has led directly to serious misjudgments in understanding and forecasting Soviet behavior.

Turning to the actual role of nuclear forces in Soviet strategy, Kohler notes that Soviet sources emphasize that a profound reorientation has been wrought in Soviet positions, concepts, organization, and force assignments in response to what was considered the "objective" requirements of the nuclear age. The on-going results of this "revolution in military affairs" is the primary subject of this book.

In more general terms the authors discuss the position of the Soviet leadership regarding nuclear forces in light of the new "détente" relationship between the US and the USSR. For the Soviets, "détente" is a strategy of struggle with the West aimed at achieving the USSR's global objectives. Utilizing extensively documented research, the authors then sifted the voluminous Soviet press publications to provide readers with the very important findings that follow.

Current Soviet statements on East-West relations reveal that regardless of agreements between states, the struggle for dominance between the Communist Bloc and the Capitalist Bloc is uncompromising, irreconcilable, and will continue as long as capitalism survives. Soviet sources explain that the basic purpose of Soviet nuclear forces is to provide the USSR with a war-fighting and war-winning capability. Consequently, Soviet authorities leave no doubt of their intended re-

liance on nuclear weapons if a general war should come, whatever its origins.

Soviet public statements show no evidence of the SALT agreements having any noticeable influence on Soviet military or strategic concepts. Nuclear weapons, in the Soviet view, have made the attack the "decisive form of military action." Furthermore, to assure the destruction of the enemy and the survival of the USSR, the doctrine calls for a Soviet preemptive counterforce strike to reduce the weight of US strikes on the Soviet Union and thus facilitate the solution of the latter's survival and ultimate victory. Soviet strategic commentaries are primarily concerned with the problem of a general nuclear war. Soviet doctrine does not discuss the possibility of using nuclear weapons in a controlled, escalatory fashion, or for war-bargaining purposes, and Soviet spokesmen are scornful of such Western theories.

This extremely well documented book reflects a keen insight into the Soviet mind, its motivations and desires, and presents its findings in a highly readable, informative manner. It is a timely work, in light of the continuing SALT II negotiations, the recent Vladivostok Agreement, and the developing "détente" relationship between the world's two superpowers. For all who claim to be knowledgeable of Soviet-American relations and who are concerned with the future, it is "must" reading.

—The reviewer, a senior government official who is involved in the study of Soviet military affairs, wishes to remain anonymous.

Expectations vs. Reality

The Soviet Union and the October 1973 Middle East War: The Implications for Détente, by Foy D. Kohler, Leon Gouré, and Mose L. Harvey. Center for Advanced International Studies, University of Miami, 1730 Rhode Island Ave., N. W., Washington, D. C. 20036, 1974. 130 pages. $4.95 paperback.

Scholars interested in understanding Soviet activities face the formidable problem of contradictory interpretations in analytical literature. Analysts have long imposed their own predispositions on Soviet behavior to "predict" how Moscow would conduct future operations.

This book, however, belongs to the growing body of literature produced by scholars who have departed from tenets about Soviet behavior previously considered immutable. Since the Kremlin plays such a significant role in developing areas, these scholars now seek to discern the process by which Moscow generates rules to govern its responses to the behavior of other states, and its interaction in potentially explosive environments.

For Kohler, Gouré, and Harvey, Soviet behavior is related to Soviet doctrine and, therefore, must be analyzed in accordance with priorities defined in Moscow, not Washington. By evaluating Soviet pronouncements, and actions, the authors have determined that to the USSR, détente presupposes a continuing political, economic, and ideological struggle with the US.

Moscow has stated that détente includes neither preservation of the status quo, nor international stability. To the contrary, since the Kremlin intends to alter the international "balance of forces" in its favor, competition will continue in those areas of greatest sensitivity to the US, *i.e.,* the Middle East. Moreover, the Soviets believe that the capitalist states are limited in their efforts to oppose "anti-imperialist" conflicts.

In the Soviet interpretation, Socialist support for "national liberation movements" is not limited by détente. More specifically, the authors show that Moscow considers the conditions in the Mideast as demanding an even more rigid position. Prior to the war, Moscow actively sought to strengthen its own stature at the expense of the US. The book points out, for example, that petroleum issues have remained unaffected by détente. Moscow has supported Arab oil policies and has urged an increased use of the "oil weapon" against the US.

With regard to the "relation of forces" at the start of the war, Moscow estimated that as a result of Vietnam and oil problems, the US had become constrained in foreign policy and was unlikely to oppose Soviet action in the Mideast. Furthermore, the perception of the military balance seemed to indicate that the US was effectively deterred from risking a nuclear war. The Soviets finally cooperated with the US to defuze the situation not because of détente, but because the US responded with a military threat.

In the final analysis, Soviet behavior in the crisis demonstrates that Moscow is not guided by loyalty to the principles of détente, but instead by its assessment of the Soviet-US balance of forces and the expected US response to Soviet actions. Although the authors indicate that Moscow is not inclined to engage in an actual shooting encounter with the US over Mideast objectives, their analysis makes clear that the Kremlin will pursue any opportunity to further its interests, even though such action might hinder détente.

—Reviewed by Capt. Lloyd W. Hackley, Department of Political Science and Philosophy, USAF Academy.

New Books in Brief

British Airborne Troops, by Barry Gregory. This short book traces the development of Britain's airborne forces from 1940 to 1945, and relates the combat experiences of the 1st and 6th Airborne Divisions. It covers organization and insignia, weapons and equipment, airlift, and unit histories. Doubleday, Garden City, New York, 1974. 160 pages. $7.95.

Defence Yearbook, 1974. This annual publication, formerly *Brassey's Annual,* appears for the first time under the aegis of the Royal United Services Institute of Defence Studies. The first section of the book is an anthology of articles by experts on the strategic posture of nations around the world. The second section is a survey of weapon systems in service or under development. Praeger, New York, N. Y., 1974. 338 pages. $20.

The Thresher Disaster, by John Bentley. The worst submarine disaster in history took place in April 1963 when the US Navy's nuclear sub *Thresher* imploded and sank, killing all 129 men aboard. Attempting to pinpoint what went wrong, the author discusses *Thresher* throughout its life, and the inquiries that followed the disaster. Doubleday, New York, N. Y., 1974. 372 pages with index. $8.95.

Yesterday's Wings, by Pete Bowers. A collection of articles about historical aircraft, from *The AOPA Pilot* magazine, covering seventy-four early planes from the Curtiss Jenny to the Mooney Mite. Each article has photos and a chart of specifications and performance. Also included are eight feature articles on early flight. Aircraft Owners and Pilots Association, Washington, D. C., 1974. 160 pages. $7.95 for nonmembers, $7.25 for members.

—Reviewed by Kathryn Foxhall

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The Military Balance and Détente

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

One of the harder things to do these days is to interest, say, an automobile dealer in the problems of the $90 billion Defense Department. And that is too bad, for in this increasingly uncertain world, defense priorities are once again—after some years of being confused by the Vietnam War—a central and vital matter to the future of our nation.

Defense Secretary Schlesinger's recent remark that our defense spending in real dollars is at its lowest point since before Pearl Harbor has not made any news telecast I have listened to. Nor has this equally interesting Schlesinger statement: "Although the conversion of rubles to dollars is an inexact science, there is no question that the Soviets are spending more than $100 billion a year on the military, and that their allocations are growing at a rate of four to five percent a year."

In a time of bad news every day, there is a natural tendency to turn off any more bad news. Perhaps that accounts for the modest, but evidently growing, success of something called *The Defense Monitor,* a publication put out by the Center for Defense Information. *The Defense Monitor* gets quoted here and there these days, and no wonder. It is a source of succinct, wonderfully simple (if not simplistic) comment on the whole complex field of defense and the US/Soviet military balance. If you read and take comfort in *The Defense Monitor,* you won't worry about what Dr. Schlesinger is telling you.

Briefly, Dr. Schlesinger says détente depends on a military balance, an equilibrium. We cannot maintain that equilibrium if we don't spend some money. And if we do not have a balance, an equilibrium, we cannot have détente. Simple.

Rear Adm. Gene LaRoque, USN (Ret.), who is the head of the Center for Defense Information, says, in effect, we are well ahead now, so we can cut back.

It is an attractive idea to a nation faced with the kind of economic troubles we find ourselves in. The fact that we have cut back our military strength by 1,386,000 (from about 3,500,000 to approximately 2,200,000), or thirty-nine percent since 1968, is evidently not germane. What, in other words, have you done for me lately?

Soviet forces in the past ten years, with no Vietnam War to fight, have grown from 3,600,000 to about 4,000,000, and 600,000 of these are in Eastern Europe. But rest easy. *The Defense Monitor* (December 1974 issue) says not to worry. May I quote just enough to reassure you?

"Recent Defense Department studies of Western European defense requirements, considered by DoD to be the most comprehensive to date, indicate that NATO has more than enough forces to defend itself against likely Soviet threats. . . . NATO can handle the probable Soviet threat with fewer ground forces in Europe."

Well, that is what *The Defense Monitor* says. The "recent studies" referred to, if they are the ones I think they are, say no such thing. They were, instead, intended to point up some positive aspects of NATO's capability—to counteract a tendency toward despair on the part of some. But no study that I am aware of concludes that NATO can handle the Warsaw Pact with fewer forces of any kind.

But never mind all that. The facts are clear enough, and they are not such good news. In the matter of air forces, for example, the Soviets have made some remarkable improvements in the last few years—improvements in standardization, in aircraft shelters, in command and control, and in the airplanes themselves. What the Soviets are furnishing their allies is good stuff. And while it is undoubtedly true that we and our allies are better trained, fly more, and are superior in many other areas, the Soviets and their Warsaw Pact have made some great advances in recent years. They have made similar qualitative improvements in their Army and Navy.

The story of the dramatic growth of the Soviet Navy cannot be covered here beyond noting that, as someone once said, a prerequisite to gunboat diplomacy is first to acquire some gunboats for yourself.

Détente with the Soviet Union will remain a desirable objective, but it can prosper only in direct proportion to our military stature. By the end of this decade—in five short years—Soviet strategic forces will be equal to or greater than our own. This is the considered judgment of, among others, the Secretary of Defense. When that time comes, conventional forces are going to be the critical element in the balance.

These conventional forces are going to have to be first class in every respect. It is going to take money, and while there must continue to be great pressure on the military to economize, the economies should come in the soft areas, not in the essential R&D, weapon systems, and combat forces. ■

The Bulletin Board

By John O. Gray
MILITARY AFFAIRS EDITOR, AIR FORCE MAGAZINE

The Shrinking Air Force

The reductions in Air Force troop strength will continue for many months, the Defense Department budget for FY 1976 makes clear. It calls for 612,000 members by July 1975 and only 590,000 a year later. Strength the first of this year was 625,000.

USAF's civilian force is slated to drop from 282,000 to 271,000 during FY 1976.

Upcoming cuts in USAF officer strength will trigger a new series of non-Regular officer RIFs, starting with a force-out of 621 next June. This will include a number of field-grade officers.

The FY 1976 officer RIF program calls for about 2,100 involuntary exits, to be carried out in two or three increments.

The service, meantime, has trimmed procurement of new officers, continued its early-out projects, and rolled back separation dates. One of the latter will automatically cut loose, on June 27, about 100 Reservists who had been scheduled to depart up to a year later.

The squeeze on active-duty non-Regulars is designed to reduce USAF's officer force to about 104,000 members by the end of June and to 100,000 during FY 1976. Despite the severe inroads being made on non-Regulars, Air Force has no plans to include Regulars in RIF actions as Army is preparing to do. Authorities contend that Army's Regular corps lacks the overall quality of the USAF Regular officer force.

Another early-out program USAF wants to exploit is Palace Chase, Headquarters reminded the field recently. Under it, members agreeing to participate in the Reserve Forces are excused from further active duty.

In the upcoming scrap over the FY 1976 budget, Hq. USAF authorities expect to wind up with about $7.4 billion for people programs. While that's about $200 million above the current year's personnel budget, inflation will have more than eaten away the extra amount. Each new budget "buys less," and this means more retrenchments ahead, officials told AIR FORCE Magazine.

A late casualty to the dollar crunch is USAF's sports programs. Training camps and command-level, Air Force-wide, and service-wide competitions have been slashed to save manpower and travel money. Emphasis is being concentrated on local sports activities, though Air Force will provide top athletes for the Pan American Games this year and the Olympic Games next year.

Some prominent USAF quarters feel the reductions in the sports programs are long overdue, that manpower has been unduly wasted for years.

Saving NCO Retirement

Some veteran airmen, through their own inaction, are jeopardizing their retirements, according to Hq. USAF. Involved are NCOs who because of nonpromotion have reached their "high year of tenure." Under exit policies, they cannot reenlist. But to assure their retirement, rather than mere separation, they must complete processing in the prescribed manner. Some, however, are waiting too long, and could be exited without retirement benefits. Headquarters has urged all concerned to check out the situation with local personnel offices.

Pay Raise Curbs?

President Ford's plan to curb the growth of federal expenditures by throttling government pay raises would reduce the next round of the "pay inversion" problem. But the service community isn't cheering. The Ford program calls for (1) limiting this year's active-duty pay boost to five percent, and (2) halting retiree raises until mid-1976. The same would apply to active and retired federal civilian employees. Social Security annuitants would be limited to five percent increases.

Congress may reject the President's request for the latter—there are thirty million of them. For the military and federal service communities, however, the outcome appears less certain. Opponents say it's unfair to single out a government-controlled group to sacrifice when the Administration opposes wage controls on the general public.

Proponents of the President's economy plan say the combined retired CPI increase of 19.1 percent over a recent twelve-month period (5.5 percent January 1974, 6.3 percent July 1964, and 7.3 percent January 1975) is more than ample and far exceeds the national average of pension increases.

The Administration at press time was drafting the proposed legislation.

The inversion problem continues to plague new military retirees. Because retired raises have outdistanced active-duty raises two to one, new retirees draw smaller pensions than those who retired before October 1, 1974. And no relief legislation—requiring that persons retiring after that date would "receive not less" than those retiring before—is likely. It would cost money.

But under the President's new pay-freeze plan, the inversion would narrow—for persons retiring after next October 1. They would compute the five percent active-duty raise in their retired pay, but in the meantime there would be no actual retired pay increases.

Modernized Pay System?

While the President eyed curbs on the escalation of active-duty and retired pay, other agencies at press time were launching new probes of the entire military compensation system. The actions conceivably could lead to a revamped, modernized set-up, even a "single salary" plan. But realistically the odds for major changes are poor. Here are the separate but closely related actions:

- The Pentagon has appointed a team of thirty-five to forty pay experts from the services to conduct the third Quadrennial Review of Military Compensation. It's expected to last into next year, according to Capt. J. B. Campbell, USN, of De-

fense's Office of Compensation Studies. He heads the new review.

The group recently briefed Defense Secretary James Schlesinger on its plans. The study marks the first in-depth pay probe since the first such Quadrennial Review in 1967. Campbell said the 1971 Quadrennial Review was only a "limited look." Since these past probes, the military pay system has become more of a hodge-podge, tougher for the troops to understand, and considerably more expensive.

Cadet Donald E. Parman was the recipient of AFA's Outstanding Civil Air Patrol Cadet Award for 1974. Ben Snell, chairman of the executive committee, California AFA, did the honors at CAP's national convention in San Francisco last fall. Cadet Parman is enrolled in ROTC at Eastern Michigan University.

• The Defense Manpower Commission, as part of its exhaustive look into manpower utilization, has also launched a compensation study. But it will consist more of riding herd on the new Quadrennial panel. The DMC, in fact, recently set down guidelines for the Defense Department to follow. DMC Chairman Curtis W. Tarr wrote Secretary Schlesinger that the review team should address the following "major areas":

1. The total amount of cash and in-kind compensation for each grade.

2. Alternative methods of structuring the compensation package, including these alternatives: (a) retaining the present system but improving "members' perception" of its value; (b) conversion "of certain in-kind" benefits to cash; and (c) full conversion to a salary system.

• The Senate Appropriations Committee has ordered the Pentagon to send it, by next January, a report on how the pay structure should be "modernized." The eventual report is slated to emerge from the Quadrennial Review now getting under way.

Lawmakers and Defense authorities are frustrated about the complex pay-allowance arrangement; they want it changed, simplified, and—if at all possible—made less costly. But most insiders claim that's impossible, and insist instead that a truly modernized system would be considerably more expensive than what now exists.

One authority said he sees no chance of any new compensation items—such as lawyer pay, variable housing allowance, and improved sea pay—getting any early Pentagon backing. "In the current economic climate, we'll do well to hold on to the pays and allowances we now have," he told AIR FORCE Magazine.

Senator Proxmire's Ire

The Defense Manpower Commission, meanwhile, has drawn the ire of Sen. William Proxmire (D-Wis.). He charged that the group is moving too slowly and has packed its staff with former Pentagon assignees to the extent that it can't work objectively. He also questioned whether the study would lead to worthwhile savings.

Mr. Tarr replied that he has recruited a "bright and intellectually honest" professional staff. He added, with an upsmanship thrust, that while the DMC "is working upon projects that can reap substantial rewards," the real test is whether Congress and the Administration will peruse its recommendations.

Defense Medical School

More than 2,000 persons, service members and civilians, early this year had applied for the first class of the Defense Department's new medical school, which authorities "hope" will open next fall with a first-year class of thirty-five to forty students. Some 10,000 applications will have been received by that time, the Pentagon estimates.

The school is officially called the School of Medicine at the Uniformed Services University of the Health Sciences. The facility is being developed at the National Naval Medical Center, Bethesda, Md.

The school is slated to enroll at least 100 new students annually by 1978 and eventually provide the services with a hard-core physician complement. But it's a painfully slow process. The government created the school two and one-half years ago, yet it got around to appointing a dean only a few weeks ago. He is Dr. Jay Philip Sanford, now with the University of Texas Southwestern Medical School in Dallas. He takes over the Defense school May 1.

A Matter of Degrees

The already slim odds on making star rank in the USAF with only a bachelor's degree are dwindling, the new brigadier generals list indicates. Of the forty-two selectees—lowest number in years—only four lack bachelor's degrees, seven hold a bachelor's or the equivalent but nothing higher, and thirty-one possess master's degrees or the equivalent.

At a lower level, all but 286 of the 4,713 USAF primary zone captains recently considered for temporary major hold bachelor's degrees or higher. The nondegree holders fared poorly: only 106 of the 286 were chosen for promotion.

Outrage Over Store Threats

The new threats to the military commissary system are probably the most serious in history. And they have touched off a torrent of outcries from the troops, dependents, and military organizations.

And small wonder: Commissaries are an emotional as well as a financial issue. The "save the commissaries" battle was triggered by disclosure of the Administration's plan to slash commissary funding and make the stores much more self-supporting than at present.

Store prices figure to soar; one authority said he foresees the present three percent surcharge eventually going to fifteen percent. Earlier, most reports dealt with a probable one or two percent increase.

Despite the furor over the fate of the commissaries, Air Force maintained official silence "until the new budget" is submitted.

The Bulletin Board

Whether the present commissary system can be saved now appears to hinge on congressional reaction to the pressure the military community will be applying on the lawmakers in the next few months.

Drug Testing on Again

Air Force on February 24 was slated to resume on a broad front urine testing for drug abuse. All members under twenty-six, the new rules say, will be tested on a random basis. And persons in the "high-risk areas" of Vietnam, Thailand, the Philippines, Okinawa, Taiwan, and Guam must submit to at least three tests per year. Service members in Korea and Panama, the so-called "moderate risk areas," will receive a minimum of 1.6 tests per year. Dates will be selected at random.

Drug "rehabilitees" will receive a minimum of four tests a month. "Urine surveillance participants," and members failing to show up for testing without a valid reason, will undergo at least twelve tests a month for a minimum of one month.

Commanders have broad powers to apply special rules "peculiar to local areas." They can order immediate testing of any person suspected of using drugs.

The Defense Department suspended drug testing last July when the US Court of Military Appeals held that a bad test resulting from one given involuntarily could not be used to give the person a general discharge. Because drug abuse remains a problem, however, the Department ordered resumption of involuntary testing. But no less than honorable discharges will be issued as a result.

Johnny Horizon '76

The Air Force Reserve has joined the Interior Department in a nationwide clean-up campaign. Aim: Involve Reserve units in the US Bicentennial. The effort is called "Johnny Horizon '76." Units will adopt local projects such as anti-litter drives, painting buildings, and teaching youths about ecology and environmental protection. Hq. Air Force Reserve, Robins AFB, Ga., has told units they'll be hearing more about the program soon.

Housing Emphasis Shifts

The Air Force came out of the FY 1975 scramble for new family housing units with only 1,050, less than half those the Pentagon asked Congress to approve. And the FY 1976 house-building program is expected to produce even fewer. The service, for a variety of reasons, "is just about built out," according to Rufus L. Crockett, USAF's Deputy Assistant Secretary for Installations.

The major emphasis, he told AIR FORCE Magazine, has shifted to improving existing housing. USAF officials were talking confidently of acquiring about $40 million in the FY 1976 construction program to refurbish thousands more run-down family quarters. That's double the amount of improvement money Air Force secured for the FY 1975 program.

In new houses, the FY 1975 program will provide 100 units at Pease AFB, N. H., and 100 at Altus AFB, Okla.—nothing more Stateside. Approved for overseas were 200 units each at Misawa AB, Japan, and Kadena AB, Okinawa, and 250 at Clark AB, P. I. Air Force had sought 500 new quarters for Clark, to alleviate a disastrous housing situation there. Because of the housing shortage, outrageous rents, and other problems facing military families at Clark, Hq. USAF recently barred wives and children from accompanying members (except E-9s and colonels and above) to the Philippines.

Another 200 homes in the FY 1975 budget were approved—for Hickam AFB, Hawaii. But they have been "deferred" because of force cuts in Hawaii, and probably won't be built.

The FY 1976 request for new units, though not spelled out at press time, will be limited to a very few sites where "special situations" create an urgent requirement for new housing, Mr. Crockett said. He cited the AWACS project as triggering a need for new units at Tinker AFB, Okla.

Beside a smaller Air Force and rising costs, "programming restraints" deter new house building. Defense, for example, limits overall programming to eighty percent of requirements. And family housing for lower grades is completely ignored, despite the services' efforts to include it.

Housing officials, meantime, expect utility costs for Air Force family quarters to hit $75 million this fiscal year, up $10 million over FY 1974. As utility costs rise, despite USAF's stern energy conservation measures, authorities have been trying to offset them by cutting other housing maintenance outlays. Until recently, utilities accounted for twenty-five percent of USAF's overall housing maintenance and operation costs. Now they consume forty percent and may soon rise to fifty percent.

In a related note, numerous Air Force families have scored the service's recent policy shift on assignment of quarters. It reduces the advantage of rank and gives lower-ranking personnel a better shot at base housing. (*See January "Bulletin Board."*) The gripes are mainly from persons with lengthy service who endured many "bad housing" years because of housing shortages and their formerly low rank. "We earned our preferential assignment status, and now they're taking it away from us," a typical complainer said of the new policy.

Saudi Deal Ups Training

The Air Force will train more Saudi Arabians as a result of the recently approved package deal under which the US will sell sixty F-5s to that country. Spares, training, and other items are included in the $756 million package.

In January, when the new pact was announced, the USAF was training sixty-one Saudi Arabians: ten in pilot schools, six in maintenance, one in intelligence, three in Squadron Officer School, three in Command and Staff College, and thirty-eight in the Defense Language Institute, Lackland AFB, Tex. The latter were learning English so they can absorb technical training.

Air Force officials said the number of Saudi trainees under the new package hasn't been determined. The first of the F-5s to be sold (forty F-5Es and twenty F-5Fs) will be delivered in July 1976.

Short Bursts

Put a low profile on **use of staff cars,** Hq. USAF has told the field. Reason: With economic conditions worsening, the public is more aware of "real or suspected government extravagance or waste," especially in the vehicle area. This means "consolidation of trips" and "more judicious vehicle use," the Air

Force Director of Transportation's office said.

Military and federal civilian **paychecks are now subject to garnishment for child support and alimony.** Must be a court order. The President approved the provision early this year, making the federal sector subject to the same rules that have applied to other citizens.

An unusual memo from the Pentagon reports that "the Department of Defense has voluntarily established procedures for public participation in DoD policy rule making." In other words, citizens will be able to participate in the **"formulation" of regulations, directives, etc.,** which have a substantial impact on the public. The services have until April 1 to implement the unique program.

Ed Gates . . . Speaking of People

"CONUS Isolated"—Today's "Frontier Posts"

Speaking of people, this is an appropriate time of year to salute a robust group of about 1,700 Air Force members, together with their wives and children, who are "CONUS Isolated."

They are located at sixteen remote Stateside sites, mostly radar stations, generally on hilltops where the wind howls, or in snow belts, where mountains of the stuff pile up each year. Early March is almost digging-out time.

The largest such station is Mt. Hebo AFS, Ore., with an authorization for thirteen officers and 163 airmen. The smallest is Hill AF Range, Utah, with only two officers and twelve airmen. The latest site to be designated CONUS Isolated is Pinedale, Wyo., where Det. 459 of the 1156th Technical Operations Squadron is in place with a complement of one officer and seventeen airmen.

The main skills involved at all these locations are in the radar operation and maintenance career fields.

How does a site get designated CONUS Isolated? What's the significance?

Air Force explains that the criteria for such a rating normally includes long periods of severe weather and extended, sometimes hazardous, driving to the nearest town. The latter, frequently an hour or more away, are distinguished by their lack of grocery stores, other stores, medical services, and recreational facilities. In short, nearby "community support" doesn't exist.

A typical example is Finley AFS, N. D. The closest general shopping outlet is in Grand Forks, more than sixty miles away. The nearest restaurant is nearly seventy miles distant; so is the nearest dentist.

Yet the Air Force reports that there "are no existing significant personnel problems associated" with this duty. And retention rates, "though varying widely, largely because of the small numbers of personnel involved, are basically consistent with the Air Force averages."

Numerous airmen in recent years have grumbled over receiving a second or even a third tour at such locations. But these gripes have tailed off. Still, USAF acknowledges that about twenty to twenty-five percent of the airmen with "radar associated skills" do get a second, though not consecutive, CONUS Isolated assignment. However, "few airmen ever experience three or more assignments to these locations," officials say.

The USAF Military Personnel Center, which monitors the special assignment programs, told AIR FORCE Magazine that despite the hardships, most assignees bring their families along. Most of the sites have twenty-seven sets of family quarters plus "a varying number of government-controlled leased houses" nearby.

But none of them is given very good official marks: "The total number of available houses, government-controlled or private, is marginal to inadequate." Families living in leased homes surrender their quarters allowances, but, considering that utilities are covered, it's a pretty good deal.

The main advantage of being labeled CONUS Isolated is that members can get reassigned after fifteen months if unaccompanied, after twenty-four if accompanied. Hq. USAF adds that persons completing short tours overseas "do not receive involuntary consecutive assignments to CONUS Isolated sites unless there is no other available resource and mission accomplishment would be impaired."

One sometimes misunderstood fact: A CONUS Isolated tour doesn't reduce a member's vulnerability for either a long or short tour abroad.

Why not designate larger bases located in frosty and remote areas as CONUS Isolated? Examples include such "northern tier" installations as Minot AFB, N. D.; Loring AFB, Me.; K. I. Sawyer AFB, Mich.; and Kincheloe AFB, Mich.

Since many persons have asked Hq. USAF about this, the Personnel Center recently reviewed the matter to determine if additions to the list were justified. The decision: None of the northern tier bases meets the basic criteria.

While life may get tiresome during the long winters, these larger bases do provide a wide range of services—exchanges, commissaries, gas stations, concessions, clubs, gyms, hospitals, movies, etc. Unlike CONUS Isolated sites, they are little cities (albeit frigid ones much of the winter) in themselves.

Air Force people serving at CONUS Isolated stations undoubtedly would now be drawing "remote-isolated" duty pay, perhaps worth $100–$200 a month, had that frequently advanced proposal ever flown. Air Force backed it strongly, but higher authority said no. Now it's just another budget casualty.

The rewards for pulling this type of essential duty, other than perhaps some first-rate hunting, fishing, skiing, and camping, are obvious. But a number of dedicated Air Force people are pulling it without complaint. More power to them.

CONUS ISOLATED STATIONS

Station	Officers	Airmen	Total
* Matagorda Island AF Range, Tex.	5	178	183
Mt. Hebo AFS, Ore.	13	163	176
Fortuna AFS, N. D.	5	117	122
Point Arena AFS, Calif.	5	117	122
Calumet AFS, Mich.	6	113	119
Baudette AFS, Minn.	6	112	118
Klamath AFS, Calif.	5	112	117
Havre AFS, Mont.	5	106	111
Makah AFS, Wash.	5	106	111
Finland AFS, Minn.	5	105	110
Finley AFS, N. D.	5	103	108
Opheim AFS, Mont.	5	103	108
Bucks Harbor AFS, Me.	4	89	93
* Benton AFS, Pa.	4	86	90
**Pinedale AFS, Wyo.	1	17	18
Hill AF Range, Utah	2	12	14

* Deactivation recently announced
** Added to list Dec. 18, 1974

The Bulletin Board

Congratulations to **Sgt. William T. Hiniker,** editor of the Duluth International Airport's base newspaper, *The Patriot, and* **Mynda McGuire,** editor of *The Tinker Take-Off,* Tinker AFB, Okla. These papers won top honors in the recent USAF base newspaper contest and, the judges feel, could repeat in the upcoming interservice competition.

A man with a strong Air Force background, **Dr. John F. Ahearne,** has been named to the Pentagon's second highest manpower-Reserve post. Now officially Principal Deputy Assistant Secretary of Defense (Manpower and Reserve Affairs), Dr. Ahearne served in the USAF for eleven years, part of the time as a physics professor at the Air Force Academy. More recently he has been Defense Deputy Assistant Secretary for program analysis.

The Military Personnel Center, Randolph AFB, Tex., has set up a round-the-clock **"rapid-response line"** so that personnel managers USAF-wide can fire in troublesome questions and get prompt replies. There's an "immediate need for improved communication" between base personnel and the Center, its Commander, **Maj. Gen. T. R. McNeil,** said in announcing the new program.

Thousands of Air Force pilots won their private licenses through the AFROTC flight instruction program (FIP); the thirty-five hours they logged met the FAA certificate requirement. But FIP, under a dollar-savings move, has been cut to twenty-five hours, which is still ample to test students' motivation and likelihood of completing military flying training.

All USAF officer and E-7, E-8, and E-9 travelers can now be assigned **transient quarters on a two-per-room basis,** where single occupancy was previously the rule. This is a temporary policy, laid on because of the shortage of per diem funds. USAF regrets the necessity, for it reduces adequacy standards of transient quarters. If the service can hack it, the single occupancy provisions will be reinstated July 1.

The President's **veto of increased travel allowances** for government civilian employees caught even Administration confidants by surprise. Aides had already drafted implementing regulations. More importantly, the veto delays the date when more realistic travel allowances may be invoked for the military community, since it usually takes a civilian increase to pave the way. The vetoed bill authorized up to **$35 per diem** and a **fifteen-cents-per-mile allowance** for employees using their own cars for official business.

Headquarters has ordered the field to raise, through on-the-job training, the **reading comprehension levels** of the numerous blue suiters who, because of reading troubles, aren't productive. ■

Senior Staff Changes

PROMOTIONS: Nominated to be temporary **Brigadier General:** William P. **Acker;** Anderson W. **Atkinson;** Walter H. **Baxter,** III; Stanley C. **Beck;** John H. **Bennett;** Rufus L. **Billups;** Max B. **Bralliar;** Jay R. **Brill;** William E. **Brown,** Jr.; Kelly H. **Burke;** Kenneth D. **Burns;** Carl H. **Cathey,** Jr.; Edgar A. **Chavarrie;** Ernest J. **Clark;** Robert F. **Coverdale;** William D. **Curry,** Jr.; Charles L. **Donnelly,** Jr.; Philip C. **Gast;** Don M. **Hartung;** Charles C. **Irions;** Thomas E. **Lacy;** Chris C. **Mann;** James R. **McCarthy;** Edward J. **Nash;** George K. **Patterson;** John R. **Paulk;** Thomas C. **Pinckney,** Jr.; Andrew **Pringle,** Jr.; Walter B. **Ratliff;** Irving B. **Reed;** Richard G. **Rumney;** George L. **Schulstad;** Eugene D. **Scott;** Robert **Scurlock;** James W. **Stansberry;** Leroy W. **Svendsen,** Jr.; Herbert V. **Swindell;** Daryle E. **Tripp;** Everett L. **True;** Ewell D. **Wainwright,** Jr.; Joseph E. **Wesp;** Robert F. C. **Winger.**

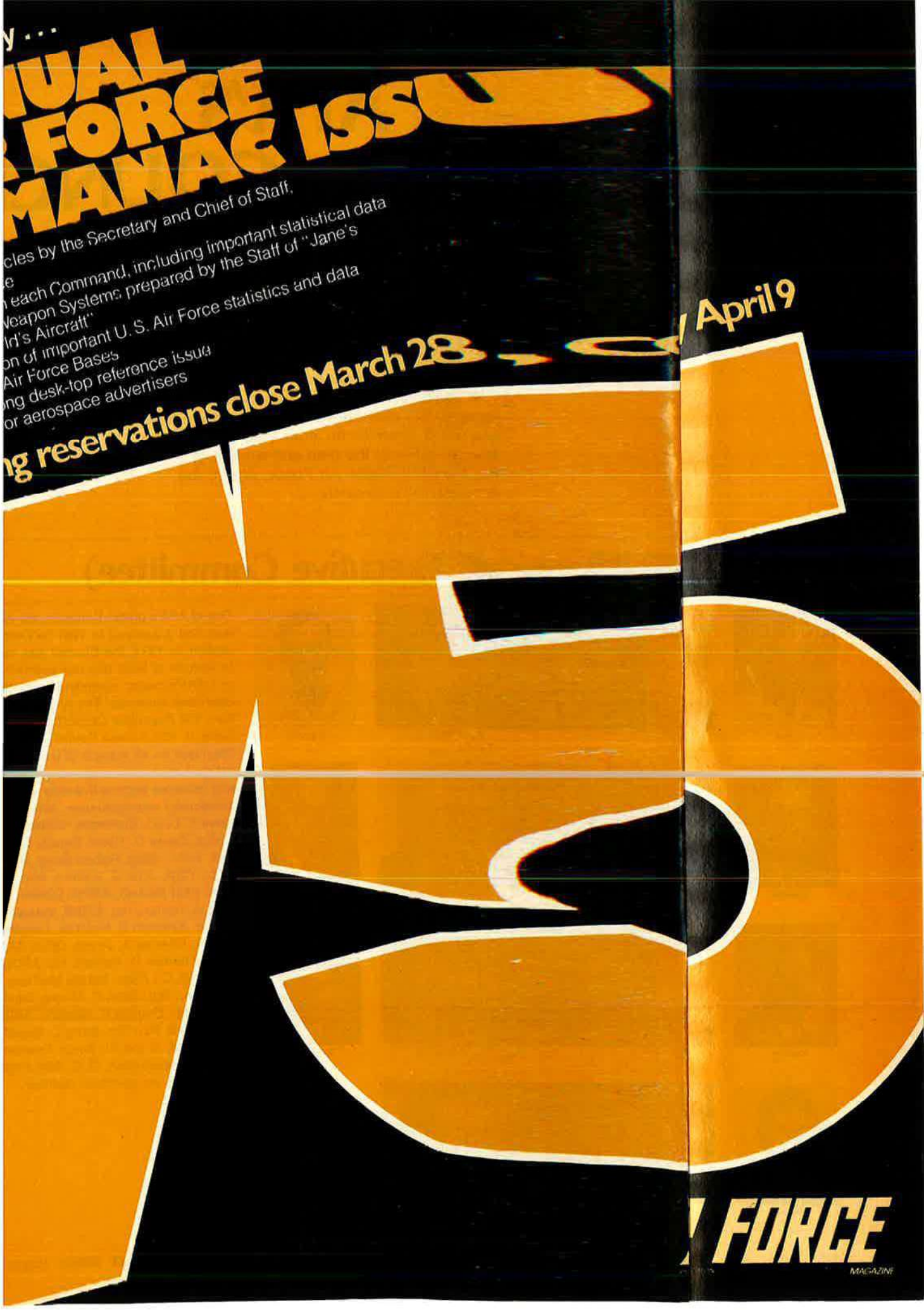
Nominated to be **Erigadier General,** Air National Guard: Harry L. **Cochran,** Jr.; Richard L. **Frymire,** Jr.; Grady L. **Patterson,** Jr.; Richard A. **Rann;** Hal C. **Tyree,** Jr.; Bobby E. **Walls.**

RETIREMENTS: M/G Jonas L. **Blank;** M/G Gordon F. **Blood;** B/G Leslie J. **Campbell;** M/G Kenneth C. **Dempster;** B/G Malcolm P. **Hooker;** B/G Irby B. **Jarvis,** Jr.; M/G Robert F. **Trimble.**

CHANGES: B/G Donald M. Davis, from Cmdr., 40th Air Div., SAC, Wurtsmith AFB, Mich., to Dep. Dir., J-3 (NMCC), Jt. Staff, OJCS, Washington, D. C. . . . **B/G Martin C. Fulcher,** from Cmdr., 47th Air Div., SAC, Fairchild AFB, Wash., to Asst. DCS/Logistics, Hq. SAC, Offutt AFB, Neb. . . . **M/G Charles A. Gabriel,** from Dep. Dir., Ops, DCS/P&O, Hq. USAF, to DCS/Ops, Hq. TAC, Langley AFB, Va., replacing M/G James A. Knight, Jr. . . . **B/G James R. Hildreth,** from Cmdr., 13th AF (ADVON), PACAF, Udorn Air Field, Thailand, to Sr. AF Member, Weapons Systems Evaluation Gp., ODDR&E, Arlington, Va.

M/G Eugene L. Hudson, from DCS/Logistics, Hq. SAC, Offutt AFB, Neb., to Dir., Log. Plans & Programs, DCS/Systems & Logistics, Hq. USAF, replacing B/G (M/G selectee) John R. Spalding, Jr. . . . **M/G James A. Knight, Jr.,** from DCS/Ops, Hq. TAC, Langley AFB, Va., to Cmdr., USAFTFWC, TAC, Nellis AFB, Nev., replacing retiring M/G Gordon F. Blood . . . **B/G Dewey K. K. Lowe,** DCS/Proc. & Prod., Hq. AFLC, Wright-Patterson AFB, Ohio, to Dir., Proc. Policy, DCS/Systems & Logistics, Hq. USAF, replacing retiring M/G Robert F. Trimble . . . **M/G George Rhodes,** from C/S, Hq. AFLC, Wright-Patterson AFB, Ohio, to Asst. DCS/Systems & Logistics, Hq. USAF, replacing retiring M/G Jonas L. Blank.

B/G (M/G selectee) Thomas M. Ryan, Jr., from Asst. DCS/Logistics, to DCS/Logistics, Hq. SAC, Offutt AFB, Neb., replacing M/G Eugene L. Hudson . . . **B/G (M/G selectee) John R. Spalding, Jr.,** from Dir., Log. Plans & Programs, DCS/Systems & Logistics, Hq. USAF, to DCS/Logistics, ADC, & DCS/Logistics, J-4, NORAD/CONAD, Ent AFB, Colo., replacing retiring M/G Kenneth C. Dempster . . . **B/G George M. Wentsch,** V/C, 21st AF, McGuire AFB, N. J., to V/C, Military Traffic Mgmt. Command, Baileys Crossroads, Va., replacing retiring B/G Malcolm P. Hooker. ■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MAGAZINE

AFA'S ADVORY COU NC

n the January issue, we introduced the
nembers of AFA's Executive, Finance,
onstitution, and Convention Com-
ittees, and the Organizational Advisory
nd Total Force Advisory Councils.
his month, we present the members
f AFA's remaining advisory groups.
he Air Force Association is indebted
o the members of all these committees
nd councils for their voluntary service
o AFA, to the men and women of the
nited States Air Force, and to the
ation's security.

Airmen Cou(Executive Committee)


Lund


Noerr Barry


Gafford


Harball


Harlan Holdren


Joyce


Kenton


McCror Moore


Nowicki


Segall


Barne Shosid

One of AFA's oldest Councils, the was first organized in 1961 by C olution. In 1974, the Council was to include at least one represent of USAF's major commands and operating agencies. The Airmen form the Executive Committee of Council. The Airmen Council adv President on all matters of intere enlisted men and women of the A and includes both active-duty an component representation. Meml Harry F. Lund, Chairman, Brooks SMSgt. David C. Noerr, Deputy C AFB, Calif.; SSgt. Robert Barry, E D. C.; TSgt. John E. Gafford, Alal TSgt. Paul Harball, ARPC, Denve Julia A. Harlan, Hq. AFOSI, Wash CMSgt. Kenneth E. Holdren, Lang CMSgt. Charles A. Joyce, Offutt MSgt. Thomas O. Kenton, Hq. AF ington, D. C.; SSgt. Stevan McCr AFB, Md.; Sgt. Ellen C. Moore, M Ala.; MSgt. Francis E. Nowicki, A Grove NAS, Pa.; Sgt. Barry L. Se and CMSgt. of the Air Force Thor Adviser, Washington, D. C. AFA F L. Shosid is an ex-officio member

Junior Officer Advisory Council (Executive Committee)


Farkas


Sams


Crosby


Gill


Haywood


Miller


Morey


Neish


Simmons


Sullivan


Strzemieczny


Walling


Tallman


Shosid

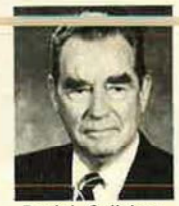
The JOAC, originally formed in 1967, was expanded in 1972 to include a representative from each major command and separate operating agency. The officers pictured here form the Executive Committee of this Council. The Council advises the AFA President and gives younger officers an avenue within AFA to address matters of particular interest to this group. Members are: Capt. Richard L. Farkas, Chairman, Offutt AFB, Neb.; Capt. Monroe S. Sams, Deputy Chairman, Scott AFB, Ill.; Capt. Michael W. Crosby, Hq. USAFE; Capt. Lawrence Gill, USAF Academy, Colo.; Capt. Ronald T. Haywood, Randolph AFB, Tex.; Capt. James A. Miller, Hq. AFOSI, Washington, D. C.; Capt. Ronald L. Morey, Hq. USAF, Washington, D. C.; Capt. Joann C. Neish, AFIT, McLean, Va.; Capt. Susan D. Simmons, Hq. USAF, Washington, D. C.; Capt. Shaun M. Sullivan, Langley AFB, Va.; Capt. Alan C. Strzemieczny, Reese AFB, Tex.; Capt. Dennis R. Walling, Ent AFB, Colo.; and the Adviser, Maj. Gen. Kenneth L. Tallman, Dir., Personnel Plans, Hq. USAF, Washington, D. C. AFA President Shosid is an ex-officio member of this group.

Membership Committee


Ryan


Brendle


Dr. Dan Callahan


Daniel Callahan


Campbell


Clark


Douglas


Higgins


Nettleton


Runice


Stearn


West


Wilson


Withers


Shosid

This is one of the longest-standing committees of AFA. It serves both to promote Association membership and to advise the President on ways and means of accomplishing this objective. Members are: Gen. John D. Ryan, USAF (Ret.), Chairman, San Antonio, Tex.; Cecil G. Brendle, Montgomery, Ala.; Dr. Dan Callahan, Warner Robins, Ga.; Maj. Gen. Daniel F. Callahan, USAF (Ret.), Nashville, Tenn.; Stanley L. Campbell, San Antonio, Tex.; Earl D. Clark, Jr., Kansas City, Kan.; George M. Douglas, Denver, Colo.; Joe Higgins, North Hollywood, Calif.; J. Gilbert Nettleton, Jr., New York, N. Y.; Robert E. Runice, Omaha, Neb.; Edward A. Stearn, San Bernardino, Calif.; A. A. "Bud" West, Newport News, Va.; Joe Wilson, Scott AFB, Ill.; and Jack Withers, Dayton, Ohio. AFA President Joe L. Shosid is an ex-officio member.

By Don Steele
AFA AFFAIRS EDITOR

Lt. Gen. Daniel "Chappie" James, Jr., Vice Commander, Military Airlift Command, was the guest speaker at the Greater Seattle Chapter's recent dinner meeting at the Boeing Space Center, Kent, Wash. More than 250 AFAers and guests, including members of the Boeing Management Association, attended the dinner. In the photo, General James visits with the world-record-setting New York-to-London SR-71 crew, Maj. Noel F. Widdifield, left, and Maj. James V. Sullivan, second from right; and Sherman W. Wilkins, Vice President for AFA's Northwest Region.

Maj. Gen. Leigh Wade, USAF (Ret.), center, and Richard C. Emrich, right, Vice President for AFA's Central East Region, present a memorial wreath for AFA's Wright Memorial Chapter of Dayton, Ohio, at the First Flight Monument during observance at Kill Devil Hills, N. C., of the seventy-first anniversary of the first flight by the Wright brothers. Col. Donald D. Zurawski, left, Director of Information, Headquarters Command, USAF, represented the Air Force at the ceremonies. The program is cosponsored annually by the Air Force Association, First Flight Society, National Aeronautic Association, and National Park Service, with the cooperation of the United States Air Force.

Gen. William V. McBride, right, the recently assigned Commander of the Air Force Logistics Command, with headquarters at Wright-Patterson AFB, Ohio, signs an AFA form transferring his AFA Chapter affiliation to the Wright Memorial Chapter headed by Fred Orazio, left. General McBride, an enthusiastic participant in the activities of the Texas AFA and the Alamo Chapter during his former assignment as Commander of the Air Training Command, supports the opinion that active-duty AFA members can best support AFA by becoming active in the Chapter nearest the Air Force base to which they are assigned.

AFA's Fort Worth Chapter and Fort Worth Airpower Council continued their outstanding support of units and personnel at Carswell AFB, Tex., by providing fancy uniforms for the key staff and crews who represented the 7th Bomb Wing in SAC's 1974 Bombing and Navigation Competition at Barksdale AFB, La., and some 120 pounds of cheese and 300 pounds of barbecued ribs for the wing's hospitality booth at the Competition Center. Shown are, from left, Col. D. E. Blais, 7th Bomb Wing Commander; Chapter President Felix Ankele; Capt. Ted Daniel; Lt. Dana Sprig; Council Chairman Herman Stute; and SSgt. Pete Kau.

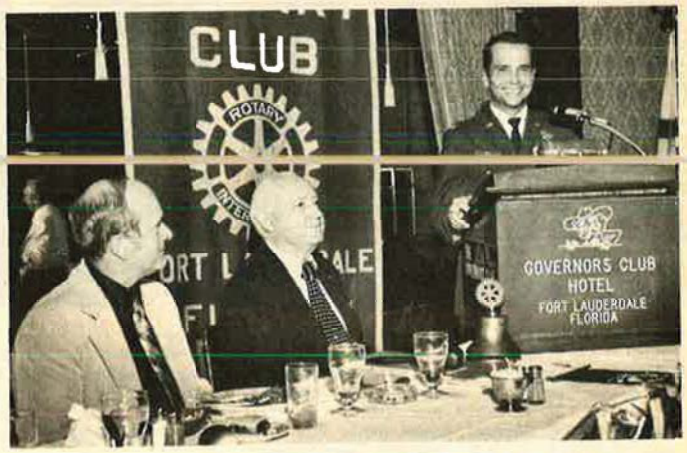
More than 250 members and guests attended a recent dinner dance cosponsored by the Chapters in the Pennsylvania AFA's Western Region, at which Maj. Gen. Andrew B. Anderson, Jr., Deputy Chief of Operations, SAC Headquarters, was the guest speaker. Shown with General Anderson are, from left, Robert L. Carr, Vice President for AFA's Northeast Region; Greater Pittsburgh Chapter President Tillie Metzger; and Edmund Gagliardi, right, the State AFA's Western Region Vice President. General Anderson's subject was the Air Force's B-1 strategic bomber.

1974 National Air Force Salute Proceeds Distributed

Mrs. Anna Chennault, General Chairman of the Women's Committee for the Iron Gate Chapter's Eleventh National Air Force Salute, recently hosted a reception in her Washington, D. C., Watergate penthouse at which proceeds from the 1974 Salute were distributed to the beneficiaries. The guest list included leading dignitaries from the White House, Congress, the Office of the Secretary of Defense, the Air Force, and other government agencies, plus AFA's President Joe L. Shosid and Treasurer Jack B. Gross, and a number of civic and business leaders. In the photo above, J. Ray Bell, left, a Past President of the Iron Gate Chapter and Chairman of three prior Air Force Salutes, and Mrs. Chennault greet Air Force Secretary and Mrs. John McLucas on their arrival. In the photo above left, J. Gilbert Nettleton, a Past President of the Iron Gate Chapter and Chairman of the Twelfth National Air Force Salute to be held at New York City's Americana Hotel on March 21, presents a check to AFA President Shosid for AFA's Aerospace Education Foundation; Mrs. Chennault is in the center. Assistant to the Chairman of the Joint Chiefs of Staff Lt. Gen. John W. Pauly and Mrs. Pauly are on the right. Mr. Nettleton also presented checks to Secretary McLucas for the Air Force Assistance Fund, and to Gen. David C. Jones, USAF Chief of Staff, for the Falcon Foundation.

Sen. Barry Goldwater (R-Ariz.), left, presents an Iron Gate Chapter Award of Appreciation to Mrs. Chennault. Lt. Gen. Ray Sitton, USAF, Director of Operations, Joint Chiefs of Staff, is at right.

Grace Kyle, President of the Rocky Mountain Chapter, Utah AFA's Ladies' Chapter, presents an AFA pin to new member Lucybeth Rampton, wife of Utah Gov. Calvin L. Rampton. Also participating in the ceremony are Edna Cleveland, member of the Chapter's Council, and Utah AFA President Gil F. Friederichs, right.



At a luncheon cosponsored by AFA's Gold Coast Chapter and the Fort Lauderdale Downtown Rotary Club, the guest speaker, Col. T. W. Guy, at podium, Vice Commander, 31st Tactical Fighter Wing, Homestead AFB, Fla., told of his experiences as a POW in North Vietnam. Head-table guests included, from left, Gold Coast Chapter President Joseph M. Bachman and Rotary Club President Charles Creighton.

AFA's Alamo, Tex., Chapter, in cooperation with the Kelly/Lackland Rotary Club, sponsors a program honoring Lackland AFB's Airman, NCO, and Junior Officer for each quarter. The recipients are guests of honor at the Rotary Club's luncheons at Air Force Village. In the photo, Texas AFA Vice President Kenneth H. Bashore, left, presents an AFA Citation to A1C Brantley Delashmutt, Lackland's Airman of the Quarter. Also participating in the presentation are Capt. Judith Dienes, Airman Delashmutt's Commander in the Officers' Section of the Personnel Processing Group, and Walter Light, from the Rotary Club.

During a recent dinner meeting of the Spokane, Wash., Chapter, Sgt. Kenneth L. Ulibarri, right, a medical specialist with the 141st Fighter Interceptor Group, Washington Air National Guard, received a plaque designating him the Washington AFA's "Airman of the Year." The award was presented by Col. Marvin Gottschall, left, Commander of the Guard unit.

Prime planners of the Eglin, Fla., Chapter's First Annual Invitational Golf Tournament included, from left, Maj. Gen. Richard C. Catledge, USAF (Ret.); Dr. T. H. Dalehite, former Chief Scientist at the USAF Armament Development and Test Center (ADTC); Maj. Gen. Henry B. Kucheman, ADTC Commander; Chapter President Walter B. "Benny" Putnam, a retired USAF major general; Maj. Gen. J. C. Maxwell, USAF (Ret.), a former Commander of ADTC; and Chapter Vice President Howard L. Dimmig. The event netted more than $1,300 for the Chapter's Aviation Scholarship Foundation. Scholarships are provided for flight instruction, and recipients are selected from among AFJROTC and CAP cadets in area high schools.

Most aerospace companies in the Greater Los Angeles, Calif., area are participating in the Greater Los Angeles Airpower Chapter's current membership campaign. Walter Brewer, Jr., left, AFA Membership Chairman at the Aerospace Corp., kicks off his company's participation by enrolling William W. Drake, seated, Vice President, Administration and Treasurer. Others in the photo, Dr. Allen F. Donovan, center, Senior Vice President, Technical, and Dr. Ernst H. Krause, Senior Vice President, Development.

The Air Force's Space and Missile Systems Organization (SAMSO) in El Segundo, Calif., was presented a painting by the Greater Los Angeles Airpower Chapter at the Chapter's recent awards banquet on board the Queen Mary in Long Beach. The painting, depicting SAMSO's commanders during its twenty years, was presented by Chapter President George Harter, right, and accepted by Lt. Gen. Kenneth W. Schultz, left, SAMSO Commander.

More than 250 members and community leaders attended a breakfast meeting sponsored recently by AFA's San Bernardino, Calif., Chapter in Norton AFB NCO Club. Maj. Gen. Homer I. Lewis, Chief of Air Force Reserve, the guest speaker, is shown with J. Johnstone, left, Division Manager, GTE General Telephone Co. of California; and Chapter President C. Jay Golding.

COMING EVENTS IN AFA

Iron Gate Chapter's **Twelfth National Air Force Salute,** New York City's Americana Hotel, March 21 . . . **Northeast Regional Meeting,** Binghamton, N. Y., April 19 . . . **Massachusetts AFA Convention,** Hanscom AFB Officers' Club, April 25–27 . . . **Washington AFA Convention,** Seattle, May 9–11 . . . **Alabama AFA Convention,** Montgomery, May 10 . . . **California AFA Convention,** Edgewater Hyatt House, Long Beach, May 16–18 . . . **Florida AFA Convention,** May 16–18 . . . **AFA Board of Directors and Nominating Committee Meetings,** The Broadmoor, Colorado Springs, Colo., May 31 . . . AFA's Annual Dinner honoring the **Outstanding Squadron at the Air Force Academy,** The Broadmoor, Colorado Springs, Colo., May 31 . . . **New York AFA Convention,** Tarrytown Hilton, Tarrytown, June 13–15 . . . **Texas AFA Convention,** Hilton Palacio Del Rio, San Antonio, June 13–15 . . . **Pennsylvania AFA Convention,** Hershey, June 20–22 . . . **New Jersey AFA Convention,** Playboy Club Hotel, Great Gorge, June 27–29 . . . **Oklahoma AFA Convention,** Oklahoma City, June 27–28 . . . **AFA National Convention and Aerospace Development Briefings and Displays,** Sheraton-Park Hotel, Washington, D. C., September 14–18.

This Is AFA

The Air Force Association is an independent, nonprofit, airpower organization with no personal, political, or commercial axes to grind; 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 to all mankind.

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(ex-officio)
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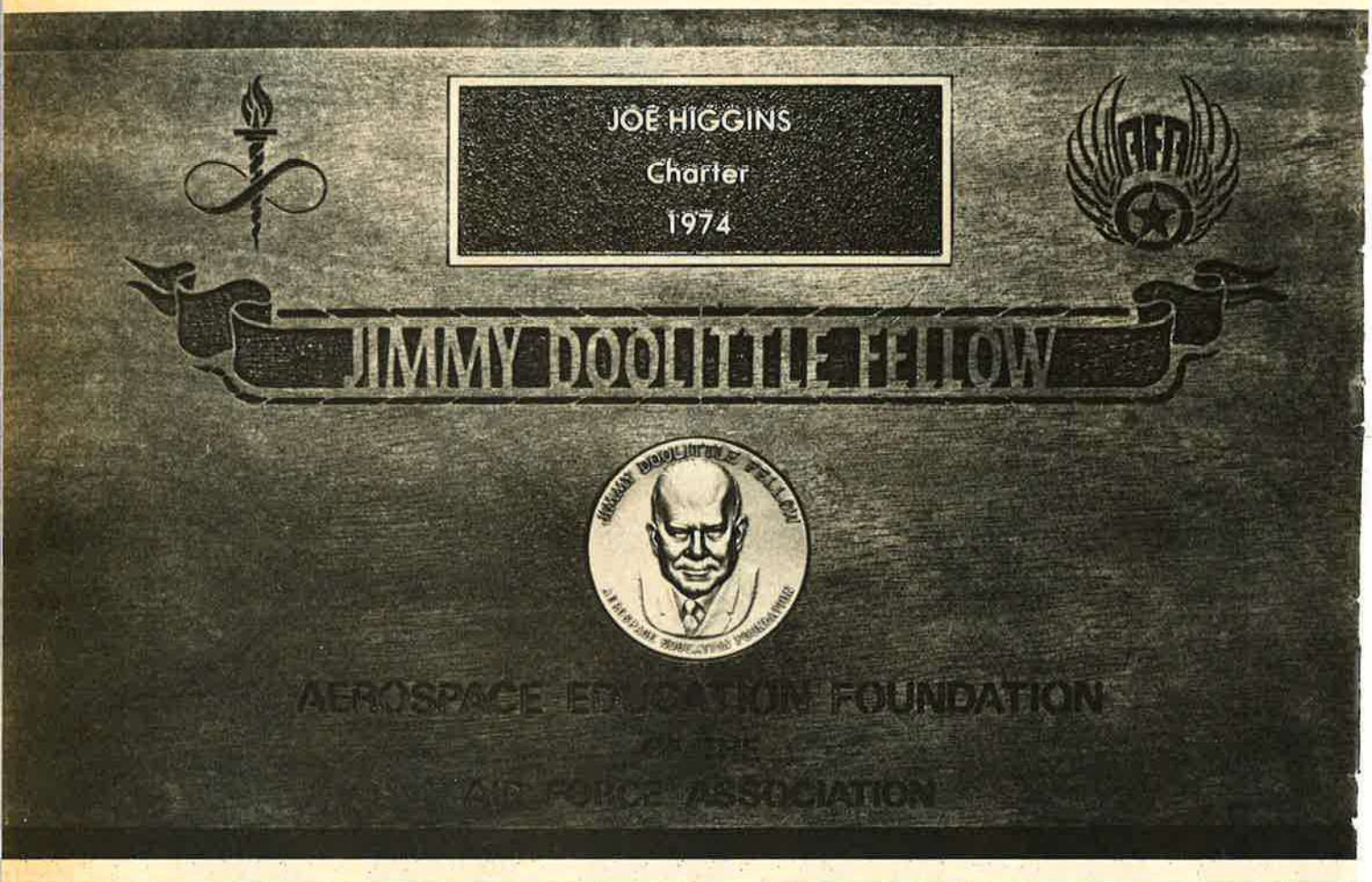


PLAQUE SIZE: 12 x 7 inches
Removable Bronze Medallion

JIMMY DOOLITTLE FELLOWS

WHO:

Individuals and groups of people, AFA units and other organizations, corporations and institutions are becoming Jimmy Doolittle Fellows of the Aerospace Education Foundation, an AFA affiliate . . . and are honoring others as Fellows in recognition of achievement and as memorials.

WHAT:

A Jimmy Doolittle Fellow receives (see opposite page) a 12" by 7" Hawaiian walnut plaque featuring a bronze medallion bearing the Doolittle portrait. In addition, a bronze plate identifies the Jimmy Doolittle Fellow by name and the year of affiliation. The plaque is designed for easy removal of the bronze medallion, on the back of which is this inscription:

"A Jimmy Doolittle Fellow supports advancement of education through transfer to the nation's schools of instructional systems based on applying aerospace technology to curriculum development, thereby enhancing the U. S. Air Force public image."

WHY:

To support the activities of the non-profit Aerospace Education Foundation . . . activities which have a positive effect on the image of the Air Force . . . which better equip public and private schools for the teaching of saleable skills, thereby enhancing vocational-technical careers. This is accomplished through the Foundation by providing schools, on a cost-plus-handling-fee basis, with advanced instructional materials developed by the U. S. Air Force. Some 250 schools in 45 states have been serviced by the Foundation. But only eight Air Force courses are available for dissemination, due to the limited financial resources of this non-endowed organization. We cannot meet the demand of the schools for more Air Force courses.

HOW:

By becoming a Jimmy Doolittle Fellow with a tax-deductible $1,000 contribution to the Aerospace Education Foundation.

APPLICATION – JIMMY DOOLITTLE FELLOW

☐ I hereby designate (indicate how name is to appear on plaque)

Name _____ Title _____
as a Jimmy Doolittle Fellow.

☐ I am enclosing a check for $1,000 made payable to the Aerospace Education Foundation. I understand that I will receive the Jimmy Doolittle Fellow medallion and plaque, and a letter confirming that this is a tax deductible contribution.

☐ Please send the plaque to:

Name _____

Address _____

Sent by _____

Address _____

Mail to:

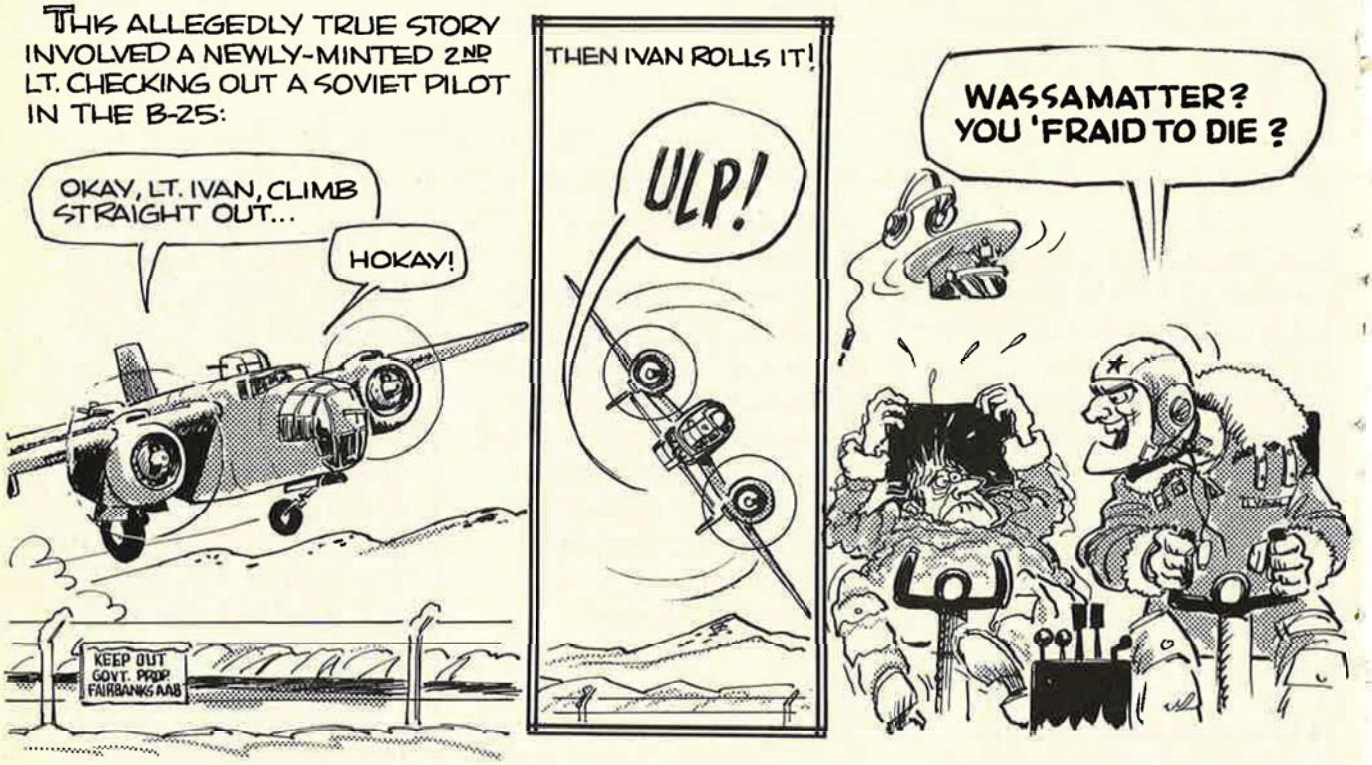
Aerospace Education Foundation
1750 Pennsylvania Ave., N.W.
Washington, D. C. 20006
Telephone: (202) 937-8797

Bob Stevens'

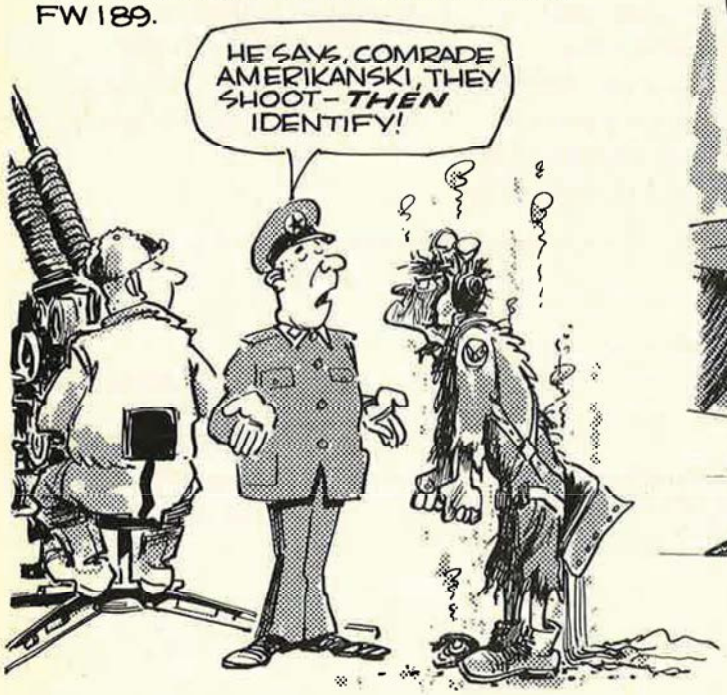
"There I was..."

SOVIET and U.S. AIRMEN MET EACH OTHER ON FEW OCCASIONS DURING "THE BIG ONE". ONE PLACE WAS ALASKA WHERE THE U.S.S.R. TOOK DELIVERY OF LEND-LEASE AIRCRAFT. ANOTHER WAS IN RUSSIA ITSELF ON THE U.S. SHUTTLE RAIDS OVER EASTERN EUROPE.

THIS ALLEGEDLY TRUE STORY INVOLVED A NEWLY-MINTED 2ND LT. CHECKING OUT A SOVIET PILOT IN THE B-25:



ON A SHUTTLE RAID TO POLTAVA, U.S.S.R., ONE OF THE FIRST P-38s IN WAS MISTAKEN FOR A GERMAN FW 189.



MORE RECENTLY, ATTEMPTS BY U.S. FIGHTER PILOTS TO HAND SIGNAL INTERCEPTED SOVIET "BEAR" BOMBERS HAVE FAILED. ONE TECHNIQUE, HOWEVER, ALWAYS WORKS–

THANKS TO PAUL DEAN – THE ARIZONA REPUBLIC

Bob Stevens

Longest duration flight. Turbofan altitude record.

Those are the unofficial marks set recently by the Garrett ATF3 advanced technology turbofan.

We can't give out the precise duration of the unrefueled mission, or the exact altitude reached—they're understandably classified—but we can tell you the altitude was in excess of 55,000 feet and the duration was more than 24 hours.

The flight was aboard a Teledyne Ryan Compass Cope 'R' Remotely Piloted Vehicle (RPV) originating at the Air Force Flight Test Center at Edwards Air Force Base, California.

The ATF3 was developed to deliver high performance in many areas of aviation both for military and commercial aircraft, and is the logical choice to power manned systems as well as RPVs because its low thrust specific fuel consumption (TSFC) means greater range and loiter ability. And the ATF3 is safer from heat-seeking missiles, because its low-noise, mixed-flow exhaust provides a low infrared signature.

ATF3: best for RPV missions.

Produced by AiResearch Manufacturing Company of Arizona, P.O. Box 5217, Phoenix, Arizona 85010.

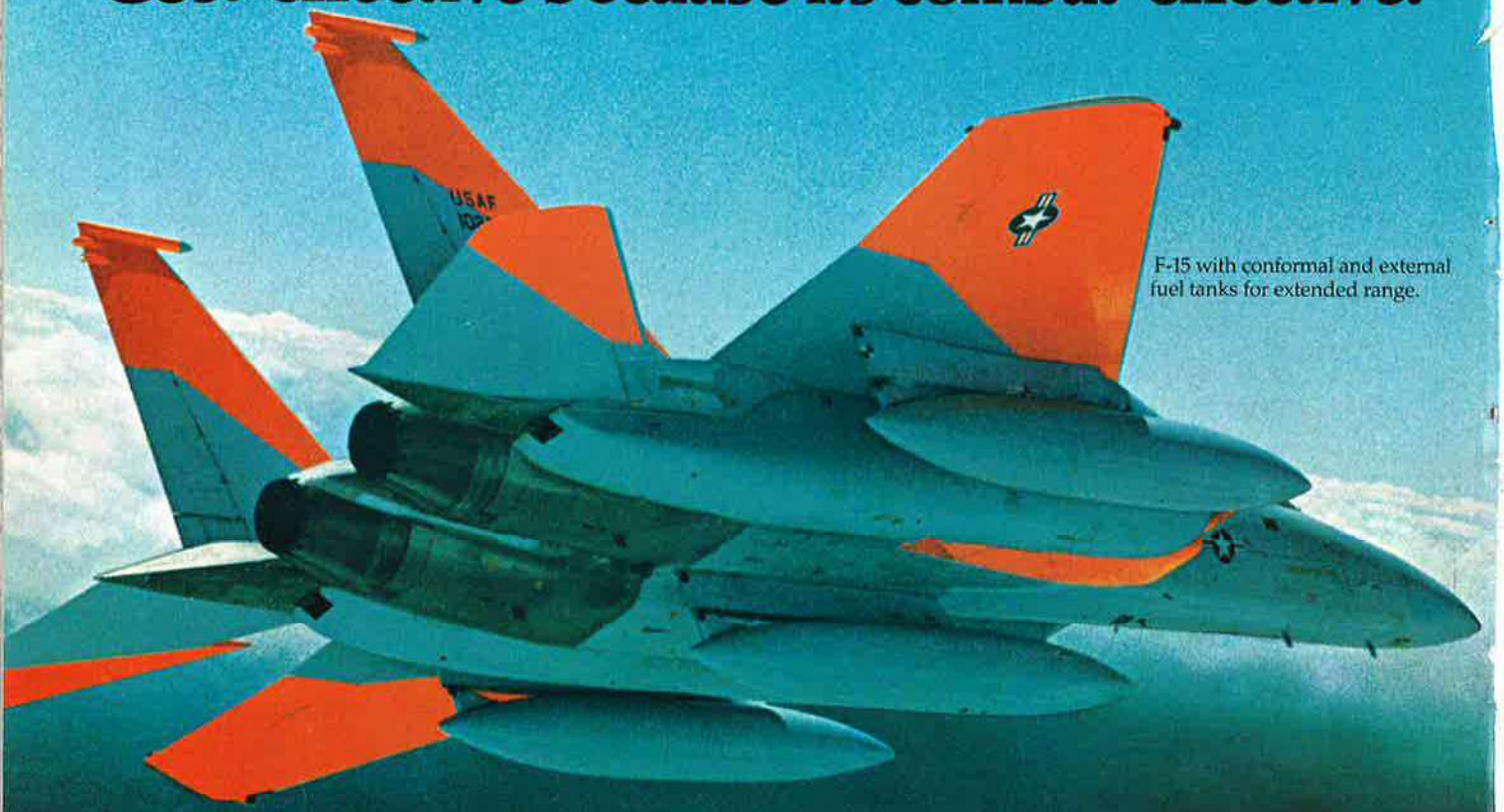
The Garrett Corporation
One of The Signal Companies

GARRETT TURBOPOWER

Ready now for tomorrow's missions.

USAF F-15 Eagle:

Cost-effective because it's combat-effective.



F-15 with conformal and external fuel tanks for extended range.

The McDonnell Douglas F-15 Eagle is joining the United States Air Force's operational inventory. It is the world's newest, most advanced air superiority fighter—the best maneuvering, highest performance, all-weather fighter plane in the air combat arena. It is what our fighter pilots need—today and in the next decade—to meet a growing challenge to our superiority in the skies.

The Eagle already has its development largely behind it and, in the advanced stages of its test program, is meeting or exceeding test objectives. The F-15's airframe has passed the most rigorous testing ever, to four times its expected lifetime.

McDonnell Douglas has developed the F-15 to be cheaper and easier to maintain. Important, considering manpower costs represent 57% of every defense dollar. Squadron-level maintenance man-hours will be cut more than 46% compared with today's best operational jet fighters. For the Air Force, that means more combat-ready time. For taxpayers, it means greater security at less cost.

At the planned production total of 729 aircraft, the F-15 will be one of the two most cost-effective fighters in the USAF inventory. The other? The world-famous McDonnell Douglas F-4 Phantom.

MCDONNELL DOUGLAS