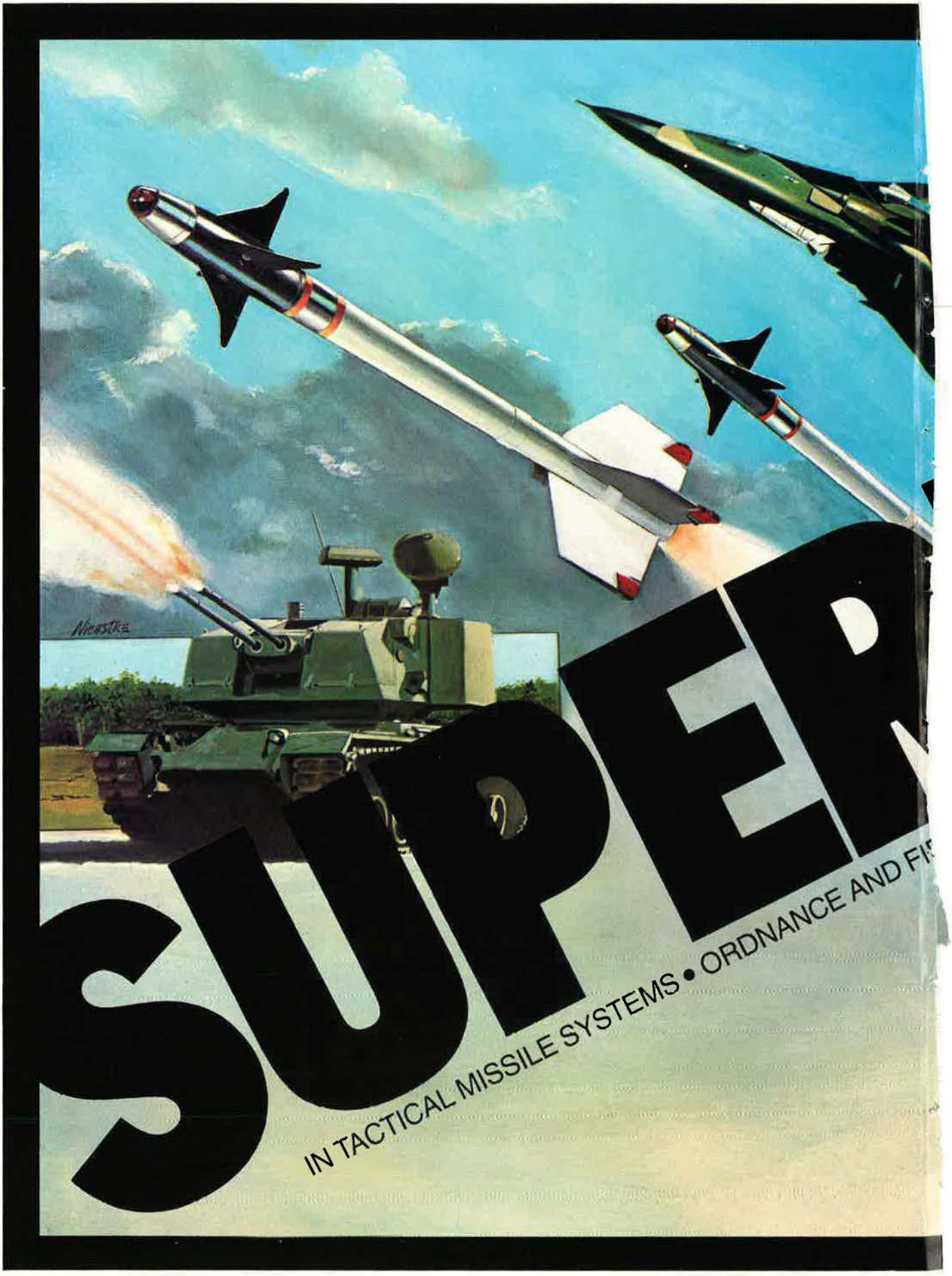
MARCH 1981/$3

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

Soviet Aerospace Almanac 1981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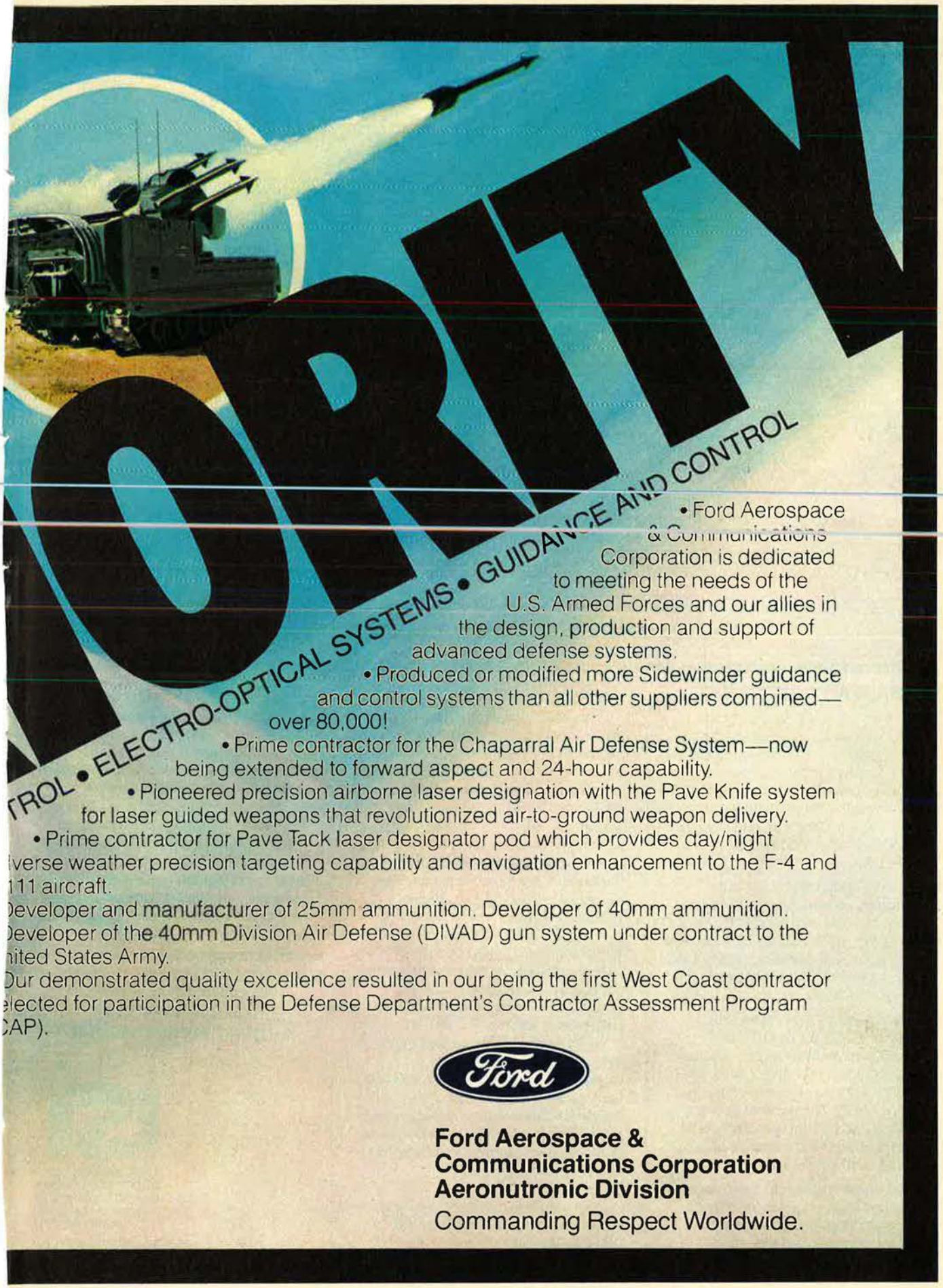

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This technology was later carried forward to the design of the avionic flight control system for the **Lockheed L-1011.** This system, with its automatic landing system technology provides complete "hands-off" operation from take-off through a Cat IIIA landing and automatic rollout.

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PUBLISHED BY THE AIR FORCE ASSOCIATION

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) 637-3300. Second-class postage paid at Washington, D.C., and additional mailing offices. **Membership rate:** $13 per year (includes $9 for one-year subscription); $36 for three-year membership (includes $24 for subscription). **Life Membership:** $200. **Subscription rate:** $13 per year; $25 additional for foreign postage (foreign postage has been increased 50% due to increased costs of international mail rates). Regular issues $1 each. Special issues (Soviet Aerospace Almanac, USAF Almanac issue, Anniversary issue, and "Military Balance" issue) $3 each. **Change of address** requires four weeks' notice. Please include mailing label. Publisher assumes no responsibility for unsolicited material.

(USPS 010-280)
BPA Circulation audited by Business Publication Audit

This Month

MARCH 1981 • VOLUME 64, NUMBER 3

ABOUT THE COVER

T-62 tanks on winter maneuvers are being overflown by MiG-27s armed for close support. Armament includes a 23-mm six-barrel Gatling-type gun, two Atoll K-13 missiles, and two 550-pound cluster bomb units (CBU) on the fixed-wing gloves. (Painting by William S. Phillips)

Departments

Eluding the world's largest navy, von Luckner prowled 30,000 miles–and terrorized Allied sea lanes.

He concocted an elaborate Norwegian disguise for his armed windjammer and crew. And bluffed his way through the British blockade. Then from January to July 1917, German Count Felix von Luckner hunted prey from North Atlantic to South Pacific, sinking 14 Allied and neutral merchant ships while dodging British warships.

His disarming technique: sidle up to the target on some innocent pretext...then suddenly haul down the Norwegian flag, hoist German colors, reveal weapons, seize the vessel, take aboard all personnel, and sink her. No one was ever hurt or killed. His multinational "prisoners" ate well and thoroughly enjoyed themselves. Still, the raids had a disruptive effect on Allied war logistics that extended beyond the sinkings themselves. Fear of the "Sea Devil" upset sailing schedules and delayed some badly needed war cargoes.

What about today? With all the technological advances in offensive systems, could a potential adversary slip through defense perimeters undetected and unidentified? To counter such a threat, the IBM Advanced Signal Processor brings to detection, identification and location systems some remarkable capabilities.

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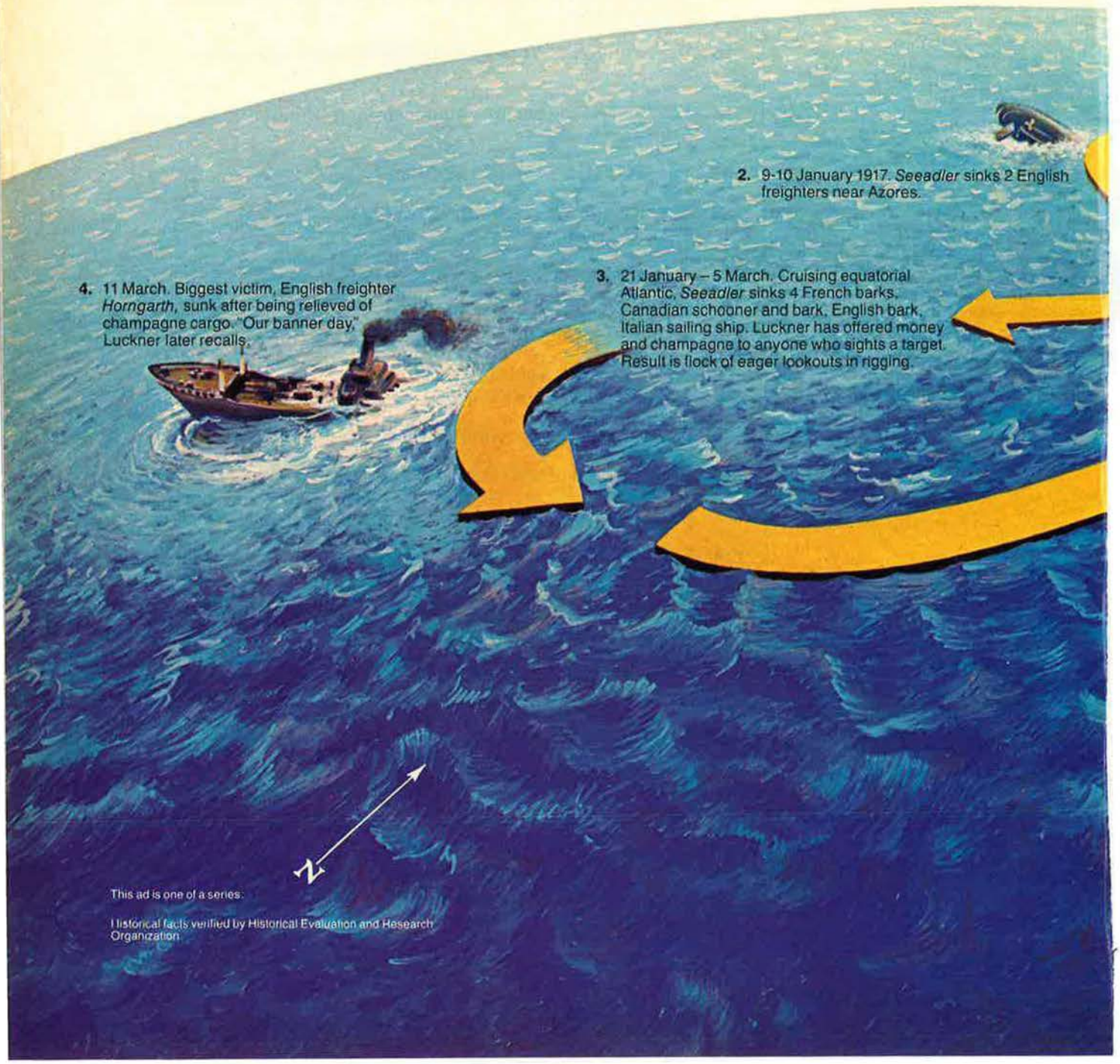

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of sensors...identifying and pinpointing threats in real time with far greater accuracy. Both in offense and defense.

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1. 25 December 1916. En route from Hamburg under orders to disrupt Allied supply lines, Count von Luckner's 3-masted, motorized *Seeadler* is boarded and searched by British cruiser crew on blockade duty. British grant clearance, fooled by Norwegian disguise that includes captain's "wife", a sailor in wig and woman's clothes.

5. 21 March. Some 450 prisoners are put aboard captured French bark bound for Rio. *Seeadler* then flees alerted British navy around Cape Horn, sinks 3 American schooners in South Pacific, is wrecked on island by tidal wave while crew is ashore. In small boat, Luckner island-hops for 2,300 miles, is captured and interned. He escapes and is interned again until war's end, when he is feted as hero by both sides.

AN EDITORIAL

Soviet Power—The Window-Opener

THE phrase "window of vulnerability" has gained currency over the past several years as thoughtful American analysts have tried to describe the international power relationships influencing world events in the 1980s. Among other aspects of the case, "window of vulnerability" includes Soviet capability to knock out US strategic missiles in their silos, burgeoning Soviet naval power able to cut US and allied sea lifelines on all the oceans, massive Soviet airlift capabilities exercised to project their power far afield or into neighboring countries, and more.

The point is, this year (or next, depending on the source) the window of vulnerability begins opening wider. Soviet power—and its buildup over the past decade while US power was declining—is the motive force to open the window. In 1981 it opens just a crack, but by 1982 and further into the decade, the window may open wide. If it's allowed to do so, then the Soviets will be able to chuck mudballs into the once-inviolate US living room at will.

Not so many years ago, the Soviet leadership's willingness to test US power and resolve was tempered by their own weaknesses, clear US superiority, and our allies' knowledge that the US was a reliable partner. When they tested—as in Cuba in 1962—the prompt US reaction usually induced restraint. That changed in the late '70s. Allies quickly began to doubt US reliability under the vacillatory Carter stewardship. US conventional and strategic power were allowed to dwindle, consciously so, slipping from superiority to a nebulous "parity" to clear inferiority. Meanwhile, the Soviet leaders devoted increasing chunks of national treasure, brainpower, and industrial capacity to ensuring that the relative relationship between the two superpowers accelerated in their favor.

As the correlation of forces turned in their favor, the Soviets became emboldened and intensified the pressure worldwide. When direct use of Soviet forces was indicated, they were used, as to invade Afghanistan in December 1979, or to gyrate the "brigade" in Cuba earlier that year, or to violate others' airspace with the Foxbat MiG-25 reconnaissance planes over Europe.

If surrogates were required, the Soviets had enough clients to put to work, such as the Cubans, East Germans, and others in Africa and Central America. Or when anonymity was sought, they used second-tier cutout organizations to train and support terrorist organizations to undertake actions whose results coincided with Soviet goals of the moment.

These activities were not thwarted by US resolve or the use of US power. Instead, the pusillanimous posturings and confused backing, filling, and trimming in Washington from January 1977 through January 1981 only encouraged more adventurism by the Soviet leadership. No amount of bluster in Washington could compensate for the reality of these facts: US power had slipped, and the US leadership lacked the resolve to employ what was left.

The outcome: a clear and open field for the Soviet leadership to work its will worldwide, starting even before the window of vulnerability began to crack open. The profit-and-loss statement must have been a pleasure for the Soviet leaders to contemplate at the just-concluded Party Congress in Moscow. At the same time, however, the merriment was probably tempered by uncertainty over what has been happening in the United States over the past year, and the possibility that the window of vulnerability may never be opened wide.

First, the American people began to realize that the USA could well become Number Two, and in some important respects had already slipped from the top slot. The terrorist seizure of the American Embassy and diplomats in Tehran, coupled with the apparent inability of this country to do anything about it, reinforced the unease. The aborted rescue mission added to that feeling. The contrived revelations of "Stealth" technology did not reverse it, because of their patent partisan political motivation. So the voters turned out Mr. Carter and elected Mr. Reagan.

Even Jimmy Carter and his top team had apparently realized they must do something to reverse the damning trends of vulnerability, but could not resist the temptation to try to do it on the cheap. That is nowhere better illustrated than in the FY '82 Defense budget submission, analyzed in this issue *(see "In Focus," p. 19).*

Now the Reagan team has worked up what they consider the essential additions and have started the revision through the authorization and appropriation process. That will take time, and there is little of that left.

Consequently, the Reagan Administration has begun to take the steps necessary to make the most of what we have, vis-à-vis the Soviets, in order to restrain further Soviet adventurism and erosion of our own position. Gen. David C. Jones, Chairman of the Joint Chiefs of Staff, pointed out that the US can react to Soviet or surrogate aggression elsewhere than their pressure point. This is salutary because it is not necessary to mount an operation against Murmansk, say, to clip the Bear's claws; it can be done off Cuba, or in El Salvador.

Secretary of State Haig has sounded the warning on Soviet-sponsored terrorist activities, citing the obvious linkage the US government will make in other areas. And the President himself has heightened public consciousness of the Russians' intentions, laying the groundwork for the actions that will surely become necessary during his tenure. These steps are designed to capitalize on US strengths while the weaknesses are overcome.

It's a good start to ensuring that US power will close the window that Soviet power has opened.

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

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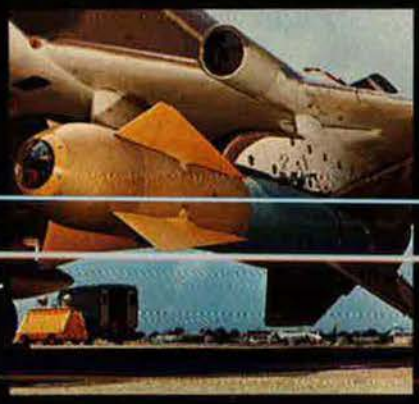

HELLFIRE Anti-armor Modular Missile System, for another. It's ready for production. HELLFIRE's launch and leave capability gives helicopters the ability to hide behind protective terrain as the missile seeks its target when the target is remotely designated.

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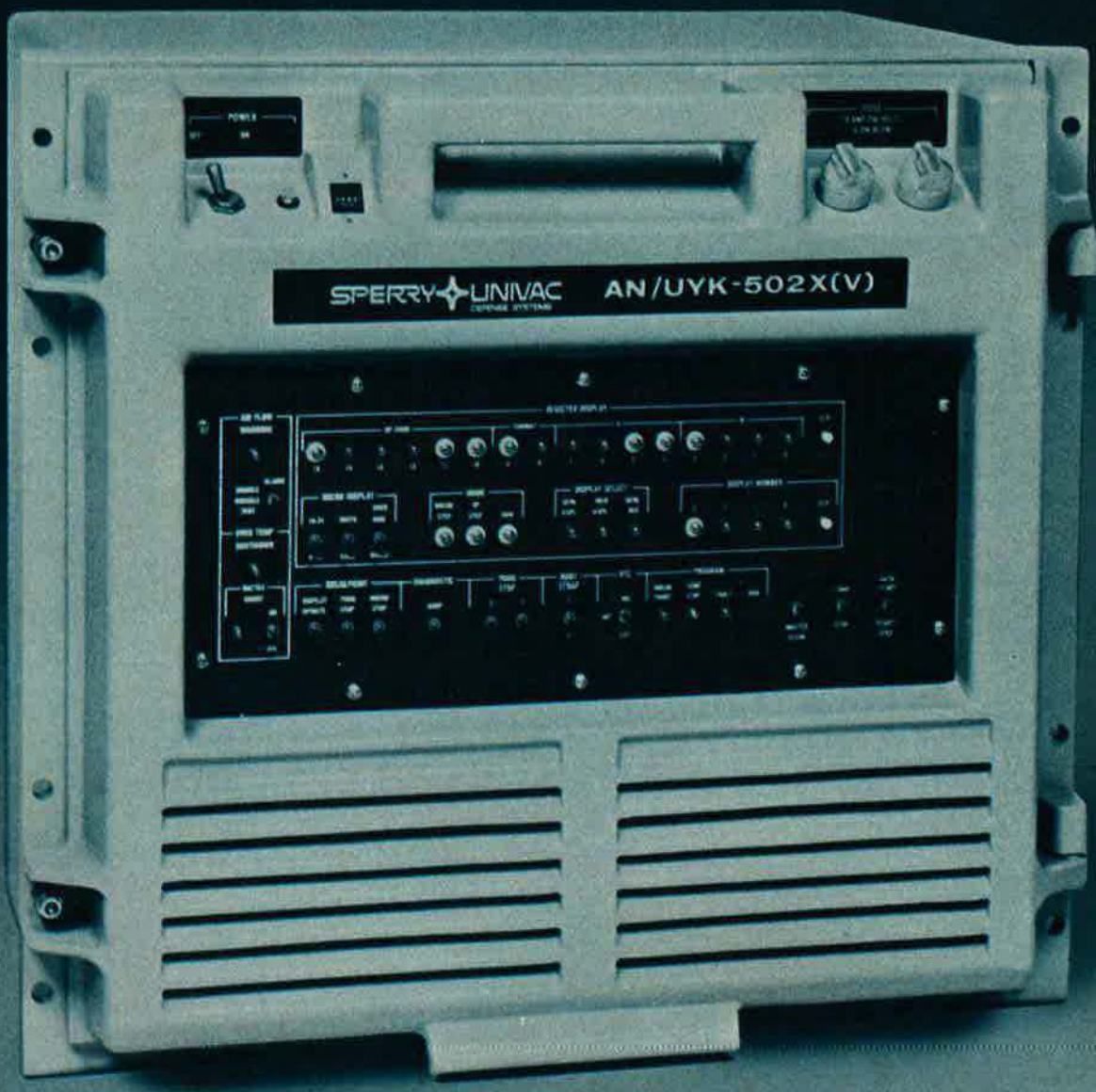

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AIRMAIL

And Thank You, Senator

Just a short note to compliment AIR FORCE Magazine for two articles in the January edition. Edgar Ulsamer's "The Alarming State of the US Defense Industrial Base" is the best summary of the issue I have read. If you will permit a personal reference, my (now extinct) Joint Committee on Defense Production held hearings on this issue every year from 1975–78, but no one paid any attention. At least now General Slay has forced Congress and the Executive Department to take action.

The second article was by Kathleen McAuliffe in the "Capitol Hill" section. It was a report on my recent vote for the Defense Appropriations Bill. It's nice to see a story that reflects the facts accurately and without prejudice. She did a good job, reported my reasons precisely right, and for that I say thank you.

Sen. William Proxmire
Washington, D. C.

Cheers for the T-6

Let's hear more from Jeff Ethell! I have just finished reading his article "The Wonderful 'Six' " with a sidebar to boot, *i.e.*, "It Lives—Formation Flying as It Used to Be" in the January '81 issue. This makes a fella that has flown the Six feel like he's right there with him every step of the way!

I graduated with Class 45-C at Shaw AFB in Selma, Ala., and the Six was our advanced trainer. I later flew the Six for three years with the Vermont ANG in Burlington. Speaking from experience, Jeff tells it like it is.

I am sure that those who have flown the Six eagerly look forward to his upcoming book on the AT-6/SNJ.

Robert B. Jones, Jr.
Redlands, Calif.

I just finished the fine article by Jeffrey Ethell in the [January '81 issue of] AIR FORCE Magazine and really enjoyed it. I would like to add some additional information.

I flew the AT-6 in training during the big war, and the aircraft at our base did not have steerable tailwheels or locking swivel systems. We heard that this had been made available later for pilots who were going to fly the P-51 after AT-6 checkouts with the locking swivel system.

This is by no means a criticism of your article. It made my mind leap and glow as I thought again of my own pleasure when I flew the AT-6.

I took my AT-6 training while in Basic flight training in the Air Corps. Our class flew the PT-13D in Primary. It, too, was a fine aircraft. I marvel that they had us solo that aircraft in about ten hours. Today we seem to solo people in the Cessna 150 in anywhere from nineteen to thirty-two hours.

I shall be on the lookout for another article from Jeff Ethell. Keep up the good work.

John C. Curry
Washington, D. C.

Let's Hear It!

As a onetime IP wife, I enjoyed Captain Connors's article in the January '81 issue titled "The Satisfactions of a T-38 Instructor Pilot."

I found only one flaw, and that was that nowhere in the article was there ever any mention of the IP wives.

I feel, and I think I speak for many IP wives, that we don't get enough recognition for the work that is required of the IP wife, flight commander wife, and especially class commander wife.

Just once we would also enjoy a round of applause for the work we do in ATC for our husbands.

Jill Rider
Alexandria, Va.

Not Enough

I enjoyed your article "New Strides in Professional Military Education" [January '81, p. 89], and found it reinforcing.

When I graduated from the Air War College in 1962 I left a one-line critique of the Course: There is not enough war in the war college.

Col. E. J. "Buck" Waid, USAF (Ret.)
Las Cruces, N. M.

AWC Commandants

I enjoyed the article "New Strides in Professional Military Education" [January '81, p. 89]. All of the changes at Air University make sense and I am sure the quality—and usefulness—of the studies offered to an Air War College student these days are markedly superior to the curriculum of decades gone by.

One bit of your research was inadequate—the caption under the picture of General Gray on p. 90 stated that he ". . . is the first Commandant of Air War College to have graduated from AWC. . . ."

To cite two examples: I was AWC Commandant for a few months in 1967, and Jack Donohew was Commandant from September '67 to about 1972. Jack and I were classmates in the class of 1950 at the Air War College, the last class under the first Commandant, Orvil Anderson.

Lt. Gen. R. A. Breitweiser, USAF (Ret.)
New Bern, N. C.

• *The General is correct. He served as AWC Commandant from February 23 to June 27, 1967. Maj. Gen. Jack N. Donohew was Commandant from September 1967 to April 1972. General Gray is the seventh AWC Commandant who is also a graduate of the College.*—THE EDITORS

Those Little Tin Guys

I am still laughing over Bob Stevens's tribute to navigators in the January AIR FORCE Magazine. Those guys (for the most part) worked their tails off, and were undervalued except when the rest of the crew was surrounded by lostness.

The beautiful Ann Sheridan (the Oomph Girl) popularized the phrase "Little Tin Gods" in 1940. Navigators didn't qualify as gods, so Little Tin Guys was the result.

"There I Was . . . " is the first feature I turn to. I am glad Bob's pen has been busy over the years.

John Hale
Halesite, N. Y.

A Public Service

I've just finished "In Focus" by Edgar Ulsamer in the January '81 issue of

Integration

of Shuttle-era Space Control Centers

With increasingly complex military space missions under development, the Air Force is planning a Consolidated Space Operations Center (CSOC).

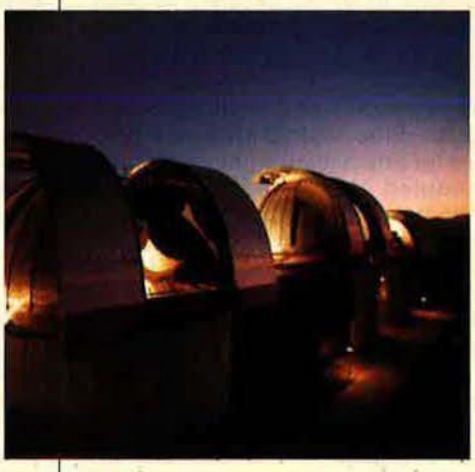
It will blend new technology with existing equipment and proven software from today's control centers; it will also use the matchless skills of the people who run them. The key to successful development of CSOC, however, will be excellence in systems engineering and integration.

TRW's experience in this extremely demanding work is both broad and deep. We started with the earliest satellite tracking and control centers twenty years ago; we supported the NASA centers throughout

the Apollo missions to the Moon. Now, we're building and integrating the ground station for the world's biggest comsat, Western Union's TDRSS. For the Air Force, we're building and integrating GEODSS, a global tracking system for monitoring all objects in Earth orbit.

Because our experience covers the entire spectrum of space technologies, we're now working on the Control Center Implementation Contract for the Air Force. It covers integration of DoD security requirements at NASA's launch and mission control center and systems definition studies for the Shuttle part of CSOC.

This combination of long experience with current studies gives TRW a unique background for successful integration of CSOC, which will become the Air Force Space Control center for the 21st Century.



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AIR FORCE Magazine. Let me say that Mr. Ulsamer has done our nation a public service by providing a well-researched "talking paper" on the state of our national defense posture.

As for General Slay's testimony before the House Armed Services Committee, his candor in presenting this politically unpopular information ranks him with Patrick Henry and others of our Founding Fathers. His forthrightness just may help save our nation.

John Lowery
Trenton, Ill.

Rare, but Unlucky

The 1940–41 period was indeed a great time to be in flying training ("A Rare Time to be Flying" January '81), provided one wasn't so unlucky as to be an upper classman in 41-C with less than ten hours of flying time and faced with taking a forty-hour checkride.

This situation occurred with a portion of Class 41-C while in basic pilot training at Randolph Field. It resulted from poor management and extremely uncooperative weather. Previous basic training classes there hadn't exceeded 300 cadets. But the Army Air Corps was being built up, and 500 cadets converged on Randolph Field for basic training.

Unfortunately, enough airplanes and instructors hadn't been accumulated for so large a class. Then, those cadets lucky enough to find themselves scheduled to fly were frequently unable to do so because of poor weather. As might be expected, some cadets didn't get to fly nearly as much as others.

The rules at that time didn't permit a cadet to be slipped back to a later class for any reason whatsoever, and scheduled class graduation dates had to be met. Their panic solution to the problem was to suddenly eliminate a large portion of Class 41-C in the hope that the remainder would be able to rapidly obtain the flying time required for graduation. They took about 100 cadets with the least amount of flying time and went through the mockery of giving them short elimination rides, in which their ability to "hack the course" wasn't a consideration. And that was how this upper classman and hot-rock pilot with less than ten hours of basic flying time was washed out, even though he had breezed through all checkrides in primary flying school and hadn't received even one demerit in primary or basic.

One can sympathize with the dilemma faced by the AAF wheels, but their solution to it has always seemed tainted to me. They had taken the easy way out, in spite of the training dollars lost and injustices and wounds inflicted on young men who would become ineligible for later acceptance in any of the armed forces flying schools. It appeared that some senior officers didn't practice the honor and integrity that we had been trained to believe was a major prerequisite for being accepted in the officers' corps.

Lt. Col. Edwin I. Boyd,
USAF (Ret.)
Rapid City, S. D.

AIRMAIL

First Nonstop Fox Able

I have read with interest the "Fox Able One" article ["Fox Able One—The First Transatlantic Jet Deployment" October '80, p. 72], and the follow-up letters.

I was a radio operator assigned to the 5th ARS at the time, and crewed one of the B-17 rescue aircraft that provided cover and navigational homing signals for the jets.

I think it should be remembered that on a later, return Fox Able flown by Colonel Schilling and Colonel Ritchie, utilizing air-to-air refueling, Colonel Ritchie was unable to fuel over Greenland. Instead of landing at BW-1, he elected to proceed to Goose Bay. He flamed out, ejected over the coast of Labrador, and was picked up by a rescue H-5.

Colonel Schilling landed at Goose Bay and, as I recall, completed the first nonstop transatlantic jet fighter crossing.

TSgt. Robert Fugia, USAF (Ret.)
Carrollton, Mo.

Science Needs to Know!

You've done your usual superb job on "The Military Balance—1980/81." But I was especially amused by Lt. Col. R. J. Vanden-Heuvel's letter on Fox Able Thirty-three ["Airmail," December '80]. He mentions that his wife "came down to Dover [to visit him] and got herself pregnant."

He should have sent a copy of his letter to the American Medical Association. We haven't had an immaculate conception (as far as I know) for 1,980 years. If she could really do that, medical science needs to know about it!

Maj. H. W. Dettmer, USAF
Riverside, Calif.

Keep It Snapped Down!

The other day I was looking through one of your magazines (December 1980), and I came across something that someone else may have noticed.

On the front cover was a full-face shot of a pilot while in flight. The picture is a good one; however, his chin strap has been unsnapped. If he had to eject I'm sure that he would lose his helmet. Being an aircrew member myself, and working in the largest test facility for aircrew equipment on the East Coast, I couldn't help but let you know what I discovered.

Everyone here likes AIR FORCE Magazine, and it's hard enough just to keep a copy around long enough to finish an article. Keep up the good work!

John C. Julian
Bohemia, N. Y.

What About the 11th AF?

How come we don't hear about the Eleventh Air Force in Alaska during WW II? We hear about the glory and excitement in the other air forces during WW II, but nothing or very little about the boys who really had a rough time of it as the only air force who fought and died on our *own* soil!

I lost a good buddy (Bloomfield) flying B-24s for the Eleventh, being the first to arrive with B-24s in that theater. I would appreciate hearing more about the Eleventh.

Andy Kmetz
Champaign, Ill.

• *A feature article on the Eleventh Air Force is in the works.*—THE EDITORS

The Courage to Try

In the midst of the celebration of the release of the fifty-two American hostages, let's not forget the military personnel who died on the Iranian desert.

The rescue attempt showed that, at least, the Americans had the courage to try.

2d Lt. Kenneth W. O'Reilly, USAF
Altus AFB, Okla.

Senior Officer Pay Cap

I am quite concerned about the adverse—and growing—impact of the pay cap affecting senior military officers. Although I am not affected monetarily, I do see the cap as a definite negative retention factor as well as an obvious injustice.

In reading a recent analysis of retention issues by the USAF Manpower and Personnel Center, I noted that most officers deciding to leave active service stated that they expected their civilian salaries to be *lower* than those which they could expect by re-

maining in the Air Force. However, in six to ten years, they fully expected to surpass any pay possible on active duty.

If this is, in fact, an accurate appraisal of current attitudes among younger officers, it appears that $100 a month extra for an O-9 would be a greater positive force for retention than $1 a month more to 100 O-4s.

In any event, it is patently unfair and ridiculous to have four-star officers drawing the same pay as two-stars. I hope AFA will join with the other services and fight this battle for equity and good management.

Capt. Philip R. Evans, USN
Omaha, Neb.

But What Do You Do for an Encore?

AIR FORCE Magazine is looking fine these days!

I'm writing to say I'm cheered to know that SSgt. R. C. Mattingly, Jr., and the men of the 159th TFG are still running down to the flight line to "kick the tire and light the fire" [January '81, p. 8]. I feared the breed had become extinct!

The Sergeant asks your opinion why USAF has gotten into such a sorry morale situation. I've got one answer for him. The fun and games have languished! Reading comic books and sleeping! When I was at Wheelus Field during the Berlin crisis with a gang of F-105 fighter-bomber pilots down from Bitburg practicing up on LABS delivery, in case they had to take on the Russians, I learned:

(1) To blow fire with my mouth. You take a mouthful of ordinary lighter fluid, snap on your cigarette lighter, hold it in front of your face, and BLOW. Keep blowing until *all* the fluid is gone. Don't swallow any. The flame is about six feet long and lights up the entire officers' club. Squint your eyes when you blow.

(2) To chew up martini glasses. You take hold of the thin lip of the glass between your teeth and grip it firmly (but don't bite it). Then, put pressure on the stem. A chunk will break off. Keep doing this until you have "chewed" the glass down to the thick part. Some sports were said to store the grit between their lower lip and their front teeth, then "drink of it," pretending to swallow the glass. I do NOT recommend it. It could kill you. But I did chew up martini glasses, being careful to get all the grit out of my mouth before I swallowed.

(3) To pick up a lighted cigarette by the glowing tip (forefinger), with the thumb on the butt. You first supercool your forefinger by holding a highball glass with lots of ice in it for several minutes. Then you pick up the cigarette and transfer it, *without delay,* to your left hand, thence to your mouth. You won't be burned. It thrills your date.

(4) Loosen your belt secretly, while standing at the bar. Then suck in your gut and let your pants fall to the floor. Stand there drinking without noticing. Again, your date will be thrilled. She may *scream.*

Best to Sergeant Mattingly, and if he and the 159th TFG practice up on these games, they'll be the hit at Luke!

Frank Harvey
Hackettstown, N. J.

Air Force Village

One of the largest benefactors of the ongoing Air Force Village Nursing Home Fund Drive has been the Iron Gate Chapter of the Air Force Association. During the past three years this fine organization has contributed $33,000 to this worthwhile endeavor. The entire Village, both residents and staff, join me in publicly thanking the Iron Gate Chapter for its continuing generosity.

When completed, our new nursing home will be one of the very finest in the Southwest—a sixty-eight-bed facility capable of giving comfort and security to our aging retired bluesuiters, their spouses, and widows. Thanks to organizations and individuals such as Officers' Wives Clubs, AFA Chapters, and members of both the active and retired Air Force, we have passed the twenty-five percent mark on our $2,000,000 goal. With your continued support we will reach that goal!

If you would like further information on the Village or how you might help, please write: Development Office, Air Force Village Foundation, Inc., 4917 Ravenswood Dr., San Antonio, Tex. 78227, or call me at (512) 673-2761.

Col. R. W. Hagauer, USAF (Ret.)
Executive Director
Air Force Village
San Antonio, Tex.

Sutterlin Scholarship Fund

The General Frederick J. Sutterlin Scholarship Fund has been established within the University of Illinois Institute of Aviation. The purpose of this fund is to assist worthy students in seeking advanced flying ratings.

Those who have worked with or have worked for General Sutterlin are well aware of his forthright and dynamic leadership qualities—something we have all sought and respected. This fund will help us to recognize those qualities and the man who espoused them.

Those who wish to participate may forward tax-deductible donations directly to: University of Illinois Foundation, 224 Illini Union, Urbana, Ill. 61801. Checks should be made out to the University of Illinois Foundation/Institute of Aviation, and the General Sutterlin Scholarship Fund should be noted on the check.

It is hoped that the first scholarships can be awarded during the Fall 1981 semester. The amount of the scholarships and the number to be awarded will be determined by your response.

Col. John B. Rosenow, USAF (Ret.)
Champaign, Ill.

Military Encyclopedia

I would like to inform readers of a new reference work that I am beginning to edit. The publisher and I intend to make it the most comprehensive and definitive work on military affairs, broadly defined, as we possibly can.

The first three of four volumes will be filled with entries just under the letter "A." Consequently, I am concentrating on that letter at present. Naturally topics relating to aerial subjects and airpower and the Air Force will be prominent in these volumes. My first concern is to expand the circle of contributors to individuals not personally known to me. I am making a list of possible authors matched to subjects of evident expertise, but I would like to reach a wider audience more quickly.

The key to success for an encyclopedia is the quality of the entries, and that means the expertise of the contributors. I am hoping that members of the Air Force Association and other professional military officers and civilians will be interested in contributing.

John F. Sloan
P. O. Box 1109
Springfield, Va. 22151

Boeing P-12

With the goal of eventual publication, Bergen Hardesty and I are researching, writing, and illustrating the technical development and operational usage of the Boeing P-12 through P-12K series of airplanes.

We are interested in contacting former Air Corps personnel, either Regular or Reserve, who flew or maintained these airplanes, and who can furnish information concerning such subjects as: flying and gunnery qualities; maintenance problems and modifications; group and squadron color schemes; flight colors and leaders' markings; use of unapproved group or squadron insignia; usage by

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AIRMAIL

Reserve squadrons; and interesting or unusual anecdotes.

If you can help, please contact me.

Robert L. Cavanagh
648 Dell Ridge Dr.
Kettering, Ohio 45429

What Is SAABS?

In 1951, I was assigned to the 527th Fighter-Bomber Squadron, 86th Fighter Bomber Wing, stationed at Neubiberg AB near Munich, Germany. As part of my greeting into the squadron I was given a humorous certificate announcing my admission to the "Bayerische Brotherhood of SAABS." It's signed by then-Capt. John Chenault as "Grosser Koenig and Ruler of SAABS."

My problem now is that I can't remember what SAABS stands for. Can anyone tell me?

Gilbert McNaughton
1025 Becklee Rd.
Glendora, Calif. 91740

We Have Met the Enemy . . .

After witnessing a steady decline in this country's military power over the past five years due to the exodus of trained and skilled manpower, I decided that once again I would bear arms for this nation. Imagine my surprise when after conferring with a recruiter I discovered that I was not eligible for military service because my wife is active-duty Army and we have one child. This regulation is counterproductive and highly discriminatory since service members on active duty may marry and have children.

It is patently obvious to me that the greatest threat to this country is not the military might of the Soviet Union but the weight of the federal bureaucracy that threatens to drown us all.

God help us.

Roger M. Jackson
Fort Meade, Md.

The Man Behind the Armor-Plated Desk

On the occasion of the fortieth anniversary of Elmendorf AFB, some of us veterans of the Eleventh Air Force gathered there for a second reunion. The highlight was a trip out the Aleutian Chain, through the generosity of Reeve Aleutian Airway, to visit several of the old World War II air bases.

Inevitably we got around to singing

"The Man Behind the Armor-Plated Desk." It turned out that there is considerable dispute as to the correct lyrics and who wrote them.

I would appreciate any help anyone can give me on those two points.

Lt. Col. Allen T. Miller, USAF (Ret.)
10 Namala Pl.
Kailua, Hawaii 96734

499th Bomb Group
We are trying to contact as many former members of the 499th Bomb Group as possible and let them know that after thirty-five years the first reunion is being planned for April 24–26, 1981, at the Hilton Inn in Salina, Kan.

The 499th, one of the 73d Wing Groups, trained at Smokey Hill Army Air Base in 1944 before departing for Saipan in their new B-29s to begin the air offensive against the Japanese homeland.

A history of the group is at the publishers now and will be out soon, and plans are to maintain a roster with current addresses of former members.

If readers who were former members of the 499th haven't heard about the reunion and want details, please contact:

Prentiss "Mick" Burkett
1335 E. Lawrence Lane
Phoenix, Ariz. 85020

AIRMAIL

Where Are You Guys?
The 7th Photo Group Association is looking for former members thus far unaccounted for. Any members of 7th Photo Group or 325th Photographic Wing: Please check in, your old buddies are looking for you.

Also, in the 1st Provisional Bomb Flight, Bluie West One, Greenland: I am looking for members of the crews of the B-25s *Baby Shoes, The Bar Fly, The First Mistake, Sad Sack, Eight Ball, Second Front,* and *Casa de Lobos.*

Mrs. Kay Bettin
202 S. 17th St.
Norfolk, Neb. 68701

I am trying to locate any pilot or crew member serving in the 310th Bomb Group, 379th Bomb Squadron, between January and July of 1943. Also desire whereabouts of 2d Lt. Albert B. Farry, Bradley Beach, N. J.; TSgt. Fred E. Bechs, Tacoma, Wash.; and SSgt. Walter T. Sundstrom, Eveleth, Minn.

Charles A. Smith
6040 Shaker Dr.
Riverside, Calif. 92506

416th Bomb Group
A book is being prepared on the Douglas A-26 Invader, and I wish to contact former 416th Bomb Group personnel who had contact with the Invader.

So if you would be able to assist in bringing back the days of aircraft like *Miss Mildred, Maggie's Drawers,* and *Winnimac Werewolf*—be it with a photograph, log book, official or unofficial records on the 416th's days with the Invader—please contact me.

John Horne
15/20-22 Speed St.
Liverpool
N. S. W. 2170
Australia

380th Bomb Group
I'm attempting to write a history of this unit, one in which my father, 1st Lt. Glenn R. Horton (529th Bomb Squadron), flew. I'm interested in any information concerning the Group's operational history, its aircraft, and, most specifically, any data on a B-24J named "Lil Nilmerg." This aircraft was flown by my father in the 529th BS from September 1944 to May 1945.

All material sent to me will be properly credited to the sender and promptly returned.

Glenn R. Horton, Jr.
9525 S. Robert Trail
Inver Grove Hts., Minn. 55075

UNIT REUNIONS

In-Flight Service Association (IFSA)
Annual meeting on May 3–5, 1981, at The Pointe in Scottsdale, Ariz. **Contact:** Salvadore Christifulli, Ozark Air Lines, Inc., P. O. Box 10007, Lambert Field, St. Louis, Mo. 63145.

Jolly Green Rescue Forces
April 24–25, 1981, Ramada Inn, Fort Walton Beach, Fla. **Contact:** Col. Ed Modica, 222 Sotir Ave., Fort Walton Beach, Fla. 32548. Phone: (904) 863-1959.

P-47 Thunderbolt Pilots
Twentieth annual reunion, May 1–3, 1981, Holiday Inn International, Orlando, Fla. **Contact:** Edward J. DiMarzo, 1511 NE 11th St., Homestead, Fla. 33033. Phone: (305) 247-4178.

Washington ANG
Thirtieth anniversary of the First Atlantic Squadron crossing. May 15–17, 1981, Spokane, Wash. **Contact:** Ray Bisterfeld, Route 1, Box 104, Newman Lake, Wash. 99225. Phone: (509) 226-3157.

47th Bomb Group
Fortieth anniversary, May 7–10, 1981, in Fresno, Calif. **Contact:** George McElhoe, 6694 Nelson St., Arvada, Colo. 80004.

86th Fighter Group
A reunion for the 86th Fighter Group (Neubiberg AB, Germany 1947–52), June 5–7, 1981, San Antonio, Tex. **Contact:** Gordon "Swede" Larson, 13239 N. Hunters Circle, San Antonio, Tex. 78230. Phone: (512) 492-2152.

97th Bomb Group
Second reunion for the 97th Bomb Group (England, Africa, Italy 1942–45), will be held at Little Rock AFB, Ark., July 10–11, 1981. **Contact:** Ped Magness, Route 1, Box 156, England, Ark. 72046. Phone: (501) 961-9348.

355th Fighter Group Associaton
Memorial dedication tour to England, departing the US May 9 and returning May 17, 1981. **Contact:** 355th FG, Galaxy Tours, P. O. Box 45, King of Prussia, Pa. 19406.

385th Bomb Group (H)
The 385th Bomb Group of the 8th Air Force, "Great Ashfield," Station 255 (England), will hold its reunion May 15–16, 1981, Fort Walton Beach, Fla. **Contact:** J. Dunlap, Box 545, Destin, Fla. 32541.

461st and 484th BGs, 15th AF
A reunion for the 461st and 484th, including the 49th Wing, will be held at the Holiday Inn, 21333 Hawthorne Blvd., Torrance, Calif. 90503, May 22–24, 1981. **Contact:** Bud Markel, 1122 Ysabel St., Redondo Beach, Calif. 90277, phone (213) 316-3300; or Frank O'Bannon, 137 Via La Soledad, Redondo Beach, Calif. 90277.

474th Fighter Group Association
Reunion at the Daytonian Hotel, Dayton, Ohio, June 12–14, 1981. **Contact:** Robert D. Hanson, 7515 Wayzata Blvd., Suite 226, Minneapolis, Minn. 55426.

557th Bomb Sqdn. Association
All former members of the 387th Bomb Group, and the 556th, 558th, 559th Squadrons are invited to attend the fourteenth biennial reunion, June 12–14, 1981, Hilton Inn, Tulsa, Okla. **Contact:** R. C. Allen, 1030 S. Fernandez #1-R, Arlington, Heights, Ill. 60005. Phone: (312) 394-8805.

3251st Flying Training Sqdn.
First reunion, **May 23–May 24, 1981,** Randolph AFB, Tex. **Contact:** Col. Walter W. Miller, 74 Outer Octagon, Randolph AFB, Tex. 78148. Phone: (512) 659-1737.

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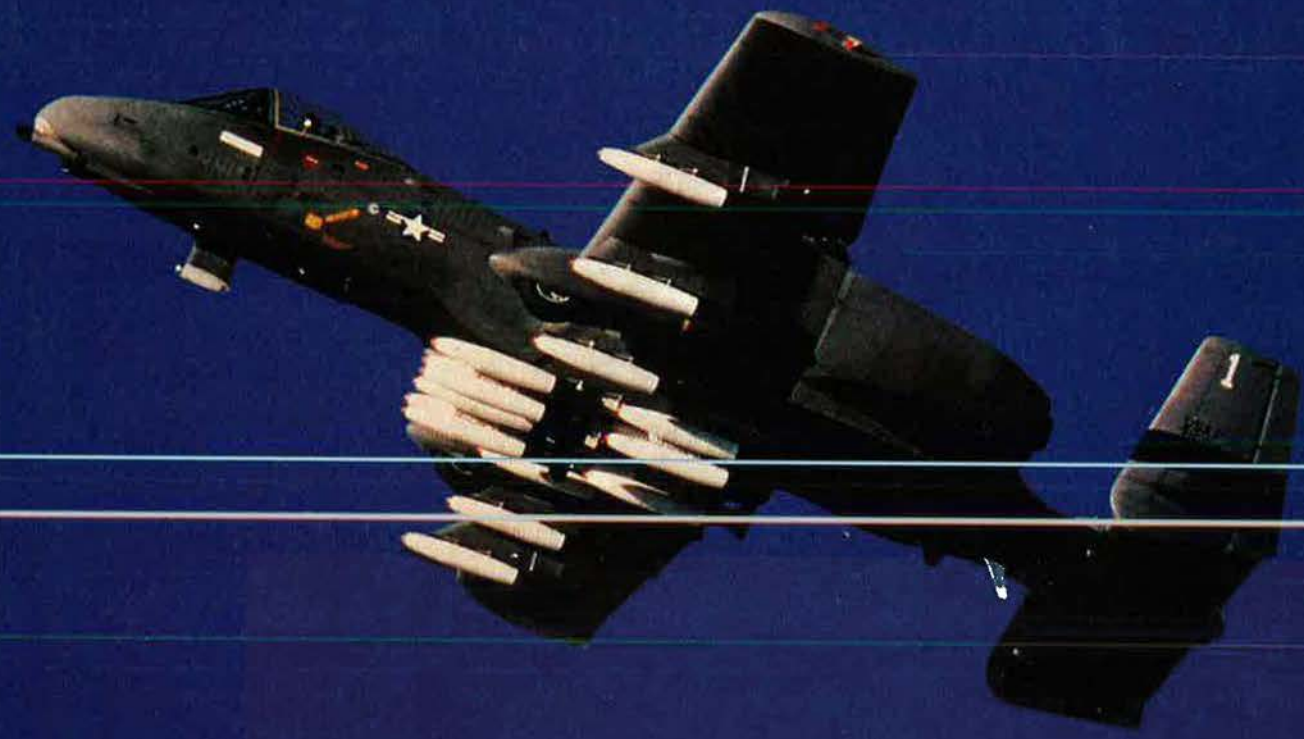

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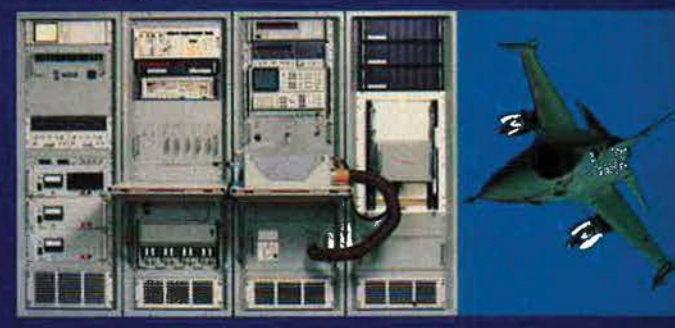
Great Neck, New York 11020.
Or, call (516) 574-2596.



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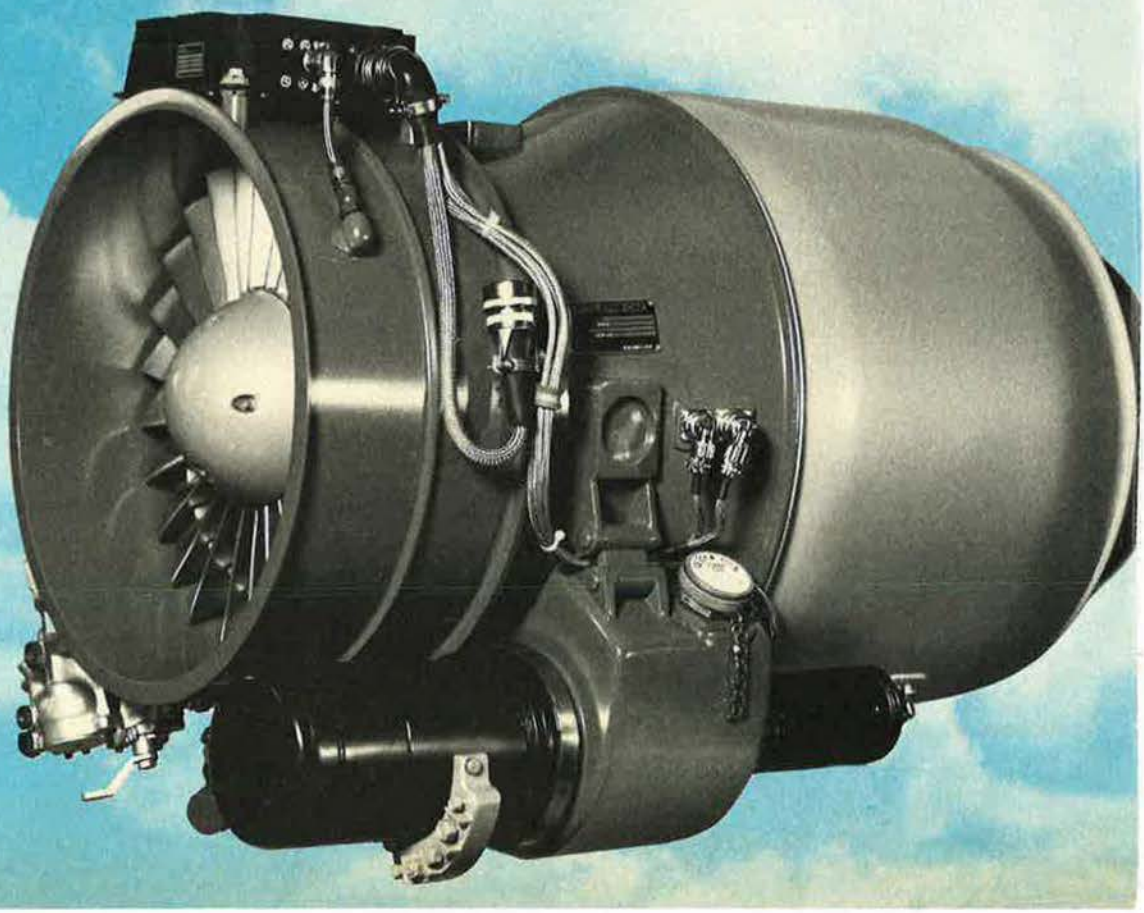


IN FOCUS...

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

Washington, D. C., Feb. 5

The FY '82 Defense Budget

The FY '82 Defense budget drawn up in the waning days of the Carter Administration creates a fiscal mine field of considerable challenge to the Reagan Administration. In a last-minute "scrubbing," dubbed the "Christmas massacre" by Pentagon insiders, the outgoing Administration—mainly through its Office of Management and Budget—stretched out, deleted, or deferred major acquisition programs that had been funded in the original Defense budget draft.

Additionally, as the Congressional Budget Office discovered, the Carter budget was underfunding defense purchases to the tune of $5.4 billion by understating inflation and fuel consumption, among others. Among the most egregious excisions was cancellation of the KC-10 and HARM programs, deferral of all E-3A purchases in 1982, and lowered production and modification of aircraft. In the case of the E-3A, the ultimate cost to the taxpayer of slipping the acquisition schedule by a year amounts to more than $100 million.

As a result, both Congress and the Reagan Administration recognize the need to amend the FY '82 budget submission by providing significant funding boosts. The extent of the increase at this writing has not been decided. There are indications, however, that the individual service budgets will be increased by at least $2.5 billion each and that $1.4 billion will be added on a Defense Department-wide basis.

Similar underfunding also characterizes the Carter Administration's supplemental budget request for the FY '81 Defense budget. The shortfalls here appear to be at least $4.9 billion, thus making it likely that the supplemental request for $6.3 billion will have to be increased to at least $11.3 billion. Testifying before the Senate Armed Services Committee on January 28, 1981—two weeks after the submission of the Carter Administration's figures—Secretary of Defense Caspar Weinberger asserted that both the FY '81 and FY '82 budgets are underfunded and the inflation rates on which they are based underestimated: "They reflect desired rather than realistic inflation rates. Similarly, the operating levels assumed in those budgets reflect a much more tranquil view of the international political scene than actually exists. Those budgets simply will not support the desired military capabilities."

The previous Administration's FY '81 Total Obligational Authority (TOA)—including the $6.3 billion supplemental—was set at $171.2 billion, which former Defense Secretary Harold Brown said represented a 7.8 percent real increase over the previous years.

Outlays in FY '81 were estimated at $157.6 billion by Dr. Brown, and assumed a climb to $180.0 billion in FY '82, for a 4.4 percent increase in real terms over the current level. The Carter Administration estimates pegged Defense spending at about 24.3 percent of the Federal budget and at 5.6 percent of the Gross National Product. For the years FY '83 to '86, the previous Administration projected outlays at $205.3 billion, $232.3 billion, $261.8 billion, and $293.3 billion, respectively.

The Air Force FY '82 budget request, as submitted by the previous Administration, totals $59.8 billion (TOA)—or $54.3 billion in outlays—which is claimed to represent 8.5 percent real growth over the previous year. The Navy's FY '82 budget request is $63.3 billion and that of the Army $47.6, both expressed in TOA. Possibly the most significant aspect of the Air Force budget, as proposed by the Carter Administration, is that the major aircraft procurement account, measured in TOA, drops from about $4.15 billion in FY '81 to $2.28 billion in FY '82, with the quantity of aircraft to be procured dropping precipitously from 306 in the current year to 130 in FY '82.

The 8.5 growth rate claimed by the Carter Administration for the FY '82 Air Force budget is probably overstated. This growth forecast assumes a composite inflation rate of 9.7 percent. Yet cost growth of major weapon systems now averages about twenty percent. An increase in the forecast inflation rate of only one percent, for instance, would cause an erosion in program growth of almost $600 million.

But all is not bleak in the proposed budget, even without upward revisions by the new Administration. Among the obvious pluses is a significant boost in the funding of items relating to readiness and sustainability, with the procurement of spares, for instance, doubled over the FY '81 level. Similarly, missile procurement is increased by about twenty-five percent, while the funding of munitions acquisition is up by a similar rate.

Almost $2 billion of the new budget is allocated to aircraft modification. These modification programs include B-52 offensive avionics systems, cruise missile integration, and electromagnetic pulse hardening; continuation of the C-5 wing modification to extend the life of these aircraft; modification of twelve F-111As to the EF-111 Tactical Support Jammer configuration; continued modification of the KC-135 involving wing reskinning and other improvements; conversion of one E-4A to the E-4B configuration to enhance the Airborne Command Post fleet; and more than $300 million to modernize tactical aircraft, including the A-7, A-10, F/RF-4, F-15, F-16, and F-111.

USAF's missile procurement climbs from $3.141 billion to $4.275 billion, with the largest increases occurring in ground launch cruise missile acquisition, and greater funding of spares and support equipment. Major space systems procurement is more than double last year's rate, with the Space Shuttle and the Defense Support Program (the early warning satellites) the principal gainers.

Overall real growth in Research, Development, Test, and Evaluation over FY '81 could approach 17.8 percent, with the all-important technology base increase providing for a ten percent growth in research programs

and a five percent boost in exploratory development programs. The increase in strategic RDT&E programs is derived from an increase in funding of the MX program, which at $2.784 billion accounts for 26.4 percent of the Air Force's total strategic budget.

The strategic mission area budget allows for an operational force of 316 B-52s and sixty FB-111As contained in twenty-four squadrons; 615 KC-135s in forty-nine squadrons; 1,052 ballistic missiles and 1,140 air-to-ground missiles in eighteen squadrons; twenty-seven EC-135s in three squadrons; 258 interceptors in sixteen squadrons; and four E-4s in support of the NEACP. The Air Reserve Forces (ARF) provide twenty-two percent of the tanker support and sixty-five percent of the interceptor support.

The tactical mission area budget provides for an operational force of 2,608 combat coded tactical fighter aircraft in 121 squadrons. Included are 876 aircraft in forty-two squadrons assigned to the Air Reserve Forces; 252 reconnaissance aircraft in fourteen squadrons, of which 144 aircraft in eight squadrons are ARF; and one fighter-interceptor squadron consisting of twelve F-4s. Also included is one KC-10 squadron with four aircraft, which activates with an associate reserve squadron; fifty-seven aircraft assigned to seven special operations squadrons; three squadrons and nine aircraft for the Airborne Mission Command post; one squadron of twelve RC-135s in support of the tactical cryptologic program; and ninety-two other aircraft in six squadrons.

The new budget envisages an aircraft force that includes 554 tactical airlift aircraft (C-130s, C-123s, and C-7s) located in forty-nine squadrons. The ARF forces account for 320 of these aircraft and thirty-five squadrons. There are 304 strategic airlift aircraft (C-141s and C-5s) located in thirty-four squadrons, which include seventeen ARF associate squadrons. Aeromedical aircraft consist of seventeen C-9s forming four squadrons with one squadron an ARF associate. There is one military airlift group consisting of three squadrons and eighteen aircraft, and there are forty-eight aircraft used in training.

In the military manpower sector, the new Air Force budget provides for a slight increase in end strength, from 564,500 in FY '81 to 569,500 in FY '82. On a Defense Department-wide basis, the number of military personnel climbs from 2,065,000 to 2,094,000. The Department's civilian work force, pegged at 995,000, remains essentially unchanged, while employment in defense-related industry is estimated to grow by 165,000 to just above the 2,500,000 mark. Total defense manpower is expected to reach a level of about 5,600,000, up by 194,000 from the current level.

IN FOCUS...

In statistical terms, the new Defense budget, measured in outlays, accounts for 24.3 percent of the total federal budget, absorbs 5.6 percent of the estimated Gross National Product, pays the salaries of 5.1 percent of the nation's total labor force, and represents about 16.9 percent of all public spending.

Land force levels funded by the Carter Administration budget request remain constant with twenty-four Army divisions—sixteen active and eight reserve—and four Marine divisions, three of which are active and one reserve. Gen. Edward C. Meyer, the Army's Chief of Staff, warned Congress, however, that his service's budget, as drawn up by the Carter Administration, fails to "provide for an adequately sized force, both military and civilian; it does not provide the requisite funds to enable us to deploy and sustain ourselves to the degree that we must; and it does not satisfy existing equipment shortages, nor provide for the necessary acceleration of modernization to even achieve parity with the Soviets by 1985."

The Navy aircraft carrier force is slated to increase to thirteen with the addition of the USS *Carl Vinson*, while its air wings remain constant with twelve active and two reserve wings. Marine Corps air is pegged at three active and one reserve wings.

The strategic missile force, by the end of the new fiscal year, is to consist of 450 Minuteman IIs, 550 Minuteman IIIs, fifty-two Titans, as well as 496 Poseidon and forty-eight Trident SLBMs. The number of B-52 and F-111 squadrons remains constant at twenty-five.

Titan II to Serve into the '90s?

The Air Force's recently released report by the Titan II Weapon System Review Group—that was convened in the aftermath of the tragic accident of September 19, 1980, at complex 347-7 at Damascus, Ark.—concluded that with relatively minor modification USAF's largest ICBM can safely be kept in the operational inventory until the 1990s.

The fifty-two Titans, each carrying a single nuclear warhead with a yield of about 9.1 megatons, are the largest ICBMs in the US arsenal. The throw-weight of Titan II is greater—by several hundred pounds—than that of MX, even though significantly less than that of the largest Soviet ICBM, the SS-18. Under the terms of SALT II—which will apparently remain in effect—the US can't replace Titan with an ICBM of equal or larger size since the accord denies the US the right to build "large" ICBMs.

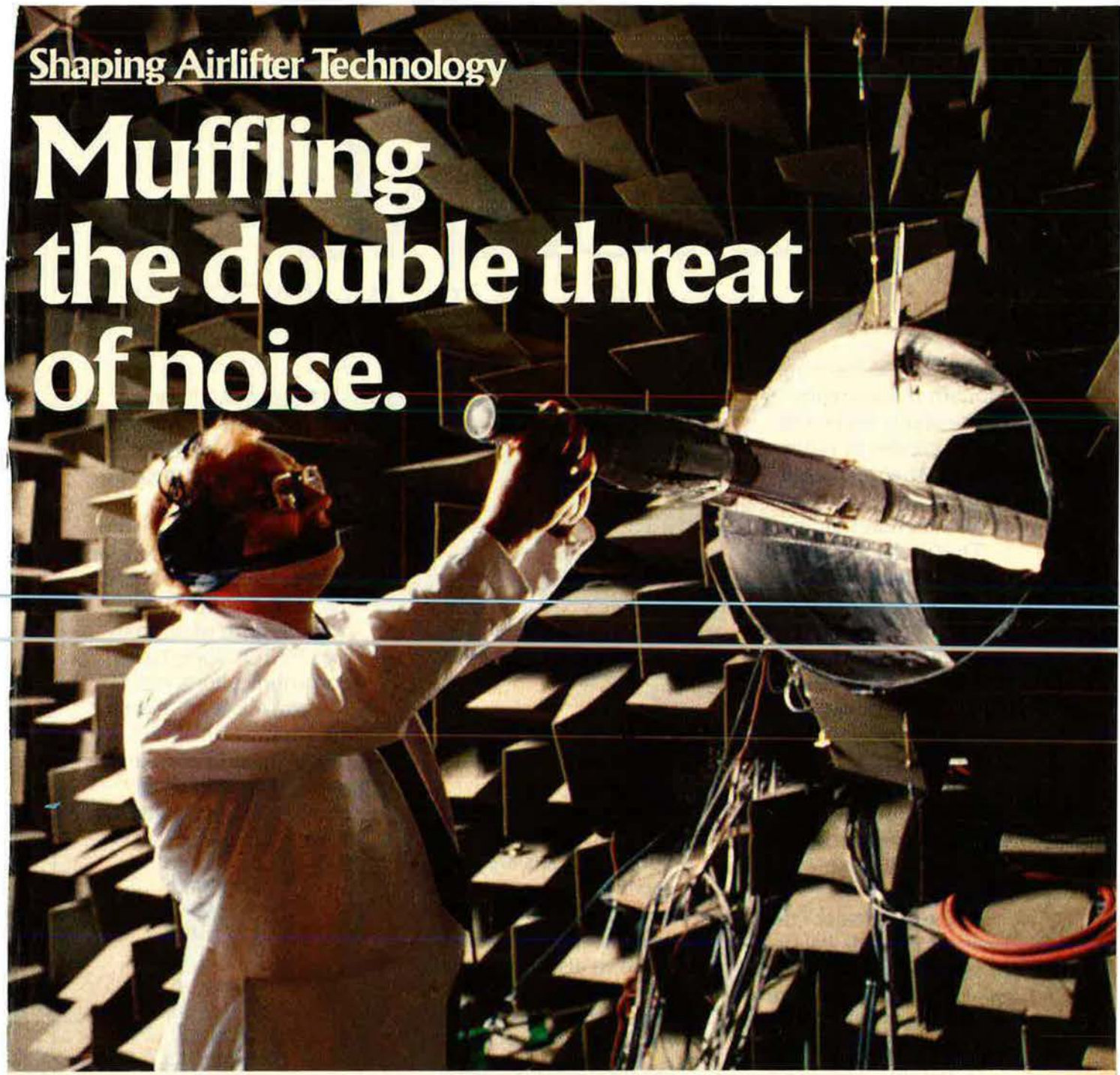
While US strategic planners in general opt for relatively small, highly accurate warheads, there is recognition of the fact that a small number of high-yield RVs has operational utility. Targeting of such area targets as concentrations of "soft" intermediate-range ballistic missiles—such as SS-20s—can be accomplished effectively with large warheads. The same applies to soft Soviet military facilities, a hundred or more of which may be located within the lethal range of a single Titan II warhead.

Formed at the direction of the then-Secretary of the Air Force, Dr. Hans Mark, and headed by Gen. Bennie L. Davis, Commander of the Air Training Command, the Review Group examined the long-term safety aspects and supportability—in terms of people, hardware, and management—of the almost twenty-year-old weapon system and concluded that with an investment of about $56 million in improved safety features the system can be kept operational for years to come without undue safety hazards. The Review Group focused on all aspects of operations and maintenance, including accident procedures and prevention as they affect the safety of Air Force people and civilian communities near Titan II silos. The group included representatives from all relevant USAF commands, the Department of Energy, the Federal Emergency Management Agency, the Lawrence Livermore National Laboratory, and other agencies.

The report pointed out also that when the Titan II's reentry vehicle/warhead (RV/WH) was built, the nuclear design criteria were not as stringent as now. Nevertheless, the RV/WH system "contains several effective safety features to prevent an accidental detonation" that were deemed adequate under normal conditions but inadequate under extreme conditions. The Review Group recommended that a modification effort be launched to reduce the likelihood

Shaping Airlifter Technology

Muffling the double threat of noise.



An engineer adjusts a model nozzle prior to testing in Lockheed's unique open-throat anechoic wind tunnel.

Aircraft noise creates two kinds of problems. First, it disturbs communities. It also disturbs aircraft. When noise impinges directly on parts of aircraft structure, it may eventually cause acoustic fatigue and can lead to malfunction of sensitive equipment.

Noise in an airlifter comes from two sources. The propulsion system is the biggest source of noise on takeoff and landing but the air friction also creates noise as the airframe rushes through the air.

To learn more about noise, Lockheed-Georgia is operating the only open-throat anechoic wind tunnel in the airframe industry. Here the effects of aircraft flight speed on the generation and reduction of engine and airframe noise can be measured accurately. Basic problems are being tackled, such as what processes actually occur when noise generated inside an engine passes through the nozzle and jet exhaust on its way to distant communities. And how can those processes be altered to reduce the noise level?

From research such as this come new concepts in noise suppression.

Ultimately, this research pays off in terms of reduced noise impact on communities and fewer problems associated with acoustic fatigue. In short, better airlifters.

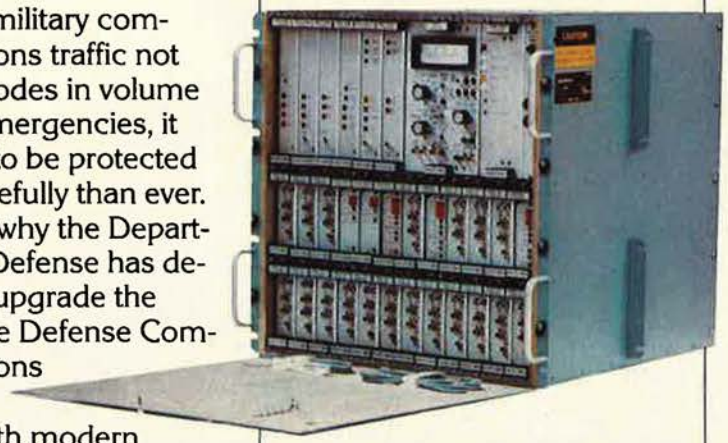
Advanced facilities such as this anechoic wind tunnel are what you would expect from the company that has built more airlifters, by far, than any other firm. When it comes to airlifters, the scientists, engineers and manufacturing experts at Lockheed know how.

Lockheed-Georgia

Cost Effective
DIGITAL
Transmission System for the DCS

Modern military communications traffic not only explodes in volume during emergencies, it also has to be protected more carefully than ever.

That's why the Department of Defense has decided to upgrade the worldwide Defense Communications System (DCS) with modern digital equipment.

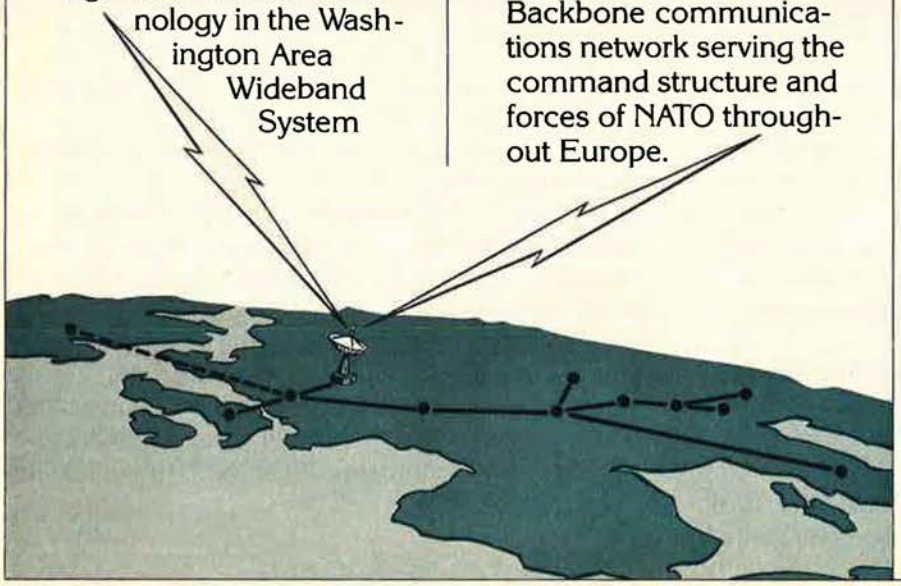


Digital technology will provide US forces worldwide with comprehensive communications security at reduced life-cycle costs.

As the first major contractor for the digital upgrade of terrestrial links in the DCS, TRW is demonstrating today's advanced digital transmission technology in the Washington Area Wideband System and at satellite ground stations in the DSCS II network.

More than 300 of our AN/FCC-98 communications terminals are now serving these critical communications areas with exceptional reliability.

We've also developed a complete line-of-sight transmission system for the Digital European Backbone communications network serving the command structure and forces of NATO throughout Europe.



Installation of our 1st and 2nd level digital multiplexers and the AN/FRC digital radio will begin in 1980.

We'll also be supplying digital radios and 3rd level multiplexers to the NATO Integrated Communications System which handles NATO's long-haul communications needs.

If you'd like additional information on TRW's digital transmission and switching capabilities, contact: Joe Wellington, TRW DSSG, (213) 535-2258.

DIGITAL COMMUNICATIONS from

A COMPANY CALLED TRW

DEFENSE AND SPACE SYSTEMS GROUP

IN FOCUS...

of the warhead "being exposed to an abnormal environment and ensure the supportability of the weapon system through the 1990s. Under some abnormal conditions, the warhead could be set off and nuclear material scattered about." The Review Group asserted, however, that the "risk to the civilian populace due to the scattering of nuclear material is virtually nil."

Because of significantly different propellant characteristics, dissimilar handling requirements, and greater safety standards, Minuteman and MX ICBMs are not susceptible to accidents of the type that occurred at the Titan facility in Damascus, Ark., the Review Group concluded.

NASA Sniping at IUS

Only last-minute rallying by the Defense Department and in congressional quarters prevented NASA's outgoing Administrator, Dr. Robert A. Frosch, from delivering a fatal blow to the Space Transportation System's three-stage Inertial Upper Stage (IUS). Dr. Frosch reportedly planned to announce on January 15 that NASA was dropping out of this phase of the IUS program that is being carried out by the Air Force as the government's executive agency, thus contravening an accord with the Pentagon in what some government officials termed a "surreptitious fashion."

The three-stage IUS is an extension of the Space Shuttle to deliver heavy payloads to high orbital altitudes or perform interplanetary missions. The IUS program encountered cost-growth problems, some of which resulted from the schedule slippage of the Shuttle on which it depends. Following intervention at the White House level, press releases announcing NASA cancellation of the three-stage IUS program were pulled back and replaced by a special statement concerning IUS. Without NASA participation, it is unlikely that USAF could have continued to carry out this expensive program, thus jeopardizing the economic viability of the two-stage IUS. Without the latter, the value of the Shuttle to the Defense/Intelligence Mission becomes questionable.

The compromise statement issued by Dr. Frosch stressed NASA's concern over "continued rapid escalation of estimated costs for the three-stage [as opposed to the two-stage configuration needed for national security missions] IUS."

Because of the "very low probability" that a three-stage IUS can be prepared in time for Galileo orbiter and probe launches to Jupiter in 1984, as originally scheduled, that schedule had to be slipped by a year in the Carter Administration's final budget submission. Further, he claimed, if a three-stage IUS could be developed by 1985, it "could not accomplish the Galileo mission because of higher energy requirements in that year."

NASA, therefore, started to work with industry to "look at the possibility of incorporating the Centaur stage into the Shuttle, an option that has been extensively studied and has frequently been proposed as an alternative to the three-stage IUS. I have concluded that within the 1981 and 1982 resources that the budget would provide, we could begin modifications of the Centaur, [make] provisions for integrating it with the Shuttle, and [carry out] the relatively minor changes to launch facilities at the . . . Kennedy Space Center, Fla., so as to have a very powerful combination available for the first launches in 1985."

Claiming that the "Shuttle/Centaur would satisfy our planetary mission needs and would offer both to the commercial customers and to national security interests a highly capable launch vehicle with growth potential," Dr. Frosch said "NASA will expand discussions with the Air Force on the best means for providing upper stages to meet the needs of the nation in the second half of this decade and work with them to continue with the development of the two-stage IUS, which both we and the Air Force are counting on for a number of critical missions."

Washington Observations

★ Secretary of State Alexander M. Haig, Jr., at his confirmation hearings before the Senate Foreign Relations Committee, highlighted what he termed the central strategic phenomenon of the post-World War II era, to wit, "the transformation of Soviet military power from a continental and largely defensive land army to a global offensive army, navy, and air force fully capable of supporting an imperial foreign policy. Considered in conjunction with the episodic nature of the West's military response, this tremendous accumulation of armed might has produced perhaps the most complete reversal of global power relationships ever seen in a period of relative peace. Today the threat of Soviet military intervention colors attempts to achieve international civility. Unchecked, the growth of Soviet military power must eventually paralyze Western policy altogether."

★ Gen. David C. Jones, USAF, Chairman of the Joint Chiefs of Staff, encapsulated his view of the US military posture and prospects before Congress as "a blend of mixed judgments and a collage of pessimism and optimism. Our capability remains formidable in most key areas and is better than some people believe. However, measured against the challenges and imperatives of the 1980s, there are many critical improvements to be made. I am pessimistic in the near term because the risks are here now and will grow in the years ahead, while the remedies will take time even under the best of circumstances. I am more optimistic over the longer term because I detect a reversal of public attitude and a greater determination to correct the consequences of our long slide down the slippery slope of wishful thinking, lost momentum, and aging capability."

★ The Defense Department informed Congress that split basing of the MX would add approximately $3.5 billion to the acquisition cost of this weapon system. Research and development costs would increase by $121 million, aircraft procurement by $98 million, and missile procurement by $2.1 billion. Of the last figure, $1.6 billion results from duplicating assembly and checkout facilities at each main operating base.

Military construction costs would increase by $1.2 billion; $527 million of this amount is for real estate and relocating people.

The report concludes that there are no overriding advantages or disadvantages to split basing the MX system in terms of environmental and operational impacts, arms-control implications, or schedule completion.

In addition to increasing the program cost by $3.5 billion, the report states that the annual operating cost to maintain the system would increase by about $19 million.

The split basing concept would place half of the proposed MX system (100 missiles and 2,300 shelters) in the Nevada-Utah Great Basin and the other half in the New Mexico-Texas Southern High Plains.

The main operating bases for the system would be located at Coyote Spring Valley, Nev., and Clovis, N. M. ■

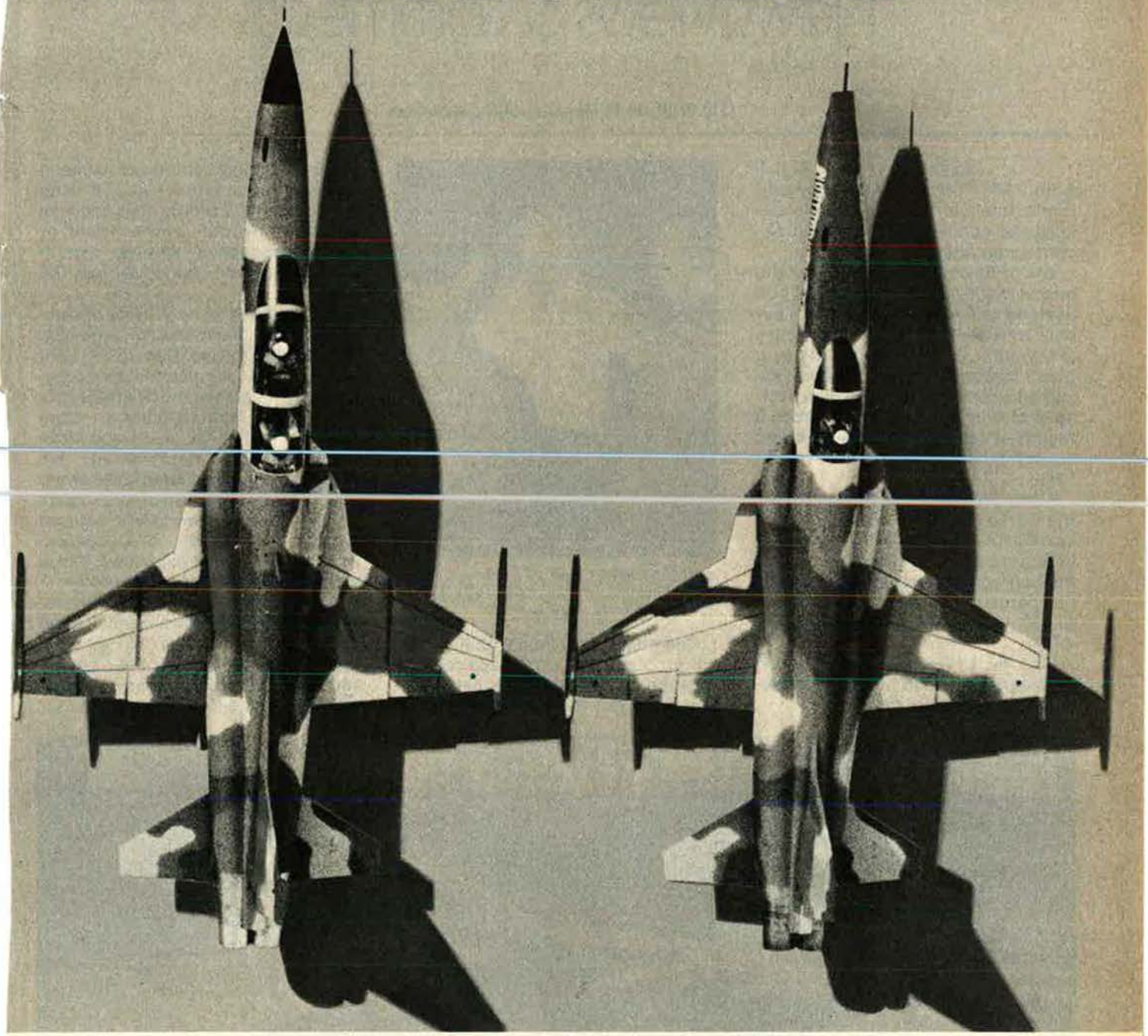
A FAMILY

F-5G Newest member of F-5 family of tactical fighters and trainers. Designed to meet emerging worldwide needs for defense through the turn of the century.

A single General Electric F-404 engine replaces twin J-85 engines of earlier F-5s. Result: 60 percent increase in available thrust. Mach 2 class.

F-5E Air-to-air combat superiority over anticipated threats. Air-to-ground capability fulfilling user needs. Easy maintenance. Rapid turnaround. All at affordable cost.

OF FIGHTERS



F-5F Fighter/trainer with two cockpits, dual controls for advanced pilot training. Retains full tactical capability.

RF-5E Dedicated reconnaissance version of F-5E. Retains air-to-air and air-to-ground capabilities.

Northrop's F-5/T-38 family. Operational flexibility. Logistics commonality. Established worldwide support system. More than 3,400 aircraft in service or on order for 28 nations.

NORTHROP

Making advanced technology work.

AEROSPACE WORLD
News, Views & Comments

By William P. Schlitz, SENIOR EDITOR

Washington, D. C., Feb. 5 ★ In 1978, Tactical Air Command found itself in serious trouble because of continuing declines in aircraft sortie rates.

TAC officials noted that the sortie rate between 1969 and mid-1978 had been halved, and the command's aircraft were averaging only 11.5 sorties per month. Even worse, pilots in a given squadron outnumbered assigned aircraft, resulting in pilot averages of only eight or fewer sorties a month—in the eyes of TAC leaders not enough to maintain combat readiness.

Along with the steady slippage in the sortie rate, the command was consistently unable to fly the number of hours allotted by Congress. In fact, the average annual underfly neared five percent in 1969–73 and climbed to eight percent between 1974 and 1978.

Gen. W. L. Creech, who assumed command of TAC in May of 1978, decided to rectify this situation.

TAC Commander Gen. W. L. Creech visits maintenance shops regularly. Here, at Tyndall AFB, Fla. (See item.)

One measure to deal with the critical problem was a massive reorganization of maintenance activities. Since the late 1960s, the Air Force had increasingly centralized its maintenance management at the wing level under the theory that such an approach would create equal or greater productivity at lower cost. In fact, decreased productivity was the result.

TAC applied a new theory: combat-oriented maintenance organization (COMO). *(See December 1979 issue, p. 47.)* "We completely decentralized and placed much greater authority and responsibility on commanders and NCOs at the squadron level," General Creech noted. "We gave each squadron what it needed to fight. Each squadron maintenance unit has its own crew chiefs, support section, engine and avionics specialists, and munitions personnel. These were all centrally managed before."

Crew chiefs were permanently assigned to a specific aircraft. "Each squadron now does its own scheduling, and pilots fly only their squadron's aircraft, which fosters unit identification and esprit. In short, we set

F-15 Eagles participating in the recent twenty-day exercise dubbed Coronet Eagle required minimum ground-support personnel, as each aircraft is equipped with on-board starting and power sources and a boarding ladder.

VERNE ORR NAMED SECRETARY OF THE AIR FORCE

A businessman and political associate of President Reagan's during his governorship of California and during the Presidential campaign is the new Secretary of the Air Force.

Verne Orr, sixty-four, from Pasadena, Calif., holds a bachelor of arts degree from Pomona College and a master's in business administration from the Stanford University Graduate School of Business.

During World War II, Mr. Orr served in the Navy's supply arm in CONUS and the Pacific. He was discharged from the Naval Reserve as a lieutenant commander in 1951.

A partner in the family auto dealership following his release from active duty in November 1945, Mr. Orr also was involved in the family investment firm and was president of Investors Savings and Loan, also in Pasadena. He served in various capacities during the Reagan governorship, including California's director of finance.

Mr. Orr was deputy director of the Reagan for President Committee and deputy director of the Office of the President-elect during the transition.

A Phi Beta Kappa, Mr. Orr has an outstanding civic service record. He and his wife, Joan, have two children, Carolyn and Robert Vernon.

up the individual squadrons just as they will have to operate in wartime," General Creech said.

Steps were also taken to stimulate motivation by encouraging competition between units and the creation of a host of incentive awards.

The result of these actions has been rewarding, with a sortie rate increase of more than sixteen percent per year since mid-1978 and an aggregate total increase of forty-four percent. TAC aircraft are averaging 16.6 sorties per month, translating into twelve sorties per combat aircrew per month.

Another advantage of COMO is that a squadron has the resources it would need in a deployment, with no need for a reorganized maintenance structure. "Its importance is underscored by TAC's requirement to move out swiftly to its wartime bases and to fight immediately upon arrival," said General Creech. That's no time to work with strangers, he said, or discover a deficiency hidden by a central peacetime organization.

★ Professor Elie Wiesel, author and chairman of the United States Holocaust Memorial Council and himself a survivor of Auschwitz and Buchenwald, announced recently that the Council will sponsor the first international conference of concentration camp liberators.

The conference is to take place this coming fall and will pay tribute to the Allied forces that liberated the Nazi camps. As host country, the US is home for more than 5,000 survivors of the camps.

The US Army Center of Military History, commanded by Brig. Gen. James L. Collins, Jr., is to provide liaison between the Council and DoD. Efforts will be made to locate medical corps personnel, military correspondents and photographers, and key personnel acting in the liberations, including those who first entered the camps.

Australia, Canada, Czechoslovakia, France, New Zealand, Poland, the UK, USSR, and Yugoslavia have been invited to send delegations of those who participated in camp liberations. Initial contact with these countries was through the State Department.

Miles Lerman, chairman of the Council's committee on international relations and a resistance fighter during the occupation, has met with representatives of US veterans organizations to seek their help in locating American liberators.

Contact Mr. Lerman (609-691-7600) or the Council (202-724-0779).

★ Air Force Communications Command technical controllers are among the military specialists who are subjected to frequent change of duty station, often to overseas locations, that create personal and family hardships and impact on retention.

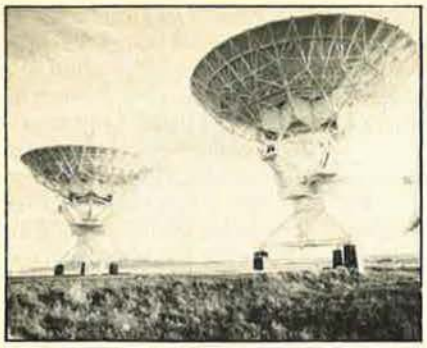
The "tech controllers" monitor communications circuits and act to restore faulty circuits or reroute voice and message traffic when things go awry in the global military communications net.

Since better than sixty percent of the tech controller jobs are overseas, these specialists average only fifteen months Stateside before once again being assigned abroad. Put another way, as of June 30, 1980, 1,179 of USAF's 2,006 controllers were serving overseas.

AFCC has devised a fourteen-point program to alleviate this imbalance and strive to increase the average tour in CONUS from fifteen to at least twenty-four months.

Without being too specific, among other things AFCC will attempt to

France's Avions Marcel Dassault-Breguet Aviation and Dornier of Germany have agreed to build thirty Alpha Jets for Egypt, the ninth country to order the two-seat, twin-engine basic and advanced trainer capable of tactical support missions.



"Desert mushrooms" in New Mexico are part of a chain of antennas designed to pick up sounds of the universe, such as quasar radio signals.

merge the tech controllers with similar skill categories to enlarge the CONUS job pool, as well as survey overseas slots to determine if they can be filled by other skills.

Besides the tech controllers, some 38,000 people Air Force-wide fall in what is called the "unsatisfactory rotational index," or URI. Said AFCC Commander Maj. Gen. Robert T. Herres, "The methodology used to develop alternatives for the tech controllers can also be used to attain a better balance in other URI career fields" throughout the globally constituted Air Force.

★ France's aero clubs have organized an air race from Paris to New York and back in conjunction with the Paris Air Show this coming June.

Planes are to depart Le Bourget Airport on June 6 and 7 and return by June 14, with a mandatory twenty-four-hour rest interval in New York.

The race is open to all types of aircraft, with handicapping giving all pilots a chance of victory in their classification.

Prize money now stands at 150,000 francs (about $33,000) with forty pilots already entered, primarily from France, Germany, and the US.

AEROSPACE WORLD

The sponsoring organization, called AIR TRANSAT, has organized increased search and rescue, weather forecasting, and air traffic control procedures over the North Atlantic during the race. It is also recruiting twin-engine aircraft to help in the supervisional effort, for which it will pay fuel costs, landing taxes, and crew expenses during the race. Such planes would be based at Le Bourget; Reykjavik, Iceland; Narssarssùaq, Greenland; Gander, Newfoundland; and Bridgeport, Conn.

For entry blanks or further details, contact the General Secretary, AIR TRANSAT, No. 83 Boulevard Exelmans, 75016 Paris, France. Enclose twenty French francs (about $4) for mailing expenses.

★ The Air Force Museum, Wright-Patterson AFB, Ohio, has turned over to AFA's Mid Ohio Chapter at Newark a World War II V-2 rocket for restoration.

The committee for the V-2 restoration project is composed of people assigned to the Aerospace Guidance and Metrology Center at Newark AFS. Thomas C. Jacobs, of the Directorate of Maintenance at the base and Chapter Vice President, is committee chairman.

Maj. James V. Jeffreys, Directorate of Inertial Engineering, is V-2 project engineer. Bradley L. Oswalt and William W. Johnson of the Directorate of Plans and Programs are project coordinators. Chuck Skidmore, Directorate of Metrology, is publicity chairman.

Objective of the project is to restore the rocket to the best possible condition, whether cosmetically or in full detail. It will then be put on permanent display at the Museum, bearing a plaque explaining the Chapter's contribution.

Chapter members have a step up if they plan to go for complete restoration: Acquired so far have been a guidance system from the Army's Redstone Arsenal in Alabama; two tail sections and a fuel tank from the International Space Hall of Fame, Alamagordo, N. M.; and a fuel tank from White Sands Proving Ground, N. M.

Historically, the V-2 was the world's first combat operational missile. By war's end, 4,000 had dropped on Allied cities, inflicting much destruction and killing thousands. They later became the prototype for US and Soviet space vehicles and missiles.

Those wishing to participate in the restoration, whether Chapter members or not, are invited to call Mr. Jacobs at (614) 522-7312 during working hours.

★ Events have come full circle. In January, Pan American World Airways resumed air service to China, interrupted more than thirty years ago with the victory of Communist forces on the mainland.

As the world has changed radically since 1949, so have the transports Pan Am is using on its US-to-China route. In the old days, the famed thirty-two-passenger, 130-mph "China Clipper" made the trip across the Pacific. The Martin M-130 flying boats required nearly sixty hours and a total elapsed time of six days to fly from San Francisco to Manila, with stops in Honolulu, Midway Island, Wake Island, and Guam.

Pan Am's new China Clippers—253-passenger, 560-mph Boeing 747SP jetliners—fly to Beijing from San Francisco with a stop in Tokyo in under sixteen hours.

Initially, the airline has scheduled two weekly round-trip flights to the

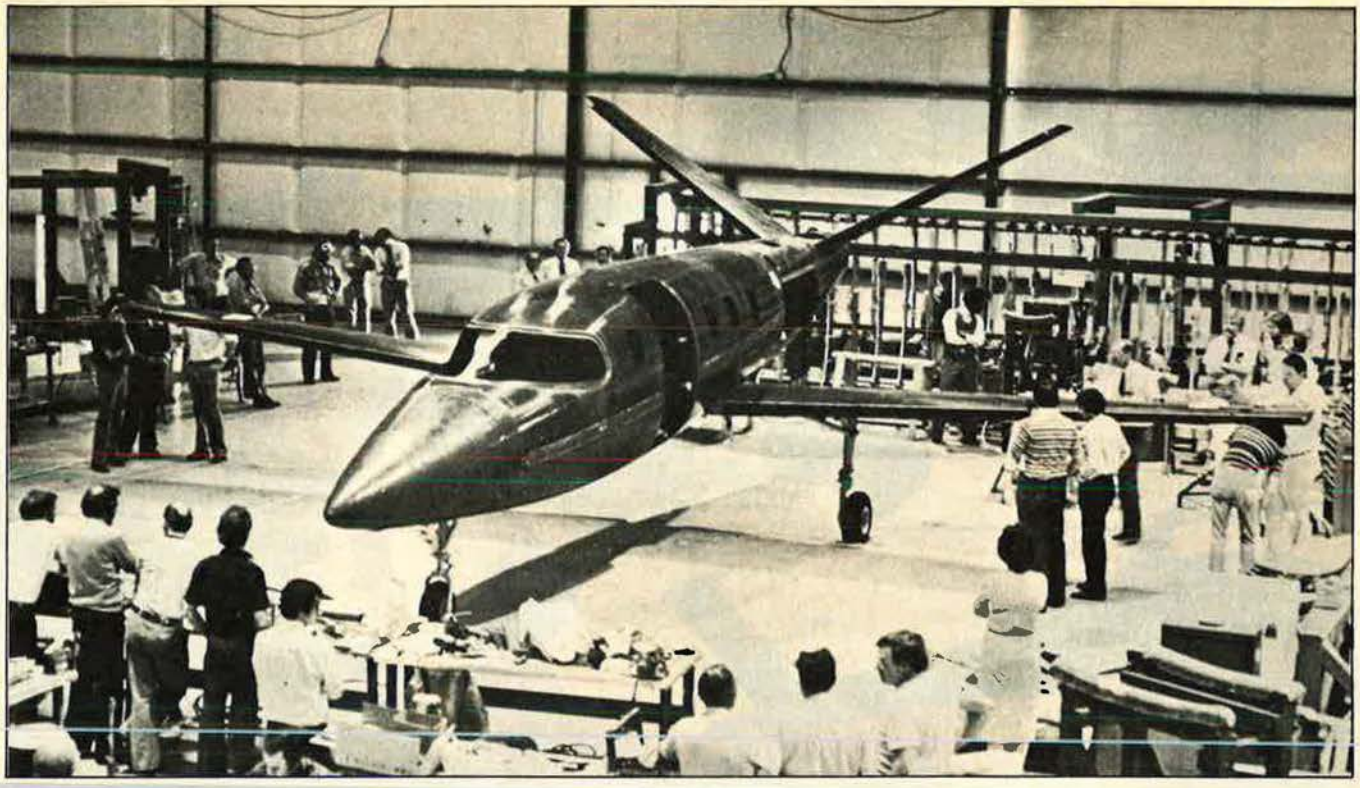
INTELLIGENCE BRIEFING...A ROUNDUP

According to *Foreign Report*, published by London's *Economist:*

The prospect of the first Republican administration since President Eisenhower with the support of a majority in the Senate is evidently causing some concern in the Soviet Union. According to CIA sources, the KGB has made its first attempts to penetrate the incoming Reagan Administration. In response, the CIA has been giving briefings to all Reagan staff members, from cleaning ladies to policymakers, on possible KGB (and other intelligence agency) tactics for recruitment and intelligence gathering. While this type of activity by the KGB and its fellow East European intelligence agencies is to be expected, CIA sources are surprised at the intensity of their efforts to gain a foothold within the new Administration.

So far, KGB efforts have been concentrated in the key areas of foreign policy and military intelligence. In particular, the KGB has been trying to find out how national security information will be handled by the Reagan Administration. The Soviet Embassy has been busy, too, trying to establish contacts, both professional and social. . . . At a briefing of more than 200 Reagan staff members, the CIA warned them that the KGB is on the lookout for both information and potential recruits. . . .

Reagan has said he will be firm in the face of further Soviet aggression. The Russians want to know how firm.



The new Lear Fan Corp. executive aircraft built almost entirely of lightweight carbon fiber promises excellent fuel conservation at optimum speeds. It is the last design achievement of the late inventor William Lear. (See item below.)

Chinese capital, due to go to three in April. Some of these flights are to originate at NYC's Kennedy International and also stop in Shanghai before going on to Beijing, but all will operate via Tokyo.

Pan Am is offering a variety of fares on its China flights, ranging from a one-way New York-to-Beijing first-class price of $1,526, to New York-to-Beijing round-trip group tour fares and advance-purchase tickets that cost $950.

The SP in the Boeing 747 designation stands for "Special Performance," meaning the long-range capability needed to cover the distance, say, of 9,014 miles from New York to Beijing, including the various stops.

In the early days, Clippers put down in Manila, where passengers transferred to Sikorsky S-42B transports for the hop into Hong Kong and from there via China National Aviation Corp. aircraft to Shanghai, Canton, Peking (now Beijing), Chungking, and other prominent mainland cities. These journeys might have proved long and tedious, but they couldn't have been more exotic.

With the World War II V-2 rocket that they will help restore are, from left, Chuck Skidmore, Billie Hartsough, and Tom Jacobs of AFA's Mid Ohio Chapter. The V-2 will then be returned to the Air Force Museum. (See item.)

★ The Lear Fan made its maiden flight on New Year's Day and its manufacturer, Lear Fan Corp., has high hopes for the new executive aircraft.

The aircraft is revolutionary in at least one sense: It is built almost entirely of lightweight carbon fiber *(see photo of prototype)*.

The Fan is powered by two Pratt & Whitney PT-6 650 shp turboprop engines driving a single pusher prop that will provide, according to the company, near-jet optimum speeds of 360 mph and range of 2,300 miles (3,701 km). The eight-seat Fan will expend about one-fifth the fuel of a comparable business jet.

The new aircraft is "the last and perhaps culminating design achievement" of aviation pioneer and inventor William Lear, who died in 1978. Work began on the Fan in 1977.

You've met Litton's Advanced Electronic Systems Group. Now learn about our most provocative component.

It's not the simple will to win. It's more basic than that.
It's the matter of pride.

We take pride in designing better products, better systems, in conceiving more imaginative, inventive solutions, and in improving on previous excellence.

Guidance and Control Systems

Guidance and Control Systems continues to strengthen its position as world leader in both the development and production of inertial navigation and guidance equipment for aircraft and missiles.

- Cruise Missiles
  We have delivered 115 LN-35 production guidance sets for the DoD Cruise Missile project. These and subsequent LN-35 guidance sets will be deployed on cruise missiles throughout the U.S. Air Force and U.S. Navy surface and submarine forces.
- Standard Navigation
  Our LN-39 Inertial Navigation Unit was selected for the USAF Standard Inertial Navigation program with immediate application for the A-10 aircraft.

Our large-scale production of sophisticated, high-technology products is supported by an aggressive R&D philosophy which investigates possible future product applications, currently typified by two successful lines of development.

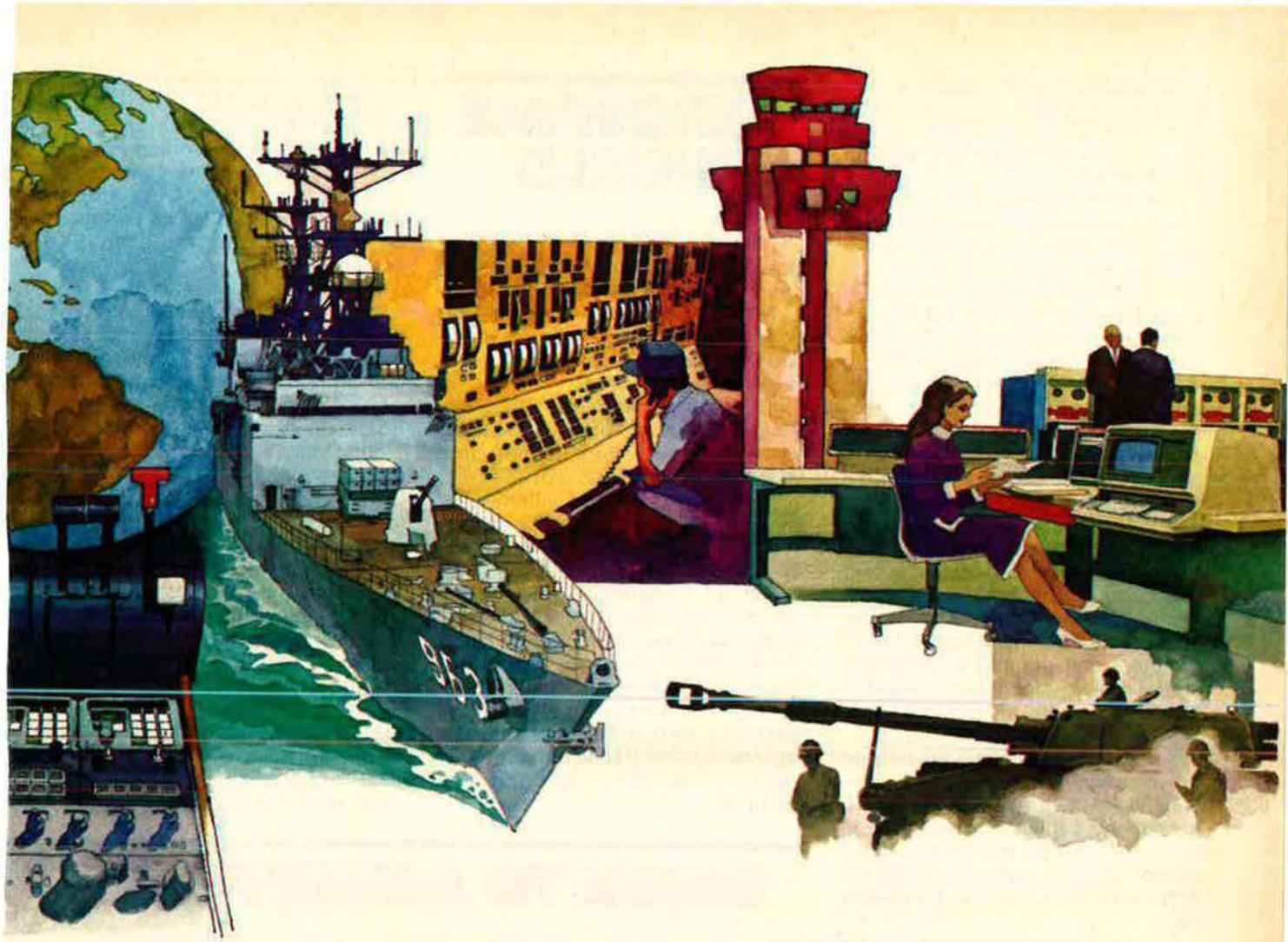
- Strapdown Inertial Systems
  The LR-80 strapdown AHRS has been selected for the U.S. Army Advanced Attack Helicopter, the AH-64A. Our small LP-81 strapdown inertial measurement unit has been selected for the U.S. Navy ADCAP MK-48 Torpedo.
- Ring Laser Gyro
  Our family of Ring Laser Gyros, range in size from the high-accuracy 28 cm gyro to the ultra-small 6 cm gyro. Litton was recently selected by the Naval Weapons Center, China Lake for the Ring Laser Gyro Alternate Source, Phase Two program: Our high accuracy 28 cm path length gyro will soon be in service onboard the Airbus A-310.

Mellonics

Mellonics continues as a major developer of software, data processing, systems engineering, analytical services, training and field engineering support to government, industry and international clients. Typically:

- Telemetry, tracking and commanding software to provide real-time control and monitoring of spacecraft
- High technology engineering support services to DoD agencies; training, weapons system testing, doctrine evaluation, system deployment studies and mission-specific scientific support
- Sophisticated full-service Computer Center to support both government and industry. This Center provides both interactive and batch processing services supported by a full range of software packages available for customer use, an extensive data entry capability and customer-oriented analyst support
- "Total capability" development of software for government and industry. Our staff provides quality software on time and within schedule and cost constraints.

Litton qu



.ero Products

Aero Products is a world leader in the design, development and application of commercial Inertial Navigation Systems and Omega Navigation Systems.

- Customers include more than 98 airlines
- Over 3000 Omega navigation systems world-wide

Unique applications include:

- Integrated Track Guidance Systems (ITGS) for photogrammetry and spraying with high-precision lane flying capability
- INS-based Flight Inspection System provides real-time inflight inspection of radio navigation aids including ILS.

Aero Products is deeply committed to research and development of new-generation avionics, including LED advanced display panels, Strapdown Inertial Systems and Ring Laser Gyro Technology. Our LTN-90 ring laser gyro INS has been selected by Airbus Industries for their new A-310 aircraft.

Data Systems

Data Systems is one of the world's foremost manufacturers of military electronic systems for command and control data processing, display, weapons control, electronic identification, and digital communications.

- TACFIRE provides automation for the U.S. Army artillery fire control center
- MISSILE MINDER provides automation for U.S. Army artillery ground-to-air missiles
- TACTICAL AIR OPERATIONS CENTER (TAOC) provides the U.S. Marine Corps with automation of their total Air Defense System

Data Systems is completely responsible for the electronics suite on the Spruance Class (DD-963) Destroyer and the LHA general-purpose amphibious assault ships. Our new C^3 family of battery-powered, hand-held intelligent digital terminals advance the state-of-the-art in communications, and are used for composing, editing, transmitting, receiving and displaying multi-color messages and graphics.

Datalog

DATALOG aggressively maintains world leadership in the research, development, and production of sophisticated graphic data transmission/reproduction equipment and systems:

- AN/UXC-4 TACTICAL DIGITAL FACSIMILE (TDF)
  Developed under NAVELEX management, under the auspices of the Joint Tactical Communications Office (TRI-TAC) for multi-service use.
- FASTFAX/2000
  A subminute, secure, digital facsimile transceiver terminal, interoperable with the AN/UXC-4
- OVERLAY GENERATOR
  To produce multi-color transparent map overlays
- POLICEFAX SYSTEMS
  To transmit and receive fingerprints and criminal data rapidly and accurately.

Non-impact, high-speed digital electronic line printers fulfill dual requirements of portability and ruggedness. These printers are used in the TACFIRE Artillery Fire Direction System and other key DoD programs.

Amecom

Amecom continues its leadership role in electronic support and electronic warfare systems.

- Development and deployment of the AN/ALR-59 Passive Detection System on the US Navy's E-2C aircraft
- AN/BLD-1 Passive Shipboard System
- AN/ALQ-125 Tactical Electronic Reconnaissance (TEREC) for the USAF RF-4C aircraft.

Amecom applies modern Time Division Multiplex communications and advanced microprocessor technology to solve complex air traffic control communication requirements.

- The Amecom 3080 Integrated Communications Switching System is in production for FAA and other national aviation agencies.

Our shipboard High Frequency communications systems are onboard:

- Spruance Class destroyer (DD-963)
- Kidd Class guided missile destroyer (DDG-993)
- Ticonderoga Class guided missile cruiser (CG-47)

Amecom's success in the totally integrated systems method of design and implementation of shipboard communications results in the optimization of communications systems for all size naval platforms.

lity; a matter of Litton pride

According to the company, the six-passenger Fan has a maximum ramp weight of 7,250 pounds (3,288 kg) and will burn about forty gallons of fuel an hour.

The smoothness of the plane's molded composite construction and the installation of engines in the fuselage also help to reduce drag.

According to Lear Fan, orders have already been placed for 175 aircraft priced at $1.6 million each. The company has production capacity for 250 units a year. Union Carbide Corp. will supply the carbon fiber.

★ More than 2,000 have registered in the competition to design a memorial to the veterans and dead of the Vietnam War, probably a record for public design competitions.

The registrants hail from all across the country and include factory workers, policemen, students, and the like, as well as such professionals as sculptors and graphic artists. Their entries will be judged in April by a distinguished panel of architects and others.

The memorial is to be erected on a two-acre site in Constitution Gardens, near the Lincoln Memorial, in the nation's capital. The main design stricture is that the memorial have inscribed on it the names of the 57,000 Americans who died in Southeast Asia.

Jan C. Scruggs, president of the fund sponsoring the memorial, said that so far $800,000 of the $3 million needed to complete the project has been received through contributions. The memorial will make no political statement regarding the war, Mr. Scruggs said.

Send tax-exempt donations to the Vietnam Veterans Memorial Fund, P. O. Box 37240, Washington, D. C. 20013.

★ A new flame-resistant material called "polyimide resilient foam" has been developed under a joint NASA/FAA program aimed at decreasing threats to passengers and crew in the wake of survivable plane crashes.

The polyimide foam is seen as a likely substitute for the polyurethane used in seat cushions, the bulk of flammable material in airliner interiors. Polyurethane releases highly toxic gases and smoke when it burns, major causes of death in post-crash fires.

By varying ingredients, the new polyimide material hardens, and thus could be used as lightweight wallboard or even high-strength floor panels. These could act as thermal barriers, reducing heat transfer and preventing other flammable materials from igniting, officials said.

They also visualize use of the new material in the interiors of such surface transport as buses, automobiles, and trains.

Not only is the foam safer, say NASA officials, but fifty percent lighter—a desirable feature in these days of increasing energy costs.

Double seats padded with the new material are to undergo fire tests at FAA's Technical Center, Atlantic City, N. J.

Aircraft manufacturers have long sought improved fire-resistant materials, but those developed by NASA for Apollo and Skylab lacked durability, were not commercially available, or were too costly to produce. The polyimide foam, developed for NASA by International Harvester's Solar Division, will go into limited production this year.

AEROSPACE WORLD

★ A new law has raised the age limit for those applying for AFROTC scholarships through the Airman Scholarship and Commissioning Program. The law also enables some active-duty applicants to apply for AFROTC two-year scholarships as part of the Airman Early Release Commissioning Program.

Previously, applicants had to be able to be commissioned before age twenty-five on June 30 of a particular year. Public Law 96-357 now allows scholarship applicants who have served on active duty in the armed forces to exceed the age limit by a period equal to that served, but only if commissioning can occur before age twenty-nine on June 30 of the calendar year.

Current or former military personnel who are pilot or navigator applicants must be able to be commissioned and enter undergraduate flying training before age twenty-seven and one-half.

The scholarship and commissioning program allows airmen to compete for AFROTC four-year scholarships. If selected, an airman is released from active duty to enter a college or university and enroll in its

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The Space Shuttle Orbiter and its launch apparatus on its way to Pad 39A at the Kennedy Space Center in Florida. Snags have once again delayed the first flight until April.

AFROTC program. On earning a degree, he or she is commissioned with a minimum four-year commitment.

The Airman Early Release Commissioning Program is designed for those who will be less than thirty-five when commissioned. Applicants must be able to complete degree requirements within two academic years.

AFROTC scholarships provide full tuition, books, and most fees, plus $100 a month stipend during the usual ten-month academic year. Competitively awarded, most scholarships go to majors in scientific, engineering, or technical disciplines.

Contact Office of Public Affairs, AFROTC, Maxwell AFB, Ala. 36112, AUTOVON 875-2825, or base education office.

★ Three F-4G "Wild Weasel" Squadrons of the 35th Tactical Fighter Wing, George AFB, Calif., will be spun off to form the 37th TFW.

The 35th will retain the 21st and 39th Tactical Fighter Squadrons and the 20th Tactical Fighter Training Squadron, all flying the F-4E. The last will continue training German aircrew.

The new 37th TFW will consist of the combat-ready 561st and 563d Tactical Fighter Squadrons and the 562d Tactical Fighter Training Squadron. "Wild Weasels" seek out and destroy enemy SAM sites.

Creation of the new wing will add about 100 manning slots, and existing facilities will be used to support the two-wing structure at George.

★ NASA has approved the continuation of the Voyager-2 space probe on a trajectory that will take it to Uranus in 1986 after the Saturn fly-past this summer.

The Uranus encounter will give earth its first close look at the planet, the seventh outward from the sun and twice as far from the sun as Saturn. A grim, frozen world, Uranus could be likened to the ice planet in the film *The Empire Strikes Back*—but one on which even a bear-monster couldn't exist.

Voyager-2 will pass Uranus at a distance of 66,000 miles (107,000 km) and take measurements and photographs on its way toward a possible encounter with Neptune. Its sister ship, Voyager-1, recently provided a historical close-up of the ringed planet Saturn and its huge moon Titan, the largest satellite in the solar system.

★ **NEWS NOTES—DoD has set 1990 as the goal for converting specifications and standards to metric dimensions** throughout the defense agency and within defense contracts. To this end, DoD's Acquisitions Policy Office has issued guidelines entitled "Guidance for Using Metric Units of Measurement in Preparing Standardization Documents."

Died: Col. Leon Booth, USAF (Ret.), an active-duty and civilian public affairs officer of long standing, of cancer in Washington, D. C., in January. He was seventy-four.

Died: Donald W. Douglas, famed aircraft designer who led commercial aviation into the Jet Age, in Palm Springs, Calif., in February. He was eighty-eight.

Died: Former Rep. Olin E. "Tiger" Teague (D-Tex.), a World War II hero and thirty-two-year veteran of Congress who was a strong advocate of veterans' benefits, US space activities, and national defense, of heart failure in Washington, D. C., in January. The long-time AFA member was seventy. ■

NASA to Build Man-Vehicle Systems Research Facility

NASA plans to build a first-of-a-kind aviation human factors research simulation facility at its Ames Research Center at Mountain View, Calif.

Designed for study of interaction between flight crews, their aircraft, and air traffic control, the Man-Vehicle Systems Research Facility will permit research not previously possible in existing NASA flight simulators. These are used primarily in aeronautical rather than human-engineering research.

The $7.5 million dual-simulator facility, scheduled for completion in 1983, is "to give scientists their first opportunity to probe psychological factors in the little-understood, highly complex relationship between pilots, crew members, and their aircraft, as well as aircraft of the future," officials said.

One of the dual simulators will be a replica of a current transport aircraft cockpit, complete with flight engineer's station, flight display, and control systems. The other will represent a future transport, incorporating advanced-technology flight controls, displays, and other flight-deck systems to test for human factors related to the newest aviation technology.

The simulation is to depict dusk or night, other aircraft, fog, clouds, and other weather conditions. A mock Air Traffic Control Facility will complete the realistic simulation, which will be able to introduce such problems as turbulence, air traffic, fog, or mechanical failure.

Under laboratory conditions, scientists will be able to study the real-world problems aircrews have experienced and told about anonymously under the Aviation Safety Reporting System, established in 1976 and run by NASA for the FAA. Previous studies have indicated that human error plays a part in about eighty percent of all aviation accidents.

Using the new facility, scientists will study how decisions are made in the cockpit and how aircraft captains manage such resources as time and people during critical moments.

One area already slated for investigation is the effect that automation might have in eroding flying skills.

Another will center on tests of human as well as engineering factors in regard to advanced-technology displays, controls, and other instrumentation. As crowded airspace forces planes closer together, researchers will be testing new instruments designed for aviation safety.

Three of the hostages seized by the Iranians in November 1979 were Air Force officers. For them—and for their families—USAF support began right after the US Embassy in Tehran was overrun. It was a quiet demonstration behind the scenes of the . . .

Air Force Caring for Its Own

BY MAJ. THOMAS L. SACK, USAF
CONTRIBUTING EDITOR

DURING Christmas 1979, one of the clergy visiting Col. Thomas E. Schaefer, then a hostage in Iran, gave him a letter from his wife. He doesn't recall her exact words, but it told him she was being "most adequately taken care of by the Air Force," and that he wasn't to worry. "And then when I got back, I found it was even better than that," Colonel Schaefer said.

He is one of three USAF officers who were among the fifty-two Americans forced into almost fifteen months of captivity after the American Embassy in Tehran was seized on November 4, 1979. The other two USAF officers are Lt. Col. (Col. selectee) David M. Roeder and Capt. Paul M. Needham.

Many Air Force people played important roles in the approximately eight days it took first to bring and then welcome the fifty-two Americans home. Two Military Airlift Command C-9 Nightingales from the 55th Aeromedical Airlift Squadron at Rhein-Main AB in Germany flew the returnees from Algeria. A C-137, the type that flies the President, landed the returnees in New York, courtesy of the 89th Military Airlift Wing at Andrews AFB, Md. Other Andrews crews and airplanes brought the former hostages and their families to Washington, D. C., for their welcome by President Reagan.

Other activities on the ground at Rhein-Main and at the USAF Hospital at nearby Wiesbaden and at Andrews were less visible, such as the support by five Air Force Communications Command units stationed in Germany. These units installed hundreds of phones, strung miles of phone lines, and put in additional switchboards to meet communication needs. For the hostages there were fifty-two phones, one for each. More than 900 news people found support, as did former President Carter and hordes of government officials. The communications people also helped activate microwave links that allowed live television coverage to be broadcast back to the US.

—USAF Photo by MSgt. Deal Toney

One hug says it all. At Andrews AFB, ,Md., the sister of Lt. Col. (Col. selectee) David M. Roeder welcomes him home after his ordeal in Iran.

—USAF Photo by SSgt. Rod Proudy

Lt. Col. David M. Roeder, left, and Col. Thomas E. Schaefer raise their arms triumphantly as they deplane at Andrews AFB, Md.

—USAF Photo by MSgt. Deal Toney

Vice President George Bush and Mrs. Bush, heading the receiving line of dignitaries, here welcome Col. Thomas E. Schaefer and his wife, Anita.

USAF Helps Early

The Air Force actually entered the picture even before its three

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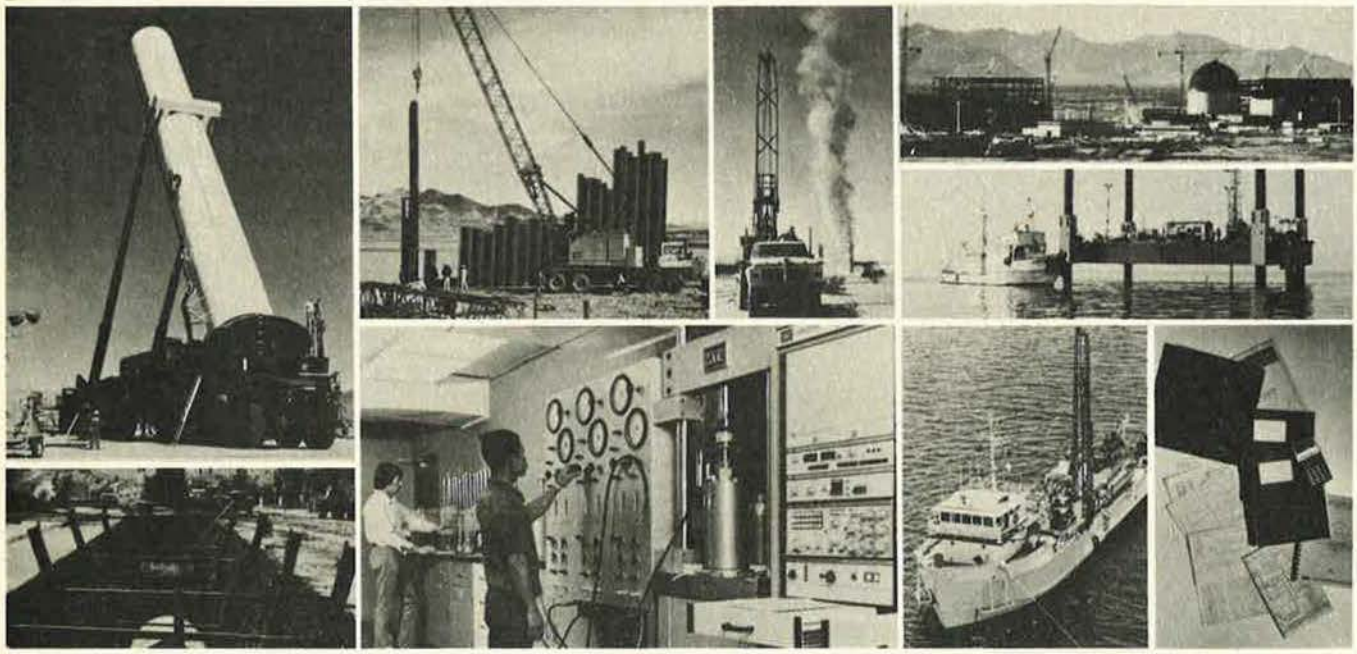

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members became hostages in Iran.

Located in the basement of the Pentagon is the USAF Personnel Readiness Center. When Air Force people become involved in a contingency anywhere in the world, the PRC, as an adjunct of the Air Force Combat Operations Staff, gets involved. When revolutionary activity started building in Iran, the PRC and the Air Force Manpower and Personnel Center (AFMPC) at Randolph AFB, Tex., assisted those USAF members who, with others, were being withdrawn from Iran.

With the storming of the US Embassy, support for the families intensified, explained Col. Gene Taylor, Chief of the Division in Personnel Plans that runs the PRC. His office established the policy and planning procedures that other elements of the Air Force were to follow in dealing with the families. The PRC became the Air Force point of contact for the Joint Staff, the Office of the Secretary of Defense, the State Department's Iran Working Group, and those offices helping hostage families from other services. Direct contact with the families was maintained by the Personnel Operations Center at AFMPC.

By February 1980, the three USAF hostages were officially declared "detained." This allowed USAF's Casualty Assistance Center at AFMPC to enter the picture, increasing the amount of assistance that could be given to the three families. In April, the CAC would become further involved in the Iran events, helping the families of those

—USAF Photo by SSgt. Rod Proudy

Col. Thomas E. Schaefer embraces his wife during their arrival at Andrews.

airmen killed in the aborted rescue attempt.

Kinds of Help

What kinds of help did the families of the three hostages receive? Some of it followed a set routine, as required in such cases. Much of it was based on individual family needs, including access to a toll-free number allowing families to contact the Casualty Assistance Center for help any time day or night. Regional Veterans Administration officials, accompanied by casualty assistance officers from Bolling and Offutt AFBs, visited the families to explain special entitlements.

For the State Department meetings and when the hostages came home, Air Force travel escorts for the families, preparation of orders, transportation, and lodging were all taken care of by the casualty assistance people.

The AF Accounting and Finance Center in Denver maintained the pay accounts for each of the three officers. Upon their return, they were given pay information packets explaining how their accounts were managed (allotments were started for one man to pay his mortgage and some routine bills) and itemizing the amount due each officer.

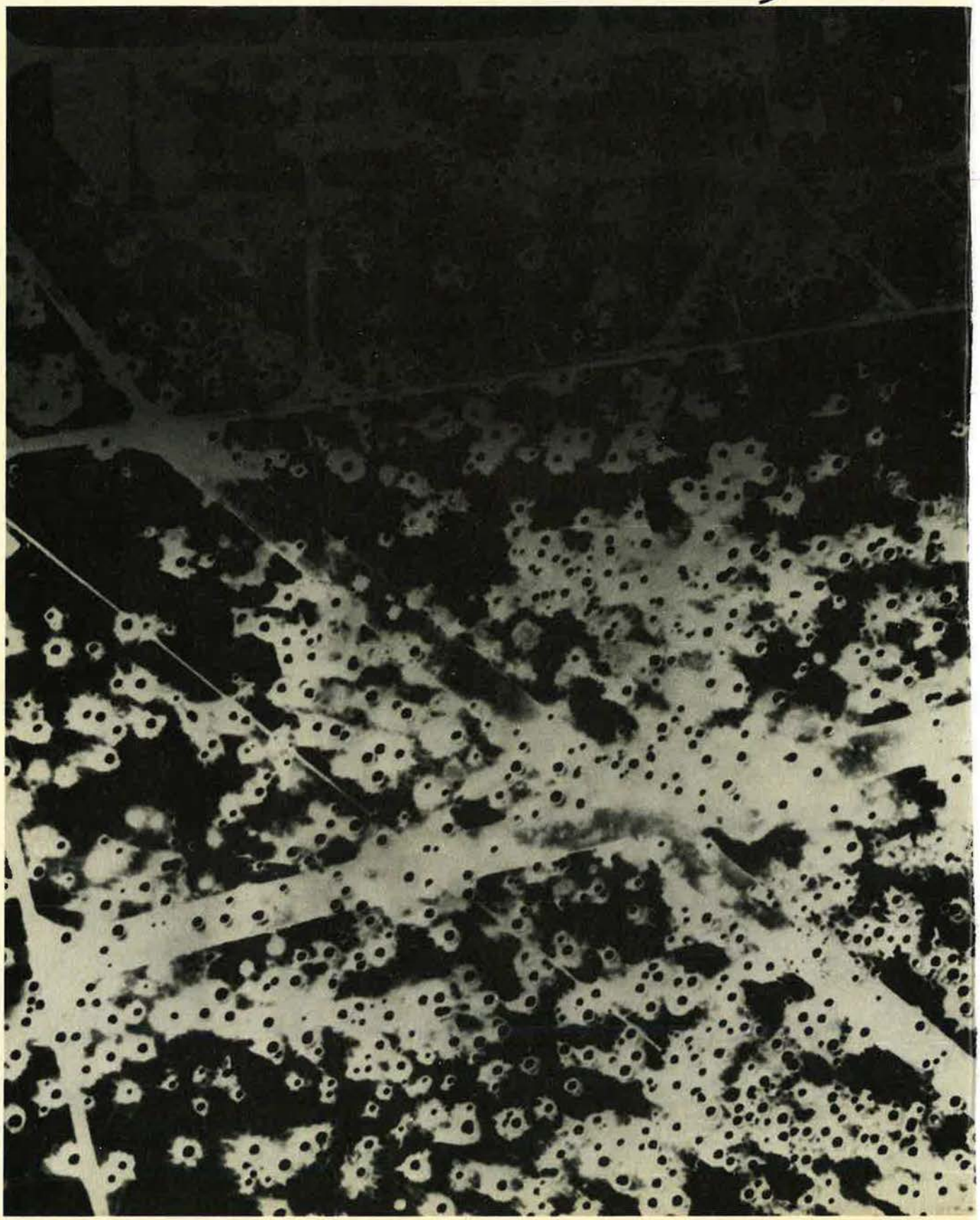
Other types of help are a tribute to how well the Air Force looked after the interests of its people. Lieutenant Colonel Roeder's name was purposely kept off the published list of colonel selectees to avoid antagonizing his Iranian captors. After Colonel Roeder arrived in Wiesbaden, at first he couldn't get his family by telephone, because he was competing with too many well-wishers who were calling his home. To solve the problem, the folks in the PRC had another phone installed in the Roeder home in a matter of hours. Earlier, as events began to move quickly for return of the hostages, it became harder and harder to reach the families. Each was loaned a telephone beeper, and when it beeped, a family knew to contact the PRC for information.

These are just samplings of the USAF effort on behalf of the hostages and their families. Many other Air Force offices and people contributed, as did many family friends. They worked behind the scenes and for the most part will go unheralded. It will be remembered, though, as the kind of effort that sustained the faith of the three former hostages and demonstrates that the Air Force in fact takes care of its own! ■

—USAF Photo by SSgt. Ernie Sealings

Well-wishers line the Andrews AFB flight line. Reflecting on his experiences, Colonel Schaefer remarked during a recent interview, "The fifty-two of us are not heroes–the heroes are the wives and the families."

Home, Sw



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Any pragmatic assessment of Soviet intentions in the foreign policy and military fields must start with an analysis of what Moscow does, rather than what its propagandists say. The central message that is being delivered by overt and covert Soviet actions is crystal-clear: The single most important military fact of life for the United States today, and into the decade of the 1980s, is the massive and continuing growth in Soviet military capability.

The Politburo's Grand Design: Total Military Superiority

BY EDGAR ULSAMER, SENIOR EDITOR (POLICY & TECHNOLOGY)

ONE OF the most illuminating tutorials on the inner workings of the Soviet system was held last year before the House Select Committee on Intelligence. Arkady Shevchenko, a Soviet career diplomat who for several years was the personal advisor of Foreign Minister Andrei Gromyko and who at the time of his defection held the rank of ambassador plenipotentiary while serving as the UN's Under Secretary General, told the committee: "The longer I served in the Soviet diplomatic service and the higher I rose, the more I saw the Machiavellian duplicity and fraud in Soviet foreign policy, and the more I was convinced that it was not a policy of peace but a policy of aggression, expansion, and enslavement of other people." Terming détente a convenient camouflage for ruthless Soviet power politics, he said the USSR is "engaged in an armaments program more rapid and intensive than any since Hitler's armament of Germany before the Second World War."

The Soviet Union clearly approaches its immutable central objective of global hegemony—meaning at a very minimum the imposition of a *Pax Sovietica* on the world—in a Clausewitzian fashion through the integration, orchestration, and flexible application of all politico-military tools. Military power, of course, is the paramount element of that arsenal. The fact that Soviet defense spending, in the view of US Sovietologists, now absorbs about twenty percent of the USSR's Gross National Product (GNP), compared with less than six percent in the case of this country, is alarming although not surprising. More ominous—and quite surprising—is a new development. Superimposed on the Soviet Union outproducing, outgunning, and outmanning the US militarily, this development presages a broad reorientation and reorganization of the Soviet Armed Forces that could multiply Moscow's military capabilities in the 1980s. While the makeup of the Soviet Armed Forces has undergone significant changes since the founding of the Red Army in 1918, little has changed in their doctrinaire character and the basic burdens imposed by restrictive and distrustful Communist ideology. But there is considerable evidence suggesting that the Soviet Armed Forces are on the verge—and may have already entered into—an era of fundamental reorganization and reorientation.

At the hub of the transition from Communist orthodoxy to streamlined pragmatism are two of the Soviet Union's most dynamic and nondoctrinaire personalities, Defense Minister and Marshal of the Soviet Union Dmitriy Fedorovich Ustinov and First Deputy Defense Minister and Marshal of the Soviet Union Nikolai Vasilyevich Ogarkov. While it is probably premature to make definite assessments of the reasons behind and the full ultimate scope of this reorientation, analysts of Soviet military thinking tend to believe that several principal factors provide impetus for these changes. As maturing weapons technologies in the Soviet Union—and elsewhere—tend to favor multirole over dedicated, single-purpose systems, forces focused on narrow mission areas represent a less than prudent use of resources and manpower. The latter point is critical because demographic trends in the Soviet Union are transforming that nation from one with a manpower surplus to one with a manpower shortage. Another condition is also feeding the momentum toward change. More and more of the superannuated *apparatchiks* who rose to top command rank in the Armed Forces because of their clout within the Communist Party rather than military professionalism are being turned out to pasture and replaced by a new breed of dynamic professionals. These relatively young general officers, well educated and eager to challenge the status quo, are rattling the cage of monolithic, immutable traditionalism by favoring efficiency and effectiveness over stodgy and stale dogma.

The reorganization of the Soviet Armed Forces seems to be headed toward arrangements that vaguely resemble the US pattern of unified, specified commands and the creation of autonomous, "purple suit" forces. There is no evidence to believe that these changes repre-

sent "mirror-imaging" of the US. The revamping suggests an approach tailored to Soviet geography and objectives. Discernible payoffs include increased readiness, less waste of manpower and materiel, quantum jumps in responsiveness and flexibility, and streamlined command structures.

Obviously, the reorientation and reorganization are producing both gainers and losers. Among the latter, US analysts predict, will be the Strategic Rocket Forces and PVO-Strany, the national air defense forces. These organizations will probably be relegated initially to the function of raising and training personnel in their respective areas of expertise without administering any operational forces. Ultimately, they might disappear completely. In the case of PVO-Strany, the change is likely to result in the transfer of some of its assets to Frontal Aviation, one of the three major components of Soviet Air Forces. PVO-Strany is considered a major target in the revamping process for two reasons. First, the greater versatility of the new generation of Soviet fighters makes it attractive to use them as main-line systems of Frontal Aviation, as well as strategic interceptors for homeland defense. Secondly, Soviet military planners seem to have recognized that the US bomber threat is not what it used to be and does not justify the extravagant assignment of personnel and weapon systems that had been lavished on this mission. With a force strength of some 550,000, PVO-Strany at present absorbs almost as much manpower as the entire USAF.

Under the emerging arrangement, the distinction between strategic and tactical forces becomes blurred. In peacetime, command authority over *all* forces located in given areas seems to be shifting to the Military District Commanders. It is not clear how the command structure changes in war and periods of crisis except that under certain conditions theater commanders would acquire considerable autonomy. Although the reorganization has not yet reached the lower echelons of the Soviet Armed Forces, US analysts believe that eventually all levels will be affected. Further, all Soviet allies, such as the Warsaw Pact nations as well as the growing number of Third World countries that receive Soviet military assistance and have Soviet military advisors can be expected to reorganize their Armed Forces along the new pattern.

While it is premature to predict when the transformation of the Soviet and affiliated forces will be completed, US analysts interviewed by AIR FORCE Magazine harbor no doubt that the momentum toward total reorganization is unstoppable. The consequence, they believe, will be a dramatic magnification of Soviet military power.

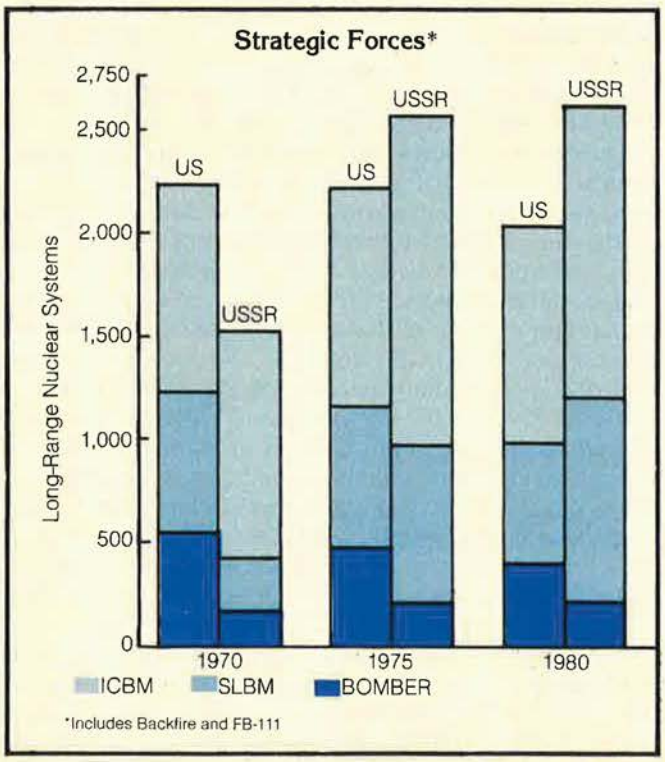
Brittleness Portends Mounting Military Adventurism

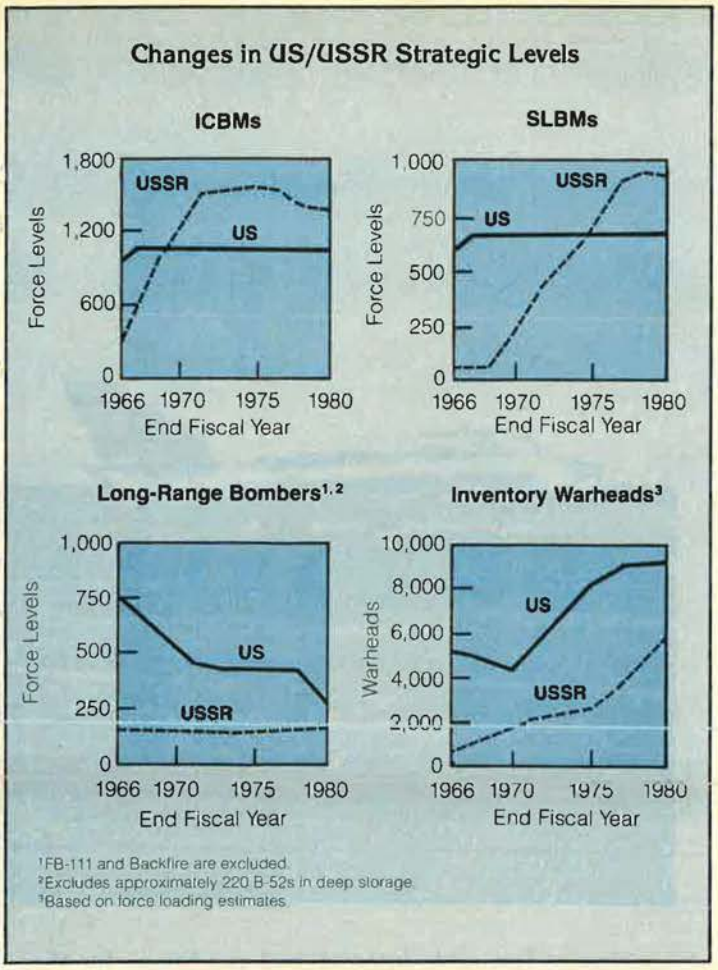
It is *possible* that adverse internal political and economic trends of major intensity contribute toward moves to get "more bang per ruble." It is *certain*, as Dr. Zbigniew Brzezinski, former White House National Security Advisor, put it recently, that these trends make military power the "main resource available to the Soviet leadership for dealing with many domestic as well as foreign problems."

While it is also possible to argue about the eventual consequences of the economic slowdown that continues to affect the Soviet Union, there is no question about stagnation accentuating the deep gap in the standard of living between the privileged elite—mainly military and Communist Party leaders—and ordinary Soviet citizens. As elitism takes on a more and more unbridled nature—vying with if not exceeding the chasm between "haves" and "have-nots" of the Czarist era—the incentives for military leaders to perform in order to secure their place in the sun become ever more compelling. The latest turn on the road to Soviet "egalitarianism," for instance, makes it possible for top leaders to bequeath their "dachas," luxurious country villas, and the *ne plus ultra* "perks" in Russia, to their families.

Concurrent with the widening gulf between the numerically small upper class and the underprivileged masses are demographic shifts within the Soviet Union that are causing formidable social pressures, especially from the non-Slavic Soviet republics. Dr. Brzezinski sagely argues that these two trends "heighten the probability of East-West confrontation and increase the risks of Soviet miscalculation and even war." He suggests that "it would be escapist to believe that domestic difficulties by themselves are likely to constrain and moderate Soviet assertiveness abroad." He adds, therefore, that Russian power is likely to be injected with increasing frequency into the international anarchy that so characterizes this decade.

There is a surfeit of evidence to back up this contention of waxing Soviet assertiveness. The insertion of Soviet military forces into Afghanistan to prop up a shaky satellite represents a fundamental departure from past Soviet policy. But this willingness to deviate from the stratagem of letting others fight the Kremlin's battles by no means signals the end of the convenient and painless use of surrogate forces. To the contrary, the





latter tactic is being refined to achieve unprecedented levels of discreet interventionism. In what can be called the second stage of the surrogate forces policy of the Soviet Union, the Kremlin is manipulating its surrogate warriors, such as Castro, to raise, train, arm, and control surrogate forces of their own.

As Soviet interventionism is being "laundered" by an additional tier of surrogates, the Kremlin's capacity for global troublemaking goes up while the risk of exposure—as the behind-the-scenes culprit—goes down. The concomitant is an increase in the USSR's ability to generate wider chaos in order to divide and conquer the Third World. Central and South America, Asia, and Africa appear to be the principal areas that Moscow has targeted for interventionism by the second tier of its surrogate forces.

The Charade of Peaceful Coexistence

One of the semantic "Trojan horses" that Moscow relies on to infiltrate and befuddle free world ideological and even military defenses is the term *peaceful coexistence*. A daring creation of the Soviet "disinformation" apparatus, the Kremlin's propagandists make clear that "peaceful coexistence between states with different social systems not only does not mean peaceful ideological coexistence, but, on the contrary, presupposes the intensification of the struggle of ideas."

Further, in decoding Soviet political language, it becomes obvious quickly that the term "struggle of ideas" extends far beyond its conventional meaning. Indeed, the neo-Clausewitzian coloration that Moscow gives the term encompasses psychological warfare, subversion, and "wars of liberation" involving nations deemed ripe for inclusion in the Communist orbit.

As the CIA's Director for Operations John McMahon told the House Select Committee on Intelligence, "Clandestine interference in the affairs of a Third World government that brings a pro-Soviet Marxist regime to power, or arms delivered to a national liberation organization may be defended in Moscow on the grounds of promoting the USSR's revolutionary ideals, but the Kremlin views such actions also as contributing to the defeat of international imperialism and the enhancement of the Soviet state's power and influence." A dead giveaway of what the Soviets mean by "struggle of ideas" is the very name with which the Politburo of the Central Committee of the Communist Party refers to operations of this sort: *aktivnyye meropriyatiaya,* meaning active measures, including paramilitary, blackmail, kidnapping, and forgery operations.

Active measures, in terms of disinformation and covert action, are being carried out, under direct Politburo guidance, by a number of party and government organizations, including the Central Committee's International and International Information Departments and Service "A" of the KGB. These organizations, according to the CIA, are supervised directly by the Politburo and answerable only to the top leadership of the Kremlin, to wit, CPSU General Secretary Leonid I. Brezhnev and Senior Secretary M. A. Suslov in the case of the two Central Committee Departments. Yuriy Andropov, a full member of the Politburo, oversees the KGB's *active measures*. This leadership structure makes it easy for the Kremlin to integrate foreign propaganda and covert action with the broader goal of Soviet power politics. Western détentists will find little solace in the fact that the current covert action and propaganda structure did not come into being until March 1978—in the middle of SALT II—when the Central Committee ordered a new propaganda offensive against the West. Closely coordinated with its satellites, surrogates, and subsurrogates, the propaganda/covert action apparatus manipulates some seventy pro-Communist Parties, international front groups, and "national liberation" movements.

The Soviet Union's own investment in *active measures* is estimated conservatively at about $3 billion per year. In addition, according to the CIA, "The Soviets have established a worldwide network of agents, organizations, and facilities [that] is second to none in comparison to the major world powers in its size and effectiveness. The Soviets also draw upon the services of their East European allies and Cuba to provide financial, technical, and operational support for plans that are formulated by the Moscow Center. Reliable defector testimony as well as our own observations over the years confirm that in certain specialized areas of covert action—such as the production of fabricated US government documents—some of the Soviet bloc intelligence services render invaluable aid to their senior partner in the Soviet Union."

A key ingredient of Soviet *active measures* are forgeries "intended to serve important strategic and tactical

objectives of Soviet foreign policy, and they are designed to damage US foreign and defense policies, often in very specific ways," according to the Central Intelligence Agency.

In two recent cases, for instance, Soviet forgers directly attributed false and misleading statements to the President and Vice President of the United States. Recent Soviet forgeries fall into three groups, according to CIA testimony: "A single forgery, a bogus US Army field manual, has surfaced in more than twenty countries around the world and has received substantial media attention. Soviet propagandists have exploited it repeatedly to support unfounded allegations that the US acts as the agent provocateur behind various foreign terrorists, in particular the Italian Red Brigade. A series of current forgeries, which now totals eight examples, has been aimed at compromising the United States in Western Europe and provoking discord in the NATO alliance. . . . Another current series of seven falsifications has been directed toward undermining our relations with Egypt and other countries in the Arab world."

One of the key targets of the current Soviet disinformation programs is the agreement between the US and its NATO allies to modernize long-range theater nuclear forces (TNFs). Another perennial target of Soviet disinformation in Europe is the deployment by the US of enhanced radiation/reduced blast nuclear weapons, colloquially known as the "neutron bomb." In September 1979, for instance, the Chief of the International Department of the Hungarian Communist Party, Janos Berecz, wrote that "the political campaign against the neutron bomb was one of the most significant and most successful since World War II."

He went on to say: " . . . we have no reason to feel satisfied. It was a good program that the European Communist and Workers' Parties adopted in Berlin three years ago, but we think it is in our common interest to make greater efforts than so far for the implementation of this program and for strengthening the antiimperialist unity." The Soviet Ambassador to The Hague at that time was decorated by the CPSU in recognition of the success of the Dutch Communist Party that—under his direction—spearheaded the antineutron bomb campaign. That campaign has been subsumed in the current anti-TNF campaign.

Another major tool in the Soviet covert action warfare arsenal is economic "warfare," meaning the preemptive buying and selling of commodities. This is being carried out for stockpiling purposes and for denying crucial products to the US. While engaging in such activities, Moscow makes sure that it obtains maximum advantages for itself as it, for example, deals in gold and other scarce materials.

Broad Military Mission

The Soviet Armed Forces have been given responsibilities and tasks by the CPSU that extend beyond the traditional military mission. Included are these responsibilities:

- Defend the USSR as the socialist homeland and ensure the decisive and full defeat of any enemy who would dare attack the Soviet country.

- Ensure favorable international conditions for the building of socialism and communism.
- Ensure together with other socialist countries the reliable defense and security of the entire socialist camp.
- Provide support and military assistance to national liberation movements.

The Soviet Union's investment in military power is vast and growing. At his last press briefing before leaving office, former Defense Secretary Harold Brown announced that the Soviet Union was boosting its military power at a massive, relentless pace that exceeded the US in output as well as investment by between thirty and fifty percent. Over the past twenty years, he added, Soviet defense spending grew at an average annual rate of between four and five percent.

Other analysts, including William T. Lee, a respected congressional consultant on Soviet economic activities in the military sphere, pegs the increase in total Soviet defense expenditures at between six and seven percent per year over the past few years. The increase in the rate of weapons procurement, in his view, proceeds at a yet higher rate, averaging more than ten percent annually. The current Soviet Five-Year Plan, according to this estimate, provides for the cumulative procurement of weapons to the tune of at least 400 billion rubles, which equates—depending on the formula used—to between $300 billion and $500 billion.

Former Under Secretary of Defense for Research and Engineering William J. Perry recently told Congress that the US would have to roughly triple the production of ordnance to match that of the Soviet Union. And

Soviet Frontal Aviation consists of about 4,800 modern fixed-wing tactical aircraft, represented by the Su-17s (Fitter-H) above, as well as some 5,200 combat helicopters.

then, he added, "as we finally got those weapons deployed, we would have to double the size of our peacetime Army to man those weapons." The difference in tactical aircraft production is smaller than in other categories. However, he said: "They are producing tactical aircraft at a rate about two times our rate and have been [doing so] for the past ten years."

Current assessments of Soviet defense spending, force levels, and related issues may well involve the type of gross underestimations that they have in the past. Whether this is of more than historical and academic importance can be debated. To say that US responses in the past to Soviet weapons buildups would have differed had there been more accurate threat estimates by the national intelligence estimate (NIE) is probably a cop out. With all estimates containing essentially three assessments—a low, medium, and high forecast—US defense spending has failed consistently to respond even to the lowest level even though in many cases the Soviet level of effort was found subsequently to have exceeded the high forecast.

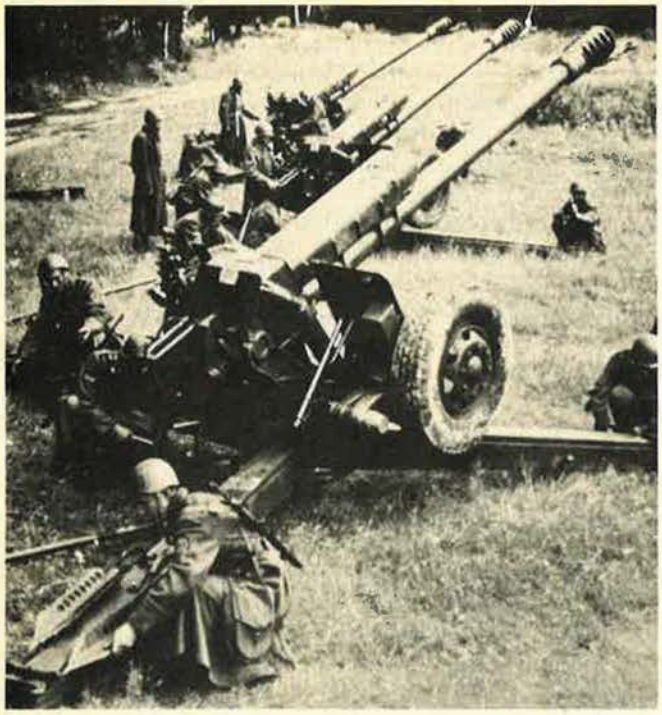
One of the best indicators of the impact of rising Soviet defense expenditures on the economy is the rapid growth in the share of weapons procurement in that nation's production of machinery and equipment. That share, Mr. Lee told Congress recently, shot up from about twenty percent in 1966 to well over fifty percent in 1980. Although it may be risky to forecast specific long-term trends in Soviet defense spending before the Twenty-sixth Party Congress convenes later this year, there is reason to predict that continued rapid growth in defense expenditures—with attendant burdens on the Soviet economy—is foreordained. Mr. Lee's testimony before the House Select Committee on Intelligence on this point is revealing: "All indications are that the Soviets will procure about 100 major weapon systems in the 1980s, just as they have done in [each of] the past two decades. Some of the systems in production, such as the Alpha-class submarine, are extremely expensive. Some of the systems under development, such as the advanced Foxbat interceptor, will be very expensive to produce."

The main thrust of Soviet defense programs in the 1980s, he suggested, will be in strategic defense systems, simply because the Soviets already have realized most of the damage-limiting potential of strategic offensive systems. The big gaps between Soviet war-fighting requirements and capabilities involve defensive systems of various kinds, from cruise missile defense and ballistic missile defense to antisubmarine warfare. It is probable, therefore, that the Soviets will break out of the SALT I ABM Treaty in the mid-1980s, according to Mr. Lee. The Soviets are likely to modernize the Moscow ABM defenses—currently consisting of sixty-four launchers, rather than the 100 allowed by the treaty—and then go on to nationwide BMD deployments, he predicts.

Dr. Brown, in his final Annual Defense Report to Congress, stated that the "Soviet commitment of massive resources to defense has produced significant gains in military capabilities across the board. Their strategic nuclear arsenal now includes both ICBMs that are sufficient in numbers and accuracy to pose a serious threat to our land-based missile silos, and a ballistic missile submarine fleet that is much larger and more capable than in the past. Their long-range theater nuclear forces, of special concern in Europe, have been greatly augmented by the MIRVed SS-20 missile and the Backfire bomber. Their navy is no longer merely a coastal patrol force, but now possesses considerable and growing sea control and power projection capabilities. Their ground forces can deliver more firepower, with greater mobility than ever before, and their capability to conduct chemical warfare (CW) continues to grow at an alarming rate."

Dr. Brown warned that "this robust growth in military power yields potential benefits for the Soviets in at least two ways: in any number of scenarios, it could alter the outcome of a war, and as important . . . this augmented military power, if not offset by our collective efforts, could translate into enhanced political power for the Soviets in situations short of war."

The outlook for the 1980s, he told Congress, "is that the Soviets will continue to rely on their growing military might to enhance their international political leverage. In Europe, they confront the West with both the carrot of the tangible rewards of détente (cross-border visits and expanded trade, including sale of Soviet oil and gas, for example) and the stick of a powerful, modern Warsaw Pact fighting force configured and deployed for a possible attack across the NATO-Pact borders. In Africa and in Latin America, they continue to use their various surrogates to exploit local tensions and to chal-



Soviet general-purpose forces are being modernized by the expansion of both division and nondivisional artillery, with emphasis on such self-propelled weapons as the 122-mm howitzer depicted here.

lenge the stability of nations and regions that are of interest to us. In Southwest Asia and the Persian Gulf region, Soviet military power looms larger and nearer than ever before. In the Far East, North Korea remains a regional power and threat, and Vietnam has already become an extended arm for Soviet naval power."

Quantitative and Qualitative Superiority

Although Soviet propagandists don't admit it, CPSU directives promote quantitative and qualitative superiority over the US in weapons development and procurement. Toward this end, the Soviet leadership is willing to spend an inordinately high portion of its GNP on defense. The tangible evidence underlying this conclusion is too overwhelming to be seriously contested even though there are disputes within the intelligence community over whether the share of GNP devoted to military matters is more or less than twenty percent.

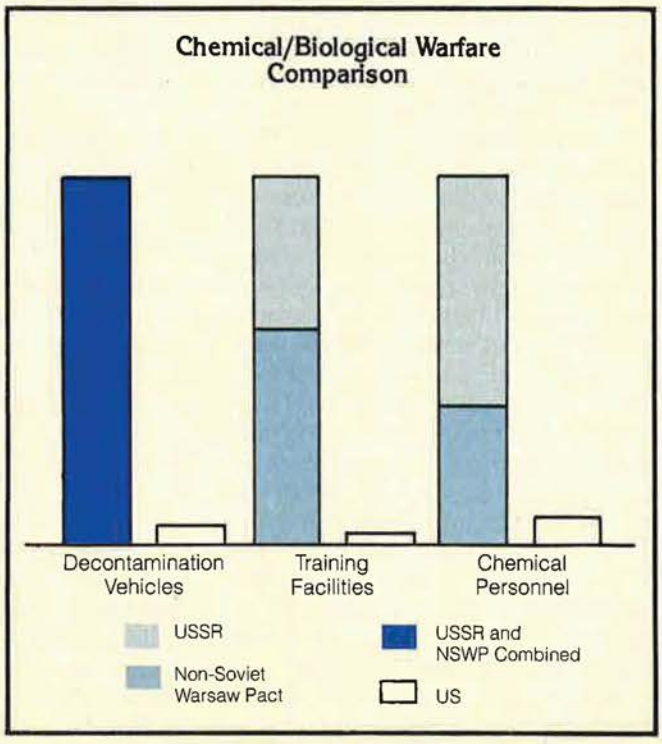
Equally clear is the fact that precipitous declines in the overall Soviet economic picture seem to have had no effect on defense spending in the past. In all likelihood, therefore, CIA forecasts about energy and economic crises in the Soviet Union during this decade will not appreciably affect the programmed growth in military investments.

The contention by the Joint Chiefs of Staff that the USSR is outgunning, outmanning, and outproducing this country can be made palpable by truly ominous general-purpose force statistics: The USSR leads this country in military manpower 4,400,000 to 2,000,000; in tanks 50,000 to 10,500; in artillery 40,700 to 18,000; and in major warships 523 to 260.

As former Defense Secretary Melvin Laird has pointed out, "When one compares overall US modernization trends with those of the Soviet Union in the area of conventional forces, one is led to [the conclusion that] US capabilities are declining relative to those of the Russians. Not only do they have a larger force structure now, they will have an even larger one in the future. Over the past seven years, the Soviets have introduced into their conventional forces four new classes of tactical fighters and a new class each of tanks, armored personnel carriers, sea control aircraft carriers, and amphibious ships. They have produced one new attack submarine per month (we produce one per year). Between now and 1985, the Soviets will begin construction of three nuclear-powered aircraft carriers, complete a class of 32,000-ton cruisers, replace the forward edge of their armored force in Central Europe with a more heavily armed and heavily armored tank, and increase significantly their arsenal of surface-to-surface missiles."

Dr. Perry illustrated the deteriorating balance in the two countries' tank production and inventory when he told Congress that the Soviet Union will be producing its newest tank, the T-80, at a rate of 2,000 units per year, or twice the number of tanks that the Pentagon hopes the US will produce annually during the same period. The Soviet T-72 tank, in the view of US analysts, is the best operational weapon system of its kind at this time. Yet the Soviets are making this tank available to their satellites and for foreign military sales. The USSR, therefore, developed a follow-on system of superior performance, the T-80, that initially at least will be reserved for use by Soviet forces only.

The move toward qualitative and quantitative superiority is manifest also in the field of tactical airpower. Not only is the Soviet Union producing tactical aircraft at a rate of about 1,150 units per year—compared to about 500 such aircraft for USAF and the US Navy com-



bined—but their quality is approaching US levels. Various versions of the MiG-23, the modified MiG-25, and the MiG-27, according to Dr. Perry, "are not modeled on the simple, straightforward designs of the MiG-19 and MiG-21. They are sophisticated, very capable airplanes." As a result, the narrow performance edge that the most modern US designs hold over their Soviet counterparts might prove insufficient to "compensate for the numerical advantage of Soviet Air Forces." Pentagon intelligence analysts predict a production run for the multirole MiG-23 well in excess of that of the F-4, of which more than 5,000 have been built to date.

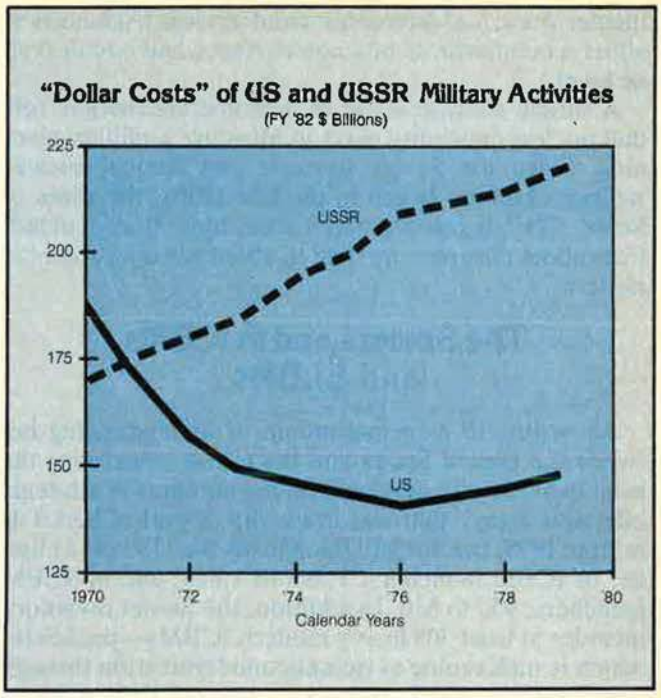
While there is circumstantial evidence that the Soviets are working on three new tactical aircraft designs, most US analysts at this time believe only one—a multirole fighter/interceptor—will be committed to production in the near future. Stressing sophisticated look-down/shoot-down capabilities, this system seemingly is optimized for interception of both tactical and strategic cruise missiles and aircraft penetrating at low levels. US experts view the next generation Soviet fighter/interceptor with awe since it combines the leading edge of several technologies—from aerodynamics and propulsion to avionics—to achieve marked performance gains over existing Soviet combat aircraft. The end result, some of the experts fear, may be a technological surprise that could alter the tactical airpower equation for the remainder of this century.

Another factor that threatens the superiority of US tactical airpower is the recent entry into the operational inventory of the SA-10 surface-to-air missile system. Far and away the most capable and sophisticated SAM in existence anywhere, the SA-10 is a multirole weapon system that serves in tactical, strategic, and naval missions and can be employed in both a static and mobile mode. Although only a small number of operational systems has been deployed so far, there are indications that the SA-10 is to be produced in massive quantities and will represent a major threat to US strategic and tactical airpower in all its forms.

Magnifying the performance gains that Frontal Aviation derives from the massive infusion of new, modern aircraft is the introduction of modern munitions, such as infrared-guided missiles and other precision-guided "smart weapons." The current inventory of Frontal Aviation is comprised of some 4,800 fixed-wing aircraft and more than 5,200 helicopters. Frontal Aviation's three modern ground-attack aircraft, the Fencer-A, Fitter-D, and Flogger-D, appear to be equipped with onboard electronic countermeasures and electronic counter-countermeasures equipment to aid in penetrating defenses. Also, these aircraft are able to operate at night and in adverse weather; nevertheless, visual target acquisition is required for their most effective performance.

The Strategic Equation

The US tendency to ascribe doomsday qualities to nuclear weapons and, hence, to treat nuclear war as unthinkable is not being shared by Soviet political and military leaders. Although Soviet theoreticians, like their brethren in the West, initially tended to view the use of nuclear weapons as suicidal and eschatological,



this notion was reversed in the early 1960s. True, in polemics earmarked for Western consumption, the top leaders of the Soviet Union continue to espouse the principle of mutual assured destruction, along with the assertion that in case of nuclear war the "living would envy the dead."

At the same time, the makeup of Soviet strategic and theater nuclear forces—especially in terms of trends of the past decades as well as all authoritative military texts—leaves no room to doubt Soviet determination, *in extremis*, to be ready to fight and win nuclear wars of any kind. Undergirding the Soviet nuclear war-fighting/war-winning posture is the precept of a "combined-arms approach," meaning a continuum of strategic, theater and conventional capabilities. In Soviet military thought these mission areas are fused into a totality that determines all military capabilities, just as there is the tendency to merge military operations into unified tactics that draw impartially on offensive and defensive forces of any kind.

Western analysts seem to have as much trouble accepting this Soviet *mindset* as they do in regard to Moscow's refusal to draw a distinction between deterrence and war-fighting or Soviet intermixing of détente and aggression.

The "combined-arms approach" concept gives rise also to the requirement that the Soviet Union and its military forces be prepared for both a short and protracted nuclear war. The assumption is that a protracted strategic war would first lead to a decisive stage involving the massive use of nuclear weapons, and then a concluding phase that might even be confined to a conflict with conventional weapons.

The Soviet war-winning/damage-limiting precept posits that strategic offensive forces, in the main ballistic missiles, are the bedrock of a nuclear strike capability because they are well suited—by dint of flexibility and adaptability—for discrete levels of nuclear warfare: tactical nuclear theater warfare; use of nuclear forces in

theater wars; and intercontinental nuclear exchanges at either a counterforce or a counterforce and countervalue level.

A simple statistic is apt to demonstrate the key role that nuclear capability plays in Moscow's military planning. Since the Soviet strategic and tactical nuclear weapons buildup began in the late 1950s, the share of Soviet GNP devoted to defense has more than doubled, from about nine percent then to about twenty percent at present.

The Soviet Lead in ICBMs and SLBMs

According to a memorandum of understanding between the United States and the USSR "regarding the establishment of a data base on the numbers of strategic offensive arms" that was drawn up as part of SALT II in June 1979, the Soviet Union leads the US in the number of ICBM launchers, 1,398 to 1,054; and in SLBM launchers, 950 to 656. In addition, the Soviet inventory includes at least 308 heavy modern ICBMs—the SS-18, which is undergoing systematic modernization through a series of so-called "mods"—while the United States has none.

The accuracy of the SALT II inventory is subject to questioning. By counting only launchers rather than missiles, it does not curb effectively the "reloading" of silos by using "cold-launched" missiles. It becomes vital, therefore, to examine what the USSR *is doing* and the US *is not doing* in this area.

First off, two of the three types of the so-called fourth-generation Soviet ICBMs that make up the bulk of the USSR's arsenal are "cold-launched," meaning that silos housing them can be refurbished relatively quickly for "reloading." Again, none of the US ICBM systems are so equipped.

Secondly, late last summer, the Soviets conducted an exercise involving the reloading of twenty-five to forty SS-18 ICBM silos. While it is not clear that this exercise violated the provisions of SALT II in a narrow legal sense, it runs afoul—in the view of most US analysts—of the intent of the accord. SALT II prohibits the "rapid reloading" of ICBMs, albeit in a somewhat waffled way.

More importantly, the accord almost invites stratagems for "break out" from its ceiling on the permissible number of ICBMs by counting launchers rather than missiles. The section of the accord pertinent to the recent SS-18 reloading exercise obligates the signatories "not to supply ICBM launcher deployment areas with intercontinental ballistic missiles in excess of a number consistent with normal deployment, maintenance, training, and replacement requirements."

In an "agreed statement"—meaning a mutually agreed-to clarification of the official treaty text that is not an integral part of the latter—"normal deployment requirements" are defined as "the deployment of one missile at each ICBM launcher." The official treaty text also makes it illegal to "develop, test, or deploy systems for rapid reload of ICBM launchers." There is no real definition in the official text or the appended statements and common understandings of what constitutes "rapid reload." Informally, the US view is that rapid reload means anything less than twenty-four hours.

The frailty of the reload definitions had been recognized by Congress long before former President Carter signed SALT II. On December 23, 1978, for instance, the House Armed Services Committee's SALT panel warned in a special report that "with the deployment of the cold-launched SS-17 and the SS-18, the Soviets have already acquired the capability to reload and reuse their silos with extra missiles." The SALT panel added that "reload times for cold-launch ICBM systems, according to testimony before the committee, would take only a matter of hours. The absence of a secure retaliatory US ICBM capability, in combination with the existing Soviet ICBM reload capability, could thus pose a serious asymmetrical threat to a stable strategic environment."

The number of Soviet ICBMs available for launcher

Introduction of US and Soviet Nuclear Delivery Systems
(Since 1950s)

	SOVIET SYSTEM	US SYSTEM
ICBMs	SS-11	Titan II
	SS-13	Minuteman II
	SS-17	
	SS-18	Minuteman III
	SS-19	
SLBMs	SS-N-4	Polaris A-3
	SS-N-5	Poseidon
	SS-N-6	
	SS-N-8	
	SS-N-18	
Bombers	Badger	B-52
	Bear	FB-111
	Bison	
	Blinder	
	Backfire	

Soviet MIRVed ICBMs

Missile	SS-17		SS-18			SS-19	
No. Deployed	About 150		More than 300			About 300	
Mod No.	1	2	1	2	3	1	2
No. of Warheads	4	1	1	8 or 10	1	6	1
Max. Range (km)	10,000	11,000	12,000	11,000	16,000	9,600	10,000
Launch Mode	cold	cold	cold	cold	cold	hot	hot
Fuel	liquid	liquid	liquid	liquid	liquid	liquid	liquid

reloading or use without hardened silos—in conjunction with gantries erected on presurveyed sites—is estimated to be in the thousands. Sen. Jake Garn (R-Utah), for instance, asserted recently, "We have no idea how many missiles the Soviets have. We can't even account for third-generation missiles [such as SS-9s and SS-11s] we know they produced for initial deployment in these silos."

The reload exercise covered a five-day period and reflected a scenario keyed to nuclear wars lasting several months. The SS-18 is the world's largest ICBM. Under SALT II rules SS-18 can carry up to ten MIRVs, but it has been tested for the release of fourteen warheads.

Beyond the fourth generation of Soviet ICBMs —comprising the SS-17, SS-18, and SS-19—yet another family of ICBMs, the fifth generation, is taking shape. Several US analysts believe that some of the latest "mods" of fourth-generation ICBMs involving ever more advanced and capable post-boost vehicles and more accurate and lethal reentry vehicles are fifth-generation designs. Other experts disagree. What is certain is that US intelligence systems last year produced evidence of two new Soviet ICBM silos at the Semipalatinsk site. Larger than the SS-18 silos, the new silos, whose construction got under way about a year ago, appear to differ from one another slightly. The Soviets have also built five new silos at Plesetsk, north of Moscow, and three at Tyuratam in Kazakhstan. The latter appear to be test facilities for fifth-generation ICBMs.

Strategic Statistics

The latest Defense Report updates the official SALT II inventory of Soviet strategic offensive forces. The ICBM force is said to now consist of more than 500 SS-11s, fifty SS-13s, about 150 SS-17s, more than 300 SS-18s, and about 300 SS-19s. The last three types, Dr. Brown's report disclosed, are MIRVed. The current modernization phase is nearing completion and "will give the Soviets a sufficient number of accurate warheads to pose a serious threat to our fixed silo ICBM force."

The report suggests also that the Soviets "may develop mobile ICBMs other than the SS-16, which has already been developed but not deployed." There are indications also that the Soviets launched a massive cruise missile program, involving the SS-NX-19, which will involve airborne, submarine, and mobile ground-based launch platforms.

The Soviet ballistic missile submarine force, according to Dr. Brown, currently consists of SS-N-6 missiles on Yankee-class submarines, SS-N-6s on a Golf-class submarine, SS-N-8s on Delta I and II class SSBNs, SS-N-8s on Golf and Hotel classes, and MIRVed SS-N-18s on the Delta III class. (There are also SS-N-5s on Hotel submarines, and launchers of the experimental SS-NX-17 on a Yankee submarine.) Modernization of the Soviet submarine-launched ballistic missile force also continues with both new submarines and new missiles. New Soviet SLBM systems will be qualitatively superior to those they replace. They will probably be more accurate and have greater throw-weight, and the new Typhoon SLBM (the SS-NX-20) almost certainly will be MIRVed.

The new SS-NX-20—roughly equal in size to MX—is expected to be deployed in the 27,000-ton Typhoon SSBN in the mid-1980s. It is possible that the Soviets will also develop follow-on SLBMs as replacements for the SS-N-6, the SS-N-8, and the SS-N-18.

The Long-Range Aviation (LRA) operational force of long-range bombers consists of forty-nine Bison bombers and 100 Bear bombers and air-to-surface missile carriers, as well as Soviet Naval Aviation (SNA) ASW aircraft. A new long-range bomber is under development.

In addition, the Soviet LRA force of bombers includes sixty-five or seventy Backfires and about 320 Badgers and 140 Blinders. With continued deployment of more Backfires to Long-Range Aviation (and to Soviet Naval Aviation units as well), this component of the Soviet bomber force is becoming larger and more capable.

Conventional Soviet Naval Forces

The Soviets are making significant changes in the character of their general-purpose warship construction. Several new classes of surface ships and submarines are being developed and deployed. The Soviets clearly have chosen to introduce a small number of large, highly capable units that can operate over wide ocean areas. At the same time, construction of traditional combatant types continues.

According to the Defense Report, Soviet general-purpose submarine construction is accelerating. Production of the Victor III and Alpha SSNs (attack submarines) is under way, while construction of the Charlie II class submarines continues at a slower rate. The gigantic new Oscar-class cruise missile submarine is about to enter service.

The new surface combatant classes are beginning to appear at sea. The first of at least two Kirov-class nuclear-powered guided missile cruisers—displacing 22,000–25,000 tons—left the Baltic last fall and sailed to northern waters for weapon trials. The second ship is expected at sea in the mid-1980s. A new general-purpose guided missile destroyer also operated in the Baltic for the first time in mid-1980, with several sister ships expected through the early 1980s. Larger numbers of a second cruiser class are anticipated, and a second destroyer class—which appears to be an ASW ship not unlike the US Spruance-class in size and layout—is also under construction.

Construction continues on Krivak-class guided missile frigates, Grisha-class light frigates, and a wide variety of mine warfare and patrol vessels. Production of amphibious lift ships remains modest, with commercially operated roll-on/roll-off ships the major increasing threat in this area.

Sixty-three years after the founding of Lenin's Red Army and Navy of Workers and Peasants, there may be basis for asserting, as Dr. Brzezinski does, that the Soviet system is entering a phase of protracted internal difficulties, that it is becoming stagnant and brittle, and that its ideology and its economy are faltering. But these real or perceived shortcomings notwithstanding, the juggernaut of Soviet military might grows at a relentless, awesome rate, singlemindedly dedicated to the goal the CPSU has set for it: total superiority over the non-Communist world. ■

The consistency of Soviet military doctrine and its applications to force structure and the use of force are often given short shrift by Western policymakers, to their peril. In so doing, they ignore . . .

Deterrence vs. War-Fighting: The Soviet Preference

BY DR. PAUL HOLMAN

Moscow draws an indelible line between deterrence and war-fighting. Deterrence, for the Soviets, is primarily the province of the diplomat, the disinformer, and the propagandist, while war-fighting is now and always has been the primary pursuit, preoccupation, and passion of the Soviet military strategist. This distinction is deeply rooted in the very nature of the Soviet system and clearly reflected in the voluminous Soviet literature on modern warfare. The impact of this war-fighting orientation is both heavy and omnipresent, with the result that it is most unlikely to vanish or even to lessen significantly over the 1980s.

American observers of Soviet affairs have been remarkably slow to appreciate Moscow's war-fighting preferences. Although individual scholars and some research institutes have worked hard to correct this ignorance, Soviet military doctrine remains *terra incognita* for a surprising number of scholars, journalists, and analysts.

At Crimean conference, February 1945, Marshal Stalin (right) talks with gestures to his Foreign Minister, V. Molotov. Stalin blended military power with doctrine.

As a result, the Soviet concept of strategic superiority has often been dismissed on the grounds that it concerns an allegedly elusive question. By the same logic, Soviet statements about victory in nuclear war have regularly been overlooked or excluded from consideration because they are supposedly vague, incomplete, or contradictory. The clear implication of such judgments is that Soviet military doctrine warrants no serious study. At most, the adherents of this persuasion seem to regard Soviet military doctrine as an expression of Soviet "bureaucratic politics," which owes its stridency to memories of suffering in World War II and to the Soviet predilection for morale-building propaganda.

No one would deny that Soviet military doctrine bears the scars of the Muscovite school of politics. Still less would anyone scoff at the impact of Russia's many wars or at the Communist Party's continuing need to preach and proselytize among the dubiously motivated masses.

Even so, such cultural and political factors should not distract Western attention from the single most important fact about Soviet military doctrine: its striking congruence with Soviet force posture. Indeed, on virtually every major issue, the written expression of Soviet strategic objectives has preceded their transmutation into physical reality by a number of years, and sometimes by decades.

Perhaps the best way to study Soviet strategy is to find an appropriate historical context in which procurement decisions could be evaluated in the light of their social background, technological limitations, and equivalents in rival countries. Hence the title of this article, which examines Soviet nuclear strategy from the perspective of a dichotomy between two extreme goals: deterrence and war-fighting. These two objectives may be hard or even impossible to distinguish at any given time, but when they are pursued over decades their impact on force posture and national behavior is starkly different.

Importance of Military Power

Like all the other nuclear powers, the USSR began with nothing more than a very modest capability for deterrence. But unlike all its rivals—and at the cost of

much bluffing in the 1950s and early 1960s—Moscow proclaimed a bold, war-fighting strategy from the earliest days of the nuclear era down to the present. Even that sweeping generalization somewhat understates Soviet strategic consistency, inasmuch as the origins of the Soviet preference for war-fighting lie much further back than the detonation of the first Soviet atomic bomb in 1949.

No single speech in all of Russian history better illustrates Moscow's view of the importance of military power than did Stalin's defense of his brutal but effective program for industrialization in 1931:

> To slacken the pace would mean to lag behind; and those who lag behind are beaten. We do not want to be beaten. . . . The history of old . . . Russia . . . is that she was ceaselessly beaten for her backwardness. She was beaten by the Mongol Khans; she was beaten by Turkish Beys; she was beaten by Polish-Lithuanian feudal nobles; she was beaten by Anglo-French capitalists; she was beaten by Japanese Samurai; they all beat her—because of her backwardness. . . .
>
> We are fifty or a hundred years behind the advanced countries. We must make good this lag in ten years. Either we do it or they crush us.

This speech should correct some parallel misapprehensions about Soviet national strategy. Above all, the current Soviet military posture is not simply the result of new policies initiated by Brezhnev as a political "payoff" to the General Staff in exchange for their helping him overthrow Khrushchev in 1964. On the contrary, the current strength of the Soviet Armed Forces is the direct and inevitable result of the socioeconomic priorities that Lenin sketched and Stalin built irrevocably into the Soviet system. Notwithstanding such major events as the post-World War II demobilization, Khrushchev's reforms, and Brezhnev's erratic displays of concern for the Soviet consumer, little has changed with regard to the Soviet Armed Forces. Politically subservient to the Communist Party but physically fattened by the best materiel that Soviet industry can produce, the Soviet Armed Forces today are precisely what Stalin would have wanted them to be.

Stalin's speech of 1931 also sheds some light on whether we should characterize Soviet military doctrine and strategy as offensive or defensive. Such a morbidly fearful and hostile view of the world is not "defensive" in the usual sense (which conjures up images of the Swiss, Austrian, or Japanese attitudes toward current military problems). Nor does "offensive" quite capture the Soviet mentality, if such characterization means that the Soviets are simply power-hungry militarists with a taste for occasional conquests of new land.

Rational or Irrational?

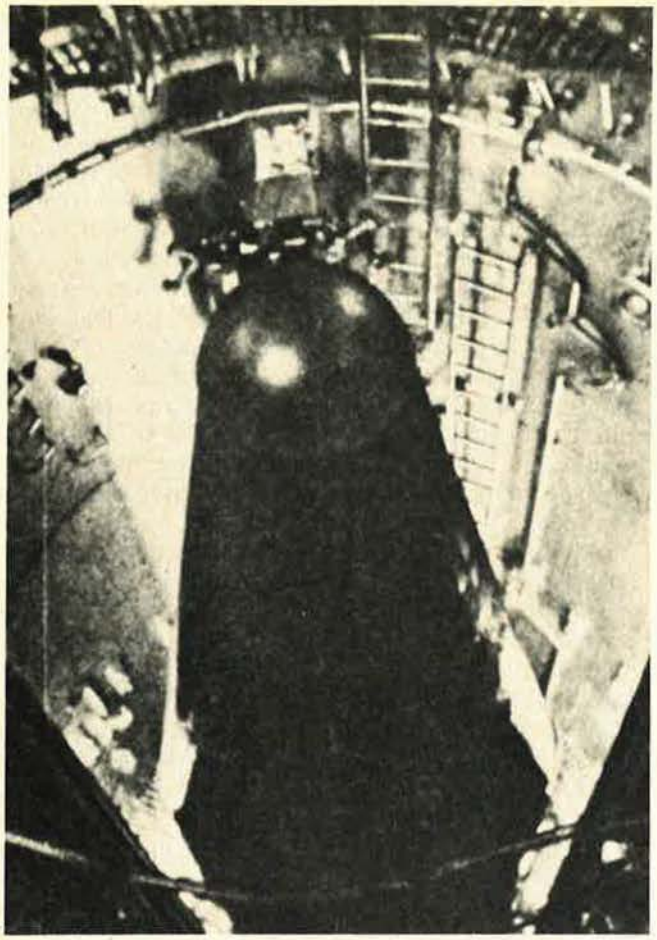
Abnormal psychology probably contains the richest lexicon for categorizing the Soviet view of military power. Recent travelers to Moscow describe an *obsession* with China, which seems to have largely replaced the traditional preoccupation with the alleged threat from Germany. Indeed, Soviet officials are now explaining their "defense" of Afghanistan as a necessary response to the evil acts of Chinese spies, Pakistani guerrillas, and Egyptian saboteurs, all egged on by sensation-hunting American journalists and the CIA.

Some of these claims may be dismissed as conscious lies, by people who know better but need a propaganda facade to justify their invasion of a supposed ally. However, when ordinary Soviet citizens express such allegations with apparent sincerity—not to mention their general hostility toward foreigners—most Westerners sooner or later begin to decide that the Russian people suffer from *paranoia*. The definition of this much over-used term in *Webster's New Collegiate Dictionary* is directly applicable to the Russian sickness: "A chronic mental disorder characterized by systematized delusions of persecution and of one's own greatness, sometimes with hallucinations." The result of all this, of course, is a *compulsion* to acquire military power, even at an economic cost which other countries would deem irrational.

Yet in some respects, the Soviet attitude toward military power is intensely rational, coldly calculating, and even wise. As an old, continental power, with historical enemies on all fronts, Russia has good reason to appreciate the direct link between a powerful armed force and an effective foreign policy. As a country that has often been beaten, Russia also knows the wisdom of overpreparing for combat—especially when neither the tactical conditions nor the level of opposition can be determined precisely in advance.

It is also likely that Moscow has a deep appreciation of the "rationality of irrationality" under certain international conditions. Soviet strategists seem to believe that Khrushchev's "rocket rattling" of 1956 frustrated the Anglo-French-Israeli attack on Egypt and disrupted the NATO alliance, even though the USSR was far from ready to fight World War III at the time. The Soviets have also criticized the alleged "irrationality" of American strategic threats during the Cuban Missile Crisis of

Realistic maneuvers are an important element in Soviet military power, as this reconnaissance patrol shows.



Soviet ICBM in silo exemplifies their doctrinal readiness to fight and win a nuclear conflict. Squeamishness about casualty figures does not attenuate doctrinal needs.

1962 and the Middle East Crisis of 1973, but they know perfectly well that in both cases a display of American strategic readiness altered Soviet foreign policy quite drastically.

Deterrence: A Little-Used Word

However one balances the themes of rationality and irrationality in Moscow's attitude toward military power, there should be no doubt that the Soviet preference for war-fighting influences every aspect of their military doctrine, strategy, and force posture. Nowhere is this preference more clear than in the Soviet attitude toward Western concepts of deterrence. The word itself is rare in Soviet parlance and used primarily to describe foreign, "bourgeois" military doctrine.

Two different Russian words are used to translate "deterrence." *Sderzhivaniye*—meaning a halt, diminution, or restraint imposed on forward movement—is usually applied to American policies of the Truman era. For the more recent period, the Soviets employ *ustrasheniye*, which connotes the halting of an opponent's behavior through the imposition of fear, fright, or terror.

The Soviets have never subscribed to Western notions of deterrence. Even those Soviet spokesmen who enjoy a sophisticated familiarity with Western ways have rejected deterrence as the basis for their military strategy. Georgiy Arbatov—Director of Moscow's Institute of the USA and Canada—was in total agreement with the Soviet General Staff when he wrote in 1974 that "the concept of deterrence itself cannot be defended—it is a concept of 'peace built on terror,' which will always be an unstable and a bad peace."

In part, the Soviets seem to have rejected a strategy of deterrence because of their own conservatism and reluctance to abandon the Stalinist emphasis on the open-ended acquisition of military power. They also seem to suspect that acceptance of the Western concept of deterrence would in some sense entrust Soviet national security to another and hostile power, rather than exclusively to their own armed forces. But most importantly, by their own testimony, they disapprove of deterrence because it was propounded by their class enemies, who allegedly sought military and political advantages unobtainable by other means.

Colonel Byely and his collective of authors summarized their view of Western military doctrine and strategy quite pungently in *Marxism-Leninism on War and Army:* "Bourgeois sociological and philosophical thought is unable to resolve so complex a problem as the essence of the nuclear war. It distorts the essence of nuclear war in many ways and consequently distorts also its content and character."

The Soviets perceive two extremes in American attitudes toward nuclear war: Some Americans exaggerate the destructiveness of nuclear war and verge on pacifism, while others hope to use nuclear weapons for their own reactionary political purposes. In both cases, however, American rhetoric about deterrence allegedly masks the reality of unchanging imperialist aggression. According to the *Soviet Military Encyclopedia,* "The trend toward expanding the scope of local wars and aggravating the conflict in them increases the danger that a local war will escalate into a world war."

Not to worry, however, for the *Encyclopedia* hastens to point out the historical solution to the problem of imperialist irrationality and aggression. "With the simultaneous growth of the economic and military might of the socialist community, there is an increased possibility of preventing local wars from escalating into a clash on a worldwide scale." Although phrased in a propagandistic way, this allusion to the "peaceful" nature of socialist military power is of more than minor interest.

The fact that the Soviets have rejected a strategy of deterrence in favor of a strategy of war-fighting does not necessarily mean that the Soviets have no concept whatever of deterrence. On the contrary, they do have such a concept, but it differs radically from the American notion of deterrence. To the Soviets, preventing war between the superpowers and managing the level of conflict in the Third World are very good things, indeed, so long as two conditions are fulfilled: the trend of Third

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The T-55 flamethrower tank above, participating in realistic maneuvers, exemplifies the concentration on power application. The T-55's successors all have the same capabilities.

World conflict outcomes favors the USSR; and the USSR continues its progress toward a superior war-fighting and war-winning capability against the United States and all other possible rivals.

War-fighting vs. Deterrence: Different Outcomes

When they review the evidence of the 1970s, Soviet strategists like what they see. That decade began with the official recognition of US-Soviet superpower equality at SALT I and then saw the most impressive succession of victories on Third World battlefields that Soviet proxies have ever won. Such concrete displays of the physical and political utility of Soviet arms may explain why US and Soviet military doctrines diverged no less sharply than their capabilities throughout the past decade. Having rejected a strategy of deterrence, the Soviets quite inevitably favored a steadily rising military budget and constant, evolutionary improvements in their armed forces. Moscow denied itself no known opportunities to improve its position in the strategic balance, while experimenting with increasingly ambitious acts of intervention in regional wars.

In force posture, no less than political behavior, the strategies of deterrence and war-fighting favor very different things. There was a time—perhaps a decade ago, at most—when it was still possible to see the differences between US and Soviet force postures as the result of Moscow's more primitive technology. Surely those days are over. What explanation do we have, other than a strong strategic preference for war-fighting, when we review such differences as the greater Soviet interest in high throw-weight and megatonnage; the greater fraction of the Soviet arsenal to be delivered by ICBM (more vulnerable intrinsically, but the first-strike and war-fighting system par excellence) and the lesser fraction allocated to SLBMs and bombers; the greater Soviet concern for passive and active defenses; the keener Soviet interest in chemical and bacteriological warfare; the far more military orientation of the Soviet space program; the far higher Soviet priority on obtaining antisatellite capabilities; the vastly larger proportion of the Soviet gross national product allocated to defense; and a host of others?

The differences between deterrence and war-fighting also pervade Soviet military doctrine. War-fighting maintains, stresses, and constantly tests the distinction between its goal—victory in war—and its means—military force. To obtain the former, the Soviets endlessly review their thinking about the latter. This attitude may explain why the tightly controlled and censored Soviet press periodically allows Soviet officers to air their differences of opinion over contested issues. More importantly, the Soviet preference for war-fighting is also reflected in their concern for combat realism in most of their exercises; for the integration of civil defense into their overall doctrine for nuclear war; for their retention of a conscript army and a highly militarized society; and for the very considerable official prestige they bestow upon military practitioners and theorists.

From a strictly theoretical perspective, nothing symbolizes more clearly the difference between deterrence and war-fighting than the Soviet description of "strategic missions." To most Americans, "strategic" equates to "intercontinental," both because of our geographic location and because of our implicit assumption that transoceanic attack is the only mission that really matters in central nuclear war.

To the Soviets—schooled in the Clausewitzean concept of war and surrounded by potential enemies on all fronts—"strategic missions" consist of all those diverse actions which the High Command must take to gain victory. The list is long. Marshal Sokolovskiy summarized these missions at great length in *Military Strategy*, which still stands as the single most important Soviet book on the subject. The last edition of Sokolovskiy's book is now more than a decade old, but more recent, albeit less prestigious, authors have not deviated from his views.

Colonel M. P. Skirdo, a former professor at two senior Soviet staff colleges, has outlined the Soviet concept of nuclear war quite concisely in *The People, the Army, the Commander*. He asserted that attainment of victory would require the destruction of enemy means of nuclear attack; disorganization of his rear areas; repelling attacks on one's own country and one's allies by enemy air, airborne, amphibious, and ground forces; safeguarding the homeland against enemy subversive activities; and using combined-arms operations to rout the enemy's armed forces, crush his resistance, and seize control of strategically important regions, staging bases, and military, political, and economic centers.

For any military planner, Skirdo's list of missions would seem fairly ambitious. But he left his readers in no doubt about the Soviet ability to win a nuclear war. Indeed, he claimed that the Soviets would gain victory, thanks to their superiority in a large number of measures of strategic power, ranging from the size of their national territory to their "indisputable advantage in the creation of the military-economic and scientific-technical potential necessary for victory in a modern war."

It must be admitted, however, that neither Sokolovskiy, Skirdo, nor any other official Soviet spokesman has given very satisfactory answers to some political questions about war which many Westerners regard as critical. For example, what potential gains would be so

important to the Soviets as to justify risking their national existence by fighting World War III? Would the Soviets attack the continental United States with airborne, amphibious, or ground troops? How would the Soviets provide for intra-war negotiations and bargaining, if at all? What would be the postwar military and political situations of their supposedly defeated rivals?

Soviet attention to such questions as these is nonexistent at worst, and propagandistic at best. War initiation—to which American arms-control specialists have devoted astronomical numbers of analyses—interests them only as an aspect of "imperialist" foreign policy. As for themselves, the Soviets assert that they would never dream of starting a nuclear war, thanks to the very nature of their way of life. Soviet spokesmen are equally unready to discuss war termination, save to note rather piously that in the aftermath of a nuclear war, the peoples of the capitalist countries will carry out their own revolutions against the governments which led them into a disastrous and losing war.

The Soviets do not seem to regard their evasion of such abstruse topics as a weakness in their military doctrine. They do provide in general terms for any possible mission that might be assigned to their armed forces, but they do not discuss subjects that might convey either intelligence information or political ammunition to their anti-Soviet rivals (or which may simply be unanswerable at the present time). In any event, it is apparently the business of spokesmen for the Soviet Armed Forces to plan for fighting and winning Soviet wars, while leaving to their political masters such questions as when, why, and how to begin or end their wars.

War-fighting Strategy Has Advantages and Pitfalls

Regardless of how one weighs the subtler points of Soviet military doctrine, a war-fighting strategy seems historically inevitable for the USSR. It has many advantages: supporting the Soviet claim to superpower equality with the US; intimidating any possible revanchists or irredentists in China or Germany; winning global clients, thanks to the spreading impression in many minds that the USSR can be counted on to provide more than a little help to its friends; maintaining domestic cohesion through a constant atmosphere of military danger; and keeping large military forces ready for use against unruly allies, as in Poland.

Without a war-fighting strategy, Moscow would rule a far smaller empire than it does. Its control over the Soviet and East European masses would be less secure, and its foreign policy in every corner of the globe would become less credible. To the extent that a strategy of deterrence would reverse some or all of these gains, it seems hardly surprising for men schooled in the Soviet tradition to cling tenaciously to their preference for war-fighting.

On their southern border, the Soviets are now fighting in a war that may serve as a test case for Soviet military doctrine and strategy. If the Soviets are beaten and withdraw ignominiously, Moscow's foreign policy will be badly discredited. The seeds may be sown for incremental changes in Soviet military strategy, although their effect on Soviet thinking about central nuclear war would probably be modest. But if the Soviets persevere and prevail, the blood they shed in Afghanistan will only increase global respect for Soviet decisiveness, and thus will reinforce Moscow's satisfaction with its military strategy.

As for Poland, its future social and economic situation may still be in doubt, but not its vulnerability to Soviet armed attack. Indeed, it seems likely that the major reason why the Polish workers refrained from anti-Soviet sloganeering and anti-Communist violence for so long was their intimate understanding of the Soviet proclivity for coercion. Whatever the level of violence that may be necessary to restore Polish orthodoxy, this most recent demonstration of East European instability will only exacerbate Moscow's distrust of all its neighbors.

From the American perspective, unrest in Afghanistan and Poland may appear supremely irrelevant to nuclear strategy. Not so for the Soviets. They claim to see class warfare on their borders, threatening Soviet interests, jeopardizing the security of other Communist Parties, calling Soviet decisiveness into question, and threatening to impact very unpleasantly on Moscow's control of its own masses, both Russian and (more poignantly) non-Russian.

These are matters that cut to the very heart of the Soviet political system. When combined with what Moscow has described for the past four years as "intensified anti-Soviet tendencies" in America, the only possible result will be to strengthen still further Moscow's oldest and darkest fears. Given their distrust of large numbers of their own people and their supposed "allies," the Soviets will be less likely than ever before to model their nuclear strategy upon that of their most serious rival.

On the contrary, the Soviets will probably find increasing reason to agree with the comment of Colonel V. M. Kulish about the importance of military power, in general, and of strategic superiority, in particular:

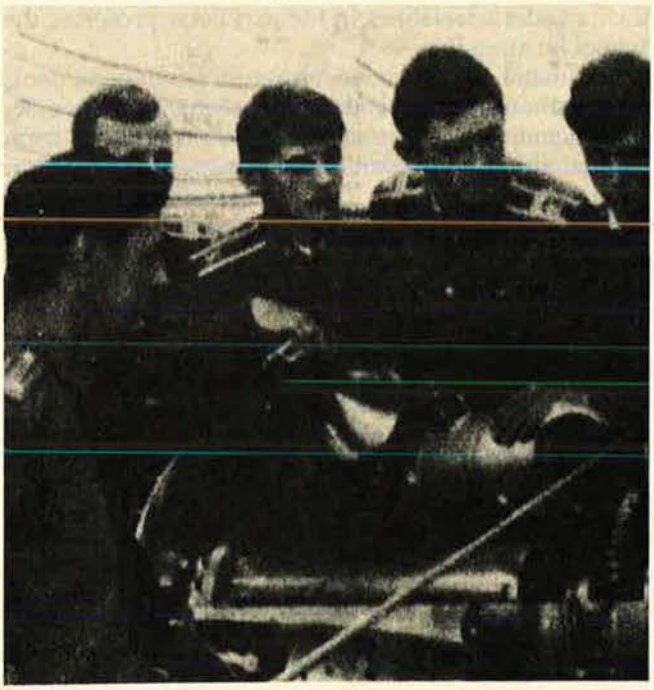
> . . . it must be borne in mind that even a relatively small and brief superiority by the United States over the Soviet Union in the development of certain "old" or "new" types and systems of armaments would increase significantly the strategic effectiveness of American military force, exert a destabilizing influence on the international-political situation throughout the entire world, and present extremely unfavorable consequences for the cause of peace and socialism. In such a case, the USA would be expected to intensify its aggression, employ military blackmail as a means for achieving its foreign policy on a more extensive scale, and thus aggravate international tension on the whole. (From *Military Force and International Relations*.)

It remains to be seen whether the Soviets will enjoy a "relatively small and brief superiority" during the 1980s, let alone what impact it would have on their own international behavior. With or without such an advantage, however, deterrence seems likely to remain in the 1980s what it has always been for the Soviets—an alien strategy, wholly inadequate as the basis for their military doctrine and force posture. War-fighting will remain Moscow's nuclear strategy, and other nations will have to plan accordingly. ■

With the need to commission 50,000 or more officers per year, and to continue professional development of nearly a million officers in the active and reserve forces, Soviet military education is a massive undertaking. This article explains . . .

The Soviet System for Commissioning Officers

BY CHRISTINA SHELTON



Cadets being instructed on the design and operation of aviation engineer technology. Course length is being increased to help officers cope with the increased complexity of modern weaponry and associated equipment.

On the international level, the Soviet Union's perceived requirements have resulted in a highly visible military presence in East Europe for more than thirty years. Moreover, Moscow has been attempting to extend its political and military influence beyond its accepted established sphere in East Europe into the Middle East, Latin America, Asia, and throughout the African continent.

In conjunction with this expansion, a high degree of militarization exists at the domestic level. USSR military forces include approximately 4,800,000 men in arms, with an annual conscription rate of 2,000,000. Military reservists number in the millions. Soviet youth are required by law to take military training at the high school level for two years. There are various forms of voluntary organizations teaching paramilitary training from grade school through college. Soviet citizens are required to participate in civil defense training. Armed troops, organized into military units with combat weapons, are in place both to guard the borders and to serve the internal requirements of a controlled society. Military personnel are scattered throughout civilian sectors such as government ministries supervising aviation, construction, and railroads. And finally, the USSR allocates a large share of its resources for military development.

Size has always been a significant factor in Russian military strategy, due to a history of continental wars with neighboring states. Geographic factors are still a reality, given the USSR's extended borders with China as well as with East Europe. In this context, the military has served such foreign policy requirements as maintaining spheres of influence.

Today, the size of the military apparatus is not only a function of policy objectives, but appears to have become a determinant of Soviet goals. Moscow is apparently attempting to influence and accelerate the historical and social processes (the "correlation of forces").

An obvious corollary to this militarization is an extensive education system for commissioning and training career officers. A large officer corps is central to the Soviet cadre force concept for rapid mobilization (*i.e.*, an army whose reduced strength units can be fleshed out by millions of reserves). The enormity of the military educational system may also be partially understood from the concept of the role of the officer, expressed by the late Minister of Defense, A. A. Grechko: " . . . officers have been, are, and always will be the core and backbone of our Army and Navy. . . . " In a more general sense, Soviet literature, although acknowledging the importance of weapons, asserts that the decisive factor in winning a war is "man."

The significance of the officer corps, as an essential element to the maintenance of military power, is reflected in the extensive size of the student body, the faculty, and the support elements, and in the number of schools (140) and academies (eighteen) and their facilities. Estimates place the size of the officer corps at 720,000 to 960,000, with an annual commissioning of 50,000 cadets. The intensiveness of the system may be seen in the aggregate duration of training officers, the

How Soviet Military Schools Specialize

Strategic Rocket Forces (SRF)		5
Ground Forces		36
Combined Arms	(11)	
Tank	(9)	
Rocket Troops and Artillery	(10)	
Air Defense Troops	(5)	
Airborne	(1)	
National Air Defense (PVO)		15
Air Force		26
Navy		11
"Special Troops"		24
Engineer	(3)	
Chemical	(3)	
Signal	(12)	
Automotive	(4)	
Railroad and VOSO	(1)	
Military Topography	(1)	
Rear Services		5
Military Construction		8
Miscellaneous		2
KGB/MVD		8
Total		140

large number of officers of general rank, and the emphasis accorded to military-scientific research throughout the system—especially at the military academy level.

A strong, well-established military system, comprising highly trained and educated officers, does not represent a potential dichotomy between military and political elements within the Soviet Union. The officer educational system inculcates loyalty to the Party. It stresses ideological conviction and a Communist world view imparted through a large dose of Marxist-Leninist courses, and Party and political work, and is manifested physically in a political structure that permeates the military school system. Notably, ninety percent of the officer corps are either Party members or Komsomols. Moreover, at the top levels of authority, institutional lines tend to become blurred. Many high-level commanders are members of the Central Committee. The Minister of Defense is a member of the Politburo, and the head of the Politburo is a marshal of the Soviet Armed Forces. In short, the presence of military leaders in the high-level bodies of the Party promotes a commonality of views and a consensus on policy decisions.

Higher Military Schools for Commissioning Officers

Most active-duty career officers for the Soviet Armed Forces are commissioned and trained at military learning institutions that include an estimated 140 higher military schools, military institutes, military faculties at civilian educational institutions, military academies, and higher offficer courses and classes.

The first step for commissioning officers in what appears to be a continuous educational process interspersed by field assignments is the higher military school. Before 1958, most of these schools offered a three-year program of study. Since that time there has been a dramatic transformation and upgrading of the system in that all but a handful of the schools now offer a four- or five-year program, and graduates are not only commissioned as lieutenants but also receive an all-union diploma, an academic equivalent to that awarded by universities and institutes.

The 140 higher military schools train and educate future officers to fill command, engineering, or political positions in the various services. In general, these schools accept civilians between seventeen and twenty-one, extended-duty servicemen to the age of twenty-three, and warrant officers to the age of twenty-five. Entrance is by competitive examination, both oral and written. There are separate admission quotas for servicemen and civilians, and usually two servicemen or four civilians compete for the respective vacancy. Command and political schools are four-year courses of study, and engineering is five years. While each school provides a balance of command, technical, and ideological training (since a Soviet officer is expected to be a combination of commander, technocrat, and indoctrinator), a cadet specializes in the particular profile of the school he attends.

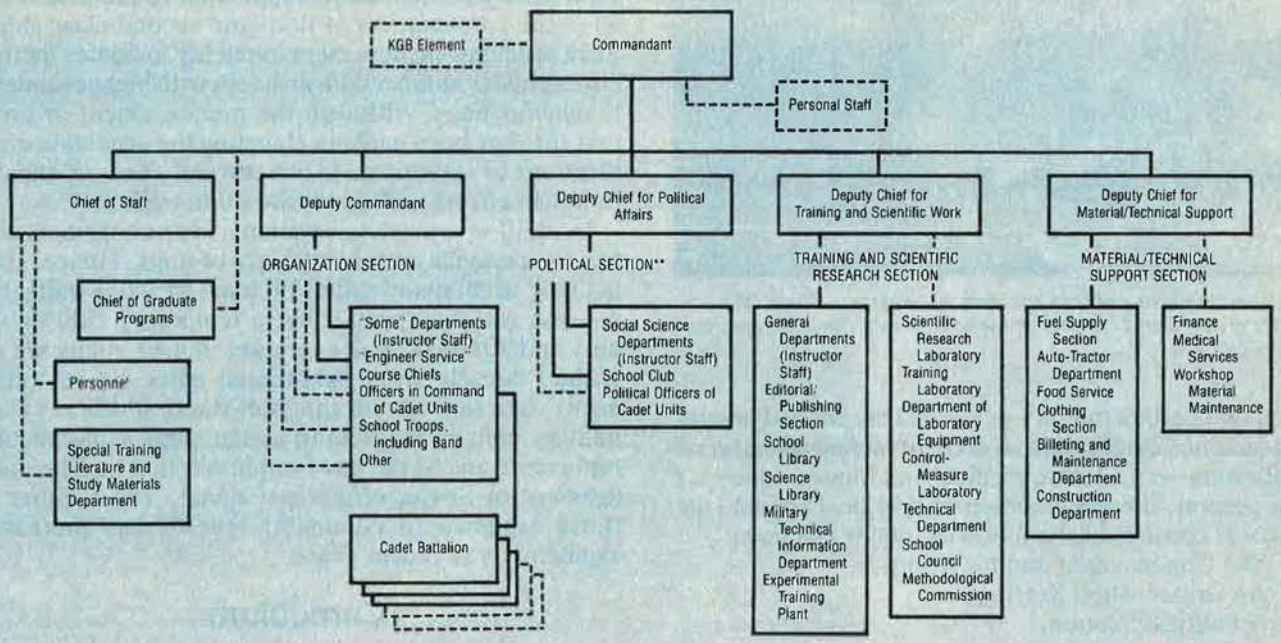
Command schools concentrate on developing one's organizational ability and the art of managing people. This includes military and political training of his men, maintaining discipline and morale, and responsibility for equipment and logistics. The task of instilling command and leadership qualities in a cadet would appear to be most difficult. Authoritative Soviet pronouncements about the need for developing initiative in officers are numerous.

The late Marshal Grechko asserted that an officer must be able to take "independent action," and Marshal P. F. Batitskiy, former Commander in Chief of National Air Defense, has maintained that primary attention in military institutions should be paid to the development of "creative thinking and wise initiative. . . ." Marxist-Leninist precepts, as well as Party directives, do impose constraints upon creative or independent thinking. The prescription for such action for the student officer and the instructors trying to develop this ability in cadets must create internal tensions not easily resolved by the Soviet leadership. For example, one Western analyst, citing Soviet difficulties in Afghanistan, suggested the USSR needs a more flexible command structure that gives authority to officers in the field. But, according to the news account, this runs counter to the Soviet military concept of a highly centralized command, in which "no colonel has any experience taking the initiative."

The military engineering school teaches officers to provide engineering support for combat operations, to maintain equipment for combat readiness, and to handle weapon systems. As a consequence of the "revolution in military affairs" and technological developments in modern warfare and weaponry, there has been a steady increase in the number of officers receiving engineering degrees from military engineering schools, 16.3 percent in 1940 to fifty percent in 1977. (Seventy percent of all Strategic Rocket Forces [SRF] are reportedly engineers.)

Military-political officers are tasked to develop among the troops loyalty to the CPSU and Soviet government. Therefore, military-political schools must focus on the ideological and Party-political work that

Figure 1: A Composite Organizational Structure for a Soviet Higher Military School*



*This figure presents a concept of the organizational structure of a composite higher military school. All of the elements and relationships portrayed with solid lines have been identified; those with dotted lines are inferred.

**The Deputy Chief for Political Affairs supervises the "voluntary" activities of such groups as Party-Komsomol organizations and Lenin Room Councils. The career political officers attached to cadet units are deputies to the commanders of cadet units, but are under the overall supervision of the Deputy Chief for Political Affairs.

will be their primary specialty as political officers. However, considerable emphasis is also placed on the military education of these officer candidates. Notably, all of the chiefs of military-political organizations and eighty percent of regimental political officers have higher military educations. Furthermore, the conspicuous stress on raising the engineering-technical training requirements of future officers is reflected in the military-political schools. Every fourth political officer, *Red Star* points out, has a military engineering degree.

A method of dividing the 140 higher military schools other than by their three fundamental profiles is by force component or branch of service, as shown in the accompanying box.

All SRF schools (except the political school) offer a five-year program. The total number of schools for the Ground Forces—thirty-six—reflects the central role of this service in the Soviet Armed Forces. Among the PVO schools, each of the three major branches has its own schools: Fighter Aviation, Surface-to-Air-Missile, and Radioelectronics. The naval schools, which have a five-year program, produce officers who are navigators and missile, artillery, and antisubmarine specialists. They are collocated with the four fleets and the Caspian Flotilla. The oldest naval school, named after M. V. Frunze, was originally established in 1701 by Peter the Great.

"Special Troops" schools commission officers for the various branches of the armed forces that are not part of the regular five services. Of the five Rear Services schools, one is thought to be actually the former Civil Defense School. The Railroad and VOSO (military communications) school under "Special Troops" is sometimes listed in Soviet literature with the Rear Service schools. Construction schools have nearly doubled in the last few years. The miscellaneous schools include a military-political school for training journalists, and a school called Krasnodar Higher Military School, which was recently identified in Soviet open sources without any further reference.

Although the KGB Border Guards and the MVD Internal Troops are not under the direction of the Ministry of Defense (MoD), they are, by law, part of the Soviet Armed Forces. Hence, KGB schools commission "lieutenants" qualified as combined-arms officers. These officers receive higher training at Frunze Military Academy. Maritime Border Guards officers are commissioned at regular MoD naval schools and receive higher training at the Naval Academy. MVD graduates are qualified as officers of motorized rifle troops and receive higher training at MoD academies.

Military Institutes

In addition to the 140 schools, there are three military institutes with specialized profiles providing programs of study for officer candidates. The first, the Military Engineering Institute/A. F. Mozhayskiy, has a five-year program and graduates military engineers. The second, the Military Institute, trains military linguists and legal personnel and is also a five-year school. Finally, the Military Institute of Physical Culture, which is a four-year school, accepts civilians, extended servicemen, and warrant officers. Military musical directors are trained at the Moscow State Conservatory/P. I. Chaikovskiy, where the course is five years. (It may be

A Colonel/Engineer instructs students on hardware. Soviet S&T officers divide their time between teaching and research at higher military schools.

noted that certain military personnel are trained in military faculties established in civilian higher educational institutions—*e.g.*, future medical and finance officers.)

In general, the organization of a typical school *(see Figure 1)* consists of the following major elements:

- The Commandant and his deputies,
- An Organization Section,
- A Political Section,
- A Training and Scientific Research Section, and
- A Material/Technical Support Section.

Most of the commandants who head each of the 140 schools hold the rank of general major or rear admiral. The commandant, who bears full responsibility for all the activities of the school, and his four deputies constitute the command element. The deputy commandant is responsible for the Organization *(Stroyevoy)* Section that, along with administrative functions, is thought to supervise military "specialized" courses applicable to a given service or branch of the armed forces, such as artillery training at an artillery school. This Section contains the career officer commanders attached to each cadet-unit as well as the school troops who assist instructors and cadets in keeping training equipment in proper condition and provide support during field training exercises.

The Deputy for Political Affairs heads the Political Section, which supervises the social science departments and the political officers who are assigned to each of the cadet-units. The deputy chief of the Training and Scientific Research Section oversees the general academic departments, scientific research, the library, and the publishing sections. Finally, the Deputy Chief of the Material and Technical Support Section has charge of all logistic and support functions.

Soviet military journals assert that the quality of the officer is directly dependent on the level of academic and scientific training of the instructors. These journals refer repeatedly to an ongoing, two-fold process of gradually replacing older instructors, who are the products of secondary (three-year) military schools, with more recent graduates who have had training in higher (four- and five-year) military institutions granting titles of engineer; and increasing the number of instructors who have had graduate training. This process of academic upgrading was promulgated in directives by the Twenty-fourth (1971) and Twenty-fifth (1976) CPSU Congresses.

Soviet sources claim that fifty percent of the officers (*i.e.*, more than six times greater than in the prewar period) have a higher military education, which include some ninety percent of the regimental commanders and all of the commanders of first- and second-class ships. Such academic achievement implicitly indicates there is also a greater number of instructors with higher academic qualifications. Although the precise extent of progress that has been made in elevating the academic qualifications of instructors is not currently known, the determined efforts and trends are quite evident.

In addition to academic training, instructors must also have experience as commanders of units. Hence, they not only accompany cadets on tours to active units, but are also assigned personally to temporary field or sea duty and attend tactical exercises. In fact, many are recruited directly from operational units. Soviet references state that advancement of the best officers from military units in the field to assignments as instructors represents one of the most important tasks in the management of Soviet officer personnel. The number of those assigned to command schools has increased significantly in recent years.

Curriculum

The academic program appears to be divided between general courses and specialized disciplines. General courses usually parallel those in the US. Significantly, every Soviet officer, depending on his functional mission, is expected to have either an in-depth understanding or at least some exposure to higher mathematics, physics, chemistry, electrical and radio engineering, and the fundamentals of cybernetics. A central role is assigned to scientific-military research. This includes independent research in theoretical work as well as the development of more efficient methods for the use, maintenance, and repair of military equipment. Specialized courses depend on the profile of the school, *i.e.*, pilot training, antisubmarine warfare, missile guidance control, and a myriad of military service/branch-oriented subjects. Based upon a survey of military articles, it is apparent that course work is replete with lessons to be learned from the "Great Patriotic War."

Along with academic work, the curriculum includes practical experience. Each school has an extensive field training program, which simulates basic combat situations. Training facilities are available at the given school and at special field training camps. Periodic tours with active military units are also an integral part of the curriculum. In the US, the goal of the service academies is to provide cadets with a general military education. Training in skills occurs after commissioning. By contrast, the goal in the USSR is for the newly commis-

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Soviet Military Academies

Strategic Rocket Forces
- Dzerzhinskiy Military Academy

Ground Forces
- Combined Arms: Frunze Military Academy
- Tank Troops: Malinovskiy Military Academy of the Armed Forces
- Rocket Troops and Artillery: Kalinin Military Artillery Academy
- Air Defense Troops: Military Academy of Air Defense of the Ground Forces
- Special Troops
  - Signal Troops: Budennyy Military Academy of Signals
  - Chemical Troops: Timoshenko Military Academy of Chemical Defense

Air Forces
- Gagarin Military Air Academy

National Air Defense
- Zhukov Military Command Academy of Air Defense

Navy
- Grechko Military Naval Academy

Rear Services
- Military Academy of Rear Services and Transport
- Kirov Military Medical Academy

Military Engineer Academies
- Special Troops: Kuybyshev Military Engineering Academy
- Air Forces: Zhukovskiy Military Air Engineering Academy
- National Air Defense: Govorov Military Engineering Radiotechnical Academy of Air Defense

Political Academy
- Lenin Military-Political Academy

MVD Academy

sioned officer to perform initial duties in his speciality when initially assigned to a unit.

Great emphasis is given to social science courses dealing with various aspects of Marxism-Leninism. The importance of "ideological conviction" in military institutions as one of the most significant elements in unifying training cannot be overstated, since political reliability is an absolute requirement. A recurring theme in military literature, which reflects the Leninist dictum of the unity of theory and practice, stresses the maintenance of school ties with the civilian sector for political indoctrination. For example, Soviet journals comment that ties between school personnel and Party/Soviet organizations, enterprises, and institutions in cities and oblasts continue to be strengthened. Also, PVO schools use specific practical material in classrooms to achieve unity of theory and practice; *i.e.*, in social science classes, the instructor teaches the history of activities in local Party organizations and labor activities in collectives of industrial enterprises. Coupled with the pervasive political apparatus in the school, the interactions between the cadets/faculty and civilian organizations reflect a marked departure from the US system of military training. In fact, this represents a basic aim of the Soviet leadership since 1917 to control and integrate the population by politicizing the military along with militarizing society.

Military Academies and Other Advanced Officer Training

After an officer is commissioned, the next formal step in the military educational system is training at one of the eighteen service or branch academies. As a rule, military academies offer a three- to five-year program for officers who have completed four to six years of troop duty. Selection for the academies includes highly competitive examinations. In general, the maximum age limits for entrance are twenty-eight at engineering academies and thirty-two to thirty-six at the other academies. Military academies are specialized and officers attend the academy that is associated with the force component or service branch in which they were commissioned. An estimated twenty to twenty-five percent of the officer corps attends academies. Classes are conducted within military districts to provide advanced or refresher training, presumably for officers who are not military academy graduates. These are presented on an informal, continuing basis. A summary of the academies is shown in the accompanying box.

All of the military academies, except Dzerzhinskiy, are identified with a specific force component or branch of service by virtue of their title or in Soviet open sources. Inasmuch as the SRF is not associated with any academy, it is presumed, by a process of elimination, that Dzerzhinskiy trains SRF officers. The Academy for the Air Defense Troops of the Ground Forces opened in September 1977. The *Soviet Military Encyclopedia* states that MVD officers receive higher military training at Ministry of Defense (MoD) academies. Therefore, the MVD Academy probably provides training for other MVD elements, such as militarized civil police (militia), militarized fire guards, and other less clearly identified MVD personnel at various administrative levels. It is likely that some MVD officers also attend the MVD Academy for specialized training. The Academy opened September 3, 1974.

Most of the Soviet military academies offer correspondence courses in addition to their regular courses of instruction. Selection for these is by means of the same stringent competitive examinations to which a full-time student is subjected. At the completion of the correspondence portion of a course, the student officer undergoes a short period of review at the academy, at the conclusion of which he takes the same final examinations as a full-time student. Military academies also offer advanced training for officers. Graduates of academies may return to pursue "Higher Academic Courses," designed for officers to keep abreast of new military theoretical and technological developments.

Other Advanced Officer Training

The next step in the formal education of Soviet officers is the Higher Officers' Courses conducted by force components and service branches. In general, these courses do not require an officer to pass an entrance examination. Those who attend are field-grade officers. Of the Higher Officers' Courses, the best known is "Vystrel" (*i.e.*, "the shot") or the First Higher Officers' Course/MSU B. M. Shaposhnikov. As much as seventy-five percent of the time during the one-year course is spent in the field, on test ranges, in tankdromes, and on firing ranges. This course is intended primarily for Soviet officers of the Ground Forces.

Several other Higher Officers' Courses have been identified, including:

- Central Artillery Officers' Courses/Marshal of Artillery V. I. Kazakov,
- Central Advanced Courses for Political Staffs,
- Higher Central Officers' Courses of Civil Defense,
- Lipetsk Higher Air Forces Officers' Courses,
- Central Radiotechnical Officers' Courses of National Air Defense,
- Courses for officers of the Veterinarian Service at the Moscow Veterinarian Academy.

The Navy also has Higher Special Officers' Classes for field-grade officers. These classes are located in Leningrad, where they have been given since 1827. One which has been identified is the Higher Officers' Aviation—Tactic Courses of the Navy.

The Military Academy of the General Staff

The final formal step in officer training is, of course, the selection to the Military Academy of the General Staff of the Soviet Armed Forces/K. Ye. Voroshilov, an institution of higher military education with an operational/strategic profile. Unlike the other seventeen academies, the General Staff Academy has a two-year program. Admission to this school is by "special situation" (or selection), and graduates are assured key positions in the Soviet Armed Forces. As stated in the January 1967 issue of the *Military Historical Journal*, there is scarcely a member of the Soviet High Command who is not a graduate of the General Staff Academy. Attendance at this Academy represents the pinnacle of a Soviet officer's education. It is thought that about half of the Academy's students are alumni of the Frunze Academy. This would indicate a heavy representation of Ground Forces' officers in the top staff positions. The ministers of defense of many Warsaw Pact countries have also attended this Academy; for example, Hoffman of East Germany, Lomsky of Czechoslovakia, and Ionestse of Romania. Defense Ministers Tsog of Mongolia and Vo Nyugen Giap of Vietnam have also studied at the Academy.

The Academy is a center for theoretical research in the fields of military arts and sciences. Great attention is accorded to training scientific and instructor personnel. In 1976, about sixty percent of the instructors of the Academy had advanced degrees and titles. Major collections on the most important questions of military science have been written at the Academy, to include the structure of the Soviet Armed Forces, the direction of the armed forces in war and major operations, and Marxist-Leninist methodology. The General Staff Academy also conducts "Higher Academic Courses."

More and more Soviet officers are obtaining advanced academic degrees. All of the academies, some higher military engineering schools, and the Higher Naval School/Frunze offer postgraduate education programs leading to advanced academic degrees—that is, Candidate of Sciences or Doctor of Sciences. In the Soviet Union, a Candidate of Science degree is almost equivalent to a Ph.D. in the US. There is no US equivalent to the higher Soviet degree of Doctor of Science. The programs are full-time and of not more than three years. Some academies also offer correspondence programs of not more than four years. Academic degrees of postgraduate students are closely controlled by the authorities and permission to enter the various programs is not easy to obtain.

Central Hierarchy of the Officer Military Educational System

The organization associated with the Soviet officer education system extends from the military district to the MoD level. At the military district level a senior staff officer of general rank is usually designated as Deputy (or Assistant) to the Commander for Military Training Institutions and is responsible for the administrative functions associated with the schools in his district. Some military districts have twenty or more schools (*e.g.*, Moscow and Kiev Military Districts), while others have only one or two (*e.g.*, Transbaykal and Belorussian Military Districts). The deputy also has responsibility for supervising premilitary training and reserve training in higher civilian educational institutions.

At the service level, officers of general rank have been identified as Deputy Commanders in Chief of their respective components for military institutions. Finally, at the MoD level, there is a Main Directorate of Military Educational Institutions, currently headed by General Colonel Tank Troops V. A. Makarov who supervises the 140 schools. The precise interfacing among the various deputies at this central level is not clear. For example, it is believed that service/branch logistical support and guidance for certain schools may emanate as much from their respective force components as from the military districts.

Overall Manpower Estimates

Efforts to determine the manpower devoted to the Soviet officer school system are difficult, based upon information that is currently available. Various estimates by Western analysts put the figure of the average number of cadets at a school between 1,200 to 1,800, and an average of 900 for staff, faculty, and support personnel. This would suggest a range for the 140 schools of 160,000 to 240,000 for cadets and about 125,000 total for school personnel. (It is thought that five to ten percent of the school personnel are civilians.) Some Western observers estimate the percentage of the officer corps of the Soviet Armed Forces to be about fifteen to twenty percent, which would mean 720,000 to 960,000 officers, using the figure of 4,800,000 total armed forces. Given a length of service of twenty-five to thirty years and a ten percent attrition rate, it would appear necessary to commission some 40,000 officers per year to maintain this size corps. This is comparable, therefore, to an average cadet population of 160,000. The total enrollment at the academies and higher course levels is estimated to be approximately 50,000 with about 50,000 staff, faculty, and support. At the central level, administrative personnel probably approach 5,000. The foregoing estimates indicate a total manpower range of 390,000 to 470,000 for the system of commissioning and training career officers. Of course, this does not include the Soviet reserve officer corps (*i.e.*, those who receive commissions at civilian universities), the extent of which is not known. ■

When considering the USAF shortages of scientific and technical officers, do you know the situation of their counterparts in the USSR? That is illuminated in this article.

The Role of the Soviet S&T Officer

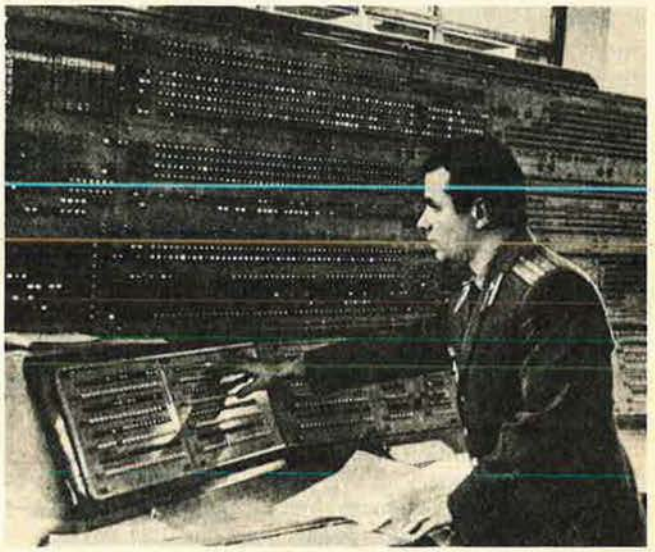
BY JILL E. HEUER

THE Soviet Union's commitment to rapid establishment of a scientific and technological (S&T) base necessary for industrial and military power can be illustrated by the emphasis placed on the training of civilian scientists and engineers. There is no difficulty in finding statistics that support this push. An often-cited example is that of engineers graduated from higher education institutes. In 1978, the Soviet Union graduated 295,100 engineers, while the US figure was 46,000. This insistence on training large numbers of scientists and engineers extends to military officer education philosophy, and is supported by the Party and military's commitment to the development of a highly competent S&T officer cadre. The purpose of this article is to explore this commitment by describing the need for such officers, how they are trained, and how they are employed and retained.

Priority of Science and Technology

The role of the Soviet S&T officer is better understood against the backdrop of the national S&T commitment. For the Soviet leadership, science is a vital instrument of national policy for the attainment of domestic and international political goals. It has come to be identified as crucial to the building of the economic base to permit the transition to a Communist society. Soviet leaders also perceive scientific and technological successes as necessary to achieve the international prestige essential to their ambition to lead the socialist countries and developing nations. Equally important, the vigorous development of science and technology permits attainment of military technological superiority over the West so that the Soviet Union can pursue its international ambitions and exercise international power.

As a result, science and technology generally, and military-related research and development (R&D) particularly, have had high national priority in the Soviet Union. Since the late 1950s, the Soviet leadership has set a national goal of attaining the position of world leader in all the most important areas of science and technology. They are convinced that they have already assumed leadership in some areas and that the twenty-first century will be the century of Soviet domination of world science.



A Captain/Engineer operating a computer at the Zhukovskiy Academy. "Substantial amounts of research are performed at military higher schools and academies."

The need for well-qualified Soviet S&T officers is demonstrated by the increasing prominence given to science and technology. This need is dictated by increased weapon complexity, the obligation of the military to make effective use of armed might to implement national policy, and the urgency that the best possible military concepts be put forth to achieve national goals.

In addition, the demand for S&T competence is observable at the highest level of national and international policymaking, as well as in the internal decisions of the Ministry of Defense. The interaction of the national political and military leadership is a significant element in the formulation of national security policy. The military leadership must demonstrate sound technical perspective relative to the engineering constraints on the feasibility and risk of plans and policies. There is an ever-present prod for military leaders to promote and employ increasingly broad S&T competence in every operational Force.

The S&T perspective of the High Command (meaning the top Soviet military leadership closely integrated

with the Communist Party of the Soviet Union) pervades the evaluation of current and near-future capabilities and hardware, and the projection of conceptual needs based on the integration of individual operational Force-level needs and capabilities. Thus, the High Command's varied functions feature constant recognition and application of diverse and complex technical expertise.

In recognition of the need for a technically upgraded officer corps at each echelon, rapid change in the nature of the professional background of military commanders began in the 1950s. With the formation of the Strategic Rocket Forces in 1959 and the introduction of nuclear weapons into all Soviet branches of the Armed Forces, increased attention was given to explaining military doctrine and strategy and to broadened engineering competence of the officer corps. As this competence began to appear, a schism developed between what can be termed the "traditionalists," *i.e.*, those with educational training strictly emphasizing military/political disciplines, and the "technocrats," *i.e.*, those with educations that were more heavily oriented toward science and engineering.

Although the differences between these two types of officers are still occasionally evident today, high-level pragmatic recognition of the need for new types of command and technical skills to operate the modernized military machine has forced a reconciliation or submergence of the differences between the two types of commanders. The expressed need for officers with broadened engineering backgrounds can be summed up by the following statement made by a Soviet colonel:

> The work experience of military cadres shows that an important condition involved in acquiring the qualities which are necessary for every officer is thorough knowledge of the exact sciences. Indeed, only he who has an excellent knowledge of higher mathematics, physics, chemistry, electronics, and the fundamentals of cybernetics is able to master the complex and formidable military equipment of the present day.

Soviet Higher Military Education System

The importance of higher military education is seen in the repetition of organizations with this special concern at the various levels of the Ministry of Defense. It is of sufficient importance to be administered by a Chief Directorate at the level of the General Staff. Each of the five Forces (Ground, Naval, Air, Rocket, and Air Defense) also has a Chief Directorate for Higher Military Education, which administers the various command and technical academies to provide tailored skills for the Force.

Future officers in the Soviet Armed Forces receive their military education in approximately 136 schools. There are at present three main types of officer schools. These are the three-year military technical school *(voyennoye tekhnicheskoye uchilishche)*, the four-year higher command school *(vyssheye kommandnoye uchilishche)*, and the five-year higher engineering school *(vyssheye inzhenernoye uchilishche)*. The trend in the 1970s has been to increase course length to five years to help officers cope with the increased complexity of modern weaponry and associated equipment. Graduates receive a degree roughly equivalent to a bachelor's degree as well as a lieutenant's commission.

Junior officer's work being reviewed by a senior officer. (Engineering training is considered indispensable to professional quality.)

The particular focus of these schools is to prepare lieutenants for duties not only in the five Forces, but also in particular branches and specialized components of the Soviet Armed Forces. Therefore, each of the Forces has its own command and engineering schools which provide tailored, narrowly specialized training. Many of these schools also offer graduate-level education for exceptional officers who are channeled into positions demanding more specialized skills. Correspondence courses are also offered at these schools, particularly for older officers (above twenty-eight) seeking to acquire scientific and technical backgrounds.

Admission to all types of higher military schools is extremely competitive. Although most of their students are officer cadets, educational opportunities also are available to outstanding enlisted personnel seeking a military career. Stringent screening of potential students assures that they meet standards of political/ideological acceptability and high moral standards. For both officers and enlisted personnel, outstanding ratings in combat readiness, military discipline, and political training are recognized in the evaluation process, in addition to academic credentials. Although all of the cited criteria weigh heavily in the screening process, each candidate must pass a series of rigorous oral and written examinations in Russian language and literature (written), physics (oral), and mathematics (oral and written). Candidates must be single males, normally between the ages of seventeen and twenty-three, who have completed their secondary education and are physically fit.

The Ministry of Defense also maintains command academies for advanced professional education purposes. Examples are well-known institutions such as the Frunze Military Academy and the General Staff Academy. The curricula at these academies have also been influenced by the need for officers with S&T backgrounds. Their programs have gradually been supplemented with some technical courses to broaden the range of command skills and to produce military commanders capable of keeping in step with advances in

military-related science and technology. Their main focus, however, remains the preparation of command cadres and most of the officer-students are at the mid-career point.

Focus of Education

The post-World War II Soviet drive to meet the need for military technical competence to guide, motivate, and evaluate the defense industry's application of complex technology to weapon design has been successful. The focus on education in the sciences and engineering is illustrated by the number of military higher schools offering degrees in these fields *(see Table I)*. More than seventy percent of the schools subordinate to the five operational Forces offer degrees in natural science and engineering. The emphasis on technical degrees is heaviest in the schools of the Air Forces and PVO-Strany, while the Ground Forces continue to concentrate on education in military-political doctrine, operations, and tactics.

The statistics on military officer degree holders are even more illustrative of S&T orientation. The following breakdown presents the percentage of officers with degrees in science and engineering in various branches of the Soviet Armed Forces in 1978:

PVO-Strany	60% of officers are technically qualified
SRF	80% of officers are technically qualified
Ground Forces	25% of officers are technically qualified
Navy	25% of officers are technically qualified

NOTE: Figures for Navy and Ground Forces are relatively low. These figures represent the most current data available and are presented without modification.

No comparable figures were found for the Air Forces. However, the percentage is believed to be well over fifty percent due to the large number of military schools of the Air Forces that offer degrees in aviation-related engineering fields.

In the early 1970s, military education institutes were renamed "higher" military education institutes and, in some cases, the training period was upgraded and extended to five years in order to make the degrees received comparable to those obtained from civilian higher education institutes. All of the Air Force schools for pilots and navigators have been renamed higher education institutes, with their graduates holding the diplomas of pilot-engineer and navigator-engineer. According to General Colonel M. N. Mishuk, a Deputy Commander in Chief of the Soviet Air Forces, "The new tasks of programmer and computer operator have been added to the engineering, navigation, communications, and other skills that fighter pilots must master." This is additional evidence supporting the estimated large number of technically qualified officers in the Air Forces.

The Soviet aerospace industry, in particular, owes much to the academies and schools of the Soviet Air Forces. In the early years of Soviet history, these schools were the only sources of aerospace-related education. The Military Air Engineering Academy imeni Zhukovskiy, for example, was the only aviation higher education institute in the Soviet Union until 1930. The Academy's graduates include famous civilian aircraft, missile, and propulsion designers such as Mikoyan, Korolev, Yakovlev, and Tumanskiy, as well as the former minister of the aviation industry, Dement'yev.

Curriculum

Soviet military education officials proudly claim that the training of officer candidates is maintained on a high technical level. Students generally have thirty-six hours of instruction per week. Seniors, who work on scientific research projects, have thirty hours per week of instruction. The teaching methods include lectures, laboratory and field training, seminars, workshops, course proj-

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Table I: Commissioning Schools by Type and Force

FORCE	TYPE OF SCHOOL			
	Technical[2]	Command[3]	Engineering	Other (Political)
Air Forces	4	13	6	-
PVO	-	11	3	-
SRF	-	5	-	-
Ground Forces	-	31	8	-
Navy	-	7	3	-
Other[1]	2	16	6	21
Total	6	83	26	21

Source: *Soviet Military Schools*, DDB-2680-52-78, DIA, 1978, UNCLASSIFIED

NOTES:
1. Includes KGB, MVD, Rear and Technical Forces, and signal troops.
2. Technical schools graduate specialists in such fields as communications, geodesy, cartography, and radio-electronics.
3. Command schools include both technical and nontechnical-degree-granting schools. Approximately sixty percent of the command schools graduate lieutenant-engineers.

ects, troop training, participation in military exercises, consultation with the teaching staff, and independent individual studies under an instructor's supervision. Depending upon his degree of specialization and level of training, a student may receive practical training in a troop unit, on board a ship, in an industrial plant, in construction projects, or on firing ranges. Students are urged to participate in scientific and inventive activity, mainly in the student design bureaus.

The academic programs at the schools include a wide variety of engineering and military subjects. Curricula for schools commissioning lieutenants for the Air Forces, PVO-Strany, and SRF would likely include the following subjects:

Aerodynamics
Aircraft and Engine Design
Aircraft Equipment and Systems
Air Navigation
Analytical Geometry
Aviation Meteorology
Bomb and Rocket Ballistics
Chemistry
Descriptive Geometry
Electronics and Automation
Foreign Language
General and Air Force Tactics
Higher Mathematics
History of Military Art
History of the CPSU
Marxist-Leninist Philosophy
Mechanical Drawing
Military Pedagogy and Psychology
Physics
Political Economy
Principles of Scientific Communism
Probability Theory
Radio Engineering
Theoretical Mechanics
Topography

The number of hours of electronics, computer technology, and related disciplines has been increased in most military schools in recent years. Even though military officers are narrowly trained, the rapid advances in weapons and technology have forced the standard inclusion of subjects in the curricula which were not recognized as necessary ten or fifteen years ago.

In addition, more attention is now being given to updating laboratory equipment that students use in their senior research projects. Laboratory work has always been a considerable segment of military school curricula. Lately, however, the number of laboratory hours has been increased in order to stimulate creative, independent thinking in future officers.

Use of S&T-Qualified Officers

The officer with higher military S&T education credentials has a broader variety of career opportunities than one without. The prima-facie case for use of S&T competence in units equipped with complex systems has been touched on already. Basically, there are four significant classes of endeavor where S&T competence is a significant factor in officer suitability. They are operational units, specialized directorates, scientific and technical directorates, and military education institutes. In each of these areas, the S&T officer's major function is to increase the effectiveness of weapons technology in order to maintain constant military capability and readiness.

The S&T officers used in operational units are required to be able to operate and maintain complex weapons and weapon systems. Pilots, navigators, and missile crewmen, for example, must have enough formal S&T training to be familiar with complex system design, pneumohydraulic systems, electromechanical and electronic control systems, and thermal and chemical devices and systems in order to ensure optimal operation of weapon systems.

Specialized directorates with the individual Forces, such as Technical Repair and Military Construction, employ S&T officers qualified as military engineer/mechanics, military engineer/electricians, and military construction engineers. The last specialty is offered at three military construction schools graduating military civil engineers.

Perhaps the greatest number of S&T-qualified officers is concentrated in the Technical Directorates of the various Forces, since there is a variety of jobs within these directorates requiring S&T expertise. As part of its job of monitoring weapons projects through development and production, the technical directorates send teams of military representatives to facilities that have substantial military R&D or production contracts. The interface of the Soviet S&T officer with military-product industrial ministries is a particularly demanding role.

Technical qualifications are especially important because the military representatives function over the entire spectrum of the weapon acquisition process. They formally accept equipment on behalf of the military customer and ensure that quality and performance meet the specifications laid out in contracts. They can also work out independent cost estimates to compare with the R&D facility's figures. There is another incentive for military representatives to be technically qualified and to perform well. They can be tried in court for criminal negligence if they accept inferior products. However, despite their potential power with production plants, the representatives perform primarily a control rather than a management function. They are, therefore, the eyes and ears of the Ministry of Defense in their relationship with the defense-industrial design bureaus, research institutes, and production plants involved in weapon system R&D and production.

Military officers are also used in the limited number of research institutes subordinate to the Technical Directorates of the operational Forces. These institutes focus on product improvement and support of future concept generation, with specific emphasis on experimentation and testing. In the Soviet Air Forces, for example, after each prototype aircraft is certified as meeting development specifications as a result of the industrial ministry's development flight test process, an Air Forces research institute performs extensive operational suitability testing which includes armament system performance and ordnance delivery.

Lastly, Soviet S&T officers are also employed as faculty members in military higher schools and academies where their time is divided between teaching and research. These positions usually require an advanced degree obtainable through military graduate programs. Training, rather than research, is the main function of military schools. However, a substantial amount of research is performed. The Novocherkassk Higher Military Command School of Communications, for example, has a scientific research laboratory that has built devices for determining methods of monitoring chemical current sources. These devices have been introduced in several industrial enterprises. Other military

Students of the Military Air Engineering Academy imeni Zhukovskiy use computers for problem-solving in their research projects.

school research projects include work on theory of mechanisms and machines, strength of materials, simulators for studying explosion processes, excavating machinery, turbojet engines, compressors, and turbines. The Military Air Engineering Academy imeni Zhukovskiy has a complex of subsonic and supersonic wind tunnels for research.

Soviet Officer Retention

The Soviet officer enjoys privileges extended only to a few elite groups. Much of the high social prestige he enjoys is based to a large extent on the people's patriotic ardor derived historically from the repulsion of recurring invaders. The Party membership held by ninety percent of the officer corps identifies them as an honored group, since only six percent of the national populace has membership in the elitist Communist Party. The military is included in the highest levels of Party and government. The military, however, does not enjoy total trust; the Party, through the Main Political Directorate, pervades every unit.

Pay and privileges indicate a condition of favorable stature.

- Officers are among the highest paid personnel, as a group, in the Soviet Union. There is additional pay for special knowledge and skills, academic degrees, remote duty, and overseas duty.
- In an area that is most troublesome to the general populace, that of obtaining living quarters, priority is given to officers.
- In a society where inordinate amounts of time are spent in normal everyday undertakings, the Soviet officer enjoys precedence over the average citizen in being able to move to the head of a line of customers awaiting access to a restaurant, and being seated promptly.
- Military stores in garrison areas provide, at low prices, scarce food items produced by collective farms.
- Many officers own a dacha or country home.
- Opportunities exist for travel abroad.
- A number of additional benefits, such as transportation, family member jobs, housing, and excellent retirement pay and privileges are just as appealing and effective.

Whatever enticement or combination of enticements appeals most to the Soviet officer, he is well motivated to excel and move ahead. The rewards of success are tangible, and the officer is very much encouraged to be the best officer and best engineer in his unit, branch, and Force. The earliest age at which he can be transferred from an active to reservist is forty. Also, the attractiveness of seeking civilian employment is reduced considerably by the probable loss of status and privilege and the common lack of advertising of job opportunities. The number of S&T officers lost to the civilian-manned facilities of the military-product industrial ministries is negligible. The research institutes and design bureaus within this sector are manned by the most talented graduates of select technical institutes who enjoy many prerequisites by virtue of the top priority accorded to military-product R&D.

(The select education institutes include such schools as Moscow Higher Technical School imeni Bauman, Moscow Aviation Institute, Moscow Physical Technical Institute, Leningrad Polytechnic Institute, and Leningrad Technological Institute. The ties between these schools and industrial facilities are strong. Many industrial scientists and engineers lecture at these institutes, assign research subjects to students, and review and approve dissertations leading to advanced degrees on R&D-related projects. Often, undergraduate research projects are carried out at industrial facilities during the students' last year.)

The graduates are also an elite group. However, employment in these industrial ministries is not a viable job option because they are exclusive in the sense that they have an established S&T manpower supply channel that limits such opportunities. Thus, there is the absence of truly competitive career opportunities in the national economy for military officers.

The Soviet S&T officer is recognized as a valuable national asset. He has a secure and prestigious berth, his skills are exercised, and officer loss to civilian occupations is not a major problem in the current environment.

This article attempted to explore how the increasing emphasis on S&T qualifications in the Soviet officer corps reflects the complexity of modern weapons and the anticipation of increasing future emphasis on technology. Therefore, the role of the Soviet S&T officer is likely to become even more vital in the future. ■

FROM GEARING UP

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Soviet airpower has evolved into a formidable multimission force over the three and a half decades since the end of World War II. This buildup occurred in the context of Soviet doctrine and burgeoning industrial capabilities . . .

Soviet Airpower: Behind the Buildup

BY COL. (SELECTEE) LYNN M. HANSEN, USAF

THE recent statement by the editor of *Jane's All the World's Aircraft* that "any belief in continued Western air superiority may be illusory" must be viewed with deep concern by all members of the North Atlantic Alliance.

Airpower has always been the West's trump card, the area of military endeavor where we were sure of technological and tactical superiority. So it is natural to ask if this superiority has been eroded and, if so, how we allowed this to happen.

A fundamental principle pervading all Soviet military thought is the primacy of the offensive.

This article makes no attempt to provide the answers to these questions. Rather, it provides some insights into how airpower is viewed by Soviet military theoreticians, where it fits into their combined-arms warfare doctrine, and some of the missions it must perform for success in modern combat. It then becomes clear that the expansion of Soviet airpower is not an overnight phenomenon, but the result of a carefully reasoned process that is producing results.

Doctrinal Factors

In the past two decades, the Soviet Union's expenditures on modernizing its air forces have increased more rapidly than for any other service, often at more than three times the rate for defense spending as a whole. Nevertheless, improvements in air force capability have been paralleled by similar advances in virtually every facet of combat capability in every service and branch of arms in the Soviet Armed Forces. This has been a kind of categorical imperative because Soviet military doctrine, enunciated by the Communist Party's Politburo, has always (with the possible exception of the Khrushchevian interlude) stipulated that war can be successfully prosecuted only through the combined efforts of all the armed forces.

There is no direct Soviet counterpart to USAF basic doctrine, nor does any other element of the Soviet military establishment have its own doctrine. There is only the national military doctrine—also extended to the Warsaw Pact Joint Command. Similarly, the air force does not have its own strategy. There is only a national strategy closely linked to military doctrine. Strategy and doctrine interact with military science and the Party's military policy as part of the process that defines the size, structure, and capabilities required to enable the Soviet Armed Forces to project military power in support of political objectives.

A fundamental principle pervading all Soviet military thought is the primacy of the offensive. The offensive, with the basic goal of destroying the enemy, is the most important aspect of military endeavor; defense is merely a condition in which a subsequent offensive is prepared. The purpose of fighting a war, the Soviets believe, is to gain some political objective, and precious few political objectives of any importance can be obtained by developing and projecting a defensive force.

Lest anyone think this is a new precept, be reminded that it was a fundamental principle from the founding of the Red Army and was enunciated with great clarity in the 1930s by such renowned officers and theoreticians as Mikhail Frunze. It has never been refuted, has survived the trauma of World War II, and is very much in effect today.

The more recent pronouncements by Soviet leaders ring with proclamations of peaceful intent, that the armed forces are defensive in nature, but structured to

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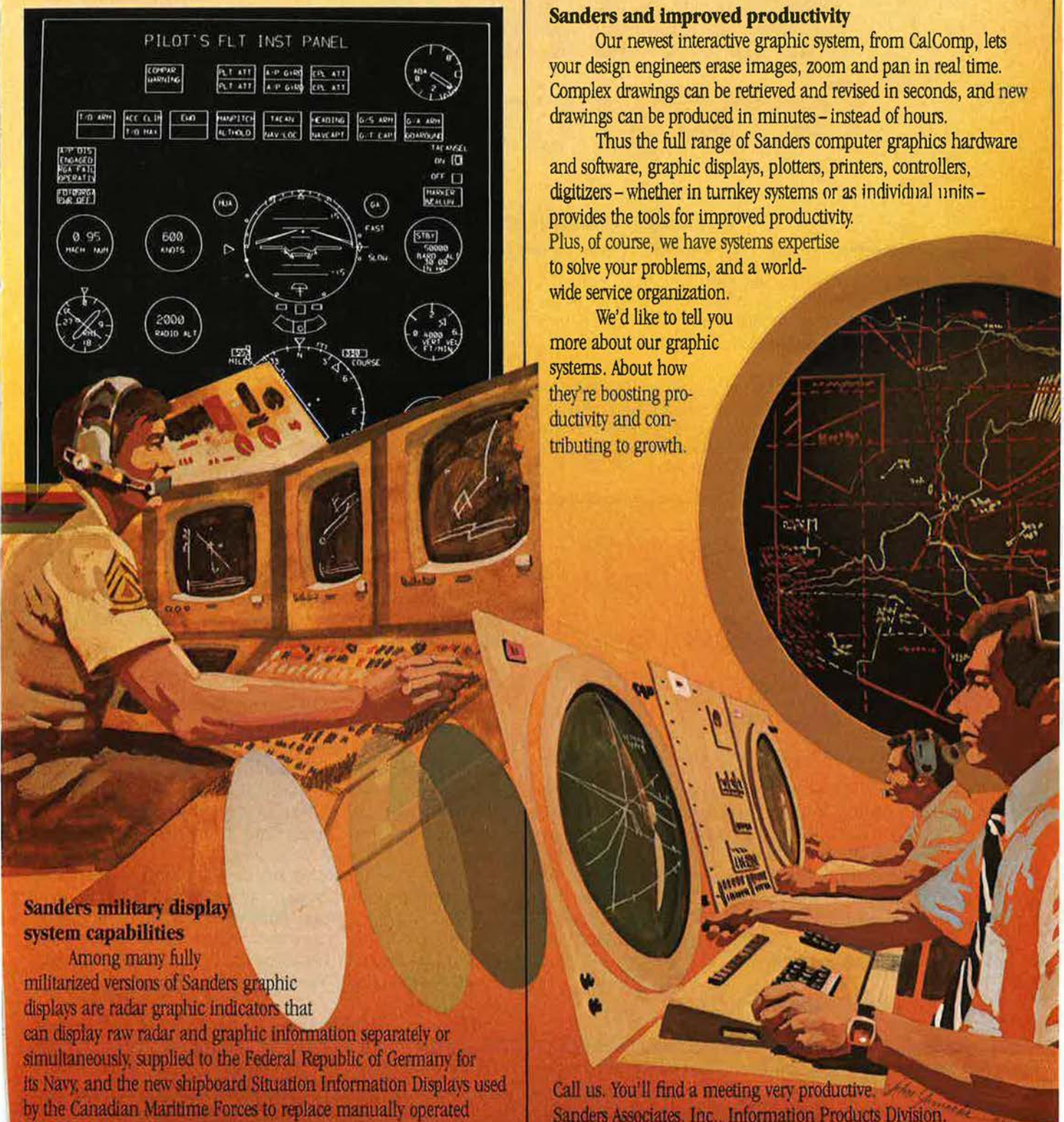

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quickly and effectively repulse any aggressor and ensure that further warfare is conducted on the territory of the aggressor. Yet, these same armed forces also have the mission of protecting the gains of socialism everywhere and of creating conditions favorable to budding revolution and peoples' liberation movements throughout the world. Thus there is a fundamental drive toward changing the so-called correlation of forces in favor of socialism. At least once in the past fifteen months, the offensive nature of the Soviet Armed Forces has been exploited to secure or maintain a government in a neighboring country that was acceptable to the bosses in the Kremlin.

Air Force Operational Art

Although the Soviet air forces do not have their own doctrine or strategy, they do have their own operational art, incorporating what may be equated roughly to USAF operational or operating doctrine. Operational art *(operativnoye iskusstvo)* is the intermediate link between tactics and strategy in the troika of categories that comprise the Soviet art of warfare, sometimes called military art *(voyennoye iskusstvo)*. Following Aristotelian logic, air force operational art is but part of the greater whole of military art and national military doctrine. It, therefore, follows that the Soviet Air Forces must be structured and equipped to operate offensively. This is all the more so since it has become a basic tenet of Soviet military theory that no significant operation in a future war can occur without the active involvement of aviation, which is to carry out diverse missions both independently and in collaboration with the other services of the armed forces.

Whereas the basic principles of operational art and tactics have remained remarkably consistent from the time of their initial formulation (and certainly since 1945), operational art has undergone some evolution in the manner and means of employing these principles in a contemporary conflict. The postwar development of Soviet Air Forces operational art has been divided into three periods or phases.

According to Chief Marshal of Aviation Pavel Kutakhov, the first phase lasted from the end of the war until 1953. Left with World War II vintage aircraft and faced with new jet technology, Soviet theoreticians grappled with the question of what kind of aircraft and armaments would be required to counter the military capabilities of the USSR's potential adversaries. The growth of large and effective air forces in the United States and Britain thus became a factor conditioning Soviet deliberations.

The presence of Western airpower in Europe focused a great deal of attention on the problem of gaining air superiority, which had proved to be a prerequisite for military victory in World War II. Consistent with their own experience, the Soviets concluded that the destruction of enemy aircraft on airfields would be the most expedient method of combating British and American air forces in Europe. Even during this early period, the Soviets contemplated offensive air operations against NATO air bases. But they simply did not have the aviation technology to successfully implement their own doctrinal theory.

The second phase in the postwar development of air force operational art lasted a relatively short period, from 1953 to 1959. Most propeller aircraft were phased out as Frontal Aviation, in particular, was reequipped with the MiG-15 Fagot, powered by a jet engine derived from Western technology. The Fagot was followed by the MiG-17 Fresco. Both have outstanding records as combat aircraft, and both are still flying in various parts of the world, though Western airplanes of a similar vintage have long since been retired. But neither possessed the range or ordnance-carrying capability that would enable the Soviets to implement, with any degree of success, offensive air operations.

In the late 1950s, such second-generation aircraft as the early model MiG-21 Fishbed-C, the Yak-25 Flashlight-A, and the Su-7 Fitter-A began to appear in frontline regiments. The Fishbeds and Flashlights, designed to counter Western aircraft and keep them off the backs of the ground forces, provided no net gain in independent offensive air capability, even though by flying cover they complemented the ground offensive. On the other hand, the Fitter-A was designed as a ground-attack aircraft with only minimal air-to-air capability. The MiG-19 Farmer was also in service with Frontal Aviation in several variants, with the D-model being optimized for ground attack. Nevertheless, both the Farmer-D and Fitter-A suffered from restricted range and ordnance-carrying capabilities, and could not be considered equal to any of the Century-series fighters in use in Western Europe at the time.

The diminutive multirole MiG-21, code-named Fishbed by NATO, was designed on the jet-to-jet experience of the Korean War. It is the best known Soviet fighter, serving some thirty nations.

The principles of operational art, however, did not change during this period. Air Force commanders were concerned that they were outmatched by the continuous development of Western technology, while their basic task remained to support offensive actions by the ground forces. Moreover, this was the period in which Khrushchev alienated his military commanders by diverging from the combined-arms concept and placing

near total emphasis on the Strategic Rocket Forces. Thus, Chief Marshal of Aviation Pavel Kutakhov will only say that new, effective methods of destroying enemy aircraft at airfields and in the air were developed. Lamenting the deplorable state of affairs, he goes on to write that under those conditions, it became even more important to *correctly* solve the problem of gaining air supremacy.

The third phase in Soviet Air Forces operational art began in 1960, and allegedly continues to the present. By this time, the military establishment had begun to reassert the primacy of long-standing doctrinal tenets and to gain support in the decision-making hierarchy for the investment in armaments and technology, for all arms and services, that would provide some promise of success in prosecuting a war against a technologically superior force. It was primarily a matter of matching technology to doctrine.

The fall of Khrushchev and the rise of Brezhnev gave further impetus to this movement and helped put into motion the huge armaments industry that now rules supreme in the allocation of resources. The development of operational art, as Marshal Kutakhov points out, was based primarily on the combat features and capabilities of Soviet aircraft and armaments, as had always been the case. The difference now was that new aircraft were on the drawing boards, new technology was finding its way into front-line units, and armament norms were generally beginning to match doctrinal requirements.

Air Supremacy

Thorough analysis of military operations in all recent wars has convinced Soviet military scientists that air supremacy *(gospodstvo v vozdukhe)* is essential for victory in any future military conflict. Without air supremacy, particularly at the operational/tactical level, the Soviet ground offensive would develop at a much slower rate, allowing time for the defense to organize and frustrate the realization of a high-speed Soviet offensive.

Winning of air supremacy, however, is not purely an Air Force mission, but one shared by all the armed forces—including the Strategic Rocket Forces.

Tactical

The large array of mobile surface-to-air missile (SAM) systems that accompany Soviet tank and motor rifle units and subunits into battle is ample testimony of the importance the Soviets attach to tactical or local air supremacy. As part of the Ground Force Air Defense organization *(PVO-Voysk),* these SAM systems (SA-4, SA-6, SA-8, SA-9) are complemented by the tracked ZSU-23-4 with radar-directed automatic antiaircraft cannon and by numerous lesser weapons. The coordination of ground antiaircraft activity with aviation assets takes place at front and army level within an air defense entity comprised of both air force and ground force personnel. In general, fighters and ground systems coordinate their operations according to zones, altitudes, and time. Fighters normally operate at extended ranges along the main enemy approaches.

Zones for SAM systems and antiaircraft fire are determined by the range and altitude of effective fire and the nature of the target they are defending. To enhance warning provided by radar systems, specially designated air observers are located in the command posts of all subunits who feed information on low-level aerial attackers into the air defense network, where computers determine the optimum weapon for combating the intruder within the allotted time.

The SA-4 Ganef antiaircraft missile's ramjet propulsion gives it a slant range of forty-three miles.

Operational

In World War II, thirty-five to forty-five percent of all Frontal Aviation sorties were dedicated to winning air supremacy at the operational level. Because of increased aircraft survivability afforded by hardened shelters and the difficulty of launching coordinated mass surprise attacks against airfields, the Soviets believe that aerial combat may comprise an even greater portion of total sorties flown in any future conflict.

Recognizing the technological superiority of Western aircraft on a one-for-one basis, long-standing principles of maneuver and mass would be employed to ensure that Eastern aircraft outnumber Western defenders in ratios that exceed 3:1 in fighters. This implies, of course, a requirement for large numbers of aircraft and the willingness to take substantial losses. Here the Soviets count on the availability of strategic reserves. These are not reserves in the more commonly understood sense, but operational units scattered throughout the military districts of the Soviet Union that are at the immediate disposal of the strategic leadership through executive action of the General Staff. These can be resubordinated to air force commanders at theater and front level in pursuit of operational air supremacy to see that requisite norms for numerical superiority are met.

Strategic

While the relationship between operational and strategic air supremacy is extremely close, the ultimate objective is overall or strategic supremacy within a particular theater of military operations. This may clearly be the sum total of tactical and operational successes, but is more likely to also involve special operations and campaigns planned and organized by the national strategic leadership, *i.e.,* the High Command.

Although the Soviet art of warfare includes employment of all armed services in the struggle for air suprem-

acy, the most massive actions would be strikes by the Strategic Rocket Forces, employing intermediate- and medium-range ballistic missiles and air operations involving a wide range of aviation assets. In an initial nonnuclear phase of a war in Central Europe, the Soviets would probably initiate the offensive with a large-scale air operation that would bear the brunt of the responsibility for neutralizing Western air forces, means of nuclear delivery, command and control facilities, and other high-priority targets.

The Air Operation

An air operation would include medium bombers assigned to both Long-Range and Naval Aviation, working in close coordination with Frontal Aviation aircraft belonging to several air armies under a single strategic command entity. Naval Backfire bombers in particular would seek to destroy aircraft carriers and naval forces in the theater, as well as air bases on coastal axes. Backfires, Badgers, and Blinders flying against air bases on the Continent and in the United Kingdom would be complemented by Fencer-As and possibly by ground-attack, swingwing Fitters and Floggers. Air combat fighters, chiefly Floggers and Fishbeds, would fly cover for the attacking forces. Yak-28 Brewer-Es would complement other platforms in providing stand-off ECM support, while other Brewers would aid MiG-25 Foxbat reconnaissance versions and pod-carrying fighters in obtaining aerial photography for damage assessment and targeting purposes.

This type of highly complex air operation would be conducted around the clock and would last from three to six days, requiring large numbers of aircraft, multiple sorties per aircraft per day, and much crew stamina. The fundamental objective would be to neutralize the main force of Western aviation on the first day of hostilities. This operation would seek to destroy sufficient numbers of Western aircraft to meet their required numerical superiority ratios, allowing them to successfully conduct the battle for air supremacy at the operational and tactical levels for the remainder of the war.

Even if the overall struggle were to decimate Eastern air assets, the criterion for success would have been met so long as strategic superiority is eventually obtained. Carefully preserved obsolescent aircraft, such as Frescos, Farmers, and older Fishbeds, could then be brought into play as a sort of second strategic echelon to exploit the void in Western air capability.

In general, fighters and ground systems coordinated their operations . . .

In that context, it should be noted that the Soviet aircraft industry currently outproduces the United States in fighter aircraft by about two to one. The sum of fighters produced at a typical two-year production rate equals the amount of all the US tactical fighters in Europe, all the fighter replacements (including the National Guard and Reserve), plus the remainder of the NATO Central Region inventory. And that is not including the large numbers of helicopters, the annual Soviet-imposed SALT II production rate of at least thirty Backfire bombers, or the apparently imminent appearance of still other offensive airframes in the near future.

Support of the Ground Forces

Soviet military science stresses that the struggle for air supremacy be conducted in the interest of the ground forces, whether at the tactical, operational, or strategic level of military art. Nevertheless, there are at least two additional Frontal Aviation missions in direct support of soldiers on the ground. Although the difference may be somewhat imprecise, these missions are support *(podderzhka)*, provided to troops in combat; and air accompaniment *(soprovozhdeniye)*, which connotes supplementing artillery in the fire-preparation phase of combat.

The assault river crossing—of which there would be many during a European conflict—is an excellent example of a combat action requiring extensive interaction of air with the ground forces. The first requirement would be detailed aerial reconnaissance provided at the tactical level by a fighter (such as Fishbed-H) with a photographic pod, by the Brewer-D, or by a reconnaissance variant of the Foxbat. Preparatory fire by artillery subunits would be coordinated with air strikes involving MiG-27 ground-attack Floggers or Fitter-C/D aircraft. Attack helicopters, such as the Mi-8 Hip-E and the Mi-24 Hind-D, would function closer to the approaching ground troops or provide suppressive fire for a landing zone for Hip-Cs with heliborne troops, whose mission would be to secure a bridgehead on the opposite bank. Counterair fighters would provide cover in what would have become a three-tiered aerial operation orchestrated to support the river crossing.

During normal breakthrough operations, air strikes would be closely coordinated with artillery barrages to extend the range of fire either vertically or laterally. The principal targets would be enemy artillery, operational

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reserves, and antitank weapons, including tanks. As the operation extended into the depth of the enemy's defense, the air mission would become more multifaceted. Both fighters and helicopters could be used during the pursuit phase to harass a retreating enemy, to disrupt transportation networks, and otherwise frustrate a successful retreat. Free search-and-destroy missions could be launched against such priority mobile targets as nuclear-delivery systems, or there might be a series of small preplanned air operations directed at specific targets in the operational interest of the ground force commander.

Attack Helicopters

Until the advent of the Mi-24 Hind, the Soviets had not practiced close air support extensively. The preference had been to rely on direct fire provided by organic artillery and tanks that could be quickly applied as the situation dictated. In part, this was because since World War II's legendary Ilyushin Il-2 *Shturmovik,* they had not possessed an aerial weapons platform with optimum characteristics for providing air support in close coordination with the fire and maneuver of troops in combat. The Mi-24 has filled the void. Not only is it considerably slower than fixed-wing jets, but it can operate from landing areas near the combat zone, fly nap-of-the-earth profiles to decrease its vulnerability, and deliver far more conventional firepower accurately than had been the case with older ground-attack aircraft.

Equipped with a large-caliber four-barrel machine cannon plus its primary armament of four thirty-two-shot rocket pods (128 unguided 57-mm rockets) and four Spiral laser-guided antitank missiles, the Hind-D may be the world's most formidable attack helicopter. Although slightly less sophisticated, the Mi-8 Hip-E is even more heavily armed, with up to 192 57-mm rockets in six pods plus four older-type antitank guided missiles. (The East German Hip-F has six, instead of four, ATGMs in addition to six 57-mm rocket pods and an aimable machine gun.)

Both helicopter types are increasing in the forces of the Soviet Union and its Pact allies. They provide an additional dimension to the Soviet doctrinal tenet of fire and maneuver, as well as clear expression of a commitment to increased firepower in support of a high-speed offensive. Despite exhaustive studies of US helicopter operations, the Soviets have not copied US employment modes, but have seized the capabilities promised by this relatively new technology to enhance their overall ability to implement the basic principles of Soviet operational art and tactics.

A Look to the Future

In the past two decades, the Soviet Air Force has undergone a total and relentless modernization program aimed at providing it with the requisite aviation technology with which to implement its operational art in the face of Western technological superiority. The next decade will no doubt witness a continuation of this program and a narrowing of the technological gap. New aircraft will continue to be introduced. A new ground attack aircraft would be especially significant in providing increased firepower and capability for ground-support operations. Unofficial sources indicate that such a close support aircraft and a new air-superiority fighter could enter the active inventory in the next few years. Look-down, shoot-down systems are being developed and should soon be appearing in air defense aircraft. It is also likely that new armaments, including various precision-guided munitions, will be available in increasing numbers in the same time period.

Despite the impressiveness of the new aviation technology that has appeared recently and will continue to appear in the Soviet Air Force, the real changes to be expected in the 1980s will be less visible but have far more impact. For the past ten years, Soviet military science has concerned itself with how doctrine and technology must fit together. This has generally fallen under the general rubric of command and control *(upravleniye voyskami),* which includes not only the external structures and mechanisms of command, but also the manner in which the individual pilot approaches his mission.

Chief among the organizational changes that have begun to emerge is the reconstitution of a prewar entity known as army aviation *(armeyskaya aviatsiya).* This places helicopter assets under the direct control of ground commanders, providing them with more responsive air support and added air mobility and maneuverability.

Even while the command and control of helicopters appears to be undergoing some decentralization, the overall trend appears to be toward greater centralization of tactical air assets in order that the principles of mass and maneuver can be executed better at the operational-strategic levels of Soviet military art. Thus, we see the recent appointment of Air Force General Colonel A. Katrich (a former Commander of the Sixteenth Air Army, GSFG) as Deputy Commander in Chief of the Warsaw Pact for Air Forces as establishing the mechanism for consolidating and controlling the use of airpower within a specific theater of military operations. This, of course, does not detract from the use of tactical air by the front commander to support ground operations at the tactical and operational levels.

Nevertheless, the more significant changes to be expected will be in the areas of individual pilot initiative and performance—areas where NATO pilots have always had the edge—as moves will be made toward more decentralized execution of command. The traditional preferred option of conducting aerial combat under the strict direction of a ground controller will still be in force, but tempered by the requirement to stay and fight at all altitudes if success is not achieved on the first controlled pass. Both fixed-wing and helicopter pilots will operate at extremely low altitudes to take advantage of terrain features in approaching targets. Thus, yet another index of Western superiority may well be eroded as Soviet and Eastern European pilots begin to maximize the capabilities of newer technology by implementing new tactics, personal initiative, and operational flexibility hithertofore not credited to the Soviet Air Forces.

In addition to ongoing Soviet refinements in matching doctrine and technology, we must now be prepared to deal with a new "style" of military operation as we attempt to answer the question raised by *Jane's* about the illusory nature of Western air superiority. ■

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Strike Eagle

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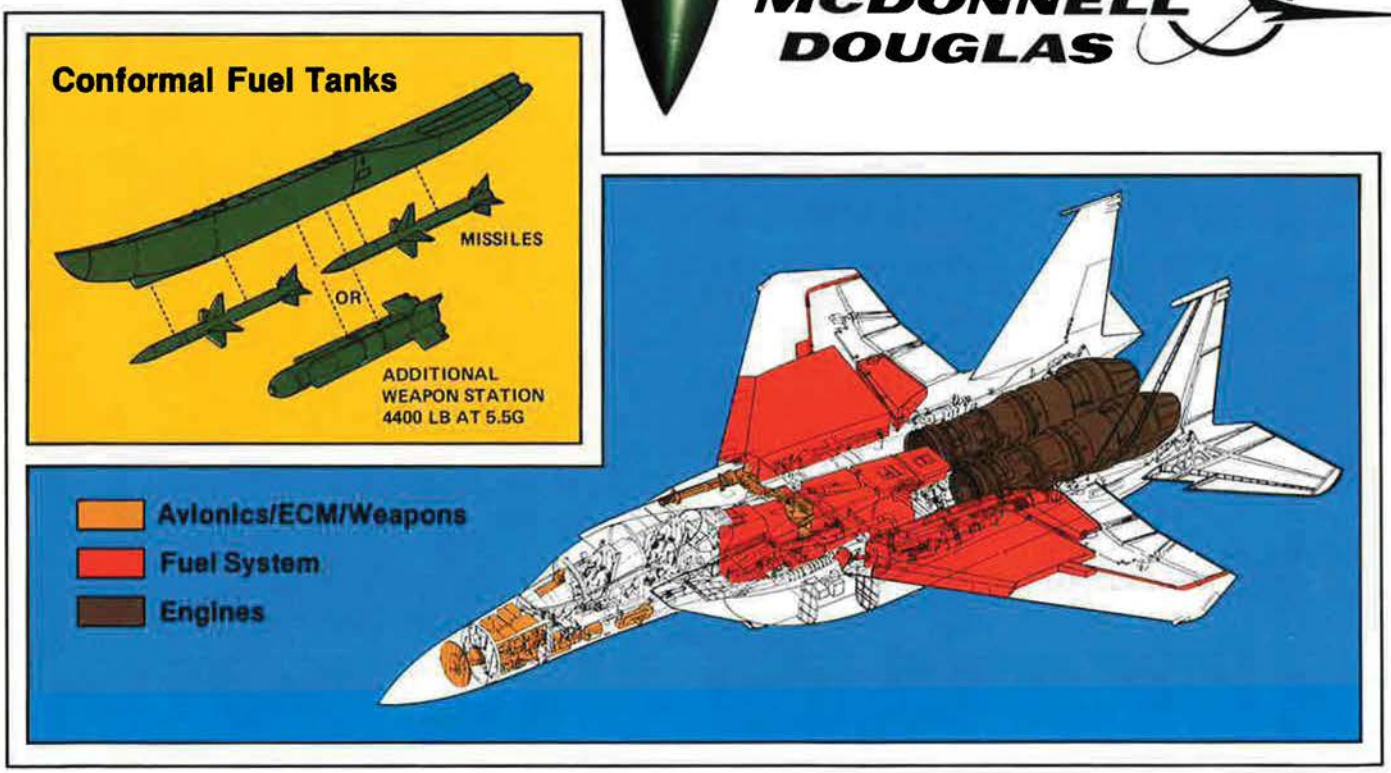

TOP LEADERS OF THE SOVIET ARMED FORCES

Marshal of the Soviet Union Leonid Il'ich Brezhnev. Born 1906. Russian. General Secretary of the Central Committee CPSU, Chairman of the Presidium of the Supreme Soviet USSR, Chairman of the Council of Defense USSR, Supreme Commander in Chief. Brezhnev was in political work in the Armed Forces during World War II, and took part in the defense of Novorossiysk. In 1957, he was given the task of expediting production of missiles and developing a space program. General Secretary of the CPSU since October 1964. He has been awarded a third Gold Star of "Hero of the Soviet Union." He also is a "Hero of Socialist Labor."

Marshal of the Soviet Union Dmitriy Fedorovich Ustinov. Born 1908. Russian. Naval artillery engineer who became wartime armaments production chief. From 1946 to 1957 he was Minister of Armaments, then Minister of Defense Industry. He worked with Brezhnev expediting missile production and the space program (1957) as Deputy Chairman of Council of Ministers. First Deputy Chairman to 1965, then Secretary of Central Committee CPSU (1965–76), Candidate Member of Politburo (1965 to March 1976), then Member of Politburo since March 1976. Minister of Defense (April 1976). Twice "Hero of Socialist Labor." Also a "Hero of the Soviet Union."

Marshal of the Soviet Union Nikolai Vasilyevich Ogarkov. Born 1917. Russian. Became 1st Deputy Minister of Defense and Chief of the General Staff in January 1977. Candidate (1966–71), then Member of the Central Committee CPSU since 1971. Deputy of the Supreme Soviet 7th through 10th sessions. With engineer troops during World War II. First Deputy Chief of the General Staff (1968–74), Deputy Minister of Defense (1974–77). Military Engineering Academy (1941), Academy of the General Staff (1959).

Marshal of the Soviet Union Viktor Georgiyevich Kulikov. Born 1921. Russian. In January 1977, appointed Commander in Chief of the United Armed Forces of the Warsaw Pact. First Deputy Minister of Defense since 1971. Member of the Central Committee CPSU since 1971. Commander of the Kiev Military District (1967–69), then Commander in Chief, Soviet Forces Germany (1969–71). From September 1971 to 1977, Kulikov was Chief of the General Staff. Frunze Military Academy (1953). Academy of the General Staff (1959).

General of the Army Aleksey Alekseyevich Yepishev. Born 1908. Russian. Chief of the Main Political Directorate since May 1962. Yepishev was in political work in the Armed Forces during World War II. Deputy Minister of State Security (MGB) (1951–53). Ambassador to Romania (1955), then to Yugoslavia (1961). Candidate (1952–64), then Member of Central Committee CPSU since 1964. Deputy of the Supreme Soviet 1st, 3d, 4th, and 6th through 10th sessions. Military Academy of Mechanization and Motorization (1938).

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

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

General of the Army Vasiliy Ivanovich Petrov. Born 1917. Russian. Commander in Chief of Ground Forces since December 1980. In World War II, commanded a cavalry platoon, then chief of operations of a rifle division. In 1957, commanded a motorized rifle division. After 1961, various command posts. In 1966, 1st Deputy Commander and Chief of Staff of the Far Eastern Military District, and in 1972, Commander. In 1976, 1st Deputy Commander in Chief of Ground Forces. Commander in Chief of Troops of the Far East. Deputy Minister of Defense, 1978–80. Full Member of the Central Committee CPSU since 1976. Deputy of the Supreme Soviet 9th and 10th sessions. Frunze Military Academy (1948). Graduate of General Staff Academy's Higher Academic Courses (1969).

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

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

Admiral of the Fleet of the Soviet Union Sergey Georgiyevich Gorshkov. Born 1910. Russian. He has held his present post as Commander in Chief of the Navy since 1956. Gorshkov took an active part in World War II landings in the Black Sea area, and supported fighting in Hungary and Yugoslavia. In July 1955, he became First Deputy Commander in Chief, then, in January 1956, Commander in Chief of the Navy and Deputy Minister of Defense. From 1956, he was Candidate, and from 1961, a Member of the Central Committee CPSU. Deputy of the Supreme Soviet 4th through 9th sessions. Graduate of Frunze Naval School (1931) and higher commanders' courses at the Naval Academy (1941).

—HARRIET FAST SCOTT

The Soviet nuclear buildup—both tactical and strategic—means that US and allied planners must be prepared for the full spectrum of conflict, should it come.

Soviet Theater Nuclear Forces

BY ROBERT KENNEDY

In a landmark speech delivered in London at the International Institute for Strategic Studies in October 1977, Helmut Schmidt, Chancellor of West Germany, mindful of the USSR's improving strategic and theater nuclear capabilities, expressed his concern over the changing strategic conditions that now confront the Alliance. According to Chancellor Schmidt, SALT had codified the Soviet/American strategic nuclear balance, thus neutralizing the strategic nuclear capabilities of the superpowers. As a result, he cautioned, the significance of the East/West balance of tactical nuclear and conventional weapons had been magnified.

Since European and American defense specialists have long been aware of what has generally been perceived as a clear Soviet conventional advantage, Chancellor Schmidt's remarks focused public attention on a series of issues that were already commanding high-level NATO interest and thus sparked an intensification of the debate over the nature of the Soviet theater nuclear buildup and over the implications of that buildup for deterrence and defense.

Soviet Theater Nuclear Improvements

During the last decade, the Soviet Union has methodically improved its theater nuclear forces at all levels. On the tactical or battlefield level, where the approximate maximum range would be equal to or less than 100 nautical miles (Rx $\leq$ 100 NM), NATO once possessed an overwhelming superiority in nuclear weapons. In some quarters that superiority has been considered one of the primary pillars in the deterrence of the overwhelmingly superior Soviet conventional forces. Today, the Warsaw Pact has more than 600 Frog and Scud-A missiles, of which more than 400 can be considered to have a nuclear mission. Moreover, they are now replacing their older Frog rockets with the SS-21. Both the Frog and Scud-A missiles are reported to have poor reaction times, low reliability, poor operational accuracy, and a primitive manual interface with Soviet targeting and command and control systems.

And while little data is currently available on the SS-21, it is reported to have a considerably greater range than the Frogs and presumedly has incorporated improvements in reaction time, missile reliability, accuracy, and handling characteristics.

The Soviet Union is also now deploying dual-capable 203-mm and 240-mm artillery. According to former Secretary of Defense Harold Brown, nuclear-capable artillery is currently only deployed in the Soviet Union. However, Soviet nuclear artillery could easily be moved to support nuclear operations against NATO.

NATO, on the other hand, while at a disadvantage in tactical missiles, still retains a relative overall advantage in short-range systems as a result of a substantial deployment of nuclear artillery. The gap, however, between NATO and Warsaw Pact battlefield capabilities has narrowed considerably over the past decade and a half, and the overwhelming superiority once enjoyed by NATO has disappeared *(see Table I)*.

The Soviet Union also has been upgrading its medium-range battlefield support systems (Rx = 101–500 NM). Currently the Soviets have deployed approximately 340 battlefield support missiles and nearly 400 tactical aircraft capable of delivering nuclear weapons. Moreover, they are now replacing their liquid-propelled Scud-B and SS-12 Scaleboard missiles with SS-23s and SS-22s and are rapidly improving the nuclear-strike capabilities of their tactical air systems. The addition of the Fitter-Cs and Ds and later versions of the MiG-21 aircraft with improved avionics and generally greater ranges than the older Soviet fighters suggests an improved capacity for low-altitude penetration and attack.

In comparison, NATO fields 180 Pershing-I missiles and approximately 200 medium-range battlefield-support aircraft (of which only about seventy are likely to be reserved for nuclear missions). Such a contrast suggests a stark imbalance in medium-range systems in favor of the Warsaw Pact *(see Table II)*. On the other hand, some of NATO's battlefield-support require-

The views, opinions, and conclusions expressed in this paper are those of the author and should not be construed as official Department of Defense, Department of the Army, or US Army War College positions, policy, or decisions unless so designated by other official documents.

Table I: Tactical Battlefield Nuclear Systems

Warsaw Pact

Artillery

Type	Rx	Number Deployed	PNM
203-mm	16	n.a.	150
240-mm	n.a.	n.a.	150
TOTALS			300

Tactical Missiles

Type	Rx	Number Deployed	PNM
Frog/SS-21	40/60	375	250
Scud-A	45	251	168
TOTALS		626	418

NATO

Artillery

Type	Rx	Number Deployed	PNM
155-mm	10	1,081	540
203-mm	11	319	160
		1,400	700

Tactical Missiles

Type	Rx	Number Deployed	PNM
Lance	60	90	90
H.J.	20	91	91
Pluton	65	32	32
		213	213

Source: Derived from data appearing in the *Department of Defense Annual Report Fiscal Year 1981*, *The Military Balance 1979–80*, and Air Vice Marshal Stewart W. B. Menaul, "The Shifting Theater Nuclear Balance in Europe," *Strategic Review*, Vol. VI (4), Fall 1978, pp. 34–45.

Key: Tactical/Battlefield Nuclear Systems: Those systems with a range equal to or less than 100 nautical miles.
Warsaw Pact: Includes all systems possessed by non-Soviet Warsaw Pact states and those in the Western Military Districts of the Soviet Union.
NATO: Includes systems currently assigned or earmarked for the European theater.
PNM: Probable nuclear mission. The US Department of Defense has indicated that some of the 203-mm and 240-mm artillery pieces, now deployed by the USSR, have been adapted to fire nuclear projectiles. Air Vice Marshal Menaul has estimated that the Soviet Union now has 150 203-mm gun/howitzers with a nuclear capability. It is reasonable to assume that as a minimum the Soviets have deployed an equal number of 240-mm gun/howitzers.
Rx: Approximate maximum range in nautical miles.

ments can be covered by tactical air assets drawn from those that because of their range are considered Eurostrategic *(Table III)*. However, tactical air assets so employed would reduce the total number of nuclear strikes likely to be available against Eurostrategic targets.

Perhaps most significant, especially for US European allies, is the slow but methodical change in the balance of nuclear capabilities that is taking place at the Eurostrategic level (Rx = 501–4,000 NM). In the mid- and late-1960s, it was generally assumed that the West had a clear advantage in systems that have recently come to be called Eurostrategic. US Polaris submarines commit-

Table II: The Balance of Medium-Range Battlefield Support Systems

Warsaw Pact

Battlefield Support Missiles

Type	Rx	Number Deployed	PNM
Scud-B/SS-X-23	160	316	316
SS-12/SS-22	435		
SS-N-4	305	27	27
TOTALS		343	343

Tactical Aircraft

Type	Rx	Number Deployed	PNM
Su-7 (Fitter-A)	275	270	68
Su-17 (Fitter-C/D)	440	480	120
Su-20 (Fitter-C)	440	35	9
MiG-21 (Fish-bed-J, K, L, N)	350	750	188
TOTALS		1,535	385

NATO

Battlefield Support Missiles

Type	Rx	Number Deployed	PNM
Pershing-I	390	180	180
		180	180

Tactical Aircraft

Type	Rx	Number Deployed	PNM
Jaguar	450	177	59
Etendard	350	24	12
		201	71

Source: Derived from data appearing in the *Department of Defense Annual Report Fiscal Year 1981*, *The Military Balance 1979–80*, and *Jane's All the World's Aircraft 1978–79*.

Key: Medium-Range Battlefield Support Systems: Those systems with a range of 101 nautical miles to 500 nautical miles.
PNM and Rx: See Table I. It was assumed that one-fourth of all Warsaw Pact tactical aircraft, one-third of all Jaguars, and half of the Etendards would be retained in a nuclear role. The approximate maximum ranges (Rx) listed for tactical aircraft are the greater of the ranges indicated in the above-mentioned source documents. Estimates of maximum range (Rx) assume a hi-lo-hi combat flight profile. The Fitter-C/D range was adjusted for a lighter bomb load than that indicated in *Jane's* and for the addition of external fuel tanks.

Table III: The Balance of Eurostrategic Systems

Warsaw Pact

Mid-Range Missiles (MR/SLBMs)

Type	Rx	Number Deployed	PNM
SS-4 (Sandal)	1,200	375	375
SS-N-5 (Serb)	700	54	54
TOTALS		429	429

Intermediate-Range Missiles (IR/SLBMs)

Type	Rx	Number Deployed	PNM
SS-5 (Skean)	2,300	68	68
SS-20[1]	3–4,000	120	120
SS-N-8	4,800	6	6
TOTALS		194	194

Aircraft

Type	Rx	Number Deployed	PNM
Su-19 (Fencer)	600	172	43
MiG-23/27 (Flogger-B & D)	520	1,052	263
Il-28 (Beagle)	1,400	5	3
Tu-16 (Badger)	1,675	238	116
Tu-22 (Blinder-B)	1,750	101	50
Tu-26 (Back-fire-B)	3,000	40	20
TOTALS		1,608	495

NATO

Mid-Range Missiles (MR/SLBMs)

Type
(None)

Intermediate-Range Missiles (IR/SLBMs)

Type	Rx	Number Deployed	PNM
SSBS-S-2	1,875	18	18
Polaris[2]	2,800	64	64
MSBS M2/M2O[2]	3–4,000	64	64
Poseidon	2,800	40	40
		186	186

Aircraft

Type	Rx	Number Deployed	PNM
Vulcan B-2	2,000	56	56
Buccaneer	1,000	50	25
Mirage IVA	950	33	33
FB-111	1,000	170	85
F-4	600	499	166
Mirage VF	650	94	31
Mirage IIIE	650	105	35
F-104	650	367	122
A-6	1,000	20	10
A-7	1,000	40	20
		1,434	583

Aggregate Eurostrategic Capabilities

	No. of Systems Deployed	PNM
NATO	1,620	769
Warsaw Pact	2,231	1,118

Source: Derived from data appearing in the *Department of Defense Annual Report Fiscal Year 1981*, *The Military Balance 1979–80*, and *Jane's All the World's Aircraft 1978–79*.

Key: Eurostrategic Systems = systems with a maximum range of 501 to 4,000+ nautical miles.
Mid-Range Missiles (MR/SLBMs) = systems with a maximum range of 501 to 1,500 n.m.
Intermediate-Range Missiles (IR/SLBMs) = systems with a maximum range of 1,500–4,000+ n.m.
PNM and Rx: See Table I.

NOTES: [1]It is assumed that 60 SS-20 missile launchers are deployed in the European theater with one reload available per launcher.
[2]It is assumed that two British Polaris and two French submarines are on patrol during peacetime and a third could be readied during time of crisis.

ted to SACEUR, NATO medium-range strike aircraft deployed on the Continent or stationed offshore on carriers, the British bomber and Polaris submarine fleets, and the French Mirage IVA strike aircraft and their expanding ballistic missile submarine fleet were considered a more-than-adequate match for the medium bombers and the 750 or so MRBMs and IRBMs the Soviets had deployed to support long-range nuclear operations in Europe.

During the last decade and a half, however, the Soviets have made a determined effort to offset Western capabilities. With the introduction of Fencer- and Flogger-type aircraft, the Soviet Union has substantially improved the range, payload, avionics, and ECM capabilities of its European nuclear strike air arm. Adm. Thomas H. Moorer, former Chairman of the US Joint Chiefs of Staff, described the Fencer in early 1974 as "the first modern Soviet fighter to be developed specifically as a fighter-bomber." Its two-man crew (pilot and weapon-systems operator) suggests an increased ability to conduct night, all-weather, low-altitude, and precision-nuclear missions into the heart of Western Europe. *Jane's* places the Fencer, which entered squadron service in 1974, in the same class as the USAF F-111. Today the Soviets have deployed more than 1,200 Fencer and Flogger-B and D aircraft in the European theater.

Coupled with continued improvements in their high-performance fighter aircraft, the Soviets have also begun deploying a new-generation, variable-geometry, supersonic bomber known in the West by the NATO code name "Backfire." Manufactured by Tupolev, the

Backfire is reported to have a maximum speed at high altitude of Mach 2.5 and an "on-the-deck" supersonic penetration capability. It can carry a full range of free-fall gravity weapons as well as the most technically advanced air-to-surface nuclear cruise missiles available in the Soviet inventory.

To date, the Soviets have deployed approximately forty Backfire bombers to the European theater. The Soviet Union, however, is reported to be producing the Backfire at a rate of thirty aircraft per year, with an expected deployment of up to 300 aircraft.

Of the new generations of systems currently being deployed by the Soviet Union in Europe, none has created as much concern and controversy as has the deployment of the SS-20 IRBM. The SS-20 is a solid-fueled, two-stage, MIRVed, mobile missile currently replacing or supplementing the older, less-accurate, less-reliable SS-4s and SS-5s. One former senior Department of Defence civilian official who now writes under the name of Justin Galen has noted that the reliability, accuracy, reload, and retargeting capability of the SS-20 should permit its use " . . . effectively in first-strike, launch-on-warning, or second-strike attacks." Furthermore, he contends that with the deployment of the SS-20, the Soviet Union " . . . could probably launch a reliable mass strike with such systems against virtually every NATO air base, weapons storage site, C^3 [command control and communications] site, and fixed missile site with negligible warning."

A more pointed illustration of the concern raised by the SS-20 is a statement by French strategist Pierre Gallois. M. Gallois has suggested that with the addition of the SS-20 the Soviet Union can now destroy NATO's entire inventory of nuclear weapons in ten minutes.

As a result of such improvements, today the Soviet Union fields a formidable array of Eurostrategic capabilities. They currently have deployed more than 600 MR/IRBMs and SLBMs and nearly 500 nuclear capable aircraft to support theater-wide nuclear operations. This compares favorably with the West which (including French theater forces) has approximately 190 IR/SLBMs and 580 tactical/strike aircraft earmarked for the European theater *(see Table III)*.

The inherent "softness" of the data available on Soviet and Western nuclear capabilities makes precise measurements of the balance the captive of many assumptions. Nevertheless, given the data at hand, the composite of theater nuclear capabilities now available to the Soviet Union suggests that the NATO/Warsaw Pact balance of nuclear forces has shifted from one that once favored the West to one that now *appears* to favor the Soviet Union and its Warsaw Pact allies. While the West may retain an advantage at the tactical/battlefield level, the Soviets are clearly ahead in medium-range

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Such mobile tactical missile launchers as the Frog-7 system considerably enhance the current Soviet doctrine of surprise and rapid offensive warfare.

systems, and now have what appears to be an aggregate numerical advantage in Eurostrategic systems. Moreover, with the addition of Fencer, Flogger, and Backfire aircraft and SS-20 IRBMs, the technological superiority once thought to clearly favor NATO is now being seriously challenged.

This is not to suggest that the Soviet Union has as yet achieved any meaningful overall quantitative or qualitative theater nuclear superiority. However, the data do support the contention that, at best, a kind of rough parity exists at the theater nuclear level. Furthermore, trends suggest that the USSR has not decided to limit or reduce its efforts in the field of theater nuclear forces. On the contrary, the continued improvement of Soviet theater nuclear capabilities portend an increased nuclear threat to the West.

Soviet Doctrine

Soviet theater nuclear force improvements complement and are complemented by Soviet doctrine. Since the Khrushchev period, Soviet military writers have rejected the idea of adopting strategic defense during the first phases of a conflict, as had Stalin in the early part of World War II. Today Soviet doctrine focuses on surprise and rapid offensive warfare.

Soviet military writings do not support the notion that the Soviets would launch a "bolt out of the blue"; surprise, however, is viewed as one of the most important principles of military art and a vital prescription for success in conflict. Colonel Vasiliy Ye. Savkin, in one of the early and basic books of the "Officers Library" series published by the Military Publishing House in Moscow and recommended for all officers and students in higher military schools, has written:

> The first law of war is that the course and outcome of war . . . depends primarily on the correlation of available, strictly military forces of the combatants at the beginning of the war. . . . [T]he beginning of a war can have a decisive effect on the outcome.

According to Savkin:

> From this law come a number of the most important principles of military art, including the principle of surprise. . . . Surprise has been a most important principle of military art since olden times.

As a result, he contends:

> The desire for surprise has begun to permeate all decisions for the conduct of operations and battles.

In another major work in the same series, Colonel A. A. Sidorenko contends that the history of conflict itself has emphasized the value of surprise. He noted: "Extremely often the absence of surprise turned out to be the reason for the failure of an operation at its very beginning."

Equally stressed by Soviet military theorists is the importance of rapid offensive combat operations. Indeed, Soviet military science considers the offensive as the main type of military combat action. Savkin has written:

> . . . the offensive is the basic form of combat actions, since only by a decisive offensive conducted at a high tempo and to a great depth is total defeat of the enemy achieved.

Similarly, Sidorenko in his seminal work on offensive warfare stressed the need for the " . . . swift development of the breakthrough," the value of a rapid " . . . offensive in depth," the importance of night operations in " . . . striving to attain surprise and continuity in the offensive," the contribution of airborne and amphibious forces to increased attack rates, and ultimately to " . . . the successful conduct of offensive operations" and, in general, the importance of maneuver and shock action on the modern battlefield. Likewise, division Commander Colonel Lobachev argues:

> A high tempo is not a goal in itself, but a means to achieving victory in combat. The speed of movement of the attackers denies the enemy the opportunity to freely maneuver with his forces and equipment, to utilize the reserve . . . and it neutralizes many of the strengths of the enemy defense.

From the Soviet perspective, nuclear weapons enhance the importance of surprise and rapid offensive operations, which in turn, synergistically, enhance the value of nuclear weapons in securing victory. In describing the relationship between nuclear warfare and Soviet doctrine and defense planning, Soviet writers have proclaimed the nuclear weapon as the "most important element of the battlefield" and "the basic means of destruction." They suggest that " . . . the side which employs nuclear weapons with surprise can predetermine the outcome of battle in his favor." The late Minister of Defense Marshal Grechko has written: "Nuclear missiles will be the decisive means of armed conflict." Likewise, Major General V. V. Voznenko has concluded that "decisive victory in an offensive is achieved by using the results of nuclear strikes. . . ."

In general, Soviet writers maintain that "nuclear weapons create an opportunity to quickly alter . . . the balance of forces of the sides . . . " and that "the high maneuverability and dynamism of warfare . . . [are] a result of equipping the troops with nuclear weapons and their complete motorization." They believe that "nuclear weapons make it possible in the shortest period of time to cause great losses to the defending side, and to create breaches in its battle formations." They contend that "nuclear strikes can destroy the strongest centers and strong points in the enemy defense, his reserves, means of mass destruction, and other important objectives." As a result, Soviet military writers have concluded that through " . . . the stunning effect of surprise attacks by nuclear and conventional weapons and decisive offensive operations by troops, the enemy's capabilities are sharply lowered, . . . the correlation of forces changes immediately. . . . He may panic and his morale will be crushed."

Thus, while there are many reasons the Soviet Union would seek to avoid conflict in Europe, especially nuclear conflict, their doctrine and the forces they have been methodically building suggest that: (1) they believe that *should* war occur in Europe it is likely to involve the use of nuclear weapons; (2) they intend to be prepared for such a war should it occur; and (3) they believe that in conjunction with surprise and rapid offensive maneuver, the coordinated use of nuclear weapons will have a decisive effect on the outcome of the conflict.

NATO Planning for the Wrong War?

Despite dramatic improvements in Soviet theater nuclear capabilities and the development by the Soviets of a doctrine that focuses on the integrated use of nuclear as well as chemical and conventional capabilities should war occur in Europe, the US bias for conventional forces and conventional planning, which began during the Kennedy Administration, persists. This bias was an outgrowth of increasing concern among Europeans as well as Americans over the effects of a two-sided nuclear exchange in Europe that had been made possible as a result of the deployment by the Soviets in the late 1950s and early 1960s of a sizable theater nuclear capability. In light of the Soviet deployment, the utility of a defense based on the near-spasmodic nuclear response to a major Warsaw Pact conventional aggression that seemed to have characterized the era of "Massive Retaliation" was seriously questioned. Capturing the essential thrust of Alliance concerns at the time, General André Beaufre has written:

> . . . as the Soviet nuclear threat developed, it became increasingly difficult to believe that recourse to a "nuclear exchange" would be made for any reason other than the defense of absolutely vital objectives. It seemed wise, therefore, to anticipate a more or less extended period of resistance before unleashing "massive retaliation."

In response to such concerns, the Kennedy Administration began to refocus its efforts on improving capabilities for defense at the conventional level. The doctrine resulting from a number of studies and pronouncements became known as the doctrine of "flexible response." In theory, old trip-wire forces would be replaced by forces more adequately prepared to meet a

In addition to its intercontinental threat to the US, the Soviet Backfire bomber could be used as a significant strategic and tactical weapon against NATO. Western strategists see such bomber forces as an adjunct to Soviet submarines operating in both the Atlantic and Pacific to choke off waterborne resupply.

Soviet conventional thrust. This would give pause to the Soviets and permit them to reflect on the consequences of pursuing a conflict that might well escalate to levels at which they were at a clear relative disadvantage. Thus, Soviet conventional capabilities would be partially offset by an improved NATO conventional force posture. Moreover, through improvements in conventional force posture, the use of nuclear weapons might be forestalled, thus raising the nuclear threshold.

The practical effect, however, of this shift to emphasis on a conventional strategy was to all but eliminate serious thinking about the conduct of operations on a nuclear battlefield and the psychological effect on friend and foe alike of being fully prepared for such a conflict should it occur. According to a study by John P. Rose, in the mid-1950s fifty percent of the instruction and training at the US Army's Command and General Staff College was devoted to theater nuclear conflict. In 1957–58, 614 regular course curriculum hours focused on the nuclear battlefield. Moreover, the weight of military writing during the period clearly indicated an emphasis on theater nuclear operations. In the eight-year period immediately preceding the Kennedy Administration's emphasis on conventional defense, the Army's *Military Review* published 155 articles dealing with theater nuclear warfare. In contrast, in the eight-year period from 1962 to 1969 only twenty-six articles were published by *Military Review* on the subject, and by the late 1960s instruction on nuclear conflict had dropped to sixteen hours.

The continued improvement in Soviet strategic and theater nuclear capabilities over the last decade and a half has significantly altered the military environment on the Continent. The US and its NATO allies can no longer rely on an unquestioned Western nuclear superiority to deter all uses of nuclear weapons by the Soviets. As a result, the assumption that several hundred allied and Warsaw Pact divisions might engage in a conflict in Europe with neither side resorting to nuclear weapons is simply unrealistic. Yet, the US emphasis on conventional forces and planning for conventional conflict remains.

In part, this is no doubt the result of a recognition of a clear imbalance in favor of the Warsaw Pact in conventional weapon systems and force structures and a perceived need in some quarters to provide some relative balance of capabilities at all levels of potential conflict—especially as Soviet strategic and theater nuclear capabilities have improved. In part, the bias toward conventional forces and planning may reflect the difficulty of planning for a nuclear war for which no previous conflict serves as a guide. In part, the bias may reflect the hope that the conventional nuclear "firebreak" would not be crossed. Almost certainly, the bias reflects a strong reluctance to broach a subject that has become extremely politically sensitive in Western Europe. On this latter point, Robert Lawrence has written:

> . . . there has been one possible kind of war that has been virtually impossible to discuss publicly in any reasoned and coherent manner. This is tactical nuclear war, the use of nuclear weapons for limited tactical military purposes, a subject that has taken on an almost leprous appearance and seems essentially unable to stir intellectual curiosity, let alone serious consideration by students, pundits, or policymakers.

Likewise, Gen. Maxwell Taylor, USA (Ret.), has noted:

> The thought of using any kind of nuclear weapons is so repugnant to civil authorities as to preclude virtually any serious discussion of the possibilities or conditions under which these weapons might be used.

As a result of this reluctance to face seriously the possibility, indeed, given improved Soviet capabilities and the implications of Soviet doctrine, the probability that should war occur in Europe it would involve the use of nuclear weapons, NATO defense posture has failed to keep pace with the changing political and military environment in Europe. It was fashioned at a time when NATO had a significant preponderance of nuclear capabilities. That preponderance has now disappeared. Yet when you strip the rhetoric from policy pronouncements and carefully examine NATO forces, doctrine, and training, you are forced to conclude as William Van Cleave and Sam Cohen have that there is " . . . little more than confusion concerning the employment of tactical nuclear weapons."

Today, strategic and theater nuclear parity mandates that the US and its NATO allies be prepared for the full spectrum of conflict, should war occur in Europe. Given Soviet capabilities and a Soviet doctrine that focuses on the intensive, coordinated use of nuclear and chemical, as well as conventional forces, NATO must now focus its efforts on improving its ability to conduct operations in a combined-arms environment that involves the potential integrated use of nuclear, chemical, and conventional munitions. Training, doctrine, force structures and dispositions, approaches to the prepositioning of equipment, the time-phasing of reinforcing capabilities, etc., must now be optimized for operations involving the use of nuclear and chemical as well as conventional munitions. ■

The long-term participation of Leonid Brezhnev in the Soviet space program is relatively little known in the West. So are the links among Brezhnev and others of the Soviet ruling hierarchy in connection with the space program . . .

SPACE: Are the Soviets Ahead?

BY WILLIAM F. AND HARRIET FAST SCOTT

To the left of the Moscow radio tower and atop a museum dedicated to Soviet space achievements is the obelisk in honor of the "Conquerors of Space." (Photo by the authors)

In 1961, after Yuri Gagarin first orbited the earth, the official journal of the Soviet Air Forces changed its name to *Aviation and Cosmonautics*. In recent months the journal has been reminding its readers that the era of manned spaceflights began just two decades ago with the launch that took Gagarin, a Soviet fighter pilot, into orbit. Manned space activities are discussed in each issue, along with articles on flying training and the role of aviation in modern war. Despite the excessive secrecy that has surrounded its space program from the beginning, the Kremlin does not attempt to conceal the fact that the Strategic Rocket Forces have been in charge of each launch while the Air Forces have been responsible for training the cosmonauts.

Most readers of this issue of Air Force Magazine can remember only dimly, if at all, the surprise that initial Soviet successes in space gave the world. Sputnik-1, the precursor to manned spaceflight, was put into orbit in October 1957. The following month, during a special United States Senate hearing on Soviet missiles and satellites, Sen. Lyndon B. Johnson stated that this event presented the United States with a challenge even greater than Pearl Harbor. In October 1960, six months before Gagarin's space success, presidential candidate John F. Kennedy asserted that "control of space will be decided in the next decade. If the Soviets control space, they can control earth, as in past centuries the nation that controlled the seas dominated the continents."

The number of technological surprises the Soviets achieved in the 1950s and early 1960s was astounding. Initial testing of Soviet atomic and thermonuclear weapons shocked United States scientists. The amazingly capable MiG-15s, along with jet bombers, were rapidly introduced into the Soviet Air Forces. By 1955, three rings of surface-to-air missiles, the SA-1, surrounded Moscow. In August 1957, the Soviets conducted the world's first successful test of an ICBM. These events, and the launch of Sputnik-1 a few months later, shook the complacency of the United States as nothing else has ever done.

On this anniversary of the second decade of man's entry into space, there has not been a United States astronaut in orbit since 1975. Although the United States hopes to fly its first Space Shuttle in 1981, the fact remains that this nation is now behind the Soviets in manned near-earth space experience. Within the past five years, Soviet boosters have placed thirty-nine cosmonauts into earth orbit. More than thirty Soyuz space ships have been flown. The Salyut has proven to be a dependable space station. Crews have been resupplied through the use of remote-controlled space freighters. The Soviets now have accumulated approximately double the man-hours in space of the United States.

Even more telling is the magnitude of the Soviet space effort. Some Western estimates place Soviet spending on space activities at between two and three percent of the GNP of that nation. In comparison, less than six percent of the total United States GNP is spent on defense as a whole. It is highly probable that in this new decade the United States will again be shocked by yet another Soviet technological surprise in manned space capabilities.

Beginning of the Space Era

To better appreciate the first manned spaceflight, it is useful to review the events of the 1950s and 1960s.

It all began quite casually. The 1957–58 International Geophysical Year (IGY) provided the occasion for the US to start work on an artificial earth satellite. Known

as "The Year of the Quiet Sun," the IGY offered ideal conditions for scientific experiments in space. In July 1955, President Eisenhower announced publicly that the United States planned to place an artificial body in earth orbit. In later 1956, Soviet spokesmen announced their nation would also contribute to the IGY with an artificial earth satellite of its own.

It was only during the international "Rocket and Satellite Conference" held in Washington, D. C., September 20–October 5, 1957, that the Soviet delegate presented a paper on "Sputnik," the name given for the artificial satellite the Soviet Union intended to launch. He also indicated frequencies on which Sputnik would broadcast, but provided no further information. The IGY Committee pressed the Soviets for additional details. The answer came sooner than expected. Sputnik-1 was launched October 4, 1957, in time to be discussed before the conference closed.

Soviet space efforts did not stop with the launch of Sputnik-1, as experiments and tests of various kinds continued. Then, in April 1961, Yuri Gagarin was launched from a pad in a Central Asian desert area. One hundred and eight minutes later, he was ejected from his space capsule shortly before it hit the ground, and he parachuted safely to earth. (It was only years later that the Soviets revealed exact landing techniques.) The Space Age, born with the launch of Sputnik-1, had been given a new dimension. Manned spaceflight had entered the equation.

Since Gagarin's flight the Soviet Union has consistently maintained a massive manned space program in near-earth orbit, where the military application of space offers the greatest potential. It would be well to look at this program from its beginning.

Brezhnev, Ustinov, and the Soviet Space Program

One reason for the continued Soviet emphasis on manned spaceflight may be the positions of two Marshals of the Soviet Union, Leonid Il'ich Brezhnev and Dmitriy F. Ustinov. Marshal Brezhnev, a Politburo member, is also General Secretary of the Communist Party of the Soviet Union, President of the Presidium of the Supreme Soviet of the USSR, and Chairman of the Council of Defense. Marshal Ustinov, the Minister of Defense, is a full Politburo member. Present and future implications for the manned Soviet space program are reflected in the roles that these two Soviet leaders played in past Soviet space activities, and the roles they continue to play today in support of these activities. A look at their roles may help place the Soviet manned space program in better focus.

The following account may not be accurate history. Much of it is from Soviet publications reporting the official Party-military line. "Creative history" of this type generally provides a better forecast of things to come in the Soviet Union than would a mere listing of historical facts.

In 1961, *Pravda* carried an announcement that Leonid Brezhnev, Dmitriy Ustinov, and other Soviet citizens had been awarded the "Hero of Socialist Labor" gold star. The citation read:

> . . . for outstanding service in the development of rocket technology and assuring the successful flight of Soviet man in cosmic space in the sputnik-ship "Vostok."

This statement merits consideration. Two of the most powerful men in the Kremlin today have worked together on missile and space programs for more than twenty years. (In contrast, every four years new men in the White House and the Pentagon have to be briefed on the need to maintain a United States space effort.) In August 1961, Leonid Brezhnev, as President of the Presidium of the USSR of the Supreme Soviet, presented the badge, "Pilot-Cosmonaut of the USSR" to "the world's first spaceman, Yuri Gagarin."

Throughout most of his career, Brezhnev has been a Party "apparatchik," meaning "a man of the Party apparatus," working wherever the Party might assign him. During the "Great Patriotic War"—as the Soviets call the period of World War II in which they participated—Brezhnev was a one-star political general. In 1953, he became chief of the Political Directorate of the Navy, and later deputy chief of the Main Political Administration of the Soviet Army and Navy. While serving in this capacity he was promoted to two stars. In 1954, the Party moved him to a position with the Kazakhstan Communist Party, and within a few months he was designated as its First Secretary.

At the Twentieth Party Congress in 1956, Brezhnev was made a candidate member of the Presidium, as the Politburo was known at the time, and in June 1957 he became a full member. This was shortly before the Soviet Union had fired the world's first successful ICBM. The decision had already been made by the

In August 1961, Leonid Brezhnev, President of the Presidium of the USSR Supreme Soviet, presented the "Pilot-Cosmonaut of the USSR" badge to the first man to be launched into space, Yuri Gagarin.

Kremlin that production of bombers would be significantly reduced, and that missiles would become the primary carrier for nuclear weapons. Senior Soviet military commanders and theoreticians were designated to attend seminars to determine what impact nuclear-armed rockets and space would have upon warfare. The Soviet leadership had committed vast resources to its missile and space programs. Direct Politburo support had to be provided to ensure success.

Brezhnev was designated to give Party direction to these new programs. Immediately upon becoming a full Politburo member, he was charged with hastening "the development and production of new military equipment and weapons, equipping the Armed Forces with them, and also the *development of the manned space program.*" (Emphasis added.)

Dmitriy Ustinov was associated with Brezhnev in the missile and space program, a task for which he was most suited as a result of his military-industrial background. By 1934, he had completed the Leningrad Military-Mechanical Institute and, in 1941, at the age of thirty-three, was made People's Commissar of Armaments. In November 1944, *Pravda* listed him as a general colonel (three stars) of Engineering-Artillery Service. After the war he served as minister of armaments and, later, as minister of defense industries. From 1957 to 1963, he was deputy chairman of the Council of Ministers. It was in this capacity that he worked with Brezhnev in expediting the missile and space program. In 1963, he became chairman of the Supreme Economic Council, and in 1965 was made a candidate member of the Politburo and a member of the Secretariat of the Communist Party. In view of his close association with Brezhnev, it is no surprise he was selected as Minister of Defense in 1976.

Ustinov's name comes up at key times in connection with the space program. For example, on New Year's Eve in 1976 *Red Star* carried a glowing article on the birth of the space age. It described events prior to the launch of Sputnik-1:

> In a small room of the control bunker the test directors gathered. There were just a few: ten or twelve men. The engineers talked in hushed tones, checking on the course of the upcoming test. Only a few minutes were left before the launch when the massive doors opened. In walked three men: Leonid Il'ich Brezhnev, Dmitriy Fedorovich Ustinov, and Sergey Pavlovich Korolyov. They said hello. Silence fell on the bunker. Korolyov invited them to the observation window.
>
> The Chief Designer reported to the Party Secretary that all was ready for the test and it could begin. Leonid Il'ich looked at each one attentively, smiled, and said: "Please, comrades, if everything is ready, then begin."

The countdown then followed, and finally the launch. Everything went well, according to the article. Brezhnev began to question the specialists. Finally, word came that "PS-1," as the Soviets call Sputnik-1, was in orbit. Everyone shook hands and congratulated each other. Then the three, Brezhnev, Ustinov, and Chief Designer Korolyov, left together.

It should be noted that this article appeared in 1976, the year that Brezhnev was "promoted" from four stars to Marshal of the Soviet Union, and Ustinov to the same rank. One purpose of the article was to emphasize the military credentials of these two men.

Brezhnev was portrayed as the most important figure in the space program. He had visited the factories that produced the space and rocket equipment, as well as the design bureau and the Baikonur space center. During these years, according to the article, Brezhnev faced a series of complicated scientific and technical problems. More powerful rocket engines had to be built, the rocket itself constructed, and the guidance system designed. Brezhnev was portrayed as the Party's expediter for the project. His office was described as a kind of staff headquarters where the most important questions associated with the Soviet space effort were decided. All of the meetings with scientists, designers, and specialists of various types, Soviet readers were told, took place under Brezhnev's direction. Ustinov provided support.

Accounts of Brezhnev's role in the early development of Soviet missile and space systems, written in the 1970s, undoubtedly were greatly exaggerated. Ustinov probably had the greater role at the time. The probable intent of the articles was to emphasize the role and concern of the Communist Party with the missile and space program and to enhance Brezhnev's prestige.

It is significant that Brezhnev and Ustinov, in the 1970s, were linked with the beginning of missile and space activities. This linkage suggests that space is still given high priority by the Soviet leadership. The names of these two men would not be linked with any program that was not enjoying success.

The Chief Designer

It is difficult for most Westerners even to imagine the secrecy that surrounds the Soviet missile and space programs. Occasionally the curtain will lift slightly when the Soviets want to impress foreigners with their successes, or when they want or need something from the West. These occasions may provide worthwhile insights.

The work of S. P. Korolyov in the Soviet missile and space program offers some idea how high priority, extremely sensitive Soviet activities may be conducted. It was not until his death in 1966 that Korolyov was identified; until that time he had been known simply as the Chief Designer. In the 1950s and early 1960s, he worked directly under Nikita Khrushchev, and with Brezhnev on two tasks. The first was to hasten the development of missile and space programs, considered essential by the Soviet leadership in order to reach military parity (or superiority) with the United States. The second was to

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gain international recognition for the technological and scientific capabilities of the Soviet Union.

The Chief Designer, whose identity was unknown in the Soviet Union as well as in the United States, became a legendary figure. When the United States planned to launch an artificial satellite in early 1958, the Chief Designer did it in October 1957. The United States announced its plan to place a satellite around the sun in 1959. A satellite with Soviet markings was placed in the sun's orbit a month earlier. Alan Shepard's planned launch in the Mercury capsule was announced to the world. Only twenty-one days before the announced suborbital flight, Korolyov launched Vostok-1 with Gagarin aboard.

It is important to note here that of forty artificial space bodies launched from earth in the first three years of the space age, only eight were Soviet, while thirty-two belonged to the United States. However, the Soviets were regarded throughout the world, including the United States, as being in the lead. This impression was achieved by conducting their own program in the greatest secrecy, revealing only that part which was successful. The United States space program was carefully monitored, with specific attention paid to time of tests and purpose. The Soviets could concentrate on what the United States had announced it would attempt, and then try to do it first. It mattered little to the world how successful United States planning was, and how open the results of the flight were. Primary credit went to the Soviet Union, which got the headlines.

Sergey Korolyov, the Chief Designer, was born in December 1906, the same year as Brezhnev. In March 1934, he attempted his first winged rocket test. By the late 1930s, he was in the Research Institute of Jet Propulsion. The chief, deputy chief, and most of the members of the Jet Propulsion Institute were executed during Stalin's purges of thousands of senior Soviet military and industrial leaders. Korolyov was arrested and sent to prison, but was ordered to continue his work there. He was assigned to a group headed by Andrei Tupelov, the famed designer of the "Tu" series of aircraft, who was also under arrest. Korolyov's prison sentence probably ended in 1945. The exact date is unknown since, as might be expected, there is nothing in current Soviet writings that admits Korolyov had ever been arrested.

Soon after the end of World War II, Korolyov was at Kapustin Yar in Central Asia, working with captured German scientists on their V-2 rockets. In 1956, he was made a "Hero of Socialist Labor" for his work on rocket engines. His work at this time, as well as for the remainder of his life, was conducted in great secrecy.

Korolyov received a gold medal for the Gagarin flight. He was directed by Khrushchev to get another cosmonaut in orbit by August 1961, before the meeting of the Twenty-second Party Congress that October. This time German Titov made seventeen orbits in Vostok-2. In another flight two men were placed in the capsule for the first "group flight." Another first was to send a woman, Valentina Tereshkova, into space, an event not duplicated since.

In 1964, Korolyov placed three cosmonauts in the Voskhod capsule. According to some accounts, this was intended as another Soviet space spectacle, demonstrating their lead over the US. The flight was a success for the cosmonauts, but not for Nikita Khrushchev. His last public words were with the cosmonauts while they were in orbit. Within hours he was summoned to Moscow from his vacation in Yalta to find that Brezhnev and Kosygin had replaced him.

Korolyov, although suffering from a heart condition, continued his work under Brezhnev's direction. He died in 1966, and it was finally revealed that he was the Chief Designer. The Soyuz spaceship that first flew in April 1967 was his last creation.

Today the Soviets have an excellent public-relations organization to deal with foreigners, and even to permit some association of Soviet and Western scientists. But the men who do the research and design of Soviet rockets and spacecraft still work under deep security safeguards.

"The Right Stuff"

An account of the selection, characteristics, and personal lives of the US astronauts has been described by Tom Wolfe in his best-seller *The Right Stuff*. What about Soviet cosmonauts?

Everything written about the Soviet cosmonauts and published in the Soviet press is carefully censored. All must be good Communists, devoted to building socialism, and with absolutely unblemished personal lives. They must represent the new "Soviet man."

In actual fact, anyone meeting the Soviet cosmonauts is likely to be favorably impressed with their sincerity and wit.

Yuri Gagarin's biography is typical of the first group of cosmonauts, which included German Titov, Andrian Nikolayev, Pavel Popovich, Valeriy Bykovskiy, Vladimir Komarov, Pavel Belyayev, Aleksey Leonov, and several others. Yuri was born in 1934 in the Smolensk Oblast west of Moscow. In his youth he joined a DOSAAF (Voluntary Society for Cooperation with the Army, Aviation, and Fleet) flying club, and made his first solo flight there. He passed the exams and was accepted by the Orenburg Pilots' School in January 1956. In October 1957, he was in the midst of final examinations when he heard that the Soviet Union had launched Sputnik-1. In his autobiography, *Road To the Cosmos*, he wrote:

> The Soviet people had overtaken the USA in the secret competition, and had created the world's first artificial earth sputnik and put it into orbit with a powerful rocket carrier. . . . We asked our instructor what would be next. "Lads," he answered, "in fifteen years or so, man himself will fly in space."

The "secret competition" Gagarin referred to was entirely of Soviet making. The Soviet people were never told that the United States announced its space shots in advance, and had published in considerable detail plans for the Mercury program and the selection of astronauts. "Secret competition" applied only to the Soviets.

Readers should note that much of the following is probably from the imagination of the ghost writer who was responsible for Gagarin's autobiography. According to the account, Gagarin graduated from pilots' school on November 8, 1957, only four days after the

launch of Sputnik-2. He married Valya Goryacheva, whom he had met while in pilot training. The honeymoon was short; Yuri was posted to the Northern Fleet, and Valya went back to school. While flying fighters in the far north, Yuri heard about the January 2, 1959, flight to the moon. A few months later, after hearing Nikita Khrushchev's address to the Twenty-first Party Congress, Gagarin joined the Communist Party "in order to help strengthen the Armed Forces."

In October 1959, the day after the Soviets launched Lunik-3 to photograph the far side of the moon, Yuri asked his commander for permission to be a candidate for the first cosmonaut group. He was not sure such a group existed at the time, but thought one would be needed. Soon afterward he was sent for a special medical examination, in which only one in ten passed. Other tests and interviews followed, including one with the Commander in Chief of the Soviet Air Forces. Gagarin then received orders to report to a secret location to begin training for space. His friends were told he finally had been selected as a test pilot.

Gagarin arrived at Star City, the Cosmonaut Training Center north of Moscow, in March 1960. The first group of cosmonauts arrived at the same time. Training started at once. Cosmonaut One was not chosen until much later, so none knew who would be first into space.

When the United States announced it would conduct suborbital flights in the spring of 1961, Khrushchev ordered everything to be speeded up. The first man in space had to be a Soviet. And more important, he had to be Russian. Of all the cosmonauts, Gagarin came the closest to having "the right stuff." His parents and grandparents were Russian and all were workers or peasants. He was a family man. In fact, his wife gave birth to a second daughter in March 1961, just days before Yuri celebrated his twenty-seventh birthday. Shortly thereafter, Cosmonauts One, Two, Three, and Four headed for the launch center at Tyuratam in Central Asia, or "Baikonur Cosmodrome" as the Soviets mislabeled it in early attempts at secrecy. (Baikonur is actually 300 miles to the north.)

Politics and Tragedy

Cosmonauts One and Two slept well the night before the launch although the Chief Designer never closed his eyes. The rest is history. Yuri Gagarin spent 108 minutes in orbit on April 12, 1961, on board the spaceship "Vostok." Today an obelisk commemorates his landing spot in Saratov Oblast.

Gagarin was feted in the Soviet Union and all over the world. He was elected as a deputy of the Supreme Soviet in 1966, as was German Titov. Gagarin was double-promoted to major upon his return to earth in 1961; and by 1963 he was a full colonel. After the Cuban missile crisis in October 1961, Gagarin became president of the Soviet-Cuban Friendship Society, another step in the political exploitation of the cosmonauts by Khrushchev. He continued to help with the training of future cosmonauts, living at Star City in a special apartment building. In 1963, he and most of the other cosmonauts began five years of studies at the Zhukovskiy Military Air Engineering Academy in Moscow. Gagarin graduated in early 1968.

Tragedy struck shortly thereafter. On a routine training flight on March 27, 1968, just after his thirty-fourth birthday, Yuri Gagarin and his copilot died in a plane crash. He was buried in the Kremlin Wall with full military honors. His hometown was renamed Gagarin, the Military Air Academy was named for him, as was the cosmonaut training center. The whole world mourned his death.

Other cosmonauts have also had political careers. Valentina Tereshkova, the first, and so far only, woman in space (Vostok-6, June 16–19, 1963), joined the cosmonaut group in 1962. She married fellow cosmonaut Andrian Nikolayev, and had the world's first "space baby." She is a colonel-engineer, and graduated from the Zhukovskiy Academy in 1969. In 1968, Nikolayeva Tereshkova became President of the Committee of Soviet Women. She is a deputy of the Supreme Soviet and has been a member of the Central Committee of the Communist Party since 1971.

There have been several tragedies. Vladimir Komarov, one of the best-liked cosmonauts and a veteran of the first three-man spaceflight in 1964, was killed when the parachutes of his Soyuz-1 spacecraft became entangled upon landing.

Pavel Belyayev, one of the original group, died in January 1970, reportedly of a perforated ulcer. Injuries he had received during reentry from his last flight were probably a contributing factor. On June 30, 1971, Vladislav Volkov, a veteran of several space missions, was killed along with Georgiy Dobrovol'skiy and Viktor Patsayev on their return to earth. They had successfully docked with the Salyut space station, and had remained there for twenty-three days. A faulty hatch apparently failed to close properly during their reentry.

Since that time there have been no other known space mishaps. The Salyut-6 space station has been visited by seven international crews: a Czech, Pole, and East German in 1978; a Bulgarian in 1979; and a Vietnamese and a Cuban in 1980. A Soviet cosmonaut piloted each of the seven "Intercosmos" program flights.

Soviet Perceptions of the US Manned Space Program

Writing about the weapon systems of the "imperialists" serves a number of the Kremlin's purposes. For instance, it explains the types of systems the West might have in order to make them known to Soviet troops. It also justifies new systems that they themselves might be planning to deploy. What the Soviets have written about *manned* US space programs serves as a possible indication of their own planning.

The first edition of Marshal Sokolovskiy's *Military Strategy*, published in 1962, stated that the imperialists are planning to use space for aggressive military aims. Artificial satellites launched by the United States, claimed to be for scientific studies, are in reality "a screen to cover up far-reaching military plans." The third, 1968 edition of this work referred to the MOL (manned orbital laboratory), and mistranslated it as "*military* orbital laboratory." According to Marshal Sokolovskiy, "the MOL laboratory is being built to conduct experiments in using piloted space means to solve purely military problems in space." With MOL, "it is

considered possible to build military stations which can be used as command posts in space for conducting strategic reconnaissance, using all types of reconnaissance equipment, to intercept satellites in orbit, and also for bombing from space."

Military Strategy was referenced by Marshal Ogarkov in December 1979 as a basic work. In his classic, Marshal Sokolovskiy went on to state that the United States program to master space for military purposes has specific plans for the use of the moon. The Apollo program was described as being for the purpose of conducting reconnaissance from space, as well as for the inspection and servicing of military space vehicles in orbit.

These were not simply the views of the Soviet military. Yuri Listvinov, a member of Moscow's Institute of the USA, wrote in *Military Thought* (the restricted journal of the Soviet General Staff) about the "militarization of the American space program." The United States, according to Listvinov, believed that the Soviet Union and the United States had reached a stalemate in the nuclear arms race that could be overcome only with the help of space weapons.

"When will the 'Space Shuttle,' so widely advertised in the American press, fly? Will it be used by the Pentagon for military purposes?" This was the question asked by "readers" of *Aviation and Cosmonautics* in their September 1980 issue. The answer began with a rather scornful comment: "The 'Space Shuttle' program began seven years ago and is now entering its most crucial stage—its first flight." More details were then given:

> However the date for this test flight keeps getting postponed: from March 1979, to the beginning of June, then to the end of 1980, but even this date, judging from press reports, is not final.

In the final paragraph of the lengthy answer, "readers" were informed:

> At the present time the creation of a reusable transport spaceship has cost the USA considerable sums, which will not soon be repaid. But the desire to assure itself advantages in performing important military tasks, to receive benefits from space technology and leadership in international cooperation in conquering space has forced the USA leadership to enormous expenditures on the "Space Shuttle" program, which, however, is far from the best means to perform the given tasks both technically and also for the foreign and domestic policies of the USA.

What would be the "best means"? The Soviet author does not explain. ■

The Space Gap

Yuri Gagarin's successful spaceflight in 1961, following the launch of Sputnik-1 in 1957, gave the Soviet Union worldwide recognition for advanced scientific and technical achievements. Soviet leaders themselves were convinced of the superiority of the Communist system. Textbooks for use in military schools described how Soviet production, including that of food, would outstrip per capita production in the United States by 1980. Nikita Khrushchev's perceptions of Soviet strength may have been one of the reasons he risked placing his missiles in Cuba—a miscalculation that brought about the world's first nuclear confrontation.

Once the space challenge was recognized, the United States moved swiftly. By the end of the decade United States astronauts landed on the moon with a confidence that made the event look easy. But as one Soviet remarked in Moscow, prior to Apollo flights to the moon, Kremlin leaders thought Soviet science was ahead of that in the United States. The moon landing forced a reevaluation. It had a significant impact on SALT and on Soviet efforts to establish more scientific and technological contacts with the West.

After this spurt in missile and space technology, the United States relaxed. Provisions of SALT I indicated to the world that the Soviet Union had reached nuclear-missile parity—or even superiority—vis-à-vis the United States. After 1975, when United States astronauts participated in a joint spaceflight with Soviet cosmonauts, no United States manned spaceflight took place for the remainder of the decade.

In contrast, the Soviet Union continued its manned space program throughout the 1970s. Neither Marshals Brezhnev nor Ustinov needed explanations of the military potential of space. A 1980 Soviet textbook for higher military schools misquoted former United States President John Kennedy: "Who controls space, will control the earth." *(See Kennedy's correct quotation on p. 84.)*

The Soviets may have concluded early on that space vehicles for placing man on the moon offered little immediate military use. Manned spaceflights in near-earth orbit provide far greater military possibilities.

Lt. Gen. Richard C. Henry, USAF Space Division Commander, has stated that the best way to discover the military applications of man in space is to place a manned space station on orbit. That is precisely what the Soviets have been doing for the past several years.

The United States now faces the possibility of technological surprises. Soviet officers have been taught the need to maintain "military-technical superiority." As one spokesman stated: " . . . the creation of a weapon that is new in principle and secretly nurtured in scientific research bureaus and constructors' collectives can in a short time sharply change the relationship of forces. . . . The *surprise* appearance of one or another new type of weapon is advancing as an essential factor, especially in contemporary circumstances." (Emphasis in original.)

At the time of this writing, the Space Shuttle orbiter *Columbia* is being prepared for flight tests. If it is an unqualified success, and pursued with the same intensity as the Apollo program, the United States may buy time to redress the current manned-space imbalance. Should the program run into difficulties, the Soviets may perceive the United States of the 1980s as Khrushchev perceived the United States of 1961. The two marshals on the Kremlin's Politburo may be tempted to dangerous adventures.

Russian eyes in the sky . . .

Soviet Satellite Reconnaissance Activities and Trends

BY NICHOLAS L. JOHNSON

EVEN before the space age began formally in 1957 with the launch of Sputnik-1, the potential of orbiting photographic platforms that transmit their findings to earth via telemetry or capsule return was obvious. As early as 1951 a Rand Corp. report entitled *Utility of a Satellite Vehicle for Reconnaissance* laid the groundwork for early US developmental efforts. Presumably Soviet scientists, who were devoting even larger resources to the construction of rockets capable of orbiting reconnaissance payloads, had made similar studies. While such a surveillance capability promised to be a tremendous aid in the monitoring of agricultural and natural resources, the military and political benefits that could be derived from these "spies in the sky" were equally well recognized.

The US was the first to successfully demonstrate the feasibility of returning a photographic capsule from earth orbit on August 11, 1960, with the retrieval of Discoverer-13 after the loss of a dozen spacecraft in an eighteen-month period. The Soviet reaction to the eventual successes of the Discoverer program, and even the Tiros weather satellites, was particularly vehement but understandable in light of the downing of Gary Powers's U-2 over the Soviet Union in May 1960.

Nevertheless, a scant nine days after the return of Discoverer-13, the USSR announced the successful recovery from orbit of the much larger Vostok precursor Korabl Sputnik-2 with two dogs on board. The feasibility of the Soviet Union's own reconnaissance satellites was now clear. In 1962 and again in the spring of 1963, the Soviets submitted a proposed ban on orbiting reconnaissance satellites to the United Nations. However, by the fall of 1963, the Soviet Union had conducted nine successful photoreconnaissance missions of its own, and the proposal was dropped.

The importance attributed implicitly to this class of satellites by both the US and the USSR is now reflected by prohibitions in the Strategic Arms Limitation Treaties (SALT I and II) forbidding any interference by

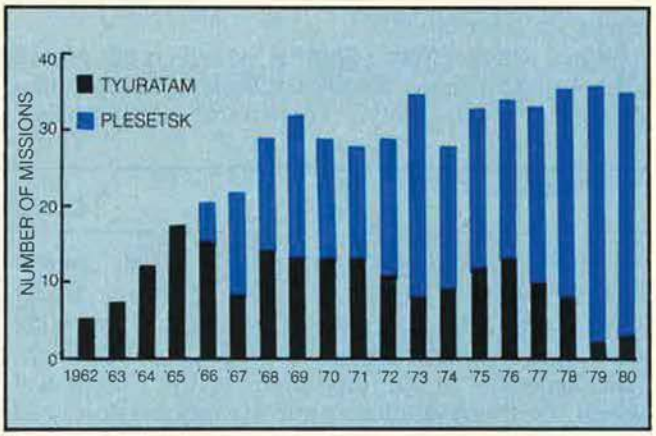


Figure 2: Annual Soviet investment in photographic earth surveillance. Almost all flights now originate from the Plesetsk military cosmodrome.

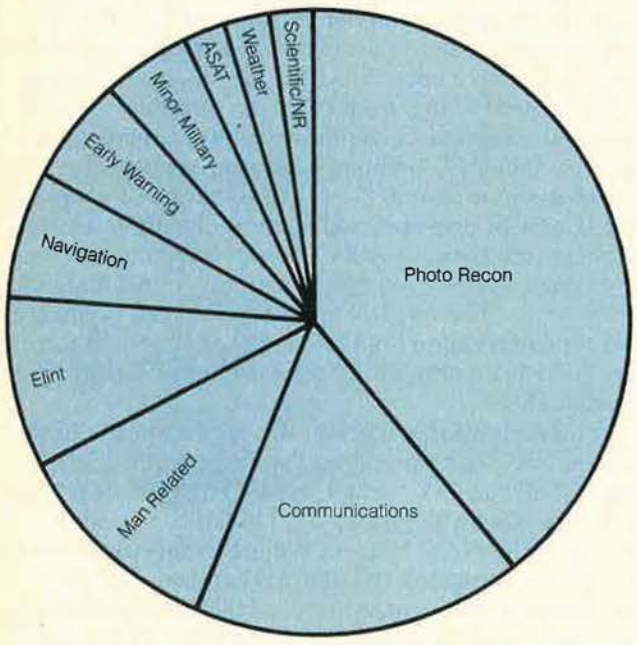


Figure 1: Relative emphasis of the USSR space programs based upon successful orbital launches in 1980.

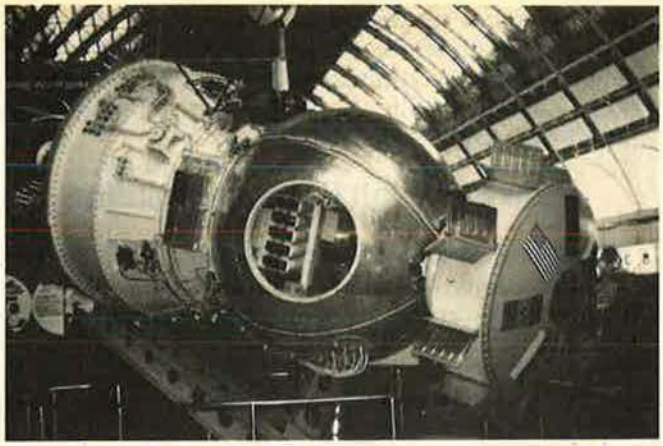


Figure 3: Replica of the Kosmos-782 biological spacecraft, a descendant of the manned Vostok space vehicle. The current two-week-long photoreconnaissance satellites may be of this type. (Photo by Ralph F. Gibbons)

a signatory with the "national technical means of verification of the other party." National technical means is a euphemism for the entire spectrum of optical and electronic surveillance satellites. Because of the ambiguity inherent in determining whether or not a foreign satellite is truly on a treaty-verification mission, in practice these prohibitions have given sanction to all types of space-based surveillance systems.

Although the Soviets officially deny the use of this class of satellites, the USSR continually employs such spacecraft to monitor allied forces in the US, Europe, and around the world. The great value of these satellites rests in their ability to rapidly acquire and relay with virtual impunity vital intelligence data. Reconnaissance satellites have frequently been given credit for preventing a rise in the temperature of the cold war by allowing both sides to confidently estimate the strengths and weaknesses of the other.

Illustrative of the tactical utility of photoreconnaissance satellites are reports that the Soviet Union used these eyes in space to warn Egypt of Israeli advances during the 1973 war, and to advise the US of possible South African preparations for nuclear weapons testing in the summer of 1977. More recently, it has been claimed that the Soviets are using these platforms to assist in planning operations in Afghanistan.

Soviet Leadership Since 1971

Since 1971, the Soviet Union has maintained her leadership over the US in orbiting photographic reconnaissance spacecraft. This program, which is the largest single effort of any space-faring nation, accounted for more than thirty-nine percent (thirty-five of eighty-nine) of all successful Soviet launches in 1980 *(Figure 1)*. By New Year's Day 1981, no fewer than 501 unmanned recoverable spacecraft had been associated with this photographic earth surveillance program—thirty-seven percent of the total 1,339 successful Soviet launches from 1957 through 1980 *(Figure 2)*.

The majority of these recoverable satellites, thought to be derivatives of the manned Vostok and Soyuz spacecraft, are placed into low-earth orbits by a variation of the SS-6, the world's first ICBM and the launcher of Sputnik-1, and return to earth with their valuable cargo in less than two weeks *(Figures 3 and 4)*. Four satellites appear to have been deliberately exploded in orbit to prevent their possible recovery by an unfriendly nation after a malfunction in their reentry systems.

Prior to 1970, the majority of the reconnaissance satellites orbited each year remained in orbit for eight days. However, during the past decade twelve- and thirteen-day flights have been the rule, suggesting a refinement in both resolution and longevity.

An example of the versatility and flexibility of the Soviet space reconnaissance program came during the Arab-Israeli conflict of 1973. During the height of hostilities, three photographic surveillance satellites were launched at intervals of three and four days. Instead of remaining aloft for the standard twelve or thirteen days, all three satellites were recovered after only 5.8 days. Thus, Soviet advisors could provide their Egyptian

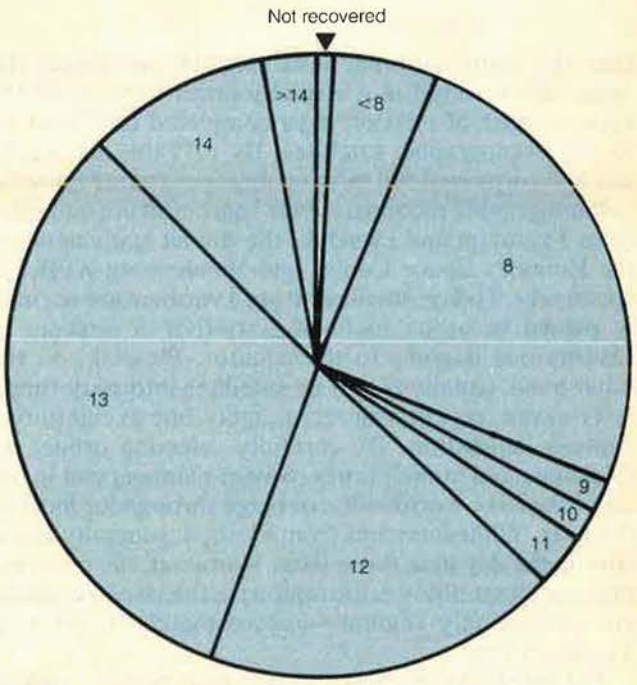
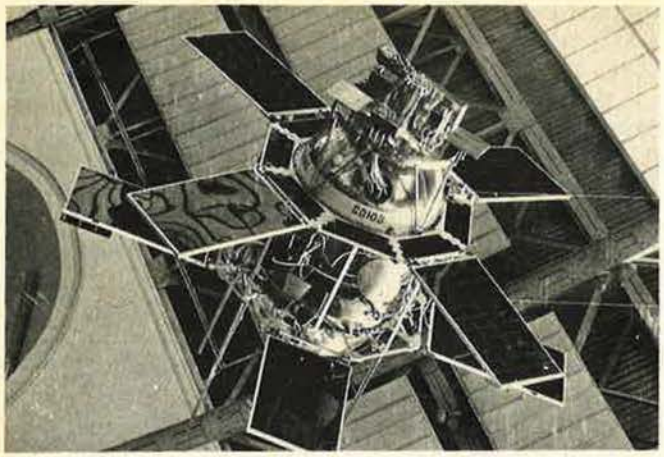


Figure 4: Breakdown of Soviet photoreconnaissance flights by orbital lifetimes, 1962–80. Two-thirds of the 1980 missions lasted thirteen or fourteen days.

charges with a more timely order of battle. Within three and a half weeks, seven Soviet photoreconnaissance satellites had been orbited.

However, this large expenditure of launch vehicles and satellites to support tactical operations does not appear to have been lost on the Red aerospace forces. In 1975, testing began on the development of a new generation of photographic reconnaissance satellites. Although the spacecraft are capable of remaining on station for more than six weeks, they reportedly carry multiple reentry capsules for the immediate return of sensitive intelligence data.

With such large numbers of satellites being orbited each year and with a steady increase in the mean orbital lifetime, it is apparent that more than one reconnaissance satellite is frequently in orbit at any one time. In



Recent uses of Soviet reconnaissance satellites: observing a joint US/Egyptian military exercise near Cairo, using intelligence gathered by satellite to plan operations in Afghanistan. Above, a Kosmos satellite on display in Moscow.

fact, this combination of more satellites and longer lifetimes has resulted in a virtually linear increase in the total number of mission days completed each year by Soviet photographic satellites. By 1979 this annual figure had surpassed 500 mission days per year *(Figure 5)*.

Photographic reconnaissance spacecraft are launched from Tyuratam and Plesetsk, the Soviet equivalents of the Kennedy Space Center and Vandenberg AFB, respectively. Today, satellites from Tyuratam are normally placed in orbits inclined sixty-five or seventy to seventy-one degrees to the equator. Plesetsk, on the other hand, usually places its satellites into sixty-three, sixty-seven, seventy-three, or eighty-one to eighty-two degrees inclination. By carefully selecting orbital inclinations and launch times, Soviet planners can maintain extensive worldwide coverage throughout most of the year. While launches from Plesetsk generally occur later in the day than those from Tyuratam, the recovery times of all satellites in the region northeast of Tyuratam are exceedingly regular—approximately 11:00 a.m. Tyuratam time.

The regularity of these recoveries is perhaps indicative of the lighting constraints imposed on the satellite photographic systems. Near-noontime passes provide almost full illumination of many targets, while the longer shadows cast in early morning or late afternoon are helpful in determining the size of particular items of interest.

This can further be seen by examining which regions of the world are typically illuminated during each revolution. Although the mean launch times vary from 0820 GMT for 71.4 degree-inclined orbits from Tyuratam, to 1430 GMT for 62.8 degree-inclined orbits from Plesetsk, the local sun time of their initial southernmost passage differs by less than ten minutes, *i.e.*, passage occurs at approximately 5:20 a.m. Virtually all flights begin their first northbound pass between 4:00 a.m. and 5:30 a.m. sun time. Even satellites in the least and most inclined orbits (51.8 and 81.3 degrees) reach their initial southernmost passage at almost identical local sun times.

Thus, Soviet satellites usually experience favorable lighting conditions during their northbound passes, and enter darkness on their southbound treks. Since the westward drift of satellites in these roughly ninety-minute orbits closely matches the movement of the sun, these lighting conditions are relatively constant during the short two-week missions.

Low and High Photo Resolution

Until very recently Soviet photographic reconnaissance missions have been of two types: either low photographic resolution or high photographic resolution. The former is characterized by wide-angle fields of view to "search" for easily identifiable movements or construction. If such a change is detected, one or more high-resolution missions with a narrower field of view will usually follow to determine in fine detail exactly what alterations have been made. To date, approximately fifty-eight percent of all Soviet reconnaissance missions have been of the high-resolution variety *(Figure 6)*.

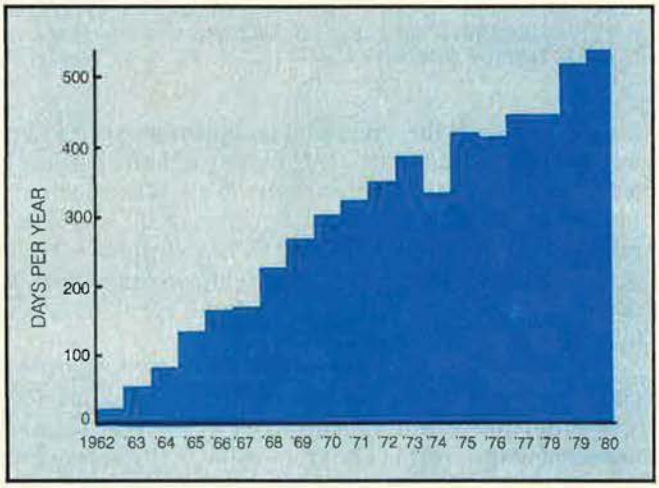


Figure 5: This chart provides dramatic evidence that the Soviet photographic reconnaissance effort continues to increase at a rate virtually unchanged since 1962. The decrease in 1974 may be due to the unexpected expenditure of spacecraft in late 1973 during the Mideast war.

Recently, however, a third type of mission, the so-called medium resolution, appears to be replacing the older low-resolution missions. This new satellite exhibits characteristics of both high- and low-resolution missions by flying in somewhat higher orbits (less resolution) but performs maneuvers indicative of positioning a smaller field-of-view camera (more resolution). Perhaps coincidentally, this new effort comes at a time when Tyuratam appears to be phasing out its role in the photographic reconnaissance program.

Recent activities in the Mideast that have apparently drawn the interest of Soviet military intelligence can demonstrate the importance of these versatile spacecraft. During November 12–28, 1980, the newly organized US Rapid Deployment Task Force conducted joint operations with Egyptian armed forces near Cairo. On the first day of the exercises, while American personnel were being airlifted to Egypt, the Soviets launched a medium-resolution photoreconnaissance

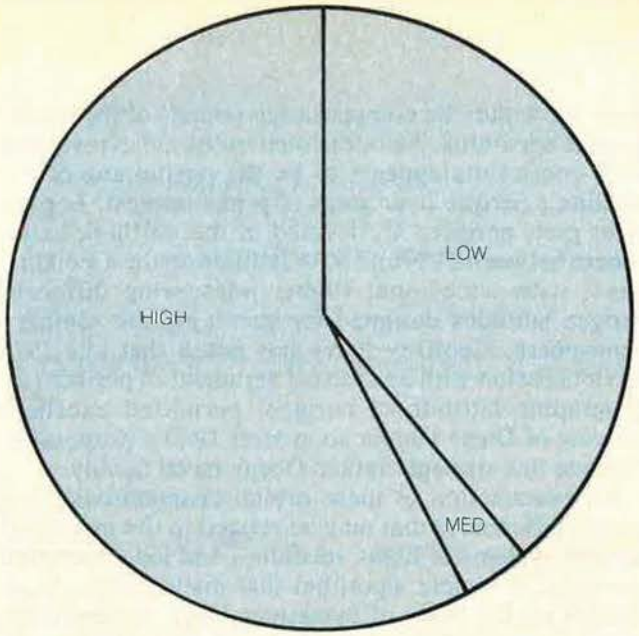


Figure 6: Percentage of low-, medium-, and high-resolution Soviet photoreconnaissance missions, 1962–80. In 1980, the medium-resolution missions accounted for almost one-fourth of all photorecon flights.

satellite, Kosmos-1,221, from Plesetsk *(Figure 7)*. Less than twenty-four hours later, Kosmos-1,221 passed approximately forty km to the east of Cairo at an altitude of 225 km at 1:15 p.m. local time. From this vantage point not only could the developing exercises be easily surveyed, but also visible were the remains of the US C-141 that had crashed the previous night at Cairo West Airport. The following day, November 14, Kosmos-1,221 passed at approximately the same time and altitude a similar distance to the west of Cairo. Kosmos-1,221 was eventually returned to earth on November 26, as the exercises were rapidly coming to a close.

A second Soviet satellite passed directly over Cairo at an altitude of 185 km on November 17, just before 8:00 a.m. Cairo time and about one and a half hours after sunrise. Named Kosmos-1,218, this satellite was one of the newest generation high-resolution photoreconnaissance spacecraft that had been launched on October 30, 1980, from Tyuratam into a lower-inclination orbit. Three days later and only hours before a scheduled orbital maneuver, Soviet interest had shifted to the Iraqi-Iranian conflict, as Kosmos-1,218 passed just to the west of Khorramshahr and Ahwaz and directly over Dezful and Tehran at an altitude of only 165–175 km.

For more than a decade the distinction between the different mission objectives of Soviet reconnaissance satellites has been made public by Geoffrey Perry of Kettering, England. By intercepting and categorizing the telemetry and recovery signals from Soviet spacecraft, Mr. Perry has developed, after extensive analysis, a means of distinguishing the three general mission types. His classifications are accepted worldwide and appear in the five-year reports published for the US Sen-

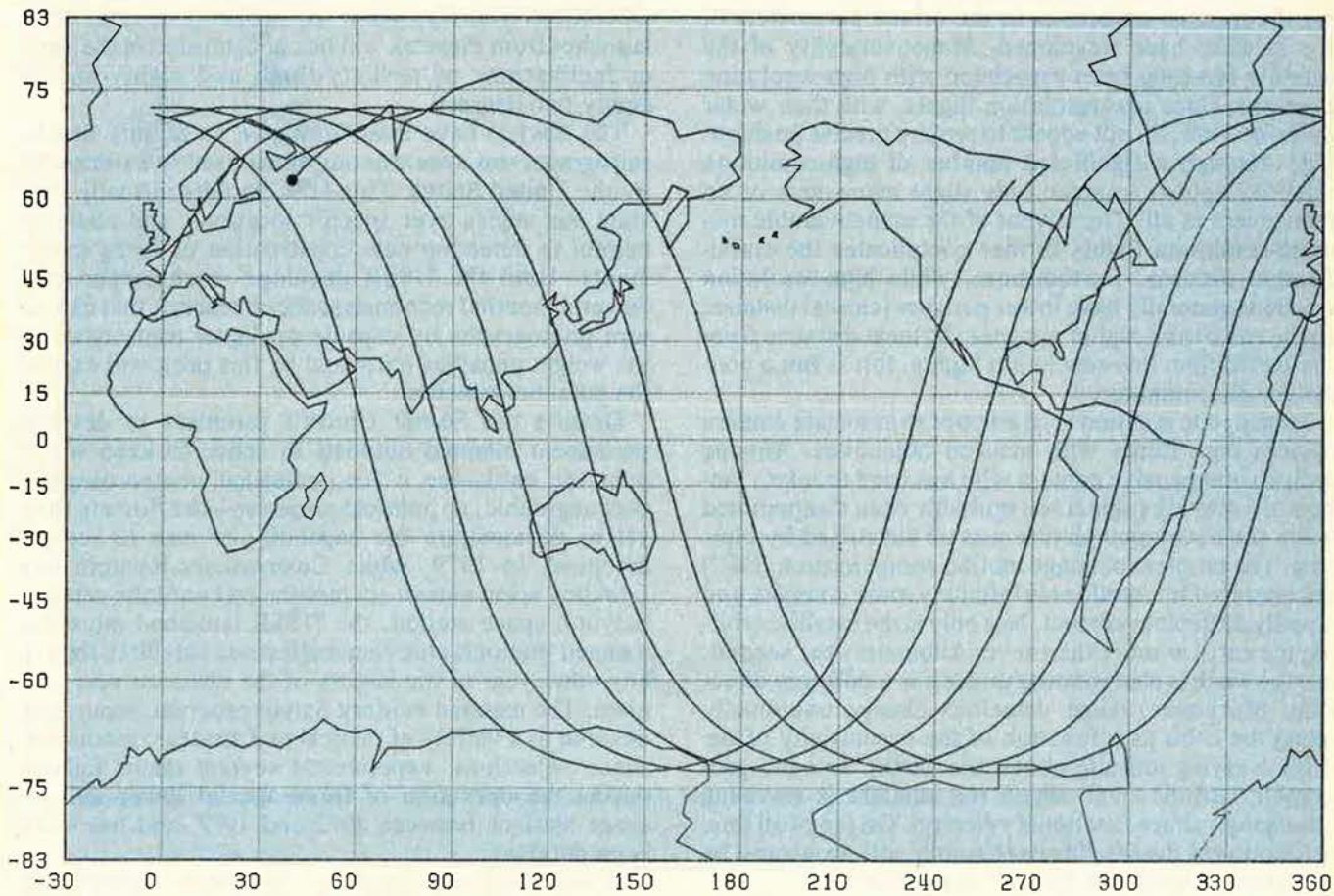


Figure 7: The initial six revolutions of Kosmos-1,221 (November 12–26, 1980) are shown. Most Soviet photoreconnaissance satellites fly in highly inclined (73–83 degree) orbits to permit worldwide coverage.

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ate under the direction of Dr. Charles S. Sheldon II of the Congressional Research Service, the Library of Congress.

Between 1969 and 1976, the majority of the flights could be tentatively classified as high resolution or low resolution by their length of stay in space. During this period eighty-one percent of the twelve-day missions were low resolution and ninety-two percent of the thirteen-day missions were high resolution. However, in the four years after 1976, the number of twelve-day missions has decreased drastically, and the percentage of thirteen-day missions that are high resolution matches roughly that of the overall high-resolution population.

Orbits and Mission Objectives

Despite a variety of trends peculiar to different reconnaissance missions, only recently has a method of relating the mission objectives to the orbital parameters of the satellite been developed. Maneuverability of the satellite has long been associated with high-resolution missions, since low-resolution flights, with their wider fields-of-view, do not appear to require precise positioning, although a significant number of high-resolution missions appear to make only slight maneuvers or no maneuvers at all. The advent of the maneuverable medium-resolution flights further complicates the classification process. Furthermore, while high-resolution missions generally have lower perigees (closest distance to the earth) and higher apogees (farthest distance from the earth) than low-resolution flights, this is not a consistent discriminator.

Hence, one solution is to attempt to associate camera system constraints with mission objectives. Anyone with an inexpensive camera who has tried to take a picture of a moving subject has probably been disappointed when the developed picture was all but ruined by blurring. The problem of image motion compensation (IMC) encountered by satellites is infinitely more complex and equally difficult to correct. Not only is the satellite orbiting the earth at more than seven kilometers per second, but the earth is also rotating under it in a different direction. Moreover, these velocities change continually along the orbit as a function of the eccentricity of the orbit (varying altitude above the earth), and the geographic latitude over which the satellite is traveling (changing surface rotational velocity). On top of all this, the motion of the satellite itself (pitch, roll, yaw) must be adequately taken into account and minimized.

Thus, Soviet photographic satellites can probably operate only under specific conditions when these motions are within the compensation bounds of the photographic apparatus. An occasional useful aid in revealing such constraints appears to be the positioning of the satellite's perigee over areas of prime interest. For the most part, perigees are located in the northern hemisphere between 25°N and 60°N latitude on the ascending pass, with occasional flights possessing different perigee latitudes designed for surveying the southern hemisphere. Geoffrey Perry has noted that one 1975 Soviet mission with an unusual argument of perigee (sic geographic latitude of perigee) permitted excellent viewing of Diego Garcia soon after DoD's proposal to upgrade this strategic Indian Ocean naval facility.

An examination of these orbital characteristics has shown differences that may be related to the individual camera systems of high-, medium-, and low-resolution missions. A simple algorithm that distinguishes these classes on the basis of maneuverability, eccentricity, and orbital velocity has been derived from carefully analyzing the 200 Soviet reconnaissance satellites orbited during 1974–79. The results of this algorithm closely match those based on telemetry transmissions.

In the not too distant future one can expect a slight reduction in the annual number of Soviet photographic reconnaissance satellites, as the newer month-long missions gradually replace the present two-week flights. The nonmaneuverable spacecraft may be replaced totally by the more versatile medium-resolution satellites. Operations from Tyuratam will probably be rare, while launches from Plesetsk will be concentrated in the higher inclinations of seventy-three and eighty-one to eighty-two degrees.

The Soviets have thus far shown no affinity for the retrograde, sun-synchronous orbits used so extensively by the United States. This orbit permits virtually constant sun angles over specific locations, and could be helpful in detecting new construction or force movements. Until the USSR develops much longer-lived (several months) reconnaissance spacecraft that can return photographs by capsule or digital transmissions, the weight penalties extracted by this orbit will exceed the potential benefits.

Despite the Soviet Union's promises to develop permanent manned outposts in space to keep watch over the earth—be it for geological, meteorological, oceanographic, or political purposes—the Soviets have yet to demonstrate the capability of man to replace machine. In 1979, while Cosmonauts Ryumin and Lyakhov spent almost six months on board the orbiting Salyut-6 space station, the USSR launched more unmanned photographic reconnaissance satellites than in any other year of the history of the nineteen-year program. The manned military Salyut program, reportedly devoted to a variety of tactical and strategic reconnaissance objectives, experienced several major failures during the operation of three special lower altitude space stations between 1973 and 1977, and has since been dormant.

It would appear, therefore, that robot "spies in the sky" will continue to train their mechanical eyes on the rest of the world for many years to come. ■

SCIENCE/SCOPE

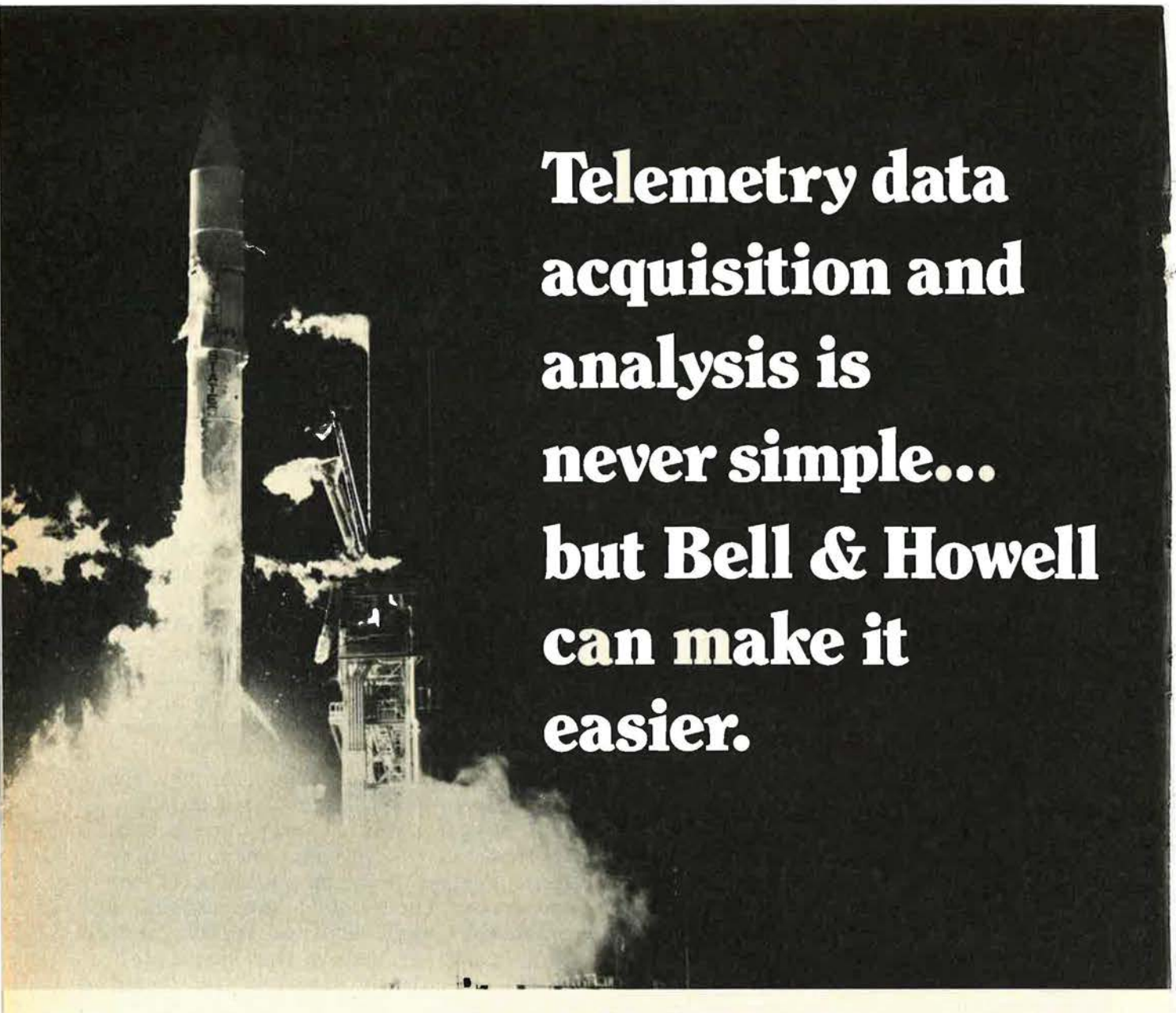
An advanced programmable signal processor is the key element of the radar on the F-15 Strike Eagle, the two-seat fighter proposed to meet NATO's need for an aircraft to fly attack missions in the severest weather. Many F-15s now stationed in Europe already have the PSP, a special-purpose digital computer capable of performing over 7 million operations per second. The Strike Eagle's PSP incorporates improvements to handle a new array of missions. The PSP is less than one cubic foot in volume and can be reprogrammed to meet future threats. The PSP determines the radar operating modes by the instructions with which the machine is programmed, rather than by a "hard-wired" circuit design. This allows rapid switching among diverse modes stored in an off-line memory. Hughes builds the AN/APG-63 radar and PSP for McDonnell Douglas Corp., builder of the F-15.

Engineers using an innovative computer graphics system now can validate the design of new software systems without having to write a single line of computer programming. The approach marks an important advance in design verification, for it makes computer programming less of an art and more of a discipline. It helps an engineer develop and chart his design while simultaneously telling him how effective his solution is. The system also pinpoints deficiencies in original specifications, helps standardize existing software, and quickly studies design tradeoffs. Hughes, under a U.S. Air Force contract, is adapting its Design Analysis System to suit a wide range of electronics and aerospace uses.

A device that scans the sky with electro-optical sensors to detect, track, and identify aircraft and missiles is being developed by Hughes for the U.S. Air Force. The device, an electro-optical threat sensor, will classify targets by order of priority and pass this data almost instantly to ground, ship, or airborne fire control systems. The threat sensor system -- which consists of an acquisition unit, an interrogation unit, and a computer -- will have several advantages over conventional radar. It is relatively small and can rapidly search a wide area. Also, its acquisition unit is a "passive" sensor that emits no telltale signals of its own as it scans the sky, acquiring aircraft and incoming missiles by sensing the infrared energy they radiate.

The first Maverick missile fired from a Marine Corps aircraft scored a direct hit on an armored personnel carrier at a test range at Eglin Air Force Base in Florida. The air-to-ground AGM-65E Maverick was launched at low altitude and long range from an A-4M attack aircraft. The missile is a laser-guided version of the U.S. Air Force's TV-guided Maverick and carries a heavier warhead. Hughes is developing the weapon under an Air Force contract primarily for use by the Marine Corps for close air support of combat troops.

Small and disadvantaged businesses play an increasingly significant role in U.S. space and defense efforts by supplying parts and serving as subcontractors. Hughes has been a leader in tapping the skills and capabilities of these businesses. In one recent fiscal year, Hughes awarded 65 percent of all purchase orders and 47 percent of the company's procurement dollar to small business. During the same period, $23.9 million went to disadvantaged business.



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

Organization of Soviet Armed Forces

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

The five Soviet services do not include Troops of Civil Defense, Troops of the Tyl (rear services), Construction Troops, or other support organizations, all of which are under the Ministry of Defense. In addition to these forces, the Soviet Armed Forces also include the Border Guards, subordinate to the KGB, and the Internal Troops, subordinate to the Ministry of Internal Affairs (MVD). A word of caution: The Soviets sometimes refer to the Strategic Rocket Forces, Ground Forces, Troops of National Air Defense, and Air Forces as the Soviet Army.

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

The **Strategic Rocket Forces,** established in 1959, operate all land-based ballistic missiles with ranges greater than 1,000 km—about 1,400 ICBMs and 600 IR/MRBMs. Little is known about the SRF outside the Soviet Union, but it is first among services, with its commander taking precedence over those of the other services, regardless of his actual rank. *The Military Balance,* published annually by The International Institute for Strategic Studies, London *(see December '80 issue of* AIR FORCE *Magazine),* credits the Strategic Rocket Forces with 385,000 personnel. Strength figures for the services below are from *The Military Balance 1980/81.*

The **Ground Forces,** numerically the largest of the five services, are divided into four major branches: motorized rifle, tanks, rockets and artillery, and troop air defense. (The last must not be confused with Troops of National Air Defense.) Airborne Forces (the USSR now has eight airborne divisions) are a special branch directly subordinate to the High Command. Ground Forces air defense equipment includes mobile surface-to-air missiles and antiaircraft artillery. The 173 Ground Forces divisions, with tanks, armored personnel carriers, self-propelled artillery, and personal equipment all are designed for a CBR environment, and equipped and trained for combat with or without nuclear, chemical, and biological weapons. Ground Forces personnel, combined with Troops of Civil Defense, Troops of the Rear Services (logistical support), and various other support personnel that serve all the other services, number about 1,825,000.

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

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

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

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

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

The **Soviet Navy** is now a maritime superpower. With its aircraft carriers of the *Kiev* class, Soviet Naval Aviation has a mix of carrier-based helicopters and V/STOL aircraft. Naval Aviation also has land-based and reconnaissance fighters, a limited transport force, bombers, and surveillance aircraft. Navy personnel strength is about 433,000, including 59,000 in Naval Aviation.

The accompanying charts, prepared by Harriet Fast Scott and current as of February 1, 1981, show the membership of the top military organization. ■

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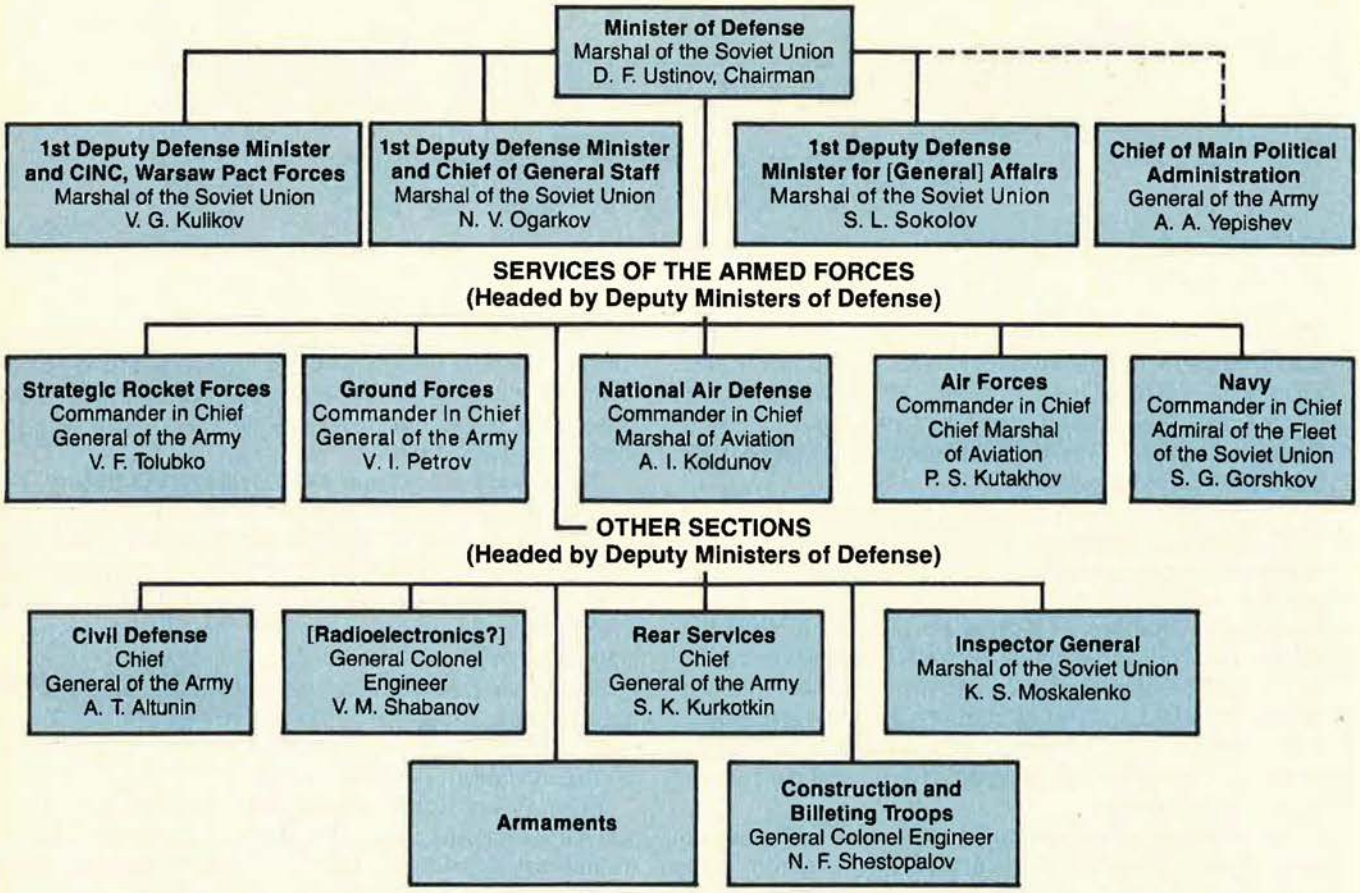

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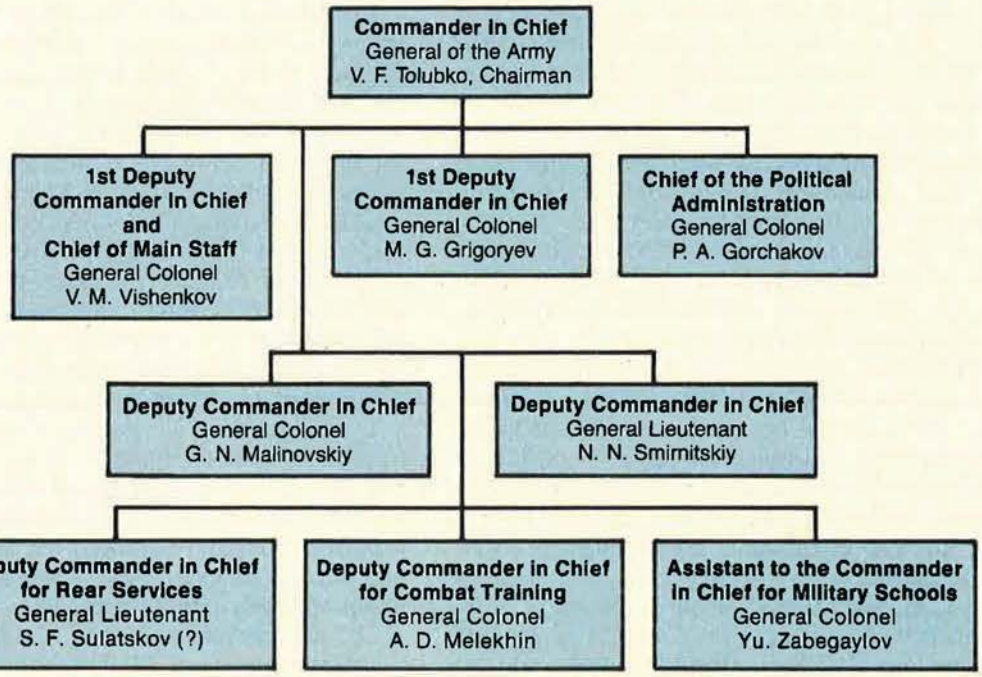

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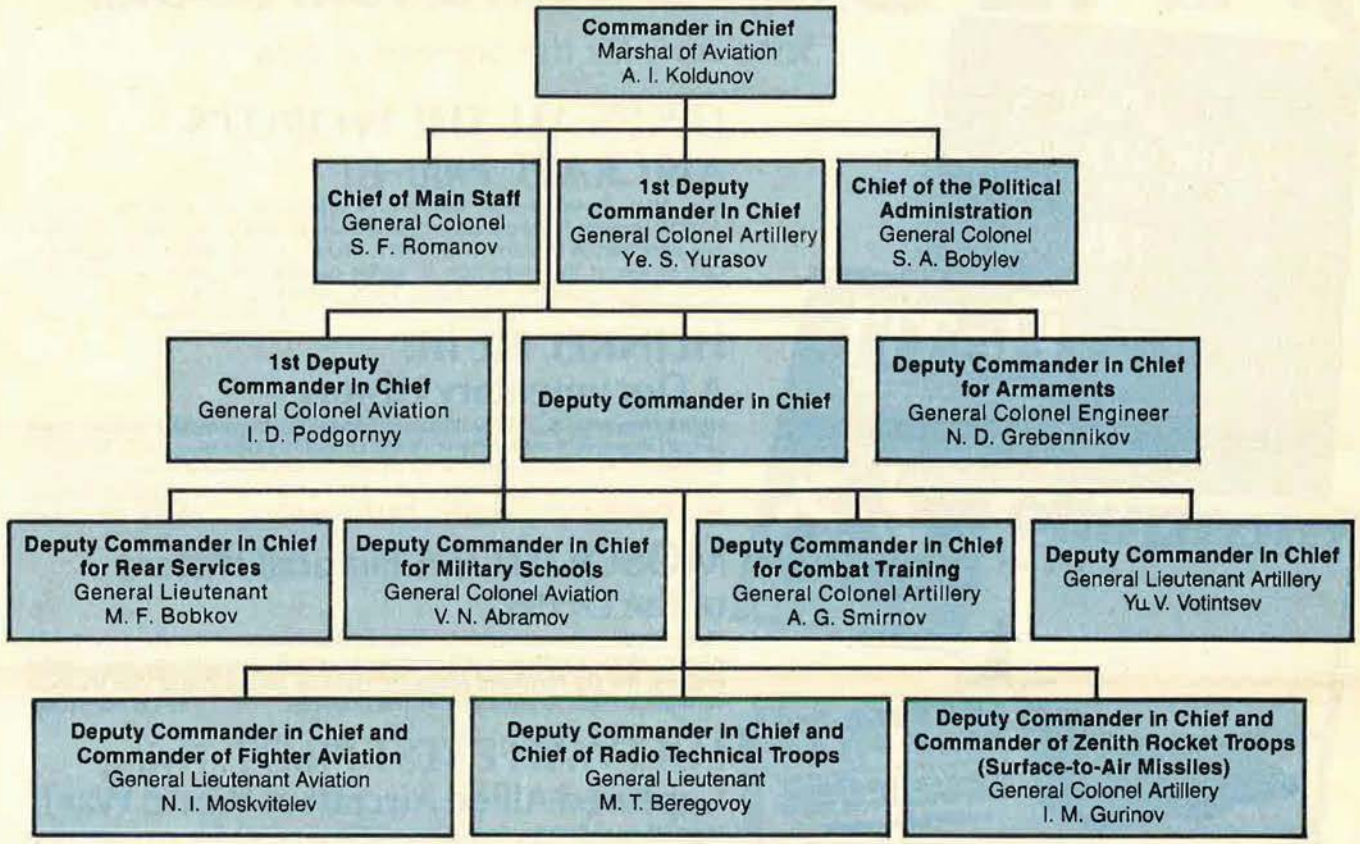

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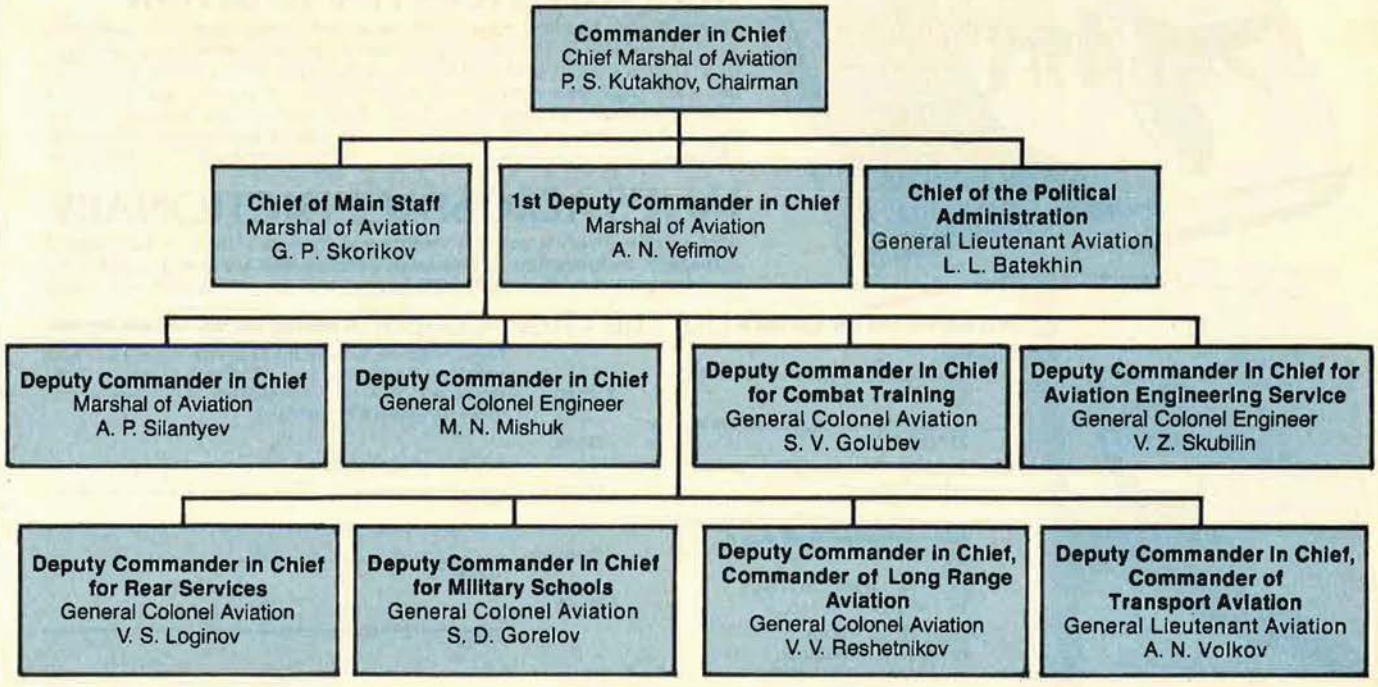

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Bombers and Maritime

New Bomber Programme

There continues to be no reliable evidence of the existence of a new Soviet strategic bomber to replace 'Bison' and 'Bear'. Soviet delegates to the SALT II talks suggested that three new types of bomber were then under development in the Soviet Union. The DoD has stated since 1979 that it expects "to see the first prototype of a new modern heavy bomber in the near future". The continued effectiveness of 'Bear', and the improved range of later 'Backfires' may have made the once-planned late-1970s generation of prototypes unnecessary.

Beriev M-12 (NATO 'Mail')

This year marks the twentieth anniversary of the M-12's first public appearance, at an Aviation Day display in Moscow. Except for the Japanese Shin Meiwa PS-1, it remains the only modern flying-boat in first-line combat service. About 80 of the 100 production models continue to operate from shore bases of the Soviet Northern and Black Sea fleets, for near-zone anti-submarine and maritime patrol duties out to some 230 miles from shore. Generally clean lines and the high length-to-beam ratio of the hull, added to new turbine engines, made the M-12 a major advance over its predecessor, the piston-engined Be-6, examples of which still serve in China. It holds all 40 records listed by the Fédération Aéronautique Internationale for turboprop-powered amphibians (Class C.3 Group II) and flying-boats (Class C.2 Group II), at speeds of up to 371 mph over closed circuits, and with payloads of up to 10 tons.

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

Ilyushin Il-38 (NATO 'May')

Standard open-ocean anti-submarine/maritime patrol aircraft with shore-based units of the Soviet Naval Air Force, the Il-38 was developed from the Il-18 airliner in much the same way that the US Navy's P-3 Orion was based on the Lockheed Electra. Its lengthened fuselage retains few cabin windows. Added equipment includes a large radome under the forward fuselage and a MAD tail-sting, with an internal weapon/stores bay aft of the radome. To compensate for the effect on the CG position of these changes, and equipment inside the cabin, the wing had to be moved forward.

Il-38s are encountered frequently over the Atlantic and Mediterranean, together with longer-range Tu-142s. A Soviet Treaty of Friendship and Co-operation, signed with the People's Democratic Republic of Yemen in October 1979, permits patrols over the Indian Ocean from a base in that country. Also to be seen are the first three of six Il-38s ordered for No. 315 Squadron of the Indian Navy, based at Dabolim, Goa. Production appears to have been limited to around 60 aircraft.

Power Plant: four Ivchenko AI-20 turboprop engines; each 4,250 ehp.
Dimensions: span 122 ft 8½ in, length 129 ft 10 in, height 33 ft 4 in.
Performance: max cruising speed 400 mph at 27,000 ft, max range 4,500 miles.
Accommodation: crew of twelve.

Beriev M-12 (NATO 'Mail') (Tass)

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

Myasishchev M-4 (NATO 'Bison')

The prototype of this heavy strategic bomber flew in 1953, making it one year younger than its US counterpart, the B-52; but it failed to match the latter aircraft's success and durability. The Soviet long-range air force, Dalnaya Aviatsiya, preferred the turboprop Tu-95 as its primary equipment; the Soviet Naval Air Force has despatched maritime reconnaissance M-4s on occasional missions during the past year, but relies mainly on Tu-142s. According to SALT II documents, only 43 M-4s remain available as heavy bombers; 31 more are configured as in-flight refuelling tankers in support of the 'Bear-Bison' attack force, with an internal probe-and-drogue hose-reel unit which makes them equally compatible with 'Backfire'. Under SALT II proposals, the tankers would have been given functionally related observable differences (FRODs) indicating that they could not perform the mission of a heavy bomber. *(Data for 'Bison-A' strategic bomber follow.)*

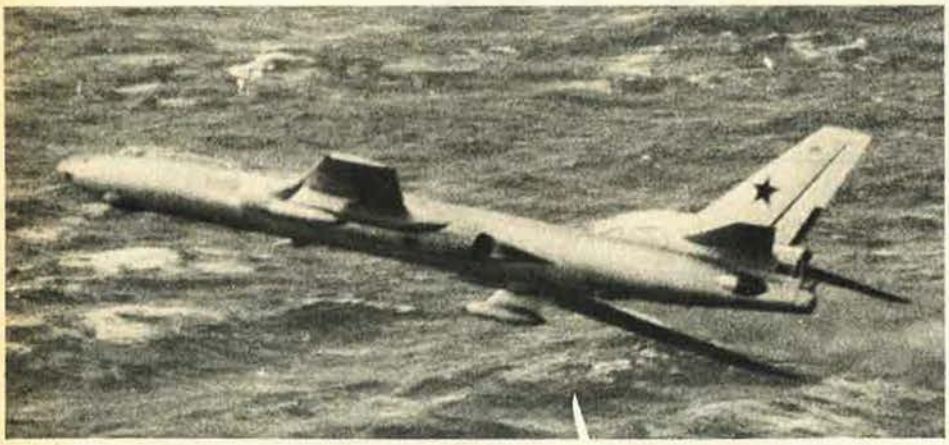
Power Plant: four Mikulin AM-3D turbojet engines; each 19,180 lb st.
Dimensions: span 165 ft 7½ in, length 154 ft 10 in.
Weight: gross 350,000 lb.

Performance: max speed 560 mph at 36,000 ft, service ceiling 45,000 ft, range 7,000 miles at 520 mph with 10,000 lb of bombs.

Armament: ten 23 mm guns in twin-gun turrets above fuselage fore and aft of wing, under fuselage fore and aft of weapon-bays, and in tail. Three weapon-bays in centre-fuselage.

Tupolev Tu-16 (NATO 'Badger')

Twenty-seven years after the Tu-16's first public appearance, around 800 aircraft of this basic type, in nine versions, continue to equip first-line squadrons of the Dalnaya Aviatsiya bomber force and Soviet Naval Air Force. Another 80 are operational in China, where production continues under the designation Sian B-6. Of the DA aircraft, about 300 serve with medium-range units, configured to deliver nuclear or conventional weapons, and supported by a small number of Tu-16 tankers, more than 90 of various versions equipped for ECM duties, and 15 for reconnaissance. The Naval Air Force has about 275 Tu-16s for maritime attack, 70 tankers, and 40 reconnaissance and ECM variants. Reporting names by which these aircraft are known to NATO are as follows:



Tupolev Tu-16 (NATO 'Badger-F') (Royal Air Force)

Tupolev Tu-22 (NATO 'Blinder')

Tupolev Tu-22M/Tu-26 (NATO 'Backfire-B') (Swedish Air Force)

Badger-A. Basic strategic jet bomber, able to carry nuclear or conventional free-fall weapons. Crew of seven. Glazed nose, with small undernose radome. Armed with seven 23 mm guns. Some equipped as in-flight refuelling tankers, using a unique wingtip-to-wingtip transfer technique. Nine supplied to Iraq.

Badger-C. Anti-shipping version, first shown in 1961 Aviation Day flypast, with 'Kipper' winged missile carried under fuselage. Wide nose radome, in place of glazing and nose gun of 'Badger-A'.

Badger-D. Maritime/electronic reconnaissance version. Nose like that of 'Badger-C'. Larger undernose radome. Three blister fairings in tandem under centre-fuselage.

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

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

Badger-G. Similar to 'Badger-A' but fitted with underwing pylons for two rocket-powered air-to-surface missiles (NATO 'Kelt'). Majority serve with anti-shipping squadrons of the Soviet Naval Air Force. One photographed by pilot of Japanese F-86F in 1977, about 50 miles north of Noto Peninsula, carrying a new missile (NATO 'Kingfish') on port underwing pylon; others seen subsequently with a 'Kingfish' under each wing.

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

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

Badger-K. Electronic reconnaissance variant. Two teardrop radomes, inside and forward of weapons-bay.

(Data for 'Badger-A' follow.)

Power Plant: two Mikulin AM-3 turbojet engines; each 19,285 lb st.

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

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

Performance: max speed 616 mph at 19,700 ft, service ceiling 40,350 ft, range 3,000 miles with max bomb load, 3,579 miles with max fuel.

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

Tupolev Tu-22 (NATO 'Blinder')

As the Soviet Union's first operational supersonic bomber, the Tu-22 caught the attention of the world press when it made a surprise appearance at the 1961 Aviation Day display in Moscow. However, its range proved so disappointing that production was limited to about 250 aircraft. Of these, about 125 are said to remain operational with medium-range units of Dalnaya Aviatsiya, plus about a dozen for reconnaissance duties. The Soviet Navy has around 40 for maritime reconnaissance and ECM duties, based mainly in the Southern Ukraine and Estonia to protect the sea approaches to the USSR. Versions identified by NATO reporting names are as follows:

Blinder-A. Original reconnaissance bomber version, with fuselage weapons-bay for free-fall nuclear or conventional bombs. Limited production only. 12 supplied to Iraq.

Blinder-B. Similar to 'Blinder-A' but equipped to carry air-to-surface missile (NATO 'Kitchen') recessed in weapons-bay. Larger radar and partially-retractable flight refuelling probe on nose. Major version for Dalnaya Aviatsiya. 17 serve with Libyan Air Force.

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

Blinder-D. Training version. Cockpit for instructor in raised position aft of standard flight deck, with stepped-up canopy.

Power Plant: two unidentified turbojet engines in pods above rear fuselage, on each side of tail-fin; each estimated at 27,000 lb st with afterburning. Lip of each intake is extended forward for take-off, creating annular slot through which additional air is ingested.

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

Weight: gross 185,000 lb.

Performance: max speed Mach 1.4 at 40,000 ft, service ceiling 60,000 ft, range 1,400 miles.

Accommodation: three crew, in tandem.

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

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

In public statements and documents, Western defence agencies seem prepared to adopt the designation Tu-22M by which Soviet delegates to the SALT II discussions referred to this aircraft. It might be premature to forget that the DoD had used Tu-26 in earlier references to 'Backfire', which remains one of the most fascinating and controversial combat aircraft in current service. There is no longer any need to leave the in-flight refuelling noseprobe at home when flying 'Backfire' over international waters; this was done to stress the peripheral/theatre range capability which excluded the aircraft from SALT II restrictions. Nobody doubts any longer that 'Backfire' *does* have an intercontinental capability, which will be enhanced as its engines are developed. Production was to be limited to a rate of 30 per year by SALT II, and is said to have been stepped up to 42 per year following non-ratification of the Treaty. Interception photographs, taken by the Swedish Air Force, have shown the aircraft carrying a 'Kitchen' missile under the fuselage. There is, however, no confirmation of suggestions that 'Backfire' can carry two 'Kitchens' or that it will eventually carry 'Kingfish'. Two production versions have been identified by non-classified NATO reporting names:

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

Backfire-B. Extensively redesigned, with increased span and with landing gear pods eliminated except for shallow underwing fairings, no longer protruding beyond the trailing-edge. Main wheels retract inward into bottom of intake trunks. About 150 operational. Deliveries appear to be divided equally between medium-range units of Dalnaya Aviatsiya and the Naval Air Force.

Of particular significance is 'Backfire's' potential as a primary strategic and tactical offensive weapon directed at NATO in Europe, and against maritime reinforcement routes between the United States and its allies in both Europe and the Pacific. This was acknowledged in the FY 1979 DoD Annual Report, which stated: "There is increasing evidence that the Soviet bomber and cruise missile force may be overtaking their submarine force as a threat to our fleet and to our forces necessary for the resupply of Europe. They can concentrate aircraft, coordinate attacks with air, surface, or submarine-launched missiles, and use new technology to find our fleet units, jam our defenses, and screen their approach." Since then, one 'Backfire' unit is reported to have been based at Komsomol'sk, about 500 miles north of Vladivostok, in

the Far East of the USSR. *(Data for 'Backfire-B' follow.)*

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

Dimensions: span 113 ft spread, 86 ft swept; length 132 ft; height 33 ft.

Weight: gross 270,000 lb.

Performance: max speed Mach 2 at high altitude, Mach 0.9 at low altitude, max unrefuelled combat range 5,000 miles.

Armament: twin 23 mm guns in radar-directed tail mounting. Nominal weapon load 20,800 lb. Primary armament of one 'Kitchen' air-to-surface missile semi-recessed in underside of centre-fuselage. 'Backfire' can also carry the full range of Soviet free-fall nuclear and conventional weapons, and Naval aircraft photographed by Swedish Air Force in 1978 had multiple racks for external stores under the front of its air intake trunks. Soviet development of decoy missiles has been reported, to supplement very advanced ECM and ECCM.

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

The Russian 'Bear' never ceases to spring surprises. Last year's Gallery was able to confirm the accuracy of the Tu-95 designation that it had always used for 'Bear' bombers, while other journals had preferred Tu-20; but Tu-142 had to be added for the assorted 'Bears' operated by the Soviet Naval Air Force. This year comes news, from a reliable source, that 'Bear' continues in production, a quarter-century after it first entered service, to offset modest attrition in key units. A total of 113 'Bear-As and Bs' was declared as the backbone of Dalnaya Aviatsiya's strategic bomber force at the time of the abortive SALT II talks. Naval Tu-142s, being employed only for anti-submarine warfare, and being observably different from the DA bombers, were excluded from SALT bargaining. There are about 75 of them. Operating from places like Cuba and Angola, they have demonstrated their capability of covering the North and South Atlantic from the Mediterranean approaches westward to the US east coast, and southward to the Cape of Good Hope. Long range and endurance are only two of the attributes that have kept the huge four-turboprop Tu-95s and Tu-142s in first-line service for so long. Their high speed, exceeding that once considered possible for propeller-driven aircraft, eclipsed the contemporary four-jet Myasishchev M-4. Their size and payload potential enabled them to accommodate the largest air-to-surface missiles and radars that have yet been carried by operational aircraft. Thus, the six major versions identified by unclassified NATO reporting names, as follows, include a variety of sub-types, with differing operational equipment:

Bear-A. Basic long-range strategic bomber, first flown in the late Summer of 1954. Chin radome. Internal stowage for two nuclear or a variety of conventional free-fall weapons. Defensive armament of six 23 mm guns in pairs in remotely-controlled forward dorsal and rear ventral turrets, and manned tail turret.

Bear-B. As 'Bear-A' but able to carry large air-to-surface winged missile (NATO 'Kangaroo') under fuselage, with associated radar in wide undernose radome replacing glazed nose. Defensive armament retained. A few 'Bs' operate in maritime reconnaissance role with Naval Air Force, with large flight refuelling nose probe, and, sometimes, a streamlined blister fairing on the starboard side of the rear fuselage. Some 'Bears' are equipped to carry 'Kitchen' air-to-surface missiles. One was photographed in 1978 with a pointed canister under each wing, presumably for air sampling.

Bear-C. Maritime patrol version, first observed near NATO ships in 1964. Differs from 'Bear-B' in having a streamlined blister fairing on each side of its rear fuselage.

Bear-D. Identified during harassment of US Coast Guard icebreakers in the Soviet Arctic in 1967, this was the first version fitted with X-band radar in large blister fairing under centre-fuselage, for reconnaissance and important anti-shipping missile role. Tasks include pinpointing of targets for missile launch crews on board ships and aircraft which are themselves too distant to ensure precise missile aiming and guidance. Glazed nose like 'Bear-A', with undernose radome and superimposed refuelling probe. Rear fuselage blisters as on 'Bear-C'. Added fairings at tips of tailplane. I-band tail-warning radar in enlarged fairing at base of rudder. About 40 serve with Soviet Naval Air Force.

A 'Bear-D' photographed in the second half of 1978, after intercept by US Navy Phantoms, had in place of the normal tail turret and associated radome a faired tail housing special equipment.

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

Bear-F. Much-refined maritime version, identified in 1973. Smaller X-band radar fairing, further forward than that of 'Bear-D'. Large blister fairings absent from rear fuselage. Lengthened fuselage forward of wings, with shallow undernose radome on some aircraft only. Enlarged fairings aft of inboard engine nacelles to improve aerodynamics. Armament reduced to two guns, in tail mounting. Two stores bays in rear fuselage, one replacing ventral gun turret. Bulged nosewheel doors, over larger or low-pressure tyres. About 30 operational in 1980.

Individual aircraft photographed by NATO interceptors, over international waters, during the past year have displayed significant new equipment configurations additional to those listed.

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

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

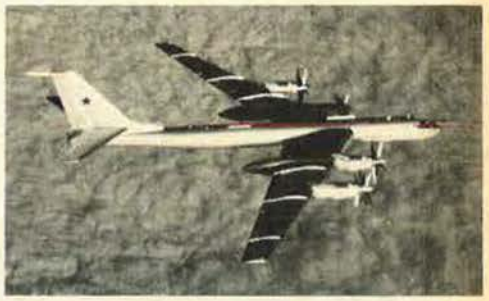
Dimensions ('Bear-F'): span 167 ft 8 in, length 162 ft 5 in, height 39 ft 9 in.

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

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

Performance ('Bear-A'): max speed 500 mph at 41,000 ft, range 7,800 miles with 25,000 lb of bombs.

Tupolev Tu-95 (NATO 'Bear-B') (Royal Navy)



Tu-142 (NATO 'Bear-F') This is one of the aircraft with 'significant new equipment' referred to in the accompanying text.

Fighters

New Fighter Programme

Although combat aircraft development is known to have continued at high priority in the USSR during 1980, there has been very little reliable information to supplement or confirm reports of new fighter designs published in some aviation journals in 1978–79. Most credible of the alleged newcomers is still the air-superiority fighter in the class of the McDonnell Douglas F-18 Hornet which was mentioned briefly in last year's Gallery. It was claimed to be at the advanced flight testing stage in Spring 1979, and to be a twin-fin, twin-engined single-seater, with wide-chord fixed wings embodying large root extensions. A T-O weight of around 25,000 lb was suggested.

MIG-21 (NATO 'Fishbed')

During 1980 the number of air forces known to have operated MiG-21s rose to 34, but the only new variant identified was the Egyptian Air Force's reconnaissance MiG-21R. Unlike its Soviet counterparts, which carry their cameras, infra-red sensors, and extra fuel in an underbelly pod, Egypt's MiG-21R has a three-camera pack which protrudes from the fuselage beneath the cockpit, replacing the belly cannon.

The original E-5 prototype of 1955 was designed by the late Colonel-General Artem Mikoyan on the basis of jet-to-jet combat experience during the Korean War, with the emphasis on good transonic and supersonic handling, high rate of climb, small size, and modest power. Subsequent development has centred on improved weapons, avionics, and range, within the limitations of an airframe much smaller and lighter in weight than either of the US types that were built under the LWF (lightweight fighter) programme of the early 1970s. How many have been manufactured in the Soviet Union, Czechoslovakia, India, and China (as the F-7), we may never know. However, about 2,000 of the 5,000 fixed-wing aircraft estimated to equip Soviet tactical air forces are MiG-21s, including 250 of the reconnaissance models known to NATO as 'Fishbed-H'. About 1,000 are multi-role 'Fishbed-J/K/L/N' variants, of which the last two represent such an advance over their predecessors in terms of constructional standards that they can almost be regarded as new types. Major versions flown by the Warsaw Pact air forces are as follows:

MIG-21F ('Fishbed-C'). Short-range clear-weather fighter, with 12,676 lb st Tumansky R-11 afterburning turbojet, internal fuel capacity of 618 gallons, and radar ranging equipment in small air intake centrebody of movable three-shock type. Armed with one 30 mm gun and two K-13 (NATO 'Atoll') air-to-air missiles or sixteen-round pods of 57 mm rockets. Pylon for 130 gallon fuel tank under belly. Semi-encapsulated escape system, in which pilot is protected by canopy, ejected with seat as shield against slipstream. Pitot boom under nose.

MIG-21PF ('Fishbed-D'). Basic model of second series, with R1L search/track radar (NATO 'Spin Scan A') in enlarged intake centrebody to enhance all-weather capability. R-11 uprated to 13,120 lb st with afterburning. Internal fuel increased to 753 gallons. Gun deleted. Late production PFs have provision for two JATO rockets, and a flap blowing system (SPS), which reduces landing speed by 25 mph. Pitot boom above nose.

MIG-21PFM ('Fishbed-F'). Successor to PF, with SPS, wide-chord fin to improve stability, conventional ejec-

MiG-21MF (NATO 'Fishbed-J')

*MiG-21*bis *(NATO 'Fishbed-L')* (Swedish Air Force)

MiG-23 (NATO 'Flogger-G') (L. Klomp)

MiG-25 (NATO 'Foxbat-A')

tion seat, windscreen with quarter lights, and sideways-hinged canopy. R2L radar ('Spin Scan B') with reported lock-on range of under 8 miles and ineffective below 3,000 ft because of ground clutter. Max permissible speed at low altitude is 683 mph.

MIG-21PFMA ('Fishbed-J'). Multi-role development of PFM, with improved radar (NATO 'Jay Bird') and four underwing pylons instead of two. Armament can include GP-9 underbelly pack, housing GSh-23 twin-barrel 23 mm gun, instead of external fuel tank. Deepened dorsal spine fairing above fuselage contains some tankage, but internal fuel totals only 687 gallons. Two additional pylons carry either 130 gallon fuel tanks or radar-homing 'Advanced Atoll' missiles to supplement infra-red K-13As on inboard pylons. Above-nose pitot boom offset to starboard. Zero-speed, zero-altitude ejection seat. Late production PFMAs can have GSh-23 gun installed within fuselage, with shallow underbelly fairing for the barrels, and splayed cartridge ejection chutes to permit retention of centreline tank.

MIG-21MF ('Fishbed-J'). Differs from PFMA in having lighter-weight, higher-rated Tumansky R-13-300 turbojet. Rearview mirror above canopy. Entered service in 1970.

MIG-21SMT ('Fishbed-K'). As MiG-21MF, but deep dorsal spine extends rearward as far as parachute brake housing to provide maximum fuel tankage and optimum aerodynamic form. Provision for ECM equipment in small removable wingtip pods. Deliveries believed to have started in 1971.

MIG-21*bis* ('Fishbed-L'). Third-generation multi-role air combat fighter/ground attack version, with wider and deeper dorsal fairing, updated avionics, and generally improved construction standards. Internal fuel capacity increased to 766 gallons.

MIG-21*bis* ('Fishbed-N'). Advanced version of 'Fishbed-L' with Tumansky R-25 turbojet engine, rated at 16,535 lb st with afterburning. Enhanced avionics indicated by 'bow and arrow' antenna under nose. *(Data for MiG-21MF follow.)*

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

Dimensions: span 23 ft 5½ in, length 51 ft 8½ in, height 13 ft 5½ in, wing area 247 sq ft.

Weight: gross 20,725 lb.

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

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun, with 200 rounds. Typical underwing loads for interceptor role include two K-13A ('Atoll') and two 'Advanced Atoll' air-to-air missiles; two K-13As and two UV-16-57 (sixteen 57 mm) rocket pods; two drop tanks and two missiles. Typical ground attack loads are four UV-16-57 rocket packs; two 1,100 lb and two 550 lb bombs; or four S-24 240 mm missiles.

MiG-23 (NATO 'Flogger-A, B, C, E, F, and G')

About 2,000 MiG-23s and related MiG-27s now equip the Soviet air forces. Others are operated by all of the Warsaw Pact nations except Romania. Export models have been delivered to Algeria, Cuba, Egypt, Ethiopia, Iraq, Libya, and Syria, with others destined for the Indian Air Force. US press reports have suggested that two former Egyptian MiG-23s were transferred to the USA. Another, presented to China, is said to have contributed much to Shenyang's latest product, the F-8. It would, therefore, be difficult to over-emphasise the importance of the first swing-wing MiG. As usual, the export models are equipped to a lower standard than those flown by Soviet units, and only East Germany among the other Warsaw Pact air forces has received MiG-27s. The 22,485 lb st Tumansky R-27 afterburning turbojet used in early production aircraft seems now to have been superseded by the R-29B in all versions except the training two-seaters. The full list of MiG-23 variants identified by unclassified NATO reporting names is as follows:

MIG-23 ('Flogger-A'). Prototype, shown in 1967 Aviation Day flypast, and small initial production series to equip one or two development squadrons from 1970. Experience with these dictated almost total redesign of the major production versions which followed.

MIG-23MF ('Flogger-B'). Single-seat air combat fighter for Soviet Air Force. Compared with prototype all tail surfaces except ventral fin moved rearward, increasing gap between wing and tailplane; size of dorsal fin increased; and fixed inboard wing leading-edges introduced. Equipment includes J-band radar (NATO 'High Lark'; search range 53 miles, tracking range 34 miles) in nose, ECM in fairings forward of starboard underwing pylon and above rudder, undernose laser rangefinder, and Doppler. Described in FY 1979 *US Military Posture* statement as the first Soviet aircraft with a demonstrated, but rudimentary, ability to track and engage targets flying below its own altitude.

MIG-23U ('Flogger-C'). Tandem two-seater for both operational training and combat use. Identical to early MiG-23MF (with R-27 engine), except for slightly raised second cockpit to rear, with retractable periscopic sight for occupant, and modified fairing aft of canopy.

MIG-23 ('Flogger-E'). Export version of 'Flogger-B', equipped to lower standard. Smaller radar (NATO 'Jay Bird'; search range 18 miles, tracking range 12 miles) in shorter nose radome. No laser rangefinder or Doppler. Armed with 'Atoll' missiles and GSh-23 gun.

MIG-23BM ('Flogger-F'). Export counterpart of Soviet Air Forces' MiG-27 ('Flogger-D') ground attack/interdictor. Has the nose shape, raised seat, cockpit external armour plate, larger, low-pressure tyres, and fixed nozzle of the MiG-27; but retains the power plant, variable-geometry intakes, and GSh-23 twin-barrel gun of the MiG-23MF.

MIG-23 ('Flogger-G'). First identified when six aircraft from Kubinka Air Base made goodwill visits to Finland and France in the Summer of 1978. Although basically similar to 'Flogger-B', these aircraft had a much smaller dorsal fin. Absence of operational equipment suggested that only a few aircraft had been modified to this standard for improved aerobatic capability as a display team. 'Flogger-G' has, however, been seen with an undernose sensor pod of new design, and is almost certainly an operational variant.

Further versions have been reported, and it is likely that a seagoing variant of 'Flogger' will equip any future large aircraft carriers built for the Soviet Navy.

On all versions, wing sweep is variable manually, in flight or on the ground, reportedly to 16°, 45°, or 72°. Full-span single-slotted trailing-edge flaps are each in three sections, permitting continued actuation of outboard sections when wings are fully swept. Upper-surface spoilers/lift dumpers operate differentially in conjunction with horizontal tail surfaces, and collectively after touchdown. Extended-chord leading-edge flap on outboard two-thirds of each main (variable-geometry) wing panel. Horizontal tail surfaces operate differentially and collectively for aileron and elevator functions respectively. Conventional rudder. *(Data for current Soviet AF MiG-23MF follow.)*

Power Plant: one Tumansky R-29B turbojet engine, rated at 25,350 lb st with max afterburning. Variable-geometry air intakes and variable nozzle. Provision for external fuel tank on centreline pylon.

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

Weight: gross 28,000–33,050 lb.

Performance: max speed Mach 2.3 at height, Mach 1.1 at sea level, service ceiling 61,000 ft, combat radius 600 miles.

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun in belly pack. One pylon under centre-fuselage, one under each engine air intake duct, and one under each fixed inboard wing panel, for rocket packs, air-to-air missiles (NATO 'Apex' and 'Aphid'), or various other stores.

MiG-25 (NATO 'Foxbat-A and C')

Because of its unique high performance for a combat aircraft, the MiG-25 was expected to equip only the Soviet Air Force, in the same way that only USAF flies the SR-71 Blackbird. Already, however, 'Foxbats' have been exported to Algeria, Libya, and Syria, with India likely to be the next recipient. It is often suggested that the Algerian, Libyan, and Syrian aircraft are piloted by Soviet aircrew, but this would certainly not be the case in India.

Five versions of the MiG-25 have been identified:

MIG-25 ('Foxbat-A'). Basic interceptor. Built mainly of steel, with titanium only in places subject to extreme heating, such as the wing leading-edges. Slightly reduced wing sweep towards tips, which carry anti-flutter bodies housing CW target-illuminating radar. Nose radar (NATO 'Fox Fire') of MiG-25 examined in Japan in 1976 was the most powerful fitted to any interceptor of that period but embodied vacuum tubes rather than modern circuitry, with emphasis on anti-jamming capability rather than range. ECCM standards were high. Armament comprises four air-to-air missiles on under-

wing pylons. Known also in USSR as E-266. Over 300 operational with PVO-Strany.

MiG-25R ('Foxbat-B'). Reconnaissance version. Described separately in Reconnaissance, ECM, EW Section.

MiG-25U ('Foxbat-C'). Trainer, of which first photographs became available in late 1975. New nose, containing separate cockpit with individual canopy, forward of standard cockpit and at a lower level. No radar or reconnaissance sensors in nose. The aircraft designated E-133 in which Svetlana Savitskaya set a women's world speed record of 1,667.412 mph on June 2, 1975, is believed to have been a MiG-25U.

MiG-25R ('Foxbat-D'). Reconnaissance version. Described separately.

E-266M. Soviet designation of aircraft which recaptured two time-to-height records from the McDonnell Douglas F-15 *Streak Eagle* on May 17, 1975, and set a further record by climbing to 35,000 m (114,829 ft) in 4 min 11.7 sec. Subsequent flights set an absolute height record of 123,524 ft and a record for climb to 121,654 ft with a two-ton payload. The engines of this version are uprated to 30,865 lb st each, and a corresponding production interceptor is expected to carry six underwing missiles and a large gun.

The operational version of the E-266M is probably the so-called 'Super Foxbat', described in the US as a tandem two-seater with an armament of radar-homing AA-X-9 missiles, and a radar that can display 20 targets and track four of them simultaneously. Soviet news services have reported numerous successes against simulated cruise missiles achieved by modified MiG-25s fitted with improved 'look-down/shoot-down' radar/missile systems. On one occasion the fighter detected a target flying below 200 ft at a range of 12.5 miles, fired an unarmed missile against it and achieved a theoretical 'kill'. In a later test, a UR-1 target operating at 70,000 ft was attacked successfully by a modified MiG-25 flying at 55,000 ft. *(Data for 'Foxbat-A' follow.)*

Power Plant: two Tumansky R-31 (R-266) turbojet engines; each 24,250 lb st with afterburning. Internal fuel capacity approx 30,865 lb. Electronically-controlled variable ramps in intakes.

Dimensions: span 45 ft 9 in, length 78 ft 1¾ in, height 20 ft 0¼ in, wing area 603 sq ft.

Weights: basic operating 44,100 lb, gross 79,800 lb.

Performance: never-exceed combat speed, with missiles, Mach 2.8, service ceiling 80,000 ft, normal combat radius 700 miles.

Armament: four air-to-air missiles. These may comprise one infra-red and one radar homing example of the AA-6 (NATO 'Acrid') under each wing. More usually, it is believed that one AA-7 (NATO 'Apex') and one AA-8 ('Aphid') are carried under each wing.

MiG-27 (NATO 'Flogger-D')

The single-seat ground attack aircraft known to NATO as 'Flogger-D' has many airframe features in common with the MiG-23, but differs in such important respects that its Soviet designation was changed to MiG-27. It appears to have the same basic power plant as the Soviet Air Force's MiG-23MF, but has a fixed nozzle and fixed engine air intakes, consistent with the primary requirement of high subsonic speed at low altitude. The forward fuselage is also completely different from that of the interceptor versions of the MiG-23. The seat and canopy are raised to improve the pilot's view. There is additional armour on the flat sides of the cockpit, and the nose is sharply tapered in side elevation, with a small sloping window under a laser rangefinder and marked target seeker at the tip. Larger, low-pressure tyres are fitted. There is provision for a ferry tank under each outer wing, which must be kept in a forward position when this is fitted. Operational equipment includes a different gun, and an ECM antenna above the port glove pylon.

The 'Flogger-F' export counterpart of the MiG-27 is a member of the MiG-23 series (which see). *(Data for 'Flogger-D' follow.)*

Power Plant and **Dimensions:** As for MiG-23.

Weights: max weapon load 6,610 lb, gross 44,310 lb.

Performance: max speed Mach 1.75 at height, Mach 0.95 at S/L, max ferry range (3 external tanks) 1,550 miles.

Accommodation: pilot only.

Armament: one six-barrel 23 mm Gatling-type gun; bomb rack under each side of rear fuselage; five pylons for external stores, known to include rocket packs, bombs, tactical nuclear weapons, and, probably, AS-7 (NATO 'Kerry') air-to-surface missiles.

Sukhoi Su-9 (NATO 'Fishpot-B')

The International Institute for Strategic Studies's *Military Balance* suggests that Su-9/11 'Fishpots' still constitute more than 15% of the 2,600-strong PVO-Strany home defence fighter force. However, after two decades of first-line service, the Su-9 must be nearing the end of its useful life. R1L (NATO 'Spin Scan') radar is standard.

Power Plant: one Lyulka AL-7F turbojet engine; 19,840 lb st with afterburning. Provision for two external fuel tanks side by side under fuselage.

Dimensions: span 27 ft 8 in, length 55 ft 0 in.

Armament: no guns; four 'Alkali' air-to-air missiles under wings.

Sukhoi Su-11 (NATO 'Fishpot-C')

As its NATO reporting name implies, the Su-11 limited all-weather interceptor is an uprated version of the Su-9. First displayed at Domodedovo in 1967, it has a lengthened nose of less tapered form, with an enlarged centrebody for the Uragan 5B (NATO 'Skip Spin') X-band radar, and two slim duct fairings along the top of the fuselage, as on the Su-7B. Its armament is also much improved, and an uprated version of the AL-7F turbojet is installed.

Power Plant: one Lyulka AL-7F-1 turbojet engine; 22,046 lb st with afterburning.

Dimensions: span 27 ft 8 in, length 56 ft 0 in.

Weight: gross 30,000 lb.

Performance: max speed Mach 1.8 at 36,000 ft, ceiling 55,700 ft.

Accommodation: pilot only.

Armament: no guns; two air-to-air missiles (NATO 'Anab') under wings, one radar-homing, one infra-red homing.

Sukhoi Su-15 (NATO 'Flagon')

The number of single-seat Su-15s deployed with PVO-Strany appears to have diminished to around 800, as deliveries of the MiG-23MF and MiG-25 interceptors have continued. 'Flagon's' basic design clearly owed much to the earlier Su-11, from which it inherited its original wings, tail surfaces, and cockpit section. Main innovations were the two side-by-side engines and large conical nose radome, which necessitated side intake boxes with splitter plates. Development led to a succession of significant changes, and five production variants may now be identified by NATO reporting names:

Flagon-A. Basic single-seater, of which a prototype and nine pre-production models participated in the Aviation Day display at Domodedovo in 1967. Simple delta wings, identical in form to those of Su-11, with constant sweep of approx 53° and span of about 30 ft. Conical nose radome. Turbojets reported to be Tumansky R-11F2-300s, as used in some of MiG-21 series, each rated at 13,668 lb st. Probably limited to small initial quantity.

Flagon-C. Two-seat training version of 'Flagon-D', probably with combat capability. Individual rearward-hinged canopy over each seat.

Flagon-D. Generally similar to 'Flagon-A' but with longer-span wings of compound sweep, produced by reducing the sweepback at the tips via a very narrow unswept section. Conical radome. First major production version.

Flagon-E. Wings similar to those of 'Flagon-D'. New and more powerful propulsion system, increasing speed and range. Uprated avionics. Major production version, operational since second half of 1973.

Flagon-F. Latest version in service, identified by ogival nose radome. Generally similar to 'Flagon-E'. *(Data for 'Flagon-F' follow.)*

Power Plant: two afterburning turbojets, reported to be Tumansky R-13F2-300s; each 15,875 lb st.

Dimensions: span 34 ft 6 in, length 68 ft 0 in.

Weight: 35,275 lb.

Performance: max speed Mach 2.5 above 36,000 ft, service ceiling 65,600 ft, combat radius 450 miles.

Accommodation: pilot only.

Armament: no guns; two missiles (NATO 'Anab') under wings, one radar homing, one infra-red homing. Two further pylons for weapons or fuel tanks under centre-fuselage.

MiG-27 (NATO 'Flogger-D')

Sukhoi Su-9 (NATO 'Fishpot-B')

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

Tupolev Tu-28P/Tu-128 (NATO 'Fiddler')

Tupolev Tu-28P/Tu-128 (NATO 'Fiddler')

Western defence experts appear never to have been impressed with 'Fiddler', the largest purpose-designed interceptor yet put into squadron service. PVO-Strany, on the other hand, seems in no hurry to retire the estimated 130 still equipping first-line interceptor units. These are generally designated Tu-28P in the press, but the Department of Defense prefers Tu-128. When 'Fiddler' was first displayed in public, at Tushino in 1961, it carried two missiles (NATO 'Ash'), each 18 ft long, had a large blister fairing under its fuselage, and was fitted with two ventral fins. The production version dispensed with the fairing and ventral fins, but appeared at Domodedovo in 1967 with armament increased to four missiles.

Power Plant: two unidentified afterburning turbojet engines; each estimated at 27,000 lb st. Half-cone shock-body in each air intake.
Dimensions: span 65 ft 0 in, length 85 ft 0 in.
Weight: gross 100,000 lb.
Performance: max speed Mach 1.75 at 36,000 ft, ceiling 65,620 ft, range 3,100 miles.
Accommodation: crew of two in tandem.
Armament: four air-to-air missiles (NATO 'Ash') under wings, two radar homing, two infra-red homing.

Yakovlev Yak-28P (NATO 'Firebar') (Flug Revue)

Yakovlev Yak-28P (NATO 'Firebar')

Even by highly economical Soviet standards, the Yak-28 proved a remarkably versatile aeroplane. The same basic airframe was adaptable to a wide variety of roles, enabling the Yak-28 to take over most of the tasks performed by the earlier Yak-25/26/27 family, and add a few of its own. About 300 Yak-28P transonic all-weather interceptors remain operational in the PVO-Strany fighter force. The much longer dielectric nosecone fitted retrospectively to some aircraft does not indicate any increase in radar capability or aircraft performance, but simply a change of material and shape.

Power Plant: two turbojet engines, believed to be related to the Tumansky R-11 fitted in some MiG-21s; each 13,120 lb st with afterburning. Each intake houses a centrebody shock-cone.
Dimensions: span 42 ft 6 in, length 71 ft 0½ in, height 12 ft 11½ in.
Weight: gross 35,000 lb.
Performance: max speed Mach 1.1 at 35,000 ft, service ceiling 55,000 ft, combat radius 575 miles.
Accommodation: crew of two in tandem.
Armament: two air-to-air missiles (NATO 'Anab') under outer wings, with alternative infra-red or semi-active radar homing heads.

Yakovlev Yak-36 (NATO 'Forger-A')

Yakovlev Yak-36 (NATO 'Forger')

First operational fixed-wing VTOL combat aircraft revealed by the Soviet Union, the Yak-36 was displayed openly on board the carrier/cruiser *Kiev* during its maiden voyage through the Mediterranean and North Atlantic in July 1976. The aircraft seen on that occasion were almost certainly from an early production series, operated by a development squadron. Detail differences were noted between one aircraft and another. For example, those with an identification number above 20 painted on their intake trunks had a row of small auxiliary intake doors aft of each lip; those with lower numbers did not. No significant differences were visible on the Yak-36s carried by the *Kiev's* sister-ship *Minsk* in 1979, and there is no reason to anticipate more advanced aircraft on the third ship of the class, *Novorissiisk*, launched in December 1978, or the fourth which is expected to be launched later this year. It would, however, be surprising if the Soviet air forces failed to show any interest in a type of combat aircraft which offers independence from fixed and easily-damaged runways.

The two currently-operational versions of the Yak-36 are as follows:

Forger-A. Basic single-seat combat aircraft. At least nine appear to be operational on each Soviet carrier/cruiser, in addition to about 22 Kamov Ka-25 helicopters. Primary operational roles are assumed to be reconnaissance, strikes against small ships, and fleet defence against shadowing, unarmed maritime reconnaissance aircraft.

Forger-B. Two-seat trainer, of which one is deployed on each carrier/cruiser. Second cockpit forward of normal cockpit, with its ejector seat at lower level, under a continuous canopy. Rear fuselage lengthened to compensate for longer nose. No ranging radar or weapon pylons. Overall length about 58 ft 0 in.

The Yak-36 has a single large turbojet, exhausting through a pair of rotating nozzles aft of the wing roots. Two lift-jets are mounted in tandem aft of the cockpit, inclined at an angle so that their thrust is exerted both upward and slightly forward. As the main vectored-thrust nozzles turn up to 10° forward of vertical during take-off and landing, the total of four effluxes can be envisaged as forming a V under the fuselage. Only vertical take-offs were observed during operations from the *Kiev* and *Minsk*. It is difficult to conceive how STOL take-off could be effected with such a power plant arrangement, which also seems to rule out the possibility of thrust vectoring in forward flight, which has proved such an advantage on the Harriers of the US Marine Corps. Puffer-jets at the wingtips and tail help to give the Yak-36 commendable stability during take-off and landing.

Power Plant: one unidentified turbojet, without afterburner, based possibly on the Lyulka AL-21; thrust estimated at 17,500 lb. Two Kolesov lift-jets; each estimated at 5,600 to 8,000 lb st.
Dimensions: span 23 ft 0 in, length 49 ft 3 in.
Weight: gross 22,050 lb.
Performance: max speed Mach 1.3 at height, service ceiling 39,375 ft.
Accommodation: pilot only.
Armament: four pylons under inner wings for stores, including air-to-air missiles, gun pods, and rocket packs.

Attack Aircraft

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

New Attack Aircraft Programme

As Soviet air forces pioneered the use of low-flying Il-2 Shturmovik aircraft for anti-tank and close support duties in World War II, it was logical to expect a modern counterpart to USAF's A-10 Thunderbolt II. Such a type is said to have been under test at Jukovski for at least two years. It is described as looking more like Northrop's A-9 prototypes than the A-10, and to be a product of the Sukhoi design bureau. The engines are reported to be 11,250 lb st Tumansky R-13-300 turbojets, without afterburning. A Gatling-type gun is fitted. Max T-O weight is said to be 36,000 lb, with bombs, rocket pods, or missiles on ten external racks.

Sukhoi Su-17 (NATO 'Fitter-C')

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

About a dozen countries continue to operate this sweptwing counterpart of the Su-9/11 interceptor, but no more than 160 are thought to await replacement in the Soviet Union's own tactical air forces. Standard versions are the Su-7B and Su-7BM, the latter with a low-pressure nosewheel tyre, necessitating bulged doors to enclose it when retracted.

Power Plant: one Lyulka AL-7F-1 turbojet engine; 22,046 lb st with afterburning. Internal fuel capacity 7,000 lb. Provision for two external tanks under belly, combined capacity 2,100 lb. Two JATO rockets can be fitted under rear fuselage to shorten take-off run.
Dimensions: span 29 ft 3½ in, length 57 ft 0 in, height 15 ft 0 in.
Weights: empty 19,000 lb, gross 29,750 lb.
Performance: max speed Mach 1.6 clean or Mach 1.2 with external stores at 36,000 ft, or 530 mph at sea level without afterburning, service ceiling 49,700 ft, combat radius 200–300 miles.
Accommodation: pilot only.
Armament: two 30 mm NR-30 guns in wing roots, each with 70 rounds; underwing pylons for two 1,650 lb and two 1,100 lb bombs, including nuclear weapons, or rocket pods. External weapon load reduced to 2,200 lb when two underbelly fuel tanks are carried.

Sukhoi Su-17, Su-20, and Su-22 (NATO 'Fitter-C, D, E, F, G, and H')

When the prototype of this family of variable-geometry ground attack fighters appeared in the Aviation Day display at Domodedovo Airport, Moscow, in July 1967, it was dismissed as a simply-produced research aircraft. Only some 13 ft of each wing was pivoted, outboard of a very large fence, the remainder of the airframe being virtually identical with that of the Su-7 (NATO 'Fitter-A'). An attachment for an external store was built into each wing fence, but there seemed no reason to expect what NATO referred to as 'Fitter-B' to form the basis of a production aircraft, in view of the modest improvement in overall performance offered by such minimal modification. Discovery of at least one or two squadrons of generally-similar aircraft in service with the Soviet tactical air forces in 1972 came as a surprise. Development of the design has been rapid and continuous. The introduction of a more powerful engine and improved avionics soon put the aircraft in a completely different class from the veteran 'Fitter-A', permitting a doubled external load to be lifted from strips little more than half as long as those needed by the Su-7, to be carried about 30% further, and delivered with greater accuracy. By the beginning of this year, it was possible to identify many different Soviet Air Force and export models, as follows:

Su-17 ('Fitter-C'). Original Soviet AF model, with Lyulka AL-21F-3 turbojet, rated at 24,500 lb st with afterburning and offering better specific fuel consumption than

AL-7F-1. Manual wing sweep control. Equipment said to include SRD-5M (NATO 'High Fix') I-band centrebody ranging radar, ASP-5ND fire control system, and Sirena 3 omni-directional radar homing and warning system.

Su-17 ('Fitter-D'). As 'Fitter-C', but with forward fuselage lengthened by about 15 in, added small undernose radome, and laser marked target seeker in intake centrebody.

Fitter-E. Tandem two-seat trainer for Soviet Air Force. Generally similar to 'Fitter-C' but entire fuselage forward of wing drooped slightly to improve view from rear seat. Port wing-root gun deleted.

Fitter-F. Export counterpart of 'Fitter-D'. Increased-diameter rear fuselage. Longer dorsal fin.

Fitter-G. Developed two-seater, with combat capability. Taller fin with straight top. Shallow ventral fin. Starboard gun only. Laser target seeker fitted.

Fitter-H. As 'Fitter-G' with drooped nose, but single-seat.

The International Institute for Strategic Studies's *Military Balance*, published in the December 1980 AIR FORCE Magazine, listed a total of 640 'Fitter-C/Ds' and 40 'Fitter-Hs' as being operational with Soviet tactical air forces. Soviet Naval Aviation units assigned to anti-shipping strike and amphibious support roles in the Baltic Sea area are known to have Su-17s; the IISS lists these as 45 'Fitter-C/Ds'. The precise role of some variants is unknown, but the IISS suggests that 'Fitter-H' is a reconnaissance aircraft. The identity of the two-seat Su-17 variant illustrated on page 72 of the June 1980 AIR FORCE Magazine remains a mystery. It has the increased-diameter rear fuselage and fin shape of 'Fitter-F', and the front fuselage droop of 'Fitter-E'. However, the rearward-hinged canopy on the rear cockpit is 'solid', except for a window at the front on each side, which would not be compatible with a normal training role. The width and depth of the dorsal spine are increased aft of the rear canopy. Other features include a ventral fin, and a laser seeker in the intake centrebody.

As usual, the aircraft supplied to other air forces have a lower equipment standard than those of the Soviet forces. In this case, the differences are such that new Sukhoi designations are allocated to them, as follows:

Su-20. Export counterpart of Soviet 'Fitter-C'. Variations in rear fuselage contours by comparison with Su-17 suggest a different engine, possibly the Su-7's AL-7F-1 afterburning turbojet (22,046 lb st). Supplied to Algeria, Czechoslovakia, Egypt, Iraq, and Poland.

Su-22 ('Fitter-C'). Variant of Su-20 first delivered to Peru in 1977 and subsequently to Syria. Further reduced equipment standard, with Sirena 2 limited-coverage radar warning receiver, virtually no navigation aids, and IFF incompatible with Peru's SA-3 (NATO 'Goa') missiles. Weapons include 'Atoll' air-to-air missiles. *(Data for Su-17 'Fitter-C' follow.)*

Power Plant: see under model description. Provision for large drop-tank under each wing fence.

Dimensions: span 45 ft 11¼ in spread, 34 ft 9½ in swept; length 61 ft 6¼ in; height 15 ft 7 in; wing area 431.6 sq ft spread, 400.4 sq ft swept.

Weights: empty 22,046 lb, take-off clean 30,865 lb, gross 39,020 lb.

Performance: max speed Mach 2.17 at height, Mach 1.05 at sea level, ceiling 59,050 ft, combat radius with 4,409 lb external stores 224–391 miles according to profile.

Accommodation: pilot only.

Armament: two 30 mm NR-30 guns in wing roots; eight pylons under fuselage and wings for up to 11,023 lb of bombs, including nuclear weapons, rocket pods, and guided missiles such as the air-to-surface AS-7 (NATO 'Kerry').

Sukhoi Su-24 (NATO 'Fencer')

What was known as the Su-19 in DoD circles at the time the last Soviet Gallery was prepared is now designated Su-24. The number of 'Fencers' in front-line service in Soviet Air Armies has increased to around 400. Otherwise, little can be changed or added to what was published one year ago, despite the fact that Su-24s are now known to have been deployed for a brief period to the advanced base of Templin in East Germany in July 1979, enabling them to be seen by people outside the Soviet Union for the first time. Drawings updated to embody new details revealed by the Templin aircraft have appeared in the aviation press. However, in certain respects, the accompanying drawing, which first appeared in *Jane's* in 1977, is considered more significant. Photographs continue to be unavailable, although NATO authorities must now have a sound knowledge of both the form and the performance of the Soviet Union's most formidable tactical combat aircraft. The data that follow should be regarded as provisional, until officially-released details may be used.

The Su-24 was the first modern Soviet fighter designed specifically for ground attack and the first to carry a weapon systems officer, in the side-by-side two-seat cockpit. Wing sweep appears to be about 16° in the fully spread position, and 70° fully swept. The outer panels carry the first pivoting pylons seen on a Soviet variable-geometry aircraft. RAF assessment suggests that it has five times the weapon load and five times the range of its immediate predecessor, enabling it to reach any target in England from East German advanced bases. At the present time, two regiments of Su-24s are reported to be based at Tukums in Latvia, near the Gulf of Riga, and at Chernyakhovsk, near Kaliningrad on the Soviet Baltic coast. There are two more at Starokonstantinov and Gorodok in the Ukraine, and a single regiment in the Soviet Far East.

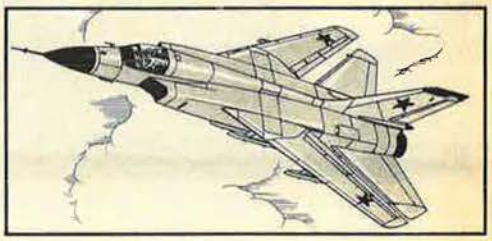
Power Plant: two unknown afterburning turbojets; possibly Tumansky R-29B, each rated at 25,350 lb st, or Lyulka AL-21F. Internal fuel capacity estimated at 3,435 gallons. Provision for large drop-tank on each glove pylon.

Dimensions: span 56 ft 3 in spread, 31 ft 3 in swept, length 69 ft 10 in.

Weight: gross 68,000 lb.

Performance: max speed above Mach 2 at height, combat radius (lo-lo-lo) over 200 miles.

Armament: one six-barrel 23 mm Gatling-type gun on port side of belly; eight pylons under fuselage, wing-root gloves, and outer wings for more than 15,000 lb of guided and unguided air-to-surface weapons, including nuclear weapons.



Artist's impression of Sukhoi Su-24 (NATO 'Fencer') (Michael A. Badrocke)

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

A small number of two-seat tactical attack Yak-28s remain in service with Soviet units in secondary areas. Most have been switched to support roles, as described under the *Reconnaissance, ECM, and Early Warning Aircraft* heading.

Yakovlev Yak-28 (NATO 'Brewer-C')

Reconnaissance, ECM, and Early Warning Aircraft

Antonov An-12 (NATO 'Cub-B and C')

The large hold of this four-turboprop transport can accommodate a wide variety of equipment for special duties. Two variants may be identified by NATO reporting names:

Cub-B. Conversion of 'Cub-A' transport for electronic intelligence (elint) missions. An example photographed over international waters by the pilot of a Swedish combat aircraft had four additional blister fairings under the forward- and centre-fuselage, plus other antennae. Few produced.

Cub-C. ECM version. Glazed nose and undernose radome of the transport version are retained, but an ogival 'solid' fuselage tailcone, housing electronic equipment, is fitted instead of the usual gun position. Additional electronic pods are faired into the forward fuselage and ventral surfaces. About 30 in service with both Soviet Air Force and Navy.

Ilyushin Il-14 (NATO 'Crate')

The traditional Soviet reluctance to discard any aircraft that remains airworthy is exemplified by the variety of types that have been adapted for reconnaissance, ECM, and other support duties after replacement in their primary roles. Thus, small numbers of Il-14 transports, each powered by two 1,900 hp Shvetsov ASh-82T piston engines, are operated on ECM and reconnaissance tasks by the Warsaw Pact air forces.

Ilyushin Il-18 (NATO 'Coot-A')

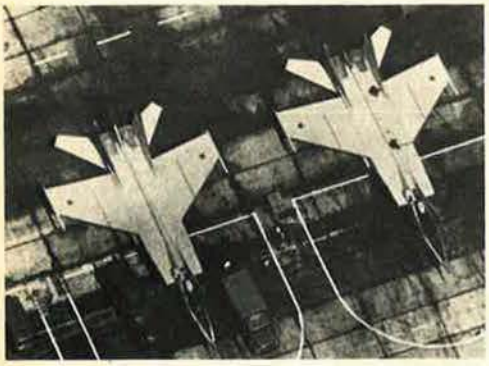
This ECM or electronic intelligence (elint) aircraft appears to be a conversion of the standard Il-18 four-turboprop transport (see under *Transports* heading). An under-fuselage container, about 33 ft 7½ in long and 3 ft 9 in deep, is assumed to house side-looking radar. Smaller containers on each side of the forward fuselage each contain a door over a camera or other sensor. About eight antennae and blisters can be counted on the undersurface of the centre and rear fuselage, plus two large plates projecting above the forward fuselage.

Ilyushin Il-76 (NATO 'Candid')

A few Il-76 four-turbofan transports are believed to be under evaluation in an AWACS (airborne warning and control system) role. Others have been evaluated as flight refuelling tankers for the 'Backfire' supersonic bombers of the Soviet Long Range Aviation force and Naval Air Fleet. (Further details under *Transports*.)

Ilyushin Il-18 (NATO 'Coot-A') (Royal Air Force)

MiG-21R (NATO 'Fishbed-H') (Flug Revue)



MiG-25R (left to right: NATO 'Foxbat-B and D')

Tupolev Tu-126 (NATO 'Moss')

MiG-21 (NATO 'Fishbed-H')

Two versions of this supersonic single-seat fighter are operated by the Soviet Air Forces and their allies as specialised tactical reconnaissance aircraft:

MiG-21R ('Fishbed-H'). Basically similar to MiG-21PFMA, but with a pod housing forward-facing or oblique cameras, infra-red sensors, or ECM devices, and fuel, carried on the fuselage centreline pylon. Suppressed antenna at mid-fuselage; optional ECM equipment in wingtip fairings.

MiG-21RF ('Fishbed-H'). Generally similar to MiG-21R, but based on MiG-21MF. Total of 250 'Fishbed-Hs' of both models estimated in service with Soviet tactical air forces.

MiG-25 (NATO 'Foxbat-B and D')

Although generally similar to the basic MiG-25 interceptor, the reconnaissance variants have a modified wing and, carrying no external weapons, are not limited to Mach 2.8. Two versions have been identified in service, as follows:

MiG-25R ('Foxbat-B'). Basic reconnaissance version, with five camera windows and various flush dielectric panels forward of cockpit. Small dielectric nosecap for radar. Equipment believed to include Doppler navigation system, and side-looking airborne radar (SLAR). No armament. Slightly reduced span. Wing leading-edge sweep constant from root to tip. Supplied also to Algeria, Libya, and Syria, and ordered by India.

MiG-25R ('Foxbat-D'). Similar to 'Foxbat-B', but with larger SLAR dielectric panel, further aft on starboard side of nose, and no cameras. Total of about 170 'Foxbat-Bs and Ds' estimated in service with Soviet tactical air forces.

Dimensions: span 44 ft 0 in.

Weights ('Foxbat-B'): basic operating 43,200 lb, gross 73,635 lb.

Performance: max speed Mach 3.2 at height.

Mil Mi-4 (NATO 'Hound-C')

Superseded by turbine-powered helicopters in their original transport and anti-submarine roles, Mi-4s continue in service with support units. A version first identified in 1977 is known to NATO as 'Hound-C'. The multiple antennae of a communications jamming system project from the front and rear of the cabin, on each side.

Power Plant: one Shvetsov ASh-82V piston engine; 1,700 hp.

Dimensions: rotor diameter 68 ft 11 in, length of fuselage 55 ft 1 in, height 17 ft 0 in.

Weight: gross 17,200 lb.

Mil Mi-8 (NATO 'Hip-D')

This medium-size helicopter is the latest Soviet aircraft known to have been adapted for electronic duties, under the following NATO reporting name:

Hip-D. Generally similar to 'Hip-C' transport, but with canisters of rectangular section on outer stores racks, and added antennae.

Tupolev Tu-126 (NATO 'Moss')

The Tu-126 is the PVO-Strany's counterpart to the USAF's Boeing E-3A AWACS (Airborne Warning and Control System). About twelve are operational, with airframe and power plant developed from those of the Tu-114 turboprop airliner rather than from the smaller-fuselage Tu-95 bomber. The 36 ft diameter rotating radar "saucer" above the fuselage is 6 ft larger than that of the E-3A; however, at its present stage of development, the Tu-126 is believed by US defence experts to have only limited effectiveness in the warning role over water and to be ineffective over land.

Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp. In-flight refuelling probe standard.

Dimensions: span 168 ft 0 in, length 181 ft 1 in, height 52 ft 8 in, wing area 3,349 sq ft.

Weight: gross 374,785 lb.

Performance: max speed 528 mph, normal operating speed 404 mph, max range without flight refuelling 7,800 miles.

Accommodation: crew of twelve.

Armament: none.

Yakovlev Yak-28 (NATO 'Brewer')

The original 'Brewer-A, B, and C' versions of the Yak-28 were two-seat tactical attack aircraft, with the navigator/bomb-aimer stationed in the glazed nose. Most have been switched from first-line attack to support roles, and Yak-28s now operational include the following two versions:

Brewer-D. Reconnaissance aircraft, carrying cameras instead of weapons in its internal bomb-bay. About 175 operational.

Brewer-E. Deployed in 1970 as the first Soviet operational ECM escort aircraft, with an active ECM pack built into its bomb-bay, from which the pack projects in cylindrical form. No radome under front fuselage, but many other additional antennae and fairings are apparent. A rocket pod can be carried under each outer wing, between the external fuel tank and balancer wheel housing. About 20 estimated in service.

Dimensions, weight, and **performance** should be in the same order as those of the Yak-28P ('Firebar') interceptor (which see).

Transports

Antonov An-12BP (NATO 'Cub')

Antonov An-22 (NATO 'Cock')

Antonov An-12BP (NATO 'Cub')

An estimated fleet of 560 An-12BPs continues to form the backbone of the Soviet VTA (Military Transport Aviation) service, with only 75 of the new four-turbofan Il-76s currently in military use. But what should never be forgotten is that the state airline Aeroflot has around 1,400 medium- and long-range transports which form a quickly-available reserve for the VTA, and are often seen participating in airlifts to places like Afghanistan and Ethiopia. An-12s also fly in the insignia of at least ten foreign air forces.

Layout of the basic An-12BP transport version (NATO 'Cub-A') is conventional for a freighter, with access to the hold via a ramp-door which forms the bottom of the upswept rear fuselage when closed. This ramp-door is made in two longitudinal halves, which can be hinged upward inside the cabin to permit direct loading from trucks on the ground, or airdropping of supplies and equipment. A full load of 100 paratroops can be despatched via this exit in under one minute. The 'Cub-B and C' elint and ECM versions are described separately.

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

Dimensions: span 124 ft 8 in, length 108 ft 7¼ in, height 34 ft 6½ in, wing area 1,310 sq ft.

Weights: empty 61,730 lb, gross 134,480 lb.

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

Accommodation: crew of six; 44,090 lb of freight, vehicles, or 100 parachute troops. Built-in freight handling gantry with capacity of 5,070 lb.

Armament: two 23 mm NR-23 guns in manned tail turret.

Antonov An-22 (NATO 'Cock')

The prototype of this giant turboprop freighter flew for the first time on February 27, 1965, and about 50 were delivered subsequently to the military air transport force. Each can carry a payload of up to 176,350 lb, including 'Scud-A' and 'Ganef' missiles on their tracked launchers; and the An-22 is the only Soviet transport capable of lifting a T-62 tank. Production ended in 1974.

Power Plant: four Kuznetsov NK-12MA turboprop engines; each 15,000 shp.

Dimensions: span 211 ft 4 in, length 190 ft 0 in, height 41 ft 1½ in, wing area 3,713 sq ft.

Weights: empty 251,325 lb, gross 551,160 lb.

Performance: max speed 460 mph, range 6,800 miles with 99,200 lb payload.

Accommodation: crew of five or six, 28–29 passengers in cabin forward of main freight hold. Four travelling gantries and two winches to speed freight handling.

Armament: none.

Antonov An-24 (NATO 'Coke')

A total of about 1,100 An-24s was built between 1960 and 1978. Aeroflot received several hundred; the last off the assembly line, delivered to Romania, was described as the 750th aircraft of the An-24/26 series to be exported. The number of An-24s in Soviet Air Force use must therefore be small. The **An-24T** freighter differs

from the basic passenger-carrying **An-24V** in having a belly freight door at the rear, instead of the port-side passenger door, and two ventral fins instead of one. The belly door can be opened in flight for air-dropping payload or parachutists. The **An-24RV** and **An-24RT** versions differ in having a 1,985 lb st RU 19-300 auxiliary turbojet in the rear of the starboard engine nacelle, for turboprop starting and to provide additional power for take-off, climb, and cruising flight, as required. *(Data for An-24V follow.)*

Power Plant: two Ivchenko AI-24A turboprop engines; each 2,550 ehp.
Dimensions: span 95 ft 9½ in, length 77 ft 2½ in, height 27 ft 3½ in, wing area 807.1 sq ft.
Weights: empty 29,320 lb, gross 46,300 lb.
Performance: normal cruising speed 280 mph at 19,700 ft, service ceiling 27,560 ft, range 341 miles with max payload, 1,490 miles with max fuel.
Accommodation: crew of three to five; seats for 44–52 passengers in main cabin. (An-24T can carry 30 paratroops, 36 combat-equipped troops, or 24 litters instead of freight.)
Armament: none.

Antonov An-26 (NATO 'Curl')

This extremely useful twin-turboprop freighter was the first aircraft to feature Oleg Antonov's new-type rear-loading ramp. This forms the underside of the rear fuselage when retracted, in the usual way, but can be slid forward under the rear of the cabin to facilitate direct loading on to the floor of the hold, or when the cargo is to be airdropped. In other respects, the An-26 is basically an An-24RT with more powerful turboprops and a completely redesigned rear fuselage. Conversion of the standard freighter to carry troops or litters takes 20 to 30 minutes in the field. Optional equipment includes an OPB-1R sight for pinpoint dropping of freight. Max payload is 12,125 lb. The Soviet Military Transport force has a total of about 40 An-24/26s; others are flown by about 20 foreign air forces.

Power Plant: two Ivchenko AI-24VT turboprop engines; each 2,820 ehp. One 1,765 lb st RU 19A-300 auxiliary turbojet in starboard nacelle *(see An-24 entry)*.
Dimensions: span 95 ft 9½ in, length 78 ft 1 in, height 28 ft 1½ in.
Weights: empty 33,113 lb, gross 52,911 lb.
Performance: cruising speed 273 mph at 19,675 ft, service ceiling 24,600 ft, range 683 miles with max payload.
Accommodation: crew of five, plus station for load supervisor or despatcher. Electrically-powered mobile hoist, capacity 4,409 lb, and conveyor to facilitate loading and airdropping. Provision for carrying 40 paratroops or 24 litters.
Armament: none.

Antonov An-32 (NATO 'Cline')

By the time of the 1979 Paris Air Show, only a single prototype of this "hot and high" variant of the An-26 had been built. Oleg Antonov commented that production would be undertaken only if sufficient orders were received in advance to justify such a move. Since then, the Indian prime minister has confirmed selection of the An-32 to meet an Indian Air Force requirement for 95 aircraft. Factors influencing the choice were said to be commonality of engines with the IAF's An-12s, and a price only one-third that of Western competitors. The basic airframe is similar to that of the An-26, with much more powerful turboprops, a slotted tailplane, and enlarged ventral fins. The An-32 is able to operate from airfields 13,000 to 14,750 ft above sea level in an ambient temperature of ISA+25°C, and can transport 3 metric tons of freight over a 683 mile stage length, with fuel reserves. Maximum payload is 6 metric tons.

Power Plant: two Ivchenko AI-20M turboprop engines; each 5,180 ehp.
Dimensions: as for An-26.
Weight: gross 57,320 lb.
Performance: normal cruising speed 317 mph, service ceiling 31,150 ft, max range 1,367 miles.
Accommodation: crew of five; freight, or 39 troops, 30 paratroops, or 24 litters and a medical attendant.
Armament: none.

Antonov An-72 (NATO 'Coaler')

Although the An-72 was viewed as a scaled-down copy of the much larger Boeing YC-14 AMST when photographs were first released in early 1978, it has a much simpler powered lift system, and introduced a number of special refinements of its own. The intention was to produce a STOL replacement for the An-26 that would be able to operate from unprepared airfields or from surfaces covered with ice or snow. The high location of the engines was adopted primarily to avoid problems caused by foreign object ingestion. Their efflux is ejected over the wing upper surface and then down over large multi-slotted flaps, to provide a considerable increase in lift for short-field operation, using the so-called 'Coanda effect'. Deflector doors at the rear of the engine nacelles, which 'spread' the efflux for optimum effectiveness during take-off and landing on the prototypes, are believed to have been dropped from production An-72s as an unnecessary complication. The first prototype flew on August 31, 1977; the second was shown at the 1979 Paris Air Show, by which time just over 1,000 flying hours had been logged by the two aircraft in about 300 flights. Handling in the air was described as outstanding, and a completely automatic Doppler-based navigation system is standard. Production is believed to be under way.

Antonov An-26 (NATO 'Curl') on delivery flight to Cuba (Austin J. Brown)

Power Plant: two Lotarev D-36 high bypass ratio turbofan engines; each 14,330 lb st.
Dimensions: span 84 ft 9 in, length 87 ft 2¼ in, height 27 ft 0¼ in.
Weights: max payload 16,535 lb, gross weight 67,240 lb.
Performance: max cruising speed 447 mph, service ceiling 36,100 ft, range 1,985 miles with max fuel, or 620 miles with max payload.
Accommodation: crew of two or three on flight deck. Folding seats for 32 passengers along walls of freight hold. Provision for carrying 24 casualties and attendant in ambulance role.
Armament: none.

Ilyushin Il-18 (NATO 'Coot')

With its airline service drawing to a close, this four-turboprop transport is finding important new military roles, of which the elint operations of 'Coot-A' (see under *Reconnaissance, ECM, and Early Warning Aircraft* heading) are typical. Eleven air forces have flown passenger versions, usually in a VIP configuration. The Soviet Air Force is thought to retain about 15 in this form.

Power Plant: four Ivchenko AI-20M turboprop engines; each 4,250 ehp.
Dimensions: span 122 ft 8½ in, length 117 ft 9 in, height 33 ft 4 in.
Weights: empty 76,350 lb, gross 134,925 lb.
Performance: max cruising speed 419 mph, range 3,230 miles with max fuel, or 1,990 miles with max payload.
Accommodation: crew of five; up to 122 passengers.
Armament: none.

Ilyushin Il-76 (NATO 'Candid')

Delivery of military Il-76s to a development squadron began in 1974, only three years after the first flight of the prototype, on March 25, 1971. Since then, the expected replacement of An-12s with Il-76s has been much slower than expected, and only 75 of the four-turbofan aircraft are thought to serve currently with the VTA transport force. Aeroflot has about 40, which it uses in areas like Siberia, the north of the Soviet Union, and the Far East, where conditions are often difficult, with short, unprepared airstrips. Iraq, Czechoslovakia, and Poland are said to have ordered military Il-76s, with a rear gun turret. Others are believed to have been evaluated by the Soviet Air Force in AWACS and flight refuelling tanker roles.

Basic requirement to which the Il-76's designers worked was to provide the ability to transport 40 metric tons of freight for a distance of 3,100 miles (5,000 km) in under six hours. Design features include rear-loading ramp/doors, a T-tail, full-span leading-edge slats, and triple-slotted flaps for good field performance, a navigator's station in the glazed nose, with ground-mapping radar in a large undernose fairing, and a unique and complex 20-wheel landing gear. The entire accommodation is pressurised. Advanced mechanical handling systems are fitted for containerised and other freight. Equipment for all-weather operation includes a computer for automatic flight control and automatic landing approach.

A series of 25 official records set by the Il-76 in July 1975 includes a payload of more than 70 tons (154,590 lb) lifted to a height of 38,960 ft, and a speed of 532.923 mph around a 1,000 km circuit with the same load.

Power Plant: four Soloviev D-30KP turbofan engines; each 26,455 lb st.
Dimensions: span 165 ft 8 in, length 152 ft 10½ in, height 48 ft 5 in, wing area 3,229.2 sq ft.
Weight: gross 374,785 lb.
Performance: cruising speed 466–497 mph at 29,500–39,350 ft, nominal range 3,100 miles with maximum payload of 88,185 lb, max range 4,163 miles.
Accommodation: crew of three to five.
Armament: gun turret in tail.

Antonov An-32 (NATO 'Cline') (Brian M. Service)

Antonov An-72 (NATO 'Coaler') (Brian M. Service)

Ilyushin Il-76 (NATO 'Candid')

Trainers

Aero L-39 Albatros

MiG-21U (NATO 'Mongol-B') of the Egyptian Air Force (Denis Hughes)

Sukhoi Su-15 trainer (NATO 'Flagon-C')

Yakovlev Yak-52

Aero L-29 Delfin (NATO 'Maya')

About 3,600 L-29 two-seat basic and advanced jet trainers were manufactured in Czechoslovakia between 1963 and 1974, for standardised use by the air forces of all Warsaw Pact nations except Poland, which preferred its own TS-11 Iskra, and for export. Replacement with another Czech-designed trainer, the L-39, has been under way since 1974, but L-29s can still be seen in the markings of 15 air forces.

Power Plant: one M701c500 turbojet engine; 1,960 lb st.
Dimensions: span 33 ft 9 in, length 35 ft 5½ in, height 10 ft 3 in.
Weights: empty 5,027 lb, gross 7,804 lb.
Performance: max speed 407 mph at 16,400 ft, service ceiling 36,100 ft, range 555 miles with external tanks.
Accommodation: crew of two, in tandem.
Armament: provision for two bombs of up to 220 lb, eight air-to-ground rockets, or two 7.62 mm machine-gun pods under wings.

Aero L-39 Albatros

The first prototype of the L-39 flew on November 4, 1968, and series production began in 1972 to replace the L-29 as the standard trainer of the Soviet and other air forces. Many hundreds have been delivered already, and the eventual production total is expected to match that of the L-29. There are three current versions:

L-39C. Basic and advanced flying trainer, delivered to the air forces of Afghanistan, Czechoslovakia, the German Democratic Republic, and the USSR.

L-39Z0. Weapon training version, with four underwing weapon stations. Strengthened wings. Exported to Iraq and Libya.

L-39Z. Weapon systems training/ground attack version, with underfuselage gun and underwing weapon stations. Strengthened wings and landing gear. Production was expected to begin before the end of 1979.

Power Plant: one Ivchenko AI-25-TL turbofan engine; 3,792 lb st. *(Data for L-39C follow.)*
Dimensions: span 31 ft 0½ in, length 39 ft 9½ in, height 15 ft 7¾ in, wing area 202.36 sq ft.
Weights: empty 7,859 lb, gross (trainer, clean) 10,028 lb.
Performance: max speed 485 mph at 19,700 ft, service ceiling 37,730 ft, range 683 miles on internal fuel.
Accommodation: crew of two, in tandem.
Armament (L-39Z): underwing bombs, rockets, air-to-air missiles, guns, or reconnaissance packs, on four hardpoints, and a 23 mm GSh-23 twin-barrel cannon in an underfuselage pod.

MiG-15UTI (NATO 'Midget')

After completing their basic and initial advanced training on the L-29 or L-39, pupil pilots of the Soviet Air Force graduate to this tandem two-seat version of the once-renowned MiG-15 jet fighter. The airframe differs from that of the original single-seater mainly in having an aft cockpit for an instructor in place of some fuselage fuel tankage. Armament is reduced to a single gun on most of the trainers, which continue in service with more than thirty air forces. Next stage of training after the MiG-15UTI is normally on one of the two-seat adaptations of current operational aircraft described after this entry.

Power Plant: one Klimov VK-1 turbojet engine; 5,952 lb st.
Dimensions: span 33 ft 0⅞ in, length 32 ft 11¼ in, height 12 ft 1⅝ in.
Weights: empty 8,818 lb, gross (clean) 10,692 lb.
Performance: max speed 631 mph at sea level, range 590 miles (clean) or 885 miles (with two underwing tanks) at 32,800 ft.
Accommodation: crew of two, in tandem.
Armament: normally one 23 mm NS-23 gun or one 12.7 mm UBK-E machine-gun under port side of nose.

MiG-21U (NATO 'Mongol')

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

MiG-23U (NATO 'Flogger-C')

(See page 104.)

MiG-25U (NATO 'Foxbat-C')

(See page 105.)

Sukhoi Su-7U (NATO 'Moujik')

The Soviet and nine other air forces use this tandem two-seat adaptation of the Su-7B as an operational trainer for their ground attack pilots. Changes are minimal. The aft cockpit is fitted with a slightly-raised canopy, from which a prominent dorsal spine extends back to the base of the tail-fin.

Sukhoi Su-9U (NATO 'Maiden')

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

Sukhoi Su-15 trainer (NATO 'Flagon-C')

(See page 105.)

Sukhoi Su-17 trainer (NATO 'Fitter-E')

(See page 107.)

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

(See page 102.)

Yakovlev Yak-11 (NATO 'Moose')

Operated still by more than a dozen air forces, this tandem two-seat basic trainer, evolved from the wartime Yak-9 fighter, is used for second-stage instruction of all Soviet pilots after graduation from the Yak-18. Small wings give it a long take-off run but a smart rate of roll.

Power Plant: one Shvetsov ASh-21 piston-engine; 800 hp.
Dimensions: span 30 ft 10 in, length 27 ft 10¾ in, height 9 ft 2½ in.
Weights: empty 4,630 lb, gross 5,512 lb.
Performance: max speed 286 mph.
Armament: provision for one machine-gun and underwing practice bombs.

Yakovlev Yak-18 (NATO 'Max')

Like the Yak-11, the prototype of this primary trainer first flew in 1946. About 8,000 have since been built, mostly for the civilian or paramilitary schools at which pilots of the Warsaw Pact air forces receive their primary training, including the Soviet DOSAAF centres. The original tandem two-seat Yak-18 had a 160 hp M-11 radial engine and tailwheel landing gear. The Yak-18U introduced a nosewheel and longer fuselage. Yak-18A switched to a 300 hp AI-14RF engine and was generally cleaned up. The Yak-18P and PM were refined single-seat aerobatic variants of the 18A, and the Yak-18PS a tailwheel counterpart of the PM. All can still be seen.

Yakovlev Yak-28U (NATO 'Maestro')

Although the operational Yak-28P ('Firebar') is a tandem two-seater, it was not possible to adapt the existing rear cockpit in order to produce a dual-control training version. Instead, the Yakovlev bureau had to design a completely new front fuselage for the Yak-28U. This has two individual single-seat cockpits in tandem, each with its own blister canopy. The front canopy is sideways hinged, to starboard. The higher rear canopy is rearward-sliding. A very large conical probe, similar to that of the 'Brewer' attack versions, projects forward of the nosecone.

Yakovlev Yak-36 trainer (NATO 'Forger-B')

(See page 106.)

Yakovlev Yak-50 and Yak-52

The Yak-50 single-seat aerobatic trainer flew for the first time in 1975 and virtually swept the board in both

the men's and women's events at the 1976 World Aerobatic Championships. Its configuration is almost identical to that of the earlier Yak-18PS, but it has a 360 hp engine, a reduced span with no wing centre-section, and a semi-monocoque rear fuselage instead of the Yak-18's fabric-covered steel tube structure. It has been followed by the tandem two-seat Yak-52, which differs mainly in having a tricycle undercarriage which leaves all three wheels fully exposed when retracted to reduce damage in a wheels-up landing. The Yak-52 is being manufactured in the IRAvB factory at Bacau in Romania to replace the Yak-18s of DOSAAF and other training organisations. *(Data for Yak-52 follow.)*

Power Plant: one Vedeneev M-14P piston-engine; 360 hp.

Dimensions: span 31 ft 2 in, length 25 ft 2 in, height 9 ft 8¼ in.

Weights: empty 2,205 lb, gross 2,844 lb.

Performance: max speed 177 mph, service ceiling 19,750 ft, max range 341 miles.

Armament: none.

Helicopters

Kamov Ka-25 (NATO 'Hormone')

About 460 Ka-25s were built in 1966–75, to replace Mi-4s in the Soviet Navy's ship and shore-based force of around 275 helicopters, and for export in small numbers to countries such as India, Syria, and Yugoslavia. Some of the tasks performed by these aircraft cannot yet be discussed, and only two variants may be identified by NATO reporting names, as follows:

Hormone-A. Basic ASW version, with large flat-bottomed housing for undernose search radar, and racks for small stores on each side of the fuselage. Other equipment varies from one aircraft to another. Some have an underfuselage weapon bay. A few have a streamlined blister fairing built into the base of the central tail-fin; others have a fairing of flower-pot shape, with a transparent top, above the central point of the tail-boom. Each of the four wheels of the landing gear is usually enclosed in an inflatable pontoon, surmounted by inflation bottles. The rear legs are pivoted, so that the wheels can be moved into a position where they offer least interference to signals from the nose radar. Dipping sonar is housed in a compartment at the rear of the cabin, but is said to be inoperable at night or in adverse weather. An electro-optical sensor and a towed magnetic anomaly detector are carried. Ka-25s fly from cruisers of the *Kara* and *Kresta* classes, the carrier/cruisers *Kiev* and *Minsk*, each of which carries 19 'Hormone-As' and 3 'Bs', and the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 18 aircraft.

Hormone-B. Special electronics variant, able to acquire targets for cruise missiles launched from the ship on which it is deployed. Larger undernose radome with more spherical undersurface. Cylindrical radome under rear of cabin. Data link equipment.

Other versions of which photographs have appeared in the press include a utility model, generally similar to 'Hormone-A' but with unnecessary operational equipment and weapons removed. This version sometimes has a yagi aerial mounted on the nose; it has been photographed in non-operational red and white paint finish. Naval 'Hormones' have been seen carrying an external weapons pod housing long wire-guided torpedoes. *(Data for 'Hormone-A' follow.)*

Power Plant: two Glushenkov GTD-3 turboshaft engines; each 900 shp.

Dimensions: rotor diameter (each) 51 ft 8 in, length of fuselage 32 ft 0 in, height 17 ft 7½ in.

Weights: empty 10,500 lb, gross 16,500 lb.

Performance: max speed 130 mph, service ceiling 11,500 ft, range 405 miles.

Accommodation: crew of two on flight deck; other crew members in main cabin, which is large enough to contain 12 folding seats for passengers in transport role.

Armament: ASW torpedoes, nuclear depth charges, and other stores in underfuselage weapon bay, when installed. Reported installation of small air-to-surface 'fire and forget' missiles on some aircraft.

Mil (WSK-PZL-Swidnik) Mi-2 (NATO 'Hoplite')

More than 12,000 turbine-powered helicopters of Mil design have been manufactured, with production in the USSR continuing at a rate of more than 1,000 a year. They include the largest, fastest, and most-heavily armed types in the world; and a total of at least 4,000 are deployed with first-line units of the Soviet tactical air forces. Only type not built in the USSR is the small Mi-2, of which manufacture was transferred to the WSK-PZL at Swidnik in Poland in 1964. More than 3,000 have been delivered for military and commercial service, with the air forces of Czechoslovakia, Poland, Romania, and the Soviet Union among known operators. The USSR has received over 2,000, and production is continuing at a rate of 300 per year.

Power Plant: two Polish-built Isotov GTD-350P turboshaft engines; each 400 or 450 shp.

Dimensions: rotor diameter 47 ft 9¼ in, length of fuselage 39 ft 2 in, height 12 ft 3½ in.

Weights: basic operating 5,213 lb, gross 8,157 lb.

Performance: max speed 130 mph at 1,640 ft, service ceiling 13,125 ft, range 360 miles with max fuel, 105 miles with max payload.

Accommodation: pilot on flight deck; eight passengers, 1,543 lb of freight, or four litters and medical attendant in cabin.

Armament: provision for air-to-surface rocket pod, or two 'Sagger' air-to-surface missiles, on each side of cabin.

Mil Mi-6 (NATO 'Hook')

When announced in the Autumn of 1957, the Mi-6 was the world's largest helicopter. It was also the first Soviet production helicopter fitted with small fixed wings to offload the main rotor in cruising flight. These wings are normally removed when the aircraft operates in a flying crane role, carrying external freight. More than 860 production Mi-6s are believed to have been delivered for commercial and military service, the latter with the air forces of the Soviet Union (about 380 currently operating with the tactical air forces), Algeria, Bulgaria, Egypt, Ethiopia, Iraq, Peru, Syria, and Vietnam. Task of these helicopters is to haul guns, armour, vehicles, supplies, freight, or 65 troops at a time, in combat areas.

Power Plant: two Soloviev D-25V turboshaft engines; each 5,500 shp.

Dimensions: rotor diameter 114 ft 10 in, length of fuselage 108 ft 10½ in, height 32 ft 4 in.

Weights: empty 60,055 lb, gross 93,700 lb.

Performance: max speed 186 mph, service ceiling 14,750 ft, range 385 miles with 17,637 lb payload.

Accommodation: crew of five; up to 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')

When teamed with the Mi-24 gunship, the Mi-8 assault transport makes up the most formidable helicopter attack force in the world. Production of the Mi-8 now exceeds 7,500, and is continuing at the rate of about 750 a year. Primary task of the aircraft, for which the crews are well trained, is to put down assault troops, combat equipment, and supplies behind enemy lines, within 15–20 minutes of a nuclear or conventional bombardment/strike. Versions serving with about 30 air forces are as follows:

Hip-C. Basic assault transport. Twin-rack for stores on each side of cabin, able to carry 128 x 57 mm rockets in four packs, or other weapons.

Hip-D. For electronic duties; see page 108.

Hip-E. Described by DoD as the world's most heavily armed helicopter. Standard equipment of Soviet tactical air forces. One flexibly-mounted 12.7 mm machine-gun in nose. Triple stores rack on each side of cabin, able to carry up to 192 rockets in six suspended packs, plus 4 'Swatter' homing anti-tank missiles above racks.

Hip-F. Export counterpart of 'Hip-E'. Missile armament changed to six 'Saggers'.

Power Plant: two Isotov TV2-117A turboshaft engines; each 1,700 shp. (Latest models reported to have TV3-117 engines, each 2,200 shp.)

Kamov Ka-25 (NATO 'Hormone-A') (US Navy)

Mil Mi-2 (NATO 'Hoplite') (Tass)

Mil Mi-6 (NATO 'Hook') of the Egyptian Air Force (Denis Hughes)

Mil Mi-8 (NATO 'Hip-E')

Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 60 ft 0¾ in, height 18 ft 6½ in.
Weights: empty 16,007 lb, gross 26,455 lb.
Performance: max speed 161 mph at 3,280 ft, service ceiling 14,760 ft, range 311 miles as passenger transport.
Accommodation: crew of two or three; up to 32 passengers, 8,820 lb of freight, 12 litters and attendant.
Armament: see individual model descriptions.

Mil Mi-10 (NATO 'Harke')

So impressive have been the achievements of Soviet flying crane helicopters in combat areas such as the Ogaden region of Ethiopia that the Mi-10 was reinstated in production after a six-year break. Even now, production is very limited by Soviet standards, but at least 60 Mi-10s are thought to have been delivered. Each embodies the power plant, rotor system, transmission, gearboxes, and most equipment of the Mi-6. The depth of the fuselage is reduced considerably, and the tailboom is deepened so that the flattened undersurface extends unbroken to the tail. The Mi-10 also lacks the wings of the standard Mi-6. Payloads can be carried by sling or cable, clasped under the belly, or on interchangeable wheeled platforms slung between the legs of the wide-track, stalky landing gear. Further freight, or up to 28 passengers on tip-up seats, can be accommodated in the main cabin.

Dimensions: rotor diameter 114 ft 10 in, length of fuselage 107 ft 9¾ in, height 32 ft 2 in.
Weights: empty 60,185 lb, gross 96,340 lb, max payload including platform 33,070 lb.
Performance: max speed 124 mph, service ceiling 9,850 ft, range 155 miles with 26,455 lb platform payload.

Mil Mi-14 (V-14) (NATO 'Haze')

About 80 Mi-14s have been delivered to date, enabling the Soviet Naval Air Force to retire the last piston-engined Mi-4s from its shore-based anti-submarine units. Export has also begun, with delivery of a few to Bulgaria in 1979. Dimensions, power plant, and dynamic components are assumed to be generally similar to those of the Mi-8, from which the Mi-14 was derived. A major innovation was the introduction of a boat hull of the kind used on the Sikorsky Sea King series. Together with a sponson on each side at the rear, this should give the helicopter a degree of amphibious capability. Other features evident in photographs include a large undernose radome, a towed magnetic anomaly detection (MAD) bird stowed against the rear of the fuselage pod, and fully retractable landing gear.

Mil Mi-10 (NATO 'Harke')

Mil Mi-14 (NATO 'Haze')

Mil Mi-24 (NATO 'Hind')

As expected, the 'Hind-D' gunship version of the Mi-24 has become the scourge of the Mujahadin in Afghanistan during the past year, searching them out in their villages and mountain retreats, and proving almost invulnerable to the small arms used against it. Substitution of steel and titanium for aluminium in critical components has clearly paid off, as have the glassfibre-skin rotor blades which replaced the original blade-pocket design. The early-1970s design task of delivering a squad of eight assault troops into a battlefield, and attacking any tanks encountered on the way, has given way to pure attack roles, with dramatically increased armament on the gunships. Today, the Mi-24 is regarded as not only an anti-tank weapon, but capable itself of functioning as a high-speed, nap-of-the-earth 'tank', and of destroying enemy helicopters in air-to-air combat. During exercises, Mi-24s have operated usually as escorts to troop-carrying Mi-8s, with responsibility for suppressing anti-aircraft defences en route. A report in *Red Star* has claimed that they are "superior to other anti-tank weapons in terms of field vision, manoeuvrability and firepower; and capable of hitting armoured enemy targets while remaining out of reach of anti-aircraft weapons. The correlation between tank and helicopter losses is 12:1 or even 19:1 in the helicopter's favour." Variants of the Mi-24 that can be identified by NATO reporting names are as follows:

Hind-A. Armed assault transport, with large enclosed flight deck for crew of four. Power plant and transmission based on those of Mi-8. Fully-retractable landing gear. Auxiliary wings of this version have considerable anhedral. One 12.7 mm machine-gun in nose; four hardpoints under stub-wings for 32-round packs of 57 mm rockets, or bombs; four 'Swatter' homing anti-tank missiles on wingtip launchers. Anti-torque rotor, originally on starboard side of offset tail pylon, repositioned to port side on later and converted aircraft. Initial production Mi-24s were of this type.

Hind-B. Similar to 'Hind-A' except that auxiliary wings have neither anhedral nor dihedral, and carry only the two inboard weapon stations on each side. This version is believed to have preceded 'Hind-A' and was not built in quantity.

Hind-C. Generally similar to late-model 'Hind-A' but without nose gun and undernose blister fairing, and no missile rails at wingtips.

Hind-D. Basically similar to late-model 'Hind-A', with tail rotor on port side, but with front fuselage completely redesigned for primary gunship role. Tandem stations for weapon operator (in nose) and pilot have individual canopies, with rear seat raised to give pilot an unobstructed forward view. Probe fitted forward of top starboard corner of bulletproof windscreen at extreme nose may be part of low-airspeed sensing device, to indicate optimum conditions for minimum dispersion of 57 mm rockets. Under nose is a four-barrel Gatling-type machine-gun in a turret with a wide range of movement in azimuth and elevation, providing air-to-air as well as air-to-surface capability. Undernose pack for sensors including possibly radar and low-light-level TV. (Reports that forward-looking infra-red might be fitted were premature, as such equipment is not expected to be ready for service in the USSR for several years.) Wing armament retained. Many small antennae and blisters. Nosewheels semi-exposed when retracted.

Hind-E. As 'Hind-D', for Soviet armed forces, but with four laser-homing 'Spiral' anti-tank missiles instead of 'Swatters', and structural hardening.

(The version listed in our 1980 Gallery as 'Hind-F' does not exist, as wire-guided missiles like 'Sagger' are not compatible with this high-performance helicopter.)

The helicopter known to the Soviet authorities as A-10, in which various FAI-approved records have been set since 1975, is now known to be an Mi-24, with the 'Hind-A/C' type of front fuselage. Engines fitted for the first seven record flights were 1,500 shp TV2-117A turboshafts, as used in the Mi-8. The A-10 in which Gourguen Karapetyan achieved a helicopter absolute speed record of 228.9 mph over a 15/25 km course in September 1978 is listed as having two TV3-117 engines, each rated at 2,200 shp.

Deliveries of all models of the Mi-24 are thought to exceed 1,000, with production continuing at the rate of more than 15 per month. Full regiments of these aircraft are known to have been based at Parchim and Stendal, northwest and west of Berlin, near the border with the German Federal Republic, since the Spring of 1974. Other operators include the air forces of Afghanistan, Algeria, Bulgaria, Czechoslovakia, East Germany, Hungary, Iraq, Libya, Poland, and South Yemen. *(Data for 'Hind-A' follow.)*

Power Plant: two Isotov turboshaft engines, related to the TV2-117A; each 1,500 shp.
Dimensions: rotor diameter 55 ft 9 in, length of fuselage 55 ft 9 in, height 14 ft 0 in.
Weight: gross 22,000 lb.
Accommodation: crew of four; eight combat-equipped troops.
Armament: one machine-gun in nose; mountings for four anti-tank missiles (NATO 'Swatter') and four other stores, including rocket pods (each thirty-two 57 mm rockets), under stub-wings.

Mil Mi-24 (NATO 'Hind-D') gunships of the Czechoslovakian Air Force

New Mil heavy-lift helicopter (NATO 'Halo')

Nothing has yet been released officially, in the Soviet Union or the West, concerning the helicopter produced by the Mil bureau to replace the now-abandoned Mi-12 (V-12), which lifted loads of up to 88,636 lb during record attempts. It is believed to have a single main rotor/tail rotor configuration, with clamshell rear loading doors. Representatives of the Mil bureau have discussed their current involvement in heavy-lift helicopters with an eight-blade main rotor and a total installed power of around 25,000 shp.

New Mil Naval helicopter

The US *Military Posture* statement for FY 1979 contained the remark: "Another new [Soviet] naval helicopter is projected in the mid-1980s for ASW and reconnaissance roles." No details were given.

Strategic Missiles

SS-4 (NATO 'Sandal')

First deployed in 1959, this is the medium-range ballistic missile (MRBM) that precipitated the Cuba crisis three years later. Its development, via the earlier SS-3 ('Shyster'), drew heavily on wartime German V-2 technology. About 350 are thought to remain operational, mostly near the western borders of the Soviet Union but some east of the Urals, targeted on China. Replacement with SS-20s is being maintained at the rate of one every five days. The age of the weapon system is indicated by the fact that about 12 tractors with special trailers, and 20 men, are needed to transport, erect, and fire the SS-4.

Power Plant: one four-chamber RD-214 liquid-propellant (nitric acid/kerosene) sustainer; 163,142 lb thrust in vacuo.
Guidance: inertial.
Warhead: alternative nuclear (1 megaton) or high-explosive.
Dimensions: length 77 ft 0 in, diameter 5 ft 7 in.
Launch weight: 60,000 lb.
Performance: max speed Mach 6.7, max range 1,200 miles.

SS-5 (NATO 'Skean')

About 60 of these intermediate-range missiles supplement SS-4s and SS-20s in the 600-strong Soviet IRBM/MRBM force. All are thought to be in the western USSR, some in silos. The SS-5 represented a further development of the SS-3/SS-4 concept, with control by vanes acting on the motor exhaust rather than by external fins.

Power Plant: single-stage liquid-propellant engine with four chambers.
Guidance: inertial.
Warhead: nuclear (1 megaton).
Dimensions: length 80 ft 0 in, diameter 8 ft 6 in.
Performance: max range 2,500 miles.

SS-11 (NATO 'Sego')

In the Fall of last year, about 580 of these 'light' ICBMs remained in their silos. Replacement of a proportion of the original force with new SS-17s appeared to have been completed; others continue to make way for SS-19s. No photograph of an SS-11 has ever been identified. It is believed to be about 3 ft shorter than the SS-13, with no space between its liquid-propellant stages. Two versions remain operational:

SS-11 Mod 2. Differs from now-retired Mod 1 in being fitted with penetration aids. Single re-entry vehicle, of slightly higher yield than that of the comparable US Minuteman, but considerably less accurate.

SS-11 Mod 3. First operational Soviet missile with MRVs (three 300 kiloton). Tests began in 1969, and greater targeting flexibility and accuracy led to rapid deployment; more than 60 emplaced. Range about 6,200 miles.

SS-13 (NATO 'Savage')

In the Minuteman category, only 60 SS-13s are deployed.

Power Plant: three-stage solid-propellant.
Guidance: inertial, offering CEP of 2 km (1¼ miles).
Warhead: nuclear (1 megaton).
Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).
Performance: range 6,200 miles.

SS-X-16

Production, testing, and deployment of the SS-X-16 ICBM would have been prohibited under SALT II. It remains to be seen whether non-ratification of the Treaty will lead to revival of the development programme, which created many problems for the USA in the past. For some time in the early stages, covered facilities at a Soviet test range impeded US ability to associate the SS-X-16 with a specific launcher. Relationship with the SS-20 meant that, by building and storing large numbers of SS-X-16 third stages, the Soviet Union would possess the means to convert all its SS-20 mobile IRBMs into ICBMs at any time, thereby increasing greatly the intercontinental force. Only solid-propellant missile among the new generation of Soviet ICBMs, the SS-X-16 is about the same size as the SS-13, which it was expected to replace, with greater range and payload capacity. It is fitted with a post-boost vehicle (PBV, known in the US as a bus-type dispensing system), but was tested with only a single re-entry vehicle. The Department of Defense believes that, like the SS-20, the SS-X-16 could be deployed in land-mobile form. Its range is at least 5,000 miles.

SS-17 (Soviet designation RS-16)

Known in the Soviet Union as the RS-16, this two-stage "light" liquid-propellant ICBM (which the US designates SS-17) is designed for cold launch. This means that it is "popped" out of its silo by a gas generator before the main booster motors are fired. As a result the silo is not heavily damaged and could be reloaded, although this would be a slow process. Since 1975, a total of 150 SS-11 silos have been modified to accept SS-17 missiles, of which deployment is believed to be complete. Two versions are operational, as follows:

SS-17 Mod 1. With four 900 kiloton MIRVs, shaped for high-speed atmospheric re-entry to ensure greater accuracy.

SS-17 Mod 2. With single large (5 megaton) re-entry vehicle, for capability against hard targets.

DoD believes that some of the silos modified for these and other modern Soviet ICBMs have been hardened to resist very high over-pressure.

Dimensions: length 75 ft 0 in, max diameter 8 ft 6 in.
Performance: range 6,200 miles with CEP of around 500 m (0.3 mile).

SS-18 (Soviet designation RS-20)

Replacement of the SS-9 (NATO 'Scarp') with 308 of these cold-launched "heavy" two-stage liquid-propellant missiles has been completed. Each has a greater throw-weight capability than any other Soviet or US ICBM, coupled with greater accuracy and flexibility than the SS-9 at the cost of a slightly reduced maximum range. Four versions have been identified:

SS-18 Mod 1. Some operational, each with single 18–25 megaton warhead, for use against deep underground shelters.

SS-18 Mod 2. Major current operational version, with eight to ten relatively large (2 megaton) MIRVs dispensed by a post-boost vehicle (PBV) similar to that employed on the US Minuteman III and Poseidon missiles.

SS-18 Mod 3. Longer-range version, with single re-entry vehicle lighter and more accurate than that of Mod 1, which it may ultimately replace. Crew training launches began in February 1976, CEP better than 590 ft achieved in trials.

SS-18 Mod 4. Press reports have suggested that this new version has been tested with 14 payloads. Four of these must have been decoys or other penetration aids, as no more than ten warheads have been tested on an SS-18, according to the Soviet authorities who agreed under SALT II not to exceed this number if the treaty were ratified.

Dimensions: length 118 ft 0 in, max diameter 10 ft 0 in.
Performance: range Mod 1 and 3, 6,500 miles, Mod 2 5,750 miles.

SS-19 (Soviet designation RS-18)

Like the SS-17, the SS-19 is rated as a "light" ICBM, and is replacing older SS-11s. It is a hot-launched two-stage liquid-propellant missile, with a range of 6,300–6,900 miles. Being longer than the SS-11 and SS-17, it requires more extensive modification to existing silos in which it is emplaced; yet at least 300 are already operational. This lends weight to DoD's belief that the SS-19's combination of accuracy and yield makes it the most capable of the current generation of Soviet ICBMs, although it carries fewer re-entry vehicles than the SS-18 Mod 2. Testing began in 1974, leading to rapid deployment of the **SS-19 Mod 1,** with a MIRVed payload of six re-entry vehicles (each 550 kilotons yield). A **Mod 2** version, with a single large (5 megaton) re-entry vehicle, has been tested. Under the terms of SALT II, all SS-17, SS-18, and SS-19 silos would have counted as MIRVed missile launchers, since these ICBMs have been tested in a MIRV mode.

SS-20

This mobile solid-propellant IRBM, which consists of the first two stages of the SS-X-16 ICBM, represents the

SS-4 (NATO 'Sandal')

SS-5 (NATO 'Skean') (Tass)

SS-13 (NATO 'Savage')

AS-3 (NATO 'Kangaroo')

AS-4 (NATO 'Kitchen') missile on Tu-22M/Tu-26

Two AS-6 (NATO 'Kingfish') missiles on Tu-16 (JASDF)

most formidable Soviet threat to NATO nations in Western Europe. It would not, however, have been subject to any restrictions under SALT II, as its range is less than 5,500 km (3,417 miles). About 160 had been deployed by the Fall of 1980, each with a MIRVed payload of three re-entry vehicles (yield of each 150 kilotons). CEP is reported to be about 2,500 ft when the SS-20 is fired from its tracked carrier/launcher at a pre-surveyed site, and the vehicle offers a multiple reload capability. Eventual force total is expected to be 300/400 plus reloads. SS-20s could reach the Aleutian Islands and western Alaska from present and likely deployment areas in the eastern USSR, but could not reach the contiguous 48 States.

New ICBMs

Now that America has not ratified the SALT II agreement, it remains to be seen whether or not the Soviet Union will step up the development of new missiles. The FY 1979 DoD Report stated: "The Soviets have a fifth generation of ICBMs in development, estimated to consist of four missiles. Flight testing of one or two of these missiles could begin at any time, with the others following by the early 1980s." SALT II would have limited each party to flight testing and deploying a single new type of ICBM in the "light" category (*i.e.*, not more than the launch weight of the SS-19). The Soviet Union would have had to choose, for example, between: (a) replacing the MIRVed SS-17 (4 warheads) and SS-19 (6 warheads) with a 10-warhead light ICBM, or (b) replacing the SS-11 with a single-warhead light ICBM that differed substantially from the SS-11. It could not have done both.

AS-3 (NATO 'Kangaroo')

When comparing the range of Soviet air-to-surface and submarine-launched cruise missiles with their US counterparts, it is important to remember that the Soviet requirement for long range is minimal. Fifty-five important US cities with some 74,000,000 inhabitants are within 530 miles (850 km) of the 100 fathoms depth curve in the Atlantic and Pacific Oceans. Only six of the major cities in the Soviet Union, with some 2,200,000 people, are located within a similar distance of the 100 fathoms depth curve. There is, however, no doubt about Soviet capability to develop a strategic cruise missile if it were required. Largest current Soviet air-to-surface missile is the AS-3, which resembles a sweptwing jet fighter in size and configuration, and was displayed for the first time under its Tu-95 carrier aircraft on Aviation Day 1961. It is known still to be operational with alternative nuclear (1 megaton) or high-explosive (5,070 lb) warhead on about 75 Tu-95 'Bear-B' and 'C' bombers.

Guidance: initial beam-riding; subsequent pre-programmed flight under autopilot control.
Dimensions: span 30 ft 0 in, length 48 ft 11 in.
Weight: 24,250 lb.
Performance: max speed Mach 1.8, range 400 miles.

AS-4 (NATO 'Kitchen')

Developed as a stand-off weapon for the Tu-95 and Tu-22 strategic bombers, and now carried also by the variable-geometry 'Backfire', the AS-4 was first seen on a single Tu-22 ('Blinder-B') in 1961. Most of the 22 Tu-22s which participated in the 1967 Aviation Day display at Domodedovo carried an AS-4, semi-submerged in the fuselage, and production by 1976 was stated by the UK Defence Minister to be around 1,000. The missile, which has been seen in more than one form, has an aeroplane configuration, with stubby delta wings and cruciform tail surfaces. Propulsion is believed to be by liquid-propellant rocket motor. Alternative nuclear (1 kiloton) or high-explosive warheads can be assumed.
Guidance: inertial, with infra-red terminal homing.
Dimensions: span 9 ft 10 in, length 37 ft 0 in.
Weight: 13,225 lb.
Performance: max speed above Mach 2, range 185 miles at low altitude.

AS-6 (NATO 'Kingfish')

First sighting of this air-to-surface missile was by the pilot of a Japan Air Self-Defence Force F-86F, in late December 1977. When scrambled to investigate a Tu-16 ('Badger') flying 50 miles to the north of the Noto Peninsula, he was able to photograph the aircraft which was carrying a 'Kingfish' under its port wing. The missile has a cylindrical body with ogival nose; two short-span, long-chord wings; and a cruciform tail unit with folding ventral fin. Propulsion is said to be by liquid-propellant rocket motor, with inertial midcourse guidance, and active radar terminal homing, giving an exceptional degree of accuracy. Primary carrier was expected to be the variable-geometry 'Backfire'; there has been no evidence of this, but a Tu-16 was photographed near Japan in early 1980 with a 'Kingfish' under each wing.
Dimensions: span 8 ft 2½ in, length 34 ft 6 in.
Performance: max speed Mach 3, range 135 miles at low altitude.

Airborne and Tactical Defence Missiles

Artist's impression of AS-2 (NATO 'Kipper') leaving Tu-16 launch aircraft

AS-5 (NATO 'Kelt') missiles on Tu-16 of Egyptian Air Force

AS-2 (NATO 'Kipper')

First seen 20 years ago, at the 1961 Aviation Day display, this aeroplane-configuration missile, with underslung turbojet engine, was described by the commentator at Tushino as an anti-shipping weapon. Radar is carried in the nose of the Tu-16 carrier aircraft, and guidance is believed to comprise initial beam-riding, subsequent pre-programmed flight under autopilot control, and infra-red terminal homing. A 2,200 lb high-explosive warhead is fitted.
Dimensions: span 16 ft 0 in, length 31 ft 0 in.
Weight: 9,260 lb.
Performance: max speed Mach 1.2, range 130 miles.

AS-5 (NATO 'Kelt')

According to the UK Minister of Defence, well over 1,000 AS-5s had been delivered by the Spring of 1976. About 25 were used operationally during the October 1973 war between Israel and the Arab states, when Tu-16s from Egypt launched them against Israeli targets. Only five eluded the air and ground defences, to hit a supply depot and two radar sites in Sinai.

The transonic AS-5 has a similar aeroplane-type configuration to that of the turbojet-powered AS-1 ('Kennel') which it superseded. The switch to liquid rocket propulsion eliminated the need for a ram air intake, and permitted the use of a larger radar inside the hemispherical nose fairing. Guidance is said to be by autopilot on a pre-programmed flight path, with radar terminal homing which can be switched from active to passive as required. A 2,200 lb high-explosive warhead is standard.
Dimensions: span 15 ft 0 in, length 31 ft 0 in.
Performance: max speed Mach 1.2 at 30,000 ft, Mach 0.9 at low level, max range 200 miles.

AS-7 (NATO 'Kerry')

Nothing is known about this tactical air-to-surface guided missile, except that it is carried by the Su-24, and other Soviet close support aircraft. It is said to have a radio command guidance system, to weigh about 2,650 lb, and to have a range of 6.2 miles.

AS-X-9

A reported anti-radiation missile, with a range of 50–56 miles, to arm the Su-24 ('Fencer').

AT-2 (NATO 'Swatter')

This standard Soviet anti-tank weapon formed the original missile armament of the Mi-24 ('Hind-A and D') helicopter gunship, and is carried by the 'Hip-E' version of the Mi-8. 'Swatter' is steered in flight via elevons on the trailing-edges of its rear-mounted cruciform wings, and embodies terminal homing.
Dimensions: span 2 ft 2 in, length 2 ft 11½ in.
Weight: 55 lb.
Performance: cruising speed 335 mph, range 985–7,220 ft.

AT-3 (NATO 'Sagger')

In conformity with the Soviet practice of not supplying advanced equipment on its export aircraft, the wire-guided 'Sagger' replaces 'Swatter' on the 'Hip-F' version of the Mi-8, as well as arming the Polish-built Mi-2.
Dimensions: span 1 ft 6 in, length 2 ft 10¼ in.
Weight: 25 lb.
Performance: speed 270 mph, range 1,650–9,850 ft.

AT-6 (NATO 'Spiral')

Unlike previous Soviet helicopter-launched anti-tank missiles, 'Spiral' does not appear to have a surface-

launched application. Few details are yet available, except that it is tube-launched, and homes on targets illuminated by a laser designator. It equips the 'Hind-E' version of the Mi-24, and is said to have a range of 4.3 to 6.2 miles.

AA-1 (NATO 'Alkali')

First Soviet air-to-air missile to become operational, 'Alkali' equipped the older generation of PVO-Strany interceptors, such as the Su-9 and all-weather versions of the MiG-19, and can be expected to disappear from service soon. It has a solid-propellant rocket motor and I/J-band semi-active radar guidance system.
Dimensions: length 6 ft 2 in, body diameter 7 in, wing span 1 ft 10¾ in.
Weight: 200 lb.
Performance: range 3.7 to 5 miles.

AA-2 (NATO 'Atoll')

Designated K-13A in the USSR, 'Atoll' is the Soviet counterpart to the American Sidewinder 1A (AIM-9B), to which it is almost identical in size, configuration, and infra-red guidance. It has long been standard armament on home and export versions of the MiG-21, and is carried by export models of the MiG-23 and Sukhoi Su-22. A solid-propellant rocket motor is fitted.
Dimensions: length 9 ft 2 in, body diameter 4.72 in, fin span 1 ft 8¾ in.
Weight: 154 lb.
Performance: cruising speed Mach 2.5, range 3 to 4 miles.

AA-2-2 (NATO 'Advanced Atoll')

The multi-role versions of the MiG-21 (NATO 'Fishbed-J, K, L, and N') can carry a radar homing version of 'Atoll' on the outer stores pylon under each wing, in addition to a standard infra-red homing 'Atoll' on the inboard pylon. The radar version is known as 'Advanced Atoll'.

AA-3 (NATO 'Anab')

The UK Ministry of Defence estimates production of this solid-propellant air-to-air missile as being "in the thousands". It was first observed as armament of the Yak-28P all-weather fighters which took part in the 1961 Aviation Day display at Tushino. Subsequently, it became standard on the Sukhoi Su-11 and Su-15 interceptors. Each aircraft normally carries one 'Anab' with an I/J-band semi-active radar seeker and one with an infra-red homing head.
Dimensions: length 13 ft 5 in (IR) or 13 ft 1 in (SAR), body diameter 11 in, wing span 4 ft 3 in.
Performance: range over 10 miles.

AA-5 (NATO 'Ash')

Several thousand of these large air-to-air missiles have been produced as armament for the Tu-28P interceptors of PVO-Strany. The version with infra-red homing head is normally carried on the inboard pylon under each wing of the Tu-28P, with an I/J-band semi-active radar homing version on each outboard pylon.
Dimensions: length 18 ft 0 in (IR) or 17 ft 0 in (SAR).
Performance: range 18.5 miles.

AA-6 (NATO 'Acrid')

This is the air-to-air missile that was identified during 1975 as one of the weapons carried by the 'Foxbat-A' interceptor version of the MiG-25. Its configuration is similar to that of 'Anab' but it is considerably larger. Photographs suggest that the version of 'Acrid' with an infra-red homing head is normally carried on each inboard underwing pylon, with a radar-homing version on each outer pylon. The wingtip fairings on the fighter, different in shape from those of 'Foxbat-B', are thought to house continuous-wave target illuminating equipment for the radar-homing missiles.
Dimension: length 20 ft 0 in (radar version).
Performance: range at least 23 miles.

AA-7 (NATO 'Apex')

This long-range air-to-air missile is one of the two types known to be carried as standard armament by interceptor versions of the MiG-23, and is reported to be an alternative weapon for the MiG-25. No details are available, except that 'Apex' has a solid-propellant rocket motor. It is likely to exist in both infra-red and radar-homing versions. The following data should be regarded as provisional:
Dimensions: length 14 ft 1¼ in, body diameter 9.4 in, wing span 3 ft 5½ in.
Weight: 705 lb.
Performance: range 17 miles.

AA-8 (NATO 'Aphid')

Second type of missile carried by the MiG-23, 'Aphid' is a close-range solid-propellant weapon with infra-red homing guidance.
Dimensions: length 6 ft 6¾ in, body diameter 5.12 in.
Weight: 121 lb.
Performance: range 3.5–5 miles.

AA-X-9

The missile known in the West as AA-X-9 is reported to have achieved successes against simulated cruise missiles, after 'look-down/snap-down' launch from a modified MiG-25 interceptor. No details are yet available.

AT-3 (NATO 'Sagger'), as carried by Mil Mi-8 and Mi-2

AA-2 (NATO 'Atoll') on MiG-21 (Denis Hughes)

Surface-to-Air Missiles

ABM-1 (NATO 'Galosh')

In a so far unexplained surprise move, the Soviet Union deactivated half of the 64 operational launchers of its 'Galosh' ABM (anti-ballistic missile) defence system, which were deployed around Moscow, during 1980. Under the terms of the SALT I agreement, the USA and USSR were each permitted a total of 100 ABMs on launchers for the defence of their national capital and 100 more for defence of an ICBM launch area. ABM deployment was further reduced to one site for each country at the Moscow Summit meeting of late June and early July 1974. The 64 'Galosh' sites were considered to be capable of protecting Moscow adequately against small attacks using unsophisticated missiles without penetration aids; but no attempt was made to add the other 36 launchers to the system, although Soviet ABM R&D has been continued at a high priority. It is possible, therefore, that the present launcher deactivation may be a prelude to updating of the system, of which few details have ever been released. Missiles purported to be 'Galosh' have been paraded through Moscow, inside containers with one open end, on frequent occasions, since 1964. No details of the missile could be discerned, except that the first stage has four combustion chambers. A single nuclear warhead is fitted. Missile range is said to be over 200 miles.

SA-1 (NATO 'Guild')

This missile was first displayed in a Moscow military parade on November 7, 1960. Although subsequently reported to be deployed as a standard anti-aircraft weapon, it took no further part in the regular Moscow parades until 1968, when it appeared on May Day. The SA-1 is not thought to have been supplied to any country outside the USSR, and its phase-out there has probably started.
Dimensions: length 39 ft 0 in, body diameter 2 ft 3½ in.
Performance: range 20 miles.

SA-2 (NATO 'Guideline')

This missile is a standard anti-aircraft weapon in about 20 countries. It was used extensively in combat in North Vietnam and the Middle East, and has been improved through several versions as a result of experience gained. One variant, first exhibited in Moscow in November 1967, has an enlarged, white-painted warhead without the usual small canard surfaces. It was claimed to be far more effective than earlier versions, and may have a nuclear warhead. About 3,500 SA-2 launchers are thought to remain operational in the Soviet Union, although the number declines annually. Data for the standard export version:
Power Plant: liquid-propellant sustainer, burning nitric acid and hydrocarbon propellants; solid-propellant booster.
Guidance: automatic radio command, with radar tracking of target. Some late versions employ terminal homing.
Warhead: normally high-explosive, weight 288 lb.
Dimensions: length 34 ft 9 in, body diameter 1 ft 8 in,

ABM-1 (NATO 'Galosh') missile in transporter

SA-2 (NATO 'Guideline') (Tass)

SA-3 (NATO 'Goa') (Tass)

SA-4 (NATO 'Ganef') (Tass)

SA-5 (NATO 'Gammon') (Tass)

SA-6 (NATO 'Gainful') (Tass)

SA-8 (NATO 'Gecko') (Novosti)

SA-9 (NATO 'Gaskin') (Tass)

wing span 5 ft 7 in.
Launching weight: 5,000 lb.
Performance: max speed Mach 3.5, slant range 25 miles, effective ceiling 60,000 ft.

SA-3 (NATO 'Goa')

Soviet counterpart of the American HAWK, the SA-3 is deployed in increasing numbers by the Soviet Union, its allies, and friends as a mobile low-altitude system to complement the medium/high-altitude SA-2. As the **SA-N-1,** it is also the most widely-used surface-to-air missile in the Soviet Navy, fired from a roll-stabilised twin-round launcher.
Power Plant: two-stage solid-propellant.
Guidance: radio command, with radar terminal homing.
Warhead: high-explosive, weight 132 lb.
Dimensions: length 22 ft 0 in, body diameter 1 ft 6 in, wing span 4 ft 0 in.
Launching weight: 1,323 lb.
Performance: max speed Mach 2, slant range 21.75 miles, effective ceiling 49,200 ft.

SA-4 (NATO 'Ganef')

Ramjet propulsion gives this anti-aircraft missile a very long range. Its usefulness is further enhanced by its mobility, as it is carried on a twin-round tracked launch vehicle which is itself air-transportable in the An-22 military freighter. The SA-4 was first displayed publicly in 1964, and is a standard Soviet weapon for defence of combat areas. It is reported to be operational also with the East German and Czech forces.
Power Plant: ramjet sustainer; four wrap-around solid-propellant boosters.
Guidance: radio command.
Warhead: high-explosive.
Dimensions: length 28 ft 10½ in, body diameter 2 ft 8 in, wing span 7 ft 6 in.
Launching weight: 3,975 lb.
Performance: slant range 43 miles, effective ceiling 80,000 ft.

SA-5 (NATO 'Gammon')

There is reckoned to be a total of 12,000 missiles on 10,000 surface-to-air missile launchers operational at 1,200 fixed sites throughout the Soviet Union. However, deactivation of SA-2 sites has been under way for some time, at a slightly faster rate than the commissioning of new SA-3 and SA-5 sites. The SA-5 is described by the US Department of Defense as providing long-range, high-altitude defence for Soviet targets, and about 1,200 are deployed. Suggestions of a possible ABM capability were denied during the SALT II talks.
Power Plant: two-stage solid-propellant, possibly with terminal propulsion for warhead.
Guidance: radar homing.
Dimensions: length 54 ft 0 in, body diameter 2 ft 10 in, wing span 12 ft 0 in.
Performance: max speed above Mach 3.5, slant range 155 miles, effective ceiling 95,000 ft.

SA-6 (NATO 'Gainful')

This mobile low-altitude weapon system took an unexpectedly heavy toll of Israeli aircraft during the October 1973 war. Its unique integral all-solid rocket/ramjet propulsion system was a decade in advance of comparable Western technology, and the US-supplied ECM equipment which enabled Israeli aircraft to survive attack by other missiles proved ineffective against the SA-6. First shown on its three-round tracked transporter/launcher, in Moscow, in November 1967, the missile has since been produced in very large quantities. Export models have been acquired by Bulgaria, Czechoslovakia, Egypt, Hungary, Iraq, Libya, Mozambique, Poland, Syria, and Vietnam.
Power Plant: solid-propellant booster. After burnout, its empty casing becomes a ramjet combustion chamber for ram air mixed with the exhaust from a solid-propellant gas generator.
Guidance: radio command; semi-active radar terminal homing.
Warhead: high-explosive, weight 176 lb.
Dimensions: length 20 ft 4 in, body diameter 1 ft 1.2 in.
Launching weight: 1,212 lb.
Performance: max speed Mach 2.8, range 22 miles, effective ceiling 59,000 ft.

SA-7 (NATO 'Grail')

This Soviet counterpart of the US shoulder-fired, heat-seeking Redeye first proved its effectiveness in Vietnam against slower, low-flying aircraft and helicopters. It repeated the process during the 1973 Arab-Israeli war, despite countermeasures, including the use of decoy flares, and deflecting upward the exhaust of helicopters. In addition to being a standard weapon throughout the Warsaw Pact forces, it has been supplied to about 20 other nations, and to various guerrilla/terrorist movements. Designed for use by infantry, the SA-7 is also carried by vehicles, including ships, in batteries of four, six, and eight, for both offensive and defensive employment, with radar aiming. An uprated version has a more powerful motor, giving higher speed and an effective ceiling of about 14,000 ft. *(Data for basic version.)*
Power Plant: solid-propellant booster/sustainer.
Guidance: infra-red homing with filter to screen out decoy flares.
Warhead: high-explosive, weight 5.5 lb.
Dimensions: length 4 ft 5 in, body diameter 2.75 in.
Performance: max speed Mach 1.5, slant range 2.25 miles, effective ceiling 5,000 ft.

SA-8 (NATO 'Gecko')

First displayed publicly during the parade through Moscow's Red Square on November 7, 1975, this short-range, all-weather surface-to-air weapon system has much in common with the European Roland. Missile configuration is conventional, with canard foreplane control surfaces and fixed tail-fins. Fire control equipment and quadruple launcher are mounted on a rotating turret, carried by a new three-axle six-wheel amphibious vehicle. Surveillance radar, with an estimated range of 18 miles, folds down behind the launcher, enabling the weapon system to be airlifted by Soviet transport aircraft. The tracking radar is of the pulsed type, with an estimated range of 12–15 miles. The SA-8 is believed to use the same missile as the well-established but enigmatic naval SA-N-4 system. Each vehicle carries a total of about 8 missiles.
Power Plant: probably dual-thrust solid-propellant.
Guidance: command guidance by proportional navigation. Possible infra-red terminal homing.
Warhead: high-explosive, about 90–110 lb weight.
Dimensions: length 10 ft 6 in, body diameter 8.25 in.
Performance: range up to 5 miles.

SA-9 (NATO 'Gaskin')

This weapon system comprises a BRDM-2 amphibious vehicle, carrying a box launcher for two pairs of missiles described as uprated SA-7 'Grails'. The launcher rests flat on the rear of the vehicle when not required to be ready for launch. Range of the missile is approximately 5 miles.

SA-10

If all reports emanating from the US press are to be believed, this is the weapon that sealed the fate of the B-1, in the bomber's original form, and threatens the viability of cruise missiles. A single-stage rocket motor is said to accelerate the SA-10 at 100*g* to a cruising speed of Mach 6. A range of up to 31 miles in the 1,000–16,500 ft height band is suggested, with active radar terminal homing. Reported dimensions are a length of 23 ft and body diameter of 17.7 in. Predicted IOC varies from 'about now' to the mid-1980s. Full deployment is likely to be protracted, as the DoD considers that an effective anti-ALCM defence system would need between 500 and 1,000 sites, each with ten launchers, and would cost $50 billion if manufactured in the US.

SA-11

This new weapon system comprises a three or four-rail launch vehicle for Mach 3 radar-guided missiles with a reported ability to deal with targets at altitudes between 80 and 49,000 ft, at ranges up to 12 miles. SA-11s are said to be deployed already alongside SA-6s, and may represent an improved version of the latter.

New Infantry SAM

To overcome the limitations of shoulder-fired, infra-red homing missiles like the SA-7, the Soviet Union has been developing improved infantry SAMs for some years. One type, of which deployment may have started, is believed to use a laser beam for beamriding guidance.

SA-N-1 (NATO 'Goa')

Ship-launched variant of SA-3.

SA-N-2 (NATO 'Guideline')

Ship-launched version of SA-2. On cruiser *Dzerzhinski* only.

SA-N-3 (NATO 'Goblet')

The twin-round surface-to-air missile launchers fitted to many of the latest Soviet naval vessels, including the carrier/cruisers *Kiev* and *Minsk*, helicopter cruisers *Moskva* and *Leningrad*, and *Kara* and *Kresta II* cruisers, carry a new and more effective missile than the SA-N-1 ('Goa'). Known as the SA-N-3, this could be similar to the SA-6.

SA-N-4

Little is known about this naval close-range surface-to-air weapon system, although SA-N-4 installations are operational on eight classes of ships of the Soviet Navy. The retractable twin-round 'pop-up' launcher is housed inside a bin on deck. The missiles are similar to those used in the land-based mobile SA-8 system.

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Will the lure of controlling Middle East oil be too much for the Russian bear to resist?

Soviet Coercive Diplomacy: Saudi Arabia

BY DR. PETER VANNEMAN AND MARTIN JAMES

FEW events would more substantially shift the world balance of power than the emergence of a pro-Soviet regime in Saudi Arabia, site of the world's largest oil reserves and a bulwark of American Middle East policy. The USSR is quite aware of this. Three times since January 1978, the Soviet Union has rapidly deployed its combat forces and those of its proxies on the borders of Saudi Arabia. By seizing Afghanistan the USSR has cut in half the distance from its border to Saudi Arabia. The Soviet Union is well on its way to developing the world's first rapid deployment force and is in the process of acquiring facilities to service it throughout the world. Such facilities are available in the Middle East and Africa. In fact, the Soviets have tested the facilities in combat in Ethiopia, a neighbor of Saudi Arabia.

Percent of Western Oil From the Persian Gulf

France	87%
Japan	75%
United Kingdom	57%
West Germany	34%
United States	14%

Early in 1978, the USSR executed the largest rapid deployment in its history, using proxy troops and elite elements of the Soviet military machine to smash an invasion of Ethiopia, providing an extraordinary demonstration to the world of its ability and willingness to protect a vulnerable ally far from the Soviet border. It was an especially poignant drama for America's Middle Eastern allies, since the United States displayed neither the ability nor will to deploy such a force, even in an area so vital to its national security.

In August 1979, the USSR carried out an equally ominous two-week airlift exercise—ferrying Soviet combat troops to its client states, Ethiopia and South Yemen, southwestern neighbors of Saudi Arabia. Two Soviet elite armies could be airlifted to Saudi Arabia in thirty-six to seventy-two hours. The importance of this exercise to the Soviets was underlined by the visit of Soviet Prime Minister Alexi Kosygin to Ethiopia and South Yemen immediately following the maneuvers.

In early 1980, the Saudis observed a third series of events which they considered even more threatening than the invasion of Afghanistan. In January, dozens of Soviet generals and hundreds of Cuban troops flew into South Yemen and Ethiopia. In February, 1,000 Cubans passed through the Suez Canal, according to Egyptian sources. There were already 400 Russian technicians in South Yemen, a skeleton staff of one paratroop brigade, and a communications and intelligence installation. In addition, some analysts estimate as many as 7,000 East Germans and 8,000 Cubans were already there—in short, facilities to receive a rapid deployment force.

The outlines of Soviet initiatives designed to facilitate the emergence of a more pro-Soviet regime in Saudi Arabia now appear to be crystallizing with extraordinary rapidity. The evidence indicates the USSR is preparing to employ the whole range of its foreign policy instruments to achieve this objective. The most important new instrument is a proxy rapid deployment force—the first in history. Initially in Angola, then in Ethiopia and South Yemen, and now in Afghanistan, the USSR has demonstrated the will and capability (whenever the costs, risks, and benefits justify it) to rapidly deploy proxy military forces to enhance its political and economic objectives. The mere availability of such an instrument creates all sorts of opportunities to enhance Soviet influence.

In the short run, a dramatic shift in Saudi policy seems unlikely, but even minor changes could have profound repercussions for the West. Saudi oil policy consistently keeps the lid on already soaring OPEC oil prices. The willingness of its rulers to continue producing more than they would like to produce might diminish under Soviet pressure. The Saudis might eventually begin selling large quantities of oil to the USSR at favorable prices. The evidence indicates the USSR has already approached the Saudis seeking cheap oil to ameliorate the embryonic Soviet energy crisis. In addition, the Saudis help finance many Western efforts to contain the USSR, such as the airlift of troops to repel the invasion of Zaire in 1978. The Saudis gave $30 million to help neighboring Oman resist a Soviet-supported uprising. Similar ventures might be curtailed by Russian pressures.

It appears that long-range Soviet strategy is to encircle Saudi Arabia with clients protected by its rapid deployment force, and then to gradually subvert Saudi stability. In the interim, the USSR seeks to mitigate Saudi support for Western policy initiatives in the Middle East and elsewhere, as well as to gain access to Saudi oil reserves. The demonstrated effectiveness of Soviet mili-

Soviet-Saudi Oil*

	Reserves	Production: 1979
Saudi	166	9.5
Soviet	67	11.9

* All figures are in billion barrels of oil. The USSR is the world's largest producer, with Saudi Arabia second, but the Saudis have the largest reserves

tary power considerably enhances the prospects for these Soviet diplomatic and economic initiatives.

The Soviet Target: Saudi Oil

The need for oil is a vital Soviet national security interest. The USSR employs its vast network of shipping companies, banks, and multinational corporations—all owned and controlled by the Soviet state—to sell oil for foreign exchange to buy needed Western technology to explore for more oil.

The USSR is the world's largest oil producer. It sold 129,000,000 barrels to Italy, Austria, and Germany in 1979. Its control over the bloc of satellite states on its western borders depends to some extent on its ability to supply them with oil.

Of course, its own sagging economy is also heavily dependent upon oil. Although there is some controversy, most analysts agree that the USSR is facing its own energy crisis. Thus access to foreign oil is much more urgent than it was when the Soviets were merely buying to resell and earn foreign exchange. The Soviet Union is more likely to take greater risks when it needs the oil for its own use. This helps explain its aggressive, multifaceted approach to Saudi Arabia.

While the development of a rapid deployment force could be attributed to preparations for severing Western and Japanese access, it is more likely that the short-term motivation for the rapid deployment force is to provide political leverage that will facilitate access for its own use.

Of course, such capabilities can alternately serve as an instrument for denying or restricting access. Sabotage would deny the Soviets access also, and thus has limited utility. But the political leverage provided by a demonstrably effective rapid deployment force could affect oil pricing policy, persuading sellers like Saudi Arabia to lower the price to the USSR and raise it to Western buyers. Informally the Soviets have already sought to trade aid in constructing oil refineries for cheap Saudi oil.

The shortage of oil in the USSR has forced it to instruct its Eastern satellites to purchase more oil from OPEC, thus diminishing Soviet control over an area it considers vital to its national security. Easy, cheap access to OPEC oil might enable the Soviets to resell to Eastern Europe at favorable prices for the satellites, while the USSR earns a profit and retains its chief economic leverage over its Eastern empire. Some reports indicate that the USSR offered extra oil allotments to East Germany for its help in Yemen, Ethiopia, and Angola.

Some Swedish analysts argue that the USSR possesses twice the oil reserves generally estimated, but even they agree that it will be costly to extract and unavailable for as long as ten years. In the interim the USSR must go to OPEC.

Thus, while there is considerable debate over the extent of Soviet oil reserves, there is no doubt that oil is becoming increasingly costly to extract from the frozen Siberian tundra. So, for the short run, it appears that the USSR is seeking greater access to cheaper Middle East oil. Its covert approaches to Saudi Arabia and Iran reflect this. Simultaneously, the USSR is aspiring to energy self-sufficiency, and its wildcat oil explorers are spreading across Siberia in search of new reserves, such as the enormous deposits at Samotlar.

In the interim decade of the '80s—the time required to develop new reserves if they are found—Soviet strategy is to pressure oil-producing nations of the Third World for supplies at favorable prices. The Soviet/proxy military exercises in Africa reflect this strategy. That is one reason why Soviet military involvement in Africa has been in oil-producing states such as Angola, Nigeria, and Libya. The Ethiopian intervention was directly across the Red Sea from the main Saudi industrial complex.

Access to minerals, and particularly oil, is a stronger motivation for the Soviets than is mere denial. Access is essential to Soviet national security, and that nation is likely to pursue an unusually forward policy to facilitate access to these minerals. The USSR is now clearly determined to play a major role in dividing the world's mineral resources, which is a major new development in international politics.

The Military Threat to Saudi Arabia: The Ethiopian Model

The magnitude of the potential Soviet military threat to Saudi Arabia was demonstrated dramatically in the spring of 1978 by the Soviet military intervention in Ethiopia immediately across the Red Sea from the main Saudi industrial complex. In that exercise, as much as fifteen percent to eighteen percent of Soviet military transport was involved. In the first six months of 1978, in an airlift of approximately 5,000 flights (roughly twenty-four per day), the USSR ferried 10,000 Cubans from Angola to Ethiopia, 15,000 Cubans from Cuba to Ethiopia, and 10,000 Cubans from Cuba to Angola. In addition, thousands of technical experts from the USSR, East Germany, Czechoslovakia, and Hungary were ferried to Ethiopia. Also, approximately 3,000 Yemenis arrived from Aden to participate in the conflict. The entire force was directed by five Soviet generals, including the Deputy Chief of Staff himself, who came from the sensitive Chinese front. As Saudi Foreign Minister Prince Saud Ibn Faisal put it, "That thousands of foreign troops are present in Ethiopia . . . is without a doubt a threat to the security and stability of the entire continent of Africa and the Middle East."

Soviet Strike Against Saudi Arabia

While it has been quite clear since the Angolan crisis of 1975 that the USSR could rapidly deploy substantial forces of its proxy states anywhere in the world, there was some mystery about the Soviet willingness to de-

Evolution of a Soviet/Proxy Rapid Deployment Force[1]

Area Deployed	Date	Nationality	Number and Nature of Troops	Routes	Transport
Angola	9/75 to 2/76	Cuban East German USSR	23,000 Combat 1,000 Security/ Technical 400 Technical	Caribbean to Algeria and Congo	An-22 aircraft Il-62 aircraft Ships[2]
Ethiopia	12/77 to 4/78	Cuban East German Hungarian Yemeni USSR	17,000 Combat Technical/Security* Technical/Combat* 3,000 Combat 1,500 Technical/Combat	1. Angola to Ethiopia via Mozambique (Cubans) 2. Cuba to Ethiopia 3. USSR to Libya to Ethiopia 4. Southern Russia via Iraq and So. Yemen to Ethiopia	20% of Soviet military transport aircraft: An-12, An-22, Il-18; 5,000 flights for six months. Ships[3]
South Yemen	8/10/79	USSR	100,000 potential, *i.e.* 2 full divisions; skeletons of 5 combat[4]	Bulgaria and South Russia to Aden	An-22 aircraft
Afghanistan	12/79 to 2/80	USSR	5,000 Airborne 80,000 Motorized rifle, helicopter gunships,[5] chemical,[6] commando[7]	Central Russia to Kabul	An-22 aircraft

NOTES:

1. The USSR is hard at work improving its capability to support an extended conflict far from its periphery. It has introduced the first genuine under-way fleet-replenishment ship, the *Boris Chilkin*, displacing 20,000 tons, and is developing the Il-76 Candid, a turbofan heavy-freight-carrying transport. The backbone of the rapid deployment transport is the long-range An-22, but the mushrooming Soviet Merchant Marine provides powerful backup after the initial attack. In Angola, Soviet shipping was protected by a small fleet off Conakry; in Ethiopia by a fleet of ships based at Aden.
2. In Angola, the Soviets combined shelling of the shore with amphibious assault, classic gunboat diplomacy *(see also Note No. 3)*.
3. Soviet gunships shelled rebel-held Ethiopian ports in the Red Sea across from Saudi Arabia.
4. 8,000 Cubans and 7,000 East Germans are reportedly operating and guarding a sophisticated communication and supply facility capable of receiving and supporting a rapid deployment force.
5. The Mi-24 has proved highly effective; some consider it the best combat helicopter in the world.
6. Unconfirmed reports indicate Soviet experimentation with chemical and biological warfare tactics.
7. In June and July 1980, the USSR introduced elite commando units, explicitly adapted for rapid deployment.

* Exact number unknown.

ploy its own combat troops. In September and October 1979, the USSR dispelled any doubts by deploying its own forces directly to the Arabian peninsula. In a giant airlift, elements of seven Soviet combat divisions were carried from southern Russia and Bulgaria aboard huge Antonov An-22 transports to air bases in South Yemen on the tip of the Arabian peninsula and to Ethiopia immediately across the Red Sea from Saudi Arabia's industrial and shipping complex at Jiddah.

Peter Vanneman was a visiting fellow at the George F. Kennan Institute for Advanced Russian Studies at the Smithsonian Institute in 1977, and is currently Chairman of the Department of Political Science at the University of Arkansas. He is the author of a recent book, The Supreme Soviet: Politics and the Legislative Process in the Soviet Political System *(Duke University Press). Martin James is a Ph.D. candidate at the Catholic University of America, and Legislative Assistant to Congressman Bill Alexander, the Chief Deputy Majority Whip. Dr. Vanneman and Mr. James have co-authored articles on Soviet involvement in the Third World that have appeared in* Strategic Review *and* Policy Review, *among others. They have also testified before the US Senate Foreign Relations Committee.*

The evidence suggests that the USSR is now capable of airlifting two fully equipped elite armies to Saudi Arabia in thirty to seventy-two hours. In two weeks of maneuvers in August 1979, the USSR airlifted airborne mechanized brigades, light armor units, and supporting arms and logistical units into South Yemen. Major combat elements of two divisions and skeletal staffs of five other divisions took part in the maneuvers.

There were already 1,500 Russian technicians in South Yemen, a skeleton staff of one paratroop brigade, and a communications and intelligence installation. In addition, some estimate as many as 7,000 East Germans and 8,000 Cubans are there. One thousand Cubans arrived in February 1980, according to Egyptian sources. In short, South Yemen is a staging area for a rapid deployment force, proxy and/or Soviet.

South Yemen is the USSR's most faithful ally in the Arab world. It was one of two Islamic states to endorse the Soviet invasion of Afghanistan. The Russians have poured large quantities of tanks, heavy artillery, and advanced aircraft and armored trucks into that country. The East Germans are setting up communications and internal security systems. Cubans have helped train Yemeni soldiers, 3,000 Cubans passed through Yemen

en route to Ethiopia. In addition, 3,000 Yemeni troops were reportedly fighting alongside Marxist Ethiopia in the Ogaden War.

Obviously, an unprovoked attack on Saudi Arabia by a Soviet rapid deployment force would ignite a general war; however, the mere existence of such a demonstrably effective instrument alters the political climate in the area. It enhances the prospects for Soviet diplomatic initiatives, as well as subversion.

It also helps protect those Soviet clients who threaten Saudi Arabia with counterrevolution. The one lesson of Afghanistan is that the USSR will not hesitate to use massive force to retain a pliant client. The emergence of reliable Soviet clients on the Saudi periphery, like South Yemen and Ethiopia, as well as the development of Soviet naval facilities and the deployment of a major Soviet fleet in the area, at the very least, threatens to diminish Saudi influence in the area.

While the world's attention remains riveted on Afghanistan, north of Saudi Arabia, the USSR is preparing to threaten Western oil sources from the south. The West is on the verge of being outflanked at the least and trapped between the tongs of two pincers at worst.

USSR Inc.: The Specter of Soviet Cartels

The general Soviet resource strategy is to obtain access to scarce minerals in developing countries now, in order to preserve its own resources for the future. It employs military power to facilitate this access, when the costs, risks, and benefits warrant it. The minerals so acquired are often resold at a profit to earn foreign exchange to buy technology to explore for other minerals (especially oil) in the USSR. Soviet banks, insurance companies, and shipping lines serve as vehicles for these foreign exchange earning operations. These Soviet multinational corporations also turn a profit themselves, thus earning additional foreign exchange. In several cases the USSR has acted like an unscrupulous metal broker with inside information.

Just before the invasion of Zaire in 1978 by Cuban-trained dissidents led by Portuguese Communist mercenaries, the USSR purchased huge quantities of cobalt. They later resold it when scarcity resulting from sabotaged mines multiplied the price. During the Rhodesian insurgency, the USSR violated UN sanctions against buying Rhodesian chrome, and resold the chrome at inflated prices resulting from the sanctions.

In 1975, the USSR dumped 200 tons of gold on the world market, and in 1976 its Zurich bank sold $100 million for Swiss francs in thirty minutes. In 1980, it has reportedly considered the sale of as much as 500 tons of gold which, at the price of $800 an ounce, would total about $30 billion.

Use of vast quantities of Soviet gold to purchase oil could seriously destabilize the international economic system since it would be highly inflationary.

Fortunately, the USSR has so far demonstrated some restraint in selling gold. Its objectives for now seem to be limited to earning foreign exchange rather than creating an "extraterritorial sphere of economic influence" *(Grossraumwirtschaft)*. Its policy is more analogous to the mercantilism of the British Empire than the *Grossraumwirtschaft* of nineteenth-century Germany.

Of course, its present policy could gradually evolve into an attempt to corner world markets and dominate the economies of specific areas by the implicit threat of its proxy rapid deployment force. In effect, the USSR possessed temporary cartels over chrome and cobalt in Rhodesia and Zaire, since it was a major producer. The potential impact of Soviet-South African cooperation in the gold market and Soviet-Saudi cooperation in oil conjures up the awesome specter of a major Soviet effort to manipulate the entire international economic system.

Soviet Strategy for the '80s

The USSR now possesses rough parity with the US in strategic nuclear weapons. In critical areas of the world where conventional conflict is possible it may possess superior forces. There is no question that the USSR has a superior rapid deployment capability that, when combined with its proxy-client forces, is the most effective military weapon in the world for extending economic and political power, especially in developing areas. This may reflect a whole new Soviet approach to the Third World, based primarily on military power. In Angola and Ethiopia the USSR has battle-tested what amounts to a Soviet/proxy rapid deployment force ultimately capable of projection anywhere in the world. The development of new wide-body planes, amphibious assault vessels, and the expansion of its multipurpose merchant marine will facilitate this.

For years, elements of the Soviet leadership have advocated a policy of employing military power at the lowest force levels, where the cost/risk is minimized. Their strategy is to create a standoff at the higher force levels, so that the USSR can deploy its proxies, as well as elite elements of its own forces, at the lowest levels where the Soviet forces are clearly superior.

As an instrument of diplomatic blackmail, strategic superiority apparently retains its effectiveness for such a capability and can be a powerful factor in the deterrence and paralysis of responses to military and diplomatic initiatives in areas marginal to the interest of the global powers. The Soviet leaders may opt for a first-strike capability *not* for the purpose of initiating and winning a nuclear war with the United States, but to escalate the risk of American reaction to Soviet initiatives. Strategic superiority could thus provide a kind of protective umbrella for Soviet diplomatic maneuvers, and would enable Moscow to maximize its options in foreign policy.

In a major policy statement in 1974, Soviet Defense Minister Marshal Andrei A. Grechko departed from the traditional Kremlin line that the military's primary function was defensive when he warned, " . . . at the present stage, the historic function of the Soviet Armed Forces is not restricted merely to their function of defending. . . . In its foreign policy activities the Soviet state actively . . . supports the national liberation struggle . . . in whatever distant region of our planet it may appear."

It has taken some time for this view to crystallize into official government policy but, in 1977, the faculty of the Soviet military academy published a book arguing that Soviet officers should study "various aspects of military action in local wars." ■

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Biological warfare opens Pandora's box in . . .

Sverdlovsk Anthrax Outbreak

BY LT. COL. DAVID T. TWINING, USA

IN EARLY April 1979, a serious outbreak of anthrax took place in Sverdlovsk, a city of 1,200,000 people some 875 miles east of Moscow. According to Western press reports, anthrax bacteria escaped into the air from a nearby military facility and led ultimately to the deaths of as many as 1,000 Soviet citizens.

Information on the incident is incomplete and drawn largely from secondary sources of unknown reliability.

A special section of the Sverdlovsk hospital, manned by military doctors and nurses, was established to treat the casualties.

Thus, it is difficult to be certain what actually happened, particularly since Sverdlovsk is a closed city. Any analysis, such as this one, which is based on open sources alone, must be considered highly speculative.

The task of objective analysis, however, requires that we think the unthinkable when disturbing events such as the Sverdlovsk incident occur. It also requires that we consider the possible implications this development may hold for future warfare—should uncertain destinies lead to this end.

This examination of the Sverdlovsk incident comes at a time when the unprecedented lethality of the modern battlefield is no longer subject to question.

In viewing the range of Soviet military programs and the momentum of the USSR research and development effort, one should not become preoccupied with new weaponry of an exotic nature at the expense of existing or supposedly antiquated systems. Biological warfare may not be a new or particularly exciting field of weaponry, but the Sverdlovsk incident has reminded us that we can ill afford to ignore the possibility of its future use.

The analysis that follows summarizes reports on the Sverdlovsk outbreak that have appeared in open sources.

Between April 3 and 6, 1979, an accidental explosion at a secret biological warfare facility in Sverdlovsk reportedly released a cloud of lethal anthrax spores. According to Mark Popovsky, a Russian science journalist who emigrated from the USSR in 1979, the explosion took place at Military Compound 19, located in the southern outskirts of the city. Biological weapons research and production were reportedly being carried out at the installation, under the command of a General Colonel Efim Ivanovich Smirnov, chief of a USSR Ministry of Defense biological warfare research directorate. The poisonous cloud drifted away from the center of the large industrial city and headed toward the village of Kashino, eighteen miles to the southeast.

High Death Rate at Kashino

The first casualties were said to be military scientists and technicians then on duty at the facility. A number of people at a nearby ceramics factory, "possibly the entire work shift," became ill, and the residents of Kashino were particularly hard hit. Several hundred people died during the first days following the explosion, and deaths continued at the rate of thirty to forty per day through the middle of May.

The illness was called "Siberian ulcer," the Russian expression for anthrax. Several Soviet citizens developed rashes and boils typical of this virulent bacterial disease, which can also result in lung congestion, paralysis of the larynx and lungs, and, ultimately, death. Others collapsed at home and died before they could be hospitalized. An emergency immunization program was initiated, and the city's main newspaper, *Vecherny Sverdlovsk*, published three articles on Siberian ulcer at the time of the accident. The editor of the newspaper later denied that the articles were motivated by a disease epidemic.

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Soviet military authorities reacted quickly to distribute large amounts of antibiotics, and medical personnel arrived from Moscow to assist with the developing situation. A special section of the Sverdlovsk hospital, manned by military doctors and nurses, was established to treat the casualties. The bodies of those who died were not returned to their families, but were said to have been cremated following a brief funeral ceremony.

The incidence of anthrax in humans is rare, even in underdeveloped countries.

A mass inoculation program was initiated, which included the several hundred thousand residents of Chkalov borough, the southern region of Sverdlovsk where the explosion occurred. They received vaccinations of an unknown serum both in mid- and late-April. This program was apparently unsuccessful, as many inoculated people also died. As the epidemic subsided, city residents were mobilized to clean the streets, topsoil was removed in the vicinity of the path of the cloud, and the streets of Kashino were paved with fresh asphalt.

Reportedly, hundreds or perhaps as many as 1,000 Soviet citizens perished from the epidemic. Had the winds blown toward Sverdlovsk instead of away from it, the death toll could have been much greater. Autopsies of the dead revealed that the victims' lungs had filled with fluid, a possible indication of the inhalation of pulmonary anthrax spores.

The incidence of anthrax in humans is rare, even in underdeveloped countries. A disease of cattle and sheep, it was a common cause of animal deaths until 1881, when Louis Pasteur developed a vaccine to protect livestock. Humans can contract anthrax in three forms: gastric, cutaneous, and inhalation or pulmonary. Gastric anthrax is caused by eating contaminated meat, while cutaneous anthrax is caused by skin contact; both gastric and cutaneous anthrax rarely cause death. Inhalation anthrax is almost always fatal, but is found in nature only under especially unusual circumstances and not in proportions sufficient to cause epidemics. Inhalation anthrax is the form likely to be used in biological warfare involving an attack with aerosols. The Subcommittee on Oversight of the House Permanent Select Committee on Intelligence reported that US government information indicates that the Sverdlovsk victims had the symptoms of inhalation anthrax.

US Biological Warfare Policy

November 25, 1969	US use of BW renounced by President Nixon	Unilaterally renounced *use* of biological weapons and ordered destruction of all US stockpiles.
January 22, 1975	US ratified Geneva Protocol of 1925	Prohibits *use* of biological and first use of chemical weapons.
January 22, 1975	US ratified 1972 Biological Warfare Convention	Prohibits *development, production,* and *stockpiling* of biological and toxin weapons and requires destruction of existing stock.

Rumors Reach Moscow

Following the incident, rumors of the anthrax epidemic began to reach Moscow. The first published report of a biological warfare-related accident appeared in the British news magazine *Now* on October 26, 1979. This account said that several thousand people had died from an unknown virus or agent at a bacteriological weapons facility in the Soviet city of Novosibirsk. On February 13, 1980, Hamburg's *Bild Zeitung* reported the deaths in Sverdlovsk of more than 1,000 people who had become infected through inhalation. According to this account, the incident was caused by an explosion on Military Installation 19 at a factory for bacteriological bombs.

Russian science journalist Mark Popovsky reported he became aware of the Sverdlovsk incident in January from underground communications with friends in Sverdlovsk. Although his information was not revealed until after the incident became public in March, Popovsky said his sources reported that a shift in the wind away from the city saved it from a much greater disaster and that a similar accident took place in 1958, with fatalities again limited by a shift in wind. The writer, who now lives in the US, said, "They ask me until what time will God continue to save the city by changing the wind."

In response to rising concern that a biological warfare-related accident had taken place, US Ambassador Thomas J. Watson, Jr., met with Georgy M. Kornienko, a First Deputy Soviet Foreign Minister, on March 17, 1980, to inquire about the Sverdlovsk incident. The following day, State Department spokesman David Passage provided the first official indication to the public when he revealed that an epidemic had occurred that "may have resulted from inadvertent exposure of large numbers of people to some sort of lethal biological agent." Passage noted that the US had expressed its concern to Soviet authorities about these reports. In response to questions that the incident may have violated the 1972 Biological Warfare Convention, Passage said, "We are not necessarily charging a violation."

The public airing of US concern over the Sverdlovsk incident brought a quick response from the Soviet government. On the day following the State Department's disquieting revelation, a Soviet Foreign Ministry spokesman strongly denounced the US claim, terming it the "latest fabrication of American propaganda" for which there was no basis and "obviously slander." Also on March 19, the Soviet publication *Krasnaya Zvezda* charged the British and the US with cooperating in the

development of chemical and bacteriological weapons. On March 20, the Soviet news service Tass accused NATO of the illegal production and storage of bacteriological weapons.

Tass went on to accuse the CIA of planting the Sverdlovsk story in *Bild Zeitung* in an effort to justify "new billions" for bacteriological weapons.

The official Soviet response to Ambassador Watson's inquiry of March 17 was given to US diplomats at the Soviet Foreign Ministry three days later. The Soviet reply stated that an outbreak of gastric anthrax had occurred in Sverdlovsk and said its source was contaminated meat.

The Soviet reply stated that an outbreak of gastric anthrax had occurred in Sverdlovsk and said its source was contaminated meat.

The anthrax issue was also raised by the US at the March 3–21 Geneva conference. It was ordained by the 1972 Biological Weapons Convention after the first five years to review the convention's operation. Soviet Ambassador V. I. Issraelyan said that the anthrax outbreak was a natural occurrence in which people had contracted the disease from the consumption of meat of sick animals. Ambassador Issraelyan gave no indication of the number of fatalities from the incident, and he termed the controversy an "epidemic of anti-Soviet hysteria."

Soviet media continued to deny that anything but a natural outbreak of an animal disease passed to humans had taken place. Radio Moscow, in an English-language broadcast, reported that some Soviet citizens had become infected by cutaneous and intestinal (or gastric) anthrax due to the handling and consumption of animal meat processed in violation of Soviet veterinary standards. The broadcast stated that no quarantine had been imposed on Sverdlovsk or environs, but said the population had been warned to adhere to hygienic norms and to avoid buying unauthorized meat.

As the incident received further attention, Western correspondents in Moscow continued to hear stories that a gaseous leak from a secret military research installation, known as a "post office box" to conceal its identity, was responsible for the outbreak. According to sources in Moscow, Sverdlovsk residents heard within hours of the incident that the secret installation had been working on bacteriological weapons and that a fatal disease was spreading from it. Some citizens fled the city, while those who remained were subjected to an extensive vaccination program. At the time of the outbreak, the official Soviet version of the incident, which attributed the illness to contaminated meat, had reportedly not been heard in the city.

Biological Warfare

BIOLOGICAL WARFARE: The use of biological agents against man, animals, plants, and materiel, as well as defensive efforts to prevent/negate their use. Such agents include . . .

VIRUSES:	Yellow Fever Dengue Fever Venezuelan Equine Encephalomyelitis Influenza
RIKETTSIAE:	Epidemic Typhus Rocky Mountain Spotted Fever
BACTERIA:	Plague Anthrax Cholera
FUNGI:	Coccidioidomycosis Potato Blight
TOXINS:	Botulinum (causes botulism) Enterotoxin (intestinal poison)

Trial of Scapegoats?

In September 1980, a Soviet legal journal provided the first indication that two Soviet citizens had been tried in connection with the incident. According to this account, a man had reportedly thrown a diseased cow carcass into an abandoned mine shaft. The cow was later determined to have died from anthrax, and the illegal disposal allegedly contaminated ground water supplies. A second person was said to have given some lamb to relatives and sold the rest following the deaths of two anthrax-infected sheep. Both were convicted and received minor penalties.

An epidemic of gastric anthrax is a possibility that deserves consideration. According to a 1961 Soviet epidemiology test, six outbreaks of the gastric form involving sixty-four people have taken place in the Soviet Union between 1923 and 1940. The largest number of deaths in a single outbreak was twenty-seven. These cases had as their cause the consumption of diseased meat (often sausage) that had not been thoroughly cooked. This Soviet case data indicated that outbreaks of gastric anthrax have occurred approximately every three years and, reportedly, Sverdlovsk has been an area long associated with the disease.

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If meat alone had been the cause of the Sverdlovsk incident, and open-source reports about the number of deaths are correct, hundreds of people would have to have contracted the disease by eating improperly cooked meat, since thorough cooking destroys the anthrax bacilli. Additionally, it is highly unlikely that the contamination of a water source by one diseased animal would cause a concentration of organisms sufficient to induce widespread anthrax illness.

A May 1980 article on the Sverdlovsk outbreak by two Soviet medical officials asserted that the actual form of anthrax can become complicated once the bacteria enters the bloodstream. This development, the doctors suggest, would promote the accumulation of fluid in the lungs and other symptoms of pulmonary anthrax. According to a standard pathology reference work, all forms of anthrax could conceivably lead to fluid in the lungs as a secondary result of the organism's toxic effect.

From a clinical point of view, however, a properly conducted autopsy would clearly indicate the cause of the illness by the location and age progression of lesions found on or within a victim's body.

Until more details about the incident are obtained, particularly on the number of victims and their location as well as on signs and symptoms, definitive conclusions are premature. In particular, it is the judgment of the Subcommittee on Oversight that the official explanation failed to meet the requirements of Article 5 of the 1972 Biological Warfare Convention for consultation and cooperation. A party suspecting a violation must first consult and cooperate with the suspected party, either directly or through procedures of the United Nations, to obtain clarifying information. Should this step prove inadequate, the only other recourse is for the party suspecting a violation to bring the matter before the UN Security Council. Both the US House of Representatives and the US Senate have passed resolutions requesting a more-satisfactory explanation of the incident.

Congressional concern over Soviet compliance with the 1972 Biological Warfare Convention has also led to some dissatisfaction with the Convention itself. A major provision of the Convention charges signatories to:

> Never in any circumstances to develop, produce, stockpile, acquire or retain microbial or other biological agents, or toxins whatever their origin or method of production, of types and in *quantities that have no justification for prophylactic, protective, or other peaceful purposes*, as well as weapons, equipment and means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict. (Emphasis added.)

Some believe this provision contains a significant loophole, because it specifies no quantity or limit on how much of a substance beyond "quantities that have no justification for prophylactic, protective, or other peaceful purposes" would constitute a violation. As noted by the report of the Subcommittee on Oversight, "A very large supply would be convincing evidence of a violation, but a relatively small quantity released into the air could cause an epidemic." This loophole, in essence, means that biological warfare research is not banned by the Convention.

In its report on the Sverdlovsk incident, the Subcommittee on Oversight concluded that an epidemic of pulmonary anthrax occurred, "almost certainly" the result of a man-made bacterial strain and that the outbreak took place at a military facility long suspected as the site of biological warfare-related activities. Whether a violation of the 1972 Convention took place cannot be ascertained, in the Subcommittee's view, since the Convention failed to specify the quantity of a substance constituting a violation.

In its pulmonary form, anthrax has a mortality rate approaching 100 percent.

Possible Soviet Motivations

Broadly speaking, there are two possible motivations that could exist for pursuing biological warfare activities. The first could be purely defensive—the desire to conduct research involving biological agents to develop measures and equipment to protect a country's population and armed forces from their possible use. The second motivation is far more serious: to develop biological agents and the means of their delivery for offensive, war-fighting purposes. Both possibilities, defensive and offensive, deserve further examination.

It has been observed that biological research for prophylactic and protective purposes is continually under way in virtually all countries of the world, including neutral ones. This maintenance of scientific vigilance is necessary to ensure national survival should prohibited biological weapons be used against a country's population. It is also necessary because many microbial or other biological agents that could be used for hostile purposes also constitute threats in their natural state to human, animal, and plant health.

The second possible motivation for biological warfare-related activities is to employ its considerable capabilities for offensive, war-fighting purposes. The use of microorganisms for military purposes is not new, and an ideal biological agent should meet the following requirements: highly infectious, capable of being produced in large amounts, stable both in storage and after release, and suitable for dissemination by aerosol.

Bacillus anthracis possesses characteristics that have caused anthrax to be considered a potential biological warfare agent since the inception of research on biological weapons. In its pulmonary form, anthrax has a mortality rate approaching 100 percent. It is ideally suited for aerosol dispersal because it forms spores that provide a protective layer for the genetic material, enable it to withstand most methods of aerosolization, and which have a long life after dispersal. Anthrax spores can survive in soil for decades and can be stored for years. Its

incubation period in man ranges from less than a day for an extreme exposure to up to four days. Anthrax is usually considered the most hardy, the most easily produced, and the most easily disseminated disease-producing organism for use against humans.

In recent years, the attractiveness of biological agents as weapons has decreased in the view of Western observers. Studies of natural outbreaks of infectious diseases have revealed that their effectiveness depends upon so many uncontrollable factors that the final result of their use is often unpredictable. Biological agents are affected by such things as the living conditions and levels of protection of the human target and the state of the atmosphere, wind, and topography. Additionally, their persistence for varying periods of time can make decontamination a significant problem. It is for just such reasons that the US unilaterally renounced biological weapons in 1969.

Biological agents, however, continue to possess some unique advantages. Biological weapons can destroy only personnel while leaving materiel intact, penetrate closed spaces, and are cheaply and easily produced and disseminated. Biological warfare materials can be developed at ordinary laboratories, and deadly amounts of agents can be produced even in private residences for clandestine purposes. Because small quantities can be very lethal, such biological agents as anthrax spores can be dispersed by rifle-fired explosive shells or small powder disseminators that release inconspicuous aerosols.

Against Strategic Targets

Perhaps the most likely use of biological weapons is for strategic purposes against key command and communication centers, weapons storage sites, and missile silos, particularly where their persistence does not pose a problem. Because large-scale attacks against major cities and large geographic areas subject the agent to the unpredictable vagaries of weather and terrain, local attacks against strategic targets are likely to be much more effective. Such attacks could be executed covertly during peacetime, when deliberate contamination and the party responsible can be concealed, or during wartime, as a part of a larger attack plan. Lethal agents may be hidden in hair spray containers, fountain pens, and insecticide bombs activated by automatic timers that will permit the perpetrators to escape prior to agent release and incubation.

Strategic facilities of limited size could be prime targets for such covert attacks. Considering the possible utility of biological weapons applied selectively and covertly against strategic targets, it is possible that Military Compound 19 in Sverdlovsk was engaged in biological weapons research and production.

Soviet writings on military science and military doctrine would support the possibility that the exigencies of military preparedness for the next war demand that attention be given biological warfare. According to V. I. Lenin, "the most dangerous thing is to underestimate the enemy and to rest on the belief that we are stronger." What is termed "scientific prediction" of military affairs requires Soviet planners to anticipate the nature of future warfare, of potential weaponry, and the organization of enemy armed forces.

Ideological considerations might also lead Soviet military planners to invest in biological warfare programs. The Leninist revolutionary ethic must be influential: morality should be judged in terms of the extent to which a specific act or decision furthers the revolutionary cause of world communism. Furthermore, the Leninist view of the world is dialectical; that is, the greater Soviet strength becomes, the stronger peace becomes and the greater the chance of preventing war.

Earlier Soviet writings on future warfare predicted that it would be characterized by the use of weapons of mass destruction such as nuclear, chemical, and biological weapons. Since 1972, however, Soviet officials have stated that the USSR does not possess biological weapons, but Soviet media clearly ascribe this capability to NATO nations. It is possible that Soviet authorities, though in compliance with the letter of the biological warfare accords, have maintained limited amounts of biological warfare materials so as to not deny themselves the advantages of these weapons in specific strategic operations, particularly if they perceive a potential adversary may choose to do likewise.

Conclusion

This review of open-source reports on the Sverdlovsk incident has suggested two possible explanations for its occurrence. First, the USSR may maintain small quantities of biological warfare materials for preventive, protective, and other peaceful purposes in compliance with the 1972 Biological Warfare Convention. There is reason to believe that this is correct, since virtually all nations are believed to engage in biological research for defense programs and public health purposes.

The second possibility—that the Soviet Union is conducting biological warfare research and production for offensive, war-fighting purposes—simply cannot be proven. While a scenario may be envisioned in which small quantities of lethal biological agents are covertly deployed against strategic targets of great importance, either before or during a war by agents and *Spetsnaznacheniya* (or "Special Designation") units controlled by the KGB, there is no evidence that the Soviets are planning such uses of biological weapons.

The truth may also lie somewhere in between. The nature of biological weapons research is such that defensive efforts inevitably provide information and materials that can be used for weapons purposes. Quantities of biological agents are routinely tested in laboratories, and some of the procedures undertaken for biological warfare defensive purposes are identical with those required of offensive preparations. For this reason, a defensive program could be used to conceal a program undertaken for offensive purposes.

Although it is difficult to judge what actually happened at Sverdlovsk, the message to the West is that Soviet use of biological weapons in future warfare remains possible. Despite the moral imperatives that have led most people to reject biological weapons as too reprehensible for man to use against man, the incident at Sverdlovsk serves to remind us that we can never be sure. The reality of Sverdlovsk requires that we think the unthinkable about World War III—and be alert to ensure it never occurs. ■

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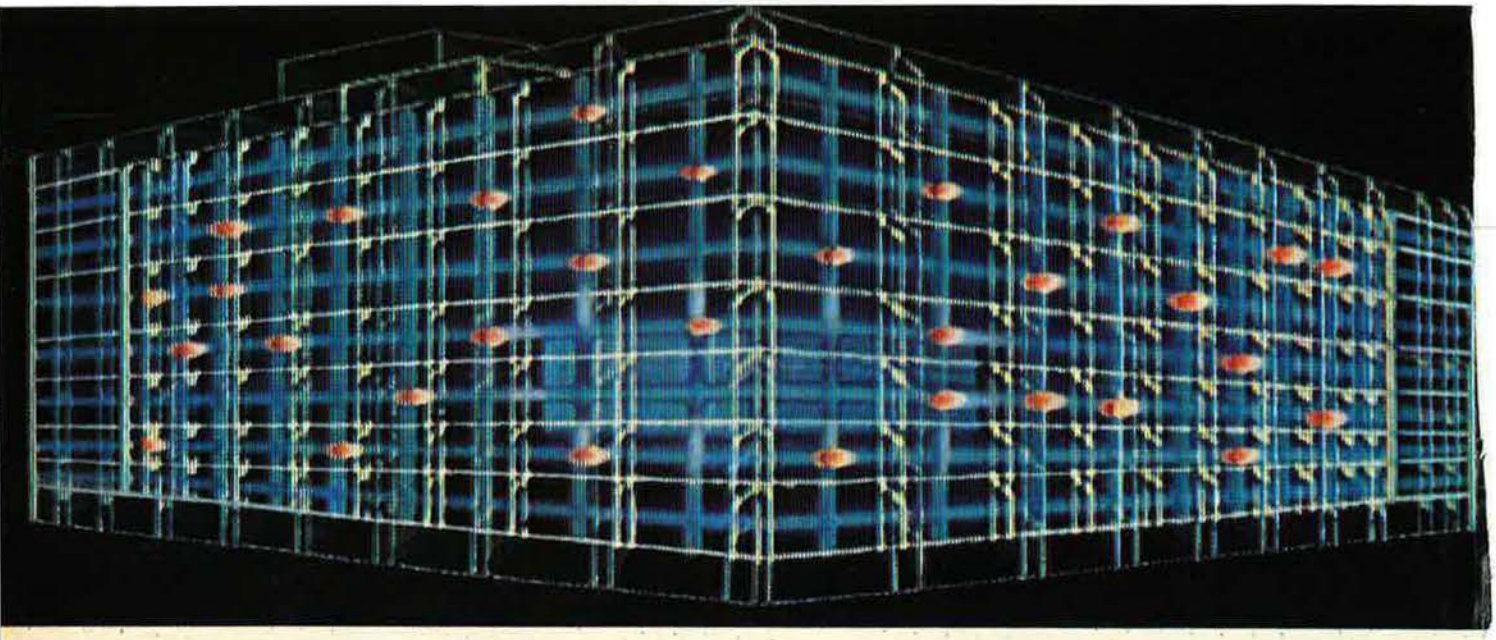

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The knowledge business

NATO's alert system, boundaries, membership, and commitment to the treaty in general will all be subject to review when the NATO ministers meet in May. Overshadowing specific issues, however, may be the new US Secretary of State . . .

Alexander Haig: Joining the Diplomatic Side of the Alliance

By Gen. T. R. Milton, USAF (Ret.)

ALONG about May, there will be a meeting of the NATO Council in ministerial session, which is to say one attended by foreign ministers and our Secretary of State. One way or another, it should be a landmark session as the former Supreme Allied Commander, Europe, joins the diplomatic side of the Alliance. It is a safe prediction that NATO's Secretary General, Joseph Luns, will be in fine form in welcoming his former colleague and nominal subordinate to NATO's senior club.

The impressive meeting room at NATO Headquarters on Brussels's outskirts will, as is generally the case, radiate good fellowship and camaraderie, at least until the business gets under way. Diplomacy, as someone once remarked, consists of doing disagreeable things in the nicest possible manner. Hence, there could be a little uneasiness here and there around the big horseshoe table over what the new American Secretary of State may be thinking, for General Haig will know better than anyone in the room the number and location of the skeletons in NATO's closet.

There is, for instance, the increasingly troublesome situation in Belgium. NATO moved to that country when General de Gaulle kicked the Alliance out of France. It was a tense time for the allies as de Gaulle withdrew from the military organization and nearly pulled out altogether. The Belgian offer of a home for NATO in Brussels came in time to allow for a dignified withdrawal from Paris well ahead of de Gaulle's deadline. A headquarters for the Supreme Allied Commander, Europe, was also provided, at Casteau, thus making Belgium the host country for NATO's most important functions. It was, therefore, a fair presumption that Belgium, however small, could be counted on as a NATO pillar. Now, there is room to doubt Belgium's commitment to European security, as inflation, the worsening Flemish-Walloon conflict, and a series of weak coalition governments leave their mark. The Belgian defense budget is shrinking, there is little money for training, and growing signs of Belgian indifference to NATO commitments.

Joseph Luns's own native land, the Netherlands, is dithering over whether to allow a share of NATO's cruise missiles to be based inside Dutch borders. Mr. Luns has been exasperated for some years with the behavior of Dutch governments toward allied defense matters, and he will doubtless lay into them again at the May meeting. On the basis of past performance, it will do little good.

Germany has been for years a NATO stalwart, second only in importance to the United States in terms of its contribution to the common defense. The Federal Republic is still in that position, but there are a few disquieting signs. We have seen, in this past year, a German retreat from the NATO agreed defense budget increase of three percent per year. Inflation has begun its insidious work on German military pay, and hence on the retention of noncoms and officers, and is causing overruns in procurement of new weapons, like the Leopard 2 tank and the multipurpose Tornado fighter. There are other signals, political ones, that are equally disturbing to the idea of a unified alliance braced against Soviet aggression. Alexander Haig, as a good and trusted friend of Helmut Schmidt, is our best bet to sort these signals out.

The Mediterranean is a mess, despite Greece's somewhat tentative return to NATO's military structure. General Haig, as SACEUR, devised a Solomon-like solution to the Turkish-Greek split. After years of haggling, the two sides finally accepted the proposal, thanks largely to the reasonableness of the Turkish generals now running things in Ankara. The new arrangement has brought Greece back to the fold, but the problems in and over the Aegean remain sticky ones. If George Papandreou should come to power in the Greek elections later this year, a nightmarish situation in the view of any supporter of Western solidarity, then affairs will surely become troublesome in that part of the world.

General Haig knows all this. He also knows, again better than anyone, the folly of a Western strategy predicated solely on a defense of Europe while the lifeline of that Europe is left unguarded. He may reflect on still other things, as he listens to the carefully worded speeches of his fellow politicians, such as the complexities of the NATO alert system, for instance, that stand in the way of any quick allied reaction to a Soviet move. Until the alert system—a system, incidentally, which few of Secretary Haig's opposite numbers thoroughly understand—has run its course, tortuous unanimous decision by unanimous decision, the Supreme Allied Commander has little in the way of a command. The time may not yet be right for an overhaul of NATO's ponderous alert machinery, but at least it might be the moment to start thinking about it. Our new Secretary of State could speak with unquestioned authority on that one.

As to NATO's boundaries, certainly the time has come to consider these self-imposed restrictions. It is a delusion to pretend the enemy in Europe is not the same enemy in South Yemen. Again, though, perhaps it is too soon to talk of an enlargement of NATO responsibilities when the Alliance is having so much trouble meeting the obligations it already has. Still, the fact is there for everyone to see. A NATO cut off from Mideast oil and African minerals cannot fight. A NATO dependent on Soviet acquiescence for its oil and minerals is not only an anomaly, it becomes an absurdity.

This first NATO appearance of Secretary of State Haig could be an illuminating occasion for European politicians who have grown accustomed to, and even jaded by, lectures from our recent Secretaries of State who, whatever their other qualifications, were not persuasive advocates of military strength. ■

AIRMAN'S BOOKSHELF

Soviet Military

The Illustrated Encyclopedia of the Strategy, Tactics, and Weapons of Russian Military Power, edited by Ray Bonds. St. Martin's Press, New York, N. Y., 1980. 249 pages with photographs and illustrations. $25.

Each of this book's sixteen chapters deals with a specific aspect of the Soviet Armed Forces, offering readers, at the very least, a satisfactory survey of the subject matter and a good reference source highlighting the major military equipment and capabilities of the Soviet Union. Of the eight contributors, Air Vice Marshal Stewart Menaul, RAF (Ret.), gets top billing as "Consultant." Bill Gunston, an assistant compiler of *Jane's All the World's Aircraft,* put together the more than 100 pages of illustrations and photographs of Soviet war-making equipment and machinery. There is a similarity to the *Jane's* format in sections of this book. Other contributors include P. H. Vigor, Professor John Erickson, and retired British Army Brig. Shelford Bidwell.

One point of view about the Soviet military that permeates the entire book is so strong that the authors explain in the beginning, "There may be some who feel that this book is an anti-Soviet diatribe, concentrating on the sensational and ignoring factors favorable to the Eastern bloc. However, it is repeated that the deeds of the Soviet Union speak louder than any words. . . . " The authors recall history that reminds readers of the Soviet Union's repeated efforts to dominate other countries, including its latest incursion into Afghanistan. Chapters I through III sketch the rise of Soviet communism, the origins and present structure of the military, and the Soviets' global military plans.

The value of *Russian Military Power* as a reference begins with its coverage of Soviet Air Force development from 1884 through the 1973 Yom Kippur War. A twenty-four-page gallery of Soviet aircraft follows. Some details, perhaps due to space limitations, are omitted. For instance, listed under the Antonov An-26 are also the references to the An-24V, -24RV, -24T, -26, -30, and -32. The An-72 is not mentioned.

The Soviet Navy chapter focuses mainly on development of the fleet—submarines, aircraft carriers, cruisers, destroyers, and frigates and corvettes. The author, retired Royal Navy Captain J. E. Moore, editor of *Jane's Fighting Ships,* also addresses Soviet amphibious forces, mine warfare, naval aviation, bases and shipbuilding, and Soviet efforts to use the Navy as an instrument of international influence. The thirty-page review of Soviet warships, like that of the aircraft, is comprehensive. Although it doesn't address every variety of ship put to sea by the Soviet Union, it fulfills the book's intention "to display the growing variety of classes."

Christopher N. Donnelly, Assistant Head of the Soviet Studies Centre, Royal Military Academy, Sandhurst, wrote the ground forces chapter. He introduces readers to the motor-rifle, tank, and airborne units; the artillery; special units (*i.e.,* engineering, signals, and chemical); and support forces (such as transportation and medical). He reviews all parts of the Soviet ground forces, including such aspects as the influence of Russia's geography and economics on its military doctrine, and Soviet principles of combat. The thirty-two pages of weapons that follow include armored vehicles, artillery and antitank weapons, air defense weapons, small arms and personal equipment, engineering and rear service equipment, and a section on nuclear, biological, and chemical warfare.

Soviet Strategic Rocket Forces, readers learn, are the senior service arm. The late Dr. James E. Dornan, Jr., traces the history of Soviet strategic power from its origin after World War II to US discontinuation of SALT II. Dr. Dornan, who was Associate Professor and Chairman, Department of Politics at Catholic University of America, deals with reconnaissance satellites and also with satellite interception before reader attention is turned to twenty-four pages of Soviet missiles.

Russian Military Power also has chapters on the defense of Soviet airspace, the Warsaw Pact forces, and uniforms of the Soviet Armed Forces. The book abounds with photographs, many four-color. It also includes informative maps, charts, organizational diagrams, and sketches.

—Reviewed by Maj. Thomas L. Sack, USAF, Contributing Editor.

Revitalizing Arms Manufacturing

The Defense Industry, by Jacques S. Gansler. MIT Press, Cambridge, Mass., 1980. 346 pages with index, notes, and bibliography. $19.95.

Despite Jacques Gansler's more than twenty years as an "insider" with the defense industry and Department of Defense, he scrupulously avoids the use of the "perpendicular pronoun" in this brilliant dissection of the US armament industry. He relies instead on massive research to document his arguments thoroughly. This important book should be read by those alarmed by spiraling weapons costs, overreliance by defense manufacturers on foreign military sales, and the weakness of many defense companies.

Dr. Gansler foresees increasing problems for this industry because of incoherent micromanagement by Congress and DoD. He demonstrates that "large numbers of small government actions are being taken and micropolicies are continually being made without consideration for their overall impact." His proposed cure starts with the government refraining from its current *ad hoc* pattern of actions and coordinating policies for the long term.

Dr. Gansler also believes that cost must become a major design and acquisition criterion if the US is to reverse both the exponential growth in system costs and the downward trend

in amounts of equipment procured. Performance is the overriding criterion today, and the result is ever-increasing expenditures purchasing ever-decreasing numbers of weapons. Dr. Gansler argues that making cost instead of performance the key criterion would bring the DoD's practices closer to the commercial way of doing business, and improve US military posture by increasing both the numbers of systems and amounts of weapons procured.

Dr. Gansler, furthermore, thinks DoD should cease encouraging foreign military sales. These were up from $1.5 billion of relatively old equipment to $14 billion of first-line systems during just the first half of the 1970s. He is concerned that the US is not only exporting its best weapons, but also its manufacturing capability and even complete plants. In some cases, foreign military sales have exceeded domestic purchases (*e.g.*, military aircraft in 1976), potentially making US firms hostage to foreign governments. Permitting military attachés to act as salesmen and offering tax incentives for foreign sales encourage a process that can weaken an industry that Dr. Gansler calls a "vital national resource."

Dr. Gansler also wants DoD to stimulate more integration of civilian and military business. This reform could strengthen industry financially, and speed the transfer of technology from military to civilian production. It might also assist the companies in absorbing the inevitable cycles of the defense business, and enable arms manufacturers to surge more quickly and efficiently in crises. This integration would also enable manufacturers to rely less on foreign sales.

One need not agree with all of Dr. Gansler's solutions to recognize that this serious study is a useful starting point for a discussion on revitalizing the critical defense industry.

—Reviewed by Lt. Col. Alan L. Gropman, Hq. USAF. Colonel Gropman is a staff officer in the Pentagon and a frequent contributor to the "Airman's Bookshelf."

New Books in Brief

Boomerang!, by Victor C. Tannehill. This book is an account of the actions of the 320th Bombardment Group in WW II, which flew the B-26 Marauder in the Mediterranean and France. A labor of love by author Tannehill, whose father served with the 320th, this history is actually three books in one—a chronological narrative of the unit, a history of the aircraft and the people who flew and maintained them, and a pictorial essay (with more than 700 photos) on life with the 320th. This handsome book is a must for those who served with the 320th. Available from the author at 3760 North Bay Dr., Racine, Wis. 53402, 1980. 320 pages. $35 postpaid.

The Chiefs of Naval Operations, edited by Robert William Love, Jr. This book is unusual in concept, being a collective biography of the nineteen men who have served as Chief of Naval Operations since the inception of the office in 1915. Partly an administrative history of the Navy and naval policy, and partly traditional biography, this approach provides the reader with a broad overview of naval history *and* a specific account of the men who made naval history. Each chapter of the book deals with one CNO, and is written by a historian versed in the period in which his subject served. Many of the men are here first treated as biographical subjects, and the book relies on much original research and recently declassified information. With photos, notes, and index. Naval Institute Press, Annapolis, Md. 21402, 1980. 448 pages. $28.95.

Early Birds, by John Halpern. Subtitled *An informal account of the beginnings of aviation*, this book is indeed a leisurely romp through the early romantic days of flight. Easy to read and conversational in tone, Halpern evokes the sense of derring-do and excitement of the pioneer "birdmen." Perhaps the greatest attraction for early aviation buffs in this book will be the many four-color photos of restored specimens of the first airplanes. Bibliography. E. P. Dutton, New York, N. Y., 1981. 89 pages. $20.95.

Fighters of World War II, by Bill Gunston. This book is an illustrated guide to the German, Italian, and Japanese fighter and attack aircraft developed in World War II. Gunston, an assistant compiler of *Jane's All the World's Aircraft*, follows a style similar to that of *Jane's*, giving technical specifications for each aircraft and a short development history. This book is a concise directory of the various Axis aircraft, and includes detailed photos, color drawings, and line drawings. Arco Publishing, Inc., New York, N. Y., 1980. 159 pages. $7.95.

The Luftwaffe in the Battle of Britain, by Armand van Ishoven. The Battle of Britain has been an oft-told story. Its lessons are clear and its history is well known. However, one rarely sees the Battle of Britain as seen through the eyes of the attackers—the Luftwaffe. Armand van Ishoven has remedied this situation with this account of the air war as experienced by the Germans. Drawing on close contacts with Luftwaffe veterans and a collection of eyewitness accounts and German wartime photos, the author has put together a fascinating look at a familiar subject from an unfamiliar vantage point. Charles Scribner's Sons, New York, N. Y., 1981. 127 pages. $19.95.

The Red Baron, an autobiography, edited by Stanley M. Ulanoff. This book is more than the autobiography of von Richthofen—the Red Baron—for it also includes memoirs of von Richthofen by his brothers; an account of the downing of von Richthofen by Capt. A. Roy Brown, credited by some with the death of the Red Baron; and various appendices listing such things as von Richthofen's confirmed victories, decorations and awards, types of aircraft flown by von Richthofen, etc. For those interested in learning about this legendary figure, this book will certainly be a valued reference. With photos and drawings. Aero Publishers, Inc., 329 W. Aviation Rd., Fallbrook, Calif. 92028, 1980. 241 pages. $12.95.

Top Secret Ultra, by Peter Calvocoressi. This book is an insider's account of the Allied intelligence operation that monitored German radio transmissions and led eventually to the breaking of the German Enigma machine ciphers. Calvocoressi was part of and later head of air intelligence at the Bletchley Park estate northwest of London during WW II, where this Allied intelligence operation was headquartered, and has written an even-handed history and lucid analysis of the sometimes peripheral, sometimes crucial work performed by the intelligence officers at Bletchley Park. With photos, drawings, appendices, and index. Pantheon Books, New York, N. Y., 1981. 132 pages. $10.95.

Weapons: The International Game of Arms, Money, and Diplomacy, by Russell Warren Howe. *Weapons* is a wide-ranging excursion into the world of arms manufacturing, the sophisticated technology of weapons, political infighting, and high-powered economic competition. Index. Doubleday & Co., Inc., Garden City, N. Y., 1980. 798 pages. $19.95.

—Reviewed by Hugh Winkler, Associate Editor.

SPEAKING OF PEOPLE

Retiree Council Presses Broad Range of Issues

By Ed Gates, CONTRIBUTING EDITOR

ONCE a year, fourteen retired Air Force members, major general through E-6, spend a week together examining retiree issues. They focus on retired pay, CHAMPUS, other benefits, mobilization call-ups, veterans programs, allotment policies, participation in active-duty affairs, and other topics that touch the lives of the nearly half-million USAF retirees and their families.

At its meeting late last year, the Air Force Retiree Council advanced positions on issues ranging from support for CHAMPUS eye and dental coverage to opposition to the "spouse bills" (with their provision that ex-wives of military retirees can bite into the latters' retired pay and perhaps over entitlements).

The group once again endorsed "recomputation," though it probably was only a gesture. Recomp, as most retirees understand, is not in the cards.

But not all the meeting's emphasis centered on compensation. Council chairman Maj. Gen. R. G. Dupont, USAF (Ret.), in his report to the Chief of Staff, devoted considerable space to the Retiree Involvement Program. Begun in September 1978 to get retirees personally involved in base activities, that project has been "eminently successful," General Dupont reported. He added that Retiree Affairs Offices have been established "at practically all bases" and that retirees are working as volunteers in many of the activities—hospitals, chapels, youth programs, family services, committees, etc.

At Andrews AFB, Md., for example, 105 retirees and dependents are doing volunteer work. So are eighty-seven others at Randolph AFB, Tex.

General Dupont said the Council's earlier request for Hq. USAF to include retired regulars as a personnel resource for mobilization purposes has been accomplished. And with many of the strictly hard-core retiree compensation worries largely overcome—attacks on and adverse changes to the retired pay system and benefits have had little success—the Council is giving closer attention "to what retirees can do to help the active force."

The Council's most interesting recommendation in that direction calls on Hq. USAF to "include retirees in the Total Force." Reserves and Guardsmen long have rated that distinction. And although the Air Force has a definite retiree recall program if an emergency arises, slated to become operational next summer, its 475,000 retired members are not officially part of the Total Force.

The Council notes that retirees, particularly those not long off active duty, are "a viable resource which the Air Force will use as necessary in an emergency." They will fill specific jobs in skills that can't be filled from the Individual Ready Reserve. Those members with the most recent service will be called first "to minimize the need for refresher training and exemptions for physical disqualification."

So why not bring them into the Total Force? The Hq. USAF Air Staff has been considering the idea. The Council has also called on Headquarters to place retiree representatives on the USAF Executive Council and the Air Force Management Committee, but the Air Staff has refused.

Welcoming retirees into the Total Force, the Council suggested, might also lead to easing the unpopular Status of Forces Agreements. The SOFAs, as many retirees and their families know only too well, deny them base privileges when they are living or traveling abroad. While the Council understands the Air Force's opposition to reopening SOFA negotiations, the complaints continue to roll in throughout the uniformed services.

The Army Retiree Council, in fact, says the Army Judge Advocate General will, in future SOFA talks, try to include Army retirees as members of the Total Force and "therefore be entitled to the same privileges as active-duty Army people."

The Air Force Retiree Council wants the Air Staff to take the same position. USAF's response is that while it favors letting retirees use exchanges and commissaries "whenever possible," the country "is not in a position to press for immediate SOFA negotiations to lift the curbs on retiree privileges." The Navy and Marine Corps take a similar position, allof which do not augur well for relief from SOFA.

There's a footnote to be added: the Air Force Retiree Council report comments that "as a practical matter, in recent SOFA negotiations the United States has had difficulty retaining existing privileges for its personnel, let alone obtaining broader privileges of any sort."

Be that as it may, Air Force retirees and near-retirees will certainly applaud the Council's firm and determined position on the SOFA issue, and on the numerous other sound proposals it has advanced. ■

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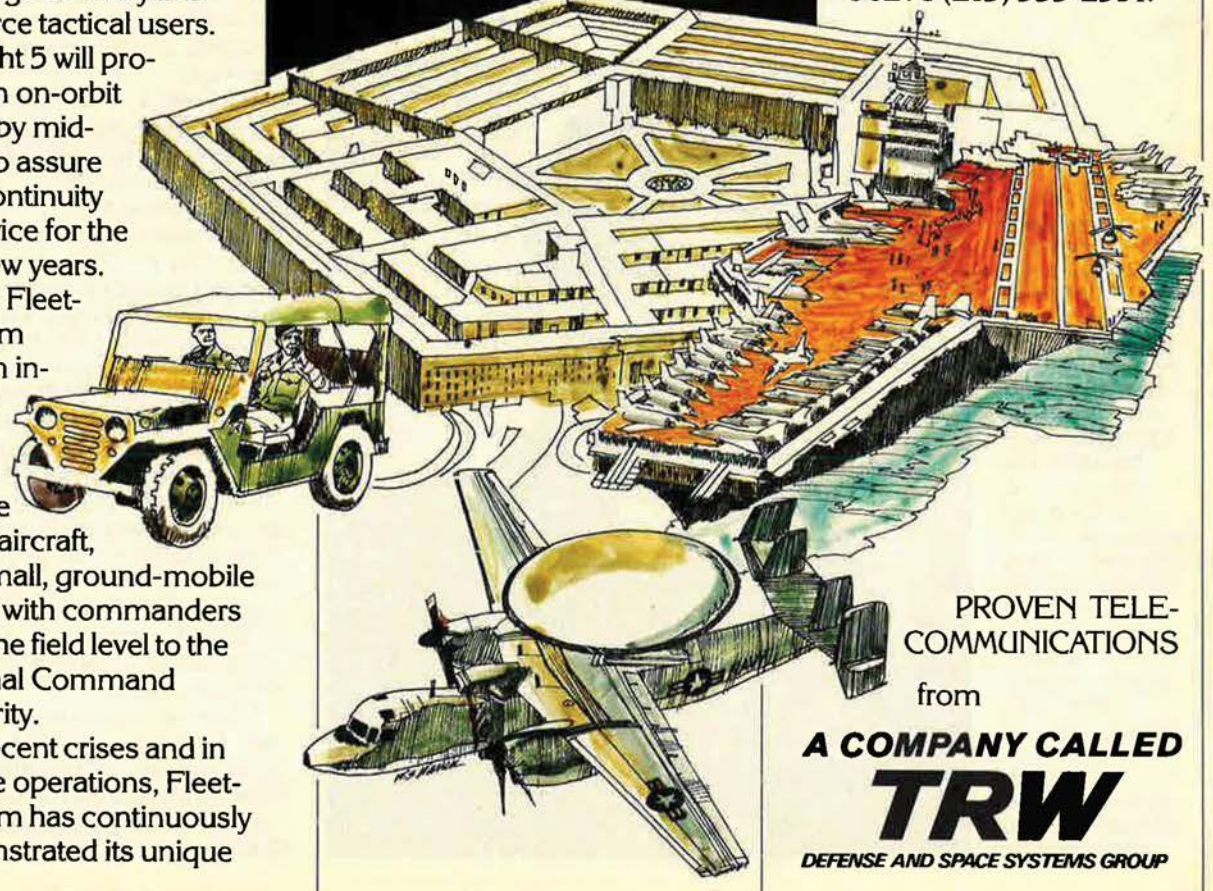

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THE BULLETIN BOARD

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

New Benefits on Order

Authorities at Hq. USAF have been pushing new pay and benefits proposals they hope the Reagan Administration and the Ninety-seventh Congress will soon enact into law. They range from an across-the-board increase in the household goods (HHG) shipping allowance to a more than 100 percent increase in the family separation allowance. Several other pays would be raised.

Meanwhile, the government's FY '82 budget (submitted by the departing Carter Administration) assumes a 9.1 percent military pay raise next October 1. It also recommends increases in recruiters' special pay and the death gratuity allowance, a BAS for all E-5s and above, a mileage reimbursement rate increase for PCS moves, and approval of the dependent dental-care package Congress failed to pass last year. The budget earmarks $123 million for that purpose.

The budget also proposes a 12.3 percent hike in compensation for 2,300,000 disabled veterans and 350,000 surviving widows and children.

The family separation allowance increase USAF wants would raise the monthly stipend from $30 to $65 per month, a more realistic figure. USAF's proposed HHG boost, besides increasing weight ceilings across-the-board, would remove the congressional funding limit of 13,500 pounds. And E-4s with less than two years of service would get dependent travel, 1,500 pounds of HHG, and dislocation allowances on Stateside PCS moves.

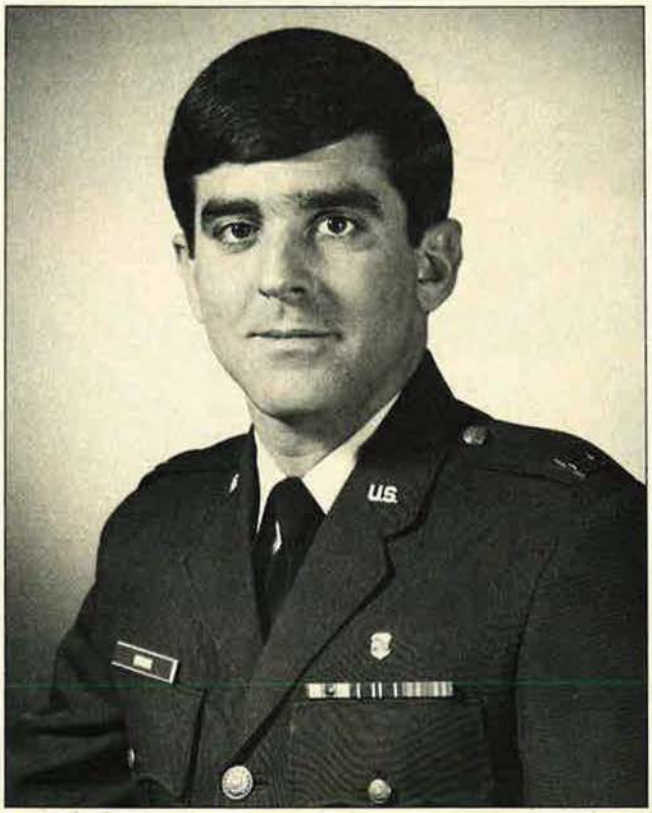
USAF began working on several new ideas in late 1980, including:

- **Emergency Travel for Dependents.** This provides transoceanic commercial travel for the member and dependents during an emergency in either's immediate family. A related USAF-backed proposal would provide government-funded travel for military personnel on TDY when an emergency occurs.
- **Hazardous-Duty Incentive Pay Raise.** This increased HDIP twenty-five percent (except enlisted crew members, who recently got a raise). A related proposition, which USAF has sent to the other services for coordination, would expand the list of duties eligible for HDIP.
- **Officer Flying Pay.** This authorizes flying pay for rated O-6s and below with more than twenty-five years of service, at the "over twenty-four" rate, if they hold flying positions. They now receive no flight pay.
- **Engineer-Scientist Bonus and Continuation Pay.** This strongly backed USAF plan authorizes an accession bonus up to $15,000 for new S&Es agreeing to serve four years. It also provides up to $3,000 in continuation pay per year for S&Es with four to nineteen years' service. Air staffers want speedy action on this because of the severe S&E officer shortage.

Hans Mark, then Secretary of the Air Force, approved the plan December 16 and fired it off to the other services for coordination.

Headquarters early this year had other benefits improvements on the front burner. They included an expanded temporary lodging entitlement, a government-financed PCS house-hunting trip, reimbursement for real-estate fees incurred as a result of PCS, new CHAMPUS improvements, funded Environmental and Morale Leave (EML) travel (for members and dependents serving in "environmentally depressed locations" around the world), Survivor Benefit Plan improvements *(e.g.,* modifying the Social Security offset), an increase in SGLI coverage from $20,000 to $35,000, and a raise in the ROTC subsistence allowance from $100 to $150 per month.

USAF, of course, is also supporting new GI Bill legislation that incorporates transfer of benefits to dependents and extends the December 31, 1989, delimiting period for the old GI Bill.



Capt. D. Creager Brown has been named the first annual Junior Medical Service Corps Officer of the Year for 1980. He is currently assigned as a health professions recruiter with the 3569th Recruiting Squadron, Los Angeles, Calif. Captain Brown earned a bachelor's degree from LaVerne University in 1975 and in 1977 a master's in health facilities management from Golden Gate University, where he is currently completing requirements for a doctorate in public administration.

Federal Execs Depart With Bonuses

The government, in implementing a recent law changing Civil Service personnel policies, began awarding $10,000 and $20,000 bonuses last summer to certain high-level federal civilian officials with top-box ratings. The idea is supposed to help develop a live-wire executive force; as civil servants scramble to win bonus money, efficiency will improve and agencies may even save money. That's the theory.

But the bonuses, it recently developed, are for past performance, not for future potential. So what is happening? Some of the bonus winners are resigning or retiring from government, taking their twenty grand with them. There's no requirement that they stay, even for a day.

This contrasts sharply with the rules governing military leaders: no bonus opportunities, promotion based on future potential only, and three years' service in grade in order to retire in it.

New Fund Drive Record Seen

The 1981 Air Force Assistance Fund drive, running from March 1 to April 3, is expected to set another record, something it has been doing for several consecutive years. In 1975, the AFAF fund campaign raised just $407,000. It has risen in every subsequent year, reaching $3,240,000 in 1980, of which the Air Force Aid Society got $2,165,547, or two-thirds.

The other two recipients, the Air Force Enlisted Men's Widows and Dependents Home and the Air Force Village, collected $747,915 and $328,247, respectively, last year. Contributors are asked to designate which of the organizations should receive their contribution.

This year's goal, considering the greatly increased donations of recent years, is a modest $3.2 million, actually less than last year's intake. The active-duty personnel goal is $2.4 million, and the retired and Reserve Forces goal $800,000. Final results of the 1981 drives are expected about July.

CBPOs at all installations are conducting the campaign and are prepared to explain why the annual drive is necessary, where the funds go, etc. In their AFAS sales pitch, for example, base fund drive officials will note that last year 32,000 Air Force people received $28 million in assistance, and educational loans topped $22 million. Both are record outlays, and both are expected to be "substantially increased this year."

The Enlisted Men's Widows and Dependents Home needs funds for major expansion and for subsidizing many of its residents who are without means. The Home has a waiting list of 315 persons.

The Air Force Village is also expanding *(see last month's "Bulletin Board")*. The Air Force disclosed that from 1970 to 1976 the Village "operated at a great loss" and said that many residents are "unable to pay maintenance fees necessary to sustain the Village on a break-even basis."

The accompanying table is the Assistance Fund collection and disbursement record for the past seven years:

AIR FORCE ASSISTANCE FUND DISBURSEMENTS

YEAR	TOTAL RAISED	AF AID SOCIETY	AF VILLAGE	WIDOWS AND DEPENDENTS HOME
1974	$460K	$287,771 (63%)	$53,925 (11%)	$117,979 (26%)
1975	407K	293,651 (72%)	29,311 (7%)	84,287 (21%)
1976	672K	436,907 (65%)	60,495 (9%)	174,763 (26%)
1977	1.759M	943,479 (53%)	235,967 (13%)	615,774 (34%)
1978	2.816M	1,267,536 (45%)	563,349 (20%)	985,861 (35%)
1979	2.916M	1,827,882 (63%)	325,257 (11%)	763,351 (25%)
1980	3.240M	2,165,547 (66%)	328,247 (10%)	746,915 (23%)

Reserve Manning Good in FY '80

FY '80 was another good recruiting and retention year for the Air Force Reserve and the Air National Guard. Both components raised their experience level by enlisting far more people with prior military service (PS) than nonprior service (NPS). This is the reverse of the active-duty annual intake, where more than ninety percent of the recruits are rookies with no previous service.

At year's end, the AFRES's Selected Reserve rolls hit a new high of 58,000 members, a 2,200 increase over the previous year. This was accomplished by reenlisting a remarkable seventy-five percent of its prior-service members whose hitches were expiring and fifty percent of the NPS members. During the year, the component recruited 9,500 PS persons, compared with only 2,800 without previous service.

Overall, enlisted AFRES manning is favorable, though vacancies exist in various skills and units. On the officer side, "continuing shortages" in engineering and technical billets were cited. Pilot manning is not a particular problem, though a Hq. USAF official forecast "shortages in the out years." The Air Force Reserve got thirty-seven new pilots direct from the Undergraduate Pilot Training Program last year and is slated to receive eighty this year.

The Air Guard grew from a force of 93,400 members in FY '79 to 96,300 at the end of FY '80. It recruited 9,500 PS personnel and 6,500 without previous service. It chalked up a healthy sixty-one percent enlisted retention rate. Officer staffing was called "good," though an official cited a "continuing need for rated officers."

Once again the two USAF components led the other services' Reserve establishments in recruit test scores and in percentage of enlistees with high school diplomas (including equivalency certificates). More than ninety-eight percent of the ANG enlistees in FY '80 were high school graduates, and so were ninety-five percent of the AFRES recruits. Both figures are well above those for USAF active-duty recruits and the other services' Reserve forces.

USAF Won't Seek Dual Comp Relief

The Air Force has rejected a proposal that it seek to remove the Dual-Compensation Act curb on federal jobs that are held by retired Regular officers.

The call for ending the restriction—which reduces the retired pay a Regular officer receives if working for the government to an amount equal to the first $5,746, plus half of the remainder—came from the Air Force Retiree Council. The Council, which meets annually and submits recommendations for improving retiree benefits, notes that the retired pay curb denies Uncle Sam the services of many talented people, as most Regular officer retirees look elsewhere for employment.

The Air Staff response to the Council agrees that the Dual-Comp Act "imposes an inequitable penalty" on retired Regulars, and went on to say, "We would like to see this penalty eliminated."

But not in "the near future," the Air Staff said in noting that "many key" lawmakers want to reduce retirement outlays, not increase them as removal of the job curb would do. The Staff position paper said, in effect, that rocking the boat on the issue might lead Congress to apply the curbs to "all retired officers or even all retired members."

Furthermore, "strong Administration criticism of 'double-dipping' has only recently subsided, and legislation such as the Council proposes

would almost certainly generate a resurgence of such criticisms, to the detriment of all our members."

Accordingly, the Air Staff position holds, the prudent course "is to avoid raising the dual-compensation issue."

The Council said the Army and Navy Retiree Councils also seek legislative relief from the dual-compensation restrictions.

USAF Stories Sought

The USAF Magazine and Books office at Hq. USAF last year got considerable publicity mileage out of its National Story Program by feeding about 500 story ideas to magazine publishers. About 200 were accepted for publication in article form.

All this is considered good for the service image as the stories spotlighted Air Force missions, doctrine, operations, activities, and people, all in a generally favorable light. Officials hope to smoke out more USAF people with clever story ideas this year.

Those interested should work up a brief synopsis of the major facts of their proposed article and send it through Public Affairs channels to the Air Force Office of Public Affairs, Magazines and Books, 1221 S. Fern St., Arlington, Va. 22202. Authors should include a list of principal characters and story contacts, explain how the piece can be illustrated, and suggest audiences it is intended to reach. The Magazine and Books shop needs this information to sell the story idea to magazine editors.

Published articles by USAF authors have appeared in such diverse magazines as *World Construction, Ebony, Official Karate, Industrial Education,* and the *Journal of Family Practices.*

Authors who prepare articles on government time and with government equipment, of course, are not paid for them. Otherwise they should receive the publication's regular payment.

In a related public affairs development, the Air Force Now office is also looking for new story ideas. AFN produces films on USAF activities. The ideas should be sent through PA channels. The ideas should have USAF-wide interest, assure action, and be geared to younger airmen and officers.

Engineer Training Expands

The Air Force this fiscal year will enroll 605 officers in graduate engineering courses and 700 the following year. Further increases are planned in subsequent years.

This may not seem like much of an inroad on the service's engineer

THE BULLETIN BOARD

shortage and low experience level, but USAF officials call it a turnaround in their until now losing battle to retain engineers, attract new ones, and "grow their own." Last year, the Air Force hit rock bottom when it recorded only 515 inputs into graduate engineer study. A decade ago, more than twice that many officers entered such training each year.

Half of the new grads will study at the USAF's resident graduate school at the Institute of Technology, Wright-Patterson AFB, Ohio, and half will attend civilian universities.

Steady USAF pressure on DoD and Congress in recent years brought about the improved graduate study picture. Still, the service finds itself in difficult straits: Although forty percent of the line officer force have graduate degrees, USAF is short 500 officers with technical interdisciplinary degrees, 1,100 in technical management, 1,400 in advanced engineering, 100 in mathematics, and 700 in physical sciences.

"To get well would require more than 1,000 inputs annually," according to an Air Staff estimate.

In a related move, the Air Force has increased the opportunity for its scientific and engineering personnel to attend "state-of-the-art" continuing education courses at AFIT and civilian schools and to attend more professional meetings, conferences, and symposia. In FY '82, for example, some 900 engineering officers will attend AFIT courses in applied optimal estimation, optical waveguide media, spread spectrum communication systems, or any of fourteen other courses offered. In addition, up to 900 engineers may attend professional engineering conferences and symposia through a new centrally funded program managed by AFIT.

At a news conference early in January, Gen. Bennie L. Davis said that studies have determined that the Titan II missile system is safe and supportable, now and in the future. The ATC chief headed the Titan II review group formed after the missile accident at Damascus, Ark., last September.

Another AFIT-directed project called "teleteach," presently reaching more than 1,300 students at nine Systems Command and Logistics Command bases, will soon expand to additional locations.

An expansion of students in AFIT's School of Civil Engineering—from 2,000 to 2,600 annually—is planned for FY '83. And AFIT's School of Systems and Logistics, which now reaches 4,300 students annually in more than fifty resident programs and 1,500 through on-site and seminar projects, is also preparing a major expansion.

AFIT is the current holder of AFA's Hoyt S. Vandenberg Award, given annually for excellence in aerospace education.

Meanwhile, the Air Force is continuing its efforts to secure 8,500 AFROTC scholarships, up from the present 6,500. All new AFROTC pacts go exclusively to engineering and technical students. And the USAF Education and Commissioning program for airmen is boosting its annual student inputs, exclusively engineering and technical, from 200 in FY '79 to 450 by FY '83.

Still another effort at overcoming overall S&E problems finds the service "growing some of its own." Sixty officers with technical—but not engineering—degrees have been enrolled in AFIT where they'll earn a second B.S. degree in eighteen months, in electrical, aeronautical, or astronomical engineering. Hq. USAF officials expect to double this input soon and expand it to civilian universities since AFIT is presently at full capacity.

Short Bursts

Among USAF athletes, **golfers** will have the best of it in this year's sports training camps and championships. They'll spend the entire time-off period at the USAF Academy, competing on a classy layout, September 1–20. Most of the other athletes—boxers, bowlers, volleyballers, etc.—will train at one site, vie in the interservice championships at another,

some far distant. Aspiring team members should contact their base athletic offices. Usually, some of the best athletes are not able to get away for the roughly three-week interlude.

Magic shows, puppet workshops, an international Volksmarch, an Air Force-wide Aero Club Day, family talent competitions, and family designer/craftsman contests—these are just a few of the special projects Hq. USAF is firming up for bases this year. They're all part of the **"Year of the Family"** theme USAF is promoting. The Manpower and Personnel Center is publishing a how-to booklet for local officials with suggested programs, rules, and playing-area changes so every family member can take part.

Until now, **Academy cadets** could attend the Colorado Springs school for three years, then voluntarily resign without repaying Uncle Sam a nickel. No service commitment whatsoever! But starting next August, cadets dropping out after one day of third-year classes will incur **a two-year service (enlisted) obligation.** Those who chuck it during their senior year must spend three years in airman status.

Interesting **new bills in Congress,** which probably won't get anywhere, would (1) allow original commissioning as late as age forty-five, and (2) deny veterans benefits to persons whose less than honorable discharges are administratively upgraded.

That **officer-exit survey** USAF began making in 1979 was so useful that the service has reintroduced it and expanded it to include separating airmen as well. All departees are being questioned closely about why they are hanging up their suits.

Military sons and daughters are smarter than high school students generally. That's the indication resulting from aptitude testing of more than a million students, including many in DoD dependent schools abroad. They participated in the American College Testing Program (ACT) and the Scholastic Aptitude Test (SAT). The DoD scholars overseas scored higher in almost every matchup. Among the DoD students themselves, males outscored females by an average 498 to 451 on the SAT math section and 438 to 432 on the SAT verbal section.

Those bills **to repeal the "Catch 62" law** have been introduced again, having failed in the last Congress. Sponsors are **Sen. Strom Thurmond** (R-S. C.) and **Rep. Charles Bennett** (D-Fla.). Catch-62 refers to the inequitable treatment of military service in computing Civil Service retired pay after age sixty-two. Civil Service retirees, when eligible for Social Security benefits due in part to military service, must actually omit all credit for their military service after 1956. AFA has long favored repeal of the unfair statute.

More than eighty-two percent of the active Air Force and seventy-six percent of the USAF civilian employees have their **pay deposited directly in a bank.** USAF's goal is 100 percent. It's safer and saves the service money, officials say.

Senior Staff Changes

PROMOTIONS: To **Brigadier General:** Richard F. **Abel;** Michael H. **Alexander;** Melvin G. **Alkire;** Carl N. **Beer;** William P. **Bowden;** Elmer T. **Brooks;** James T. **Callaghan;** Duncan W. **Campbell;** Michael P. C. **Carns;** Aloysius G. **Casey;** Wilson C. **Cooney;** Thomas L. **Craig;** Milford E. **Davis;** Chris O. **Divich;** Frederic F. **Doppelt.**

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SENIOR ENLISTED ADVISOR CHANGES: CMSgt. Harry E. Davis, from Wing Maintenance Superintendent, 375th Aeromedical Airlift Wing, MAC, Scott AFB, Ill., to SEA, Hq. MAC, Scott AFB, Ill., replacing retiring CMSgt. James R. Vitale. ■

THIS IS AFA

The Air Force Association is an independent, nonprofit, aerospace organization serving no personal, political, or commercial interests; established January 26, 1946; incorporated February 4, 1946.

The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength

OBJECTIVES

adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principle of freedom and equal rights for all mankind.

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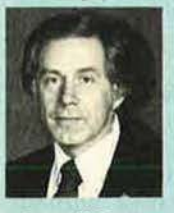

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Once every two years, Paris comes alive with aviation. And AFA has arranged, through Destinations Unlimited, to take you there in worry-free comfort.

The Paris Air Show is the best in exhibits and technology — worldwide. Military, air carrier, general aviation and space are fully represented — from the single engine to sophisticated military aircraft, electronics and weaponry. All the latest developments in air transportation.

Add the beauty and splendor of Paris and you have a dream come true. AFA and Destinations Unlimited will help you live that dream.

This is Destinations Unlimited's fourth Paris Air Show tour, so they have the experience and know-how to make your trip successful. They make all your travel arrangements down to the last detail. If you need to go earlier or want to stay later than our tour, just tell them what your needs are and they will take care of the rest while you sit back, relax and enjoy!

After the air show, consider staying an extra week or two abroad — river barging thru the wine country — ballooning — visiting the chateau country — the Riviera — or the ultimate, fly the Concorde to Paris and sail home on the Queen Elizabeth II!

Take advantage of our package plan, June 6-13, or we'll make special arrangements to suit your personal travel requirements.

Join us at the 1981 Paris Air Show.

Package plan includes:

• Round trip airfare from New York to Paris via Air France Concorde or wide-body jet. • Six nights at the deluxe Hotel Concorde LaFayette or the standard Hotel Saint Augustin. • Continental breakfast daily. • Transfers airport/hotel/airport. • Half-day orientation tour of Paris. • Transportation and entrance ticket to the airshow on 2 days. • Taxes and services for hotels, porterage, etc. • Professional escort.

June 6-13, 1981

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The 34th PARIS AIR SHOW

Le Bourget Airport

JUNE 4-14

Highlights of the 1979 Paris Air Show:

26 countries
209 aircraft
692 exhibitors
730 flight demonstrations
552,338 attendees

THE 1981 SHOW PROMISES TO BE EVEN MORE IMPRESSIVE!

AFA NEWS

Chapter and State Photo Gallery

By Dave C. Noerr, AFA AFFAIRS EDITOR

Last December, AFA's Steel Valley Chapter in Pennsylvania, in conjunction with the Steel Valley Disabled American Veterans, the American Ex-Prisoners of War, and the Polish War Veterans, held their annual Christmas Party at the Duquesne Golf Club in West Mifflin, Pa. During the party, Chapter President Pat Logan, far left, presented Fred Hiller, center, and Maj. Richard Givens, USAF (Ret.), second from right, Certificates of Appreciation for their assistance to the Highland Drive Veterans Hospital. Hiller, President of the Mon Valley Shriners Luncheon Club, and Givens, Pittsburgh City Councilmember, participated in a drive to help disabled veteran Bill Langston, seated, find work to support his family. Representing Highland Drive Veterans Hospital at the presentation was Nurse Janet Scullion, second from left. More than 150 people attended the event, including twenty handicapped veterans from the Veterans Hospital.

During the winter meeting of the Lawrence D. Bell Chapter, the Chapter's first president, William G. Gisel, left, was honored and presented a plaque by Chapter President Lawrence B. Ryan, second from right. Mr. Gisel is Chairman of the Board of Bell Aerospace Textron. Also present at the ceremony were Maj. Gen. James W. Stansberry, USAF, second from left, who serves as Deputy Chief of Staff for Contracting and Manufacturing, AFSC; and New York State AFA President Tom Hanlon. General Stansberry was the featured speaker at the meeting in Buffalo, N. Y., which attracted more than 200 guests.

AFA Executive Director Russell Dougherty was the featured speaker at a recent meeting of the Grissom Memorial Chapter held in the Officers Club at Grissom AFB, Ind. Crew members of the 305th Aerial Refueling Wing, who participated in the recent SAC Bombing Competition, were honored at the meeting. Pictured at the meeting are (from right to left): Chapter President Thomas Hayes; Mrs. Hayes; Russ Dougherty; Indiana State AFA President Donald E. Bradford; Mrs. Richard Wallace; and Col. Richard Wallace, USAF. Colonel Wallace is the Commander of the 305th Aerial Refueling Wing.

CALENDAR OF EVENTS

March 14, **Chicagoland O'Hare Chapter Symposium,** O'Hare Ramada Inn, Des Plaines, Ill. . . . March 28, **Iron Gate Chapter's 18th National Air Force Salute,** Sheraton Center, New York City . . . April 11–12, **Mississippi State AFA Convention,** Biloxi . . . May 1–2, **Idaho State AFA Convention,** Boise . . . May 1–2, **South Carolina State AFA Convention,** Charleston . . . May 2, **Phoenix Sky Harbor Chapter's Sixth Annual Ball,** Phoenix Country Club, Phoenix, Ariz. . . . May 15–18, **Florida State AFA Convention,** Miami . . . May 16, **Kansas State AFA Convention,** Wichita . . . May 23, **AFA Nominating Committee and Board of Directors Meeting,** The Broadmoor, Colorado Springs, Colo. . . . May 23, **Twenty-second Annual Outstanding Squadron Dinner,** The Broadmoor's International Center, Colorado Springs, Colo. . . . May 22–24, **Washington State AFA Convention,** Spokane . . . May 23, **Connecticut State AFA Convention,** Windsor Locks . . . June 12–13, **Alabama State AFA Convention,** Mobile . . . June 19–21, **New York State AFA Convention,** Niagara Falls . . . June 26–28, **New Jersey State AFA Convention,** Cape May . . . June 26–28, **Texas State AFA Convention,** San Antonio . . . July 17–18, **Ohio State AFA Convention,** Youngstown . . . July 17–19, **Pennsylvania State AFA Convention,** Hershey . . . August 7–8, **Missouri State AFA Convention,** Springfield . . . August 13–15, **California State AFA Convention,** Lompoc . . . August 21–22, **Colorado State AFA Convention,** Colorado Springs . . . September 14–17, **AFA National Convention,** Washington, D. C.

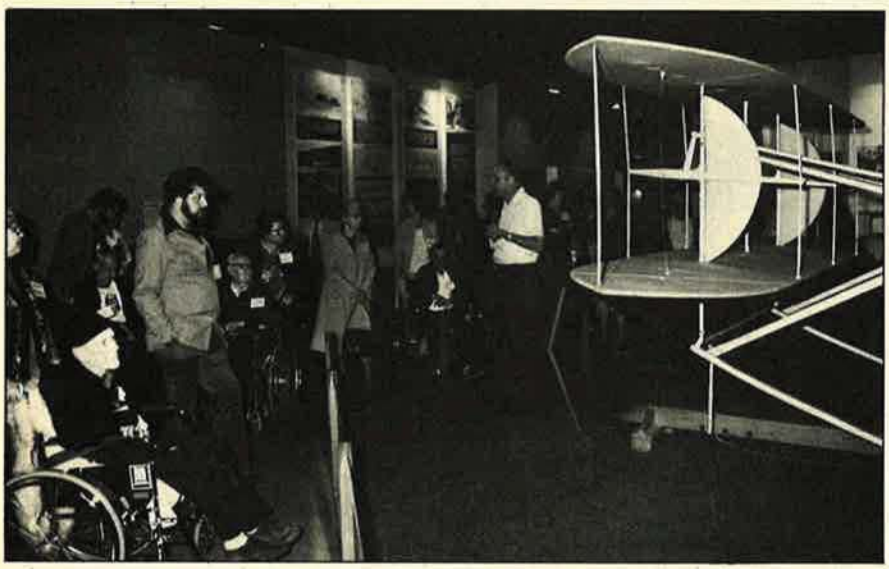
"Soviet Views of American Politics and Foreign Policy" were discussed by Dr. William Buffington, Professor of Russian Language at Purdue University, as a guest speaker at a recent meeting of the Gus Grissom Chapter of West Lafayette, Ind. Dr. Buffington, second from right, told of his experiences in the Soviet Union and provided insights into Soviet policies. Pictured with Dr. Buffington are the newly elected officers of the Grissom Chapter. They are (from left to right): Dr. Richard Ortman, Secretary; J. J. Wagner, Treasurer; Donald James, President; Dr. Buffington; and Vice President Robert Burris.

More than 300 members and guests of the Hawaii Chapter attended a recent luncheon meeting featuring Maj. Gen. Kenneth L. Peek, Jr., USAF, right, Commander of Air Force Manpower and Personnel Center at Randolph AFB, Tex., as guest speaker. General Peek is shown congratulating A1C Eli S. Alicea of the USAF Clinic at Hickam AFB, Hawaii, for his selection as Outstanding Airman of the Quarter. Hawaii Chapter President Col. Bill Taylor, USAF (Ret.), left, looks on. Airman Alicea and nine other Hickam AFB outstanding airmen were special guests of the Hawaii Chapter at the meeting.

AFA Medals of Merit were awarded to Col. Richard Duckworth, USAF, left, and Dr. Frank Lugo, right, at the Alabama State AFA Executive Council meeting held last December at Maxwell AFB, Ala. Making the presentation was AFA's Vice President for the Southeast Region Tom Bigger.

During their annual Christmas Party, the Tacoma, Wash., Chapter presented scholarships for the amount of $500 each to Thomas V. Gallo, second from left, and Patricia L. Meyer, second from right. Gallo and Meyer were the outstanding cadets from AFROTC Detachment 900 at the University of Puget Sound. Pictured with the cadets are the Chapter's ROTC Coordinator, Col. Joseph E. Tucker, USAF (Ret.), left, and Chapter President Howard O. Scott.

AFA NEWS PHOTO GALLERY



Seventeen veterans from Newark, Ohio, area nursing homes recently visited the Air Force Museum at Wright-Patterson AFB, Ohio, as guests of AFA's Mid Ohio Chapter and the Aerospace Guidance and Metrology Center at Newark AFS, Ohio. Here the vets listen as Col. Richard L. Uppstrom, USAF, Commander of the Air Force Museum, center, explains one of the displays. (Photo by Chuck Stout)

AFA's "Man of the Year" for 1979 and immediate past national vice president for the Great Lakes Region Alexander C. Field, Jr., left, was presented the Air Force Recruiting Service Commander's Award by Recruiting Service Commander Brig. Gen. Keith McCartney. The Award, given in recognition of contributions to the Air Force recruiting mission, was presented to Mr. Field by General McCartney at the 3505th Recruiting Group's recent annual awards banquet held at Chanute AFB, Ill.

A joint meeting of the South Bend Chapter and representatives from USAF was held last November to celebrate "Air Force Awareness Week," as proclaimed by South Bend, Ind., Mayor Roger O. Parent. Those present at the meeting included (from left to right): Indiana State AFA President Donald E. Bradford, Sr.; Col. Gail T. Bulmer, USAF, Professor of Aerospace Studies at the University of Notre Dame; Lt. Col. W. D. Sheppard, USAF, Vice Commander of the 3505th Recruiting Group; Lt. Col. Ken Lawrence, USAF, Air Officer Commander at the Air Force Academy; and South Bend Chapter President John R. Kagel.

At a recent dinner meeting, the newly formed Charles A. Lindbergh Chapter was presented its charter by Connecticut State AFA President Frank J. Wallace. The new chapter was formed by CMSgt. Alton G. Hudson, USAF (Ret.), a former AFA National Director (ex-officio) and former Chairman of the AFA Enlisted Council. Pictured are some of the officers elected for the first year of operation. They are (from left to right): Waldo R. Mowen III, Treasurer; Fred H. Lynn, Historian; Robert G. Whitcher, Secretary; Alton G. Hudson, President; and Publicity Committee Member Marion Ciardullo.

At the Annual Awards Program of California's Tennessee Ernie Ford Chapter held last November, the Chapter presented twenty-four awards to individuals of various organizations. Ernie Ford was himself on hand to present the Technical Achievement Award to Capt. Ronnie Martin, USAF, right, who serves in the Air Force Plant Representative Office, Lockheed Missiles & Space Co., Sunnyvale, Calif.

Lt. Gen. James P. Mullins, left, Commander of the Fifteenth Air Force at March AFB, Calif., recently accepted a check from Lee Derrick, of the Riverside County Chapter, for support of various people-oriented projects at March AFB and for other Air Force charities. The check is proceeds from the Riverside County Chapter/March AFB Celebrity Golf Tournament, and was presented to General Mullins at a dinner-show held last October. Bob Hope serves as Honorary Chairman of the Tournament. (Photo by F. H. Resteivo)

Phoenix Sky Harbor Chapter President Brig. Gen. Robert W. Waltz, USAF (Ret.), left, presents a plaque of appreciation to past Sky Harbor Chapter president William D. Eikner during a recent meeting of the Chapter in Scottsdale, Ariz. Mr. Eikner was honored for his fund-raising efforts for the Air Force Enlisted Men's Widows and Dependents Home Foundation, Inc., and the Arizona Kidney Foundation.

20% Dividend paid for 1979 calendar year

SEE NEW BENEFITS FOR FAMILY COVERAGE!

NOW AVAILABLE TO

CURRENT BENEFIT TABLES

Insured's Attained Age	STANDARD PREMIUM: $10 per month Basic Benefit*	HIGH OPTION PREMIUM: $15 per month Basic Benefit*	HIGH OPTION PLUS PREMIUM: $20 per month Basic Benefit*
20-29	$85,000	$127,500	$170,000
30-34	65,000	97,500	130,000
35-39	50,000	75,000	100,000
40-44	35,000	52,500	70,000
45-49	20,000	30,000	40,000
50-54	12,500	18,750	25,000
55-59	10,000	15,000	20,000
60-64	7,500	11,250	15,000
65-69	4,000	6,000	8,000
70-74	2,500	3,750	5,000
Aviation Death Benefit*			
Non-war related	$25,000	$37,500	$50,000
War related	$15,000	$22,500	$30,000
Extra Accidental Death Benefit*	$12,500*	$15,000*	$17,500*

*The Extra Accidental Death Benefit is payable in addition to the basic benefit in the event an accidental death occurs within 13 weeks of the accident, except as noted under AVIATION DEATH BENEFIT (below).

*AVIATION DEATH BENEFIT: The coverage provided under the Aviation Death Benefit is paid for death which is caused by an aviation accident in which the insured is serving as pilot or crew member of the aircraft involved. Under this condition, the Aviation Death Benefit is paid in lieu of all other benefits of this coverage. Furthermore the non-war related benefit will be paid in all cases where the death does not result from war or an act of war, whether declared or undeclared.

OTHER IMPORTANT BENEFITS

COVERAGE YOU CAN KEEP. Provided you apply for coverage under age 60 (see "ELIGIBILITY") your insurance may be retained at the same low group rates to age 75.

FULL TIME, WORLD WIDE PROTECTION. The policy contains no war clause, hazardous duty restriction, combat zone waiting period or geographical limitation.

DISABILITY WAIVER OF PREMIUM. If you become totally disabled at any time prior to age 60 for at least a 9-month period, your coverage will be continued in force without further payment of premiums as long as you remain disabled.

FULL CHOICE OF SETTLEMENT OPTIONS. All standard forms of settlement options, as well as special options agreed to by the insured and United of Omaha, are available to insured members.

CONVENIENT PAYMENT PLANS. Premium payments may be made by monthly government allotment (payable to Air Force Association), or direct to AFA in quarterly, annual or semi-annual installments.

DIVIDEND POLICY. AFA's primary policy is to provide maximum coverage at the lowest possible cost. Consistent with this policy, AFA has provided year-end dividends in all but three years (during the Vietnam War) since the program was initiated in 1961, and basic coverage has been increased on six separate occasions.

ADDITIONAL INFORMATION

Effective Date of Your Coverage. All certificates are dated and take effect on the last day of the month in which your application for coverage is approved, and coverage runs concurrently with AFA membership. AFA Group Life Insurance is written in conformity with the insurance regulations of the State of Minnesota. The insurance will be provided under the group insurance policy issued by United of Omaha to the First National Bank of Minnesota as trustees of the Air Force Association Group Insurance Trust.

EXCEPTIONS: There are a few logical exceptions to this coverage. They are:

Group Life Insurance: Benefits for suicide or death from injuries intentionally self-inflicted while sane or insane will not be effective until your coverage has been in force for 12 months.

The Accidental Death Benefit and Aviation Death Benefit shall not be effective if death results: (1) From injuries intentionally self-inflicted while sane or insane, or (2) From injuries sustained while committing a felony, or (3) Either directly or indirectly from bodily or mental infirmity, poisoning or asphyxiation from carbon monoxide, or (4) During any period a member's coverage is being continued under the waiver of premium provision, or (5) From an aviation accident, either military or civilian, in which the insured was acting as pilot or crew member of the aircraft involved, except as provided under AVIATION DEATH BENEFIT.

ELIGIBILITY

All members of the Air Force Association are eligible to apply for this coverage provided they are under age 60 at the time application for coverage is made.

*Because of certain restrictions on the issuance of group insurance coverage, applications for coverage under the group program cannot be accepted from non-active duty personnel residing in either New York or Ohio. Non-active duty members residing in Ohio, however, may request special application forms from AFA for individual policies which provide coverage quite similar to the group program.

OPTIONAL FAMILY COVERAGE
(new benefit schedule effective 6/30/80)
PREMIUM: $2.50 per month

Insured's Attained Age	Life Insurance Coverage for Spouse	Life Insurance Coverage for each Child*
20-39	$20,000.00	$4,000.00
40-44	15,000.00	4,000.00
45-49	10,000.00	4,000.00
50-54	7,000.00	4,000.00
55-59	5,000.00	4,000.00
60-64	3,000.00	4,000.00
65-69	2,000.00	4,000.00
70-75	1,000.00	4,000.00

*Children under six months are provided with $250 coverage once they are 15 days old and discharged from the hospital.

Upon attaining age 21, and upon submission of satisfactory evidence of insurability, insured dependent children may replace this $4,000 group coverage (in most states) with a $10,000 permanent individual life insurance policy with guaranteed purchase options.

Please Retain This Medical Bureau Prenotification For Your Records

Information regarding your insurability will be treated as confidential. United Benefit Life Insurance Company may, however, make a brief report thereon to the Medical Information Bureau, a nonprofit membership organization of life insurance companies, which operates an information exchange on behalf of its members. If you apply to another bureau member company for life or health insurance coverage, or a claim for benefits is submitted to such a company, the Bureau, upon request, will supply such company with the information in its file.

Upon receipt of a request from you, the Bureau will arrange disclosure of any information it may have in your file. (Medical information will be disclosed only to your attending physician.) If you question the accuracy of information in the Bureau's file, you may contact the Bureau and seek a correction in accordance with the procedures set forth in the federal Fair Credit Reporting Act. The address of the Bureau's information office is P.O. Box 105, Essex Station, Boston, Mass. 02112. Phone (617)426-3660.

United Benefit Life Insurance Company may also release information in its file to other life insurance companies to whom you may apply for life or health insurance, or to whom a claim for benefits may be submitted.

ALL AFA MEMBERS (under age 60)

APPLICATION FOR
AFA GROUP LIFE INSURANCE

United of Omaha

Group Policy GLG-2625
United Benefit Life Insurance Company
Home Office Omaha Nebraska

Full name of member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of birth (Mo. Day Yr.)	Height	Weight	Social Security Number

This insurance is available only to AFA members

☐ I enclose $13 for annual AFA membership dues (includes subscription ($9) to AIR FORCE Magazine). Please send membership application.

☐ I am an AFA member.

Name and relationship of primary beneficiary

Name and relationship of contingent beneficiary

Please indicate below the Mode of Payment and the Plan you elect:

Mode of Payment	Plan of Insurance: Standard Plan		High Option Plan		High Option PLUS Plan	
	Member Only	Member And Dependents	Member Only	Member And Dependents	Member Only	Member And Dependents
Monthly government allotment (only for military personnel). I enclose 2 month's premium to cover the necessary period for my allotment (payable to Air Force Association) to be established.	☐ $ 10.00	☐ $ 12.50	☐ $ 15.00	☐ $ 17.50	☐ $ 20.00	☐ $ 22.50
Quarterly. I enclose amount checked.	☐ $ 30.00	☐ $ 37.50	☐ $ 45.00	☐ $ 52.50	☐ $ 60.00	☐ $ 67.50
Semi-Annually. I enclose amount checked.	☐ $ 60.00	☐ $ 75.00	☐ $ 90.00	☐ $105.00	☐ $120.00	☐ $135.00
Annually. I enclose amount checked.	☐ $120.00	☐ $150.00	☐ $180.00	☐ $210.00	☐ $240.00	☐ $270.00

Names of Dependents To Be Insured	Relationship to Member	Dates of Birth Mo. Day Yr.	Height	Weight

Have you or any dependents for whom you are requesting insurance ever had or received advice or treatment for: kidney disease, cancer, diabetes, respiratory disease, epilepsy, arteriosclerosis, high blood pressure, heart disease or disorder, stroke, venereal disease or tuberculosis? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance been confined to any hospital, sanatorium, asylum or similar institution in the past 5 years? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance received medical attention or surgical advice or treatment in the past 5 years or are now under treatment or using medications for any disease or disorder? Yes ☐ No ☐

If YOU ANSWERED "YES" TO ANY OF THE ABOVE QUESTIONS, EXPLAIN FULLY including date, name, degree of recovery and name and address of doctor. (Use additional sheet of paper if necessary.)

I apply to United Benefit Life Insurance Company for insurance under the group plan issued to the First National Bank of Minneapolis as Trustee of the Air Force Association Group Insurance Trust. Information in this application, a copy of which shall be attached to and made a part of my certificate when issued, is given to obtain the plan requested and is true and complete to the best of my knowledge and belief. I agree that no insurance will be effective until a certificate has been issued and the initial premium paid.

I hereby authorize any licensed physician, medical practitioner, hospital, clinic or other medical or medically related facility, insurance company, the Medical Information Bureau or other organization, institution or person, that has any records or knowledge of me or my health, to give to the United Benefit Life Insurance Company any such information. A photographic copy of this authorization shall be as valid as the original. I hereby acknowledge that I have a copy of the Medical Information Bureau's prenotification information.

Date _____, 19 ___ _____
Member's Signature

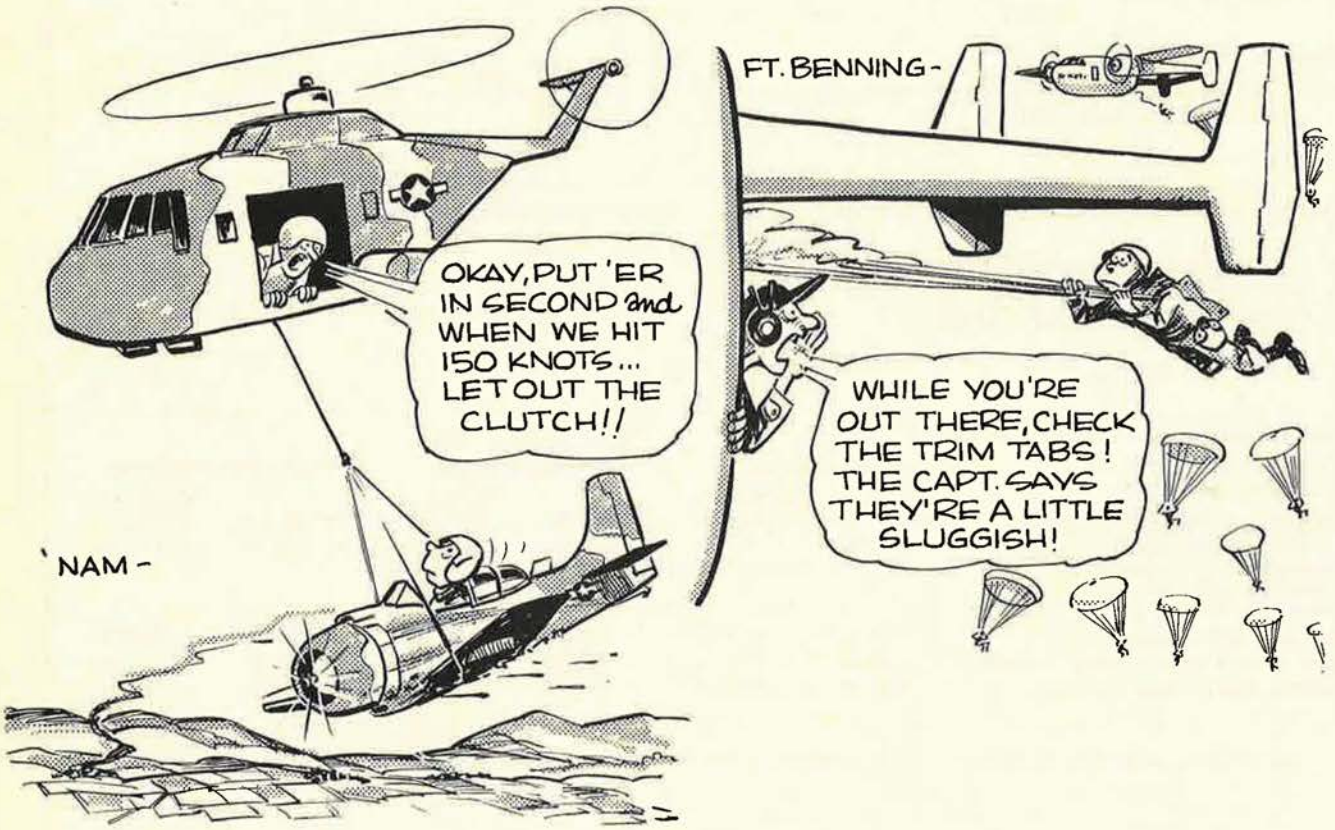
FORM 3676GL App. REV. 10-79

Application must be accompanied by a check or money order. Send remittance to:
Insurance Division, AFA, 1750 Pennsylvania Avenue, NW, Washington, D.C. 20006 3/81

Bob Stevens'

"There I was..."

IT'S POTPOURRI TIME AGAIN- HERE IS A SAMPLER OF VIGNETTES FROM VARIOUS TIMES and VARIOUS PLACES. NO BIG THEME OR MESSAGE - ENJOY!



Nostalgia Quiz Corner

WHAT DID THIS "MEMORY ENHANCER" MEAN? (TIP: IT WAS USED IN PLOTTING A COURSE).

"TRUE VIRGINS MAKE DULL COMPANIONS" answer

TRUE COURSE ± VARIATION = MAGNETIC COURSE ± DEVIATION = COMPASS COURSE.

The future is digital. With flight controls from Sperry.

The KC-10 Extender's aerial refueling boom must maintain a vital link between two high-speed aircraft only feet apart. Digital avionics from Sperry, including an active, fly-by-wire boom control system, provide automatic load alleviation and position rate sensing to help the KC-10 extend global mobility to the Air Force fleet.

Sperry's experience in digital avionics has produced the first digital flight guidance system, for the DC-9 Super 80. Digital air data computers for the F-15, F-16, and F-18. Multiplexer-demultiplexer systems for the AH-64 attack helicopter and the Space Shuttle. And we're working on advanced technology for next-generation aircraft.

How can we help *you?* Write Sperry Flight Systems, Defense and Space Systems Division, P.O. Box 29222, Phoenix, Arizona, 85036, or call (602) 869-2368. *We understand how important it is to listen.*

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48 "very precise contacts" in key test of KC-10.

In its first aerial refueling flight, hooking up with a C-5 transport, the KC-10 successfully passed what Air Force and McDonnell Douglas officials described as "the first significant test" for the new tanker/cargo aircraft.

Flying out of the Yuma Marine Corps Air Station, at 25,000 ft. and 255 KIAS, the KC-10 and the C-5 first conducted a series of proximity tests to establish flight characteristics of the two large aircraft in the refueling formation.

The test was important in that it flight-checked the advanced boom in the "bow wave" surrounding the massive C-5.

Comments from Air Force boom operators were that the boom was very stable throughout the enlarged operating envelope, and that the "boomers" were able to make very precise contacts.

The flight test successfully demonstrates one of the prime missions for the KC-10: Refueling of strategic airlifters. One refueling by a KC-10 can virtually double the range of a fully-loaded C-5.

The KC-10. It's in the air and on the way toward providing America with the strategic mobility it needs in the years ahead.

KC-10

MCDONNELL DOUGLAS