MARCH 1986/$5

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

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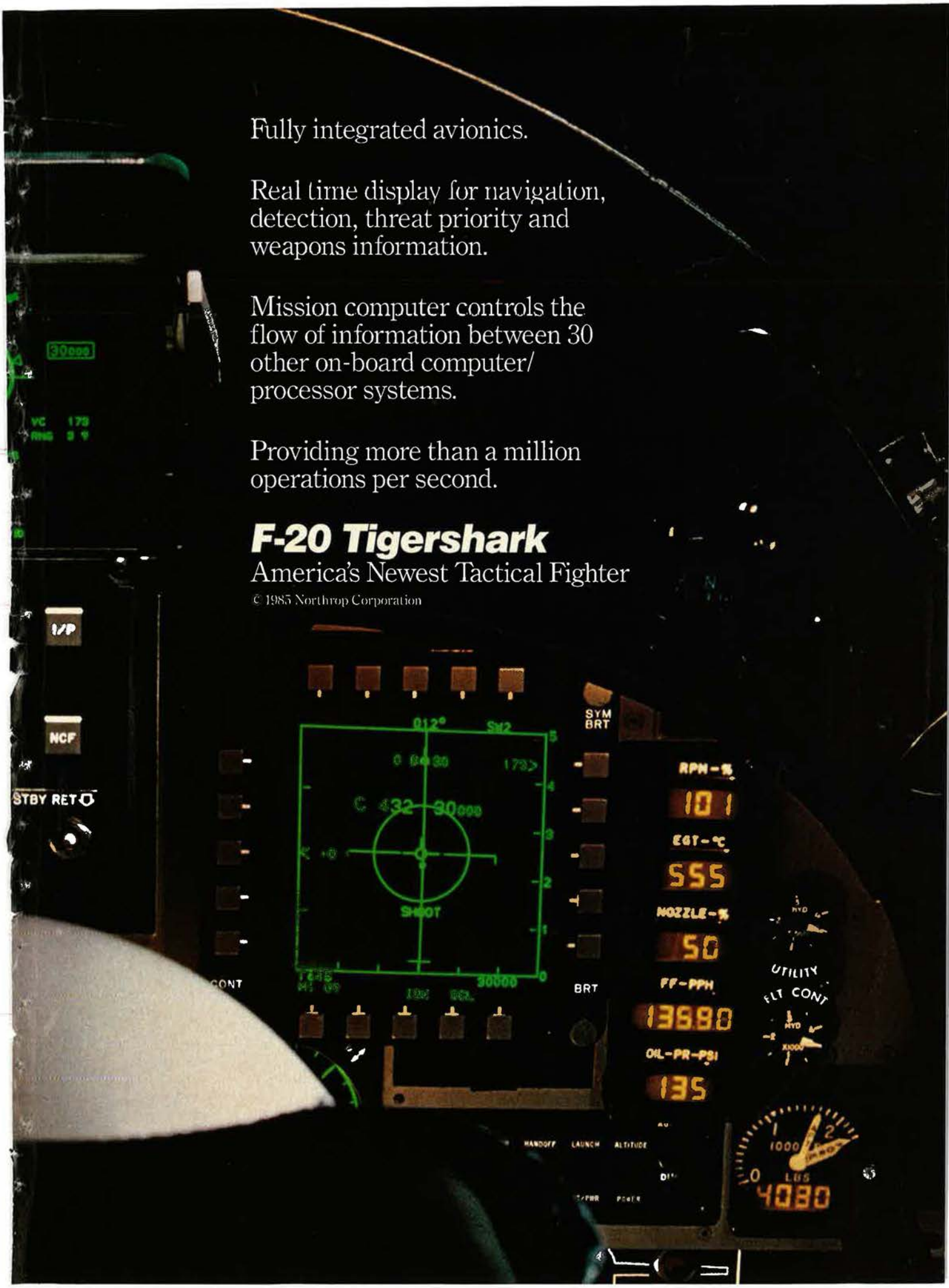
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MARCH 1986
VOLUME 69, NUMBER 3

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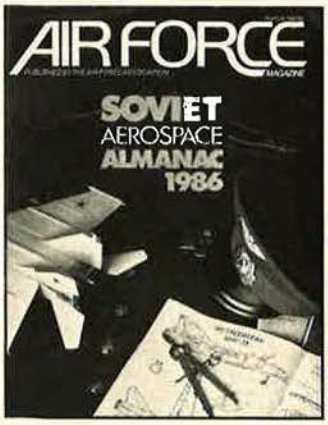

About the cover: The dark-green uniform of a Soviet Air Forces colonel dominates the cover collage. Our annual Soviet Aerospace Almanac begins on p. 40. (Photo by Tom Radcliffe)

Special Section: Soviet Aerospace Almanac

Features

Departments

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AN EDITORIAL

Nothing Ends Here

By James W. Canan, SENIOR EDITOR

NEARLY five years ago, on April 14, 1981, Space Shuttle *Columbia* landed like a champion at Edwards AFB, Calif., after orbiting the planet thirty-six times. A winged spacecraft had actually been flown back to earth in fine shape to go into space again.

Columbia's triumphant reentry and return marked the beginning of a new era for the United States in the space age. It held bright promise for the Space Transportation System (STS) of reusable Shuttle orbiters on which the National Aeronautics and Space Administration and the Department of Defense had pinned their hopes. It meant that the US, as Astronaut Robert Crippen put it on emerging from *Columbia* at Edwards, was "back in the space business to stay."

Shuttle flights became commonplace. With relatively few setbacks, military and commercial satellites were routinely deposited in space. Shuttle crews conducted scientific experiments, repaired a satellite, and came up with some observations of terrestrial features that space sensors had missed.

The Shuttle fleet was expanded to four orbiters. The Air Force built a Shuttle launch facility at Vandenberg AFB, Calif., and was preparing for its first launch of a military payload there this year.

USAF had become, in fact, overly dependent on the Shuttles. As a precaution, it moved to build ten big, new booster rockets as a complementary means of launching top-priority military payloads *(see p. 25)*. Even so, "In the future, the Space Shuttle will be our primary launch vehicle, and fully eighty percent of our launches will be on the Shuttle," USAF Maj. Gen. Donald J. Kutyna told an Air Force Association/Aerospace Education Foundation Roundtable audience last January 21.

One week later, *Challenger* blew up. The US space program, pegged to a Shuttle fleet suddenly reduced to three orbiters and with a fatal frailty shockingly exposed, was in trouble.

It is impossible to imagine how the human tragedy of the *Challenger* accident could ever be redeemed. For the space program, however, that accident may well have been a positive turning point.

There is every chance that the space program will rebound from it to become, in the long run, stronger and clearer of purpose than before.

For example, plans to go beyond the Shuttle in developing a new generation of reusable spacecraft—manned, unmanned, or both—have been crystallized by the *Challenger* catastrophe and are much more obviously justified. It is now conceivable that some such spacecraft will be capable of taking off from runways, vaulting into orbit, and circling the globe in no time flat. Their military and commercial applications are alluring, and it is time to hurry them along.

More broadly, space policymakers, scientists, and technologists are now called upon to bear down harder in their search for conclusions to some fundamental questions. Among them: What is man's role in space? What exactly does the nation need to accomplish in space? How much money will it and should it be willing to devote to space? Which new technologies will be crucial to the US exploitation of space?

Whatever the answers, one philosophical conclusion is inescapably clear. The US cannot pull back from space in the wake of the *Challenger* disaster. It must have assured, routine access to space for whatever purposes that it deems necessary, consistent with arms-control agreements, to deter war and, if need be, to wage war.

President Reagan had it exactly right. "Nothing ends here," he told the nation in the aftermath of the *Challenger* tragedy.

The President was at Edwards AFB on the Fourth of July 1982 to watch *Columbia* come back with flying colors for the fourth straight time. He took the occasion to enunciate his new National Space Policy, in which he ordered up a comprehensive civil and military program to establish and maintain US preeminence in space.

Less than a year later, President Reagan broached his Strategic Defense Initiative (SDI) program that would determine the feasibility of defending against enemy ICBMs with nonnuclear weapons, using space, if necessary, to "save lives rather than avenge them" should those ICBMs ever mount the skies.

The President also ordered NASA and DoD to identify the space-launch capabilities and technologies that the US will need in order to transcend the payload and orbital maneuvering limitations of the Shuttles well before the turn of the century. He also set up the National Space Commission as the first move in his Administration's formulation of a national strategy for space.

So the stage is set for the nation, if it has the will and can come up with the money, to gain the military and civilian supremacy in space that is President Reagan's goal. If it doesn't, the Soviets will.

Following the Apollo program and prior to the advent of the Space Shuttle, the US let its manned space program languish and concentrated instead on unmanned exploration of the solar system. The Soviets did it the other way around, learning well how to live and work in space. They also came up with an operational antisatellite (ASAT) system, worked hard on other kinds of space weaponry, and got going on a Shuttle of their own.

Shortly before the first US Space Shuttle flew, the late Gen. Jerome F. O'Malley, then USAF's three-star Deputy Chief of Staff for Operations, Plans, and Readiness, declared: "I fervently hope that the advent of the Shuttle will regain the initiative for the US in deploying man in space."

It did. Let us now fervently hope that the *Challenger* disaster does not sap that initiative and cause the US to forfeit its place in space. ■

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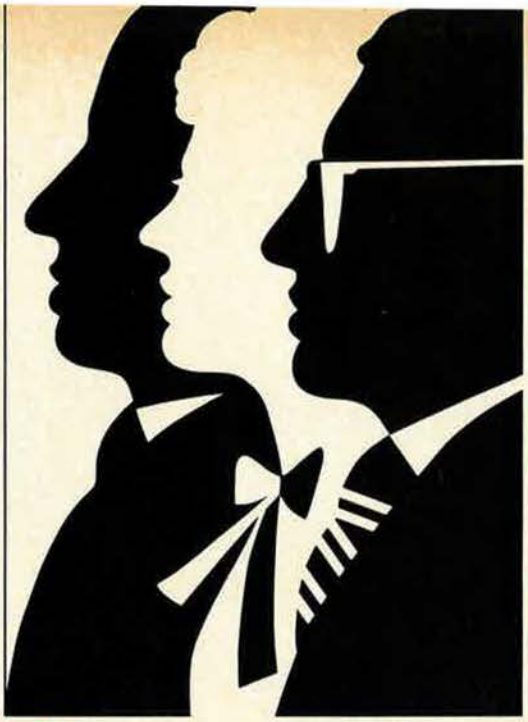

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Department of Defense attacks telecommunications expense with integrated satellite/terrestrial network.

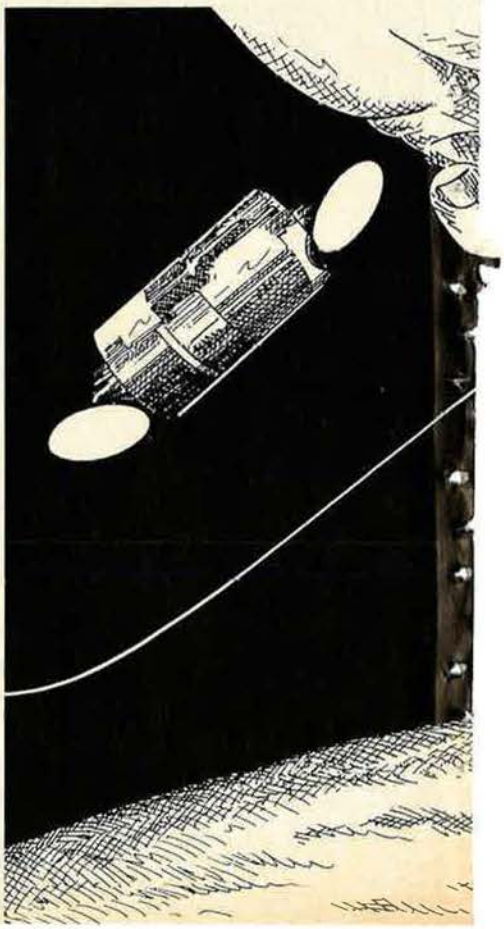
The Department of Defense is introducing new technology to military telecommunications by combining voice, data, and multi-point video teleconferencing in the world's first and largest centrally-controlled, digital integrated network.

Developed and managed by AT&T, the Defense Commercial Telecommunications Network (DCTN) provides network flexibility through software reconfigurability. Network privacy is ensured by sophisticated Data Encryption Standard (DES) protection on Telstar 3 satellite links.

The system is being introduced by the Defense Communications Agency in cooperation with the Military Departments and the GSA.

Weekend reconfiguration of IRS "800" network hardly taxes its system.

When the IRS recently conducted a weekend TV tax clinic on the Spanish Information Network, AT&T was asked to reconfigure the agency's Advanced 800 Network so that viewers' calls could be answered during the program. AT&T reconfigured the software for the network, which handles millions of taxpayer queries every week, so that clinic calls from local viewers could be routed directly to IRS locations. Then, after the broadcast, AT&T restored the network to its standard configuration, ready for the usual Monday morning deluge of calls from taxpayers.

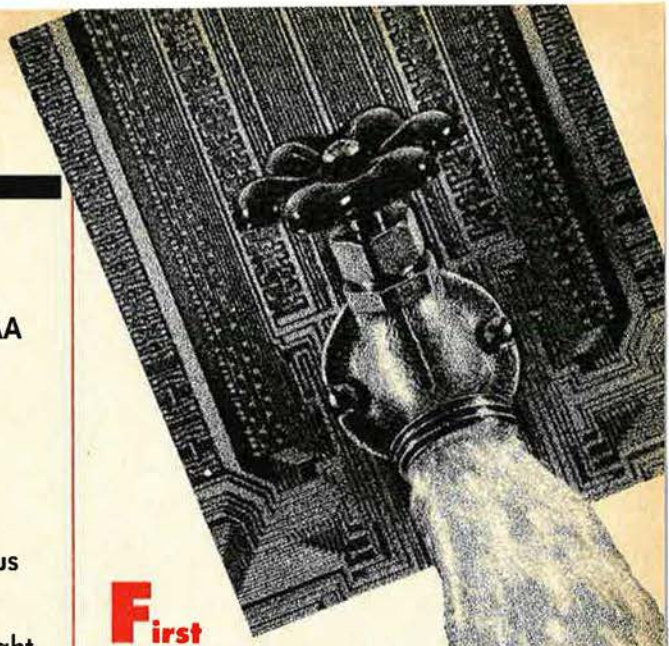


Microwave link technology to be backbone of new FAA Air Traffic Control System.

Faced with the problem of handling 28 million flights a year, the FAA is taking a major step to improve its Air Traffic Control System.

A 1,000-station microwave network—engineered, manufactured, and installed by AT&T—will help reduce the cost of linking FAA air traffic control facilities in the future, when the system is expanded.

Designed to provide high reliability, the system includes back-ups to ensure continuous communication through any problem that might arise.



First commercially available megabit chip announced by AT&T.

This new memory device pours out 1,048,576 bits of information faster than you can say the word "byte." Its unique fast-column access mode is roughly twice as fast as the page mode of other megabit chips. Created by scientists at AT&T Bell Laboratories, and planned for use in a number of Department of Defense computer and signal-processing applications, the megabit chip uses only ⅛ the power-per-bit of most 256K DRAMs.

For more about the items on this page, dial **1 800 424-2988, Ext.1.** In metro Washington, dial **457-0177, Ext.1.**

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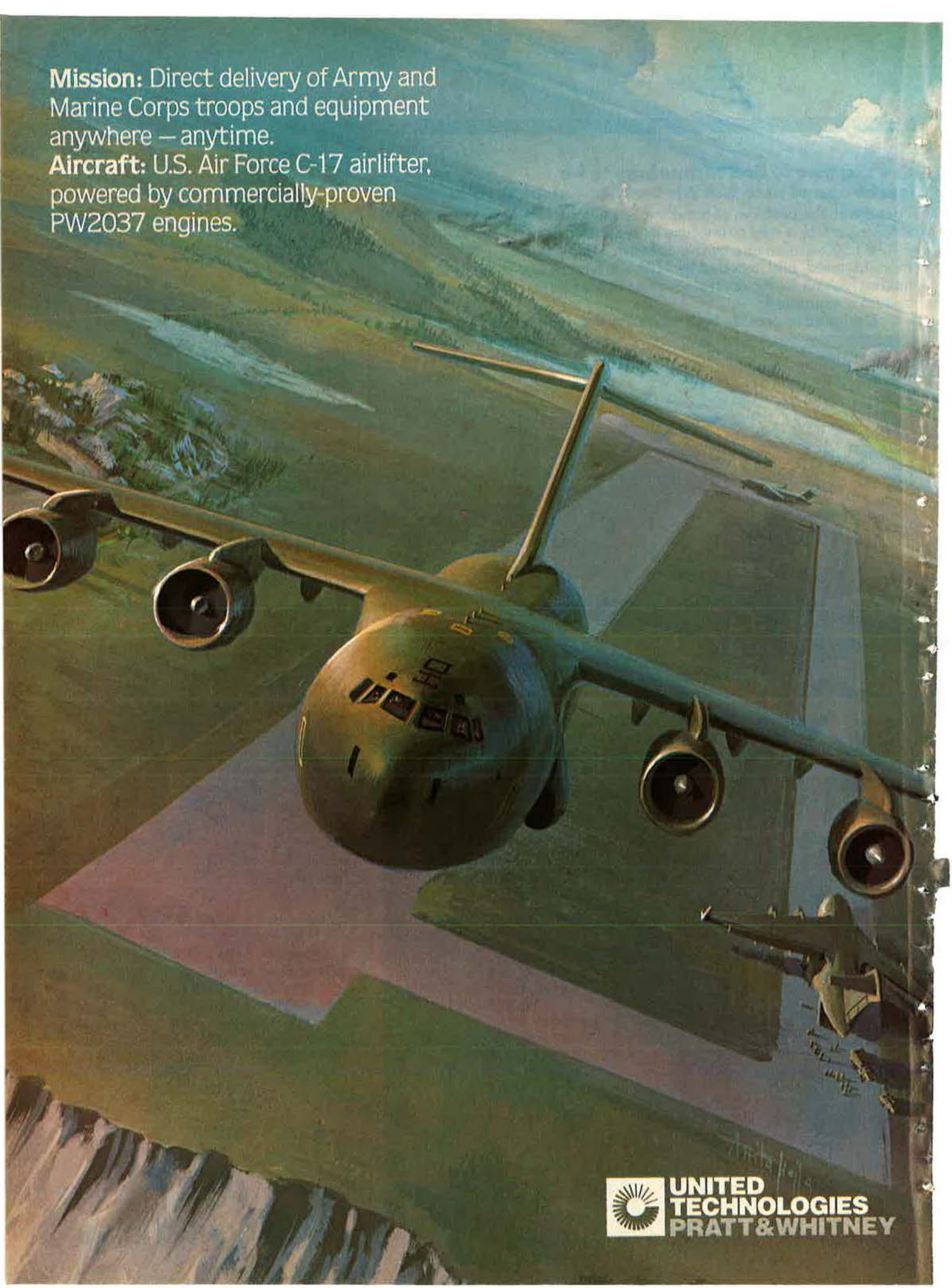
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Aircraft: U.S. Air Force C-17 airlifter, powered by commercially-proven PW2037 engines.
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AIRMAIL

Too Few Flying Hours?

I have just finished a very enjoyable several hours reading the special section on aeronautics in your January 1986 issue. But I was dismayed by a statistic cited in the article "Progress, Priorities, and Fantasies" *(January '86 issue, p. 86).* The author states, "Average flying hours in the tactical force now run at about 142 per year. . . ."

There were two reasons for my dismay. First, in the article "Jane's Aerospace Survey 1986" in the January '86 issue, the point was made that the lack of experience in the Royal Netherlands Air Force "may result from the restriction to only 180 hours' flying a year." The second reason was my own experience. I separated from the Air Force in 1979, and in more than twelve years of flying the F-4, I averaged slightly more than 226 hours per year. How can we expect our aircrews to operate effectively in an environment as taxing as the one we are placing them in with that amount of practice?

On a different subject: Since leaving the service, I have worked for one of DoD's prime contractors. I would like you to know that I continue to be amazed at the level of knowledge that the managers and design engineers have about the environment that today's fighting forces operate in. They spend a great deal of time reading, listening, and learning in order to provide a product that meets the need. All of our group spends a great deal of time and money trying to produce a better, cheaper, and more reliable product.

While this is not altogether altruistic (if we don't keep up, we lose business and profits), the result is a better weapon system for the fighting forces and a better price for all of us taxpayers.

Frederick J. Meyer
Richardson, Tex.

Safety and Black Boxes

Your article "USAF's Safer Skies" in the January 1986 issue describes the impressive achievements in aerospace safety that have occurred over the years and correctly relates the need for crash-survivable flight data recorders (CSFDRs) in today's environment of expensive, complex aircraft, fly-by-wire flight controls, and cockpit CRT displays. You state that CSFDRs are installed only in the "most modern" USAF aircraft. Actually, CSFDRs are currently found in certain USAF transports, the argument being that the weight and volume penalty of recording systems could not be tolerated in fighter, trainer, and attack aircraft.

All that is changing now because of rapid advancements in recording technology that use solid-state memory devices and data-compression techniques. Lear Siegler's Instrument Division is developing a recorder, now in flight test, for installation in the F-16C/D beginning in 1987. The eighteen-pound system consists of two boxes, one to collect and process the data and another to protect information stored in the memory. . . . The crash-protected memory will furnish the accident investigator with more information than has been available from any previous recorder. . . . Designed to a triservice specification, the CSFDR will be applicable to Army, Navy, and USAF aircraft.

We support the Safety Center in aiming for the 1.25 Class A mishap rate, and we're confident that the CSFDR will make a major contribution to that goal.

Jerry Schopf
Lear Siegler, Inc.
Fort Worth, Tex.

Follow That Gas Station!

The "dumb almost-accident" related in "USAF's Safer Skies" in the January '86 issue brought to mind a similar incident. It also occurred on a black moonless night in advanced training (B-25s, Class 44-G, Moultrie, Ga.).

As No. 2 on takeoff, I had been briefed to join up on the instructor by turning into, or leading, his navigation lights—a pretty cluster of red, green, and white lights. As we climbed out, leading the lights as instructed, I thought we were turning rather sharply, and so did the guy in the right seat. He hit me on the shoulder and asked, "Where are you going?" I replied, "I got him. I got him!" A moment or two later, as the aircraft experienced ever-increasing bank and decreasing airspeed, he hit me again and shouted, "What are you *doing?"* As I started to reply, he screamed, "That's a damn *gas station!"*

And so it was. Thank you, then-Cadet Jankovic, wherever you are.

Lt. Col. William A. Callis,
USAF (Ret.)
Pawleys Island, S. C.

Technology Transfer

I would like to comment on the January 1986 issue of your magazine. The article in question is "Jane's Aerospace Survey 1986."

I do not understand why our country is so lax concerning technological security. As a taxpayer and strong supporter of national defense, it disturbs me greatly that our defense R&D to develop weapon systems and aircraft is copied and implemented by the Soviet Union at a fraction of the original cost paid by the United States.

Is it fair for the United States to be the creator of advanced technology that the Soviet Union uses for its benefit to produce defense systems at a real savings in time and money? In a sense, we are technological slaves to the Soviet Union. . . . Where does it end?

I honestly believe that R&D and enhanced security should go hand in hand. A complete security umbrella over all of our defense R&D is not a

Do you have a comment about a current issue? Write to "Airmail," AIR FORCE Magazine, 1501 Lee Highway, Arlington, Va. 22209-1198. Letters should be concise, timely, and legible (preferably typed). We reserve the right to condense letters as necessary. Unsigned letters are not acceptable, and photographs cannot be used or returned.

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AIRMAIL

bad idea. Let's widen the gap, shall we?

Chris G. Buemi
Palatine, Ill.

A Problem of Leadership?

This letter concerns the "Viewpoint" article on "The Quest for Unity" in the January 1986 issue. I feel that the article addresses effects or symptoms, not the real cause of the problem. Let me try to explain.

I think the root problem in the military today is one of leadership. Pursuing mission objectives has become second to individual careers and single organizations or services. It appears that this situation most likely evolved from an officer corps that lost or forgot most of the basics of the trade, including duty, honor, and country.

Politics has been the key catalyst in the evolution of this situation—specifically, the trading and bartering of vested authority. This goes on now in the military as it does in the civilian side of government as well as private industry. However, the military deals in commodities that must not be bartered: national security and the lives of military personnel.

Politics must never cross the organizational authority lines between the service Secretaries and the service Chiefs or the operational authority line between the President and the Secretary of Defense and the Joint Chiefs of Staff. To ensure that this never happens, our military leaders must know their trade, obey their oaths, and show all others that they have the integrity, discipline, and will to do so. Our top civilian leaders must demand it from them, thereby helping them to find the courage to do it.

The people whose freedom must be protected and who do not understand the military profession deserve nothing less than selfless service from public officials at all levels. We may very well need some "politicians" on the staffs to lubricate the system. However, military commanders and civilians with the vested authority must remain within the structure and address the mission with crystal-clear understanding and objectivity.

Most important, we must not try to change a workable structure as an excuse to avoid the more basic cause of the present problem. We must find the personal courage to tell someone that they are doing it wrong and that they must do it right. If personal courage would replace personal interest, then the current system would work just fine!

Col. Robert E. Kellock,
USAF (Ret.)
Marina Del Rey, Calif.

Proud to Serve

I sensed an "I'm quality, but the Air Force has done nothing for me" attitude from the "Airmail" letters titled "Quality People" in your January 1986 issue. I suppose getting reimbursed for being "quality people" is relative. In my experience with officers and enlisted alike, I have found that, because of our benefits, we are very fortunate and are, to put it bluntly, spoiled.

When I joined the Air Force in September 1970, I was considered poor by most social standards. I was a high-school dropout. I did not understand the Air Force way. Getting through my five-level CDCs was an enormous task. The Air Force had a lot to offer, though, and I took advantage of it. I worked long and hard to get my GED, and I'm very proud of it. I have since earned a CCAF degree and a bachelor of science degree in civil engineering and now have the opportunity, with the Air Force's help, to pursue a master's degree.

I'm married and have two children, with a new arrival expected. My wife and I manage our money well enough so that she does not have to earn an additional income. As a matter of fact, she's getting her associate degree in middle management through the base education office. Should the need occur, or if she wishes to take outside employment, she'll be prepared.

We enjoy the many other benefits in dollar savings and medical services that the Air Force provides. Since we live on base, we have a comfortable house that is nearby the base exchange, commissary, hospital, library, education office, and many other money-saving facilities.

I'm concerned about what the government has to pay for "quality people." What else does it take? The Air Force is trying to get dental care for our dependents, more PCS moving assistance, and other benefits. When I retire, I'll be able to draw a nice monthly retirement check for the rest of my life—not counting the medical benefits for life. At that time, I'll still be young enough to continue a career on the outside. Again, what else does it take to change some people's attitude?

Perhaps those disgruntled people,

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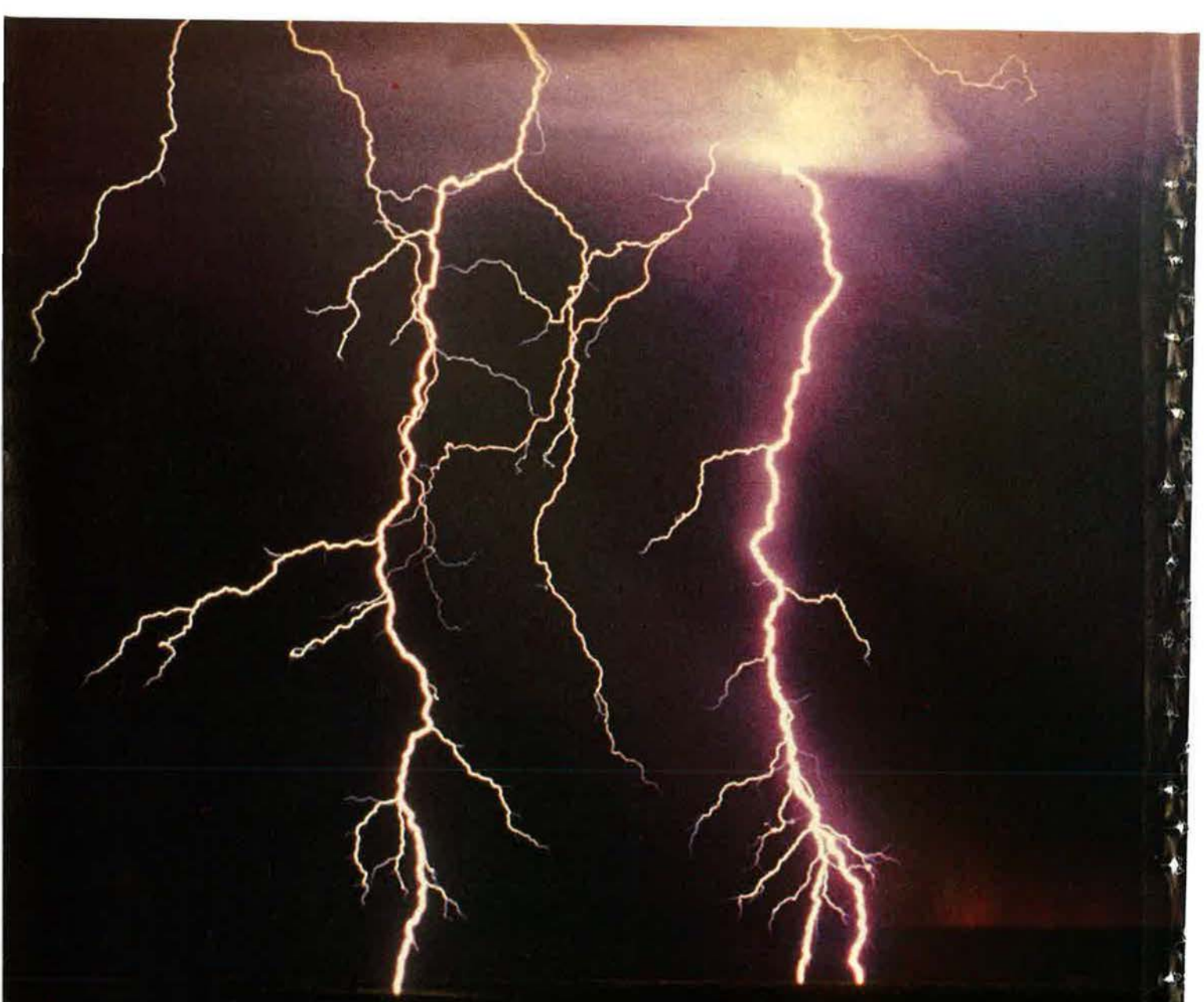

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regardless of their qualities, should get out and make room for qualified, enterprising people who are proud to serve and be members of the United States Air Force.

TSgt. William A. Proffit, USAF
Fairchild AFB, Wash.

Airline Accidents

The cutline beside the photograph on page 83 of your January 1986 issue stated that 1985 was a new high for the number of commercial airline accidents. That is not the case. Last year was a new high for the number of fatalities.

If the airlines were formed into a single organization, I'm sure they would now be writing you about your "irresponsibility." My point is that whether you call something irresponsible or a simple mistake often depends on which side of the fence you are standing.

Robert L. Gore
Las Vegas, Nev.

• *According to the Federal Aviation Administration, "The number of major commercial airline accidents reached a new high" in 1985, as we reported. Incidentally, the FAA says also that 1985 was the worst year for worldwide commercial airline accident fatalities, but not for US airline accident fatalities.*—THE EDITORS

Phantom Upgrade: Pro . . .

Capt. William A. Clifford neglects important facts and makes several incorrect assumptions in his assessment of an F-4 upgrade program *(see "Airmail," p. 9, January '86 issue).*

In fighters, task saturation is not solely due to flying qualities. Instead, it results from a combination of flying the aircraft, employing the weapon systems, and negating enemy threats. The HUD and cockpit avionics proposed for the F-4 would greatly reduce the task level of the crew. It might even be argued that with the improved avionics and two-man crew, the F-4 could be employed for missions that would task-saturate single-seat fighters.

The impact of an F-4 upgrade on the "Pilot's Associate" is a moot point. The Pilot's Associate program will not be implemented in a fighter before the year 2000. Upgrading F-4s will not thwart this *research* effort and will improve tactical airpower during the interim.

Captain Clifford apparently doesn't understand that modern radars and missiles decrease the importance of maneuverability in visual identification as well as BVR air-combat scenarios. A reliable look-down radar is vital for obtaining a tally-ho (often the deciding factor in engagements). The all-aspect, off-boresight capability of the AIM-9L makes it the "great equalizer" in dogfight scenarios. Also, greater maneuverability is not a key criterion for performing low-level interdiction missions. In any case, it should be remembered that F-4 maneuverability would be improved by the addition of higher-thrust engines.

Currently, the F-4 *is* expensive to maintain. The proposed F-4 modernization program would replace most of the high-maintenance items with modern, reliable, off-the-shelf systems, greatly reducing the maintenance required. In many cases, the reduction in maintenance costs would pay for the new system.

Captain Clifford suggests that the Air Force would be better off with fewer but more capable fighters. However, at some point, a numerically superior fighter force will defeat even our most advanced fighters. This is a major reason why TAC desires to increase its fighter force to a minimum of forty wings. The question is how to accomplish this under the restrictions imposed by the Gramm-Rudman-Hollings legislation.

I agree with Captain Clifford that "museum pieces should not be out on the flight lines in defense of our nation." The harsh reality is that unless our F-4s are upgraded, this will be the case for the next fifteen years.

Capt. Jeffrey G. Canclini, USAFR
Edwards AFB, Calif.

. . . And Con

Back in the early days of World War II, when the P-40 was getting badly shot up by the Zero, it was stated by a leading "expert" that the P-40 should not be withdrawn because it was nonetheless the more maneuverable. Captain Clifford could not be more correct about the upgrade of the F-4. Don't do it.

General Dynamics has committed to producing the F-16 in numbers for the same money as upgrading the F-4. Which would you rather fly in combat against the Su-27?

If the Air Force will go to General Dynamics and tell them how many F-16s, current model, that they must have and by what time, I am quite sure that General Dynamics will perform.

Edward V. Collom
Minden, Nev.

AIRMAIL

The Pregnant Guppy

I enjoyed the article by C. V. Glines on "The Grand Old Gooney Bird" *(see December '85 issue, p. 94).* However, I was a bit surprised that there was not any mention of the bomber version of the C-47—the B-18, frequently called the Pregnant Guppy.

We had them in the 17th Bomb Group at McChord Field in the early 1940s. The B-18 was a C-47 with an extended bomb-bay belly and a bombardier nose. We also flew them on coastal patrol out of Chandler Field at the beginning of World War II.

Col. W. E. Sault, USAF (Ret.)
Minnetonka, Minn.

B-26 Marauder

I am currently working on a book on the Martin B-26 Marauder's role in World War II. The text is complete, but I need photographs of the Marauder in the air or on the ground and under combat in the South Pacific, Alaskan, Mediterranean, and European theaters of war.

I would appreciate the loan of any such photographs that readers might have. I will give proper credit. All photos or negatives will be treated with extreme care and returned promptly after copies are made.

Lt. Col. J. K. Havener, USAFR (Ret.)
5579 Melvin
Memphis, Tenn. 38119

Daniel Field

I am attempting to gather material relating to Daniel Army Air Field, which was located in Augusta, Ga., during World War II.

Of particular interest are photographs of the flight line and hangar area, cantonment area, and the administrative area. An aerial photograph of the base is most desirable. Also needed are personal remembrances of the base and the immediate surrounding area.

This material is being gathered for a possible forthcoming article about Daniel Field and for a book that will include chapters covering Daniel Field during World War II.

Any assistance in obtaining any of the needed material will be most gratefully appreciated.

Arthur R. Holliday
4121 Michael Pl.
Hephzibah, Ga. 30815

B-29 *Snugglebunny*

I would like to enlist the help of readers in a research project. I am cur-

rently collecting data on the career of *Snugglebunny,* a B-29 (44-69667) that flew with the 6th Bomb Group during World War II and with the 98th Bomb Group in Korea. I am hoping to write a book on the grand old bird.

I would like to hear from anyone who flew or maintained her or who was just around her. I am looking for any information or anecdotes pertaining to the specifics of her operational life. Interior as well as exterior photos of *Snugglebunny* would also be appreciated. These, of course, would be copied and returned to the lender.

Robert A. Mann
39211 Logan Dr.
Fremont, Calif. 94538
Phone: (415) 792-6177

Trainer Aircraft

I should like very much to hear from anyone who has flown or served as a mechanic or technician on any military training aircraft dating from JN-4s through all primary, basic, and advanced trainers up to the present. This would include post-advanced "training" and "familiarization" flying, such as with P-39s and P-40s, etc. I am also looking for photos of these aircraft.

Please contact me at the address below.

C. M. Morris
417 Fourth Ave., S.
Grand Forks, N. D. 58201

U-2 Incident

I am looking for any information on Francis Gary Powers and the U-2 incident. I am doing a report on him and what happened to him after the ill-fated flight on May 1, 1960, during which he was downed by a near-miss.

If you have any information, please contact me at the address below.

Russell Mackey
6318 Forest Hills Ct., N. E.
Albuquerque, N. M. 87109

Yankee Air Force C-47

The Northeast Division of the Yankee Air Force is assisting in the restoration of a World War II C-47B aircraft, serial number 43-49819-D-K.

We would like to hear from anyone who had any contact with this venerable old aircraft. We would like to return it to its original configuration and colors.

Please contact the address below.

Otto K. Mueller
95 Franklin St.
Cedar Grove, N. J. 07009

Korean War

For the second volume of an oral history of the Korean War that will cover the period from New Year's Day 1951 to July 1953, I would appreciate hearing from veterans who have human-interest stories, anecdotes, diaries, or letters.

Anyone who can contribute to this effort should contact me at the address below.

Donald Knox
4661 Marlborough Dr.
San Diego, Calif. 92116

AIRMAIL

ACSC Eagles

The Air Command and Staff College is researching the activities of Brig. Gen. Harold R. Harris, USAF (Ret.), Col. William R. Lawley, USAF (Ret.), Lt. Gen. Benjamin O. Davis, USAF (Ret.), Lt. Col. Clyde B. East, USAF (Ret.), Col. Joseph W. Kittinger, USAF (Ret.), and Lt. Col. Roger Locher, USAF.

We would appreciate hearing from anyone possessing period photographs of these individuals and their aircraft. Postage and reproduction costs will be refunded. Time is crucial.

Please contact the address below.

ACSC/CCX
Bldg. 1402
Maxwell AFB, Ala.
36112-5542

Harvard Refugee Project

I am soliciting information regarding USAF liaison with the Harvard Refugee Interview Project in Munich, Germany, during 1950–51. I would appreciate hearing from any former USAF personnel associated with the Harvard Project.

Please contact me at the address below.

Charles T. O'Connell
Dept. of Sociology
UCLA
405 Hilgard Ave.
Los Angeles, Calif. 90024

AAS Staffelbach Squadron

The Staffelbach Squadron of the Arnold Air Society at AFROTC Detachment 045 at San Jose State University is currently looking for news of its alumni. If you are an alumnus (or if you know someone who is), please send us your name, rank, current mailing address, job assignments, year of graduation, and any other information that you would like to include.

We would like to start an alumni newsletter. Any information that you can provide will be greatly appreciated. Please respond to the address below.

Arnold Air Society
Staffelbach Squadron
AFROTC Det. 045
San Jose State University
San Jose, Calif. 95192-0051
Phone: (408) 277-2743

AFROTC Det. 155

If you are an alumnus of AFROTC Detachment 155 at the University of Miami, the cadets presently in the corps would like to hear from you. Your experiences and travels are of extreme interest to our cadets.

Will any alumni please send a short biography to the address below? If you need any help in finding fellow alumni, please ask us, and we'll get back to you.

AFROTC Det. 155
University of Miami
Coral Gables, Fla. 33124

AFROTC Det. 206

A newsletter for alumni of AFROTC Detachment 206 at Southern Illinois University at Edwardsville has been started.

Any person who was associated with Detachment 206 and who would like to receive a copy of the newsletter should write to the following address.

AFROTC Det. 206
% C/2d Lt. Susan Miller
Southern Illinois University
Edwardsville, Ill. 62026-1048

Collectors' Corner

I am a collector of military manuals of all kinds. I am especially interested in pilot's manuals and manuals on weapons and weapon systems. I also collect other military artifacts of all kinds and would like to hear from anyone having such items for sale.

Please contact me at the address below.

Mitchell L. Smith
11352 Wells Rd.
Maybee, Mich. 48159

I am an active-duty Air Force staff sergeant and a collector of Air Force, AFRES, and ANG unit patches. I would like to hear from any fellow collectors with trading in mind. If you send me a list of your patches, I will reply. (Donations are also gladly accepted.)

Please contact me at the address below.

SSgt. Kevin J. Killean, USAF
306 Longleaf Rd.
Sangaree
Summerville, S. C. 29483

I would like to hear from someone who would be interested in acquiring a collection of more than 500 three-by-five-inch glossy black-and-white photographs of aircraft. The collection includes photos covering the period from 1905 to 1955. Fifteen eight-by-eleven-inch glossy B&W photos are included in the collection.

Please contact me at the address below.

Peter M. Hansen
3822 Jason Circle
Torrance, Calif. 90505

For the past five years, I've been collecting anything I can find about F-100, F-101, F-102, F-104, F-105, and F-106 aircraft. I would especially like to receive donations of slides and photographs. I can exchange information about the Royal Netherlands Air Force.

Please contact me at the address below.

Jeff van Summeren
Kleuterweg 1
5406 SC Uden
The Netherlands

I am a very serious collector of unit patches of USAF Special Operations Forces, past and present. Information about patches of C-47, AC-47, AC-119, AC-130, MC-130, and other special ops and air commando units would be greatly appreciated. I have trade items or will accept donations.

Fred Gockel
76 Josie Rd.
Mary Esther, Fla. 32569

I am beginning a collection of USAF patches and unit crests. I am also looking for pilot flight manuals for aircraft used by USAF, AAF, and USN/USMC.

Please contact me at the address below.

Pete Biebel
61-39 84th St.
Rego Park, N. Y. 11375

I would like to trade for or buy any squadron patches from any branch of the services. I have some extra patches for trade.

Please contact the address below.

A1C Charles R. Barton, USAF
PSC Box 2983
Holloman AFB, N. M.
88330-5365

I am a serious collector of any and all Air Force tanker unit patches. I would especially like to find any unofficial boomer patches.

Louis M. Michell
4809 Via Ventura
Mesquite, Tex. 75150

Roll Call

I am trying to locate retired Col. James H. Miles, who was last heard from at Barksdale AFB, La., fifteen years ago.

Anyone knowing his present address is asked to contact me at the address below.

Ted E. Slanker
10001 E. Michigan Ave.
Sun Lakes, Ariz. 85224
Phone: (602) 895-9312

I am looking for Jack "Lucky" Vogel. He was born in the late 1920s in Pennsylvania and served at Lowry AFB, Colo., from 1948–49. He played bass fiddle.

Anyone knowing how I might find this person should contact me at the address below.

Lori-Ann Paynich
P. O. Box 5313
Tucson, Ariz. 85703
Phone: (602) 624-6016

IN FOCUS...

Hipshots in the Dark

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

Dingell's sweeping charge of waste and abuse in USAF "dark" programs turns out to rest on farfetched deductions and illogical conclusions.

Washington, D. C., Feb. 4

Rep. John D. Dingell (D-Mich.), Chairman of the House Subcommittee on Oversight and Investigations, has, in a seeming shot in the dark, targeted the Air Force's so-called "black" programs, especially the Advanced Technology (or "Stealth") Bomber, for intensive investigations. In a recent letter to Defense Secretary Caspar Weinberger that was hyped for broad media consumption, the Michigan Congressman claimed that the "subcommittee is aware of an increasing number of abuses by the contractors involved in these 'black programs.' We have documented evidence that abuses are occurring."

Elsewhere in his widely publicized letter to Secretary Weinberger, Mr. Dingell quotes unnamed trade journals to the effect that the "Stealth" bomber program might cost as much as $47 billion. Mr. Dingell then leaps nonchalantly to the conclusion that "with such enormous sums involved and the propensity of many contractors to plunder the Defense Department, coupled with ineffective oversight, it is little wonder why 'black' programs foster waste and abuse."

The "substantiation" for these sweeping charges that Mr. Dingell appended to his letter is a sentencing report by the United States District Court, Central District of California, on a defendant by the name of Ronald Emile Brousseau, Sr. Brousseau had pleaded guilty to two counts of mail fraud and one count of receiving kickbacks on government contracts. According to the sentencing report, the "defendant admitted, as part of his guilty plea, to receiving a $4,000 bribe in June 1984 in exchange for his awarding a Northrop Corp. subcontract on the government's classified Stealth program" to a machine shop in Chatsworth, Calif.

The link between Mr. Dingell's discovery of transgressions by a second-tier former Northrop purchasing agent—whose malfeasance was discovered and reported to the FBI by company superiors—and his omnibus indictment of the Air Force's "black" programs appears farfetched at best. His call for investigations is probably motivated by recurring rumors on Capitol Hill about alleged cost overruns and schedule slippages involving the "Stealth" bomber program.

While for good and valid reasons much of the information surrounding the Advanced Technology Bomber (ATB) is classified, AIR FORCE Magazine has learned from authoritative sources that the program is progressing well and that the unit cost of the new bomber—on an "apples-to-apples" basis—will be within three percent of that for the B-1. The suggestion of cost overruns is groundless for a number of reasons, one of which is technically unassailable: the program's baseline hadn't been firmed up until just now. Any overruns, therefore, would have had to occur "before the fact."

City-Busting Beams Dismissed

Recent highly theoretical studies have created a media spectacular by equating the Strategic Defense Initiative (SDI) with the ability to burn down whole cities from space instantly. The notion underlying these studies is that directed-energy weapons—such as high-powered lasers capable of heating up ICBMs above the atmosphere so that they break up—could also be used to incinerate cities on the surface of the earth. Pentagon experts consider this apocalyptic view farfetched and militarily nonsensical.

Several physical factors militate against the feasibility of these types of laser attacks. For one, laser energy cannot penetrate the atmosphere easily, especially downward from space. There are *some* advanced concepts on how to ease the scattering effects of the atmosphere on laser energy that is being pumped from the ground into space. There are *no* known ways for reliably delivering lethal amounts of laser rays from space to the ground. SDI's proposed use of defensive space-based lasers, therefore, is confined to the interception of ICBMs after they have climbed through the atmosphere, but preferably before their post-boost vehicles can disperse their individual MIRVs.

Starting fires on the territory of a potential adversary by using space-based lasers during periods when the atmospheric conditions might permit that seems to make little sense for a number of reasons. For one, the cost of doing so is exorbitant. In addition, the military impact would fall barely above the mischief level. Clearly, both nuclear and conventional warheads delivered by missiles or aircraft can be used far more effectively and reliably to "start fires" on the ground than can space-based lasers.

Aside from the seeming infeasibility of using space-based laser weapons to burn down whole cities in minutes and create environmental catastrophes resembling a "nuclear winter," the notion that one side would use its lasers to burn down the other side's cities overlooks the fact that the "victim" would almost certainly respond in kind. The net result would be another form of mutual assured destruction (MAD).

One of the studies warning of this alleged offensive capability associated with SDI's concept of space-based laser defenses against ballistic missiles counseled against the advisability of sharing SDI technology with the Soviet Union. These concerns seem to be premature. For the time being, serious military concerns about offensive fallout from SDI's proposed defensive space lasers—either based in space completely or in the form of mirrors that relay ground-generated laser energy—are confined to their potential use as antisatellite weapons. But the prospect for effec-

tive countermeasures will probably negate even these concerns before SDI could achieve operational status.

Mobile ICBM Ban?

One of the more startling facets of the strategic arms-control terms reportedly proposed by the US at the Geneva negotiations is to ban all mobile ICBMs. Some military experts originally favored language that would outlaw only all MIRVed mobile systems. This proposal was presumably aimed at keeping the Soviets from deploying their ten-MIRV SS-24 on rail-mobile launchers, halting the MIRVing of the mobile SS-25, and shutting down the development of yet newer MIRVed mobile systems known to be in the USSR's R&D pipeline.

Such a provision would not have affected the US Midgetman, a small single-warhead missile meant to be deployed primarily in a mobile but possibly also in a complementary fixed superhard fashion. Elements of the Pentagon and the National Security Council eventually broadened that language to encompass all mobile ICBMs in the proposed ban. The result is that the US proposal would rule out all mobile ICBMs, including a mobile Midgetman or the rail-mobile deployment of the second fifty MX Peacekeepers—assuming that such a deployment were sought by the Administration and authorized by Congress.

The reasoning behind this Administration action seems to be the belief that US space-based sensors are unable to keep track of and locate Soviet mobile ICBMs and that the prospects for improvements in this regard are slim. If that were so, it would presumably be best to maximize the negotiating leverage at the Geneva arms-control talks that resides in the mobile Midgetman *before* the Soviets shift major portions of their ICBM arsenal to a mobile deployment form. The risk that the Soviets might continue the deployment of mobile ICBMs even after a treaty incorporating such a provision had gone into effect was apparently allowed for by the Administration. But even that eventuality was apparently deemed preferable to unbridled deployment of new generations of mobile Soviet ICBMs that would largely be beyond the ken of the US space-based detection systems.

Another Administration arms-control proposal that plays to mixed Pentagon reviews is the offer to halt air-launched cruise missile deployments at 1,500 or 1,700 weapons. If accepted by the Soviets, this condition could force termination of this country's advanced cruise missile (ACM) program, a largely "dark" effort aimed at replacing the ALCM-B cruise missile with a design incorporating advanced low observable features, significantly greater range, and higher accuracy. On the other hand, if the US decided to proceed with the development and deployment of ACMs, then the proposed ceiling would force the ALCM-Bs out of the inventory.

This latter—obviously militarily preferable—course of action is apt to raise congressional hackles in a constrained budget environment. The ALCM-B, although unquestionably less capable than ACM, is nevertheless an essentially brand-new weapon. The programmed buy of some 1,700 ALCM-Bs is just about to be completed, yet the missile might have to be scrapped before the end of the decade to make room for ACM.

Some Pentagon experts see a way out of this dilemma. They recommend that any ALCM-Bs that come out of the inventory be converted to a conventional warfare role. This could be achieved at relatively low cost by trading off some of the weapon's fuel for an increase in payload and by retrofitting Navstar GPS receivers. The result would be an extremely accurate missile capable of delivering a nonnuclear warhead weighing about 1,000 pounds over a distance of about 1,000 miles. (ALCM-B carries a much lighter nuclear warhead over a distance of 2,000 miles.) The Soviets, of course, would have to be persuaded to accept some mutually-agreed-upon visible means for differentiating between nuclear-armed strategic and conventionally armed tactical cruise missiles. This would not appear to be an insurmountable problem. Under the SALT II terms, for instance, the Soviets agreed to visible differences—called FRODs, for functionally related observable differences—between bombers equipped for various missions, such as types converted for cruise-missile carriage and others that are not.

While the cost of ALCM-Bs converted to a conventional warfare role might be higher than that of weapons developed specifically for such a purpose, advocates of this approach believe that the fact that these are sunk costs could carry the day.

DMA Digitizes the World

In the never-ending struggle to maintain a technological edge in military hardware that will offset Soviet numerical advantages, a central requirement is to know as precisely and as soon as possible where targets are. Also, modern weapons—be they RPVs flying covert penetration missions, manned interceptors flying on the deck, or missiles of any kind homing in on distant targets—need that information in a format that is readily digestible by their on-board computers. That means digital data. Yet most of the maps and charts used by the armed forces are still being drawn by hand in a manner essentially unchanged from the methods used during World War II. Translating the analog, graphic information they contain into digital data is both time-consuming and laborious.

But dramatic improvements are in the offing. The Defense Mapping Agency, which provides mapping, charting, and geodetic support to the armed forces and a number of other government agencies and allied governments, has launched a $2.3 billion program to digitize, largely on a three-dimensional basis, geopolitically important areas of the globe by 1991. The Defense Mapping Agency will draw on a variety of sources, including overhead imagery provided by space-based sensors, to produce digital maps and charts. This digital data will open the door to automated mapping, charting, and geodetic (MC&G) data handling, meaning, for instance, the automatic recognition of both man-made and natural features and the detection of changes as they occur.

In a practical sense, this eases and speeds up the task of preparing computerized routing information, which, in everyday terms, is akin to the American Automobile Association's "Triptik" booklets. Tomorrow's automated maps require a spatial data base of mind-boggling magnitude that has to reflect not only subtle terrain features but buildings, radio towers, fixed radars, power lines, etc., as well. Once such a spatial data bank has been developed, advanced high-speed computers can select and process the data needed to produce maps and charts tailored to specific military operations or tasks.

The initial impetus for this digitized spatial data base was generated by the voracious appetite for information of this type by such weapon systems as cruise missiles, the US Army's new Pershing II theater ballistic missile, and the E-3 AWACS. Cruise missiles, for example, are guided primarily by a terrain contour matching process (TERCOM) backed by Digital Terrain Elevation Data (DTED) and Vertical Obstruction Data (VOD). Whether launched from land, sea, or air, the cruise missile initially utilizes inertial guidance and then, after making a landfall, turns to low-altitude terrain contour matching guidance to fly at

predetermined altitudes on a preplanned evasive flight path—often just above treetop level—for hundreds of miles.

The cruise missile's inertial guidance system uses steering information from an on-board computer that must be updated periodically to keep the missile on course. For that reason, the missile's computer—at predetermined points along the flight path—compares the weapon's altimeter readings to its known height above sea level in order to compute the profile of the terrain below. This "sensed profile" is compared with a digital map of the surrounding area compiled by the Defense Mapping Agency. Locating itself within DMA's computerized "Triptik," the computer determines the weapon's true position, velocity, and heading and then executes needed course corrections. This process must be repeated several times along the missile's flight path.

The accuracy of the missile obviously depends on the accuracy and resolution of the spatial data as well as on the efficiency of the on-board computer, especially in terms of how rapidly it can calculate flight-path corrections. In producing the terrain evaluation data, DMA also has to ensure that when the missile compares its sensed profile to the computerized map, there is one—and only one—place where it will match. As a result, large-scale topographic maps must be examined to identify unique terrain features in TERCOM areas that have been chosen by the mission planners. The next step is to produce a digitized matrix of the terrain of the flight path to serve as the basis for picking the most suitable areas for TERCOM updates.

Once this is done, DMA verifies by means of special computer programs that no profile encountered by the missile can be confused with other similar ones. The accuracy of the spatial data bank must be sufficient to take full advantage of terrain-masking, including flying below the elevation of some structures and maneuvering in the terminal area to avoid antimissile defenses.

In developing guidance for the US Army's Pershing II, the same terrain data used by cruise missiles are called up from the data base and amplified with additional information that includes such man-made features as roads, railroads, bridges, and towers. This digitized information is used to develop radar return scenes for storage in the weapon's computer. Descending from high altitude, the Pershing II's radar reads the target-

IN FOCUS...

area returns and compares them with the on-board radar map to permit needed course corrections by its MaRVed (Maneuvering Reentry Vehicle) warhead. (It is somewhat ironic that, in compiling some of the initial TERCOM data covering the western parts of the USSR, the DMA initially used highly accurate maps prepared by the Nazi troops who invaded Soviet Russia during World War II.)

In providing digital, automated cartography for the approximately 146,000,000 square kilometers of the earth's land surface, DMA breaks up the task into about 164,000,000,000 squares, each thirty meters on a side. While the amount of digital information reflecting the topography of each square is already vast, advanced technologies under examination by the Agency could provide considerably higher resolutions and yield data several orders of magnitude more detailed than is currently possible.

The increasing computerization of the MC&G support furnished by DMA to the armed forces and other users translates into major palpable payoffs. For one, vital sophisticated terrain analysis information can be made available to ground force and tactical air commanders so that they can preplan individual operations. Ground troops, prior to deployment, can be given detailed data on whether the soil is rocky or sandy, for example, and whether a particular bridge is strong enough for various types of tanks or other vehicles. By providing detailed information about foliage, DMA can give military mission planners vital clues about what cover is available where. Equally essential is advance information about steep hills that can stop tanks or about areas that are likely to become impassable due to certain weather conditions.

In addition to keeping a worldwide inventory of civilian and military airfields—and the radar and navigation facilities associated with them—DMA also incorporates into its spatial data base all "vertical obstruction" information relevant to strategic or tactical air operations. Other associated data are designed to help aircrews in capitalizing on the opportunities for terrain masking in such key spots as the Fulda Gap on NATO's Central Front.

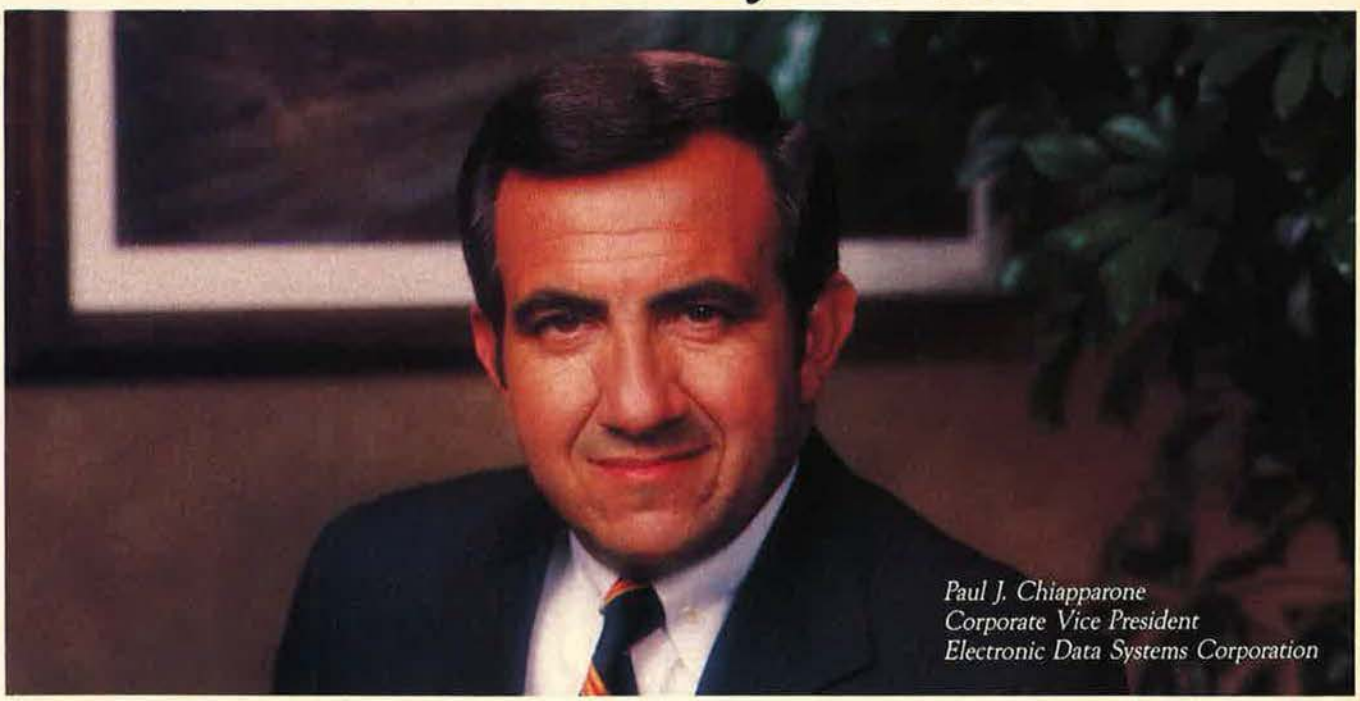
The advent of weapons with advanced guidance systems—such as the Advanced Cruise Missile (ACM), a longer-range, more survivable, and more accurate follow-on to or replacement of the ALCM-B—places further tough demands on the Defense Mapping Agency. New exotic guidance systems are likely to rely on a range of sensors, such as radar, infrared, gravity information, and electro-optics, in a complementary fashion to enhance weapons accuracy in the end game.

A thorough mapping of the gravity fields surrounding the earth is essential to fine-tune the accuracy of ballistic missiles and other weapons and vehicles relying on inertial guidance. DMA provides essential gravity information that is being incorporated into an Earth Gravity Model for the Defense Department's new World Geodetic System. Also contributing to DMA's global gravity measurements—along with providing vital, detailed data about relative height differences of ocean surfaces—are such calibration systems as the Geosat earth-measuring satellite.

Establishing anomalies in the earth's gravitational fields is of crucial importance to the accuracy of ballistic missiles, especially ICBMs, that in case of war have to overfly areas that in peacetime are not available for testing. There have been allegations, for instance, that US ICBMs may be far less accurate than assumed by the Pentagon since they have neither been test-flown from operational silos nor launched over the polar regions that they would have to overfly in case of nuclear war. But DMA, along with other relevant elements of the Defense Department, is confident that its gravity modeling and geodetic data are sufficiently precise to ensure that US ICBMs can hit the targets that they are aimed at. The Defense Mapping Agency also provides the targeting data base for all other US ballistic missiles and weapon systems all over the world.

The Agency's task of compiling cartographic data of any kind is helped by the fact that the US has agreements for the exchange of such information with some eighty countries. Obtaining gravity measurements required for ballistic missile operations and other cartographic data can be politically sensitive. As a result, there remain areas of the world where DMA's data base is spotty and dependent almost exclusively on overhead sensors. In the cosmic arena, DMA compiles star charts for celestial navigation by the Space Shuttle and by advanced SLBMs that rely on celestial guidance systems updates to improve accuracy. ■

"IT'S WHAT YOU DON'T SEE IN THE CONTRACT THAT GETS THE JOB DONE."



Paul J. Chiapparone
Corporate Vice President
Electronic Data Systems Corporation

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CAPITOL HILL

By Brian Green, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., Jan. 27

Gramm-Rudman-Hollings Starts to Pinch

The new Gramm-Rudman-Hollings (GRH) balanced-budget legislation has been the main concern on Capitol Hill as members returning from their Christmas break began to take a careful look at its implications for the FY '87 budget.

Congress also got a good look at the automatic cuts for FY '86, which were revealed in a joint report by the Office of Management and Budget (OMB) and the Congressional Budget Office (CBO). The report was adopted with only minor revision by the General Accounting Office (GAO). The report was issued following an earlier estimate by OMB and CBO that the FY '86 deficit would total about $220 billion—far higher than the deficit target of $172 billion. The cuts in the federal budget were limited to $11.7 billion, even though that figure is insufficient to reach the FY '86 deficit target. A total of $5.85 billion in outlays was trimmed from the defense budget. Of that, $5.1 billion—the equivalent of $13.3 billion in budget authority—came from Department of Defense programs. Barring the unlikely event that alternative budget proposals are adopted, the cuts will take effect March 1.

The new legislation affords some flexibility for the Pentagon in determining how the cuts will be made, but only for FY '86. President Reagan has used this flexibility to exempt some programs and virtually all of the military personnel accounts from this first round of cuts. Procurement, R&D, and operations and maintenance (O&M) accounts were thus reduced by a higher percentage than if personnel accounts had not been exempted—4.9 as opposed to three percent.

Uniform 4.9 percent reductions were made in broad accounts. Some specific programs, however, were exempted from the cuts, while a larger uniform cut was applied to other programs within those accounts. Included among the programs exempted were:

- The entire Strategic Defense Initiative (SDI).
- The Integrated Operational Nuclear Detonations Detection System (IONDS).
- The Defense Satellite Communication System (DSCS).
- The Global Positioning System (GPS).

SDI was exempted because Congress had already reduced the original Adminstration request by more than twenty-five percent. As a result of the SDI exemption, the other programs in the "Research, Development, Test and Evaluation, Defense Agencies" account absorbed a 9.5 percent cut. IONDS, DSCS, and GPS in the "Air Force, Missile Procurement" account were exempted because they are multiyear procurement programs. Any cuts to them would have caused renegotiation of the contracts. Most other programs in that account were reduced by 5.5 percent.

New Budget Process

Passage of GRH has significantly changed the budget process. Key dates and events in GRH concerning the FY '87 defense budget include:

April 1—Senate Budget Committee reports the concurrent budget resolution.

April 15—Congress completes action on the concurrent budget resolution. The resolution will set an overall dollar figure for defense for FYs '87, '88, and '89.

May 15—Appropriations bills may be considered in Congress.

June 10—House Appropriations Committee reports last of the appropriations bills.

June 15—Congress completes action on reconciliation legislation.

June 30—House completes action on appropriations bills.

August 15—A so-called "snapshot" is taken of the deficit.

August 20—OMB and CBO report to the GAO, identifying the size and distribution of any automatic reductions that might be necessary.

August 25—GAO issues the final report to the President.

September 1—Presidential order to "sequester" (cut) funds is issued.

October 1—Fiscal Year 1987 starts; automatic cuts take effect if necessary.

Some congressional actions, such as the authorization process, have no legally mandated deadlines. Authorization of funding has in the past been considered after passage of the budget resolution (now set for April 15) and before appropriations (due to start May 15). The Armed Services committees, which handle the defense authorization bill, will thus be pressured to speed up the process. They are aiming, according to staffers, for early markups and final passage no later than June 1.

Congress could take other actions as well. During September, alternative budget proposals could be explored that would avoid the necessity of automatic cuts.

For the past several years, political brinksmanship and lack of consensus have led to budgetary deadlocks that have been difficult to resolve. The compressed GRH schedule and the painful cuts inherent in the new legislation will make it even more difficult for Congress to achieve its deadlines.

Legal Challenge to GRH

The balanced-budget legislation could be affected by a suit brought by Rep. Mike Synar (D-Okla.) and twelve other members of Congress. They are seeking to have the courts declare unconstitutional the automatic budget-cutting mechanism in GRH. They maintain that the procedure violates constitutional separation of powers by mandating that GAO, an agency of Congress, order the President to make budget cuts. They also argue that a law can constitutionally be changed only by passing another law and that the automatic cutting procedure avoids that process. A decision is expected soon.

If found to be unconstitutional, the automatic process would then be dropped. Instead, the final GAO report on necessary budget cuts would be submitted to Congress for a vote and then go to the President for his signature or veto. ■

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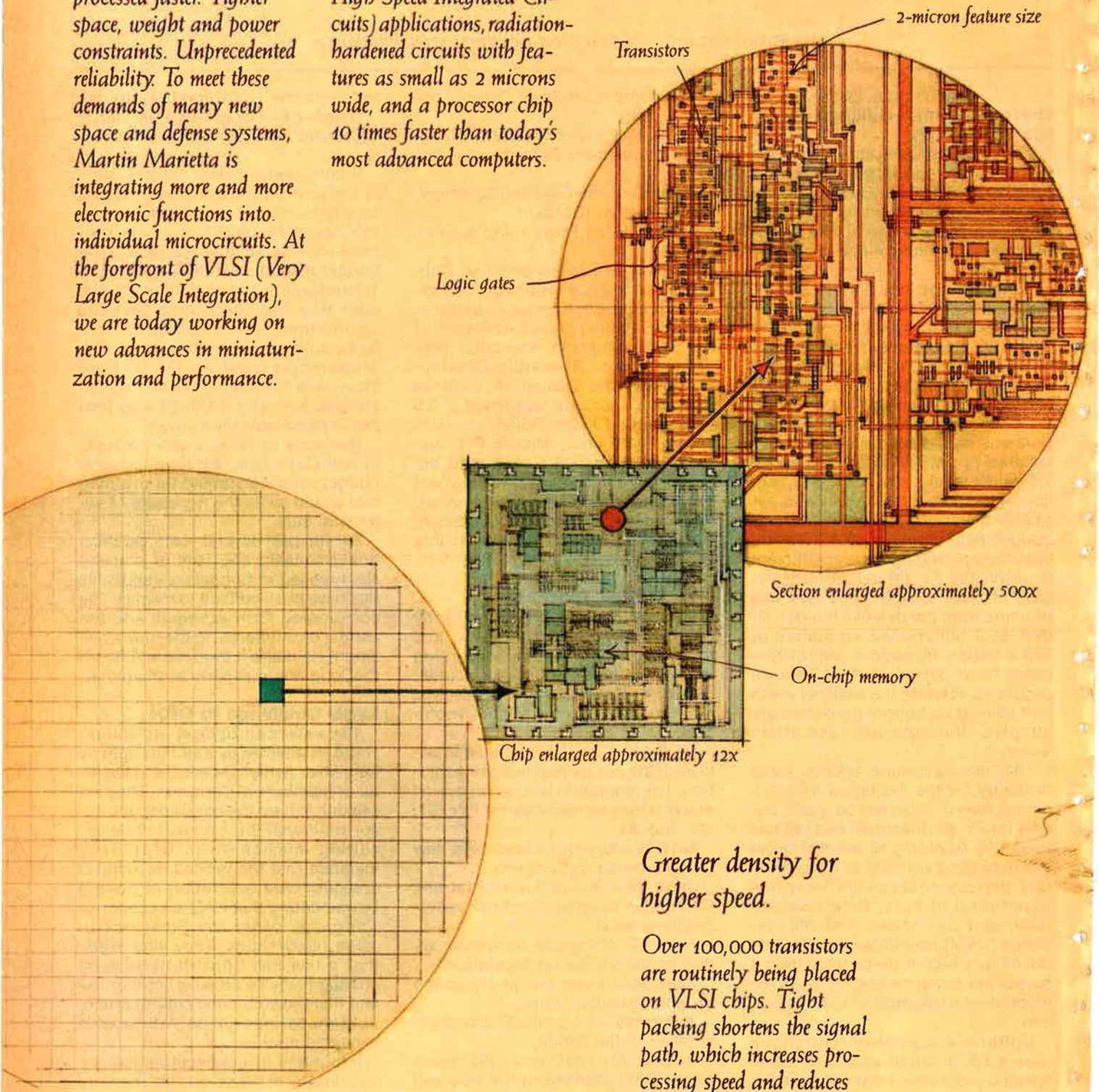

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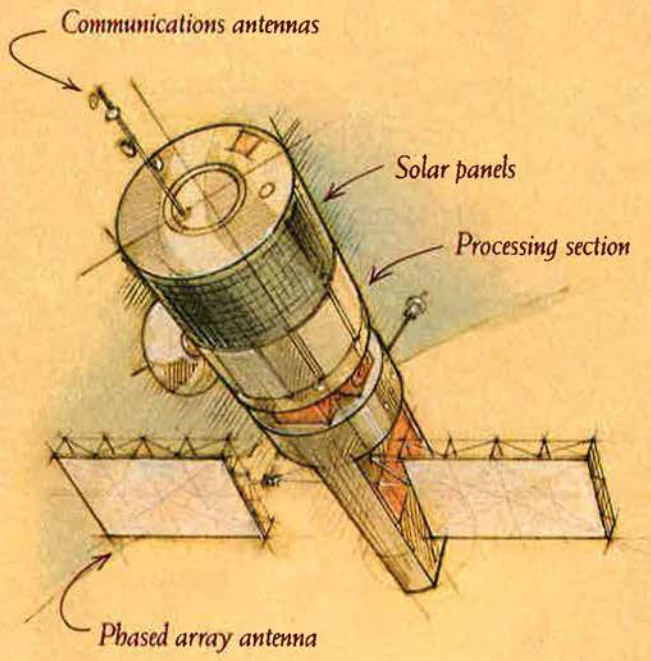

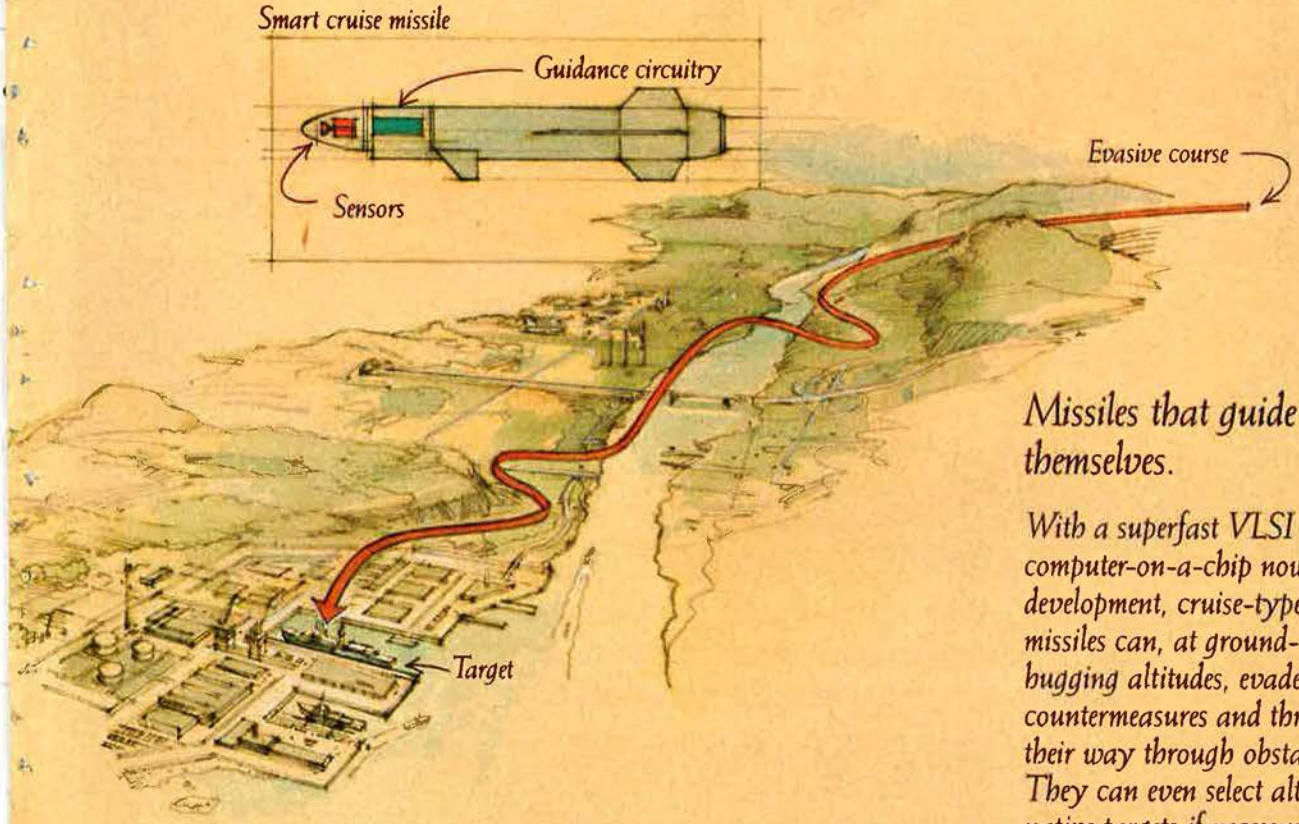

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AEROSPACE WORLD

Including Bulletin Board

Compiled by Jeffrey P. Rhodes, STAFF EDITOR

Washington, D. C., Feb. 4

★ The Air Force's farsighted program to acquire complementary expendable launch vehicles (CELVs) took on additional urgency and legitimacy in the wake of the tragic explosion of the Space Shuttle *Challenger* on January 28.

USAF was successful last year in getting the Reagan Administration and Congress to approve its plan to build ten Titan 34D-7 boosters as CELVs. They were planned to augment, not to replace, the Space Shuttle as USAF's means of propelling heavy payloads into orbit. The Air Force made the case that it needed the CELVs for launching priority payloads in the event of scheduling or operational difficulties in the Shuttle-based Space Transportation System (STS).

The Titan 34D-7 vehicles, each of which will be capable of lifting a payload of 10,500 pounds to geosynchronous orbit, will be built by Martin Marietta Corp., maker of the Shuttle's external fuel tank. Scheduled to become operational in 1988, the CELVs will give USAF heavy-lift capability that the *Challenger* tragedy has made much more imperative.

That tragedy eliminated one of only four Shuttle orbiters and raised difficult questions for space policymakers and budget officials. Among questions arising in its immediate aftermath were whether or not the US should build another Shuttle orbiter, perhaps from spare parts already on hand, and how long it would take to get the remaining Shuttles back into space.

Estimates of the cost of building another Shuttle orbiter hovered at around $2 billion. NASA had requested funding for an additional orbiter several years ago, but was turned down by the Office of Management and Budget.

With the federal budget currently under severe constraints, any move by NASA to reinstitute that request would probably stir up heated debate and heavy opposition in some policymaking and budgeting circles.

The timing for resuming flights of the remaining three orbiters (their eventual resumption seemed to be a foregone conclusion) depended on NASA's success at pinpointing the cause of the *Challenger* accident and then at fixing it.

Meanwhile, the Air Force was taking stock of its existing expendable launch vehicles (ELVs)—Titan 34Ds, Titan IIs, and other boosters, all with less payload capacity than that of the Shuttles or of the embryonic Titan 34D-7 CELVs—to determine whether it needs to build more of them and just how it would use them.

With its full complement of four Shuttle orbiters, NASA had planned to increase the frequency of its Shuttle launches from fifteen this year to twenty-four by 1990. About one-third of all Shuttle flights during that period were to have accommodated military payloads.

Eighty percent of all future USAF space launches had been programmed for Shuttle orbiters prior to the *Challenger* accident. Air Force payloads have priority over all others aboard Shuttles and can bump them if necessary.

Among high-priority USAF space launches are those for the Navstar Global Positioning System (GPS) satellites, which are scheduled for operational test and evaluation (OT&E) this year. Those satellites can go aloft on some existing ELVs as well as on Shuttles, it was said.

Following the *Challenger* accident, there was informed speculation at the Pentagon that USAF may ask for funds to build more than the ten Titan 34D-7 CELVs originally planned.

Their importance to USAF was summed up by Under Secretary of the Air Force Edward C. Aldridge, Jr., at last November's AFA national symposium on "The Military Uses of Space," held at Vandenberg AFB, Calif.

The* Challenger *crew. Top row (from left): Lt. Col. Ellison S. Onizuka, USAF, mission specialist; S. Christa Corrigan McAuliffe, Teacher in Space participant; Gregory B. Jarvis, payload specialist; and Dr. Judith A. Resnik, mission specialist. Bottom row (from left): Cmdr. Michael J. Smith, USN, pilot; Francis R. (Dick) Scobee, Mission 51-L commander; and Dr. Ronald E. McNair, mission specialist. (NASA photo)

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Disclosing that USAF planned to launch two of the Defense Department's "most critical payloads" each year on CELVs, Secretary Aldridge asserted that the CELVs "are very capable of launch on demand [in circumstances] when we can't afford the inflexibility of the Shuttle" and that each CELV would be "sitting there ready to go in a relatively short time whenever the satellite is ready for launch."

When this EC-135J touched down on December 31, it marked the close of PACAF's first-ever year without a major accident. The flight crew and the maintenance personnel are attached to the 9th Airborne Command and Control Squadron based at Hickam AFB, Hawaii.

★ In a recent speech before the Washington Foreign Law Society, Deputy Secretary of Defense William H. Taft IV cited the "unprecedented effort by the Soviet Union to acquire our technology legally or illegally throughout the 1970s and into the 1980s.

"We estimate that an average of over 5,000 Soviet military weapons research projects benefited each year from Western hardware and technical documents in the 1980s. In fact, annually, they acquire about 6,000 to 10,000 pieces of hardware and over 100,000 documents. . . . About $800 million was saved by their electro-optics, armor, and aviation industries alone between 1976 and 1980. That savings translated into roughly 100,000 man-years of research work saved by the Soviets. In effect, they used Western technology to subsidize their military R&D program."

The Soviets have implemented two programs to obtain this information. The first program uses Soviet intelligence agencies to steal one-of-a-kind military and dual-use (military and civilian) hardware, product samples, and the like. The second operation is run by the Ministry of Trade and diverts export-controlled technologies.

"In the late 1970s alone, they acquired about 700 embargoed products, including key microelectronics production and test equipment," said Secretary Taft. The Soviets used their success in the acquisition of Western technology to reverse-engineer technically superior equipment they are unable to produce for themselves.

Secretary Taft went on to state that in order for the Soviet Union to achieve its goals, it employs roughly 100,000 people to abstract and evaluate Western academic and technical publications and other open information sources.

In conclusion, Secretary Taft said, "It is a mistake to think that all the Soviets are after is military hardware. They also concentrate on dual-use technologies and manufacturing technologies that can increase the efficiency of their defense industries. And frequently overlooked is their effort to acquire Western technical assistance—follow-on support that provides the means for better exploiting technologies they have acquired."

★ As a result of a profusion of major accidents and a record number of fatalities, 1985 was a woeful year for commercial airline safety. The Air Force, however, recorded its safest year of flying ever—1.49 Class A mishaps per 100,000 hours.

A Class A mishap is one that results in a fatality, the loss of an aircraft, or more than $500,000 worth of damage. The 1985 rate represents a sixteen percent drop from 1984's Class A rate of 1.77 and a fourteen percent reduction in the previous record rate of 1.73, which was set in 1983.

Other notable safety achievements for 1985 include a record low number of what the Air Force call "logistics-related" (or having to do with equipment) mishaps, a zero-mishap rate for the bomber force, and a reduction in the fighter/attack accident rate for the sixth consecutive year. All this was achieved while flying more hours of realistic training than in any other year. The Air Force flew nearly 3,500,000 hours in 1985.

Pacific Air Forces led the way by flying the full year without a Class A mishap, a first for PACAF. Tactical Air Command (TAC) finished 1985 with a Class A rate of 2.1, a forty-five percent reduction in the command's previous record rate of 3.2. US Air Forces in Europe (USAFE) also had a record rate (2.6), and Military Airlift Command (MAC) recorded its second-best-ever rate (.50). MAC's rate is considerably lower due to the much larger number of hours flown.

The new year began badly for USAF, however, as three F-15 Eagles were destroyed in two separate accidents over Iceland and Germany in early January.

In related news, the Aircraft Owners and Pilots Association (AOPA), the vanguard of general aviation, reports that general aviation continued its twenty-five-year trend of improving flight safety by chalking up a 1.53 fatal accident rate per 100,000 flight hours. General aviation transports 1,500,000

David L. Gray to Be New Executive Director

Maj. Gen. David L. Gray, USAF (Ret.), will become Executive Director of the Air Force Association on June 1.

David L. Gray has been selected to become Executive Director of the Air Force Association and its affiliate, the Aerospace Education Foundation. He will join the AFA staff in April and assume the executive directorship June 1 upon the retirement of Russell E. Dougherty.

Gray is a retired Air Force major general, presently in the financial programming and investment business in Charleston, S. C. A member of AFA for more than thirty years, he serves currently as President of AFA's Charleston Chapter.

Gray was born in Portland, Ore., and he entered active military duty as an aviation cadet in 1950. He flew sixty-two combat missions in F-51 aircraft in the Korean War.

His thirty-one-year USAF career includes five years on the Air Staff in personnel and operations jobs. During the Vietnam War, he was war planner and later Special Assistant to the Deputy Chief of Staff for Operations at Seventh Air Force headquarters in Saigon. He subsequently served in a number of European posts, including Executive Officer to Chief of Staff, Supreme Headquarters Allied Powers in Europe (SHAPE). He returned to the Pentagon as Executive Officer to the USAF Chief of Staff.

Several command assignments in Strategic Air Command led to his selection as DCS/Plans at SAC headquarters. His final active-duty post was Commandant of the Air War College.

Gray holds a B.S. degree in business administration from the University of Colorado and an M.B.A. from George Washington University. He is married to the former Nelda Ryan of Selma, Ala. The Grays have a daughter, Vicki Lynn Murphy of Columbia, S. C., and two sons in the Air Force. Capt. David Scott Gray is a C-130 instructor pilot at Pope AFB, N. C., and 2d Lt. Steven Mark Gray is now completing pilot training at Laughlin AFB, Tex.

—J.T.C.

people daily. These statistics reflect a nine percent drop in total accidents from 1984 and a sixteen percent decrease in fatalities.

★ Military Airlift Command's goal of being able to haul 66,000,000 ton-miles per day of cargo took a giant step toward fulfillment in late December as Air Force System Command's Aeronautical Systems Division awarded a $3.387 billion fixed-price, incentive-firm, full-scale development contract to McDonnell Douglas for continuing development of the C-17 airlifter.

The C-17 will fill an important gap in MAC's airlift fleet with its ability to carry outsize cargo (such as the Army's M1 Abrams tank) up to 2,400 nautical miles unrefueled and to land on forward strips in combat areas. The C-17 is to be powered by four Pratt & Whitney PW2037 turbofan engines that have been proven in commercial operations. The plane can be crewed by only two pilots and a loadmaster, and it has the ability to back up on the ground.

The contract calls for the construction of one flight-test aircraft and two airframes for static and structural durability testing. Full-scale development is scheduled to continue until June 1992. The C-17 has been a low-level development program since 1982.

The test aircraft will be built by Douglas Aircraft Co., a division of McDonnell Douglas, in its Long Beach, Calif., plant. The Air Force plans production of up to 210 of the C-17s.

The ZMC-2, the first all-metal airship, was a highlight of the 1929 National Air Races held at Cleveland, Ohio. As evident from this still photograph, the nitrate-based film used by the Movietone News crew to capture the scene has deteriorated a good bit. This is a part of the 800,000 feet of Movietone News to be preserved. (See item.)

★ The University of South Carolina, in conjunction with the National Air and Space Museum, has launched a campaign to save more than 800,000 feet of aviation-related Fox-Movietone News newsreel footage from the 1920s and 1930s.

The footage was shot on volatile and rapidly deteriorating 35-mm nitrate stock, and the cost of transferring this irreplaceable historical record to safety film is estimated at $500,000. After the aviation film is transferred, Museum officials plan to incorporate the footage into exhibits. A Movietone News theater is also being planned for the Museum. Videotape versions will eventually be available to the public.

The Fox Film Co., which later became Fox-Movietone News, shot the

AEROSPACE WORLD

footage during the years 1919 to 1934. Most of the silent film taken from 1919 to 1927, and much of the later sound film, had never been taken out of its original cans until recently. The first Fox "talkie," that of Charles A. Lindbergh taking off from Roosevelt Field on Long Island, N. Y., before his solo flight to Paris in 1927, is included in the footage to be transferred.

Most of the 5,000 newsreels that were shown in theaters have already been converted to safety film, but the outtakes, which comprise nearly ninety percent of the exposed film, are the main emphasis of this preservation effort.

Twentieth Century-Fox Film Corp. donated the entire 60,000,000 feet of Movietone News to USC in 1980. The cost to transfer the entire collection to safety film and videotape is estimated to be between $6 million and $10 million.

★ On the Senate floor recently, Sen. William Proxmire (D-Wis.) took issue with the assumption that service women are barred by law from engaging in combat. He said, "The fact is, only the Air Force, Navy, and Marines are currently restricted from allowing women to serve on combat vessels and aircraft with combat missions. Army and Coast Guard women do not face the same legal restrictions. Rather, women are barred from combat by Army policy and face no combat restrictions under current Coast Guard policy."

The Senator went on to make his larger point that gender exclusion hampers flexibility and inhibits readiness and deployability of the armed forces. Events, he pointed out, will determine which aircraft and vessels see combat, not policy.

"Navy women may serve on destroyer tenders, but not destroyers—even though tenders and destroyers sail together as part of the same battle group," Senator Proxmire added. "Women can fly tankers to refuel bombers—but they cannot fly the bomber. Where is the logic in that?"

He summed up the situation as it appears to him by saying that "current policy effectively allows women to serve in positions where they could be shot at, but prohibits them from positions where they could shoot."

He asked fellow lawmakers to help eliminate "confusing policies that hamper readiness."

★ Dyess AFB, Tex., is now more than one-sixth of the way to becoming Strategic Air Command's first fully equipped B-1B base following the arrival of the base's fourth and fifth assigned aircraft in January. The SAC base near Abilene, Tex., is to receive its full complement of twenty-nine aircraft by the end of this year. The first B-1B was delivered to Dyess in June 1985, and crews are now flying ap-

This nearly fifty-foot-diameter antenna is the largest deployable mesh antenna to be assembled, deployed, and RF-tested. Called a "hoop-column" antenna, the concept was conceived by NASA's Langley Research Center, Hampton, Va., and the Harris Corp., Melbourne, Fla., to demonstrate that large space antennae are feasible. Large space antennae of this precision and size or larger allow an increased sensitivity to and resolution of weak microwave signals. (NASA photo)

The Rockwell International plant at Palmdale, Calif., is busy as B-1B production swings into high gear. This photo shows seven aircraft (numbers fifteen to twenty-one) being fabricated in the final assembly building.

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Infrared sensor transplants would enhance Air National Guard F-4 Phantoms for approximately one-tenth the cost of developing a new infrared system. Hughes has developed a concept to transfer Infrared Search and Track (IRST) systems to F-4 aircraft from deactivated U.S. Air Force interceptors. IRST detects targets passively and supplements radar detection. It would allow a pilot to establish and maintain target tracks when the F-4 radar couldn't pick out targets because of clutter, countermeasures, or malfunctions. Hughes built IRST in the 1960s to provide low-altitude detection and countermeasure capabilities for the F-101, F-102, and F-106. The systems have been upgraded, most recently in 1980 with a new detector that improved performance and cut operating costs.

Enhancements to NATO's air command and control system will include provisions for interoperability among all member nations, as well as a variety of systems that will prevent gaps in the network. These enhancements to NATO's C^3I (Command, Control, Communications, and Intelligence) system will also include the expanded use and reliance on advanced high-speed digital computers to sort vital information from sensors and immediately relay it to commanders in the most useful form. Hughes is part of an international team that is studying NATO's needs and defining just how the command and control network should be upgraded.

A new laser that better penetrates battlefield smoke, haze, and dust will let tank gunners determine the range of any target they can see with a thermal imaging system. The laser is the first carbon dioxide laser rangefinder developed in the U.S. for tactical military applications. It determines range based on the few millionths of a second it takes a laser pulse to reach a target and reflect back. During advanced development tests, the rangefinder demonstrated greater performance under obscured battlefield conditions than the solid-state lasers currently used for military rangefinding. Because the laser and the thermal imaging system operate in the same wavelength, they have the same performance characteristics under battlefield conditions and bad weather. The Hughes laser is also harmless to the human eye and can be safely fired during training exercises. A development model has been configured for evaluation in the M1 Abrams main battle tank.

The U.S. Navy can detect enemy ships and submarines at long range with a towed array sonar system carried by nuclear-powered submarines. The AN/BQQ-5 and AN/BQQ-6 systems are designed to meet current submarine threats and provide major improvements over existing systems. Hughes manufactures the beamformer, processor, and low frequency receiver portions of the systems.

For more information write to: P.O. Box 45068, Dept. 79-5, Los Angeles, CA 90045-0068

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proximately five training flights a month.

Ellsworth AFB, S. D., will be the second base to receive the new bombers and will eventually be assigned thirty-five aircraft. First delivery there will be in late 1986 when Rockwell International, the prime contractor, reaches its peak production of four airplanes per month. Other bases to receive B-1Bs by the end of the decade include Grand Forks AFB, N. D., and McConnell AFB, Kan.

The first production B-1B is assigned to Edwards AFB, Calif., for flight testing. Aircraft number nine will also be used for testing. The tenth of the planned 100 aircraft will be sent to Eglin AFB, Fla., later this year for climatic testing.

In other notable aircraft deliveries, Panavia Aircraft GmbH delivered the 500th Tornado all-weather combat aircraft to Germany in early January. A joint British, West German, and Italian air defense/attack aircraft, a total of 809 Tornado aircraft is on order by the three countries.

The first of fifty C-5B cargo aircraft was flown by MAC Commander in Chief Gen. Duane H. Cassidy from the Lockheed plant in Marietta, Ga., to Altus AFB, Okla., in early January. The C-5B, which features more than 100 improvements over the C-5A, was assigned to Altus first because of the base's C-5 pilot, flight engineer, and loadmaster training programs.

★ The Air Force has issued Requests for Proposals to replace the two C-137C aircraft presently used as the prime Presidential transports.

Commonly known as *Air Force One,* the two aircraft are aging and have seen a great deal of use. The primary Presidential airplane, serial number 27000, was accepted by the Air Force in August 1972, and the current backup aircraft, 26000, has been in use since October 1962. The planes are maintained and operated by the 89th Military Airlift Wing at Andrews AFB, Md.

The candidates to replace the C-137s are the Boeing 747 and the McDonnell Douglas DC-10. Versions of both aircraft are currently used by the Air Force. The KC-10 tanker/cargo airplane is based on the commercial DC-10 Series 30CF, and the E-4B, which is used as the National Emergency Airborne Command Post (NEACP) aircraft, is similar to the 747.

Roughly $280 million is in the congressional authorization to acquire the new airplanes, and a further $20 million will be used for research, development, testing, and evaluation (RDT&E). The contract is scheduled to be awarded this May, and the aircraft will be delivered in 1988 and 1989.

★ It seems that aerospace technology makes almost daily breakthrough advances. In late January, however, aviation, with the aid of a computer, took a giant step backward. A half-scale model of a pterodactyl, a flying reptile that last plied the nation's airways 65,000,000 years ago, flapped its wings and flew over the El Mirage Dry Lake in the Mojave Desert in California.

The brainchild of Paul MacCready, whose other designs include the *Gossamer Condor* (which, in 1977, became the first airplane to take wing under human power only), the pterodactyl represents the first successful flight of a man-made device whose stability was controlled by the fore-and-aft movement of flapping wings.

The model, which has an eighteen-foot wingspan, is patterned after a fossil found at Big Bend National Park in Texas. Its wings are operated by

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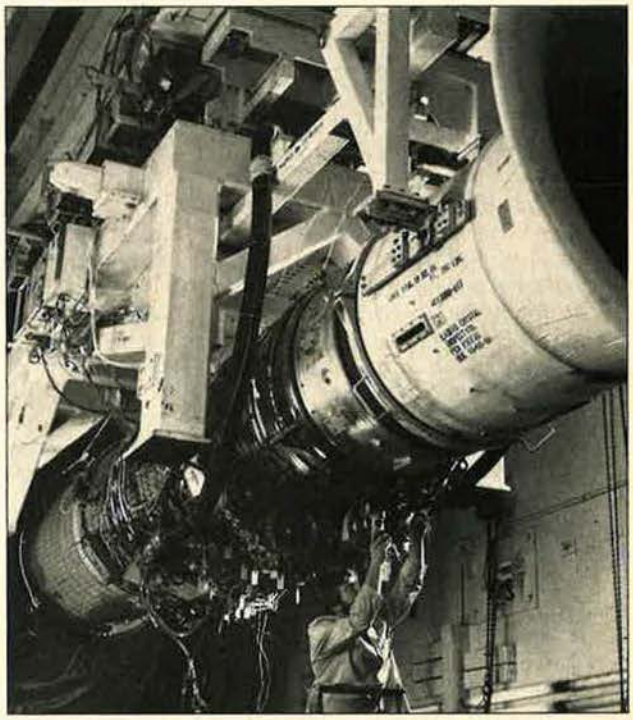
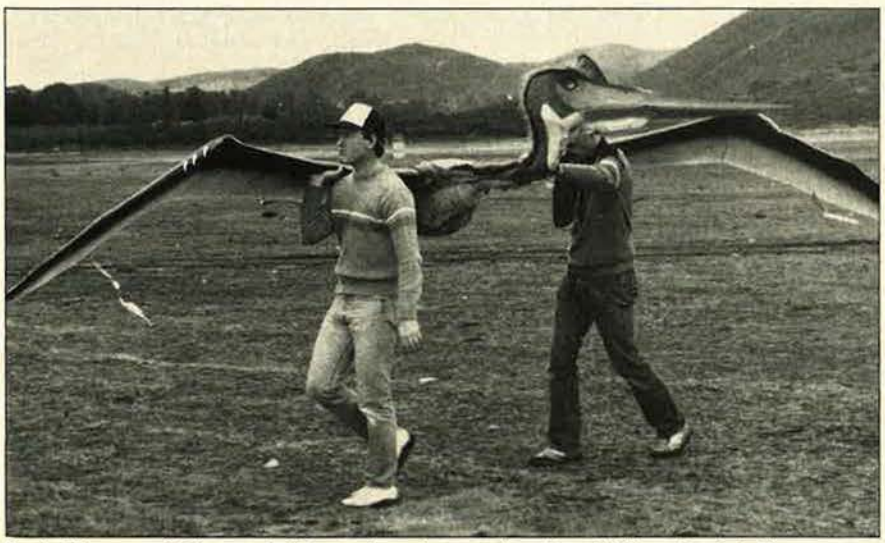


The first General Electric F110-GE-400 engine for the US Navy has begun testing at the company's Evendale, Ohio, plant. After being tested at the Naval Air Propulsion Center at Trenton, N. J., the engine will begin flight testing in August. The first production engine will be delivered to the Navy in July 1987 for use in the F-14A Plus aircraft.



Technicians walk the model* Quetzalcoatlus northropi, *or QN for short, to its launching trolley before one of the pterodactyl's flights in January. The QN is the first man-made device to be stabilized by flapping wings.

battery-powered electric motors and are controlled by a computer. The pseudo-reptile's "brain" senses any deviations from stable flight and compensates by moving its head from side to side, extending fingers midway out on the wings, twisting the wings, and swinging them forward and backward.

The model pterodactyl, whose real-life progenitor is known scientifically as *Quetzalcoatlus northropi*, takes off from a trolley pulled back to stretch a bungee cord. The QN, as it is known, is radio-controlled and is acrobatic. It was banked as sharply as 270 degrees, was able to dip, and could spiral down. The longest of the model's early test flights lasted two minutes.

The model will be brought to Washington for a mid-June flight around the Mall. The Smithsonian Institution's National Air and Space Museum is a participant in the project, as is the Johnson Wax Co. Total cost of the QN is an estimated $500,000. The pterodactyl will be one of the stars of the Smithsonian's new IMAX film, *On the Wing*, which will premiere this summer.

★ Late in December, the LTV Aerospace and Defense Co. of Dallas, Tex., received a $22,947,397 contract from Air Force Systems Command's Armament Division for the construction and flight test of the Hypervelocity Missile (HVM).

AEROSPACE WORLD

The HVM is a low-cost, relatively simple missile that destroys armored targets by using the kinetic energy of a heavy metal rod traveling five times the speed of sound. The missile does not have an on-board guidance system or an explosive warhead. The missile's electronics and sensors are kept aboard the carrier aircraft.

The contract, which runs for a little over two years, calls for two configurations for the missile—an air-to-ground version for the Air Force and a slightly larger version for the ground troops of the Army and the Marine Corps. Twelve samples, six of each configuration, are called for under the contract.

The Air Force version is 3.8 inches in diameter and 114.79 inches long and weighs approximately sixty-six pounds. It has a lethal range of 3,000–10,000 feet and will cost under $8,500 each in FY '85 dollars.

The program is scheduled to enter full-scale development in 1989.

★ Capt. Paul Kendrick, an Individual Mobilization Augmentee with the 6512th Test Squadron, Strategic Systems Combined Test Force (CTF), made history in late December when he became the first Reservist to participate in an actual test mission for the Air Force Flight Test Center (AFFTC) at Edwards AFB, Calif.

Captain Kendrick was responsible for an avionics software test conducted during a simulated Air-Launched Cruise Missile (ALCM) launch over the Utah Test and Training Range. The software package that Captain Kendrick tested is designed to reprogram the missile's direction after launch.

A graduate of the Air Force Test Pilot School, Captain Kendrick was one of the first flight-test navigators to launch an ALCM from a B-52 during the missile's original development test and evaluation (DT&E) program in the late 1970s.

★ A US District Court judge in New Jersey recently ruled that state and local government employees there who are veterans must receive credit toward their state pensions while they are on active duty or training with the armed forces or reserves.

Never in doubt was the legal requirement for employers to give back old jobs—or comparable or better

The Coming Changes in Health Care for Military Retirees

This may be the year that military retirees experience the most drastic change ever in their health-care system.

In a speech designed to head off anxiety generated by several recent media stories, the Department of Defense's Assistant Secretary for Health Affairs, Dr. William Mayer, told Congress last year, "I want to make it very clear that we will not make a departure from our firm commitment to provide quality health care to dependents of our active-duty forces and to retired members and their families. Recent press stories that this is among our plans are not at all correct."

This followed closely an announcement by Secretary of Defense Caspar W. Weinberger that the armed services would make wartime medical readiness rather than peacetime health care their first priority. In conjunction, Dr. Mayer had described the medical needs of the current authorized users, including dependents and retirees, as "an enormous burden" for DoD's system.

"We do not intend to change the possibility of a dependent or a retiree being treated by a civilian source vs. in a military facility," a DoD spokesman told AIR FORCE Magazine. "Right now, there are about 10,000,000 'customers' for the system. About 2,000,000 are active duty and about 8,000,000 are retirees and dependents. The latter group gets about seventy-five percent of its care from the military system and about twenty-five percent from CHAMPUS. We're not going to change that, but we do want to change the way we farm out the CHAMPUS dollars," he said.

In response to a query, the spokesman said that DoD is sending out "requests for information" to HMOs and others in the commercial health-care business to see what suggestions they might have for bringing the burgeoning CHAMPUS expenses under control.

CHAMPUS expenditures currently run about $1.5 billion a year. The biggest problem with these expenses, as DoD sees it, is that there is no cap on spending—CHAMPUS pays what the bill says (minus the standard deductibles). The ideal situation is a prepaid plan, similar to Medicare, where the government pays ahead of time for a guaranteed quantity and quality of health care. This would eliminate the anomaly that currently exists where, for example, a Medicare patient and a CHAMPUS patient, both admitted and treated for the same operation, might pay strikingly dissimilar—and higher for the CHAMPUS patient—rates. This dichotomy occurs because the hospital has previously agreed to charge one flat sum for the Medicare admission.

DoD anticipates the next step, to issue Requests for Proposals, will be ready by early fall. The spokesman said that DoD would like to see bids from a contractor that would either be big enough to handle the program on a national level itself or that could serve as an umbrella agency for regional efforts. In any event, the government would prefer to deal with as few prime contractors as possible.

How will all this affect the patient? It is still too early to tell. DoD says it will settle for no less than the current quality of care, although it must be at substantially less cost. Air Force officials say the health-care program is a DoD operation, and for the moment, they will not comment on the matter. The end results remain to be seen.

One thing is certain—change is coming.

—JAMES A. MCDONNELL, JR.

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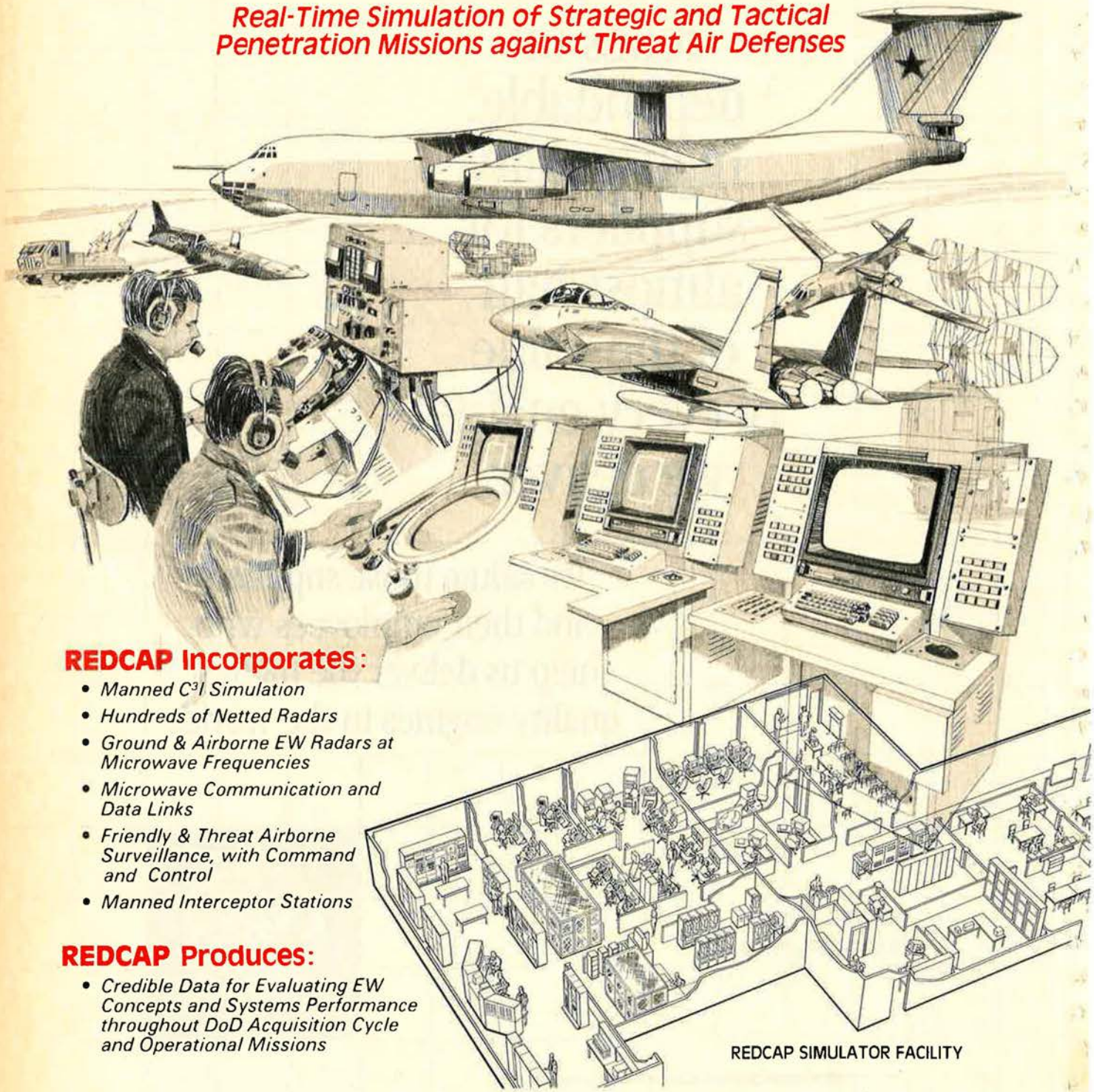

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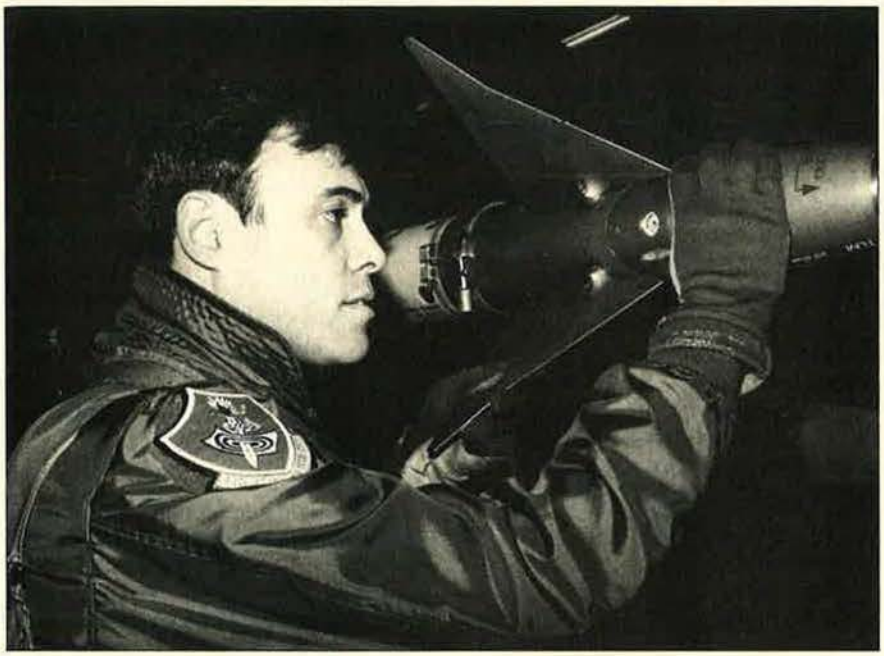
ones—to returning veterans. Other court decisions in that area had already broadened the eligibility to allow receipt of various employee benefits, such as pensions and seniority. The sticking point came when New Jersey not only failed to credit time spent in the armed forces toward pension vesting and retirement credit but also when the state refused to allow returning employees to buy back pension credits for which they would have contributed had not they been away in military service. As a result, the Labor Department brought suit.

The ruling affects present, retired, and former employees of the State of New Jersey and its political subdivisions who have periods of qualifying service in the armed forces.

AEROSPACE WORLD



Lt. Col. Serge DelHoyo, operations officer for the 10th Tactical Fighter Squadron at Hahn AB, West Germany, recently made history when he became the first Air Force pilot to reach the 2,000-hour plateau in the F-16. (USAF photo by SSgt. Wil Perkins)

★ The second of three planned squadrons of Rapier air defense missiles went operational at RAF Brize Norton in late December. The unit, maintained and operated by Royal Air Force Regiment personnel, will protect USAFE assets at RAF Upper Heyford and at RAF Fairford.

The Rapier, a lightweight, mobile, surface-to-air weapon system, is designed primarily for use against fast (Mach 1+), low-flying targets in both day and night. The Air Force is buying thirty-two of the four-missile systems from British Aerospace Dynamics Group.

The first Rapier unit went operational in November 1984 at RAF West Raynham and covers RAF Lakenheath and RAF Mildenhall. The third squadron will start operations later this year at RAF Honington and will provide protection for RAF Bentwaters and RAF Alconbury.

★ **NEWS BRIEFS**—Congress recently authorized a **Prisoner of War Medal** for members of American military forces who were taken prisoner and held captive anytime after April 5, 1917. This new decoration will rank in precedence as the highest medal for services rendered (as opposed to awards for valor) that the nation can bestow upon a service member. The medal's design is to be completed by the end of May.

The Veterans Administration wants veterans to know that the agency **will furnish headstones or markers for graves in private cemeteries overseas.** The US Embassy or consular offices in the foreign countries will take delivery. In other news, the VA has changed its policy and will now inscribe "US Army Air Corps" or "US Army Air Forces" on gravemarkers. The VA had maintained that since both of these organizations were a part of the Army, "US Army" would be the authorized inscription. The new policy is not retroactive.

A modified version of the **GBU-15 TV-guided glide bomb** was successfully tested in mid-January by AFSC's Armament Division at Eglin AFB, Fla. The variant has a new short-chord

SENIOR STAFF CHANGES

PROMOTIONS: To be **Major General:** George E. **Ellis.**

To be **AFRES Major General:** Charles R. **Cargill;** Leonard W. **Hegland;** Arthur H. **Hutton;** Byron E. **Mills,** Jr.; Roger P. **Scheer.**

To be **AFRES Brigadier General:** Joseph R. **Albi;** William L. **Carpenter;** Roger G. **Knight;** Michel **Levant;** Edmund X. **Loughran;** Allen S. **Mason;** Harvey J. **McCarter;** Clark O. **Olander;** Angelo J. **Perciballi;** Glenn W. **Redmond;** Donald C. **Roth;** James E. **Simon;** George T. **Wier.**

RETIREMENT: M/G Clifton D. **Wright,** Jr.

CHANGES: B/G (M/G selectee) George E. Ellis, from Dep. Dir., Engineering & Services, DCS/L&E, Hq. USAF, Washington, D. C., to Dir., Engineering & Services, DCS/L&E, Hq. USAF, Washington, D. C., replacing retiring M/G Clifton D. Wright, Jr. . . . **Col. (B/G selectee) Paul D. Gleason,** from Cmdr., David Grant USAF Med. Ctr., MAC, Travis AFB, Calif., to Command Surgeon, Hq. USAFE, Ramstein AB, Germany, replacing M/G William H. Greendyke . . . **M/G William H. Greendyke,** from Command Surgeon, Hq. USAFE, Ramstein AB, Germany, to Command Surgeon, Hq. USEUCOM, Vaihingen, Germany . . . **ANG M/G Harold G. Holesinger,** to Reserve Forces Policy Board, Washington, D. C., replacing ANG M/G Darrol G. Schroeder.

B/G Paul A. Maye, from Command Dir., NORAD Combat Ops., Cheyenne Mountain Complex, Colo., to Dep. Dir., Def. Mobilization System Planning Activity, OSD for Force Mgmt. and Personnel, Washington, D. C. . . . **AFRES M/G Robert G. Mortensen,** to Reserve Forces Policy Board, Washington, D. C., replacing AFRES M/G James W. Taylor . . . **Col. (B/G selectee) Kenneth E. Staten,** from Cmdr., 6510th Test Wing, AFSC, Edwards AFB, Calif., to Dep. for National Aerospace Plane, AFSC, Wright-Patterson AFB, Ohio . . . **Col. (B/G selectee) Robert F. Swarts,** from Dep. Dir., Log. Plans & Prgms., DCS/L&E, Hq. USAF, Washington, D. C., to Dep. Dir. of Budget (Operating Appropriations), USAF Comptroller, Hq. USAF, Washington, D. C., replacing B/G Mark J. Worrick. ■

wing that is projected to cost $5,000 less per missile than the long-chord wing now in production. Cost of each of the 2,500-pound precision-guided weapons has fallen by more than $71,000 in the last five years.

There are now **more than 1,000,000 female veterans** on the rolls of the VA, or about four percent of the total veteran population. This number is expected to climb slowly until it peaks at about 1,300,000 in 2015.

After 11,000 hours of major repair, an F-16 that crashed in 1983 has been **returned to flying status.** Maintenance crews at the Ogden Air Logistics Center at Hill AFB, Utah, replaced all major flight surfaces, including the vertical tail, wings, and forward fuselage. All wiring was replaced as well. Repairs totaled $1.2 million, but saved the Air Force the cost of replacing the F-16. The restored aircraft is based at MacDill AFB, Fla.

AEROSPACE WORLD

★ **DEATHS—Maj. Gen. George Griffin Finch, USAF (Ret.),** Fourteenth Air Force Commander from 1954 to 1957 who also served as Deputy and later Deputy Commander for National Guard Affairs, Continental Air Command (CONAC), died on January 3. He was eighty-three. General Finch organized and commanded the 54th Air National Guard Wing, the first completely organized ANG wing, in 1946. In 1953, he served as the senior Air Force member of the Panmunjom Truce Negotiation Team, whose work helped to bring an end to the Korean War.

Dr. Charles I. Stanton, who had a distinguished forty-four-year career connected mostly with the design, construction, maintenance, and modernization of the nation's airways system, died January 1 at the age of ninety-two. Dr. Stanton became Administrator of the Civil Aeronautics Administration (CAA) in 1942, and following two other aviation-related jobs, he retired in 1962 as Chief of the Airport and Aircraft Branch of the Federal Aviation Administration's (the CAA's direct descendant) System Research and Development Service.

Henry H. Ogden, shown here in a 1924 photo, was one of the last survivors of the Army Air Corps Round-the-World flight. He died in January at the age of eighty-five.

Henry H. Ogden, one of the last survivors of the Army Air Corps first Round-the-World flight in 1924, died January 24 at the age of eighty-five. Then-Sergeant Ogden, as "mechanician," and then-Lt. Leigh Wade, as pilot, flew the Douglas World Cruiser *Boston* (one of four aircraft on the mission) three-quarters of the way around the world before being forced down in the North Atlantic. The crew then picked up the prototype World Cruiser, renamed it *Boston II,* and finished the remainder of the 26,345 miles of the route. Mr. Ogden, after getting his discharge, started the Ogden Aeronautical Corp., which produced the trimotor Ogden Osprey. After brief careers as the owner of a shuttle airline and as a silver miner, Mr. Ogden joined and became manager of the Lockheed Overseas Corp., which built Hudson patrol bombers for the RAF. He retired at age sixty-five in 1965 as a Lockheed vice president. Of the eight airmen who started on the 1924 circumnavigation, only General Wade and then-Sgt. Alva L. Harvey survive. ■

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Careful analysis may explain the strong Soviet reaction to SDI—and also tell us much about SDI-like programs under way for years in the USSR.

THE SOVIETS AND STRATEGIC DEFENSE

BY WILLIAM F. SCOTT

The Soviet Armed Forces, represented in this poster depicting the Ground Forces, Air Forces, Troops of Air Defense, Navy, and Strategic Rocket Forces, have nurtured the equivalent of the Strategic Defense Initiative for years.

PROMOTIONS in the Soviet Armed Forces provide one indication of priorities. In 1985—the year Mikhail Gorbachev took over the leadership—only three senior military promotions were announced in the Soviet press. One was a KGB officer promoted to General of the Army. Second was the leading Soviet ace of World War II, currently a member of the General Inspectors Group, promoted to Marshal of Aviation.

The third was Anatoliy U. Konstantinov, Commander of the Moscow Air Defense District, also promoted to Marshal of Aviation. Of the three, Konstantinov was the only one occupying a major position within the Soviet Ministry of Defense.

This was the smallest number of military promotions announced in any one year for at least a quarter of a century. In such a sparse year, why Konstantinov?

Today, Moscow and the surrounding countryside providing *dachas* for the Party elite are the only areas in the world protected by antiballistic missile defenses. These defenses are part of Marshal of Aviation Anatoliy Konstantinov's command. His 1985 promotion attests to their importance.

Soviet propagandists, seeking to enlist support against the US Strategic Defense Initiative (SDI) program, seldom acknowledge that such defenses exist. If Soviet publications mention that an ABM system surrounds Moscow—and it could take an analyst days to find such a reference—there will be no indication of where it is actually deployed or the type of equipment used.

Kremlin leaders rarely admit to their own people that the Soviet Union has tested an antisatellite system or

that its own space programs have military utility. Disinformation agents, who include official Soviet spokesmen appearing on US television, deny that such military activities are under way.

Soviet ABM and military space programs are subject to security measures that are unknown in the West. There is never a hint in Soviet publications that more than fifty percent of Soviet space launches serve military purposes.

Glavkosmos USSR (the Main Directorate for the Development and Use of Space Technology for the National Economy and Scientific Research) was established in October 1985, just before the Geneva summit. Its first chief, A. I. Dunayev, asserted that its formation was in the interests of the national economy, science, and international cooperation. There was no suggestion that the new organization might have military implications.

During the summit meeting in Switzerland last November, US television viewers frequently saw and heard Roald Sagdeyev, director of the Soviet "Space Research Institute" under the Academy of Sciences. The stated purpose of this Institute is to provide for the centralization and coordination of Soviet civil space programs. Academician Sagdeyev appeared along with Georgiy Arbatov, head of the Institute of the US and Canada. Their main thrust was to denounce SDI.

Also under the USSR Academy of Sciences is the Intercosmos Council, formally referred to as the "Council for the International Cooperation in the Exploration and Uses of Outer Space." It is subordinate to the Presidium of the USSR Academy of Sciences and appears to concentrate on maintaining contact with foreign scientists under the pretext of "international space cooperation." It is reasonable to assume that its major purpose is to collect as much scientific and technical information as possible.

It is likely that leading Soviet personalities in the Academy of Sciences, such men as Roald Sagdeyev, are actually unaware of what is taking place in their own country. During the early SALT I negotiations, it became apparent to US participants that the civilian members of the Soviet team were denied access to information about their own military capabilities. This tight compartmentalization is not new to Soviet security.

US Air Force attachés and other foreigners have visited Star City, the Soviet cosmonaut training center. On rare occasions and under extremely tight security, visitors have been taken to the Tyuratam Launch Center, commonly known as the "Baikonur Cosmodrome." These facilities are obviously under military control, but the pretense is maintained that they support only "peaceful" space programs. Selected cosmonauts meet with foreigners under carefully controlled conditions.

Soviet leaders maintain that they are against the "militarization of space." They state further that planning in Washington to develop and deploy an ABM system will upset the condition of "approximate military parity" currently existing between the USSR and the United States. Billions of rubles are being spent worldwide on a massive propaganda campaign to kill the US SDI program. More billions may be spent to conceal from the Soviet people, as well as from the outside world, that the Kremlin rulers themselves *have had the equivalent of an SDI program under way for years!*

Reading Between the Lines

From declassified intelligence information, including photographs, we know something of Soviet ABM and space hardware programs. Less is known about how these weapon systems will be controlled and about concepts for their deployment. But Soviet military books, journals, and newspapers regularly describe the latest Western concepts for a possible ABM defense and for military spacecraft, both manned and unmanned. The information is attributed to "the foreign press," but nevertheless provides an indication of what the Soviets themselves are doing. By using selected data from the foreign press, Soviet leaders can comment on what is new in ABM and military space technology.

A 1973 article entitled "Conventional Weapons Systems for Troops of National Air Defense" gives an example. Judging from the title, one might assume that it would describe Soviet conventional air defense weapons. That, however, was not the case:

"Air defense troops consist of fighter aviation, zenith [ground-to-air] rocket troops, and radio-technical troops, forces, and means for warning of a missile attack and monitoring outer space. *In this section the status of Troops of National Air Defense will be examined, using materials from the foreign press.*" (Emphasis added.) The text that followed was carefully written so that the concepts and weapon systems attributed to "foreign air defense forces" were equally applicable to Soviet forces.

Three Soviet services play leading roles in the military use of space and ballistic missile defense: the Soviet Air Forces, Troops of Air Defense, and Strategic Rocket Forces. Together, these three services—less certain components of the Troops of Air Defense—correspond roughly to USAF. An examination of their respective roles in the Kremlin's equivalent of SDI suggests how Soviet military space systems and ground-based ballistic missile defenses will be controlled and points to concepts for their deployment and use.

In the Soviet Union, the Soviet Air Forces appear to have a dominant role in manned spaceflights, which to some degree corresponds to NASA's responsibilities in the United States. Evidence of this is the attention given to space activities, both manned and unmanned, by the official Soviet Air Forces journal, *Aviatsiyia i Kosmonavtika* (Aviation and Cosmonautics). Almost every issue has one or more articles on space. (Articles on the military use of space ritually cite "the foreign press.")

None of the other Soviet military journals gives equivalent attention to military space topics. Articles in *Aviation and Cosmonautics* about US military space activities can be expected not only to describe US space equipment and organizational structure but also to suggest comparable Soviet programs.

In June 1984, this journal reviewed "the intensified development of American space weaponry aimed at undermining the approximate strategic balance achieved between the USSR and the USA." Readers were told that the Pentagon has plans to build "military space forces" consisting of orbiting fighters and bombers and space weapons based on laser, nuclear, and beam technology. Another article in the same issue asserted that USAF, in accordance with a Presidential directive, "has

developed a doctrine that defines the immediate tasks of the space command."

The word *doctrine* catches the eye of Soviet readers. To them, it has a specific meaning. It is the military policy of the state and has the force of law. Doctrine provides the guidelines that the armed forces are to follow. It is concerned with goals and missions, and it specifies what military developments are needed. If the US were changing its military doctrine and establishing a space command, Soviet readers would assume that their own Party leadership had taken similar steps already or were in the process of doing so.

The August 1984 issue of *Aviation and Cosmonautics* claimed that, at the request of readers, "the editors have prepared a series of articles in which the military space means of the United States, both currently existing and planned, will be examined." Since then, the articles have discussed United States military space matters in detail.

"The White House administration views the military-space potential, a component part of which is the Space Shuttle, almost as a fourth element of its strategic arsenal, alongside ICBMs, strategic bombers, and SLBMs," one article said.

Declassified photographs published in the US show Soviet attempts to develop an equivalent of the US Shuttle. Less is known, however, about where concepts for the military use of the Shuttle and other spacecraft might be developed. The roles and assignments of Soviet military cosmonauts may provide some indications.

Cosmonauts and Think-Tanks

Soviet cosmonauts are trained and managed by the air forces. Of the fifty-two current Soviet cosmonauts, three are Generals Lieutenant of Aviation, seven are Generals Major of Aviation, and twenty-two are colonels. No rank is given for the other twenty, but they were generally identified at the time of their flights as civilian specialists.

The military ranks held by cosmonauts attest to the attention given by the Soviet Air Forces leaders to manned space activities. Once officers become cosmonauts, they are on a fast promotion track. Upon completion of their first mission, each is awarded the nation's highest decoration—Hero of the Soviet Union.

While training or taking part in actual missions, cosmonauts are primarily engaged in mastering details of spaceflight. At other times they attend one of the two air forces academies.

In the Soviet Union, new military concepts—including concepts for employment of new weapon systems—are formulated in the General Staff, the military staffs of the services, and the military academies. In particular, the Soviet military academies serve as the Soviet think-tanks.

The most important Soviet academy is the Academy of the General Staff. Here carefully selected colonels or senior Navy captains, almost all of whom will become generals or admirals, spend two years studying operational art and strategy. Later, wearing stars or the insignia of marshals, they may return to the Academy for another year of refresher work. Faculty members include many of the leading Soviet strategists. This Academy plays a major role in developing concepts for ballistic missile defense and the military use of space that would apply to the Soviet Armed Forces as a whole.

Each of the Soviet services has one or more academies, and most of the major writings on operational art and tactics are by faculty members of these institutions.

The Soviet Air Forces have two such academies—the Gagarin Air Academy and the Zhukovskiy Military Air Engineering Academy. A majority of the military cosmonauts attends one of these academies, where concepts for the military use of space by manned spaceships are studied and formulated.

The fifteen Soviet cosmonauts who have spent three years attending the Gagarin Air Academy will receive training considerably different from that given to their US counterparts. The Academy is charged with the preparation of "command cadres of various aviation specialties and is a scientific center *for working out problems of operational art of the Air Forces and tactics of branches and types of aviation.*" (Emphasis added.)

In the three years the Soviet cosmonauts spend at the Gagarin Air Academy, they work with faculty members and other students, investigating the military role of man in space. There is no comparable place in the United States where astronauts are brought into such a military-academic environment. "It is no accident"—to use a favorite Soviet expression—that the major think-tank of the Soviet Air Forces is named after the first man in space.

Professors at the Gagarin Air Academy publish relatively few books and articles available to the general public. In all probability, their writings are classified. There would be little need for their wide dissemination.

Soviet cosmonauts are on a fast track for military promotion, and all receive the nation's highest decoration—Hero of the Soviet Union.

The Academy is only a few miles northeast of Moscow, but in an area closed to foreigners.

Western tourists visiting Moscow generally arrive by air at Sheremetyevo Airport. En route to their hotel, they travel down Leningrad Prospekt and pass by the Central Airfield. When opposite this airfield, if they should glance to the left, they would see a picturesque prerevolutionary palace and probably a few captains and majors in air forces uniforms. The building houses some of the offices of the Zhukovskiy Military Air Engineering Academy. It is possible that some of the students glimpsed are Soviet cosmonauts. Thirteen have thus far taken this five-year military air engineering course.

The Academy is more than an institution of higher

learning. It also is "a scientific center for working out problems in the areas of aviation technology, its technical exploitation, and combat utilization." It has elaborate research facilities and a library with more than a million books.

The Air Engineering Academy does not attempt to conceal its close ties with the Academy of Sciences, and a number of academicians are on the faculty. The arrangement is ideal for development of manned military space vehicles, with cosmonauts at this prestigious engineering institution working with faculty members and selected individuals from the Academy of Sciences.

The highest levels in the Soviet Armed Forces give significant attention to manned space activities. Voyenizdat, the publishing house of the Soviet Ministry of Defense, has issued a number of books about man in space. Most appeared in the 1960s, which, in light of Soviet security practices, is not unusual. Once a concept or a system nears actual military application, discussion of it generally disappears from the open press.

In the early 1960s, during the period of the so-called "Cold War," there was much closer contact between Western air attachés and Soviet Air Forces officers than would be the case later. At that time, the achievements of Soviet cosmonauts were unequaled. One leading Soviet Air Forces strategist remarked there should be no artificial boundary between conventional aircraft and manned space vehicles. Someday ships would take off from a runway and go into space! In 1971, *Aviation on the Threshold of Space* appeared in Soviet book stores.

The current attention in the United States to scramjets and concepts for manned vehicles taking off from runways, achieving speeds of Mach 8—or even going into orbit—must be matched by equivalent interest in the Soviet Union, especially by the cosmonauts at the military academies of the Soviet Air Forces.

New Aspects of Air Defense

In the mid 1960s, two new components of air defense were described in Soviet military texts. The first, *protivoraketnaya oborona* (PRO—antimissile defense), was for "detection and destruction of enemy ballistic missiles on their flight trajectories, and for subjecting them to electronic countermeasures. The basic means of antimissile defense are antimissile missiles and special electronic countermeasures."

The second of these new components, *protivokosmicheskaya oborona* (PKO—antispace defense), "has as its main purpose the destruction in their orbits of space systems used by the enemy for military purposes. The principal means of antispace defense are special spacecraft and vehicles (*e.g.*, satellite-interceptors), which may be controlled either from the ground or by special crews."

These new aspects of air defense were in accordance with basic Soviet military concepts. Soviet military theory states that once a new weapon is anticipated, immediate attention must be given to development of a counterweapon.

In light of this basic tenet of Marxism-Leninism, it is little wonder that the Troops of Air Defense are the second largest Soviet military service, a fact frequently overlooked in the United States. Its Commander in Chief, Aleksandr I. Koldunov, is a Chief Marshal of Aviation. The Commander in Chief of the Soviet Air Forces is still only a Marshal of Aviation.

While the Soviet Air Forces have responsibilities for manned space activities, Troops of Air Defense are concerned with both ballistic missile defenses and, to some extent, unmanned satellites. The Moscow Air Defense District, with its ABM facilities, is part of the Troops of Air Defense.

As problems of operational art and tactics of the Soviet Air Forces are studied at its two military academies, similar tasks of the Troops of Air Defense are worked at the Zhukov Military Command Academy of Air Defense and the Govorov Military Engineering Radiotechnical Academy of Air Defense. The Military Command Academy of Air Defense appears to be the major Soviet think-tank studying all aspects of air defense, including missile and space defenses.

In 1976, Marshal of Aviation Georgiy V. Zimin, then Commandant of the Academy, covered ballistic missile defense systems in his book, *Development of Anti-aircraft Defenses*. Because of Soviet censorship requirements, he could not acknowledge or describe Soviet developments, so when addressing weapon systems, he cited the "foreign press." Zimin concluded:

"Now victory or defeat in war will depend on how the state will be able to reliably protect important objectives on their own territory from destruction by strikes *from the air and out of space*." (Emphasis added.)

Soviet senior officers seldom write about subjects that are outside their area of responsibility. It is unlikely that Zimin would have been permitted to discuss ballistic missile and space defenses unless these matters were the concern of the Academy. His book appeared at the very height of détente. Even in that setting, the author made it plain that the Soviet Union considers a ballistic missile defense system necessary. The survival of the nation may depend on it.

Concerns With Communications

The second academy, the Govorov Military Engineering Radiotechnical Academy of Air Defense, is concerned with communications and sensors in air defense equipment. Faculty members work closely with the Academy of Sciences. It should be expected that major attention is given to the study of radars necessary for ballistic missile defenses and their attendant communications systems.

By the early 1960s, the Soviets were already working to deploy an ABM system. Huge sites, apparently ABM facilities, were constructed around Leningrad, but for reasons still unknown were never completed.

"I am not boasting when I say that we really have a global missile that cannot be destroyed by any antimissile means, and I know what antimissile means are because we have them," Nikita Khrushchev said in a 1962 speech only months before the Cuban missile confrontation. "Our rockets could practically hit a fly in outer space."

The Soviets wanted to ensure that their successes in ballistic missile defenses were known to the outside world—and probably sought to mislead the West into thinking that the defenses were more effective than they really were. There are only two roads in the Soviet Union over which Westerners exit or enter the nation

with any frequency. One is the Helsinki-Leningrad-Moscow route. By 1964, huge ABM radars could be seen by anyone traveling this route. The other road is the Warsaw-Minsk-Moscow highway, along which a second major radar was constructed. In November 1964, the "Galosh" missile was shown in the military parade.

In the 1960s, as the Kremlin leadership was deploying its ICBMs at a rate completely unanticipated by Washington, the necessity for an ABM system was explained as follows: "Missiles, like any other weapons, no matter how terrible, are not absolute weapons. An effective means of defense will always be found against any weapon."

In the 1980s, Soviet spokesmen attempt to show that it is the United States that escalates the arms race by introducing new weapon systems and that the US seeks military superiority over the Soviet Union. The situation was different in the 1960s.

"The USSR has far outstripped the United States not only in creation of intercontinental and other rockets, but also in the area of antimissile defense," said *Soviet Rocket Forces*, published by Voyenizdat in 1967. "In our country we have successfully solved the problem of destruction of rockets in flight."

Unchanging Concepts

One of the first significant Soviet military books to appear after the SALT I treaty, with its ABM protocol, stated the following: "Nor should one dogmatically absolutize the correlation between offensive and defensive weapons that prevailed at the initial stage of the present technological revolution. History attests to the fact that there are no offensive weapons that cannot be in time be countered with effective defensive weapons."

Soviet research, testing, and planning for an ABM system, still in place around Moscow, was carried out in secret.

In order to justify what they themselves were probably doing, throughout the 1970s Soviet spokesmen asserted that the United States was deploying an ABM defense. Soviet research, testing, and planning for an ABM system was done in the greatest secrecy.

A 1985 pamphlet by Marshal of the Soviet Union N. V. Ogarkov, *History Teaches Vigilance*, again reviewed the constant struggle between the offense and the defense, including missiles and antimissiles. Ogarkov's assertions are essentially the same as those expressed by other Soviet leaders throughout the 1960s and 1970s.

President Reagan's Strategic Defense Initiative impinges primarily on the land-based missiles of the Strategic Rocket Forces. It was this force that took the Soviet Union to superpower status in the early 1970s. Soviet attacks on SDI should be interpreted in this light.

Soviet military textbooks say that the Strategic Rocket Forces are not simply the primary strategic offensive nuclear forces; they also have a defensive role. One of their tasks is "to render aid to the Troops of Air Defense." Although the means of executing that mission are never explained, the most reasonable interpretation is that the phrase refers to a preemptive strike to destroy the opponent's force before it can launch.

In the day-to-day peacetime role, the Strategic Rocket Forces launch both the manned and unmanned satellites for the Air Forces, Troops of Air Defense, and other agencies.

In a March 1985 interview, Chief Marshal of Artillery Vladimir F. Tolubko, then CINC of the Strategic Rocket Forces, gave his view of the proposed US missile defense system. He described US intentions as follows:

- Four satellites in stationary orbits over the USSR at 35,000–36,000 kilometers will identify launchers.
- Ten satellites are to be on solar-synchronized orbits at altitudes of 20,000, 10,000, and 6,000 kilometers. These will guide and command 100 other satellites carrying antimissile weapons.
- Each of the 100 satellites will carry 150 antimissile missiles with heat-operated, self-propelling missile heads weighing 200–400 kilograms.
- Weapons are to strike Soviet missiles at altitudes of 100 to 800 kilometers over the territory of the USSR.
- By the year 2000, the stations will have laser, ray, and electromagnetic weapons.
- The first tier of the system is expected to destroy seventy percent of the missiles; the remaining thirty percent will be destroyed by the second tier. Effectiveness is estimated at ninety to ninety-two percent.

Tolubko then gave his propaganda line:

- The first tier of the system is not essentially a defense measure, but represents an offensive operation because it is aimed at destroying Soviet missiles on Soviet territory.
- The 100 satellites that are supposed to carry antimissile weapons with ordinary warheads could be nuclear warheads, intended for a disarming first strike on the USSR.

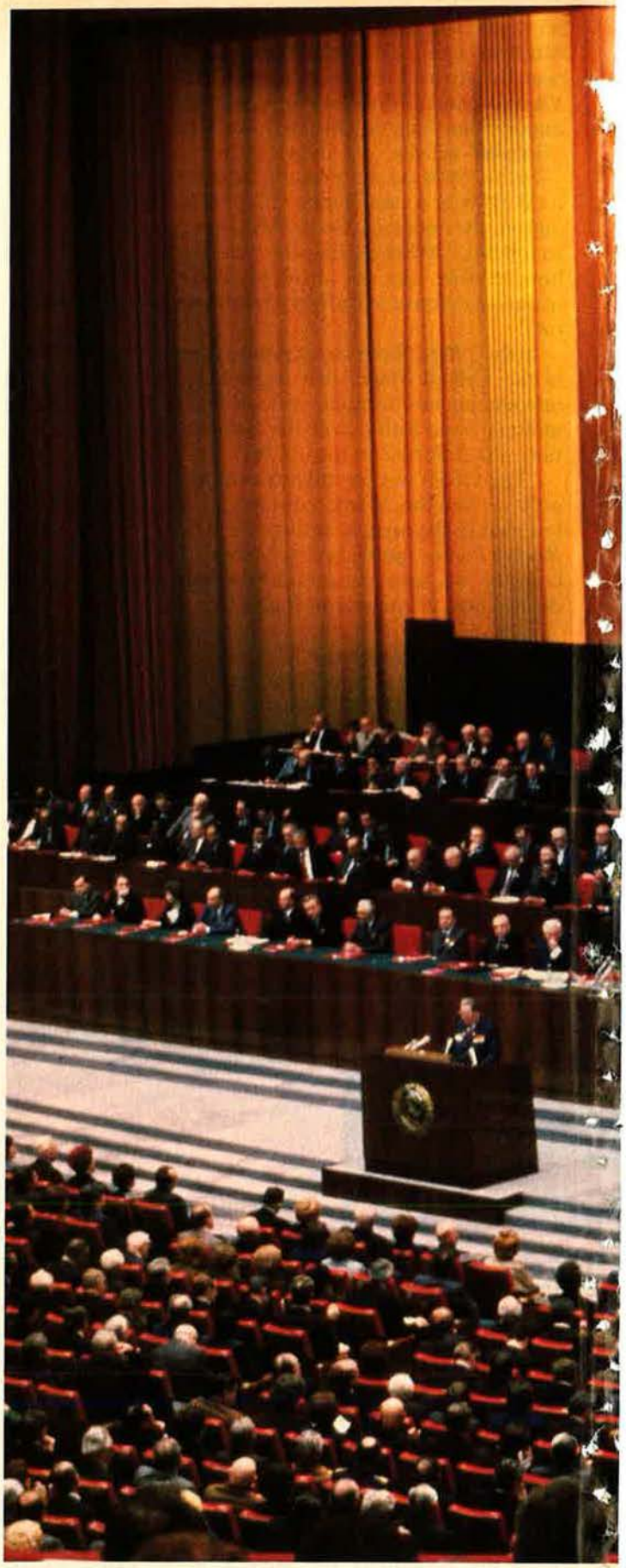
In all probability, Tolubko does not believe these last two statements. Instead, this view harks back to the early 1960s, when Nikita Khrushchev claimed that he had global rockets that could not be destroyed by air defense means. The possibility should not be overlooked that this type of system is what the Soviets themselves are seeking. ■

Dr. William F. Scott retired from the Air Force in 1972 as a colonel. He served two tours in the US Embassy in Moscow, first as Senior Air Attaché (1962–64) and later (1970–72) as Air and Defense Attaché. Since then, he and his wife, Harriet Fast Scott, have made several trips across the Soviet Union and have traveled in China. Their book, The Armed Forces of the USSR *(Third Edition), is now published in a number of foreign countries, including a Japanese translation. Dr. Scott is presently a consultant to the Arms Control and Disarmament Agency and to a number of research institutions.*

The Communist Party is holding its first Congress of the Gorbachev era. The power and prestige of the military are duly reflected.

THE PARTY ASSEMBLED

BY HARRIET FAST SCOTT



ONCE every five years, the Communist Party faithful gather in Moscow to attend the Party Congress. The first of these assemblies was in 1898 in Minsk. In the early years, they were held irregularly. Soon after this article appears in early March, the Communist Party of the Soviet Union (CPSU) will conclude its Twenty-seventh Party Congress.

Some 5,000 delegates, more than 100 of them from abroad, will jam the Kremlin's Palace of Congresses for a week of all-day speeches. More than 300 of the delegates will be in uniform, representing the Armed Forces of the Soviet Union.

The culminating point of a Congress is the selection of a new Party Central Committee. The list of members to be selected for the Central Committee is prearranged, so there are no surprises. The new Central Committee immediately holds its first plenum and unanimously selects a "new" Politburo and a "new" Secretariat.

Not everyone in the Soviet Union is a member of the Communist Party. In fact, in a population of 277,000,000, only 19,000,000 belong to the Party—about seven in every hundred. For the armed forces, the percentage is higher, more than twenty in every hundred. The percentage of Party members in the officer corps goes much higher than that.

It is possible to join the Party at eighteen, but before the age of twenty-three, only members of the Komsomol (the nearly 45,000,000-strong Communist Youth League of young men and women aged fourteen to twenty-six) are considered. Even then, the candidate stage lasts a year.

Ninety percent of the members of the Soviet Armed

This was the scene on February 23, 1981, in Moscow at the 26th Congress of the Communist Party. At the rostrum was Leonid Brezhnev, then General Secretary of the Central Committee of the Party. (TASS from SOVFOTO)

Forces belong to either the Communist Party or the Komsomol. Eighty-seven percent of the men called up for compulsory military service are either Communists or Komsomols. Komsomol members predominate, since they are primarily of the call-up age of eighteen. According to Soviet official sources, the percentage of the military belonging to the Communist Party itself varies from twenty to twenty-two percent. This is concentrated in the officer force, more than ninety percent of whom are Party or Komsomol members. Young officers (whose numbers predominate in the armed forces) are still more likely to be Komsomol members.

In the months leading up to the Party Congress, regional Party meetings have been held all over the Soviet Union. These sessions dealt with budgets and plans, but an item of special interest was the new edition of the third program of the Party. These were the main topics for discussion at the Congress. The Party conferences also chose their delegates to the Party Congress in Moscow.

All-Star Cast

The General Staff held its Party Conference in late December. Attending were Marshals of the Soviet Union (there are currently six holding this five-star rank), Generals of the Army, Admirals of the Fleet, and Marshals of Aviation and other branches of service. The gold star of a "Hero of the Soviet Union" flashed on the chests of twenty-eight. Four more sported two such stars. Five wore the slightly spikier gold star of "Hero of Socialist Labor." Scattered among the attendees were forty-five winners of Lenin and government prizes and forty-nine doctors (Ph.D.s) and candidates (M.A.s) of science. Every fourth officer there had participated in the "Great Patriotic War," as the Soviets call that part of World War II in which they fought against Hitler's Germany. Every officer present had been decorated.

The Chief of the General Staff, Marshal of the Soviet Union Sergey Akhromeyev, sixty-two, noted in his speech that the recent summit meeting between President Reagan and General Secretary Gorbachev had laid the groundwork for improved relations. "However," he added, "the USA does not want to abandon its aggressive plans, intends to continue pursuing a line of gaining a one-sided advantage in the future, and calculates on carrying out their military program at any price, including the creating of space strike means *[udarnyye kosmicheskiye sredstva]*. They have not given up their attempts to shatter the parity in strategic forces which has been built up, to forestall [the Soviet Union] in deploying many other kinds of weapons in order to pressure the Soviet Union to make concessions. All this forces us to be on guard and to approach questions of protecting the country with special responsibility."

Akhromeyev reported that the work of the General Staff grew more complex each day. It was very important, he said, to follow and objectively evaluate military-political tendencies, changes in the relationship of forces, and the nature and direction of military preparations of the probable enemy in order to develop effective countermeasures.

The military Party conferences lasted until mid-January. The General Staff and the main staffs and directorates of the five services—Strategic Rocket Forces, Ground Forces, Troops of Air Defense, Air Forces, and the Navy, along with the Rear Services, Civil Defense, and Airborne Troops—all convened Party conferences. So did each of the sixteen military districts, the four groups of forces abroad, the Moscow Air Defense District, the four fleets, and the Leningrad Naval Base. Several of the military academies and leading divisions also held meetings.

The pattern of military Party conferences followed by regional Party Congresses was repeated in all the other military districts, groups abroad, and in fleets. The welding of links between the military and the Communist Party strengthens the latter's control over the former to a very high degree.

Who Are the Delegates?

The delegates are the elite of the Communist Party with a few "representatives of the people" mixed in. The full statistics are not yet published, but if past performance is any guide, seven out of every ten delegates are attending the Congress for the first time. Twenty-five percent are women. Half the delegates are between thirty-six and fifty years of age, a quarter between fifty-one and sixty, and the rest evenly divided between those under thirty-five and those over sixty.

About 1,500 come from industry and fewer than 900 from agriculture. About 250 are writers, scientists, artists, and composers—the intelligentsia. More than 600 are managers and directors of some sort. More than 1,000—one in five—are full-time Party workers. Nearly 700 work for the government, the trade unions, or the Komsomol. More than 100 are academicians or corresponding members of the Academy of Sciences USSR or of one of the union republic academies of science. There are a dozen or so cosmonauts to add glamor.

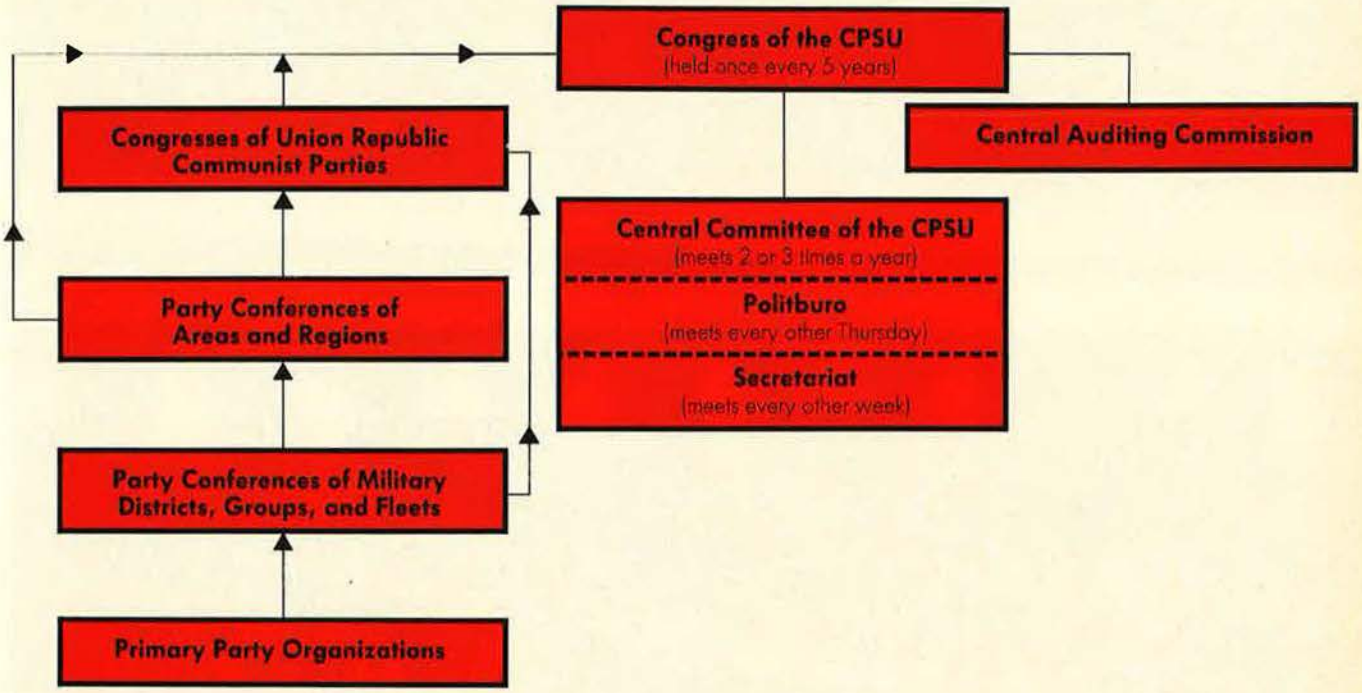
Three out of five delegates represent the Russian Soviet Federated Socialist Republic—the RSFSR—largest of the fifteen Soviet republics. About 900 come from the Ukrainian Communist Party, with Kazakhstan running third with a little over 200. Belorussia and Uzbekistan send nearly 200 each, and so on. Georgia and Azerbaydzhan each have more than 100 delegates, while Armenia sends fifty-odd. Turkmen's Communist Party is lowest, with only about thirty delegates.

Many delegates are from the Moscow area. There are about 500, of whom two-thirds represent the city itself and the other third the region around Moscow. That gives the Moscow Party organization a very strong voice at the Congress and in Party matters generally. The Leningrad area sends nearly 200 delegates, about the same number as the union republics of Kazakhstan, Belorussia, and Uzbekistan. The leading industrial areas—such places as Donets, Rostov, Krasnodar, Gor'kiy, and Sverdlovsk—are represented with nearly 100 Party members each.

There are a few delegates who joined the Communist Party before the Revolution in 1917. Two hundred or so joined before the Great Patriotic War, and about 400 during the war. Four out of five joined since the war. A third of the delegates have had a "Party stage" of less than fifteen years.

The delegates are well educated. Only five percent have less than a high school education. There are more than 500 Ph.D.s and M.A.s.

Organization of the CPSU



CENTRAL COMMITTEE POWER PLAYERS

Military and political leadership are intertwined. The popular notion that they are at odds is a fallacy.

In the misty world of Kremlinology, membership on the Central Committee of the Communist Party is considered a sign that the marshal, general, or admiral is powerful. Is this really so? Are these men to be considered the high command of the Soviet Armed Forces?

One way to test the theory is to trace the ups and downs of the careers of those who were members of the Central Committee selected before the Twenty-seventh Party Congress. Was being a member of the Central Committee a factor in advancing the careers of any of them? Who were they, and where are they now?

In brief, of the twenty-three marshals, generals, and admirals selected as members of the Central Committee in 1981, seven (Ustinov, Yepishev, Kutakhov, Moskalenko, Bagramyan, Batitskiy, and Chuykov) have died in the intervening five years. Two Generals of the Army (Kurkotkin and Petrov) were promoted to Marshal of the Soviet Union. Two branch marshals were promoted to Chief Marshals, a rank slightly below Marshal of the Soviet Union and Admiral of the Fleet of the Soviet Union (Tolubko became Chief Marshal of Artillery, and Koldunov was advanced to Chief Marshal of Aviation). One was promoted to General of the Army.

Almost all of the reassignments for this group have been a game of musical chairs among themselves. This has kept members of the Central Committee in the most important posts. The most publicized change was the appointment of Marshal Sergey Akhromeyev to replace Marshal Nikolay Ogarkov as Chief of the General Staff in September 1984. Akhromeyev was already a candidate and subsequently elevated to full membership on the Central Committee. Ogarkov immediately became Commander in Chief of the Western Theater Command (TVD), one of three activated at that time. Not surprisingly, the other two TVDs were headed by generals who were already candidate members of the Central Committee.

The past four Party Congresses were under the aegis of Leonid Brezhnev. The Twenty-seventh Party Congress will be the first post-Brezhnev congress. Mikhail Gorbachev has moved rapidly to replace dead wood in important positions. Many others had been anxious to retire, but could not do so because of the turmoil caused by the illnesses and deaths in rapid succession of Party General Secretaries Leonid Brezhnev, Yuri Andropov, and Konstantin Chernenko. Thus, there are many reasons why the new Central Committee will have a different look.

The mix of members and candidates has fluctuated over the years. The Central Committee has been enlarged by thirty at every congress since 1961 and went up by forty-four in 1981. The new Central Committee will be more than 500. Thirty-eight of them should be military men.

How will the military fare over the next five years? That largely depends on who gets tapped for membership on the prestigious Party Central Committee.

The process by which the military is ever more closely tied to the highest political leadership of the Soviet Union demonstrates the fallacy of the sometimes popular notion that the military and the Party are at odds with one another. The top men in the military hierarchy also sit on the highest Party councils. And highest Party officials are members of the highest military councils in their areas.

Membership in the Communist Party unites them all and gives them a common philosophical outlook and world view. The military policy of the Party becomes the military doctrine of the Soviet Armed Forces. As Party members, they take part in shaping it, and as military officers, they carry it out.

—HARRIET FAST SCOTT

At the Kremlin Palace of Congresses in February 1981, representatives of the Soviet Armed Forces greet the delegates to the 26th Congress of the Communist Party. (TASS from SOVFOTO)

They are also decorated. More than fifty gold stars suspend from scarlet ribbons pinned on the chests of Heroes of the Soviet Union. Almost 700 delegates wear the slightly thinner gold star of Hero of Socialist Labor, the civilian counterpart to Hero of the Soviet Union (although several Hero of Socialist Labor decorations are on military uniforms).

Each delegate represents 3,670 Party members. They were selected early this year at local and regional Party conferences. While packing their bags for the trip to Moscow in February, some remembered the tragedy that befell the delegates from the Pacific Fleet on their way to the Twenty-sixth Party Congress in 1981. Seventy military men, a score of them admirals and generals, died when their plane crashed near Leningrad. The dead included the commander of the Pacific Fleet, the fleet's political officer, and the commander of the Air Forces of the Pacific Fleet.

On the evening before the Congress ends, the delegates will be presented with a single list of names for membership and candidates for membership in the new Central Committee of the CPSU and also for the Central Auditing Commission. The vote will be "secret." The new Central Committee then convenes its first plenum, at which it "unanimously" selects a "new" Politburo and a "new" Secretariat. The "new" Politburo and "new" Secretariat, of course, will be the same as the old ones.

The Politburo and Secretariat

Everyone knows that the Communist Party's Politburo makes all the final decisions in the Soviet Union. They also recognize that Politburo member Mikhail Gorbachev, as General Secretary, heads the Party's Secretariat, making him the nation's top leader. Politburo membership fluctuates in number. Going into the Congress, it had eleven members and six alternate or candidate members. One of the Politburo's candidate members was Defense Minister Marshal of the Soviet Union Sergey L. Sokolov. Although Sokolov became Minister in Defense in December 1984, ailing General Secretary Chernenko was unable to hold a plenum of the Central Committee to raise Sokolov's Party status.

(For the record, past Ministers of Defense have not always been on the Politburo: Malinovskiy (1957–67) never made it. Grechko (1967–76) was made a full member only in 1973. Ustinov (1976–84) was already a member when he became Minister of Defense.)

The power and prestige of the military will be reflected in the new Politburo. The Chairman of the KGB and the Minister of Foreign Affairs are already full members. If the Minister of Defense does not become a full member at the Congress, his influence will be diminished.

Day-to-day work is handled by some two dozen "departments" of the Central Committee. These departments look after everything from keeping tabs on the nationwide Party apparatus to overseeing heavy industry, influencing foreign policy, and directing science and education. The Main Political Directorate of the Soviet Army and Navy, although not a department, operates with the rights of a department of the Central Committee. In other words, the political officers in the armed forces report not to the Minister of Defense, but to the Central Committee. This is complicated by the fact that the Minister of Defense wears two hats—one as a government minister and the other as a Politburo member.

Appointments to the *nomenklatura* positions, civilian and military, Party and KGB, are jealousy guarded prerogatives of the high Party leadership. People occupying these key positions must be approved by the Party and are regarded as the "ruling elite" of the Soviet Union.

Nominally backing up the Politburo and the Secretariat is the Central Committee of the Communist Party of the Soviet Union. In 1981, the Central Committee chosen by the Twenty-sixth Party Congress had 319 members and 151 alternate members. (Numbers of members and alternate members vary from congress to congress.) Thirty-six high-ranking marshals, generals, and admirals were on the 1981 Central Committee, and four more were members of the Central Auditing Commission, which keeps track of Party finances.

Plenums of the Party Central Committee are held irregularly, between one and four times a year, for a few days at a time. They approve certain items, such as the five-year plans and budgets, resolutions of various types, and long-range plans. ■

On PEACE, WAR, and THE WEST

A Sampler of Sentiments from the CPSU Program (New Edition)

"The most acute problem facing mankind now is the problem of war and peace."

"The citadel of international reaction is US imperialism. It is from here, above all, that the threat of war emanates."

"Imperialism threatens a third world war."

"There has never been such an awesome danger hanging over mankind. . . ."

"It is possible to avert war and to safeguard mankind from catastrophe. This is the historic calling of socialism. . . ."

"The ultimate foundation of the strengthening of the defense of the socialist motherland is the Communist Party's leadership of the armed forces."

"Service in the ranks of the armed forces is the USSR citizen's honorable obligation and sacred duty."

Harriet Fast Scott, a Washington consultant on Soviet military affairs, is a member of the General Advisory Committee on Arms Control and Disarmament. She has lived and traveled extensively in the USSR and maintains one of the largest private libraries in the US of Soviet military publications. Her translation and analysis of the Third Edition of Marshal V. D. Sokolovskiy's Soviet Military Strategy *is a standard reference, as are three of her other books—*The Armed Forces of the USSR, The Soviet Art of War, *and* The Soviet Control Structure, *all coauthored with her husband, Dr. William F. Scott.*

Some Western journalists need to look more carefully for fingerprints on the stories that come their way.

THE SKY'S NO LIMIT ON DISINFORA

BY JAMES E. OBERG

READERS are invited to participate in an experiment in space-age disinformation. Take the line of text below, which is from the title page of a magazine, and ask several people what the proper citation of the document should be. That is, just which issue of the monthly journal are we looking at? What is the magazine's issue date?

The line is as follows:

Volume 20 No. 7 *July 1978* *Published 25 June 1978.*

Collect the results and keep them on hand. I'll discuss them later.

There is a good reason for this exercise, and it has to do with the quality of Soviet disinformation products—false documents and leads released to confuse and mislead Western public opinion and to support Soviet policies at home. Often, such disinformation—particularly some recent cases, such as the "KKK letter" to Third World Olympic athletes that was dripping with Jack London-style curses at least three generations out of use—is relatively easy to unmask. That leads to a question with an embarrassing answer: If the Soviets are so smart, why are they so clumsy about their propaganda?

The answer is that they don't have to be very adept to

into East Germany while an American electronics eavesdropping satellite (a "ferret") orbited overhead. The article, which was by-lined "P. Q. Mann," was written, according to London newspapers, by Tony Devereux, a public-relations executive in London with no spaceflight expertise.

The story spread around the world like wildfire. NBC-TV News in New York discussed it with a background graphic showing the Space Shuttle hovering over Alaska. The Washington *Post* gave it a prominent position. When the Baltimore *Sun* reprinted the article several weeks later (along with a refutation by its Pentagon correspondent), the two textual arguments were below the fold of a page that showed the Space Shuttle soaring directly over Sakhalin Island while the airliner fell in flames below it. And as might be expected, the Soviet media embellished the story and trumpeted it enthusiastically.

VATION

deceive large segments of the Western news media and public. The deceived parties often take a remarkably cavalier attitude toward verification of stories they are inclined to believe in the first place. Unveiling of disinformation seldom gets the publicity that the original disinformation got, so the net effect is productive from the Soviet point of view.

This willingness to disseminate less-than-perfect disinformation products applies particularly to technical subjects, about which the average Westerner (even the average Western newsman) is abysmally ignorant. An excellent case in point is the recent flap over the alleged connection of the Space Shuttle with the South Korean airliner, KAL 007, in 1983.

In mid-June 1984, the story broke in London that a new study had disclosed a connection between the KAL 007 "spy mission" the previous September 1 and the mission of STS-8, the Space Shuttle *Challenger.* According to an article in the respected bimonthly magazine *Defence Attaché*, the spaceship was in proper position to monitor Soviet air defense radars and communications during the unfolding of the tragedy. The deliberate penetration by 007 was said to be a repetition of several 1964 incidents in which military aircraft flew

Apologies and Recantations

The affair later took a marked turn for the better after Korean Airlines filed a libel lawsuit against *Defence Attaché* in the British courts. Lawyers for the magazine quickly realized they did not have a fact to stand on. So they settled out of court, paying a "substantial" damage fee, repudiating the P. Q. Mann story, and apologizing to the airline for baselessly suggesting it would knowingly place its passengers in danger. Even before the case had come up in court, *Defence Attaché* had agreed to publish my detailed factual correction. My article appeared in the January-February issue of the magazine, which was published in late March 1985.

The magazine's recantation received nowhere near the publicity accorded the Mann article. In fact, not a single Western newspaper, wire service, or television or radio station mentioned the rebuttal article. The left-wing media explained it away as being merely the practical way out of a long, expensive court fight that the small magazine, right or wrong, could not afford.

The Mann story had been factually absurd from the start, but nobody seemed to notice or care. The incidents over East Germany in 1964 did not involve a "ferret." The satellite identified as such by Mann was a

weather observation platform, which was obvious from its orbital path. And the Shuttle's orbit never took it within radio or radar range of the Korean airliner or any Soviet transmitting facility. These facts were readily available to anyone who wanted to verify Mann's claims.

Even the magazine's editor, Rupert Pengelley, had quickly backed off after the Mann article came under question and after he had accepted my offer to write a rebuttal piece. "I am indebted to you for taking up the cudgels," he wrote me the following month. "You will be doing us all an immense service if you could produce sober, factual, and succinct refutations of the assertions made by P. Q. Mann. . . . "

Disinformation Fingerprints

The central question before us is this: Was the 1984 P. Q. Mann piece (and similar "spy scenario" claims in other Western journals) a deliberate Soviet plant? Or was it merely a "windfall" benefit to Moscow, engendered by the scientific illiteracy of the writers and editors? Before tackling those questions, let us review some additional journalistic history.

Some disinformation products have clearer fingerprints left on them than others. Probably the best example of clear fingerprints was the story that suckered in leading American journalists and editors in 1977—a story in which I was directly involved during its later stages. It was claimed that the small West German rocket development corporation, OTRAG, was secretly building nuclear-armed cruise missiles for the West German military (and for South Africa, too) and was testing them in Africa. Further, the test range in Shaba Province of Zaire was being forcibly depopulated by Zairian troops, and hundreds of thousands of refugees were reportedly fleeing into neighboring nations.

Tad Szulc, a former New York *Times* reporter who more recently has written regularly for *Parade*, was the most famous journalist to take the bait. The story was apparently based in part on material that appeared in such known Soviet-front publications as *Afrique-Asie*, published in Paris, but Szulc may have received it from an intermediate source and detected no warning signs. He sold his embellished version of the story to *Penthouse* magazine, which subsequently broadcast hyped-up allegations of NATO-backed West German militarists on the rampage. The national wire services highlighted the story, and Radio Moscow gratefully echoed all these "independent corroborations" of its own original claims.

The story, as it turned out, was baseless. The OTRAG rocketeers were really only a group of tinkerers trying to make a breakthrough (technological and financial) in space transportation systems. The engineers were building multistage ballistic missiles, not winged cruise missiles. They needed a near-equatorial site with lots of empty space around it for dropping expended stages during satellite launchings.

The reason for the launching of this fake "military missile" story soon became clear when Shaba Province (formerly known as Katanga) was invaded by an Angola-based and East German-armed band of former Katangan soldiers who took to plunder and slaughter before being driven out eventually by the hastily imported French Foreign Legion. About 2,000 people are believed to have lost their lives, and the provincial economy was crippled. Meanwhile, the OTRAG allegations conveniently allowed most African nations to look the other way during the Communist-led invasion and to profess that it was an "internal matter" understandably provoked by NATO militaristic intervention in Africa. Some elements of the Western news media, presumably merely careless and sensational, obligingly helped lay the diplomatic groundwork for the invasion.

But how about those disinformation fingerprints? They were all over Szulc's story. Most prominent was the misspelling of the full name of the German firm MBB, which was indicted by Szulc in the cruise-missile plot. In *Penthouse*, the second and third names were spelled "Belkov" and "Blaum." In German, the names are "Bölkow" and "Blohm." Why the errors? Merely sloppy notetaking or typographical errors?

Maybe, but the misspellings also happened to parallel

Sloppy notetaking or typos? Maybe, but the misspellings paralleled the Cyrillic transliterations.

the way the names are sometimes transliterated into Cyrillic, the alphabet used in the USSR. Anyone whose source material was derived from a document originally in Russian might misspell them in about the same way they appeared in Szulc's article. Yet Szulc continues to insist he got the story from "top Washington sources." I have repeatedly made inquiries to him, requesting his explanation for the misspellings. His reply, even after many years, is a curt "I stand by my story."

Another Soviet attempt to float spaceflight disinformation in the Western news media occurred early in 1984 in Japan. There, a writer named "Akio Takahashi" (which appears to be a pseudonym) published a booklet entitled *The Crime of the President: The Provocation of the South Korean Airliner on Direct Order of Reagan.* The Soviet press touted the book triumphantly, and Novosti quickly brought out a Russian-language edition. Observers suspected it was a plant, but there was no obvious proof.

Then I found some proof. It was part of the book's phony claim that the earlier Korean airliner intrusion over Murmansk in 1978 was also coordinated with "Ferret-D" type satellites. (At random, any such satellites cover two-thirds of the northern latitudes on every

orbit, so the alleged coordination was merely a coincidence.) Identification numbers of the alleged American spies-in-the-sky were given: 1974-085-3 and 1978-029-3.

But the international designators of satellites use the launch year plus sequence number for that year plus a Latin letter code in alphabetical order for various objects associated with each launch. The sixty-kilogram ferret satellites ("Ferret-D" is a purely Soviet designation anyway) on these launchings were hitchhikers atop thirteen-ton "Big Bird" reconnaissance vehicles, and their code numbers were actually 1974-085B and 1978-029B. There were no objects in orbit at the time of the airliner penetration with either a "3" or a "C" in the designation.

"B," of course, is not the third letter of the Latin alphabet. So why did Takahashi translate "B" as "3"? Well, Japanese has no character for "B," so a straight transliteration from characters to numerals should have been written as 1974-085-2 and 1978-029-2. The symbol "B" *does*, however, happen to be the third letter of the Cyrillic alphabet. What these two terminology mistakes point toward is that whoever it was who made them—whoever saw "B" and wrote "3"—was likely working in the Russian alphabet. Examples such as these haven't hurt the utility of disinformation activities.

'B' is not the third letter of the Latin alphabet, but *is* the third letter of the Cyrillic alphabet.

The Role of Fronts

A leading role in this campaign is played by groups generally considered to be Soviet fronts, such as the US Peace Council, founded in 1979 by two leading officials of the American Communist Party, according to congressional testimony by the FBI. Late in 1984, the organization put out a pamphlet called *The Curious Flight of KAL 007* and written by Dr. Conn Hallinan, associate editor of *People's World*, published in Berkeley, Calif. *Pravda* reviewed it in glowing terms, but no other publication in the world (except perhaps the *Daily World* and *People's World*) touched it.

In the pamphlet, Hallinan repeats the 1978 spy satellite (for some odd reason, misspelled as "Ferrits" instead of "Ferrets") identification numbers, "74085-3" and "72029-3," and explicitly assigns the claim to the Soviets. But my further inquiries to track down the precise origin of the assertion went unanswered by Hallinan, who could only suggest in a private communication that perhaps some associate had gone through his files and removed that source article.

The biggest "KAL 007 spy scenario" article in the US was published in *The Nation* (whose credibility was still recovering from a 1977 report asserting that the tales of "Cambodian genocide" under the Khmer Rouge regime were fictitious slander concocted by the CIA) in its August 18–25, 1984, issue. The article, "KAL 007—What the US Knew and When We Knew It," was written by David Pearson, a sociology graduate student at Yale. He displayed some ignorance of basic principles of radar, air traffic control procedures, spaceflight, and other key topics, but his conclusion—that the US was deeply involved—was welcomed by the magazine.

Pearson's article mentioned the P. Q. Mann charges without judgment, but in later television interviews Pearson explicitly claimed that the Shuttle had carried a spy antenna (the object of his reference was, in fact, the "PFTA" dummy payload used to exercise the robot arm) to eavesdrop on Soviet radar and communications during the airliner's final hours.

One of Pearson's private sources was a long-retired aerospace engineer in California. But that man's own sources are of greater interest here. In a telephone interview with me, he referred to the author of the *Defence Attaché* article as "P. K. Mann" rather than P. Q. Mann.

Another honest mistake? Maybe. But, by coincidence, who uses the "K" for "Q"? Readers should not be surprised to learn that since there is no "Q" in the Cyrillic alphabet, all Soviet-media references to the name use "P. K. Mann"—even references subsequently translated back into English for Radio Moscow broadcasts, and elsewhere. Pearson's source carried a clear fingerprint. At least some of his information came directly from Soviet sources.

Shortly before the airliner incident, a book appeared called *Inside the Soviet Army*. The author, a defecting Red Army officer, used a pseudonym, Viktor Suvorov. Most interesting is the author's assertion that representatives of the Chief Directorate of Strategic Deception, helped by Soviet military intelligence, "have recruited a collection of mercenary hack journalists abroad through which it spreads false information, disguised as serious studies." The Directorate of Strategic Deception was formerly headed by Marshal of the Soviet Union N. V. Ogarkov, who gave the official Soviet version of the airliner's "spy mission" in a carefully staged press conference in Moscow.

It must be stated clearly that there is no evidence that any of the journalists discussed here were in any way "agents of influence" or in the direct hire of the KGB. It does seem, however, that they were vulnerable to stories fed them through intermediaries.

What is disappointing is the uncritical acceptance given such questionable stories by a few supposedly professional, unbiased, news media representatives.

Overt attempts at KAL 007-related disinformation were made immediately after the downing. Geraldo Rivera of ABC's *20/20* news program recounted on the first anniversary of the KAL downing how someone had fed

his office a phony story about the airliner having been seen at Andrews AFB in Washington being outfitted with spy gear. *Time* magazine's Washington bureau was also given this story, but quickly determined it was counterfeit. The claim that Richard Nixon had been scheduled for the flight but had been warned off by a call from the CIA seems to have popped up in West Germany, but probably originated somewhat to the east. A widely published account of a phony post-shootdown telephone powwow by State Department bigwigs discussing the best tricks of propaganda exploitation also appears to have been a work of fiction by experienced craftsmen of such products.

That some attempts were so patently transparent is no reason to assume that other stories of similar origin would not have been more subtle and of less obvious pedigree.

"senior military officers." The Mann article *as published* did not contain this claim. One is tempted to ask if *Izvestia* possessed a prepublication draft.

Well, those "fingerprints" are badly smudged, and the author of the Mann article elsewhere shows remarkable scholarly ineptitude in discussions of basic space technology, so it is conceivable that the mistakes are innocent ones. The magazine's subsequent unwillingness even to attempt a factual defense of the article suggests that its editors concluded that it was indefensible and that they were eager to close the matter as quickly and quietly as possible.

Mann's own subsequent behavior has been puzzling and not a little suspicious. He refuses to "go public," probably because anonymity fosters rumors of high-level contacts (American spyflight conspiracy nuts still insist Mann is really a top-level British military aero-

Can we find fingerprints that suggest who might have floated the "Space Shuttle connection"?

More Coincidences?

So, now, how about the *Defence Attaché* story itself? Who floated the "Space Shuttle connection"? The fingerprints on it are not nearly as clear-cut, in part perhaps because the magazine's editor did heavy editing. But there are at least two smudges that are highly suspicious.

In reference to an allegedly supporting document (which, in fact, directly contradicts the main pillar of the article), P. Q. Mann cites an issue of *Spaceflight* magazine published by the British Interplanetary Society in London. He calls it the "issue dated July 7, 1978."

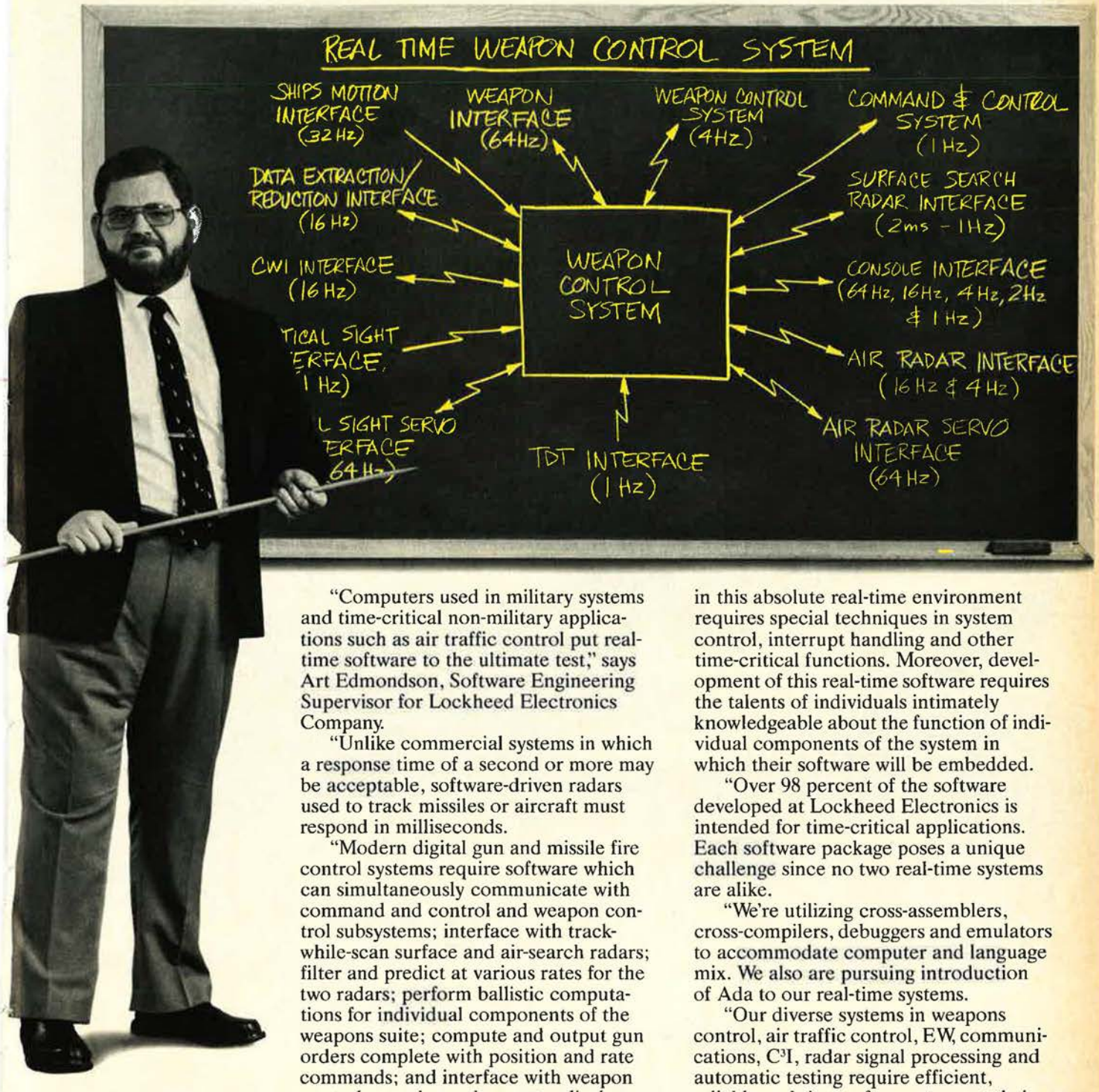
Depending on the results of your survey (if you followed directions at the beginning of this article), you may have verified the results I got. To anyone whose native language is English, "No." is obviously the abbreviation for "number" and goes with the volume reference; that is, it reads "volume twenty, number seven" (of course, July is the seventh month). But whoever did the article's original research appears to have read the dateline as "7 July 1978."

A few days after the P. Q. Mann article appeared, *Izvestia* published its own account of it. The Mann material was summarized, with a slight difference: *Izvestia* appeared to be quoting Mann as asserting (falsely, in fact) that all the STS-8 Space Shuttle's astronauts were space executive!). He has not commented any further on the thesis, has not responded to any of the criticisms, and has not backed off an inch from the claims in the article. Pengelley relayed the word to me that "Mann" would explain all these things to me "in confidence"—*i.e.*, if I agreed never to discuss them in public. I refused such terms.

As for those elements of the Western news media that enthusiastically splashed the story in the public eye, they once again prove the value and true worth of such clumsy disinformation. If it's critical of America, it will probably be widely disseminated without much attempt at verification. And when it is ultimately exposed, that fact will not be considered "newsworthy." ■

James E. Oberg is a professional space engineer working on the Space Shuttle program in Houston, Tex. He is the author of many works on space topics, with more than 200 articles and seven books (including the widely respected Red Star in Orbit *and the newly published* Pioneering Space*) to his name. A former Air Force captain, he is generally considered one of the West's leading experts on the Soviet space program. He last wrote for* Air Force *Magazine in July 1985 with the article "A Dozen Anti-ASAT Fallacies."*

Art Edmondson on advances in real-time software technology.



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Top Leaders of the Soviet Armed Forces

Marshal of the Soviet Union Sergei Leonidovich Sokolov. Born 1911, Russian. Minister of Defense (December 1984). Entered service in 1932. Fought at Lake Khasan (1938). Served in armored units on the Western and Karelian Fronts in World War II. Chief of Staff, Moscow Military District (1960–64). First Deputy Commander (1964–65), then Commander of the Leningrad Military District. First Deputy Minister of Defense (1967–84). Candidate Member of the Politburo of the Central Committee CPSU since April 1985. Deputy of the Supreme Soviet 7th through 11th sessions. Military Academy of Armored and Mechanized Troops (1947). Academy of the General Staff (1951). "Hero of the Soviet Union" (1980).

Marshal of the Soviet Union Sergei Fedorovich Akhromeyev. Born 1923. Russian. First Deputy Minister of Defense and Chief of the General Staff since September 1984. Entered service in 1940. Graduated from naval school, but fought from Stalingrad to Berlin in infantry in World War II. Deputy Chief (1975–79), then First Deputy Chief (1979–84) of the General Staff. Candidate (1981), then Member of the Central Committee since 1983. Deputy of the Supreme Soviet 11th session. Military Academy of Armored Forces (1952). Academy of the General Staff (1967). "Hero of the Soviet Union" (1982). Lenin Prize.

Marshal of the Soviet Union Viktor Georgiyevich Kulikov. Born 1921. Russian. Commander in Chief of United Armed Forces of the Warsaw Pact (since 1977). First Deputy Minister of Defense since 1971. Member of the Central Committee CPSU since 1971. Deputy of the Supreme Soviet 7th through 11th sessions. Entered service in 1939. Commander of the Kiev Military District (1967–69), then Commander in Chief, Soviet Forces Germany (1969–71). Chief of the General Staff (1971–77). Frunze Military Academy (1953). Academy of the General Staff (1959). "Hero of the Soviet Union" (1981).

Marshal of the Soviet Union Vasiliy Ivanovich Petrov. Born 1917. Russian. First Deputy Minister of Defense since February 1985. Entered service in 1939. In World War II, commanded a cavalry platoon, then chief of operations of a rifle division. In 1957, commanded a motorized rifle division. In 1966, First Deputy Commander and Chief of Staff of the Far Eastern Military District, and, in 1972, Commander. In 1976, First Deputy Commander in Chief of the Ground Forces. Commander in Chief of Troops of the Far East (1978–80). Commander in Chief of the Ground Forces (1980–85). Full Member of the Central Committee CPSU since 1976. Deputy of the Supreme Soviet 9th through 11th sessions. Frunze Military Academy (1948). Graduate of General Staff Academy's Higher Academic Courses (1969). "Hero of the Soviet Union" (1982).

General Colonel Aleksey Dmitriyevich Lizichev. Born 1928. Russian. Chief of the Main Political Directorate since July 1985. Entered service in 1946. Assistant to Chief of Main Political Directorate for Komsomol Work (1962–65). In Moscow Military District (1965–71), then Soviet Forces Germany as First Deputy Chief of Political Directorate. Chief of Political Directorate of Transbaykal Military District (1975–80). Deputy Chief of the Main Political Directorate (1980–82). Chief of Political Directorate, Soviet Forces Germany (1982–85). Member of Central Committee CPSU (1986). Deputy of the Supreme Soviet 11th session. Graduated from Lenin Military-Political Academy.

General of the Army Yuri Pavlovich Maksimov. Born 1924. Russian. Commander in Chief of Strategic Rocket Forces since June 1985. Joined Red Army in 1942. Division commander (1965), then First Deputy Commander of an army (1969). First Deputy Commander of the Turkestan Military District (1973–76). On special assignment (1976–78). Commander of the Turkestan Military District (1979–84). Commander in Chief of Southern TVD (1984–85). Candidate (1981), then Member of the Central Committee CPSU (1986). Deputy of the Supreme Soviet 10th through 11th sessions. Frunze Military Academy (1950). Academy of the General Staff (1965). "Hero of the Soviet Union" (1982).

General of the Army Yegeniy Filippovich Ivanovskiy. Born 1918. Belorussian. Commander in Chief of the Ground Forces since February 1985. Joined the Red Army in 1936. Took part in invasion of Poland (1939), war with Finland (1939–40). Commander of an army (1961–65). First Deputy Commander of the Moscow Military District (1965–68), then Commander (1968–72). Commander in Chief, Soviet Forces Germany (1972–80). Commander of the Belorussian Military District (1980–85). Member of Central Committee CPSU since 1971. Deputy of the Supreme Soviet 8th through 11th sessions. Military Academy of Mechanization and Motorization (1941). Academy of the General Staff (1958).

Chief Marshal of Aviation Aleksandr Ivanovich Koldunov. Born 1923. Russian. Commander in Chief of Troops of Air Defense (Voyska PVO) and Deputy Minister of Defense (since July 1978). Entered service in 1941. Koldunov was one of the ten top Soviet fighter aces of World War II, destroying forty-six enemy aircraft. Flew 358 sorties, taking part in 96 air battles. In the postwar period, he commanded fighter aviation units. Commander of Moscow Air Defense District (1970–75). First Deputy Commander in Chief of National Air Defense (1975–78). Candidate (1971–76), then Member of the Central Committee CPSU (since 1981). Deputy of the Supreme Soviet 9th through 11th sessions. Military Air Academy (1952). Academy of the General Staff (1960). Twice "Hero of the Soviet Union" (1944, 1948).

Marshal of Aviation Aleksandr Nikolayevich Yefimov. Born 1923. Russian. Commander in Chief of the Air Forces since December 1984. Entered service in 1941. Flew 222 sorties in ground attack aircraft. Squadron commander in the 198th Air Attack Regiment of 4th Air Army. First Deputy Commander in Chief of Air Forces (1969–84). Member of the Central Committee CPSU (1986). Deputy of the Supreme Soviet 2d and 9th through 11th sessions. Military Air Academy (1951). Academy of the General Staff (1957). Twice "Hero of the Soviet Union" (1944; 1945). Distinguished Military Pilot USSR (1970). Candidate of Military Sciences (1968).

Admiral of the Fleet Vladimir Nikolayevich Chernavin. Born 1928. Russian. Commander in Chief of the Navy since December 1985. Joined the Navy in 1947. Commanded one of the first atomic submarines (1959). Chief of Staff and First Deputy Commander of the Northern Fleet (1974–77). Commander of the Northern Fleet (1977–81). Chief of the Main Naval Staff and First Deputy Commander in Chief of the Navy (1981–85). Candidate (1981), then Member of the Central Committee CPSU (1986). Deputy of the Supreme Soviet 10th through 11th sessions. Naval Academy (1965). Academy of the General Staff (1969). "Hero of the Soviet Union" (1981).

—HARRIET FAST SCOTT

SENIOR MILITARY LEADERSHIP CHANGES FOR 1985 ★

PROMOTIONS

To Marshal of Aviation:

Konstantinov, Anatoliy Ustinovich. Commander of the Moscow Air Defense District. April 30, 1985.

Kozhedub, Ivan Nikolayevich. Group of General Inspectors. Top war ace and thrice "Hero of the Soviet Union." May 7, 1985.

To General of the Army:

Yemokhonov, Nikolay Pavlovich. First Deputy Chairman of the KGB. April 10, 1985.

TRANSFERS

Gorshkov, Sergei Georgiyevich. Admiral of the Fleet of the Soviet Union. Removed from position as Commander in Chief of the Navy, he is believed to be assigned now as General Inspector, Group of General Inspectors. As leader of the Soviet Navy for three decades (1956–85), he transformed the fleet into a powerful, oceangoing force. Born in 1910, Gorshkov joined the Navy in 1927 and saw action in the Black Sea during World War II. Member of the Central Committee CPSU since 1961. Deputy of the Supreme Soviet 4th through 11th sessions. Twice "Hero of the Soviet Union" (1965, 1982). Replaced by Admiral of the Fleet V. N. Chernavin.

Petrov, Vasily Ivanovich. Marshal of the Soviet Union. Commander in Chief of the Ground Forces from 1980, Petrov was elevated to First Deputy Minister of Defense in February 1985 to occupy the fourth most important position in the Soviet military hierarchy. General of the Army Ye. F. Ivanovskiy succeeded Petrov as leader of the Ground Forces.

Tolubko, Vladimir Fedorovich. Chief Marshal of Artillery. Commander in Chief of the Strategic Rocket Forces and Deputy Minister of Defense from 1972, he was removed from command in 1985. He is believed to be assigned now to the Group of General Inspectors. Born in 1914, he entered the service in 1932 and saw action as a tank brigade commander during World War II. He served as First Deputy Commander in Chief of the Strategic Rocket Forces during the 1960s. "Hero of Socialist Labor" (1976). Replaced by General of the Army Yu. P. Maksimov.

FATAL ACCIDENTS

Dotsenko, Viktor Mikhaylovich. General Major of Aviation. Chief of the Political Section of the Air Forces of the Carpathian Military District. Died in an air accident on May 3, 1985.

Grazhdan, Anatoliy Afanas'yevich. General Major. Born 1935. Political officer. Killed May 1985.

Krapivin, Yevgeniy Ivanovich. General Major of Aviation. Commander of the Air Forces of the Carpathian Military District. Died in an air accident on May 3, 1985.

Lykov, Ivan Aleksandrovich. General Lieutenant. Born 1919. First Deputy Chief of the Main Directorate of Military Schools. Candidate of Technical Sciences, Professor. Served for thirty years at the Govorov Military Engineering Radiotechnical Academy of Air Defense as a department head and as deputy commandant for studies and scientific work. Died May 1985.

Semenchukov, Vladimir Il'ich. General Lieutenant. Born 1936. Attached to headquarters of the Western TVD. Died February 1985 in automobile accident.

Volzhin, Aleksey Nikolayevich. General Lieutenant. Born 1915. Distinguished Leader of Science and Technology of the RSFSR. Winner of Lenin Prize and other state prizes. Doctor of Technical Sciences and Professor. Served with Main Rocket and Artillery Directorate (GRAU). Killed July 1985.

OTHER DEATHS

Babayev, Aleksandr Ivanovich. General Colonel of Aviation. Born 1923. Pioneered combat flying of jet aircraft. Commander of the Air Forces of the Leningrad Military District from 1979. "Hero of the Soviet Union." Died May 1985.

Batov, Pavel Ivanovich. General of the Army. Born 1897. Wartime commander of the 65th Army. Chief of Staff of the Warsaw Pact (1962–65). Chairman of the Soviet Veterans Committee (1970–81). Twice "Hero of the Soviet Union." Died April 1985.

Chernenko, Konstantin Ustinovich. General Secretary of the Communist Party. Born September 24, 1911. Chairman of the Defense Council, USSR. Died March 10, 1985.

Gromov, Mikhail Mikhaylovich. Retired General Colonel of Aviation. Born 1899. Test pilot (1924–42). In 1937, he flew across the North Pole to Portland, Ore. Chief of Combat Training for Frontal Aviation during World War II. "Hero of the Soviet Union." Died January 1985.

Gulayev, Nikolay Dmitriyevich. General Colonel of Aviation. Born 1918. Wartime ace (credited with fifty-seven enemy aircraft). Deputy Commander in Chief of Troops of Air Defense for Combat Training (1969–76). Twice "Hero of the Soviet Union." Died October 1985.

Kokkinaki, Vladimir Konstantinovich. Retired General Major of Aviation. Born 1904. Leading test pilot for the Ilyushin design bureau from 1935. Flew nonstop to the United States in 1939. Holds twenty-two world records. Lenin Prize. Twice "Hero of the Soviet Union." Died January 1985.

Moskalenko, Kirill Semenovich. Marshal of the Soviet Union. Born 1902. Member of the Central Committee CPSU and General Inspector. Commanded the 38th Army during World War II. Rumored to have arrested Beria in 1953. Deputy Minister of Defense and Commander in Chief of the Strategic Rocket Forces (1960–62). Inspector General (1962–83). Twice "Hero of the Soviet Union." Died June 1985.

Nagornyy, Nikolay Nikiforovich. General Colonel. Born 1901. Chief of the Main Staff of National Air Defense during World War II. Commander of National Air Defense (1952–53). Died June 1985.

Pokryshkin, Aleksandr Nikolayevich. Marshal of Aviation. Born 1914. Candidate Member of the Central Committee CPSU. A leading Soviet ace of World War II, he took part in 156 air battles and shot down fifty-nine enemy aircraft. Deputy Commander in Chief of Troops of Air Defense (1968–71). Chairman of DOSAAF (1972–81). Thrice "Hero of the Soviet Union." Died November 1985.

Popov, Nikolay Mikhaylovich. Retired General Colonel. Born 1903. As Deputy Chief of Building and Quartering Troops, he supervised construction work for the Strategic Rocket Forces. "Hero of Socialist Labor." Died February 1985.

Yepishev, Aleksey Alekseyevich. General of the Army. Born 1908. Member of the Central Committee CPSU. Chief of the Main Political Directorate (1962–85); replaced by General Colonel A. D. Lizichev. "Hero of the Soviet Union." Died September 1985.

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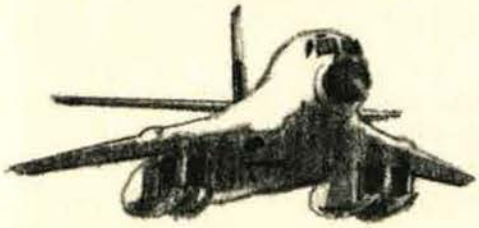
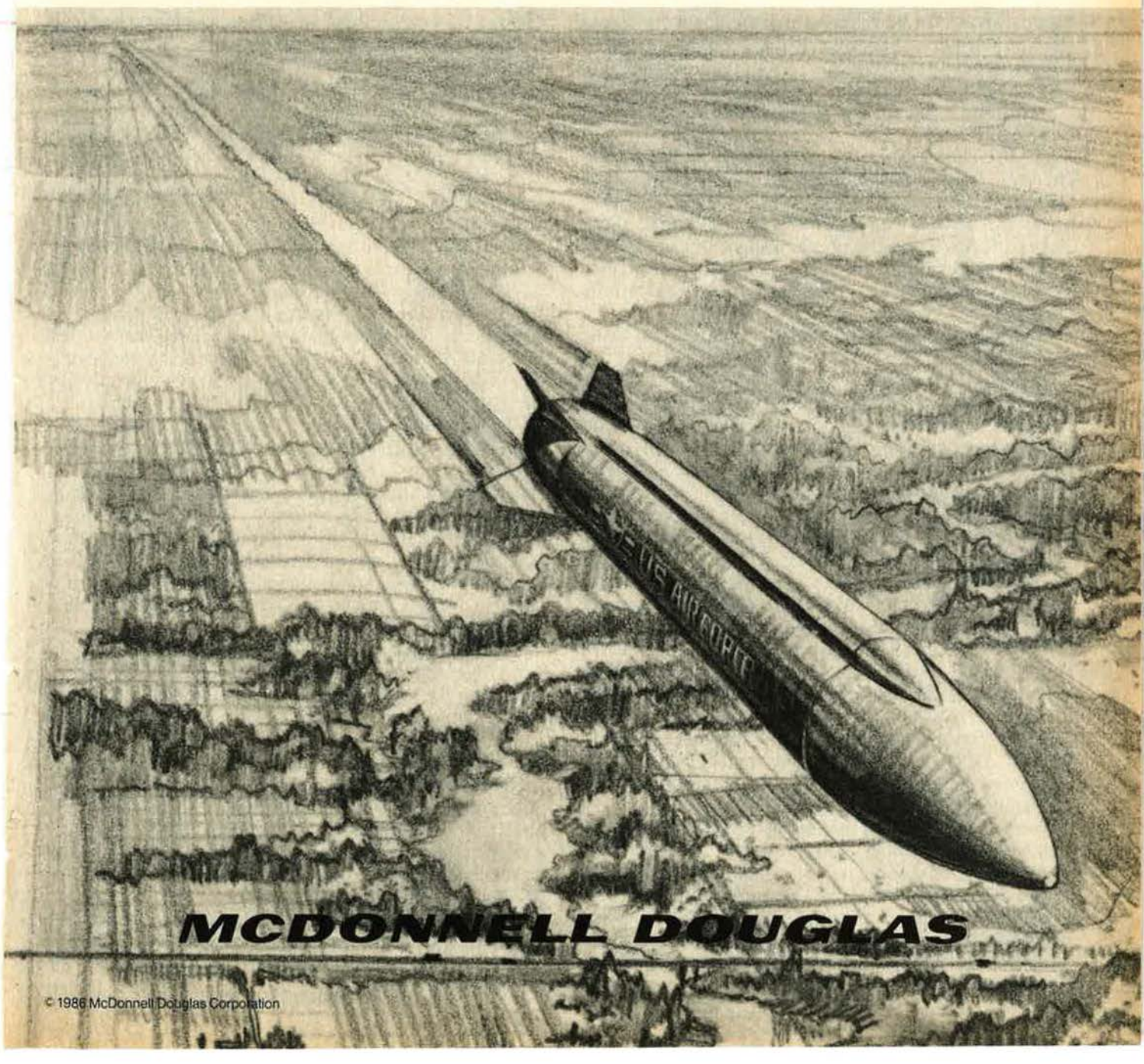




ORGANIZATION OF THE SOVIET ARMED FORCES

The major elements of aerospace power that make up the US Air Force are, in the USSR, spread among three separate services. All combat and principal support functions are headed by serving officers who are also Deputy Ministers of Defense.

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

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

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

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

The **Strategic Rocket Forces,** established in 1959, operate all land-based ballistic missiles with ranges greater than 1,000 km—about 1,400 ICBMs and 550 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 the February 1986 issue of* AIR FORCE *Magazine),* credits the Strategic Rocket Forces with 300,000 personnel.

The **Ground Forces,** numerically the largest of the five services, are divided into motorized rifle and tank troops, airborne troops, rocket troops and artillery, and troops of troop air defense. The 199 Ground Forces divisions, with tanks, armored personnel carriers, self-propelled artillery, and personal equipment, are all designed for a CBR environment and are equipped and trained for combat with or without nuclear, chemical, and biological weapons. Ground Forces personnel number more than 1,990,000.

The **Troops of Air Defense** (Voyska PVO) was formed in 1948 as PVO-Strany. Its three major components comprise 1,200 fighter-interceptors, 9,600 SAM launchers, and a huge radar network. Other components are antirocket defense (PRO) and antispace defense (PKO).

The **Soviet Air Forces** have been completely reorganized in the last several years. In border regions, aircraft that were previously assigned to PVO and to Frontal Aviation are now combined in "Air Forces of the Military District," consisting of about 6,000 aircraft. These have the same mission as the old tactical air armies and are subordinate to the commanders of the Theaters of Military Operations through the commanders of Military Districts. These forces also include aircraft in the four Soviet "Groups of Forces Abroad."

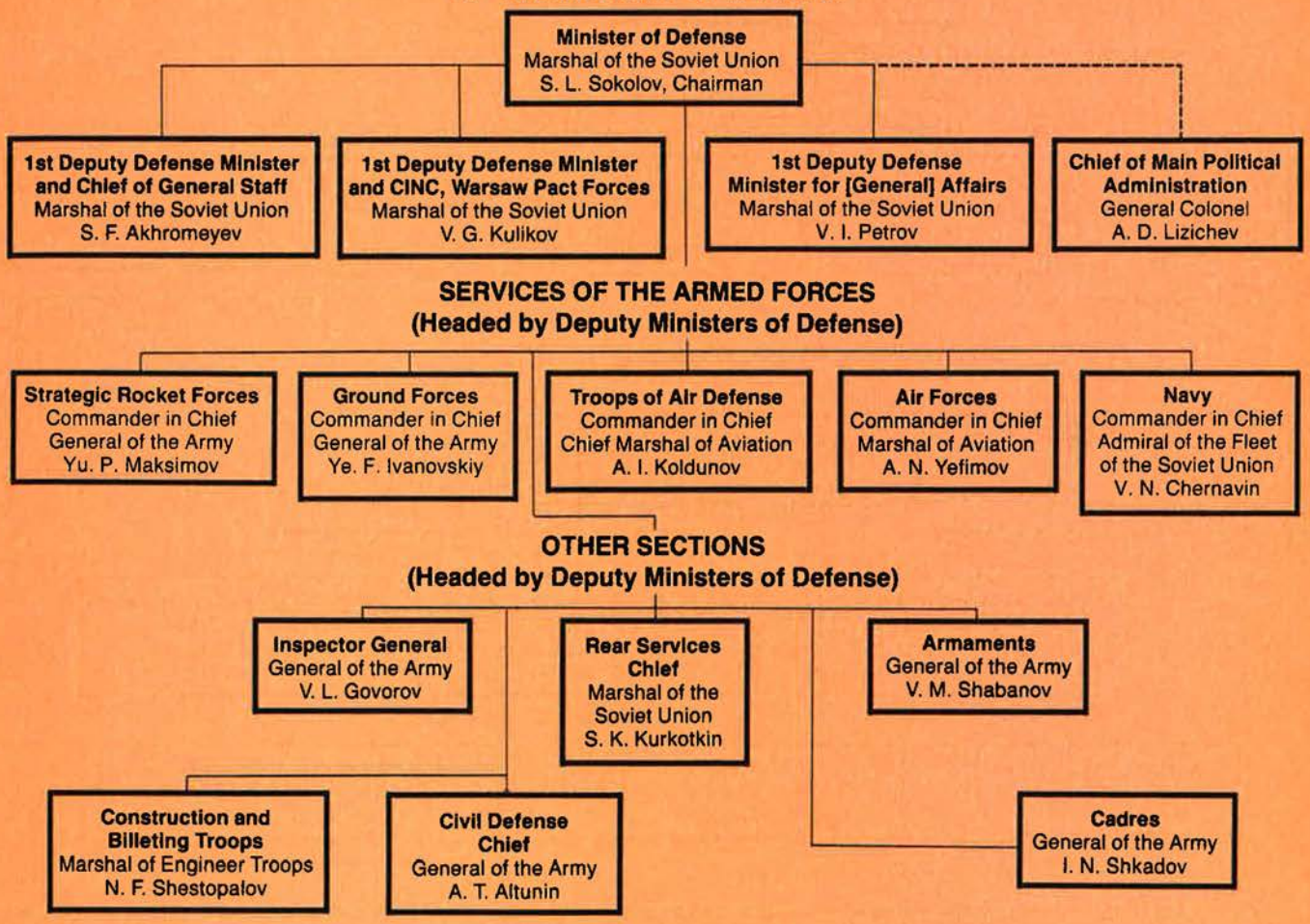
Elsewhere in the Soviet Union, bombers and strike aircraft are combined into five air armies. Included in these air armies are about 170 Bison and Bear bombers, 500 medium-range Blinder, Badger, and Backfire bombers, 450 Fencer strike aircraft, more than 300 tanker, reconnaissance, and ECM aircraft, plus fighter escort aircraft. Combat aircraft are equipped to carry either nuclear or conventional weapons. The 2,300 armed helicopters are also allocated to Air Forces of Military Districts.

Transport Aviation includes some 600 fixed-wing aircraft. The transport aircraft of the Soviet airline, Aeroflot, with its 1,600 medium- and long-range transports, should also be included as a full-time reserve of this component.

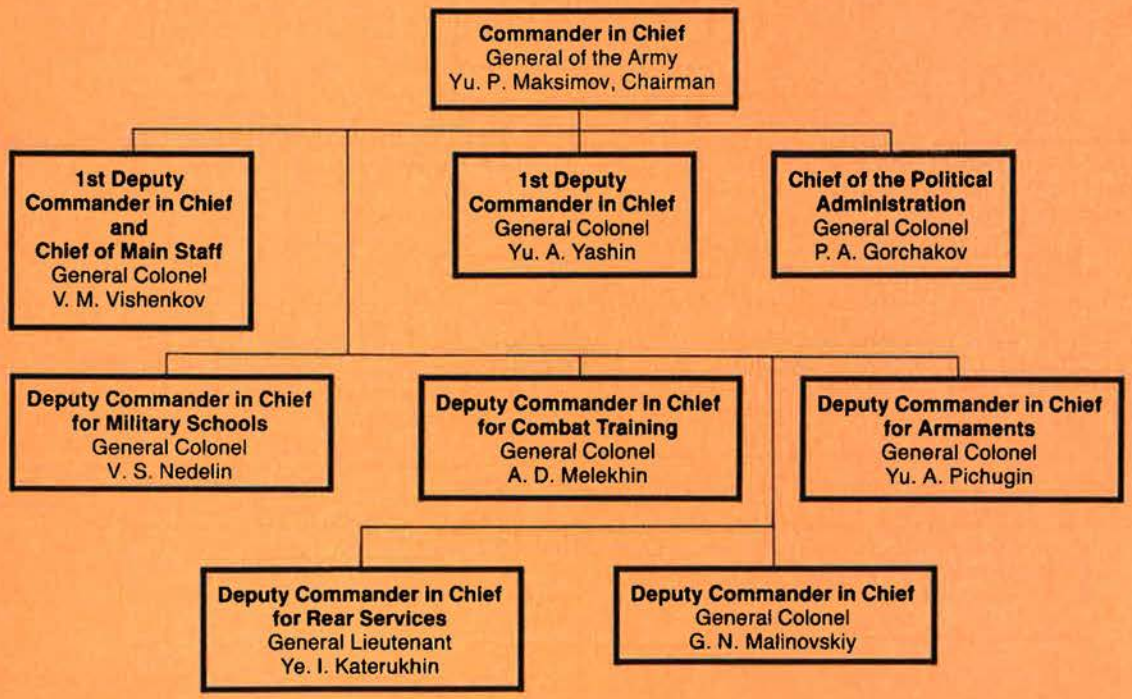
The **Soviet Navy** is a maritime superpower. With its aircraft carriers of the Kiev class, Soviet Naval Aviation has a mix of carrier-based helicopters and V/STOL aircraft. Naval Aviation also has land-based and reconnaissance fighters, a limited transport force, bombers, and surveillance aircraft. Navy personnel strength includes 70,000 personnel in Naval Aviation.

The accompanying charts, prepared by Harriet Fast Scott and current as of January 1, 1986, show the top members of the USSR's military organization. ■

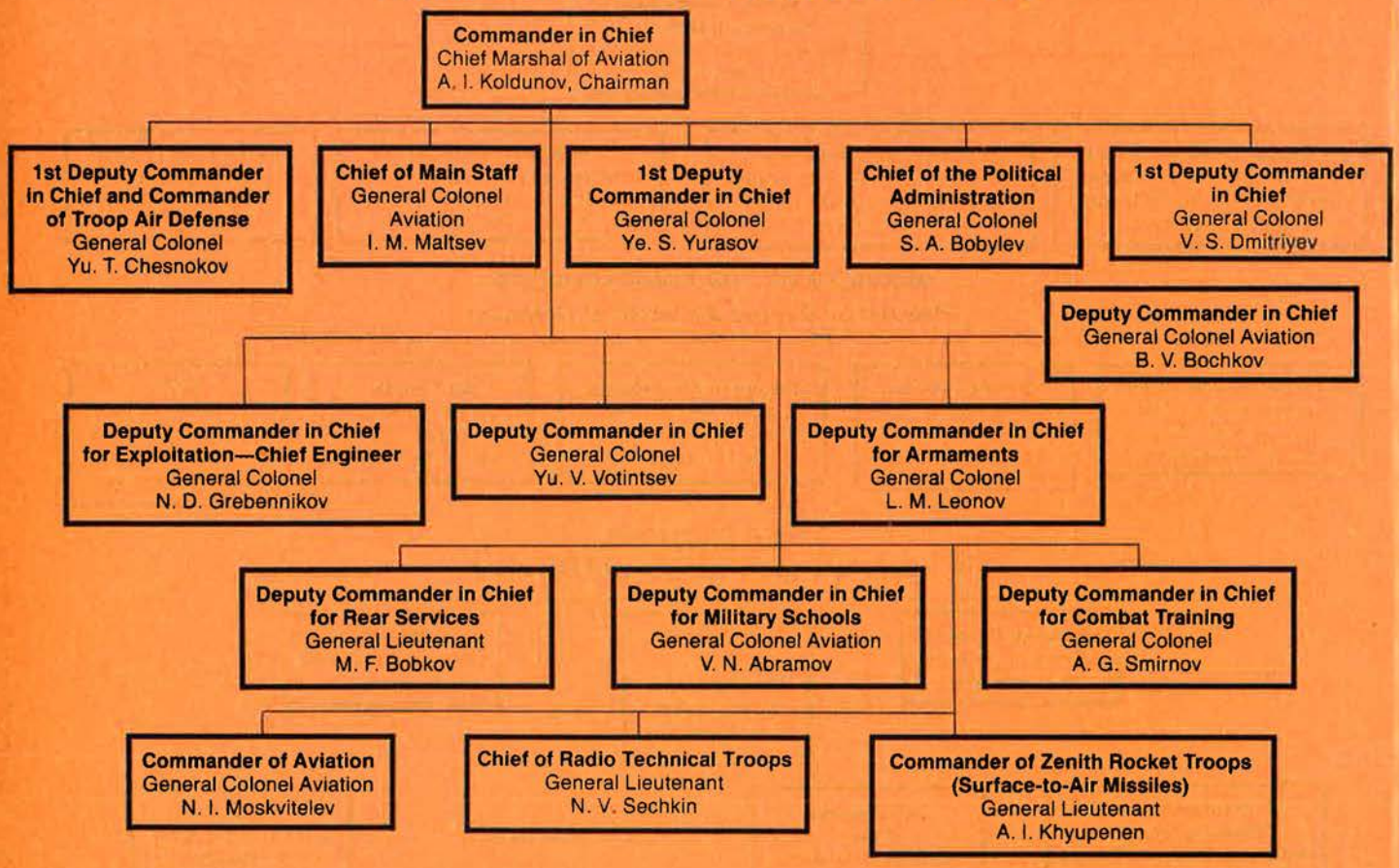
MEMBERS OF THE MAIN MILITARY COUNCIL *(KOLLEGIYA)* OF THE MINISTRY OF DEFENSE



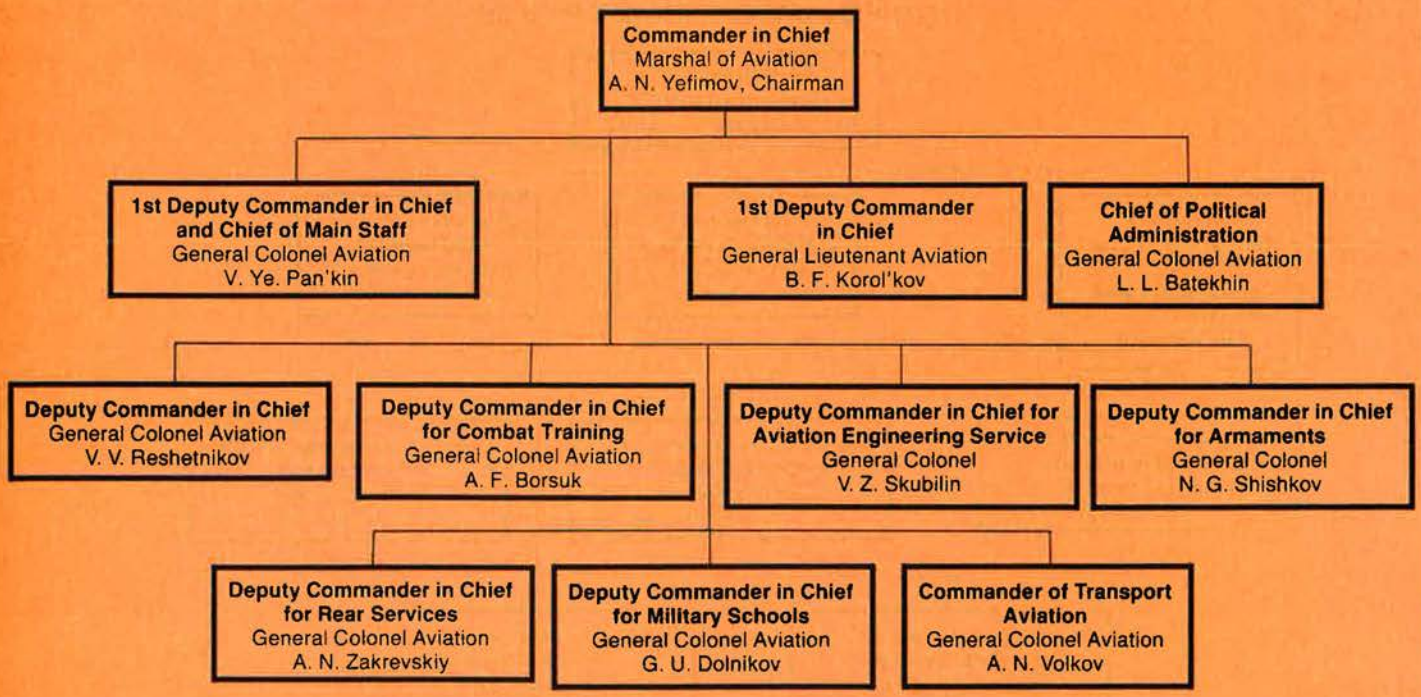
MEMBERS OF THE MILITARY COUNCIL OF COMMAND AND STAFF OF THE STRATEGIC ROCKET FORCES



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



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



—CHARTS COMPILED BY HARRIET FAST SCOTT

SOVIET AEROSPACE ALMANAC 1986

Significant Dates in Soviet History

1917—February Revolution. Nicholas II abdicates (March 15). October Revolution. Bolsheviks seize power (November 7–8).

1918—Treaty of Brest-Litovsk ends Russia's participation in World War I (March 3). Russian Civil War begins. Fighting lasts until 1920 in western regions of the country and until 1922 in far eastern regions.

1921—Russo-Polish War. A naval mutiny at Kronshtadt/Petrograd is put down by the Red Army (March 7–18).

1922—Union of Soviet Socialist Republics is established (December 30).

1936—The Soviet Union aids the Republicans during the Spanish Civil War (through 1939).

1937—Stalin initiates his Great Purges of the Soviet military. The purges continue through 1938.

1939—Soviet forces battle Japanese forces at Khalkhin Gol in Outer Mongolia (May–August). The Soviets sign a nonaggression pact with Nazi Germany (August 23). Hitler's invasion of Poland begins World War II (September 1). The Soviets join the Germans in the invasion of Poland (September 17). War breaks out between the Soviet Union and Finland on November 30 and lasts into March 1940.

1940—The independent Baltic republics of Lithuania, Latvia, and Estonia are occupied by the Soviets and are incorporated into the USSR (July–August).

1941—The Soviets and Japanese conclude a treaty of neutrality (April 13). Germany invades the Soviet Union (June 22). German forces push to the gates of Moscow, but are turned back by the Soviets (September 30–December 5). The US approves Lend-Lease to the USSR (November).

1942—The Battle of Stalingrad is fought (November to February 1943).

1943—The Battle of Kursk is fought (July 5–August 23).

1945—Berlin falls to Soviet troops (May 2). Germany surrenders to the Allies (May 8). The Soviet Union declares war on Japan (August 8). Japan surrenders to the Allies (September 2).

1948—The Soviets begin the Berlin Blockade (April 1 through September 1949).

1949—The Soviets explode an atomic bomb (August 29).

1953—The Soviets explode a hydrogen bomb (August 12).

1955—The Warsaw Pact organization is established (May 14).

1956—Soviet forces crush the Hungarian uprising (November 4).

1957—The Soviet Union announces its first successful ICBM test (August 26). The first Sputnik earth-orbiting satellite is launched by the Soviets (October 4).

1960—An American U-2 is shot down over the USSR (May 1). A rift begins to develop between the USSR and the People's Republic of China (approximate).

1961—The Soviets begin construction of the Berlin Wall (August 13).

1962—The Cuban Missile Crisis occurs (October 22–November 2).

1968—Soviet forces invade Czechoslovakia (August 20–21).

1969—The USSR clashes with China along the Sino-Soviet border.

1972—The US and the USSR sign the SALT I accord (May 22).

1979—The US and the USSR initial the SALT II accord (June 18). The Soviets invade Afghanistan (December 25).

1983—Soviet fighters down KAL 007, a civilian South Korean airliner that had strayed into Soviet airspace (September 1).

Information for this Soviet Aerospace Almanac was compiled by the staff of AIR FORCE Magazine from a variety of open sources. Since the Soviets publish relatively little data about their armed forces, some details are necessarily estimates.

We especially acknowledge the assistance of the US Air Force's Directorate of Soviet Affairs, Bolling AFB, D. C. We would also like to thank William and Harriet Fast Scott for their review of this material.

—THE EDITORS

Top Soviet Aces of World War II

Men	Solo Victories
Kozhedub, I. N.	62
Pokryshkin, A. I.	59
Gulaev, N. D.	57
Rechkalov, G. A.	56
Yevstigneyev, K. A.	56
Vorozheykin, A. V.	52
Glinka, D. B.	50
Women	
Yamschikova, O.	17
Litvyak, L.	12
Budanova, K.	10

More than 800 Soviet aviators claimed sixteen or more victories in the "Great Patriotic War." Many of these—including Gulaev, Rechkalov, and Yevstigneyev—are additionally credited with shared victories in "group flights."

Flags of the Armed Forces

The Ground Forces
Sukhoputnyye Voyska (SV)

The Air Forces
Voyenno-Vozdushnyye Sily (VVS)

The Navy
Voyenno-Morskoy Flot (VMF)

The Military Uniform

Soviet uniforms can vary widely, depending on the rank, service, and position of the wearer as well as the season, occasion, and environment. The following distinctions are applicable to a Soviet equivalent of a USAF officer's Class-A uniform.

- The color of the collar tabs indicates the branch of service. The hatband of the billed cap will be the same color as the collar tabs. Some examples: light blue = aviation and airborne; red = combined arms; black = rocket, artillery, armor, and most technical (chemical, etc.) troops; royal blue = KGB (except Border Guards); and green = KGB Border Guards.
- The branch emblem on the tab indicates the individual's specialty. Some examples: propeller and wings = aviation, parachute = airborne, wreath and star = motorized rifle, crossed barrels = rocket and artillery, and tank = armor.
- Shoulder boards indicate grade *(see chart on adjacent page).*
- The right side of the blouse will display qualifications and classification badges, including aviator wings and elite unit designations.

A Typical Day for a Soviet Conscript

0600–0609	Reveille
0610–0630	Exercise (tidying up)
0630–0650	Barracks time
0650–0720	Political information (morning inspection)
0725–0755	Breakfast
0800–1400	Training periods (six fifty-minute periods with ten-minute breaks between)
1400–1440	Dinner
1440–1510	After dinner time
1510–1530	Maintenance: personal, weapon, and equipment
1530–1830	Political education work (Monday and Thursday)
	Equipment maintenance (Tuesday and Friday)
	Sports (Wednesday and Saturday)
1830–1940	Self-preparation or homework
1940–2010	Supper
2010–2040	Personal time
2040–2155	Evening walk and checkup
2200	Taps

Official and Military Holidays

Official Holidays of the USSR

(Workers are given time off on these days)

January 1	New Year's Day
March 8	International Women's Day
May 1 & 2	International Workers' Solidarity Days
May 9	Victory Day
October 7	Constitution Day of the USSR
November 7 & 8	Anniversary of the Great October Socialist Revolution

Key Military Days of the USSR

(Time off from work is not normally given, but celebrations are held)

February 23	Soviet Army and Navy Day
April 12	World Aviation and Cosmonautics Day
Second Sunday of April	Troops of Air Defense Day
May 28	Border Troops Day
First Sunday after July 22	Navy Day
Third Sunday of August	USSR Air Force Day (Aviation Day)
Second Sunday of September	Tank Forces Day
November 10	Soviet Militia Day
November 19	Rocket and Artillery Forces Day

Soviet Active Military Population

(As of July 1, 1985)

Ground Forces	1,991,000
Air Forces	453,000
Naval Forces	434,000
Air Defense	371,000
Strategic Attack (includes Strategic Rocket Forces and strategic elements of the Air Forces and Navy)	410,000
Command/General Support	1,471,000
Security Forces (KGB/MVD)	570,000
Total	**5,700,000**

Comparative Grades and Insignia

Glavnyi Marshal Aviatsii
General of the Air Force

Marshal Aviatsii
General

General-Polkovnik Aviatsii
Lieutenant General

General-Leytenant Aviatsii
Major General

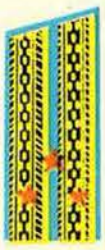
General-Mayor Aviatsii
Brigadier General

Polkovnik
Colonel

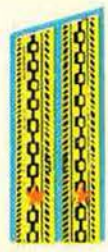
Podpolkovnik
Lieutenant Colonel

Mayor
Major

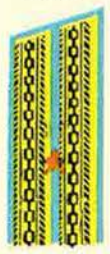
Kapitan
Captain



Starshiy Leytenant
1st Lieutenant



Leytenant
2d Lieutenant



Mladshiy Leytenant
2d Lieutenant

Starshiy Praporshchik
Senior Warrant Officer

Praporshchik
Warrant Officer

Starshina
Chief Master Sergeant

Starshiy Serzhant
Senior Master Sergeant

Serzhant
Master Sergeant

Mladshiy Serzhant
Staff Sergeant

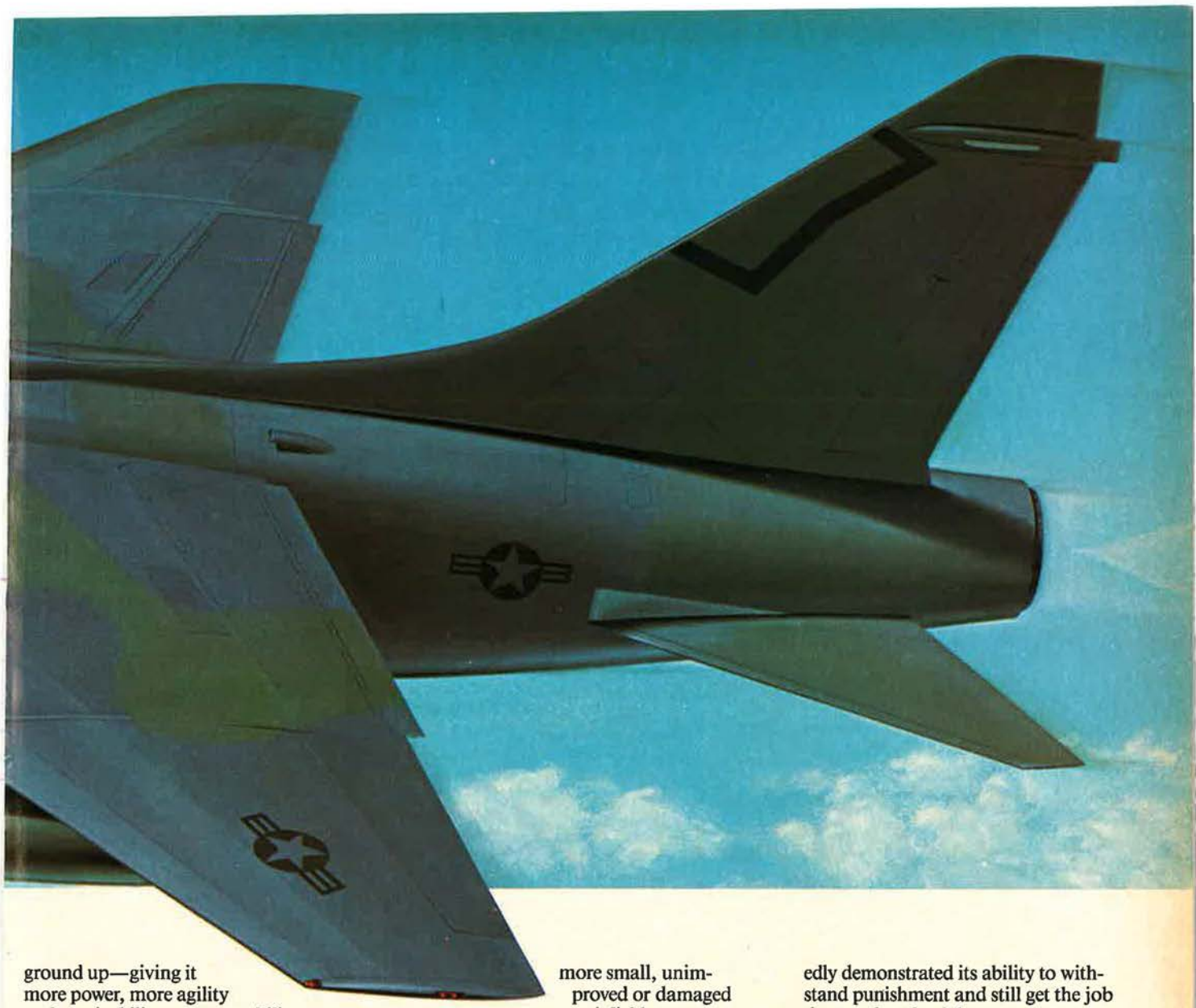
Efreytor
Airman First Class

Ryadovoy
Airman Basic

A-7 STRIKEFIGHTER

A new "A-7 Plus" Corsair re-engineered to deliver a new standard in Close Air Support/Battlefield Air Interdiction

Already a legend in its ability to deliver weapons on target accurately and efficiently, the A-7 is being enhanced to accomplish the CAS/BAI role well into the 21st century. Vought Aero Products, a division of LTV Aerospace and Defense Company, will remanufacture the A-7 from the



ground up—giving it more power, more agility and survivability, more capability and performance straight across the board.

More accurate under-the-weather CAS/BAI

It will carry the very latest advanced technology digital avionics for enhanced navigation, C^3I, FLIR and weapons delivery capabilities under the weather, day or night.

The A-7's performance envelope is increased dramatically with a high-thrust afterburning engine. With double the thrust of existing A-7's, the new engine boosts its agility and thus its survivability and effectiveness.

On the other end, takeoff roll is decreased by 45 percent, further enhancing the A-7 Strikefighter's ability to operate from more small, unimproved or damaged airfields.

Better performance all around

Automatic maneuvering flaps, together with its new afterburning engine, give the aircraft greater agility and survivability throughout every phase of the mission. The pilot can "turn and burn"...be in and out faster. He can make evasive maneuvers right up to the moment of weapons release. Moreover, with a full 15,000-lb. load (a wide mix of bombs, rockets and 20mm cannon), he can loiter on station for up to an hour and a half. And yet the Strikefighter offers all of these performance improvements with no sacrifice in the A-7's range or endurance.

The Corsair's toughness is already legend. In conflicts around the world, the A-7's rugged airframe has repeatedly demonstrated its ability to withstand punishment and still get the job done and get back home.

The low-cost, high-capability answer

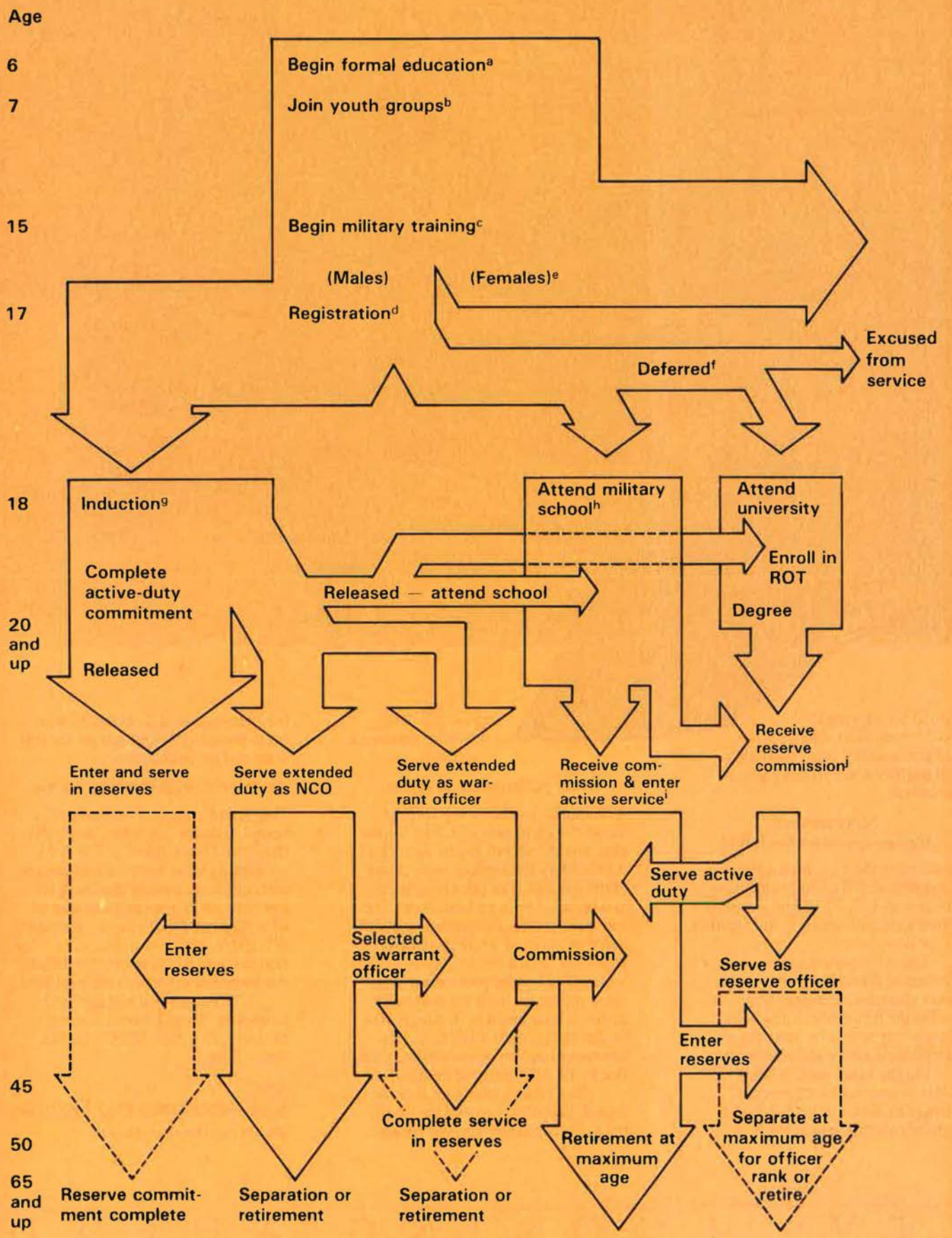
The Strikefighter is specifically engineered to do the job better, more efficiently and economically. The A-7 is an existing asset with trained people and equipment already deployed. Its low conversion price and low cost of ownership combine to make it the most affordable, effective and capable solution to Close Air Support/Battlefield Air Interdiction through the year 2010.

LTV Aerospace and Defense Company, Vought Aero Products Division, P.O. Box 225907, Dallas, Texas 75265.

LTV Aerospace and Defense
Vought Aero Products Division

L T V : L O O K I N G A H E A D

THE SOVIET MILITARY EXPERIENCE



Footnotes

[a] Formal education begins at age 6; eleven years of schooling required.

[b] Youth groups include Little Octobrists (ages 7-9), Young Pioneers (10-14/15), and Komsomol, the All-Union Communist Union of Youth (14-28).

[c] At age 15, Soviet teenagers begin military training and receive a minimum of 140 hours before induction. Boys get thirty additional hours during summer camp. First aid is emphasized for girls.

[d] By age 17, all males must register for military service. They may be assigned to specific training prior to induction.

[e] Soviet law provides for conscription of women, but in practice this is not done. However, women may volunteer. A very few women are commissioned officers.

[f] Few deferments from military service are granted; the majority of these allows selected students to attend approved schools to learn skills critically needed by the state or military. Males enroll concurrently in Reserve Officer Training (ROT). In rare instances, males may be deferred for health or family reasons and excused from their active commitment upon reaching age 27.

[g] Most Soviet males are inducted for enlisted service at the age of 18. Call-ups are held annually in the spring and fall. Conscripts rarely have a choice of service or branch. The usual term of service is two years for the Army and Navy ashore and three years for the Navy afloat.

[h] Males who qualify by competitive examination and political recommendation may attend one of about 140 higher military schools. These schools are the primary sources of active-duty officers.

[i] The Soviet military does not have an "up-or-out" policy for officers, but does impose maximum ages on active service according to rank. An officer who reaches his maximum age but is not eligible for retirement will be transferred to the reserves.

[j] The Soviet armed services require a large number of reserve officers. Citizens receiving reserve commissions may spend their entire careers as part-time reservists, or they may be called to a period of active duty, particularly if they possess critical skills.

The Military Oath

Soviet officers and enlisted members take the same oath. The text printed below is the official Soviet translation.

> I, citizen of the Union of Soviet Socialist Republics, joining the ranks of the Armed Forces, take the oath and solemnly pledge to be a conscientious, brave, disciplined and vigilant warrior, strictly to observe military and state secrets, to observe the constitution of the USSR and Soviet laws, unquestioningly to carry out the requirements of all military regulations and orders of commanders and superiors.
>
> I pledge conscientiously to study military science, to preserve in every way military and public property and to remain devoted till my last breath to my people, my Soviet homeland, and the Soviet government.
>
> I am prepared at all times, on orders from the Soviet government, to come out in defense of my homeland, the Union of Soviet Socialist Republics. I pledge to defend it courageously, skillfully, with dignity and honor, without sparing my blood and life in securing complete victory over the enemies.
>
> If I break this solemn vow, may I be severely punished by the Soviet people, universally hated, and despised by the working people.

Col. G. Kobozev described the Soviet military oath thusly in *Soviet Military Review* in 1983: "If you ask [a Soviet] ex-serviceman or serviceman which was the most memorable day in his life, he will, in most cases, say that it was the day when he took the Oath of Allegiance. And that is quite natural, because it is a solemn pledge of loyalty to his Homeland. As soon as a man takes it, he assumes responsibility for the fate of his country and people, he swears he will defend them to his last breath, to the last drop of his blood."

Soviet Theater Estimates

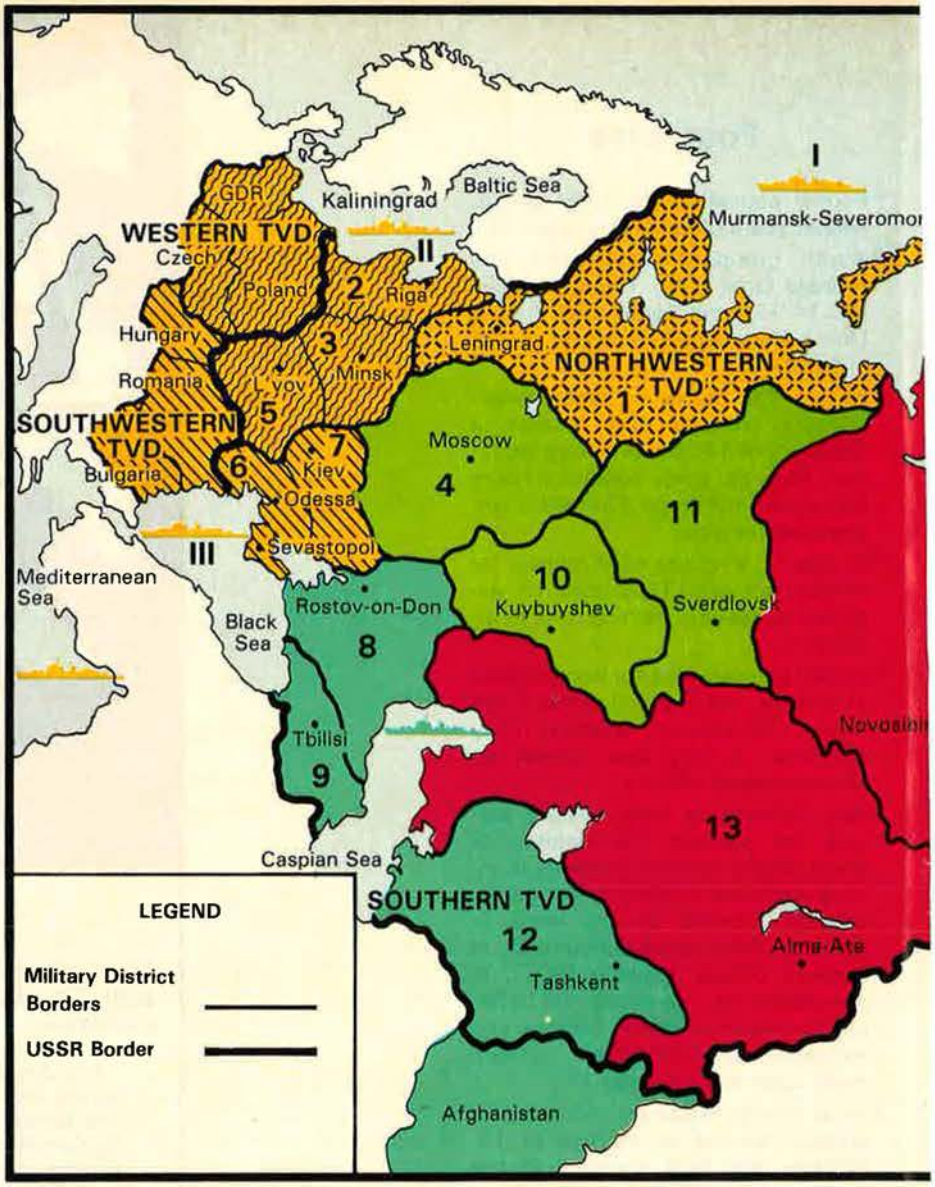
COMBAT ORGANIZATION

Normal peacetime command and control of Soviet combat forces (excepting strategic elements, some air defense assets, and KGB and MVD units) is primarily exercised through the Commanders of the sixteen Military Districts, the four Naval Fleets within the country, and the four Groups of Soviet Forces in eastern Europe. District commanders are responsible for the training and housekeeping of the diverse forces in their geographic area; individual services handle administrative support.

In wartime, operational control would shift to Theaters of Military Operations (TVD — Teatr Voyennykh Deystviy), which could include several "fronts." In some instances, district commanders would become the TVD commanders. Fifteen TVDs have been tentatively identified. Some of these may be grouped into continental Theaters of War (TV — Teatr Voyny). While the Far Eastern and Southern TVs probably correspond to their TVDs, the Western TV most likely includes the Northwestern, Western, and Southwestern TVDs.

Commanders of TVDs and TVs are combined-arms commanders, directing all operations in their areas during conflict and reporting directly to the Soviet Supreme High Command. The Soviets consider the Western TV the most important, and its commander holds a position of special responsibility — perhaps extending to control of all Warsaw Pact forces in wartime.

The Soviets have never published specific information on TVs or TVDs.



FAR EAST THEATER

Far East TVD

Divisions	53
Tanks	14,900
Artillery[2]	15,200
Tactical Aircraft	1,690

Pacific Ocean TVD

Pacific Ocean Fleet	
Aircraft Carriers	2
Principal Surface Combatants	85
Other Combatant Craft	354
Auxiliaries	235
Submarines[3]	110
Naval Aviation	500
Naval Infantry Division	1

WESTERN THEATER[1]

Northwestern TVD

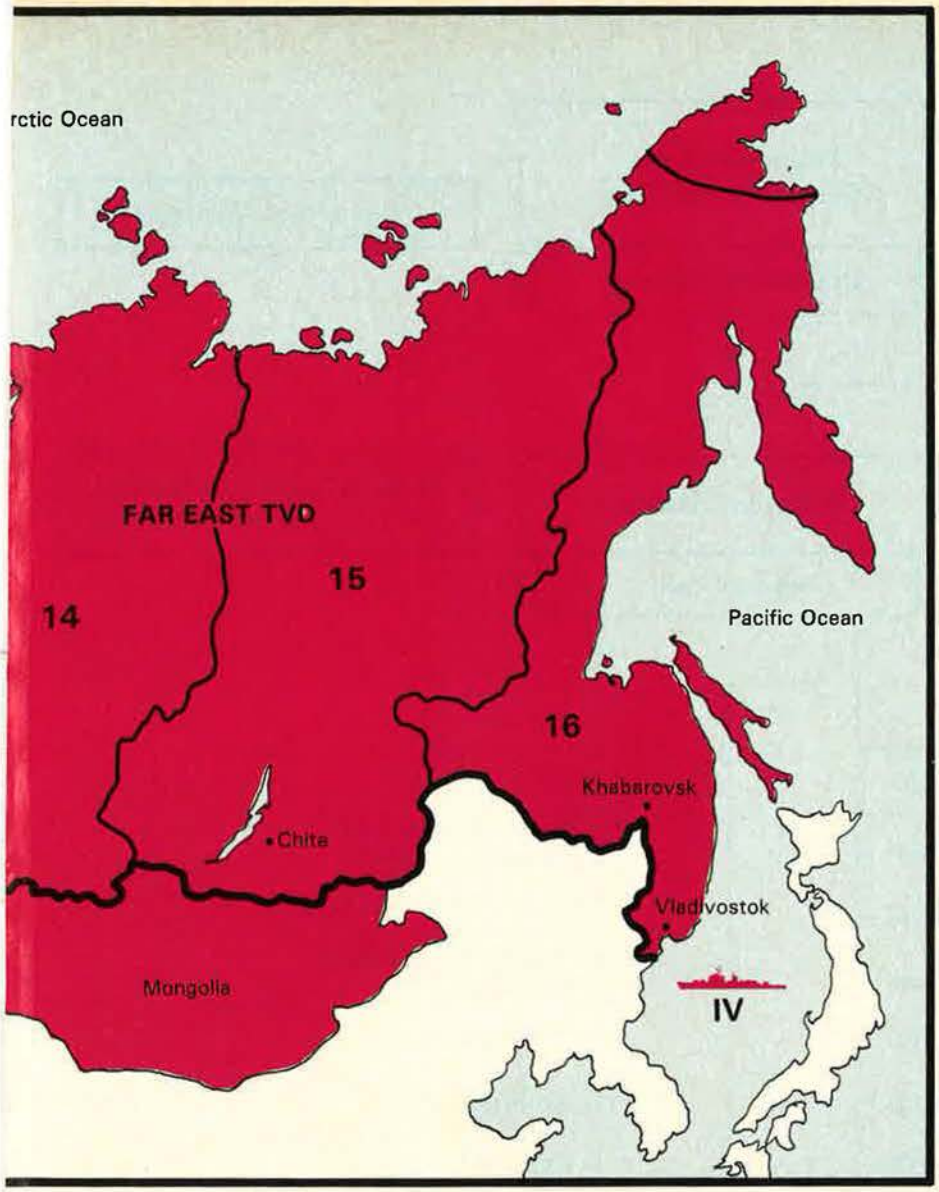
Divisions	10
Tanks	1,400
Artillery[2]	2,375
Tactical Aircraft	225

Southwestern TVD

Divisions	26
Tanks	6,890
Artillery[2]	5,670
Tactical Aircraft	890

Western TVD

Divisions	62
Tanks	19,680
Artillery[2]	15,750
Tactical Aircraft	2,290



MILITARY DISTRICTS

1. Leningrad
2. Baltic
3. Belorussian
4. Moscow
5. Carpathian
6. Odessa
7. Kiev
8. North Caucasus
9. Trans-Caucasus
10. Volga
11. Ural
12. Turkestan
13. Central Asian
14. Siberian
15. Trans-Baykal
16. Far Eastern

FLEETS

I. Northern
II. Baltic
III. Black Sea
IV. Pacific Ocean

[1] During wartime, the Western Theater would comprise the Northwestern, Western, and Southwestern Theaters of Military Operations (TVDs).

[2] This category includes all field artillery, mortars, and multiple rocket launchers 100 mm in size or greater.

[3] Not including SSBNs.

Atlantic TVD

Baltic Fleet

Principal Surface Combatants	43
Other Combatant Craft	347
Auxiliaries	170
Submarines	33
Naval Aviation	270
Naval Infantry Brigade	1

Black Sea Fleet

Aircraft Carriers	1
Principal Surface Combatants	74
Other Combatant Craft	235
Auxiliaries	150
Submarines	33
Naval Aviation	435
Naval Infantry Brigade	1

Mediterranean Squadron
(units drawn from Black Sea and Northern Fleets)

Ships, average	30–40
Submarines	6–8
Cruisers	1–2
Destroyers	1–3
Frigates	3–5
Amphibious Warfare Ships	1–2
Mine Warfare Ships	1–2
Auxiliaries	17–18

Arctic TVD

Northern Fleet

Principal Surface Combatants	80
Other Combatant Craft	132
Auxiliaries	200
Submarines[3]	142
Naval Aviation	440
Naval Infantry Brigade	1

SOUTHERN THEATER

Southern TVD

Divisions	30
Tanks	5,200
Artillery[2]	6,600
Tactical Aircraft	890

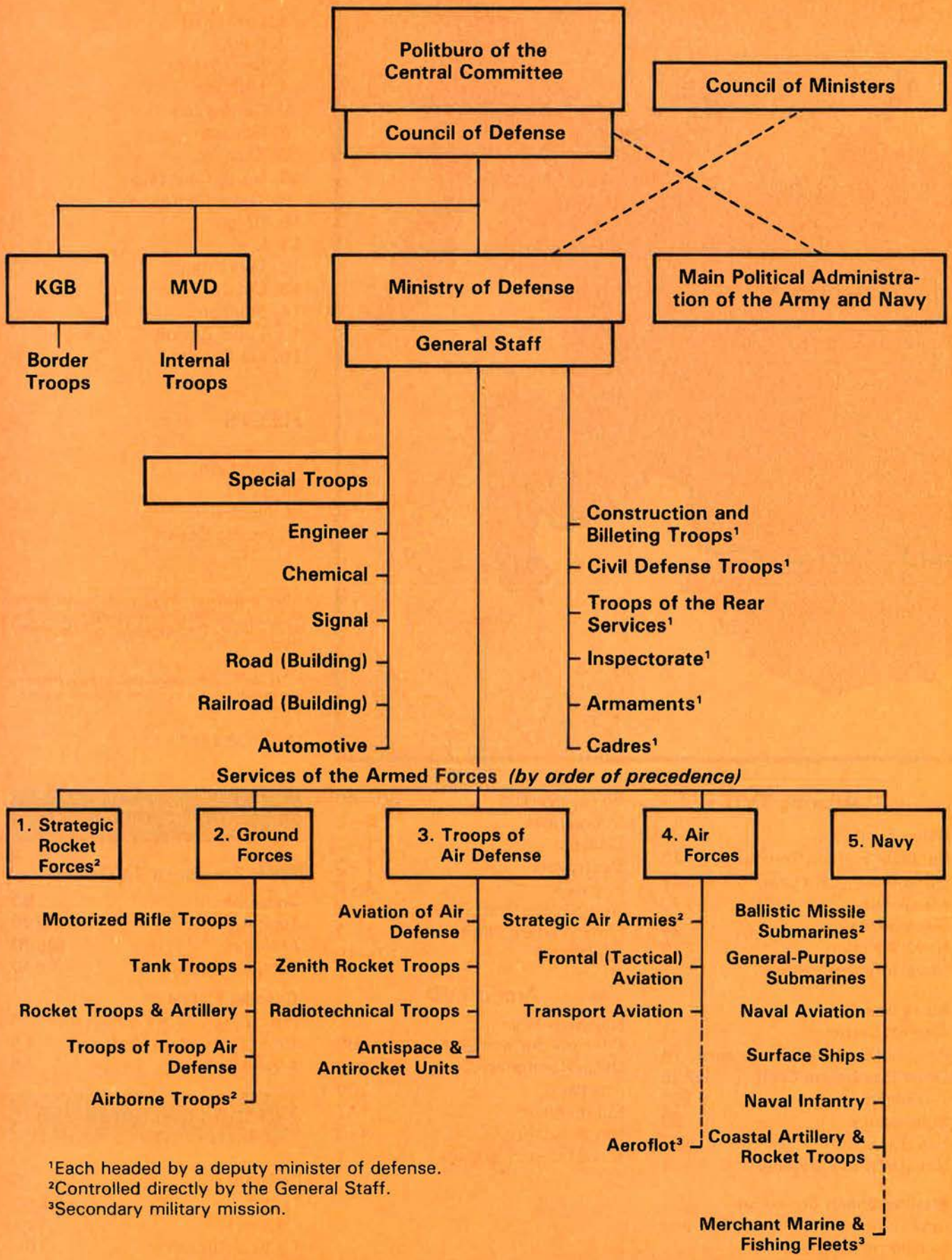
Caspian Flotilla

Principal Surface Combatants	5
Other Combatant Craft	65
Auxiliaries	25

STRATEGIC RESERVES

Divisions	18
Tanks	4,590
Artillery[2]	4,170
Tactical Aircraft	150

The Soviet Military Establishment



[1]Each headed by a deputy minister of defense.
[2]Controlled directly by the General Staff.
[3]Secondary military mission.

Lineup of Soviet Military Power

(As of January 1, 1985)

Strategic Nuclear Missiles

1,398—Intercontinental ballistic missiles (ICBM). SS-11: 520. SS-13: 60. SS-17: 150 (with 600 warheads). SS-18: 308 (with 3,080 warheads). SS-19: 360 (with 2,160 warheads). SS-25 deployments are believed to have started in mid-1985.

982—Submarine-launched ballistic missiles (SLBM). SS-N-5: 39. SS-N-6: 336. SS-N-8: 286. SXS-N-8: 6. SS-N-17: 12. SS-N-18: 224. SS-N-20: 60. SS-N-23: 16.

534—Intermediate/medium-range ballistic missiles (IRBM/MRBM). SS-4: 120 (all based west of the Urals). SS-20: 414 (272 west of the Urals, 142 east of the Urals).

Air Defense

1,200+—Interceptors (aircraft in operational units only). MiG-23 Flogger: 430. MiG-25 Foxbat: 300. Su-15 Flagon: 225. Tu-28/-128 Fiddler: 90. Yak-28 Firebar: 80. MiG-31 Foxhound: 75.

9,565—Strategic surface-to-air missile (SAM) launchers. SA-1: 2,875. SA-2: 2,900. SA-3: 1,250. SA-5: 2,020. SA-10: 520.

4,225—Tactical SAM launchers. SA-4: 1,350. SA-6: 875. SA-8: 700. SA-9: 575. SA-11: 50. SA-13: 675. The SA-X-12 is under development.

13—Airborne warning and control aircraft. Tu-126 Moss: 9. Il-76 Mainstay: 4.

32—Antiballistic missile launchers. ABM-1B Galosh (SH-04 and SH-08 are being emplaced).

7,000+—Warning systems. These include early warning and ground control intercept radars and satellites.

Air Forces

173—Long-range strategic bombers. Tu-95 Bear: 125. Mya-4 Bison: 48. Blackjack is undergoing flight test.

553—Medium-range bombers. Tu-22M Backfire: 130. Tu-16 Badger: 287. Tu-22 Blinder: 136.

2,850—Tactical counterair interceptors. MiG-21 Fishbed: 585. MiG-23 Flogger: 1,745. MiG-25 Foxbat: 130. Su-15 Flagon: 340. Tu-128 Fiddler: 25. Yak-28 Firebar: 25.

2,650—Ground attack aircraft. MiG-21 Fishbed: 135. MiG-27 Flogger: 790. Su-7/-17 Fitter: 1,020. Su-24 Fencer: 635 (of which 450 are assigned to the strategic air armies as strike/attack aircraft). Su-25 Frogfoot: 70.

50—Tanker aircraft. Mya-4 Bison: 30. Tu-16 Badger: 20.

635—Tactical reconnaissance and electronic countermeasures aircraft. MiG-21 Fishbed: 60. MiG-25 Foxbat: 170. Su-17 Fitter: 175. Su-24 Fencer: 10. Yak-28 Brewer: 220.

260—Strategic reconnaissance and ECM aircraft. Tu-16 Badger: 115. Tu-22 Blinder: 15. Tu-95 Bear: 4. Yak-28 Brewer: 102. MiG-25 Foxbat: 24.

2,650—Attack assault helicopters (including Mi-8 Hip and Mi-24 Hind aircraft).

1,700—Training aircraft (including 1,000 fixed-wing and 700 rotary-wing aircraft).

568—Military air transports assigned to Transport Aviation (VTA). An-22 Cock: 55. An-12 Cub: 260. Il-76 Candid: 250. An-124 Condor: 3.

1,250—Transports assigned to military districts and commands include An-2 Colt, An-24 Coke, An-26 Curl, and Il-14 Crate aircraft.

1,600—Civil aviation aircraft (Aeroflot). An-12 Cub: 150. Il-76 Candid: 50. Other medium- and long-range transports: 1,400.

Ground Forces

52,660—Main battle tanks. T-54/-55/-62: 33,600. T-64: 9,300. T-72/-80: 9,760.

1,470—Surface-to-surface missiles. FROG-7: 700. SS-21: 50. SS-1 Scud B/SS-23: 590. SS-12 Scaleboard/SS-22: 130.

49,765—Artillery pieces, mortars, and multiple rocket launchers. Artillery pieces: 29,200. Mortars: 10,715. MRLs: 6,200. Antitank artillery: 3,650.

59,100—Infantry fighting vehicles and armored personnel carriers.

4,095—Combat and support helicopters. Mi-2 Hoplite: 740. Mi-4 Hound: 20. Mi-6 Hook: 450. Mi-8 Hip: 1,750. Mi-24 Hind: 1,125. Mi-26 Halo: 10. Mi-28 Havoc and Hokum are in development.

Naval Forces

78—Ballistic missile submarines. Delta: 36. Hotel: 2. Yankee: 23. Typhoon: 3. Golf: 14.

127—Nuclear-powered general-purpose submarines. Cruise missile attack: 49. Attack: 67. Other: 11.

160—Diesel- and electric-powered general-purpose submarines. Cruise missile: 18. Attack: 138. Training: 4.

15—Auxiliary submarines.

3—V/STOL aircraft carriers (Kiev class).

2—Aviation cruisers (Moskva class).

38—Cruisers. Kirov class nuclear-powered guided missile: 2. Sverdlov class light: 9. Guided missile: 27.

70—Destroyers (including 45 guided missile destroyers).

177—Frigates and corvettes (including 32 Krivak class guided missile frigates).

955—Small surface ship combatants. Patrol: 160. Coastal and river patrol: 410. Mine warfare: 385.

178—Amphibious warfare ships and craft.

780—Auxiliary ships. Mobile logistics: 150. Fleet support: 145. Other: 485.

Naval Aviation

375—Strike and bomber aircraft. Tu-22M Backfire: 100. Tu-16 Badger: 240. Tu-22 Blinder: 35.

135—Fighter and fighter-bomber aircraft. Su-17 Fitter: 75. Yak-36 Forger A: 60.

75—Tankers (Tu-16 Badger).

175—Reconnaissance and electronic warfare aircraft. Tu-16 Badger: 80. Tu-95 Bear D: 15. Tu-22 Blinder: 20. An-12 Cub: 25. Other aircraft: 35.

205—Antisubmarine aircraft. Tu-142 Bear F: 60. Be-12 Mail: 95. Il-38 May: 50.

410—Transport and training aircraft.

350—Helicopters (various roles). Mi-14 Haze A: 105. Ka-27 Helix A: 50. Ka-25 Hormone A: 120. Hormone B: 70. Hip: few.

Alliances and Treaties

Prior to the 1970s, the Soviet Union maintained very few alliances or treaties with other nations. The Warsaw Pact, initiated by the Soviets in 1955 as a response to NATO, remains the only multinational defense alliance to which it is a signatory.

Known bilateral treaties of military significance are listed. Others may exist, but, if so, have been kept secret by the signatories. The USSR also maintains bilateral arrangements with each of the other Warsaw Pact countries.

Multinational Alliances

- Warsaw Pact Organization. Members include Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the USSR. Albania was an original signatory, but was excluded from the Pact in 1962. Pact Headquarters is in Moscow; the Pact's Commander in Chief is a Soviet Marshal.

Bilateral Treaties

- Afghanistan: Friendship, Cooperation, and Mutual Assistance (1978).
- Angola: Friendship and Cooperation (1976); Military Cooperation Agreement (1983).
- Congo: Friendship and Cooperation (1981).
- Ethiopia: Friendship and Cooperation (1978).
- Finland: Mutual Assistance (1948).
- India: Friendship, Cooperation, and Mutual Assistance (1971).
- Iran: Provisions of a treaty dating from 1921 between what was then Persia and the USSR were abrogated by Iran in 1979. These provisions permitted Soviet intervention in Iran if a third party should attempt an attack against the USSR from Iranian soil. The Soviets have not recognized this unilateral abrogation.
- Iraq: Friendship, Cooperation, and Mutual Assistance (1972, 1978).
- Mongolia: alliance (1921); defense treaty (1966).
- Mozambique: Friendship and Cooperation (1977).
- North Korea: Friendship, Cooperation, and Mutual Assistance (1961).
- North Yemen: Friendship (1984).
- South Yemen: Friendship, Cooperation, and Mutual Assistance (1980); Agreement of Joint Cooperation (1983).
- Syria: Friendship, Cooperation, and Mutual Assistance (1980).
- Turkey: Nonaggression Pact (1978).
- Vietnam: Friendship, Cooperation, and Mutual Assistance (1978).

Comparison of Key Military Technologies
As of January 1, 1986

Basic Technologies	
Aerodynamics/Fluid Dynamics	
Computers & Software	▲
Conventional Warhead (including Chemical Explosives)	
Directed Energy (Lasers)	
Electro-Optical Sensor (including IR)	
Guidance & Navigation	
Life Sciences	
Microelectronic Materials & Integrated Circuit Manufacture	
Nuclear Warhead	
Optics	
Power Sources (Mobile)	
Production Manufacturing (includes Automated Control)	
Propulsion (Aerospace and Ground Vehicles)	▼
Radar Sensor	▼
Robotics and Artificial Intelligence	
Signal Processing	
Stealth (Signature Reduction Technology)	
Structural Materials (Light-weight, High-strength)	▼
Submarine Detection	▼
Telecommunications	

US Superior

US-USSR Equal

USSR Superior

▼ Indicates US Lead is Diminishing

▲ Indicates US Lead is Increasing

Significant Military Deployments Outside the Soviet Union

(As of July 1985)

EUROPE	
Warsaw Pact Countries	715,000
ASIA	
Afghanistan[1,4]	115,000
Mongolia	75,000
Vietnam[2]	2,500
Laos	500
India	200
Kampuchea	200
MIDEAST	
Syria	2,500
South Yemen[4]	1,000
Iraq[4]	600
North Yemen	500
AFRICA[3]	
Ethiopia[4]	1,500
Libya[4]	1,400
Algeria	1,000
Angola[4]	500
Mozambique[4]	300
Mali	200
Congo[4]	100
LATIN AMERICA	
Cuba[5]	5,600
Peru	160
Nicaragua[4]	50

1 Total includes an estimated 10,000 MVD and KGB forces.
2 Estimate does not include transient Soviet naval presence.
3 About 900 additional Soviet military advisors are deployed in smaller numbers to many other African nations.
4 Significant Cuban military forces are also deployed to this country.
5 Does not include an estimated 3,100 Soviet technicians in Cuba.

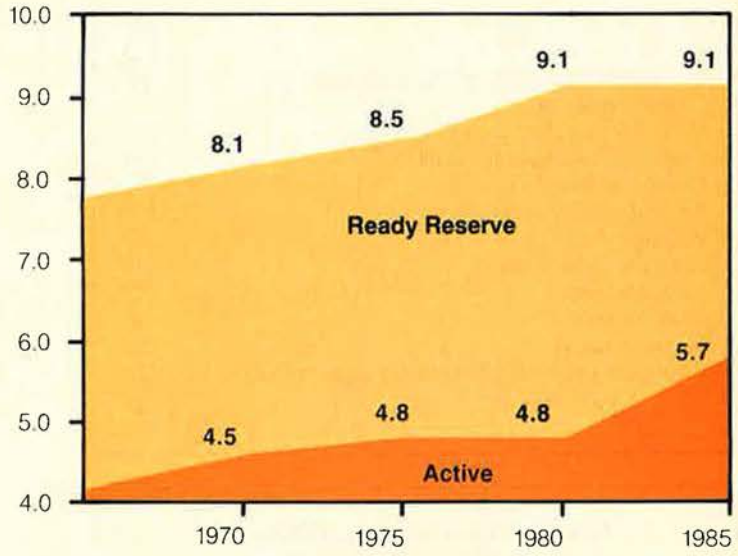
Aeroflot

Aeroflot, with a fleet of more than 1,600 aircraft, is the only Soviet civil air carrier and the world's largest airline. The operation is state-run and extensive; Aeroflot serves 3,600 cities and towns within the USSR and flies international routes to more than eighty other countries. Aeroflot is also responsible for maintaining all Soviet airports, navigation services, and flying clubs and additionally conducts aerial agriculture, forest fire patrol, survey, and air ambulance work. While many Western observers judge Aeroflot's service to be generally inferior to that of commercial airlines, it was the first carrier to introduce jetliner (T-104) service and the first to operate a supersonic passenger aircraft (Tu-144).

The military applications of this large airfleet are unquestionable. Aeroflot is headed by a chief marshal of aviation, one of only two active-duty military officers currently holding that rank in the Soviet Union. Aeroflot also operates several hundred military air transports as part of its civil fleet, while 1,400 other long- and medium-range transports are usable for military support without major refurbishing.

Trends in Soviet Military Force Levels

(in millions)



Recipients of Soviet Military Exports

(Ranked by value of Soviet military equipment received, 1984–85)

1. Syria
2. Iraq
3. Libya
4. Vietnam
5. India
6. East Germany
7. Cuba
8. Poland
9. Algeria
10. Czechoslovakia

Soviet Aircraft Designations

The several parts of a Soviet aircraft designation have distinct meanings. Take the designation "MiG-21MF Fishbed J" as an example.

MiG is an abbreviation of the design bureau responsible for the aircraft—Mikoyan and Gurevich (the bureau's originators) in this case. Other examples are Su for Sukhoi (or Sukhoy), Tu for Tupolev, and Yak for Yakovlev.

The numeral 21 is the model number of the production aircraft. Odd numerals are assigned to fighters, even numerals to bombers and transports.

The letter arrangement MF is the progressive development suffix. M stands for modified or modified for export, F for boosted. Other examples are A for aerodynamic refinement, B for attack or bomber version, *bis* for a reinitialized suffix, P for interceptor version, S for boundary layer blowing, and U or Uti for trainer.

Fishbed is the identifying code name assigned to this MiG series by NATO. All important Soviet aircraft are named as they are identified by photographs from a man-operated camera. The first letter of the name identifies the aircraft type—F for fighter, B for bomber, C for cargo or transport, H for helicopter, and M for miscellaneous. A code name of one syllable means the aircraft is propeller-powered; a code name of two syllables means it is jet-powered.

The letter following the name—J in this example—indicates the point in the letter sequence at which this version was identified by NATO.

Top Soviet Military Aircraft Exports

(1984–85)

Aircraft Type	NATO Code Name	Primary Role	Number Exported
MiG-21	Fishbed	Multirole fighter	270
MiG-23/-27	Flogger	Interceptor/ground attack	210
Su-7/-17/-22	Fitter	Ground attack	175
An-32	Cline	Short/medium-range transport	50
MiG-21U	Mongol	Miscellaneous/trainer	40
An-26	Curl	Short-range transport	40
Su-25	Frogfoot	Ground attack	25
MiG-25	Foxbat	Interceptor/reconnaissance	20

Soviet Space Shots by Program

(1957–84)

Photo Reconnaissance	647
Communications	233
Related to Manned Spaceflight (Manned: 61; Unmanned: 78)	139
Minor Military (Radar calibration, etc.)	138
Electronic Intelligence (ELINT)	134
Navigation/Geodetic	112
Scientific/Natural Resources	107
Weather	58
Venus or Mars Missions	40
Early Warning	39
ASAT-Related	38
Lunar Missions	30
Fractional Orbital Bombardment System (FOBS)	18
Total	**1,733**

—Courtesy Teledyne Brown Engineering

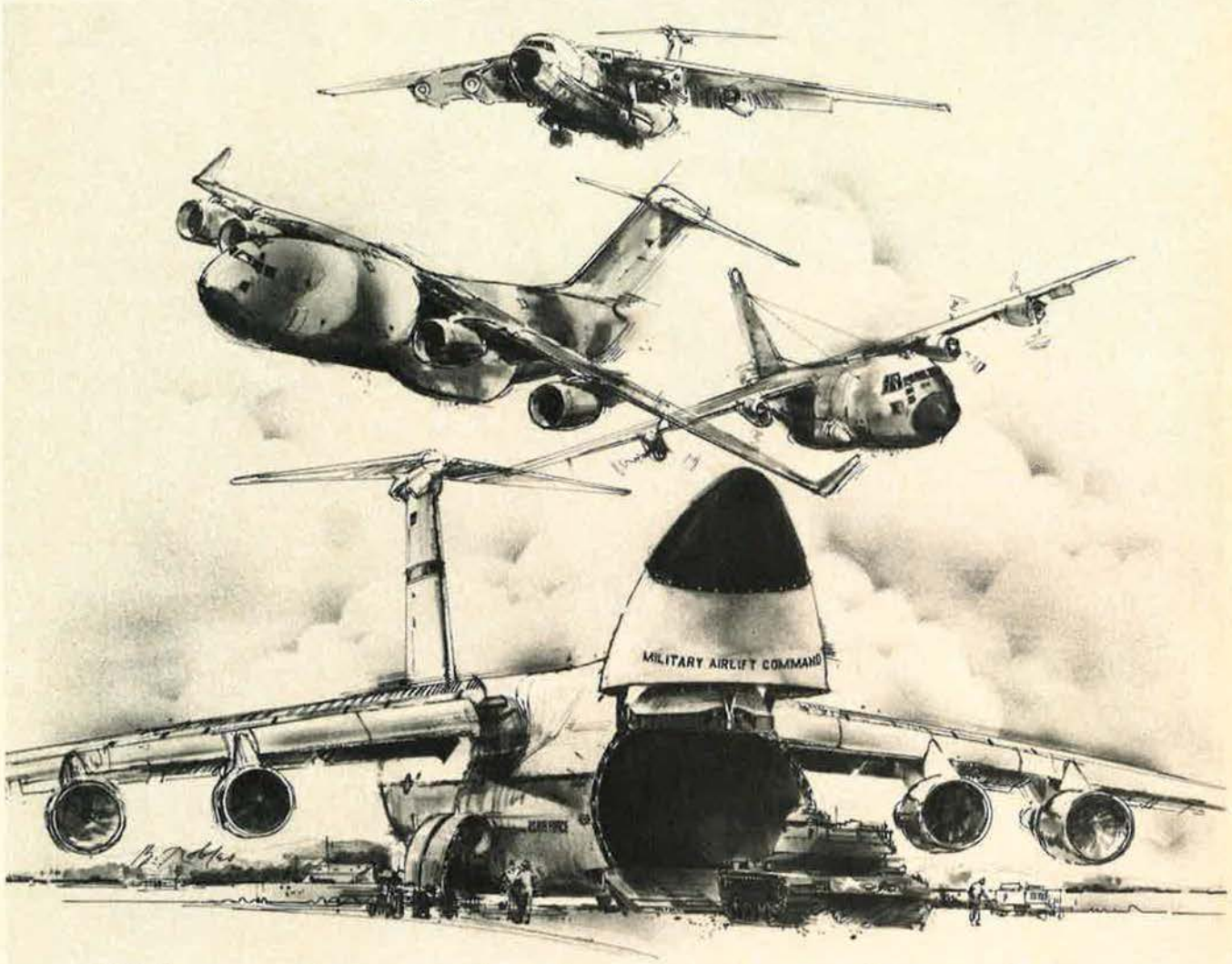
Soviet Space Launches to Orbit or Beyond

1957	2	**1967**	66	**1977**	98
1958	1	**1968**	74	**1978**	88
1959	3	**1969**	70	**1979**	87
1960	3	**1970**	81	**1980**	89
1961	6	**1971**	83	**1981**	98
1962	20	**1972**	74	**1982**	101
1963	17	**1973**	86	**1983**	98
1964	30	**1974**	81	**1984**	97
1965	48	**1975**	89	**1985**	96
1966	44	**1976**	99		

Soviet Space Firsts

October 1957	Sputnik 1	First artificial earth satellite
November 1957	Sputnik 2	First satellite to collect biological data
September 1959	Luna 2	First lunar probe to hit the moon
October 1959	Luna 3	First photographs of the moon's far side
April 1961	Vostok 1	First manned orbital flight (Cosmonaut Yuri Gagarin)
June 1963	Vostok 6	First woman in space (Cosmonaut Valentina Tereshkova)
October 1964	Voskhod 1	First multiple crew member spaceflight (Cosmonauts Komarov, Yegarov, Feoktistov)
March 1965	Voskhod 2	First space walk (Cosmonaut Alexei Leonov)
January 1966	Luna 9	First soft landing of a probe on the moon
October 1967	Kosmos 186/188	First automatic docking of satellites
November 1968	Kosmos 252	First successful ASAT test
January 1969	Soyuz 4/5	First linkup of manned vehicles and in-orbit crew exchange
October 1969	Soyuz 6/7/8	First triple launch and rendezvous of manned ships
November 1970	Luna 17	First robot vehicle on the moon
April 1971	Salyut 1	First launch of a prototype manned space station
July 1975	Apollo/Soyuz Test Project	First international rendezvous and docking in space
January 1978	Soyuz 27	First manned double docking in space
October 1984	Soyuz T-10/11	Record of 237 days living in space

Now that you've offloaded, how do you tell mother?



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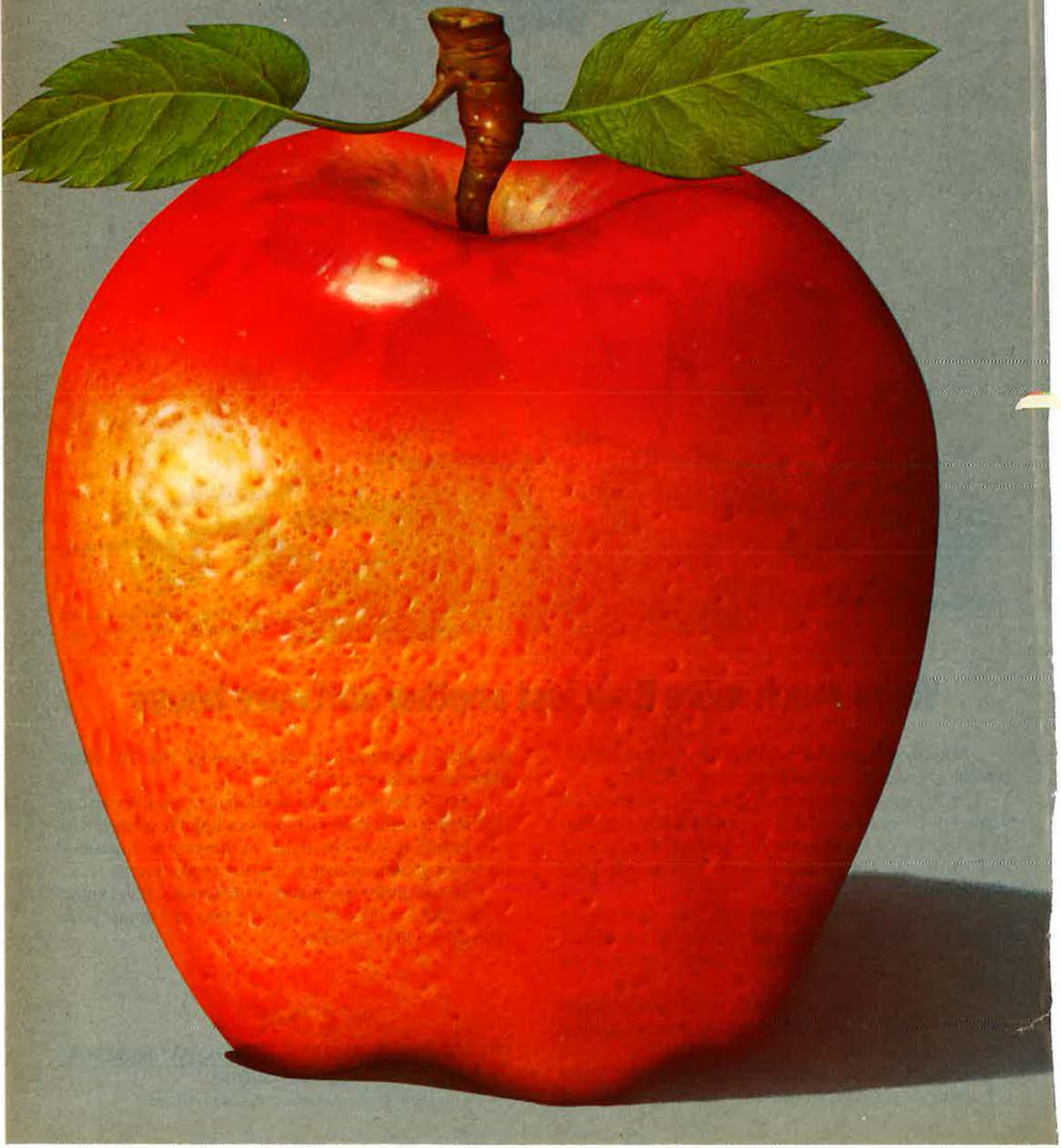

TION: THE SCIENCE
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Our ability to effectively mix apples and oranges has made us the fastest growing division of the Grumman Corporation. For further information about any of our capabilities, contact Wesley R. Stout, Director, Technical Services at (516) 682-8500.

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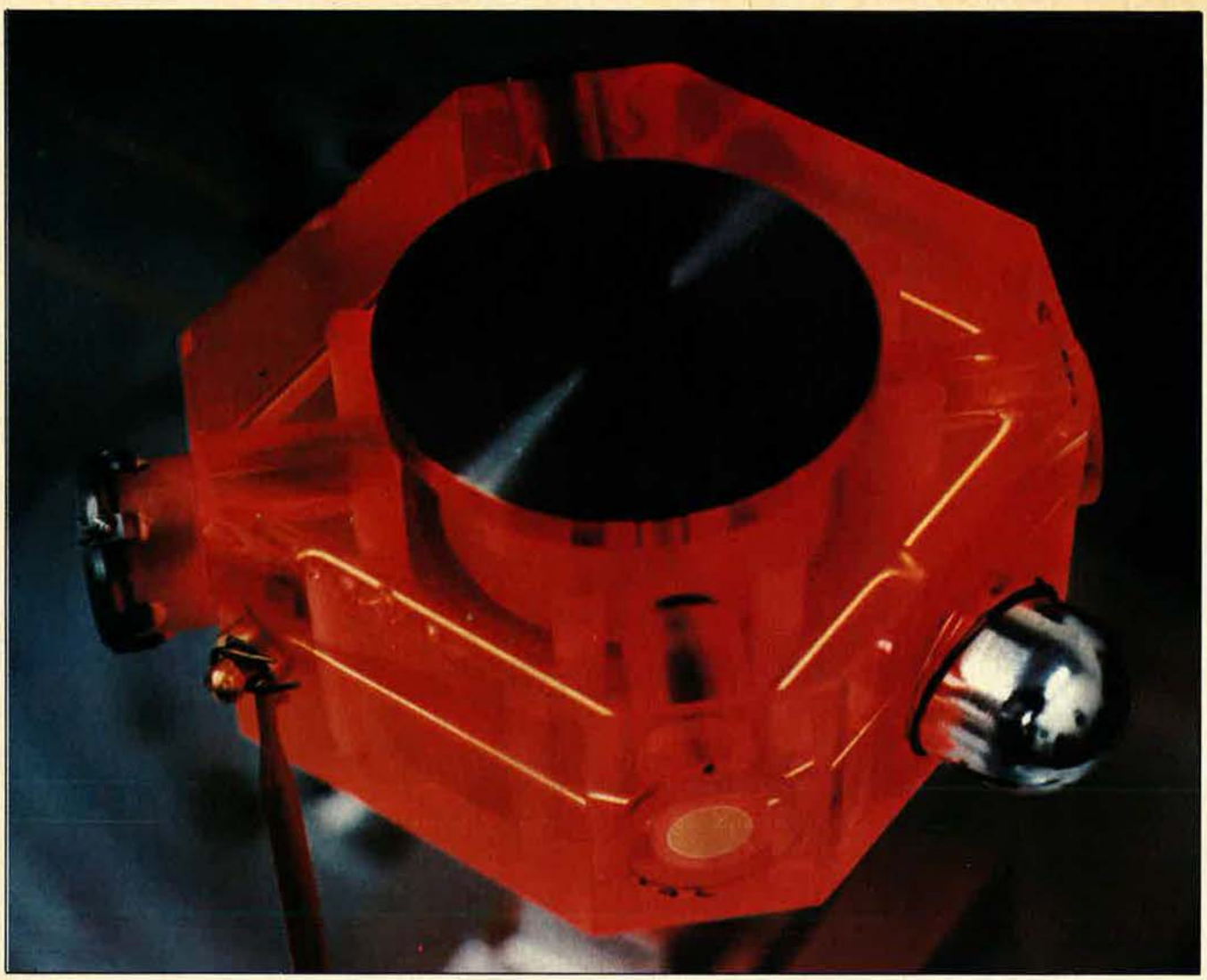


Compared to any triangle, Litton's square "ring" laser produces measurably less backscatter, a definite benefit.

USAF selects Litton for Standard RLG INU, world's first military RLG production program.

C-130 and RF-4C aircraft to receive first units, with HH-60A and EF/F-111 soon after.

The United States Air Force has selected Litton's Guidance and Control Systems Division, long a world leader in inertial navigation, to produce the LN-93 Standard RLG Inertial Navigation Unit. Litton's LN-93 was the first RLG system to successfully complete all tests at the Central Inertial Guidance Test Facility, Holloman Air Force Base, New Mexico, and will be the Form-Fit Function alternative to the AN/ASN-141, currently manufactured by Litton for the F-16, A-10, FB-111, and other Air Force and Army aircraft. Initially, the Standard RLG INU will be employed in the C-130 Self-Contained Navigation System and the RF-4C, and later in the HH-60A and EF/F-111. A variant of the LN-93 will be purchased for the F-15; the two configurations will share over 90% commonality.

The LN-93 Standard Ring Laser Gyro INU is Litton's most recent system to employ Ring Laser Gyros in strapdown configuration. As there are no moving parts, these gyros will have significantly better reliability than earlier-design spinning-wheel gyros. The LN-93 system employs the same 28cm pathlength Ring Laser Gyro and much of the same electronics as both the Litton commercial LTN-90 Inertial Reference System, and LN-92 RLG INS, currently under development for the U.S. Navy CAINS II. The high reliability guaranteed by Litton will allow the Air Force to employ a two-level maintenance approach, eliminating the need for test equipment at base shops.

LN-93 Standard RLG INU, a full step ahead.

Litton Guidance & Control Systems

GALLERY OF SOVIET AEROSPACE WEAPONS

BY JOHN W. R. TAYLOR
EDITOR IN CHIEF, *JANE'S ALL THE WORLD'S AIRCRAFT*

Bombers and Maritime

Beriev M-12 (NATO 'Mail')

Although new generations of advanced fighters, bombers, and combat helicopters are entering service with the Soviet armed forces, the designs of many aircraft in first-line units originated anything from 25 to 35 years ago. Typical of such veterans is the M-12 amphibian, of which an estimated 100 were built primarily for overwater surveillance and antisubmarine duties within a 230-mile radius of shore bases of the Soviet Northern and Black Sea fleets. About 80 still fly, with no seaplane replacement in sight.

Power Plant: two Ivchenko AI-20D turboprop engines; each 4,190 ehp. Internal fuel capacity approx 2,905 gallons.
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 4,660 miles.
Accommodation: crew of five.
Armament and Operational Equipment: variety of weapons and stores for maritime search and attack carried in internal bay aft of step in bottom of hull and on four pylons under outer wings. Radar in nose 'thimble'; MAD (magnetic anomaly detection) tail-sting.

Ilyushin Il-38 (NATO 'May')

The airframe of this antisubmarine/maritime patrol aircraft was developed from that of the Il-18 airliner in the same way that the US Navy's P-3 Orion was based on the Lockheed Electra. Its lengthened fuselage retains, few cabin windows. Il-38s of the original production series each have 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. On some aircraft, the weapon-bay doors are replaced now by a second, longer, blister fairing.

Il-38s of the Soviet Naval Air Force are encountered frequently over the Baltic and North Atlantic. 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. Periodically, deployments are made to Libya and to Tiyas in Syria. About 60 Il-38s are in service, including three that were passed on to No. 315 Squadron of the Indian Navy, based at Dabolim, Goa.

Power Plant: four Ivchenko AI-20M turboprop engines; each 4,250 ehp. Fuel capacity 7,925 gallons.
Dimensions: span 122 ft 9¼ in, length 129 ft 10 in, height 33 ft 4 in.
Performance: max speed 400 mph at 27,000 ft, max range 4,473 miles, patrol endurance 12 hr.
Accommodation: crew of twelve.

Myasishchev M-4 (NATO 'Bison')

About 75 of these four-turbojet aircraft remain available as bombers for maritime and Eurasian missions and as probe-and-drogue aerial refueling tankers for the 'Backfire/Bear/Bison/Blinder' attack force. Pending replacement, respectively, by 'Blackjacks' and a tanker version of the Il-76 'Candid' transport, the 'Bisons' are being phased out of service and placed in storage. *(Data for 'Bison-A' strategic bomber follow.)*

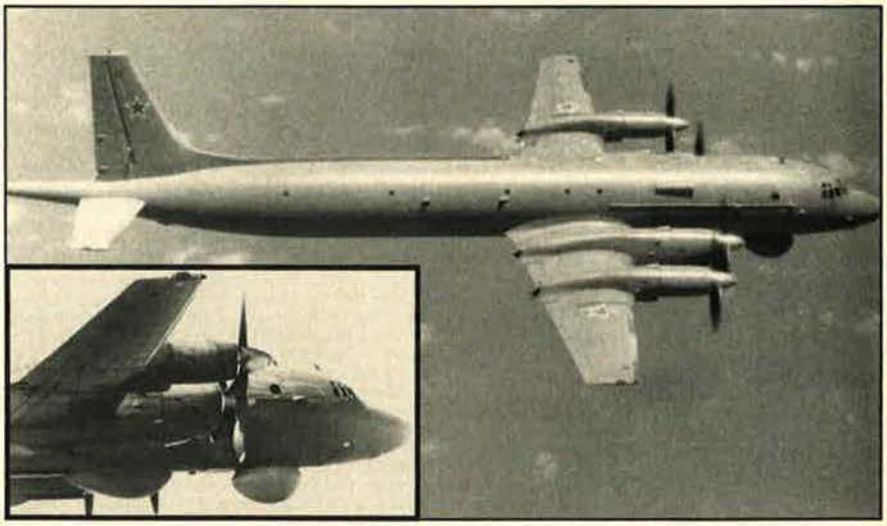
Power Plant: four Mikulin AM-3D turbojet engines; each 19,180 lb st.

Beriev M-12 (NATO 'Mail') (Swedish Air Force)

Dimensions: span 165 ft 7½ in, length 154 ft 10 in.
Weight: gross 350,000 lb.
Performance: max speed 620 mph at 36,000 ft, service ceiling 45,000 ft, range 4,970 miles at 520 mph with more than 12,000 lb of bombs, max unrefueled combat radius 3,480 miles.
Armament: eight 23 mm NR-23 guns in twin-gun turrets above fuselage forward of wing, under fuselage fore and aft of weapon-bays, and in tail. Three weapon-bays in center-fuselage, for free-fall weapons only.

Tupolev Tu-16 (NATO 'Badger')

The prototype Tu-16 flew for the first time in the winter of 1952. About 2,000 production models were delivered to the medium-range bomber force and Soviet Naval Aviation in eleven basic versions. Replacement with 'Backfires' has been under way for a decade, but 285 are estimated to remain operational in the five Soviet air armies, supported by a few Tu-16 aerial refueling tankers, more than 90 of various versions equipped for ECM duties, and 15 for reconnaissance. Soviet Naval Aviation is thought to have about 200 Tu-16 attack models, plus 75 tankers and up to 80 reconnaissance and ECM variants. The attack aircraft carry antiship cruise missiles with standoff ranges varying from 90 to more than 300 km and are often supplemented by air army Tu-16s in naval exercises. A squadron deployed to a permanent base at Cam Ranh Bay, Vietnam, comprises ten aircraft equipped for attack and six for reconnaissance missions, with a potential combat radius encompassing Thailand, the Philippines, Guam, most of Indonesia, and southern China. Known versions of the Tu-16 are as follows:



Ilyushin Il-38 (NATO 'May') (US Navy). Inset shows new version of Il-38 with second radome replacing forward weapons bay doors

Myasishchev M-4 (NATO 'Bison-B') (Royal Air Force)

Badger-A. Basic strategic jet bomber, able to carry nuclear or conventional free-fall weapons. Glazed nose, with small undernose radome. Armed with seven 23 mm guns. Some equipped as aerial refueling tankers, using a unique wingtip-to-wingtip transfer technique to refuel other 'Badgers' or a probe-and-drogue system to refuel 'Blinders'. About 120 operational with Chinese Air Force (still being built in China as Xian H-6).

Badger-B. Generally similar to 'Badger-A', but

equipped originally to carry two turbojet-powered aeroplane-type antishipping missiles (NATO 'Kennel') underwing. Still serves as conventional bomber with free-fall weapons.

Badger-C. Antishipping version, first shown in 1961 Aviation Day flypast. 'Kipper' winged missile carried in recess under fuselage, or 'Kingfish' missiles underwing. Wide nose radome, in place of glazing and nose gun of 'Badger-A'. No provision for free-fall bombs. Operational with Soviet Northern, Baltic, Black Sea, and Pacific fleets.

Badger-D. Maritime/electronic reconnaissance version. Nose like that of 'Badger-C'. Larger undernose radome. Three blister fairings in tandem under centerfuselage.

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') that can be carried to a range greater than 2,000 miles. Free-fall bombing capability retained. Majority serve with antishipping squadrons of the Soviet Naval Air Force. A few have been passed on to Iraq.

Badger-G modified. Specially equipped carrier for 'Kingfish' air-to-surface missiles. Large radome, presumably associated with missile operation, under center-fuselage. Device mounted externally on glazed nose might help to ensure correct attitude of Tu-16 during missile launch. Total of about 85 standard and modified 'Badger-Gs' believed operational with Soviet Northern, Black Sea, and Pacific fleets.

Badger-H. Standoff or escort ECM aircraft to protect missile-carrying strike force, with primary function of chaff dispensing. The chaff dispensers (max capacity 20,000 lb) are probably located in the weapons-bay area. Hatch aft of weapons-bay. Two teardrop radomes, fore and aft of weapons-bay. Two blade antennae aft of weapons-bay.

Badger-J. Specialized ECM jamming aircraft to protect strike force, with at least some of the equipment located in a canoe-shape radome protruding from inside the weapons-bay. Anti-radar noise jammers operate in A to I bands inclusive. Glazed nose like 'Badger-A'.

Badger-K. Electronic reconnaissance variant with nose like 'Badger-A'. Two teardrop radomes, inside and forward of weapons-bay. *(Data for 'Badger-A' follow.)*

Power Plant: two Mikulin RD-3M (AM-3M) turbojet engines; each 20,950 lb st. Internal fuel capacity approx 12,000 gallons.

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 with 8,360 lb bomb load 3,000 miles.

Accommodation: crew of six.

Armament: seven 23 mm NR-23 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')

About 250 Tu-22s were built, and were the first Soviet operational bombers capable of supersonic performance for short periods. More than half of these are said to remain operational with medium-range units of the air armies. The Soviet Navy has about 35 bombers and 20 equipped 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, first seen in 1961, with fuselage weapons-bay for free-fall nuclear or conventional bombs. Limited production only.

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 refueling probe on nose. About 135 'Blinder-As and Bs' remain in service with Soviet air armies, including 15 equipped for reconnaissance, and others with Soviet Naval Aviation. The Libyan and Iraqi Air Forces each have about seven.

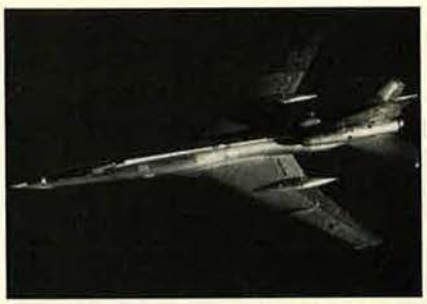
Blinder-C. Maritime reconnaissance version, with six camera windows in weapons-bay doors. New dielectric panels, modifications to nosecone, etc., on some aircraft suggest added equipment for ECM and electronic intelligence roles.

Blinder-D. Training version. Cockpit for instructor in raised position aft of standard flight deck, with stepped-up canopy. Used by Soviet and Libyan Air Forces.

Power Plant: two Kolesov VD-7 turbojet engines in pods above rear fuselage, on each side of tail-fin; each 30,900 lb st with afterburning. Lip of each intake is extended forward for takeoff, creating annular slot through which additional air is ingested.

Dimensions: span 78 ft 0 in, length 132 ft 11½ in, height 35 ft 0 in.

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



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

Weight: gross 185,000 lb.

Performance: max speed Mach 1.4 at 40,000 ft, service ceiling 60,000 ft, max unrefueled combat radius 1,925 miles.

Accommodation: three crew, in tandem.

Armament: single 23 mm gun in radar-directed tail mounting. Other weapons as described for individual versions.

Tupolev Tu-26 (Tu-22M) (NATO 'Backfire')

Although Soviet delegates to the SALT II Treaty talks referred to 'Backfire' as the Tu-22M, its current service designation is believed to be Tu-26. The 1985 edition of DoD's *Soviet Military Power* document refers to it as "a long-range aircraft capable of performing nuclear strike, conventional attack, antiship, and reconnaissance missions", adding later that "unrefueled 'Backfire' bombers can fly a variety of strike profiles against targets in Europe or China. Although Soviet spokesmen have stated [that it] does not have an intercontinental role, the aircraft has the capability to strike the US on one-way intercontinental missions with forward recovery (in nonhostile territory such as Cuba). Using Arctic staging bases and in-flight refueling, the 'Backfire' could achieve similar target coverage on two-way missions. If staged, but not refueled in flight, it could conduct strike missions against some targets in the US." Almost the only unknown is whether its refueling nose probe is removable or retractable.

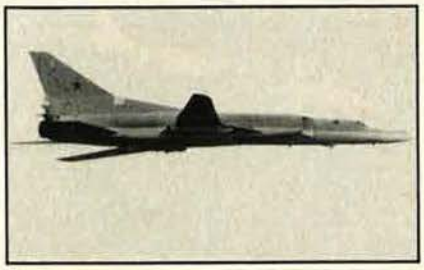
Three versions have been identified, as follows:

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. Equipped a single 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. Mainwheels retract inward into bottom of intake trunks.

Backfire-C. Advanced version with wedge-type engine air intakes, similar to those of MiG-25. No photograph yet available.

About 300 'Backfires' are in service. Two-thirds of them oppose NATO in Europe and over the Atlantic, with the others in the far east of the Soviet Union. The latter are observed frequently over the Sea of Japan, and 30 of them are reportedly drawn from the 120 'Backfire-Bs' deployed in a maritime role by Soviet Naval Aviation. Production is expected to continue at the current rate of 30 a year into the 1990s, with progressive design changes to enhance performance. 'Backfires' have been used for development launches of new-generation cruise missiles, but are not considered likely to become designated AS-15 carriers. *(Data for 'Backfire-B' follow.)*



Tupolev Tu-26 (NATO 'Backfire-B') (JASDF)

Power Plant: two unidentified engines, reported to be uprated versions of the 44,090 lb st Kuznetsov NK-144 afterburning turbofans developed for the Tu-144 supersonic transport. Can be refueled in flight.

Dimensions: span 113 ft spread, 86 ft swept; length 140 ft; height 33 ft.

Weight: gross 270,000 lb.

Performance: max speed Mach 1.92 at high altitude, Mach 0.9 at low altitude, max unrefueled combat radius 3,400 miles.

Armament: twin 23 mm guns in radar-directed tail mounting. Nominal weapon load 26,450 lb. Primary armament of one to three 'Kitchen' or 'Kingfish' air-to-surface missiles semirecessed in the underside of the center-fuselage and/or carried under the fixed center-section panel of each wing. 'Backfire' can also carry the full range of Soviet free-fall nuclear and conventional weapons, and can have multiple racks for external stores under the front of the 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')

Andrei Tupolev's huge four-turboprop 'Bear' provides impressive proof of the importance that the Kremlin still attaches to strategic airpower. The first Tu-95 prototype was flown in the summer of 1954. From the start, it flew at speeds 100 mph faster than anyone had expected a propeller-driven aircraft to achieve, and production has been continuous for a variety of duties. Fifteen years after the last of the original bomber variants left the assembly line, the entirely new 'Bear-H' entered series production, at Taganrog, as the first vehicle for the Soviet Union's AS-15 long-range air-launched cruise missiles with nuclear warheads. Twenty-five were in service by the spring of 1985, together with many 'Bear-Gs', which are early bombers reconfigured to carry the supersonic AS-4 'Kitchen' air-to-surface missile instead of the subsonic AS-3 'Kangaroo' with which they were formerly armed.

Versions of 'Bear' that can be identified by unclassified NATO reporting names are as follows:

Bear-A. Basic Tu-95 long-range strategic bomber. 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 rear dorsal and 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 flight refueling nose probe, and, sometimes, a streamlined blister fairing on the starboard side of the rear fuselage.

Bear-C. Third strike version, with ability to carry 'Kangaroo', first observed near NATO ships in 1964. Differs from 'Bear-B' in having a streamlined blister fairing on each side of its rear fuselage. Has been seen with a faired tail as mentioned under 'Bear-D' entry. Refueling probe standard.

Bear-D. Identified in 1967, this maritime reconnaissance version is equipped with I band surface search radar in a large blister fairing under the center-fuselage. Glazed nose like 'Bear-A', with undernose radome and superimposed refueling probe. Rear fuselage blisters as on 'Bear-C'. Added fairing at each tailplane tip. I-band tail-warning radar in enlarged fairing at base of rudder. Carries no offensive weapons, but tasks include pinpointing of maritime targets for missile launch crews on board ships and aircraft that are themselves too distant to ensure precise missile aiming and guidance.

A 'Bear-D' photographed in the second half of 1978 had in place of the normal tail turret and associated radome a faired tail housing special equipment.

Bear-E. Reconnaissance bomber. Generally as 'Bear-A', but with rear fuselage blister fairings and refueling probe as on 'Bear-C.' Six or seven camera windows in bomb-bay doors. Few only.

Bear-F. First deployed by Soviet Naval Aviation in 1970 and since upgraded, this is a much refined antisubmarine version. Originally, it had enlarged and lengthened fairings aft of its inboard engine nacelles for purely aerodynamic reasons, but current aircraft have reverted to standard size fairings. The undernose radar of 'Bear-D' is missing on some aircraft; others have a radome in this position, but of considerably modified form. On both models the main underfuselage I band radar housing is considerably farther forward than on 'Bear-D' and smaller in size; the forward portion of the fuselage is longer; the flight deck windscreens are deeper, giving increased

headroom; there are no large blister fairings under and on the sides of the rear fuselage; and the nosewheel doors are bulged prominently, suggesting the use of larger or low-pressure tires. 'Bear-F' has two stores bays for sonobuoys, torpedoes, and nuclear depth charges in its rear fuselage, one of them replacing the usual rear ventral gun turret and leaving the tail turret as the sole defensive gun position. Some aircraft have an MAD 'sting' projecting from the rear of the fin tip.

Bear-G. Generally similar to 'Bear-B/C', but reconfigured to carry two supersonic AS-4 ('Kitchen') air-to-surface missiles instead of one subsonic AS-3 ('Kangaroo'), on a large pylon under each wingroot. Other new features include a small thimble radome under the in-flight refueling probe and a solid tailcone similar in shape to that on some 'Bear-Ds'. Operational.

Bear-H. This new production version, based on the Tu-142 type airframe of 'Bear-F', is equipped with pylons under the inboard wing panels to carry long-range cruise missiles, including the AS-15. It achieved initial operational capability in 1984. Features include a larger and deeper radome built into the nose and a small fin-tip fairing. The familiar blister fairings on the sides of the rear fuselage and ventral gun turret are deleted.

The majority of the 125 'Bears' now serving with the five Soviet air armies are of the new 'G' and 'H' models. Soviet Naval Aviation units have about 45 'Bear-Ds' and 55 'Bear-Fs'. Their duties include regular deployments to staging bases in Cuba and Angola, and eight are stationed permanently at Cam Ranh in Vietnam. Three 'Bear-Fs' have been transferred to the Indian Navy. *(Data for 'Bear-F' follow.)*

Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp. Internal fuel capacity 19,280 gallons. Equipped for in-flight refueling.
Dimensions: span 167 ft 8 in, length 162 ft 5 in, height 39 ft 9 in.
Weight: gross 414,470 lb.
Performance: max speed 575 mph at 41,000 ft, unrefueled combat radius 5,150 miles.

New Tupolev Bomber (NATO 'Blackjack')

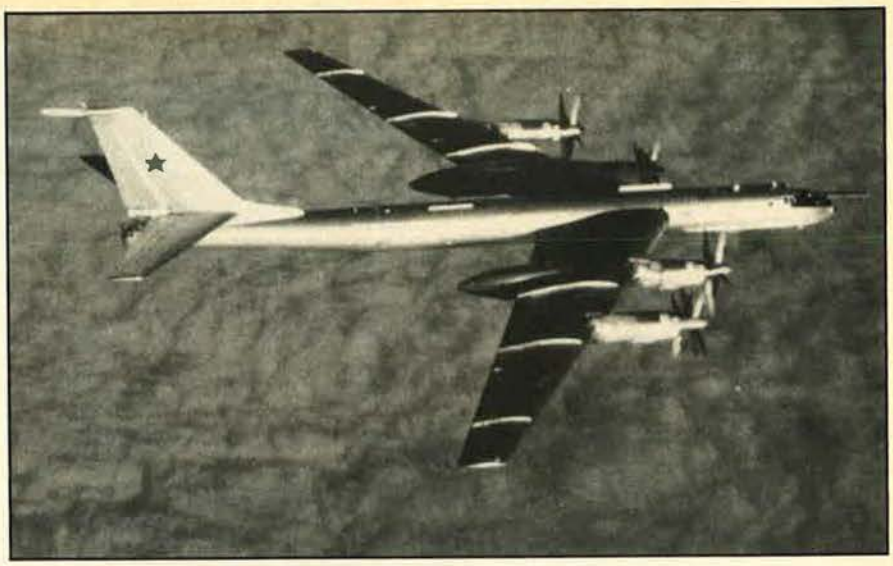
Two years away from anticipated operational capability, this long-awaited replacement for the M-4 'Bison' and Tu-95 'Bear' is longer than a B-52, is 50 percent faster than a B-1B, and has a range that offers much the same target coverage as 'Bear'. Apart from one poor-quality reconnaissance photograph taken over Ramenskoye flight test center on November 25, 1981, only DoD artists' impressions are available to show that 'Blackjack' is in no way a simple scale-up of Tupolev's earlier 'Backfire'. Common features include low-mounted variable-geometry wings and large vertical tail surfaces with a massive dorsal fin, but 'Blackjack's' horizontal tail surfaces are mounted higher, at the intersection of the dorsal fin and main fin. The fixed root panel of each wing seems to be long and very sharply swept, like the inboard section of the Tu-144's delta wing. The engine installation also seems to resemble that of the now-retired airliner rather than 'Backfire', leading to suggestions that 'Blackjack' might be powered by four Koliesov single-shaft turbojets of the kind that gave the developed Tu-144D an increased range (these might be related to the Type 57 engines tested in the experimental bomber known as 'Aircraft 101'). Such assessments should be regarded with caution, as the Tu-144D was designed to cruise at around Mach 2 throughout its flight, whereas the bomber would need to cruise at subsonic speed to conserve fuel and accelerate to supersonic speed at high altitude, or transonic speed at penetration height, only as it approached and left the target area. Major differences in flight profile normally call for different engines. However, it is Soviet policy to uprate or adapt an existing engine for a new aircraft rather than develop a new design, whenever this is possible. If the engines are mounted in pairs inside two divided underwing ducts, as on the Tu-144, the gap between the ducts will determine the type and size of weapons that 'Blackjack' can carry. DoD expects the Soviet Union to build a production series of about 100 in a new complex added to the Kazan airframe plant. The AS-15 air-launched cruise missile, with a range of 1,600 nm, will be 'Blackjack's' primary weapon.

Power Plant: possibly four 'Type 57' engines; each 44,100 lb st.
Dimensions: span 172 ft spread, 110 ft swept; length 166 ft; height 45 ft.
Weight: gross 590,000 lb.
Performance: max speed Mach 2.1 at high altitude, max unrefueled combat radius 4,535 miles.
Armament: up to 36,000 lb of free-fall bombs or ALCMs.

Fighters

MiG-21 (NATO 'Fishbed')

MiG-21s continue to be flown by at least 37 air forces worldwide, but replacement with the MiG-23 and other



Tupolev Tu-142 (NATO 'Bear-F') with MAD tail 'sting' (USAF)

MiG-21MF (NATO 'Fishbed-J')

types has left only 700 in first-line units of the Soviet tactical air forces, including 50 of the reconnaissance models known to NATO as 'Fishbed-H'. Early MiG-21F/PF/PFM variants (NATO 'Fishbed-C/D/F') are flown by various Warsaw Pact air forces, but the major versions deployed with Soviet air forces of the military districts (MDs) and groups of forces are as follows:

MiG-21PFMA ('Fishbed-J'). Multirole development of PFM, with Tumansky R-11-300 turbojet, improved radar (NATO 'Jay Bird'; search range 12 miles), 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 infrared K-13As on inboard pylons. Zero-speed, zero-altitude ejection seat. Later 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 centerline tank.

MiG-21MF ('Fishbed-J'). Differs from PFMA in having lighter-weight, higher-rated Tumansky R-13-300 turbojet. 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 multirole 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. Rate of climb at T-O weight of 15,000 lb, with 50% fuel and two 'Atoll' missiles, is 58,000 ft/min. Armament uprated to two radar-homing 'Atolls' and two 'Aphids'. *(Data for MiG-21MF follow.)*

Power Plant: one Tumansky R-13-300 turbojet engine; 14,550 lb st with afterburning.
Dimensions: span 23 ft 5½ in, length 51 ft 8½ in, height 14 ft 9 in, wing area 247 sq ft.
Weight: gross 20,725 lb.
Performance: max speed Mach 2.1 above 36,000 ft, Mach 1.06 at low altitude; practical ceiling about 50,000 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 rockets.

MiG-23 (NATO 'Flogger')

An estimated 2,100 MiG-23 interceptors form the backbone of the slimmed-down Voyska PVO air defense force and air combat elements of the tactical air forces. Versions are flown by all of the non-Soviet Warsaw Pact air forces and have been exported to at least ten other nations. Currently operational MiG-23 variants identified by unclassified NATO reporting names are as follows:

MiG-23M ('Flogger-B'). First series production version. Single-seat air combat fighter with Tumansky R-27 turbojet, rated at 22,485 lb st with afterburning, and considerably modified airframe compared with Lyulka-engined prototype and preproduction models. Deliveries began in 1972.

MiG-23MF ('Flogger-B'). Generally similar to MiG-23M, but with more powerful R-29 turbojet and uprated equipment, including 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, infrared sensor pod beneath cockpit, and Doppler. Described as the first Soviet aircraft with a demonstrated ability to track and engage targets flying below its own altitude. Standard version for Soviet Air Force from about 1975 and for other Warsaw Pact air forces from 1978.

MiG-23U ('Flogger-C'). Tandem two-seater for both operational training and combat use. Identical to early MiG-23M (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 infrared sensor or Doppler. Armed with 'Atoll' missiles and GSh-23 gun.

MiG-23BN ('Flogger-F'). Export counterpart of Soviet Air Forces' MiG-27 ('Flogger-D') ground attack/interdictor. Has the nose shape, laser rangefinder, raised seat, cockpit external armor plate, and larger, low-pressure tires of the MiG-27, but retains the power plant, variable-geometry intakes, and GSh-23 twin-barrel gun of the MiG-23MF.

MiG-23MF ('Flogger-G'). First identified when six aircraft from Kubinka air base made goodwill visits to Finland and France in the summer of 1978. Although basically similar to 'Flogger-B', these aircraft had a much smaller dorsal fin. Absence of operational equipment suggested that only a few aircraft had been modified to this standard for improved aerobatic capability as a display team. 'Flogger-G' has since been confirmed as a standard operational variant, with lighter-weight radar and, on some aircraft, an undernose sensor pod of new design.

MiG-23BN ('Flogger-H'). As 'Flogger-F', but with small avionics pod added on each side at bottom of fuselage, immediately forward of nosewheel doors.

On all versions, wing sweep is variable manually, in flight or on the ground, 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 (except when cut out at 72° sweep), and collectively after touchdown. Leading-edge flap on outboard two-thirds of each main (variable-geometry) wing panel, coupled to trailing-edge flaps. Horizontal tail surfaces operate differentially and collectively for aileron and elevator functions respectively. Conventional rudder. *(Data for current Soviet AF MiG-23MF follow.)*

Power Plant: one Tumansky R-29B turbojet engine, rated at 27,500 lb st with max afterburning. Variable-geometry air intakes and variable nozzle. Internal fuel capacity 1,519 gallons. Provision for 211 gallon external fuel tank on centerline pylon, and two more under fixed wing panels. Attachment for assisted take-off rocket on each side of rear fuselage.

Dimensions: span 46 ft 9 in spread, 26 ft 9½ in swept; length 59 ft 6½ in; wing area 293.4 sq ft spread.

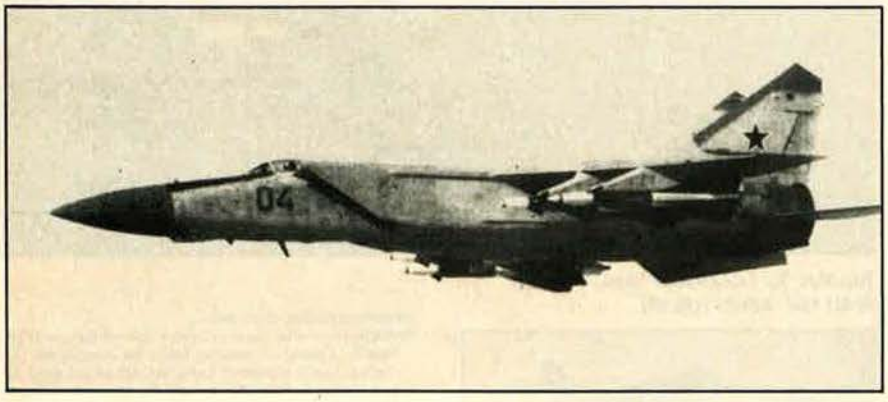
Weight: gross 35,275–41,670 lb.

Performance: max speed Mach 2.35 at height, Mach 1.2 at sea level, service ceiling 61,000 ft, combat radius 560–805 miles.

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun in belly pack. One pylon under center-fuselage, one under each engine air intake duct, and one under each fixed inboard wing panel, for rocket packs, air-to-air missiles, or other stores. Use of twin launchers under air intake ducts permits carriage of four AA-8 (NATO 'Aphid') missiles, in addition to two AA-7 (NATO 'Apex') on underwing pylons.

MiG-23MF (NATO 'Flogger-B') (Camera Press)



MiG-25M (NATO 'Foxbat-E')

MiG-25 (NATO 'Foxbat-A, C, and E')

Fastest armed combat aircraft yet identified in squadron service, the MiG-25 was designed more than 25 years ago to counter the threat of the B-70 Mach 3 strategic bomber then under development for USAF. Emphasis was placed on high speed, high altitude capability and a radar/missile fit that would permit attack over a considerable range; maneuverability was less important. Despite the subsequent NATO switch to low-level operations, MiG-25s continue to equip approximately one-quarter of the 1,200-strong Soviet strategic interceptor force; a further 130 interceptors and 170 reconnaissance MiG-25s serve with the tactical air forces. Others fly in the national markings of Algeria, India, Iraq, Libya, and Syria. Five versions have been identified:

MiG-25 ('Foxbat-A'). Basic interceptor designed to attack high-flying targets. Built mainly of steel, with titanium only in places subject to extreme heating, such as the wing leading-edges. Slightly reduced wing sweep towards tips, which carry antiflutter bodies housing ECM and CW target-illuminating radar. Nose radar (NATO 'Fox Fire') of MiG-25 examined in Japan in 1976, after the defection of its pilot, was the most powerful fitted to any interceptor of that period, but embodied vacuum tubes rather than modern circuitry, with emphasis on antijamming capability rather than range. Most operational aircraft are being uprated progressively to 'Foxbat-E' standard.

MiG-25R ('Foxbat-B'). Reconnaissance version. Described separately in *Reconnaissance, ECM, and EW Aircraft* section.

MiG-25U ('Foxbat-C'). Trainer, of which first photographs became available in late 1975. New nose, containing separate cockpit with individual canopy, forward of standard cockpit and at a lower level. No search radar or reconnaissance sensors in nose.

MiG-25R ('Foxbat-D'). Reconnaissance version. Described separately.

MiG-25M ('Foxbat-E'). Converted 'Foxbat-A' with changes to radar and equipment to provide limited look-down/shootdown capability comparable with that of 'Flogger-B'. Undernose sensor pod. Engines uprated to 30,865 lb st. Developed via aircraft known as E-266M, which recaptured two time-to-height records from the F-15 *Streak Eagle* in 1975 and subsequently set the current absolute height record of 123,524 ft. *(Data for 'Foxbat-A' follow.)*

Power Plant: two Tumansky R-31 (R-266) turbojet engines, each 27,010 lb st with afterburning. Internal fuel capacity approx 4,600 gallons. Electronically-controlled variable ramps in intakes.

Dimensions: span 45 ft 9 in, length 78 ft 1¾ in, height 20 ft 0¼ in, wing area 611.7 sq ft.

Weights: basic operating 44,100 lb, gross 82,500 lb.

Performance: never-exceed combat speed, with missiles, Mach 2.83, max speed at low altitude, with missiles, Mach 0.85, service ceiling 80,000 ft, max combat radius 900 miles.

Armament: four air-to-air missiles. These may comprise one infrared and one radar homing example of the AA-6 (NATO 'Acrid') under each wing. Alternatively, one AA-7 (NATO 'Apex') and one AA-8 ('Aphid') can be carried under each wing.

MiG-29 (NATO 'Fulcrum')

Operational since early 1985, the MiG-29 is expected to replace MiG-21s, Su-15/21s, and some MiG-23s in Soviet service. The basic version is a twin-engined single-seat fighter comparable in size to USAF's F-16 Fighting Falcon. An important difference is that the MiG is fitted from the start with a large pulse-Doppler look-down/shootdown radar that gives it day and night all-weather operating capability against low-flying targets as well as freedom from the outmoded ground control interception techniques that restricted Soviet air defense effectiveness in the past.

References to this fighter first appeared in the Western press in 1979, after a prototype had been identified in photographs taken over Ramenskoye flight test center by a US reconnaissance satellite. From the start, it was plain that the MiG-29 (NATO 'Fulcrum') represented a concerted effort by the Soviet Union to close the technology gap with the West. Combat radius and sustained turn rate are much improved over earlier Soviet fighters, and thrust-to-weight ratio is better than one. Although intended primarily as a counterair fighter, it is likely to have a full dual-role air combat/attack capability, and a combat capable two-seater is also in production. Manufacture is centered at a factory in Moscow, from which about 75 MiG-29s are believed to have been delivered by the beginning of 1986. India was awaiting delivery of an initial batch of six single-seaters and two two-seaters at that time and expects to manufacture MiG-29s under license to meet its requirement for fighters to match Pakistan's F-16s.

Power Plant: two Tumansky R-33D turbofans, each 18,300 lb st with afterburning.

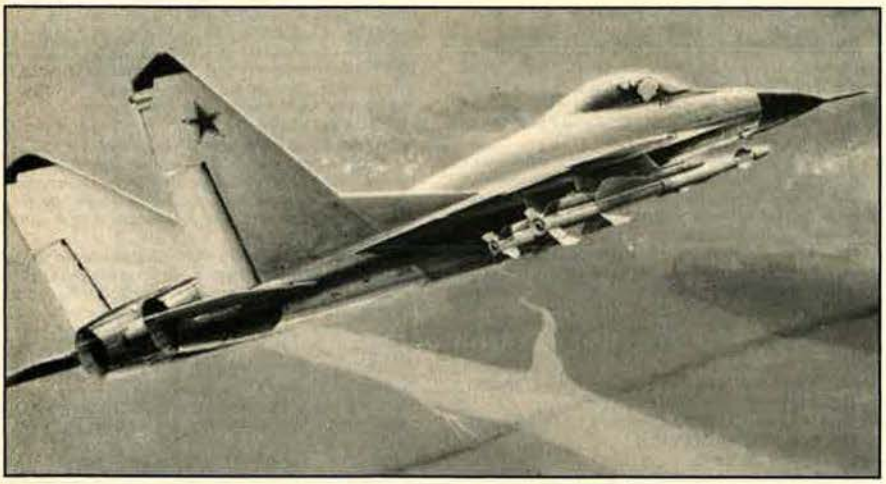
Dimensions: span 33 ft 7½ in, length 50 ft 10 in, height 17 ft 2 in.

Weights: empty 17,250 lb, gross 36,375 lb.

Performance: max speed at height Mach 2.2, at S/L Mach 1.06, combat radius 500 miles.

Accommodation: pilot only (tandem two-seater to follow).

Armament: six AA-10 medium-range radar homing air-to-air missiles, bombs, rocket pods, or other stores on two pylons under each wing and one under each engine air duct. At least one large-caliber gun is also likely.



Artist's impression of MiG-29 (NATO 'Fulcrum') (DoD)

MiG-31 (NATO 'Foxhound')

First Soviet interceptor to offer true lookdown/shootdown and multiple-target engagement capability, the MiG-31 is expected to reequip many MiG-21, MiG-23, Su-15/21, and MiG-25 units. Although it inherits its general configuration from 'Foxbat' and may have the same power plant as 'Foxbat-E', it is a very different aircraft, with a crew of two and reduced emphasis on highest possible speed. Nonetheless, Assistant Secretary of Defense Donald Latham raised a few eyebrows last year by stating his opinion that the MiG-31 is superior to any existing US fighter, with better avionics, a better C^3 system to work into, a better air-to-air missile, and greater speed and combat range. Key to this superiority is the aircraft's new pulse-Doppler radar, allied to eight beyond-visual-range missiles considered to be better than the embryonic US AMRAAM.

Deployment of MiG-31s with Voyska PVO air defense regiments has been under way for three years, and more than 70 were already operational by the spring of 1985, from the Arkhangelsk area near the USSR's western borders to Dolinsk on Sakhalin Island, north of Japan. Production is centered at the Gorkiy airframe plant.

Power Plant: two Tumansky R-31 turbojets; each 30,865 lb st with afterburning.

Dimensions: span 45 ft 10½ in, length 77 ft 1¼ in.

Weights: empty 48,115 lb, gross 90,725 lb.

Performance: max speed Mach 2.4 at height, combat radius 1,305 miles.

Accommodation: two crew, in tandem.
Armament: eight air-to-air missiles, including new radar homing AA-9.

Sukhoi Su-15/21 (NATO 'Flagon')

With deployment of the new MiG-29 and MiG-31 gathering pace, the number of 'Flagons' in first-line home defense units is believed to have diminished from about 750 to fewer than 200 during the past year. Those remaining are of three variants, of which 'Flagon-E/F' are so different from early Su-15s that they are said to be designated Su-21 in the USSR:

Flagon-C. Two-seat training version, probably with combat capability. Individual rearward-hinged canopy over each seat.

Flagon-E. Single-seat interceptor. Longer-span wings than those of original 'Flagon-A', with compound sweep. R-13F-300 turbojets, each rated at 14,550 lb st, increasing speed and range. Uprated avionics. Major production version, operational since second half of 1973.

Flagon-F. Last known production version, identified by ogival nose radome instead of conical type on earlier variants. Generally similar to 'Flagon-E', but with uprated engines. *(Data for 'Flagon-F' follow.)*

Power Plant: two afterburning turbojets, reported to be Tumansky R-13F2-300s; each 15,875 lb st.
Dimensions: span 34 ft 6 in, length 68 ft 0 in.
Weight: gross 35,275 lb.
Performance: max speed Mach 2.1 above 36,000 ft, service ceiling 65,600 ft, combat radius 450 miles.
Accommodation: pilot only.
Armament: one radar homing and one infrared homing air-to-air missile (NATO 'Anab') on outboard underwing pylons; infrared homing close-range missile (NATO 'Aphid') on each inboard pylon. GSh-23L 23 mm gun pods or fuel tanks on two underbelly pylons.

Sukhoi Su-27 (NATO 'Flanker')

Sukhoi's equivalent to USAF's F-15 Eagle, the Su-27 (NATO 'Flanker') is a supersonic all-weather counterair fighter with lookdown/shootdown weapon systems and beyond-visual-range air-to-air missiles and with a possible secondary ground attack role. The aircraft's range, thrust-to-weight ratio, and maneuverability are all said to be improved by comparison with earlier Soviet fighters. Its large pulse-Doppler radar and heavy armament should also give it formidable potential against low flying aircraft and cruise missiles, particularly when it is deployed in partnership with the new Soviet AEW&C aircraft based on the Il-76 transport and known to NATO as 'Mainstay'.

The only photographs of the Su-27 yet published are thought to show a prototype or preseries model with curved wingtips. Production Su-27s have square tips, carrying launchers for air-to-air missiles; the twin tail fins are also moved outboard of the engine housings. Production is centered at a plant in Komsomolsk, Khabarovsk territory. The fighter was expected to achieve operational capability during 1985 and, with the MiG-31, to replace many of the MiG-21, MiG-23/27, Su-15/21, and MiG-25 aircraft in the 17 tactical air forces assigned to Soviet military districts and groups of forces.

'Flanker' has also been observed with various other types at Saki naval air base on the Black Sea. There, the Soviet Navy has a 975 ft dummy flight deck, complete with arrester gear and barriers as well as two ski-jump ramps, as part of the development program for the 65,000 ton nuclear-powered aircraft carrier built at Nikolayev. This may suggest the eventual manufacture of a navalized version of the Su-27 to equip the ship's carrier air group.

Power Plant: two unidentified turbojets, possibly related to Tumansky R-31; each 30,000 lb st with afterburning.
Dimensions: span 47 ft 7 in, length (excl nose probe) 69 ft 0 in, height 18 ft 0 in.
Weight: gross 44,000–63,000 lb.
Performance: max speed Mach 2.35 at height, Mach 1.1 at S/L, combat radius 930 miles.
Accommodation: pilot only.
Armament: six radar homing AA-10 air-to-air missiles under fuselage and wings and on wingtip launchers, or 13,225 lb of external stores (*e.g.*, twelve 1,100 lb bombs) for secondary attack role.

Tupolev Tu-28P/Tu-128 (NATO 'Fiddler')

Largest purpose-designed interceptor yet put into service, 'Fiddler' is usually designated Tu-28P in the press, but DoD prefers Tu-128. Which is correct is unlikely to be of consequence for much longer; after 20 years of service, only about 90 of the production 'Fiddler-Bs' remain operational.

Power Plant: two unidentified afterburning turbojet engines; each estimated at 27,000 lb st. Half-cone shockbody in each air intake.
Dimensions: span 59 ft 4½ in, length 89 ft 3 in.
Weight: gross 100,000 lb.
Performance: max speed Mach 1.65 at 36,000 ft, ceiling 65,600 ft, range 3,100 miles.
Accommodation: crew of two in tandem.
Armament: four air-to-air missiles (NATO 'Ash') under wings, two radar homing, two infrared homing.

Yakovlev Yak-28P (NATO 'Firebar')

About 90 Yak-28P all-weather interceptors are thought to remain operational in the Voyska PVO fighter force. The 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, related to the Tumansky R-11 fitted in some MiG-21s; each 13,120 lb st with afterburning. Each intake houses a centerbody shock-cone.
Dimensions: span 42 ft 6 in, length 75 ft 5½ in, height 12 ft 11½ in.
Weight: gross 44,000 lb.
Performance: max speed Mach 1.88 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 infrared or semiactive radar homing heads.

Yakovlev Yak-38 (NATO 'Forger')

The Yak-38 is the only jet combat aircraft that shares the Harrier's V/STOL capability, but it requires three engines, rather than one, to achieve this. Its single large propulsion turbojet exhausts 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 upward and slightly forward. All three engines are used for takeoff, which was always vertical when first observed on board the carrier/cruiser *Kiev* during the ship's maiden voyage through the Mediterranean and North Atlantic in July 1976. More recently, the vertical takeoff technique has been superseded by a STOL type with a short forward run, which can be assumed to offer improved payload/range performance. This has been made practicable by an automatic control system that ensures "that the lift engines are brought into use, and the thrust vectoring rear nozzles rotated, at the optimum point in the takeoff run."

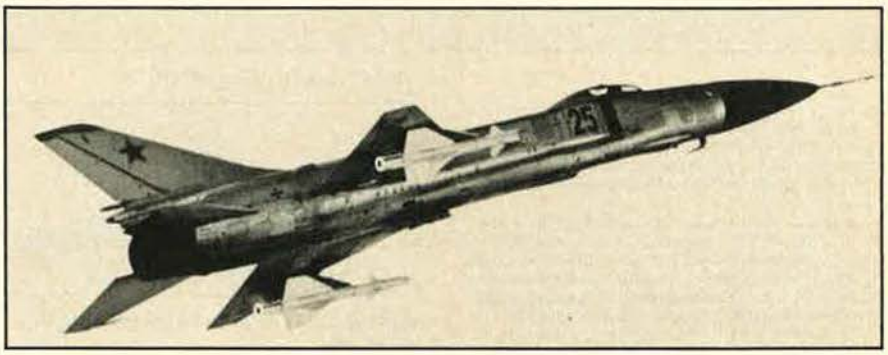
Landing procedure begins with a gradual descent from far astern, with the last 1,300 ft flown essentially level, about 100 ft above the water. The aircraft crosses the ship's stern with about a 6 mph closure rate, 35–45 ft above the flight deck, then flares gently to a hover and descends vertically. Precise landings are ensured by the automatic control system, perhaps in association with laser devices lining each side of the rear deck. Puffer-jets at the wingtips and tail help to give the Yak-38 commendable stability during takeoff and landing.

With small refinements, the Yak-38, known to NATO as 'Forger', has become standard equipment also on the *Kiev's* three sister ships. There are two operational versions:

Forger-A. Basic single-seat combat aircraft. Prototype was completed in 1971 and production began in 1975. Twelve appear to be operational on each Soviet carrier/cruiser, in addition to about 19 Kamov Ka-25 or Ka-27 helicopters. Primary operational roles are assumed to be reconnaissance, strikes against small ships, and fleet defense against shadowing, unarmed maritime reconnaissance aircraft. Production probably totals about 70 aircraft.

Forger-B. Two-seat trainer, of which one is deployed on each carrier/cruiser. Second cockpit forward of normal cockpit, with its ejection seat at lower level, under a continuous canopy. Rear fuselage lengthened to compensate for longer nose. No ranging radar or weapon pylons. Overall length about 58 ft 0 in.

Power Plant: one Lyulka AL-21 turbojet, without afterburner, exhausting through two vectored-thrust nozzles that can turn up to 10° forward of vertical for VTOL; 17,985 lb st. Two Koliesov lift-jets; each 7,875 lb st.
Dimensions: span 24 ft 0 in, length 50 ft 10¼ in, height 14 ft 4 in.
Weights: basic operating (incl pilot) 16,500 lb, gross 25,795 lb.
Performance: max speed Mach 0.95 at height, Mach 0.8 at S/L, service ceiling 39,375 ft, combat radius 115–230 miles.
Accommodation: pilot only.
Armament: four pylons under inner wings for 5,730–7,935 lb of stores, including 'Kerry' short-range air-to-surface missiles, armor-piercing antiship missiles. 'Aphid' air-to-air missiles, gun pods each containing a 23 mm twin-barrel GSh-23 cannon, rocket packs, bombs, and auxiliary fuel tanks.



Sukhoi Su-15 (NATO 'Flagon-F') (Royal Norwegian Air Force)

Tupolev Tu-28P (NATO 'Fiddler') (Royal Norwegian Air Force)

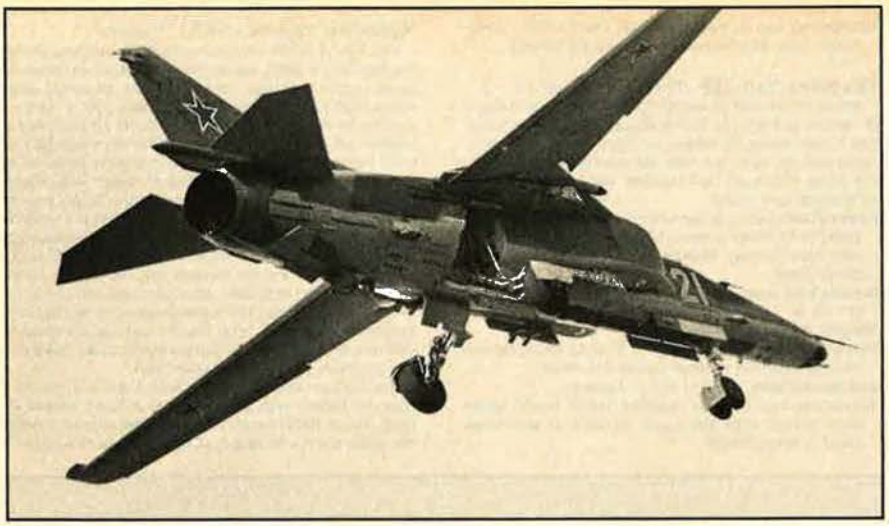
Yakovlev Yak-28P (NATO 'Firebar')

Yakovlev Yak-38 (NATO 'Forger-A')

Attack Aircraft

MiG-27 (NATO 'Flogger')

This single-seat ground attack aircraft has many airframe features in common with the MiG-23, but differs in such important respects that its Soviet designation was



MiG-27 (NATO 'Flogger-D')

changed to MiG-27. It has the same basic power plant as the Soviet Air Force's MIG-23MF, but with a fixed nozzle and fixed engine air intakes, consistent with the primary requirement of transonic speed at low altitude. Two versions are operational in Soviet tactical air force regiments:

Flogger-D. Basic version, with forward portion of fuselage completely redesigned by comparison with interceptor versions of MiG-23. Instead of having an ogival radome, 'Flogger-D' nose is sharply tapered in side elevation, with a small sloping window covering a laser rangefinder and marked target seeker. Additional armor on flat sides of cockpit. Seat and canopy raised to improve view from cockpit. Six-barrel 23 mm Gatling-type underbelly gun replaces GSh-23 of interceptor. Bomb rack under each side of rear fuselage in addition to five pylons for external stores, including tactical nuclear weapons and, probably, the air-to-surface missile known to NATO as 'Kerry'. Provision for external fuel tank for ferry flights under each outer wing, which must be kept fully-forward when tanks are in place. Bullet-shape antenna above each glove pylon.

Flogger-J. Identified in 1981. New nose shape, with lip at top and blister fairing below. Antennae above glove pylons deleted. Wing-root leading-edge extensions on some aircraft. Armament includes two gun pods on underwing pylons, with gun barrels that can be depressed for attacking ground targets.

A total of about 730 'Flogger-Ds' and 'Js' is deployed with Soviet tactical air forces, plus at least one squadron with the East German Air Force. The somewhat similar aircraft known to NATO as 'Flogger-F' and 'H' are MiG-23s. Both have been operated by Soviet units, but are basically export counterparts of the MiG-27, equipped to lower standards. *(Data for 'Flogger-D' follow.)*

Power Plant: generally similar to MiG-23MF, but R-29B engine rated at 25,350 lb st with afterburning.
Dimensions: span as MiG-23, length 52 ft 6 in.
Weights: max external weapon load 8,820 lb, gross 44,313 lb.
Performance: max speed Mach 1.7 at height, Mach 1.1 at S/L, service ceiling 52,500 ft, combat radius (lo-lo-lo, with underbelly tank, four 1,100 lb bombs, and two 'Atoll' missiles) 240 miles, max ferry range (3 external tanks) 1,550 miles.
Armament: described above.

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

This big single-seat ground attack fighter has been seen in action in support of Soviet forces in Afghanistan, and eight other air forces continue to fly Su-7s. However, the number deployed with Soviet regiments has diminished to about 130, in the following versions:

Su-7BM. Compared with the original Su-7B of the late 1950s, this introduced a zero-altitude ejection seat, Sirena tail-warning radar, a second pair of underwing stores pylons, larger blast panels forward of wing-roots, JATO attachments under rear fuselage, twin brake-chutes in a container at base of rudder, and an uprated engine.

Su-7BKL. Introduced low-pressure nosewheel tire, necessitating bulged doors to enclose it when retracted, and small extensible skid outboard of each mainwheel for operation from short, unprepared fields.

Su-7BMK. As Su-7BKL, but with further equipment changes. *(Data for this version follow.)*

Power Plant: one Lyulka AL-7F-1-100 turbojet engine; 21,150 lb st with afterburning. Internal fuel capacity 777 gallons. Provision for two external tanks under belly, combined capacity 317 gallons, and two ferry tanks on inner wing pylons, total capacity 475 gallons. Two JATO rockets can be fitted under rear fuselage to shorten takeoff run.
Dimensions: span 28 ft 9¼ in, length 55 ft 1½ in, height 15 ft 9 in.
Weights: empty 18,360 lb, gross 29,630 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 59,050 ft, combat radius 155–215 miles.
Accommodation: pilot only.
Armament: two 30 mm NR-30 guns in wing roots, each with 70 rounds; underwing pylons for two 1,650 lb and two 1,100 lb bombs, including nuclear weapons, or rocket pods. External weapon load reduced to 2,200 lb when two underbelly fuel tanks are carried.

Sukhoi Su-17 (NATO 'Fitter-C') carrying ECM pod

Sukhoi Su-17, Su-20, and Su-22 (NATO 'Fitter-C, D, E, F, G, H, and J')

The original prototype of this family of aircraft, known to NATO as 'Fitter-B', was simply an Su-7 with about 13 ft of each wing pivoted outboard of a very large fence. By the time the Sukhoi Bureau had introduced also a more powerful engine and improved avionics, the variable-geometry 'Fitter' was in a completely different class from 'Fitter-A'. A doubled external load could be lifted from strips little more than half as long as those needed by the original fixed-wing aircraft; it could then be carried about 30% farther and delivered with greater accuracy. As a result, the fighter was put into series production, and about 1,000 of the 2,350 ground attack aircraft in service with Soviet tactical air forces are now Su-17s. Soviet Naval Aviation has about 65 assigned to the Baltic Fleet for antishipping strike and amphibious support roles and has formed a further Su-17 unit in the Pacific. Variants in Soviet service are as follows:

Su-17 ('Fitter-C'). Basic single-seat attack aircraft for Soviet Air Forces, with Lyulka AL-21F-3 turbojet. Manual wing sweep control. Fuselage diameter constant between wing and tailplane. Curved dorsal fin between tail fin and dorsal spine fairing. Equipment said to include SRD-5M (NATO 'High Fix') I-band centerbody ranging radar, ASP-5ND fire control system, Sirena 3 omnidirectional radar homing and warning system, and SRO-2M IFF. Operational since 1971 in relatively small numbers. Serves also with Soviet Navy.

Su-17M ('Fitter-D'). Generally similar to 'Fitter-C', but forward fuselage lengthened by about 1 ft 3 in. Added undernose electronics pod for terrain avoidance radar. Laser marked target seeker in intake centerbody.

Su-17UM ('Fitter-E'). Tandem two-seat trainer for Soviet Air Force. Generally similar to 'Fitter-D', without electronics pod, but entire fuselage forward of wing drooped slightly to improve view from rear seat. Deepened dorsal spine fairing, almost certainly providing additional fuel tankage. Port wing-root gun deleted.

Su-17 ('Fitter-G'). Two-seat trainer variant of 'Fitter-H', with combat capability. Deepened dorsal spine fairing and drooped front fuselage like 'Fitter-E'. Taller vertical tail surfaces. Shallow ventral fin (removable). Starboard gun only. Laser target seeker fitted.

Su-17 ('Fitter-H'). Improved single-seater for Soviet Air Forces. Basically as 'Fitter-C', but with wide and deep dorsal fairing aft of canopy, like 'Fitter E/G'. Terrain avoidance radar said to be fitted internally in deepened undersurface of nose. Taller fin like 'Fitter-G'. Removable ventral fin. Retains both wing-root guns. Additional pylon for AS-7 (NATO 'Kerry') air-to-surface missile or other external store under wing center-section on each side. About 200 'Fitter-H/K' equipped for tactical reconnaissance duties.

Su-17 ('Fitter-K'). Latest single-seat version for Soviet Air Forces, identified in 1984. Dorsal fin embodies small cooling air intake at front.

It was deduced for some years that certain export versions of the variable-geometry 'Fitter' series had different engines from the Su-17 variants listed above. 'Fitter-C/D/E/G/H/K' operated by the Soviet Air Force and some other air forces have a rear fuselage of basically constant diameter and are powered by a Lyulka turbojet. Versions exported to Angola, Libya, Peru, Syria, Vietnam, and North and South Yemen were seen to have a more bulged rear fuselage, now known to house a Tumansky R-29B turbojet, as fitted in the MiG-27, with rearranged external air ducts and a shorter plain metal shroud terminating the rear fuselage. This change of power plant, together with variations in equipment standard, is covered by the following changes to the Soviet type designation:

Su-20 (Su-17MK, 'Fitter-C'). Generally similar to Soviet Air Force 'Fitter-C', with Lyulka engine, but with reduced equipment standard. Supplied to Algeria, Czechoslovakia, Egypt, Iraq, Poland, and Vietnam.

Su-22 ('Fitter-F'). Export counterpart of 'Fitter-D', with modified undernose electronics pod. Tumansky R-29B turbojet, rated at 25,350 lb st with afterburning, in increased-diameter rear fuselage. Gun in each wing-root. Weapons include 'Atoll' air-to-air missiles. Aircraft supplied to Peru had Sirena 2 limited-coverage radar warning receiver, virtually no navigation aids, and IFF incompatible with that nation's SA-3 (NATO 'Goa') surface-to-air missiles.

Su-22 ('Fitter-G'). Export counterpart of Su-17 'Fitter-G', with R-29B engine.

Su-22 ('Fitter-J'). Generally similar to 'Fitter-H', but with Tumansky engine. Internal fuel capacity 1,656 gallons. More angular dorsal fin. 'Atoll' air-to-air missiles. Supplied to Libya.

There is also a two-seat counterpart of 'Fitter-J' that has no separate NATO reporting name. *(Data for Su-17 'Fitter-C' follow.)*

Power Plant: one Lyulka AL-21F-3 turbojet, rated at 24,700 lb st with afterburning. Internal fuel capacity 1,200 gallons. Up to four 211-gallon drop-tanks under fuselage and wings.
Dimensions: span 45 ft 11¼ in spread, 34 ft 9½ in swept; length 61 ft 6¼ in; height 15 ft 7 in; wing area 431.6 sq ft spread, 400.4 sq ft swept.
Weights: empty 22,046 lb, takeoff clean 30,865 lb, gross 39,020 lb.
Performance: max speed Mach 2.09 at height, Mach 1.05 at sea level, ceiling 59,050 ft, combat radius (lo-lo-lo) 224 miles, (hi-lo-hi) 391 miles.
Accommodation: pilot only.
Armament: two 30 mm NR-30 guns in wing-roots; eight pylons under fuselage and wings for more than 7,000 lb of bombs, including nuclear weapons, rocket pods, and such guided missiles as the air-to-surface AS-7 (NATO 'Kerry').

Sukhoi Su-24 (NATO 'Fencer')

Best interdictor in the Soviet inventory, the Su-24 was the first modern Soviet fighter designed specifically for ground attack and the first to carry a weapon systems officer, in a side-by-side two-seat cockpit. Smaller and lighter than USAF's F-111, its variable-geometry wings have a fully spread sweep of about 16°, fully swept angle of 68°, and intermediate sweep of 45°. The outer panels carry the first pivoting pylons seen on a Soviet vg aircraft. The primary pulse-Doppler radar dish appears to have a diameter of at least 49 in; other equipment is thought to include terrain avoidance radar and a laser rangefinder and marked target seeker. RAF assessment suggests that the Su-24 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. A USAF senior officer has said that it can deliver ordnance within 180 ft of its target in all weathers.

Known to NATO as 'Fencer', the Su-24 entered squadron service in December 1974 as a replacement for the Yak-28 ('Brewer'). More than 500 are now serving with first-line squadrons, including those assigned to strategic missions. Two full regiments have been reported at

Tukums in Latvia, near the Gulf of Riga, and at Chernyakhovsk, near Kaliningrad on the Soviet Baltic coast. Two more are said to be stationed at Starokonstantinov and Gorodok in the Ukraine, and one in the Soviet Far East. First brief deployment beyond the Soviet borders was made to Templin Air Base, north of Berlin in East Germany, in July 1979. Su-24s have been standard equipment of the 16th Air Army in that country since 1982.

Three variants have been identified by NATO reporting names:

Fencer-A. Identifiable by rectangular rear fuselage box enclosing jet nozzles.

Fencer-B. Rear fuselage box around jet nozzles has deeply dished bottom skin between nozzles.

Fencer-C. Introduced in 1981. Important equipment changes. Multiple fitting on nose instead of former simple probe. Triangular fairing forward of each fixed wing-root, on side of air intake, presumably housing equipment of the kind seen on the fuselage sides, forward of the nosewheel doors, of ground attack MiG-23/27 'Floggers'.

Power Plant: two afterburning turbojets; believed to be related to Lyulka AL-21F fitted in Su-17. Internal fuel capacity estimated at 3,435 gallons. Provision for large drop-tank on each glove pylon.

Dimensions: span 56 ft 7 in spread, 32 ft 9½ in swept; length 69 ft 10 in; height 18 ft 0 in.

Weights: empty equipped 41,885 lb, gross 87,080 lb.

Performance: max speed Mach 2.18 at height, Mach 1.2 at S/L, service ceiling 54,135 ft, combat radius (lo-lo-lo) over 200 miles, (hi-lo-hi, with 4,400 lb weapons and two external tanks) 1,115 miles.

Armament: one gun on port side of belly; eight pylons under fuselage, wing-root gloves, and outer wings for 24,250 lb of guided and unguided air-to-surface weapons, including nuclear weapons.

Sukhoi Su-25 (NATO 'Frogfoot')

Nobody is suggesting any longer that experience in Afghanistan has persuaded the Soviet Union to limit production of this counterpart to USAF's single-seat A-10 Thunderbolt II attack aircraft. Su-25s are leaving the Tbilisi airframe plant in numbers adequate to reequip not only Soviet tactical units but those of other Warsaw Pact nations, beginning with Czechoslovakia and Hungary. The aircraft's engines are now confirmed as nonafterburning versions of the Tumansky turbojets fitted in late-model MiG-21s. The first good photographs of the type, published in Czechoslovakia, have revealed details of the split airbrakes at the rear of each wingtip fairing, like those of the Grumman A-6 Intruder, as well as a variety of operational equipment including SRO-2 ('Odd Rods') IFF, Sirena 3 radar warning system, nose-mounted laser rangefinder and marked target seeker, and a flare dispenser in the tailcone. A large-caliber gun is fitted.

This is a type of aircraft that the Soviet forces pioneered with the Ilyushin Il-2 *Shturmovik* of World War II. The pilot is again protected by flat slabs of armor around his cockpit, and big wings support ten weapon pylons for 9,920 lb of ordnance, including chemical weapons. Since 1982, in Afghanistan, the Soviet tactical air forces have been testing techniques for coordinating low-level close support by Su-25s operating in partnership with Mi-24 'Hind' helicopter gunships. With new attack helicopters like the Mi-28 'Havoc' and Kamov 'Hokum' set to join the Mi-24, the upgrading of Soviet tactical airpower clearly continues to enjoy high priority.

Power Plant: two nonafterburning Tumansky R-13-300 turbojets; each 11,240 lb st.

Dimensions: span 50 ft 10 in, length 47 ft 6 in, wing area 404.7 sq ft.

Weights: empty 20,950 lb, gross 39,950–42,330 lb.

Performance: max speed 546 mph, combat radius 345 miles.

Accommodation: pilot only.

Armament: one 30 mm twin-barrel gun on port side of nose. Ten underwing pylons for external stores, including 57 mm and 80 mm rockets, and 1,100 lb incendiary, antipersonnel, and chemical cluster bombs.

Reconnaissance, ECM, and Early Warning Aircraft

New Reconnaissance Aircraft

Among Soviet military aircraft said to have been observed at Ramenskoye flight test center is a high-altitude reconnaissance vehicle in the class of USAF's Lockheed TR-1. It is known at present as Ram-M, a designation which suggests a development status somewhere between the MiG-29 (Ram-L) and the Tupolev bomber known to NATO as 'Blackjack' (Ram-P). No details are yet available, except that it has twin tail fins.

Antonov An-12 (NATO 'Cub-A, B, C, and D')

The large hold of this four-turboprop transport can accommodate a wide variety of equipment for special duties. Four variants may be identified by NATO reporting names:

Cub-A. Electronic intelligence (elint) version. Generally similar to basic 'Cub' transport, but with blade antennae on front fuselage, aft of flight deck, and other changes.

Cub-B. Conversion of 'Cub' transport for elint missions. Examples photographed over international waters by the crews of Norwegian and Swedish combat aircraft each had two additional radomes under the forward- and center-fuselage, plus other antennae. About 10 produced for Soviet Naval Air Force.

Cub-C. ECM variant carrying several tons of electrical generation, distribution, and control gear in the cabin, and palletized jammers for at least five wavebands faired into the belly, plus ECM dispensers. Glazed nose and undernose radar of transport retained. An ogival 'solid' fuselage tailcone, housing electronic equipment, is fitted in place of the usual gun position.

Cub-D. This further variant of the An-12 reflects the huge efforts being made by the Soviet Union to ensure effective handling of every conceivable ECM task. Equipment differs from that of 'Cub-C' to perform different active countermeasures duties. Up to 40 'Cub-C and D' aircraft are believed to serve with the Soviet Air Force and Navy.

In addition to these operational variants, an An-12 has been utilized as a test-bed for advanced avionics housed in a large blister fairing on each side of the fuselage, forward of the landing gear fairings, and in other containers under the front of the loading ramp/door and rear turret.

Antonov An-12 (NATO 'Cub') testbed for advanced avionics

Ilyushin Il-20 (NATO 'Coot-A') (Royal Navy)

Ilyushin Il-20 (NATO 'Coot-A')

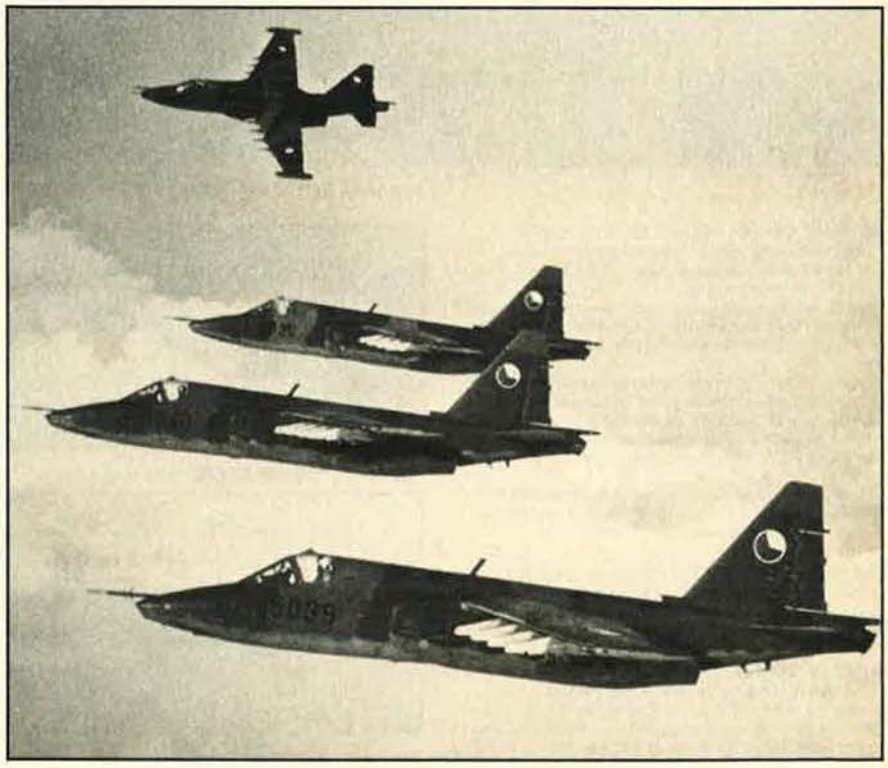
This ECM or electronic intelligence (elint) aircraft appears to be a conversion of the standard Il-18 four-turboprop transport. An under-fuselage container, about 33 ft 7½ in long and 3 ft 9 in deep, is assumed to house side-looking radar. Smaller containers on each side of the forward fuselage each contain a door over a camera or other sensor. About eight antennae and blisters can be counted on the undersurface of the center and rear fuselage, plus two large plates projecting above the forward fuselage.

Ilyushin Il-76 AEW&C Variant (NATO 'Mainstay')

An AEW&C (airborne early warning and control) version of the Il-76 has been under development since the 1970s as a replacement for the Tu-126s operated by the Voyska PVO home defense force and tactical air forces. Known to NATO as 'Mainstay', it is believed to have a conventionally located rotating 'saucer' radome, lengthened fuselage forward of the wings, and flight refueling probe. In the latest edition of *Soviet Military Power*, DoD states that 'Mainstay' will improve substantially Soviet capabilities for early warning and air combat command and control. It provides the Soviet forces with the capability to detect and track aircraft and cruise missiles flying at low altitude over land and water, and could be used to help direct fighter operations over European and Asian battlefields as well as to enhance air surveillance and defense of the USSR. Test and evaluation were continuing in 1985. At least four 'Mainstays' had been produced by then, with others expected to follow at a rate of five a year. They are intended to operate primarily with the Voyska PVO's new-generation MiG-29, MiG-31, and Sukhoi Su-27 counterair fighters.

MiG-21 (NATO 'Fishbed-H')

Two versions of this single-seat fighter are operated by the Soviet Air Forces and their allies as specialized tactical reconnaissance aircraft:



Sukhoi Su-25 (NATO 'Frogfoot') (copied from Letectvi + Kosmonautika)

MIG-21R ('Fishbed-H'). Basically similar to MiG-21PFMA, but with a pod housing forward-facing or oblique cameras, infrared sensors, or ECM devices, and fuel, carried on the fuselage centerline pylon. Suppressed ECM 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 50 'Fishbed-Hs' of both models estimated in service with Soviet tactical air forces.

MiG-25 (NATO 'Foxbat-B and D')

Although generally similar to the basic MiG-25 interceptor, the reconnaissance variants have a modified wing and, carrying no external weapons, are not limited to Mach 2.8. Two versions have been identified in service, as follows:

MiG-25R ('Foxbat-B'). Basic reconnaissance version, with five camera windows and various flush dielectric panels aft of very small dielectric nosecap for radar. Equipment believed to include Doppler navigation system and side-looking airborne radar (SLAR). No armament. Slightly reduced span. Wing leading-edge sweep constant from root to tip. Total of about 170 'Foxbat-Bs and Ds' estimated in service with Soviet tactical air forces. 'Foxbat-B' also operational in Algeria, Libya, Syria, and with No. 106 Squadron of the Indian Air Force.

MiG-25R ('Foxbat-D'). Similar to 'Foxbat-B', but with larger SLAR dielectric panel, farther aft on side of nose, and no cameras. Supplied also to Libya.

Dimension: span 44 ft 0 in.

Weights ('Foxbat-B'): basic operating 43,200 lb, gross 73,635 lb.

Performance: max speed Mach 3.2 at height, service ceiling 88,580 ft, operational radius 560 miles.

Mil Mi-8 (NATO 'Hip-D, G, J, and K')

Versions of this medium-size helicopter adapted for various electronic duties have been allocated the following NATO reporting names:

Hip-D. For airborne communications role. Generally similar to 'Hip-C' transport, but with canisters of rectangular section on outer stores racks, and added antennae.

Hip-G. Airborne communications version. Rearward inclined antennae projecting from rear of cabin and from undersurface of tailboom, aft of box for Doppler radar.

Hip-J. Additional small boxes on sides of fuselage, fore and aft of main landing gear legs, identify this ECM version.

Hip-K. Communications jamming ECM version with large antenna array on each side of cabin. No Doppler radar box under tailboom.

Sukhoi Su-17 (NATO 'Fitter-H and K')

About 200 of the Su-17 ('Fitter-H/K') fighters serving with Soviet tactical air force units are thought to be equipped for reconnaissance duties.

Tupolev Tu-126 (NATO 'Moss')

The Tu-126 is the Voyska PVO's counterpart to USAF's Boeing E-3 AWACS (Airborne Warning and Control System). About nine are operational, with airframe and power plant based on those of the now-retired Tu-114 turboprop airliner rather than 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-3; however, the Tu-126 is believed 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. Internal fuel capacity 20,075 gallons. In-flight refueling 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 refueling 7,800 miles.

Accommodation: crew of twelve.

Armament: none.

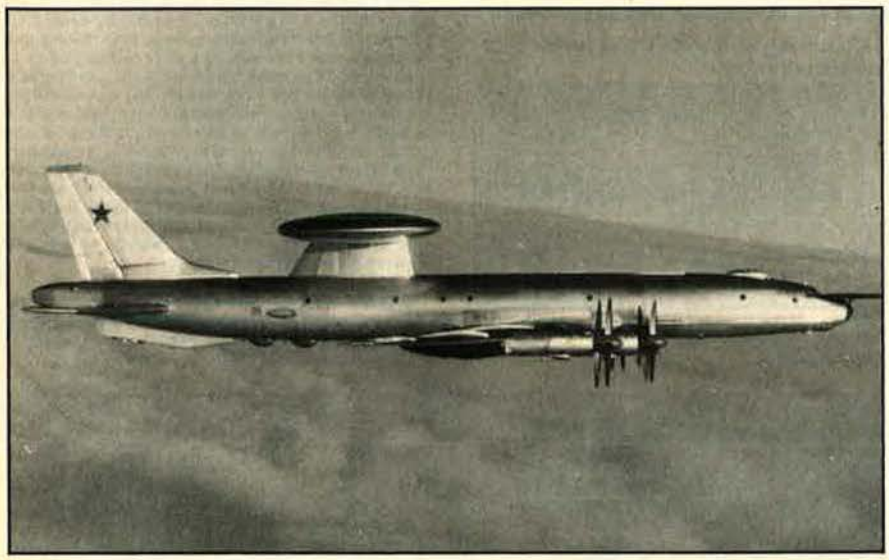
Yakovlev Yak-28 (NATO 'Brewer')

Versions of this two-seat tactical aircraft still operational in support roles are as follows:

Brewer-D. Reconnaissance aircraft, carrying cameras or other sensors, including side-looking airborne radar, instead of weapons in its internal bomb-bay. Blister radome under fuselage forward of wings. About 150 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 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 30 estimated in service.

Dimensions, weight, and **performance** should be in the same order as those of the Yak-28P ('Firebar') interceptor (which see).



Tupolev Tu-126 (NATO 'Moss')

Yakovlev Yak-28 (NATO 'Brewer')

Antonov An-26 of Czechoslovak Air Force

Transports

Antonov An-12BP (NATO 'Cub')

More than 220 of the total of almost 600 medium- and long-range transports operated by the Soviet Military Transport Aviation force (VTA) are still An-12BPs. They are outnumbered by Il-76s, which have been replacing them at the rate of 30 a year since the 1970s, but the totals quoted are misleading. VTA also has about 55 large An-22s. The impressive An-124 will enter service this year, and the assets of VTA can be boosted at any time by drawing on the 200 An-12s and Il-76s belonging nominally to the national airline Aeroflot, as well as the 1,250 smaller military transports assigned to air commands and 1,200 medium- and long-range passenger airliners in the Aeroflot fleet.

The An-12BP has served as a standard Soviet paratroop and freight transport since 1959. Its usefulness is limited slightly by lack of an integral rear loading ramp/door. Instead, the bottom of the rear fuselage is made up of two longitudinal doors that hinge upward inside the cabin to permit direct loading from trucks on the ground or airdropping of supplies and equipment. A full load of 60 paratroops can be dispatched via this exit in under one minute.

An-12s serve with nine other air forces and are in production in China under the designation Y-8 for both transport and maritime patrol duties. The Soviet 'Cub-A, B, C, and D' elint and ECM versions are described separately.

Power Plant: four Ivchenko AI-20K turboprop engines; each 4,000 ehp. Normal fuel capacity 3,672 gallons; max capacity 4,781 gallons.

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, 90 troops or 60 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')

Pending delivery of the new An-124 'Condor', the An-22 remains the only Soviet transport aircraft capable of lifting the Soviet Army's battle tanks and theater missile systems. The prototype flew for the first time on February 27, 1965. Production was terminated sooner than expected, in 1974, and only 55 An-22s are now available to VTA. Each has a max payload of 176,350 lb.

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 traveling gantries and two winches to speed freight handling.

Armament: none.

Antonov An-26 (NATO 'Curl')

The An-26 twin-turboprop freighter was the first aircraft to embody Oleg Antonov's unique 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. An OPB-1R sight is available to ensure pinpoint delivery into the dropzone. Max payload is 12,125 lb; conversion of the standard freighter to carry troops or litters takes 20 to 30 minutes in the field. In addition to military models assigned to air commands in regiments and squadrons, more than 200 Aeroflot An-26s are available to the Soviet Military Transport force; others are flown by about 27 foreign air forces. Some operated by Angola and Mozambique have a rack on each side of the fuselage below the wing for bombing missions.

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 for turboprop starting and to provide additional power for takeoff, climb, and cruising flight, as required.

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 dispatcher. Electrically-powered mobile hoist, capacity 4,409 lb, and conveyor to facilitate loading and airdropping. Provision for carrying 40 paratroops or 24 litters. Improved An-26B version has rollgangs and mechanical handling system, enabling

two men to load and unload three 8 ft long standard freight pallets in 30 minutes.
Armament: none on Soviet Air Force An-26s.

Antonov An-32 (NATO 'Cline')

The Indian Air Force has begun reequipping its paratroop training school and five transport squadrons with this specialized 'hot and high' short/medium-range transport, for which there may not be a Soviet Air Force requirement. The basic airframe is similar to that of the An-26, except for having triple-slotted trailing-edge flaps, automatic leading-edge slats, much enlarged ventral fins, and a full-span slotted tailplane. When fitted with two 5,180 ehp Ivchenko AI-20DM turboprops, 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 14,770 lb.

Alternatively, the An-32 can be fitted with 4,195 ehp AI-20M engines for operation in moderate climatic conditions. *(Data for version with AI-20DM engines.)*
Dimensions: span 95 ft 9½ in, length 77 ft 8¼ in, height 28 ft 8½ in.
Weight: gross 59,525 lb.
Performance: normal cruising speed 329 mph, service ceiling 29,525 ft, range with max payload 497 miles, with max fuel 1,367 miles.
Accommodation: crew of five; freight, or 39 troops, 30 paratroops, or 24 litters and a medical attendant.
Armament: none.

Antonov An-72 (NATO 'Coaler')

The An-72 was conceived as 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 foreign object ingestion. Their efflux is ejected over the wing upper surface and then down over large multislotted flaps to provide a considerable increase in lift for short-field operation, using the so-called 'Coanda effect'. The first prototype flew on December 22, 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; standard features include a completely automatic Doppler-based navigation system and a special 'slide-forward' loading ramp of the kind fitted to the An-26.

An An-72 set 17 height, time to height, and payload to height records in November/December 1983. Its current production status is not known, although the An-74 (which see) appears to be a production development.
Power Plant: two Lotarev D-36 high bypass ratio turbofan engines; each 14,330 lb st.
Dimensions: span 84 ft 9 in, length 87 ft 2¼ in, height 27 ft 0¼ in.
Weights: max payload 22,045 lb, gross weight 72,750 lb.
Performance: max cruising speed 447 mph, service ceiling 36,100 ft, range 2,360 miles with max fuel, or 620 miles with max payload.
Accommodation: crew of two or three on flight deck. Folding seats for 32 passengers along walls of freight hold. Provision for carrying 24 casualties and attendant in ambulance role.
Armament: none.

Antonov An-74

In February 1984, the Soviet newspaper *Pravda* referred to a new transport aircraft, designated An-74, which had been built for operation in the Arctic and Antarctic regions. Unlike the Il-18D turboprop transports used currently to carry men and equipment between Leningrad and the Antarctic base of Molodejnaya, the An-74 has a wheel-ski landing gear for operation on snow and ice landing strips. It appears to be a development of the An-72 (which may also be designated An-74 in standard production forms), as *Pravda* described it as a STOL transport powered by two Lotarev D-36 engines of 14,330 lb st, with a max T-O weight of about 66,140 lb and max payload of 16,535 lb.

The An-74 is an all-weather aircraft, equipped with the latest available radio navigation aids, and with de-icing equipment on the wings, tail unit, and engine air intakes. In the Polar regions, its duties will include assistance in setting up scientific stations on Arctic ice floes, airdropping supplies to motorized trans-Antarctic expeditions, and reconnaissance to observe changes in the icefields.

Antonov An-124 (NATO 'Condor')

An An-124, named *Ruslan* after the giant hero of Russian folklore immortalized by Pushkin, was the undoubted star of the 1985 Paris Air Show. Never before exhibited in public, it was confirmed as the largest aircraft currently flying, in terms of wingspan, with the heaviest max takeoff weight of any aeroplane yet built. For once, NATO was seen to have chosen well the reporting name 'Condor', after the world's largest flying bird.

The example shown in Paris was one of three An-124s flown by mid-1985. First flight of the original prototype had been made on December 26, 1982; production was said to be well advanced, with initial operational capability scheduled for the summer of this year. Except for having a low-mounted tailplane, the An-124's general configuration is similar to that of its US counterpart, the Lockheed C-5 Galaxy. It has an upward hinged visor-type nose and rear fuselage ramp-door for simultaneous front and rear loading/unloading. Advanced features include a 100 percent fly-by-wire control system, titanium floor throughout the main hold, and 12,125 lb of composites, making up 16,150 sq ft of its surface area and giving a weight saving of 3,968 lb. The 24-wheel landing gear enables the An-124 to operate from unprepared fields, hard packed snow, and ice-covered swampland. Payloads will range from the largest Soviet battle tanks to complete SS-20 nuclear missile systems, Siberian oil well equipment, and earth movers.

Of particular significance is that the Soviet Union has available at last turbofan engines comparable with those fitted in the latest Western transport aircraft. They enabled an An-124 to set 21 official records by lifting a payload of 377,473 lb to a height of 35,269 ft on July 26, 1985, exceeding by 53 percent the previous record set by a C-5A.
Power Plant: four Lotarev D-18T turbofans; each 51,650 lb st.
Dimensions: span 240 ft 5¾ in, length 228 ft 0¼ in, height 72 ft 2¼ in.

Antonov An-72 (NATO 'Coaler')

Antonov An-32 in production form, with extended overwing nacelles

Antonov An-124 (NATO 'Condor')

Weights: nominal max payload 330,693 lb, gross 892,872 lb.
Performance: max cruising speed 537 mph, range 2,795 miles with max payload, 10,250 miles with max fuel.
Accommodation: crew of six, plus reserve crew; up to 88 passengers on upper deck; freight on lower deck, positioned by two electric traveling cranes with total lifting capability of 44,100 lb.
Armament: none on aircraft shown in Paris.

Ilyushin Il-76 (NATO 'Candid-B')

This Soviet counterpart to USAF's C-141 StarLifter now equips 50 percent of the Soviet VTA transport force and will continue replacing An-12BPs at the rate of about 30 a year. Its designers were given the task of producing an aircraft that would haul 40 metric tons of freight over a distance of 3,100 miles (5,000 km) in under six hours in the harsh operating conditions of Siberia. The prototype flew for the first time on March 25, 1971. By July 1975, Il-76s were able to set 25 official records, including a payload of more than 70 metric tons 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.

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 pressurized, making it possible to carry 140 troops or 125 paratroops as an alternative to freight. Advanced mechanical handling systems are fitted for containerized and other freight. Equipment for all-weather operation includes a computer for automatic flight control and automatic landing approach.

The unarmed Il-76/76T/76TD versions are known to NATO as 'Candid-A'. Deliveries to a development squadron of military Il-76Ms ('Candid-B'), with rear guns and small ECM fairings, began in 1974. Current operators include the air forces of India, Iraq, Czechoslovakia, and Poland, as well as the VTA, which can also draw on the Il-76Ts and Ms of Aeroflot as necessary. A developed version of the Il-76 is entering service with the Soviet Air Forces in an AEW&C role (see entry on 'Mainstay') and will be joined by Il-76 in-flight refueling tankers deployed in support of both strategic and tactical combat forces.

The following data refer to the basic military Il-76M. Also in service is an improved version, designated Il-76MD, with an increased gross weight of 418,875 lb, max payload of 105,820 lb, and additional fuel to extend max range by 745 miles.
Power Plant: four Soloviev D-30KP turbofan engines, each 26,455 lb st. Fuel capacity 21,615 gallons.
Dimensions: span 165 ft 8 in, length 152 ft 10¼ 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 payload of 88,185 lb, max range 4,163 miles.
Accommodation: crew of seven, incl two freight handlers; up to 140 passengers.
Armament: two 23 mm NR-23 guns in tail turret.

Trainers

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 standardized 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, began in 1974, but L-29s remain in large-scale service in the Soviet Union.
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 supplement and eventually replace the L-29 as the standard trainer of the Soviet and other air forces. Well over 1,500 have been delivered, and production will continue through the 1980s at a rate of 200 a year. There are five versions:

L-39C. Basic and advanced flying trainer; operators include the air forces of Afghanistan, Czechoslovakia, the German Democratic Republic, and the USSR. Production continues.

L-39V. As basic L-39C, but with added winch for target towing for antiaircraft artillery training.

L-39Z0. Weapon training version, with four underwing weapon stations. Strengthened wings. Exported to Iraq, Libya, and Syria. Production continues.

L-39ZA. Ground attack and reconnaissance version, with underfuselage gun and underwing weapon stations. Strengthened wings and landing gear. Operational with air forces of Czechoslovakia and Romania. Production continues.

L-39MS. New version with improved airframe and upgraded avionics and equipment, including electronic displays. Prototype flying in 1985, initially with standard engine. New power plant (approx 5,300 lb st), available in 1987, will enhance performance, notably rate of climb.

Power Plant (current production versions): one Ivchenko AI-25-TL turbofan engine; 3,792 lb st. Internal fuel capacity 332 gallons. Provision for two 92.5 gallon underwing drop tanks.
Dimensions: span 31 ft 0½ in, length 39 ft 9½ in, height 15 ft 7¾ in, wing area 202.36 sq ft.
Weights (L-39ZA): empty 8,060 lb, gross (clean) 10,029 lb, max 12,346 lb.
Performance (L-39ZA): max speed 469 mph at 16,400 ft, service ceiling 36,100 ft, range 621 miles on internal fuel.
Accommodation: crew of two, in tandem.
Armament (L-39ZA): underwing bombs, rockets, air-to-air missiles, or reconnaissance packs, on four hardpoints, and a 23 mm GSh-23 twin-barrel cannon in an underfuselage pod.

MiG-15UTI (NATO 'Midget')

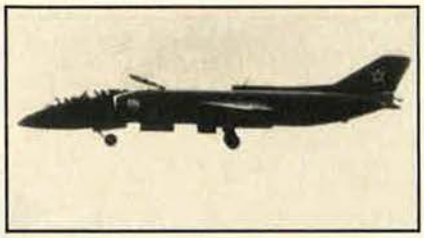
After completing their basic and initial advanced training on the L-29 or L-39, pupil pilots of the Soviet Air Force graduate to this tandem two-seat version of the MiG-15 jet fighter. The airframe differs from that of the original single-seater mainly in having a rear cockpit for an instructor in place 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 listed after this entry.
Power Plant: one RD-45F turbojet engine; 5,000 lb st.
Dimensions: span 33 ft 0⅞ in, length 33 ft 1½ in, height 12 ft 1⅝ in.
Weights: empty 7,716 lb, gross (clean) 10,692 lb.
Performance: max speed 631 mph at sea level, range 590 miles (clean) or 833 miles (with two underwing tanks) at 32,800 ft.
Accommodation: crew of two, in tandem.
Armament: normally one 23 mm NR-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 mainwheels and tires, a one-piece forward airbrake, and repositioned pitot boom, above the air intake. It carries no guns. Later production models ('Mongol-B') have 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.

Aero L-39ZA of Czechoslovak Air Force

MiG-23U (NATO 'Flogger-C') (Camera Press)



Yakovlev Yak-38 trainer (NATO 'Forger-B')

MiG-23U (NATO 'Flogger-C')

(See page 85.)

MiG-25U (NATO 'Foxbat-C')

(See page 86.)

Sukhoi Su-7U (NATO 'Moujik')

The Soviet and several 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 forward fuselage fuel tank is deleted and the fuselage lengthened slightly, to make room for the second ejection seat, the occupant of which has a periscopic sight for improved forward view. The aft cockpit is fitted with a slightly-raised canopy, from which a prominent dorsal spine extends back to the base of the tail-fin. Versions in service are the **Su-7UM** and **Su-7UMK,** corresponding to the single-seat 'M' and 'MK' respectively.

Sukhoi Su-15 trainer (NATO 'Flagon-C')

(See page 87.)

Sukhoi Su-17 trainer (NATO 'Fitter-E and G')

(See page 88.)

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

(See page 84.)

Yakovlev Yak-18 (NATO 'Max')

The prototype of this primary trainer first flew in 1946. About 8,000 were built subsequently, for use mainly at the civilian or paramilitary schools at which pilots of the Warsaw Pact air forces receive their primary training, including the Soviet DOSAAF centers. 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. Replacement with Yak-52s is well advanced. *(Data for Yak-18A follow.)*
Power Plant: one Ivchenko AI-14RF piston engine; 300 hp.
Dimensions: span 34 ft 9¼ in, length 27 ft 4¾ in, height 11 ft 0 in, wing area 191.6 sq ft.
Weights: empty 2,259 lb, gross 2,910 lb.
Performance: max speed 186 mph, service ceiling 16,600 ft, max range 435 miles.
Armament: none.

Yakovlev Yak-28U (NATO 'Maestro')

Although the operational Yak-28P ('Firebar') is a tandem two-seater, it was not possible to adapt the existing rear cockpit in order to produce a dual-control training version. Instead, the Yakovlev Bureau had to design a completely new front fuselage for the Yak-28U. This has two individual single-seat cockpits in tandem, each with its own blister canopy. The front canopy is sideways hinged, to starboard. The higher rear canopy is rearward-sliding. A very large conical probe projects forward of the nosecone.

Yakovlev Yak-38 trainer (NATO 'Forger-B')

(See page 87.)

Yakovlev Yak-50

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 more powerful engine, a reduced span with no wing center-section, and a semi-monocoque rear fuselage instead of the Yak-18's fabric-covered steel tube structure.
Power Plant: one Vedeneyev M-14P piston engine; 360 hp. Fuel capacity 14.5 gallons.
Dimensions: span 31 ft 2 in, length 25 ft 2¼ in.
Weights: empty 1,686 lb, gross 1,984 lb.
Performance: max speed 199 mph, service ceiling 18,045 ft, max range 307 miles.
Armament: none.

Yakovlev Yak-52

Announced in 1978, the Yak-52 is a tandem two-seat variant of the Yak-50, with generally similar overall dimensions but with a tricycle landing gear that leaves all three wheels fully exposed when retracted to reduce damage in a wheels-up landing. Large-scale production has been centered at the Intreprinderea de Avioane Bacau works, in Romania, to provide replacements for the old Yak-18s of DOSAAF and other training organizations. The 500th Yak-52 was delivered in 1983, and production continues.
Power Plant: one Vedeneyev M-14P piston engine; 360 hp. Fuel capacity 32 gallons.
Dimensions: span 30 ft 6¼ in, length 25 ft 5 in, height 8 ft 10¼ in, wing area 161.5 sq ft.
Weights: empty 2,205 lb, gross 2,844 lb.
Performance: max speed at 1,650 ft 186 mph, econ cruising speed 118 mph, service ceiling 19,685 ft, max range 341 miles.
Armament: none.

Yakovlev Yak-53

This fully-aerobatic single-seater is identical dimensionally to the Yak-50, and has the same power plant, but utilizes the semiretractable tricycle landing gear of the Yak-52. After a period of initial manufacture in the Progress Factory at Arsenyev in the USSR, production is expected to be transferred to Bacau, alongside the Yak-52. The Yak-53 is intended as a 'long life' trainer, whereas the Yak-50 is a maximum performance high-*g* aircraft supplied exclusively to State Cooperatives.
Weights: empty 1,985 lb, gross 2,337 lb.
Performance: max speed 186 mph, cruising speed 143 mph, max endurance 50 min.

Helicopters

Kamov Ka-25 (NATO 'Hormone')

It has been emphasized for years in these Soviet Galleries that the apparent lack of sophistication of the Ka-25 should not be allowed to camouflage the ingenuity of its designers. By adopting a compact twin-turbine/coaxial-rotor configuration for this helicopter, the Kamov Bureau was able to package extensive equipment permutations into aircraft small enough to operate from platforms on a wide variety of naval and merchant ships. About 460 Ka-25s were built in 1966–75, primarily to replace Mil Mi-4s in the Soviet Navy's ship- and shore-based force of around 250 ASW helicopters. Replacement with the similarly compact but vastly more effective

27 is under way, with perhaps 125 Ka-25s remaining in viet Navy service and others operational in India, Syr-, Vietnam, and Yugoslavia. Meanwhile, the same basic configuration has made possible Kamov's pioneering combat helicopter, known to NATO as 'Hokum'.

Versions of the Ka-25 that can be identified by NATO reporting names are as follows:

Hormone-A. Basic ship-based ASW version, with large flat-bottomed housing for undernose search radar, and racks for small stores, including canisters of sonobuoys, on the starboard side of the fuselage. Other equipment varies from one aircraft to another. Some have an underfuselage weapon bay, which can be extended downward as a container for wire-guided torpedoes. Most have an electro-optical sensor in the tailboom, under a 'flower pot' housing with a transparent top, and over a corresponding window in the undersurface of the boom. Each of the four wheels of the landing gear can be 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 the Ka-25 is unable to operate with this at night or in adverse weather. Ka-25s have been observed on cruisers of the *Kara* and *Kresta* classes, the nuclear-powered guided missile cruiser *Kirov*, the carrier/cruisers of the *Kiev* class, each of which can carry about 19 'Hormone-As and Bs', and the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 18 aircraft.

Hormone-B. Special electronics variant able to provide over-the-horizon target acquisition and midcourse guidance for SS-N-3, SS-N-12, and SS-N-19 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.

Hormone-C. Utility and search and rescue model, generally similar to 'Hormone-A' but with inessential operational equipment and weapons removed. This version sometimes has a yagi aerial mounted on the nose; it has been photographed in nonoperational red and white paint finish. *(Data for 'Hormone-A' follow.)*

Power Plant: two Glushenkov GTD-3F turboshaft engines; each 900 shp (later aircraft have 990 shp GTD-3BMs).
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 136 mph, service ceiling 11,500 ft, range 250–405 miles.
Accommodation: crew of two on flight deck; other crew 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. Some aircraft reportedly armed with small 'fire and forget' air-to-surface missiles.

Kamov Ka-27 (NATO 'Helix')

The first edition of DoD's *Soviet Military Power* document, published in September 1981, contained a brief reference to "Hormone variant" helicopters that could be carried in a telescoping hangar on the *Sovremennyy* class of Soviet guided missile destroyers for secondary ASW missions. Photographs were released after two of them had been observed on the stern platform of the *Udaloy*, first of a new class of Soviet ASW guided missile destroyers, during the *Zapad-81* (West-81) series of exercises in the Baltic. Soon afterwards, NATO gave the new helicopters the reporting name 'Helix', and DoD began referring to them by the designation Ka-27. At least 16 were observed on board the *Kiev* class carrier/cruiser *Novorossiysk* during its maiden deployment in 1983, leaving little doubt that the Soviet Navy was eager to replace its Ka-25s with Ka-27s as quickly as possible. By that time, it was apparent that the Ka-27 and the new Kamov civilian helicopter known as the Ka-32 shared the same airframe. When, therefore, an example of the Ka-32 was exhibited at the 1985 Paris Air Show, it became possible to appreciate the high quality of contemporary Kamov engineering.

According to its designer, the Ka-27 was conceived as a completely autonomous "compact truck", able to stow in much the same space as the Ka-25 with its rotors folded, despite its much greater power and capability, and able to operate independently of ground support equipment. Titanium and composite materials are used extensively throughout the airframe, with special emphasis on resistance to corrosion at sea. The twin turboshaft engines are similar to those used in the Mi-24 'Hind' gunship, enabling flight to be maintained on one engine at max takeoff weight. Ease of handling, with a single pilot, is ensured by such features as a 'mix' in the collective control system that maintains constant total rotor thrust during turns to reduce the pilot's work load when landing on a pitching deck and to simplify transition into hover and landing. The autopilot is capable of providing automatic approach and hover on a preselected course, using Doppler.

Three versions of the military Ka-27 may be identified:

Helix-A. Basic ASW version, with probable crew of three. Equipment includes undernose radar, a ventral weapons bay for torpedoes and other stores, sonobuoys, IFF, two radar warning antennae above the tailplane, two ESM radomes above the rear fuselage and tail. About 50 operational. Eighteen ordered for Indian Navy.

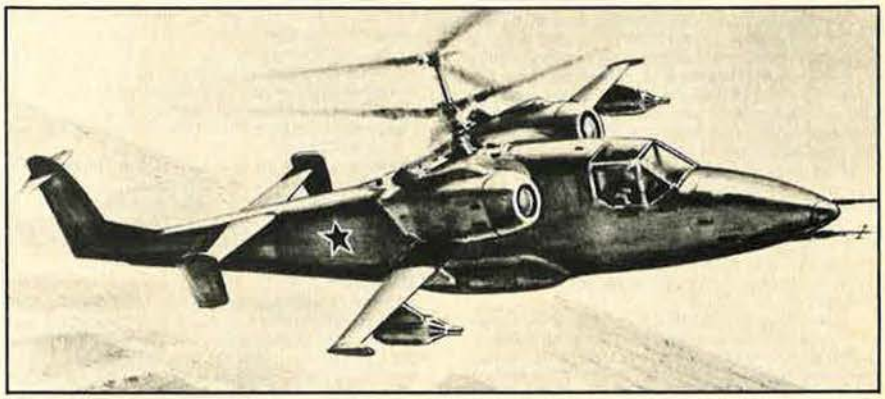
Helix-B. Missile target acquisition and midcourse guidance version to replace 'Hormone-B'. Different undernose radome.

Helix-C. Search and rescue and plane guard version. External fuel tank on each side of cabin and winch beside cabin door. Variants of this could provide an answer to the Soviet Navy's long-time need for an infantry assault and vertical replenishment shipboard helicopter.

Power Plant: two Isotov TV3-117V turboshaft engines; each 2,225 shp.
Dimensions: rotor diameter 52 ft 2 in, length of fuselage 37 ft 1 in, height 17 ft 8½ in.
Weights: max payload 8,818 lb internal, 11,023 lb slung; normal gross 24,250 lb, with slung load 27,775 lb.
Performance: max speed 155 mph, service ceiling 19,685 ft, range 497 miles.
Accommodation: flight crew of two, with seat for third person; folding seats for 16 passengers as alternative to mission equipment, litters, or freight.
Armament: not yet determined.

Kamov Ka-25 (NATO 'Hormone-A') (US Navy)

Kamov Ka-27 (NATO 'Helix-A') (Royal Navy)



Kamov Ka-? (NATO 'Hokum') (Herkenning, Netherlands)

Kamov Ka-? (NATO 'Hokum')

An accompanying illustration is believed to be representative of Kamov's 'Hokum', first of the long awaited new generation of combat helicopters suitable for air-to-air as well as air-to-ground missions. All that is known with reasonable confidence is that 'Hokum' has coaxial contra-rotating rotors, a take-off weight in the 12,000 lb class, and probable two-man crew, side by side. Survivability is enhanced by the use of infrared suppressors, infrared decoy dispensers, and armor. 'Hokum' has no current Western counterpart, and DoD has commented that it "will give the Soviets a significant rotary-wing air superiority capability". Flight testing has already been under way for two years.

Dimensions: rotor diameter 59 ft 8 in, length 52 ft 6 in, height 17 ft 8 in.
Performance: max speed 217 mph, combat radius 155 miles.

Mil (WSK-PZL Swidnik) Mi-2 (NATO 'Hoplite')

Manufacture of this smallest helicopter in the current Mil range was transferred to the WSK-PZL at Swidnik in Poland in 1964. More than 4,500 have been delivered for military and commercial service, with the air forces of Cuba, Czechoslovakia, Poland, Romania, and the Soviet Union among known operators. The USSR has received well over 2,000, and production is continuing.

Power Plant: two Polish-built Isotov GTD-350 turboshaft engines; each 400 shp.
Dimensions: rotor diameter 47 ft 6¾ in, length of fuselage 37 ft 4¾ in, height 12 ft 3½ in.
Weights: basic operating 5,213 lb, gross 8,157 lb.
Performance: max speed 130 mph at 1,640 ft, service ceiling 13,125 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' 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 currently with the air forces of Algeria, Iraq, Peru, the Soviet Union, Syria, and Vietnam. Task of these helicopters is to haul guns, armor, vehicles, supplies, freight, or 70 fully equipped troops in combat areas.

Power Plant: two Soloviev D-25V turboshaft engines; each 5,500 shp.
Dimensions: rotor diameter 114 ft 10 in, length of fuselage 108 ft 10½ in, height 32 ft 4 in.
Weights: empty 60,055 lb, gross 93,700 lb.
Performance: max speed 186 mph, service ceiling 14,750 ft, range 385 miles with 17,637 lb payload.
Accommodation: crew of five; up to 90 passengers, 26,450 lb of freight, or 41 litters and two medical attendants.
Armament: some aircraft have a 12.7 mm gun in the nose.

Mil Mi-8 (NATO 'Hip')

Production of the Mi-8, for military and commercial use, totaled 8,100 before this helicopter was superseded by the uprated Mi-17 (see separate entry). An estimated total of 1,615 support Soviet armies in the field. Teamed with Mi-24 gunships, these aircraft make up the most formidable helicopter attack force in the world. At Soviet army level alone, according to DoD estimates, there are now some 20 helicopter attack regiments, each with up to 60 Mi-8s and Mi-24s. At division level, helicopter detachments are expanding to squadrons. Primary combat task of the Mi-8, for which the crews are well trained, is to put down assault troops, equipment, and supplies behind enemy lines within 15–20 minutes of a nuclear or conventional bombardment/strike. Versions serving with about 40 air forces are as follows:

Hip-C. Basic assault transport. Twin-rack for stores on each side of cabin, able to carry 128 × 57 mm rockets in four packs, or other weapons.

Hip-D. For electronic warfare duties; see page 90.

Hip-E. Standard equipment of Soviet army support 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 antitank missiles on rails above racks.

Hip-F. Export counterpart of 'Hip-E'. Missile armament changed to six 'Saggers'.

Hip-G. For airborne communications duties; see page 90.

Hip-H. See entry on Mi-17.

Hip-J and K. ECM versions; see page 90.

Power Plant: two Isotov TV2-117A turboshaft engines; each 1,700 shp. Standard fuel capacity 494 gallons, max ferry capacity 977 gallons.

Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 59 ft 7¼ in, height 18 ft 6½ in.

Weights: empty 16,007 lb, gross 26,455 lb.

Performance: max speed 161 mph at 3,280 ft, service ceiling 14,760 ft, range 311 miles as passenger transport.

Accommodation: crew of two or three; up to 32 passengers, 8,820 lb of freight, or 12 litters and attendant.

Armament: see individual model descriptions.

Mil Mi-14 (V-14) (NATO 'Haze')

Comparison of photographs of this aircraft and the Mi-8 transport helicopter shows that the Mi-14 has shorter engine nacelles, with the intakes positioned above the mid-point of the sliding cabin door. Such nacelles, found also on the Mi-24 'Hind' and Mi-17, house TV3-117 turboshaft engines in place of the lower-rated TV2s of the Mi-8. Overall dimensions and dynamic components of the Mi-14 are generally similar to those of the Mi-8, from which it was derived, except that the tail rotor is on the port side of the vertical stabilizer. New features to suit it for its role as a shore-based antisubmarine aircraft include a boat hull of the kind used on the Sikorsky Sea King and a sponson on each side at the rear to confer a degree of amphibious capability. The landing gear is fully retractable. Operational equipment can be seen to include a large undernose radome, a retractable sonar unit housed in the starboard rear of the planing bottom, forward of what appear to be two sonobuoy or signal flare chutes, a towed magnetic anomaly detection (MAD) 'bird' stowed against the rear of the fuselage pod, and a Doppler radar box under the tailboom. Weapons include torpedoes and depth charges carried in a weapons-bay in the bottom of the hull.

The Mi-14 flew for the first time in 1973. About 100 are currently in service with the Soviet Naval Air Force for antisubmarine duties, as Mi-4 replacements, and are designated **Haze-A** by NATO. Ten others (NATO **Haze-B**) are in service for mine countermeasures duty, with a fuselage strake and pod on the starboard side of the cabin, and no MAD. Three Mi-14s have been exported to Bulgaria, four to Cuba, twelve to Libya, at least four to Poland, six to Romania, and eight to East Germany. Production continues.

Power Plant: two Isotov TV3-117 turboshaft engines; each 2,200 shp.

Dimensions: rotor diameter 69 ft 10¼ in, length overall incl rotors 83 ft 0 in, height 22 ft 7¾ in.

Weight: gross 30,865 lb.

Performance: max speed 143 mph, range 497 miles.

Accommodation: crew of four or five in 'Haze-A'.

Mil Mi-14 (NATO 'Haze-A') (US Navy)

Mil Mi-24 (NATO 'Hind-D') of Czechoslovak Air Force

Mil Mi-24 (NATO 'Hind-E') with twin-barrel cannon instead of nose turret (Camera Press)

Mil Mi-17 (NATO 'Hip-H')

Revealed at the 1981 Paris Air Show, the Mi-17 combines the airframe of the Mi-8 with the uprated power plant, short nacelles, and port-side tail rotor of the Mi-14. The engine air intakes can be fitted with deflectors to prevent the ingestion of sand, dust, or foreign particles at unprepared landing sites. If an engine fails, the output of the other is increased automatically to 2,200 shp for sustained single-engine flight. Export deliveries include 16 to Cuba and others to India and Peru.

Power Plant: two Isotov TV3-117MT turboshaft engines; each 1,900 shp.

Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 60 ft 5¼ in, height 15 ft 7¼ in.

Weights: empty 15,653 lb, gross 28,660 lb.

Performance: max speed 155 mph, service ceiling 11,800 ft, max range 590 miles with auxiliary fuel.

Mil Mi-24 (NATO 'Hind')

The Mi-24 was designed originally to deliver a squad of eight assault troops into a battlefield. Its weapons were intended then to clear a path past any tanks, antiaircraft guns, or other obstructions to its progress, but it was not long before training exercises caused a major change in tactics. Today, the Mi-24 is regarded as not only an antitank 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. Other duties include escort of troop-carrying Mi-8s and ground attack. To reduce vulnerability to ground fire, steel and titanium have been substituted for aluminum in critical components, and glassfiber-skinned rotor blades have replaced the original metal blade-pocket design. Variants identified to date are as follows:

Hind-A. Armed assault transport, with large enclosed flight deck for crew of four, and places for up to eight fully-equipped troops in main cabin. Dynamic components and TV2-117 engines of Mi-8 fitted initially. F retractable landing gear. Auxiliary wings of this versi have considerable anhedral. One 12.7 mm machine-gu in nose, slaved to undernose sighting system; four hard points under stubwings for 32-round packs of 57 mm rockets, up to 3,300 lb of chemical or conventional bombs, or other stores; four AT-2 (NATO 'Swatter') homing antitank missiles on wingtip launchers. Antitorque rotor, originally on starboard side of offset tail pylon, repositioned to port side when TV2 engines were replaced by TV3s on later and converted aircraft. Initial series production Mi-24s were of this model.

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 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 TV3-117 engines and tail rotor on port side, but with front fuselage completely redesigned and heavily armored for primary gunship role, although transport capability retained. 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 bullet-proof windscreen at extreme nose may be part of low-airspeed sensing device to indicate optimum conditions for minimum dispersion of 57 mm rockets. Under nose is a four-barrel Gatling-type 12.7 mm machine-gun in a turret with a wide range of movement in azimuth and elevation, providing air-to-air as well as air-to-surface capability. Undernose packs for sensors, including radar and low-light-level TV. Wing armament of 'Hind-A' retained. Many small antennae and blisters, including 'Odd Rods' IFF. Infrared suppressors and infrared decoy dispensers optional.

Hind-E. As 'Hind-D', for Soviet armed forces, but with four laser-homing AT-6 (NATO 'Spiral') tube-launched antitank missiles instead of 'Swatters', and enlarged undernose sensor pod on port side. Modified 'Hind-E', first shown in service with Soviet forces in photographs published in 1982, has the nose gun turret replaced by a twin-barrel cannon mounted inside a semicylindrical pack on starboard side of fuselage. Bottom of nose smoothly faired above and forward of sensors.

Under the Soviet designation A-10, the Mi-24 has set a number of major FAI-approved records, including the current world speed record for helicopters of 228.9 mph over a 15/25 km course.

Deliveries of all models of the Mi-24 exceed 1,700, from plants in Arsenyev and Rostov, with production continuing at the rate of more than 15 per month. In addition to the Soviet Armed Forces, operators include the air forces of Afghanistan, Algeria, Angola, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, India, Iraq, Libya, Nicaragua, Poland, Vietnam, and South Yemen. Some export models, including those for India, are designated **Mi-25,** suggesting different equipment standards.

Power Plant: two Isotov TV3-117 turboshaft engines; each 2,200 shp.

Dimensions: rotor diameter 55 ft 9 in, length 60 ft 8½ in, height 21 ft 4 in.

Weights: empty 18,520 lb, gross 24,250 lb.

Performance: ('Hind-D' with full military load): max speed 199 mph, service ceiling 14,750 ft, range 99 miles.

Accommodation ('Hind-D/E'): crew of two; eight troops or four litters in main cabin.

Armament: see individual model descriptions.

Mil Mi-26 (NATO 'Halo')

Design of the Mi-26 heavy-lift helicopter began in the early 1970s to meet the requirement for an aircraft of greater capability than the Mi-6, for day and night operation in all weathers. Except for the four-engined twin-rotor Mi-12, which did not progress beyond prototype testing, it is the heaviest helicopter yet flown anywhere in the world. Its rotor diameter is smaller than that of the Mi-6, but this is offset by the fact that the Mi-26 is the first helicopter to operate successfully with an eight-blade main rotor. Other features include a payload and cargo hold very similar in size to those of a C-130 Hercules, loading via clamshell doors and ramp at the rear of the cabin pod, and main landing gear legs that are adjustable individually in length to facilitate loading and to permit landing on varying surfaces. The Mi-26 began in-field testing and development with the Soviet Air Force in early 1983 and is now fully operational. First export deliveries, of ten for India, are due this year. Infrared suppressors and decoy dispensers are optional on production aircraft.

In the course of establishing five world helicopter payload-to-height records, in 1982, an Mi-26 lifted a total mass of 125,154 lb to a height of 2,000 m, including a payload of 25,000 kg (55,115 lb).

Power Plant: two Lotarev D-136 turboshaft engines; each 11,400 shp.

Dimensions: rotor diameter 105 ft 0 in, length of fuse-

lage 110 ft 8 In, height to top of main rotor head 26 ft 8¾ in.
Weights: empty 62,170 lb, gross 123,450 lb, max payload, internal or external, 44,090 lb.
Performance: max speed 183 mph, service ceiling 15,100 ft, range 497 miles.
Accommodation: crew of five; about 40 tip-up seats along side walls of hold; max seating for about 90 combat-equipped troops. Other loads include two airborne infantry combat vehicles.

Mil Mi-28 (NATO 'Havoc')

Because of its origins as an assault transport, the Mi-24 'Hind' offers a large target for ground fire. When designing the Mi-28, the Mil Bureau was able to begin with a clean sheet of paper and produce a two-man attack helicopter with heavy armament but altogether slimmer and less vulnerable. The best illustration yet available is a DoD artist's impression, showing an aircraft similar in general configuration to its US counterpart, the AH-64 Apache, with stepped cockpits for the weapons operator and pilot, a heavy caliber gun in an undernose turret, and weapon pylons carried on stub wings. It is expected that these will provide for an air-to-air combat capability in addition to the conventional air-to-surface roles.

Knowledge of Soviet design practice suggests that the Mi-28 will have two Isotov TV3-117 turboshaft engines of the kind fitted to the Mi-24 and Ka-27, but its rotor system is believed to be new. Like all current Soviet first-line helicopters, it will be fitted with infrared suppressors, decoy dispensers, and extensive armor. The 1985 edition of DoD's *Soviet Military Power* anticipated deployment of the Mi-28 "in the near future".
Dimensions: rotor diameter 55 ft 9 in, length 57 ft 1 in.
Performance: max speed 186 mph, combat radius 150 miles.

Strategic Missiles

SS-4 (NATO 'Sandal')

Based on German wartime V-2 technology, this is the medium-range ballistic missile (MRBM) that precipitated the Cuba crisis in 1962. An estimated 120 remain operational, near the western borders of the Soviet Union. Replacement with SS-20s is being maintained at a steady pace. 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 68 ft 0 in, diameter 5 ft 3 in.
Launching weight: 60,000 lb.
Performance: max speed Mach 6.7, max range 1,200 miles.

SS-11 (NATO 'Sego')

Three versions of this 1966–70 vintage 'light' ICBM remain operational. Although considerably less capable than later generations of Soviet strategic weapons, and housed in less survivable silos, DoD states that "their destructive potential against softer area targets in the US and Eurasia is significant". Following replacement of a proportion of the original force with SS-17s, a total of 420 SS-11 Mod 2/3s and 100 SS-11 Mod 1s is deployed. Differences are as follows:

SS-11 Mod 1. Single reentry vehicle, of slightly higher yield than that of the comparable US Minuteman, but considerably less accurate, with CEP of 1.4 km (0.87 miles).

SS-11 Mod 2. As Mod 1 but with added penetration aids.

SS-11 Mod 3. First operational Soviet missile with MRVs (three 300 kiloton). CEP 1.1 km (0.7 miles).
Power Plant: two-stage storable liquid-propellant.
Guidance: inertial.
Warhead: single nuclear (Mod 1 and 2); three MRVs (Mod 3).
Dimension: length 66 ft 0 in.
Performance: max range Mod 1 6,835 miles, Mod 2 8,075 miles, Mod 3 6,585 miles.

SS-13 (NATO 'Savage')

In the Minuteman category; only 60 SS-13 ICBMs are deployed, in Mod 2 configuration.
Power Plant: three-stage solid-propellant.
Guidance: inertial, offering CEP of 2 km (1¼ miles).
Warhead: nuclear (750 kilotons).
Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).
Performance: range 5,840 miles.

Artist's impression of Mil Mi-28 (NATO 'Havoc') (DoD)

SS-16 (Soviet designation RS-14)

This three-stage solid-propellant ICBM is basically an SS-20 IRBM with an added stage. Testing of the SS-16, which can be silo or vehicle based, took place in 1972–76, but further production, test, or deployment were to be banned under the nonratified SALT II agreement. DoD's official view is that available information does not allow a conclusive judgment on whether or not the Soviets have deployed the SS-16 but that activities at the Plesetsk test center suggest a probable violation of SALT II.
Power Plant: three-stage solid-propellant.
Guidance: inertial.
Warhead: single RV, nuclear.
Dimension: length 59 ft 0 in.
Performance: range 5,600 miles.

SS-17 (Soviet designation RS-16)

Known in the Soviet Union as the RS-16, this 'light' 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, all of which are thought to have been upgraded to Mod 3 standard with four MIRVs. The silos, like those for the SS-18 and SS-19 ICBMs, are hardened to resist very high overpressure.
Power Plant: two-stage storable liquid-propellant.
Guidance: inertial.
Warhead: four MIRVs (each 750 kilotons).
Dimensions: length 68 ft 0 in, max diameter 8 ft 6 in.
Performance: max range 6,200 miles.

SS-18 (Soviet designation RS-20)

There are 308 of these cold-launched 'heavy' missiles in the Soviet ICBM force. All have been upgraded to Mod 4 standard, with ten MIRVs, each with more than 20 times the destructive power of the nuclear bombs dropped on Hiroshima and Nagasaki in 1945. DoD believes that the SS-18 force, by itself, has the capability to destroy more than 80% of US ICBM silos, using two nuclear warheads against each silo. A CEP of under 1,000 ft has been quoted.
Power Plant: two-stage liquid-propellant.
Guidance: inertial.
Warhead: ten MIRVs (each 500 kilotons).
Dimensions: length 104 ft 0 in, max diameter 10 ft 0 in.
Performance: max range 6,835 miles.

SS-20 IRBM (DoD)

SS-19 (Soviet designation RS-18)

The Soviet Union's 360 SS-19 Mod 3 missiles are classified as light ICBMs, but the SS-19 force is judged by DoD to have nearly identical capabilities to the 308 larger SS-18s, with the added flexibility of being able to attack targets in Eurasia as well as the US. The hot-launched Mod 3 carries six MIRVs and offers a CEP of under 1,000 ft.
Power Plant: two-stage liquid-propellant.
Guidance: inertial.
Warhead: six MIRVs (each 500 kilotons).
Dimensions: length 75 ft 0 in, max diameter 9 ft 0 in.
Performance: max range 6,200 miles.

SS-20

This mobile solid-propellant IRBM represents the most formidable Soviet threat to NATO nations in Western Europe and would not have been subject to any restrictions under SALT II, as its range is less than 5,500 km (3,417 miles). About 423 had been deployed by the late summer of 1985, of which 261 were opposite NATO, with the others targeted on China and Japan. SS-20s could reach the Aleutian Islands and western Alaska from present and likely deployment areas in the eastern USSR, but could not attack the contiguous 48 States. Force expansion is continuing, and the number of deployed SS-20s could increase by 50% by the end of this decade. The missile is carried on a wheeled launcher capable of both on- and off-road operation, which renders detection and targeting difficult. Furthermore, the launcher has the capability of being reloaded, and refire rounds are known to be stockpiled. A CEP of about 1,300 ft is estimated when the SS-20 is fired from a presurveyed site. An improved version, with even greater accuracy, is being flight tested.
Power Plant: two-stage solid-propellant.
Guidance: inertial.
Warhead: three MIRVs (each 150 kilotons).
Dimension: length 54 ft 0 in.
Performance: max range 3,100 miles.

SS-X-24

In *Soviet Military Power,* DoD suggests that modified versions of the SS-18 ICBM are likely to be deployed in existing silos in due course. Two completely new solid-propellant ICBMs have also been tested from the range head at Plesetsk, in the north of the Soviet Union. The first of these, designated SS-X-24 in the US, is about the same size as the US Peacekeeper (MX) and is expected to be silo based initially. It could achieve IOC in this form during 1986, with rail-mobile deployment to follow in the late 1980s. The SS-X-24 is expected to be even more accurate than the current SS-18 Mod 4 and SS-19 Mod 3. Eight reentry vehicles were released during the missile's second successful test flight on November 22, 1983.
Power Plant: three-stage solid-propellant.
Guidance: inertial.
Warhead: up to ten MIRVs (each 100 kilotons).
Dimension: length 69 ft 0 in.
Performance: max range 6,200 miles.

SS-X-25

This new ICBM is about the same size as the US Minuteman, with a single reentry vehicle. DoD states that it has apparently been designed for mobile deployment from a home base comprising launcher garages with sliding roofs. The system includes massive off-road wheeled transporter/erector/launchers and necessary mobile support equipment for refires from the launcher. Two home bases were stated to be nearing operational capability in 1985.

Power Plant: three-stage solid-propellant.
Guidance: inertial.
Warhead: single RV (550 kilotons).
Dimension: length 59 ft 0 in.
Performance: range 6,525 miles.

Sixth-Generation ICBMs

According to DoD, activity at test ranges indicates that two further Soviet ICBMs are under development. A replacement for the SS-18 was nearing the flight-test stage in early 1985. Additionally, a solid-propellant missile that may be larger than the SS-X-24 will begin flight tests soon. Both missiles are expected to have better accuracy and greater throw-weights than their predecessors.

AS-3 (NATO 'Kangaroo')

'Kangaroo' was a standard air-to-surface missile on Tu-95 'Bear' strategic bombers from the early 1960s. It is replaced by the supersonic AS-4 'Kitchen' on aircraft uprated to 'Bear-G' standard.

AS-4 (NATO 'Kitchen')

Developed as a standoff weapon for the Tu-22 strategic bomber, and now carried also by the Tu-95 ('Bear-G') and 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, semisubmerged in the fuselage, and production by 1976 was stated by the UK Defence Minister to total 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 (200 kiloton) or 2,200 lb high-explosive warheads can be assumed.
Guidance: inertial, with radar terminal homing.
Dimensions: span 9 ft 10 in, length 37 ft 0 in.
Weight: 13,225 lb.
Performance: max speed above Mach 2, range 185 miles at low altitude.

AS-6 (NATO 'Kingfish')

This advanced air-to-surface missile was first photographed by the pilot of a Japan Air Self-Defense Force F-86F in December 1977 under the port wing of a Tu-16 ('Badger'). It is standard armament of modified 'Badger-Gs', which carry a 'Kingfish' under each wing. Variable-geometry 'Backfire' bombers can carry up to three, as alternatives to 'Kitchens'. Propulsion is said to be by liquid-propellant rocket motor, with inertial midcourse guidance and active radar terminal homing, giving exceptional accuracy. The warhead can be either nuclear (200 kiloton) or 2,200 lb high explosive.
Dimensions: span 8 ft 2½ in, length 34 ft 6 in.
Weight: 11,000 lb.
Performance: max speed Mach 3, range 135 miles at low altitude.

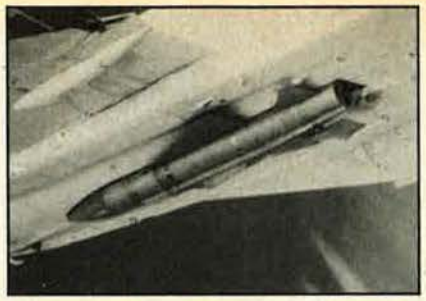
AS-15

After at least six years of development testing, including launches from 'Backfire' bombers, the Soviet Union began deployment of its new-generation AS-15 long-range air-launched cruise missiles on 'Bear-H' strategic bombers in 1984. The AS-15 will also arm the new supersonic 'Blackjack' bomber, providing the Soviet strategic attack force with greatly improved capabilities for low level and standoff attack in both theater and international operations. Configuration of the AS-15 is similar to that of USAF's much smaller General Dynamics ground-launched cruise missile. Submarine-launched and ground-launched versions are under development, as the SS-NX-21 and SSC-X-4, respectively. All have a guidance system similar to the US Tercom, making possible a CEP of about 150 ft, and a nuclear warhead.
Dimensions: span 10 ft 8 in, length 23 ft 0 in.
Performance: range 1,850 miles.

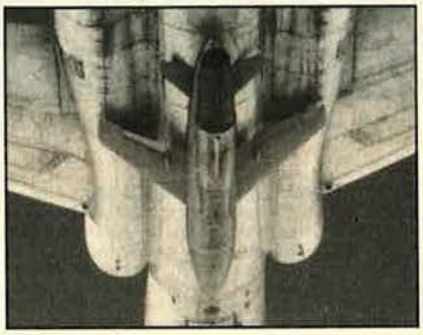
Airborne and Tactical Defense Missiles

AS-2 (NATO 'Kipper')

First seen 24 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 antishipping weapon. Radar is carried in the nose of the Tu-16 carrier aircraft, and guidance is believed to comprise preprogrammed flight under autopilot control, with optional command override, and active radar terminal homing. A 2,200 lb high-explosive warhead is fitted.



AS-4 (NATO 'Kitchen') on Tu-26 ('Backfire-B')



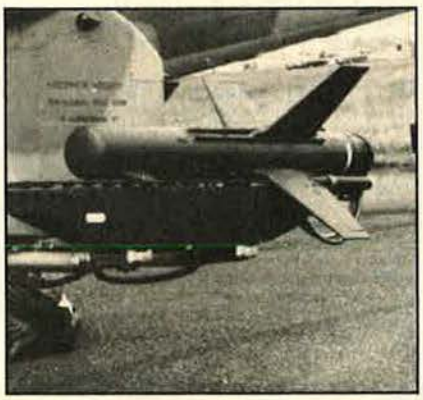
AS-2 (NATO 'Kipper') on Tu-16 ('Badger-C')

Dimensions: span 15 ft 0 in, length 32 ft 10 in.
Weight: 9,260 lb.
Performance: max speed Mach 1.2, range 132 miles.

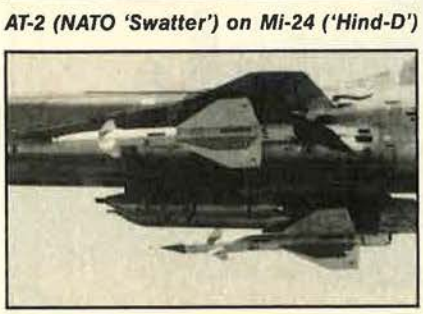
AS-5 (NATO 'Kelt')

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 defenses.

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 preprogrammed flight path, with radar terminal homing that can be switched from active to passive as required. A 2,200 lb high-explosive warhead is standard.
Dimensions: span 14 ft 1¼ in, length 28 ft 2 in.
Weight: 7,715 lb.
Performance: max speed Mach 0.9 at low altitude, Mach 1.2 at 30,000 ft, range 100 miles at low altitude, 200 miles at height.



AT-2 (NATO 'Swatter') on Mi-24 ('Hind-D')



AA-3 (NATO 'Anab') on Su-15/21

AS-7 (NATO 'Kerry')

Carried by the Su-17 'Fitter', Su-24 'Fencer', and Yak-38 'Forger', this tactical air-to-surface missile is said to have a single-stage solid-propellant rocket motor, radio command guidance system, and 220 lb high-explosive warhead.
Dimension: length 11 ft 6 in.
Weight: under 880 lb.
Performance: max speed Mach 0.6, max range 7 miles.

AS-X-9

A reported antiradiation missile, with a range of 50–56 miles, to arm the Su-24 ('Fencer').

AS-10

This is a semiactive laser homing weapon with a solid-propellant rocket motor. It is said to be operational on MiG-27, Su-17, and Su-24 attack aircraft.
Dimension: length 9 ft 10 in.
Performance: max speed Mach 0.8, max range 6.2 miles.

AT-2 (NATO 'Swatter')

This standard Soviet antitank 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. The solid-propellant '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 3 ft 9¾ in.
Weight: 65 lb.
Performance: cruising speed 335 mph, range 1,640–11,500 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, and Gazelles of the Yugoslav services.
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 antitank 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-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 infrared 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 and 13 lb fragmentation warhead are 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 multirole 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 infrared homing 'Atoll' on the inboard pylon. The radar version is known as 'Advanced Atoll'. Length is increased to at least 9 ft 10 in.

AA-3 (NATO 'Anab')

This solid-propellant air-to-air missile was first observed as armament of the Yak-28P all-weather fighters that took part in the 1961 Aviation Day display at Tushino. Subsequently, it became standard also on Sukhoi Su-15/21 interceptors. Each aircraft normally carries one 'Anab' with an I/J-band semiactive radar seeker and one with an infrared 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 were

produced as armament for the Tu-28P interceptors of Voyska PVO. The version with infrared homing head is normally carried on the inboard pylon under each wing of the Tu-28P, with an I/J-band semiactive radar homing version on each outboard pylon.
Dimensions: length 17 ft 4½ in (IR) or 17 ft 0 in (SAR), body diameter 12 in, wing span 4 ft 3 in.
Performance: range 18.5 miles.

AA-6 (NATO 'Acrid')

This air-to-air missile 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, with a 220 lb warhead. Photographs suggest that the version of 'Acrid' with an infrared 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.
Dimensions: length 20 ft 7½ in (radar version), 19 ft 0 in (IR version).
Weight: 1,650 lb.
Performance: cruising speed Mach 2.2, range at least 23 miles.

AA-7 (NATO 'Apex')

This long-range air-to-air missile is one of the two types carried as standard armament by interceptor versions of the MiG-23 and is reported to be an alternative weapon for the MiG-25. 'Apex' has a solid-propellant rocket motor and is deployed in both infrared and semiactive radar homing versions. Warhead weight is 88 lb.
Dimensions: length 15 ft 1¼ in, body diameter 8.75 in, wing span 3 ft 5½ in.
Weight: 705 lb.
Performance: range 20 miles.

AA-8 (NATO 'Aphid')

Second type of missile carried by the MiG-23, and also by late-model MiG-21s, Su-15/21s, and Yak-38s, 'Aphid' is a highly maneuverable close-range solid-propellant weapon with infrared homing guidance and a 13.2 lb warhead.
Dimensions: length 7 ft 2½ in, body diameter 4.75 in, wing span 1 ft 3¾ in.
Weight: 121 lb.
Performance: range under 1,650 ft min, 3–4.3 miles max.

AA-9

This radar homing long-range missile is reported to have achieved successes against simulated cruise missiles after 'lookdown/shootdown' launch from a MiG-25M interceptor. It is standard armament on the MiG-31.
Performance: range 25–28 miles at height, 12.5 miles at S/L.

AA-10

The AA-10 has generally similar capabilities to those of the AA-9, but is intended for use over medium ranges. It forms the basic interception armament of the MiG-29 and Sukhoi Su-27 counterair fighters.

Antihelicopter 'Grail'

In addition to AT-3 antitank missiles, Gazelle helicopters license-built by SOKO for the Yugoslav Air Force carry SA-7 'Grail' tube-launched IR homing missiles for use against other helicopters. A similar installation on some Mi-24 helicopters has been reported.

Surface-to-Air Missiles

ABM-1 (NATO 'Galosh')

Keeping within the terms of the SALT I agreement, as amended by the 1974 Moscow Summit meeting, the USSR maintains around Moscow the world's only operational ABM (antiballistic missile) system. Its purpose is to provide a measure of protection for Soviet military and civil central command authorities during a nuclear war, and this has required major upgrading of the system in the past five years. When fully operational, perhaps by next year, it will provide a two-layer defense based on a total of 100 silo-based launchers for long-range modified ABM-1 'Galosh' interceptors designed to engage targets outside the atmosphere and high-acceleration interceptors to engage targets within the atmosphere. The launchers may be reloadable and will be supported by engagement and guidance radars, plus a large new radar at Pushkino designed to control ABM engagements.

Missiles purported to be 'Galosh' have been paraded through Moscow inside containers about 65 ft long 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 more than 200 miles.

Artist's impression of ABM-1 (NATO 'Galosh') launch (DoD)

SA-3 (NATO 'Goa')

ABM-X-3

The Soviet Union is believed to have at least two new ABM development programs under way. One, designated ABM-X-3 by DoD, is said to be a rapidly deployable system using a phased-array radar, missile-tracking radar, and a new missile. Its availability would permit the Soviets to deploy a nationwide ABM system relatively quickly, should they decide to do so. In addition, the SA-10 and SA-X-12 surface-to-air missiles may have the potential to intercept some types of US strategic ballistic missiles.

SA-2 (NATO 'Guideline')

This land-mobile surface-to-air missile has been operational since 1959 and continues in first-line service in some 22 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. SA-2 launchers are thought to remain operational at 350 sites in the Soviet Union, although the number declines annually. Data for 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 radar terminal homing.
Warhead: high-explosive, weight 288 lb.
Dimensions: length 34 ft 9 in, body diameter 1 ft 8 in, wing span 5 ft 7 in.
Launching weight: 5,070 lb.
Performance: max speed Mach 3.5, slant range 31 miles, effective ceiling 82,000 ft.

SA-3 (NATO 'Goa')

Soviet counterpart of the American Hawk, the SA-3 is deployed by the Soviet Union at more than 300 sites and by about 24 of its allies and friends as a mobile low-altitude system (on two-, three-, and four-round launchers) 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 and is fired from a roll-stabilized 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: 1,402 lb.
Performance: max speed Mach 2, slant range 15–18.5 miles, effective ceiling over 43,000 ft.

SA-4 (NATO 'Ganef')

Ramjet propulsion gives this antiaircraft missile a very long range. Its usefulness is further enhanced by its mobility, as it is carried on a twin-round tracked launch vehicle that 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 (approx 1,400 launchers) for defense of combat areas. It is operational also with Bulgarian, East German, Hungarian, Polish, and Czechoslovak forces.
Power Plant: ramjet sustainer; four wrap-around solid-propellant boosters.
Guidance: radio command, with semiactive radar terminal homing.
Warhead: high-explosive, weight 220–300 lb.
Dimensions: length 28 ft 10½ in, body diameter 2 ft 8 in, wing span 7 ft 6 in.
Launching weight: approx 5,500 lb.
Performance: max speed Mach 2.5, slant range 43 miles, effective ceiling 80,000 ft.

SA-5 (NATO 'Gammon')

The SA-5 is described by DoD as a surface-to-air weapon to provide long-range, high-altitude defense for Soviet targets. A drawing released in Washington suggests that its configuration is unusual for a Soviet missile, with long-chord cruciform delta wings, small tail surfaces, and four wrap-around jettisonable boosters. More than 2,000 SA-5s are said to be deployed at more than 100 sites, with significant deployments outside the USSR, in Eastern Europe, Mongolia, and Syria.
Power Plant: two-stage solid-propellant, possibly with terminal propulsion for warhead.
Guidance: semiactive radar homing.
Dimensions: length 34 ft 9 in, body diameter 2 ft 10 in, wing span 9 ft 6 in.
Performance: max speed above Mach 3.5, slant range 185 miles, effective ceiling 95,000 ft.

SA-6 (NATO 'Gainful')

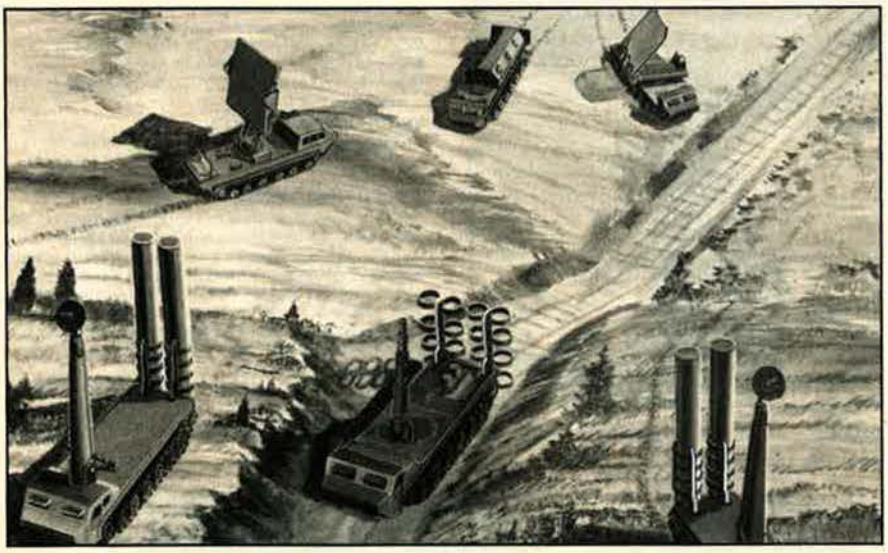
This mobile weapon system took an unexpectedly heavy toll of Israeli aircraft during the October 1973 war. Its unique integral all-solid rocket/ramjet propulsion system was a decade in advance of comparable Western technology, and the US-supplied ECM equipment that enabled Israeli aircraft to survive 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 many nations, including Algeria, Angola, Bulgaria, Cuba, Czechoslovakia, Egypt, East Germany, Guinea, Hungary, India, Iraq, Kuwait, Libya, Mozambique, Peru, Poland, Romania, Syria, Tanzania, Vietnam, North and South Yemen, Yugoslavia, and Zambia.

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; semiactive radar terminal homing.

SA-8 (NATO 'Gecko')



SA-12 air defense system (DoD)

Warhead: high-explosive, weight 176 lb.
Dimensions: length 20 ft 4 in, body diameter 1 ft 1.2 in.
Launching weight: 1,212 lb.
Performance: max speed Mach 2.8, range 18.5 miles, effective ceiling 59,000 ft.

SA-7 (NATO 'Grail')

This Soviet counterpart of the US shoulder-fired, heat-seeking Redeye first proved its effectiveness in Vietnam against slower, low-flying aircraft and helicopters. It repeated the process during the 1973 Arab-Israeli war, despite countermeasures. In addition to being a standard weapon throughout the Warsaw Pact forces since 1968, it has been supplied to about 39 other nations and is used by various guerrilla/terrorist movements. Designed for use by infantry, the tube-launched 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. Some are deployed on helicopters for antihelicopter combat use.

Power Plant: solid-propellant booster/sustainer.
Guidance: infrared homing with filter to screen out decoy flares.
Warhead: high-explosive, weight 5.5 lb.
Dimensions: length 4 ft 3 in, body diameter 2.75 in.
Launching weight: 20 lb.
Performance: max speed Mach 1.5, slant range 5–6 miles; effective ceiling 5,000 ft.

SA-8 (NATO 'Gecko')

First displayed publicly during the parade through Moscow's Red Square on November 7, 1975, this short-range, all-weather system is unique among Soviet tactical air defense weapons in that all components needed to conduct a target engagement are on a single vehicle. In the original SA-8A version, two pairs of exposed missiles were carried, ready to fire; the later SA-8B system has six missiles in launcher-containers. Missile configuration is conventional, with canard foreplane control surfaces and fixed tail-fins. Fire control equipment and four- to six-round launcher are mounted on a rotating turret, carried by a 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-8B uses the same missile as the well-established but enigmatic naval SA-N-4 system. Each vehicle carries up to six reload missiles. About 700 SA-8 vehicles are thought to be in Soviet service; export customers include Angola, Guinea, India, Jordan, Kuwait, Libya, Poland, and Syria.

Power Plant: probably dual-thrust solid-propellant.
Guidance: command guidance by proportional navigation. Semiactive radar terminal homing.
Warhead: high-explosive, about 90–110 lb weight.
Dimensions: length 10 ft 6 in, body diameter 8.25 in.
Launching weight: 440 lb.
Performance: range 6–8 miles, effective ceiling 20,000 ft.

SA-9 (NATO 'Gaskin')

This weapon system, deployed initially in 1968, comprises a BRDM-2 amphibious vehicle carrying a box launcher for two pairs of infrared homing missiles. The launcher rests flat on the rear of the vehicle when not required to be ready for launch. Four reload rounds are stowed in the BRDM-2. In addition to the Soviet Union, operators include most Warsaw Pact states and 11 other nations. (See also the SA-13 entry.)
Dimensions: length 5 ft 9 in, body diameter 4.33 in.
Launching weight: 66 lb.
Performance: range 5 miles, effective ceiling 16,400 ft.

SA-10 (NATO 'Grumble')

If press reports are to be believed, this weapon threatens the viability of US cruise missiles. A single-stage rocket motor is said to accelerate the SA-10 at 100*g* to a cruising speed of Mach 6. A range of up to 60 miles and all-altitude capability are suggested, with active radar terminal homing and multiple target engagement capability. Reported dimensions are a length of 23 ft 6 in and body diameter of 17.7 in. By the spring of 1985, the SA-10 was operational at some 60 sites in the USSR, with 520 launchers and four missiles per launcher. A landmobile version, carried on a four-axle truck, was expected to deploy during 1985.

SA-11 (NATO 'Gadfly')

This new weapon system comprises a four-rail tracked launch vehicle for Mach 3.5 radar-guided missiles with a reported ability to deal with targets at altitudes between 100 and 46,000 ft and at ranges up to 18.5 miles. SA-11s are being deployed alongside SA-6s. Missile length is 18 ft.

SA-12

This formidable container-launched weapon is considered capable of dual-mode operation against aircraft and intermediate-range and submarine-launched missiles. The SA-12 is in production. Little reliable information is available, but a DoD drawing has suggested a missile of fairly conventional configuration, about the same size as the SA-10. A complete fire unit could include two twin-round erector-launchers, a reload vehicle, two planar-array radar vehicles, and a command vehicle, all tracked for maximum capability. A range of 60 miles is expected.

SA-13 (NATO 'Gopher')

Deployed on a tracked vehicle in the late 1970s, the SA-13 is a replacement for the SA-9, providing improved capability in rough terrain and increased storage for reload missiles. Together with the ZSU-23-4 tracked gun vehicle, it equips the antiaircraft batteries of motorized rifle and tank regiments. Range is about 5 miles at altitudes between 165 ft and 16,500 ft.

SA-14 (NATO 'Gremlin')

This uprated version of the SA-7 is believed to have a more powerful motor, giving higher speed and an effective ceiling of about 14,000 ft.

New Infantry SAM

To overcome the limitations of shoulder-fired, infrared homing missiles like the SA-7, the Soviet Union has been developing improved infantry SAMs for some years. One type, of which deployment is about to start, uses a laser beam for beam-riding guidance.

SA-N-1 (NATO 'Goa')

Ship-launched variant of SA-3, carried on roll-stabilized twin launchers by 43 ships of the Soviet Navy.

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 *Kiev* class carrier/cruisers, helicopter cruisers *Moskva* and *Leningrad*, and *Kara* and *Kresta II* cruisers, carry a new and more effective missile than the SA-N-1 ('Goa'). This is said to have an antiship capability and to carry an 88 lb high-explosive warhead. The original version has a range of 18.6 miles and effective ceiling of 82,000 ft. A later version has a range of 34 miles.
Dimension: length 19 ft 8 in.
Weight: 1,200 lb.

SA-N-4

This naval close-range surface-to-air weapon system is operational on at least nine 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-8B system.

SA-N-5

At least 169 small Soviet ships have this simple air defense system, which carries four SA-7 'Grail' launch-tubes in a framework that can be slewed for aiming.

SA-N-6

This missile is housed in 12 vertical launch tubes under the foredeck of the Soviet battle cruiser *Kirov* and is carried also by *Slava* class cruisers. It is assumed to deal with the same multiple threats as the US Navy's Aegis area defense system. No authentic information on the SA-N-6 missile is available, although some relationship to the land-based SA-10 seems likely. Best estimates suggest a length of about 23 ft, effective ceiling of at least 100,000 ft, and range of 37 miles at Mach 6, carrying a 200 lb warhead. Likely features include multiple target detection and tracking, midcourse guidance, terminal homing, and high resistance to ECM and jamming.

SA-N-7

Two single-rail launchers for this new missile are fitted in each ship of the *Sovremennyy* class of guided missile destroyers. The sophistication and rapid-fire potential of the weapon system is indicated by the requirement for six associated fire control/target illuminating radars. The SA-N-7 itself is thought to be a naval equivalent of the land-based SA-11.

SA-N-8

Nothing is known positively about this vertically launched missile system carried by the new *Udaloy* class of antisubmarine ships.

SA-NX-9

In addition to the SA-N-4 and SA-N-6 surface-to-air missile systems installed in the *Kirov*, its sister ship, the *Frunze*, has provisions for a total of 128 shorter-range SA-NX-9 missiles. These will be shared between two rows of four vertical launchers, on each side of the stern helicopter pad, and two rectangular groups of four launchers on the forecastle. No other details are available. ■

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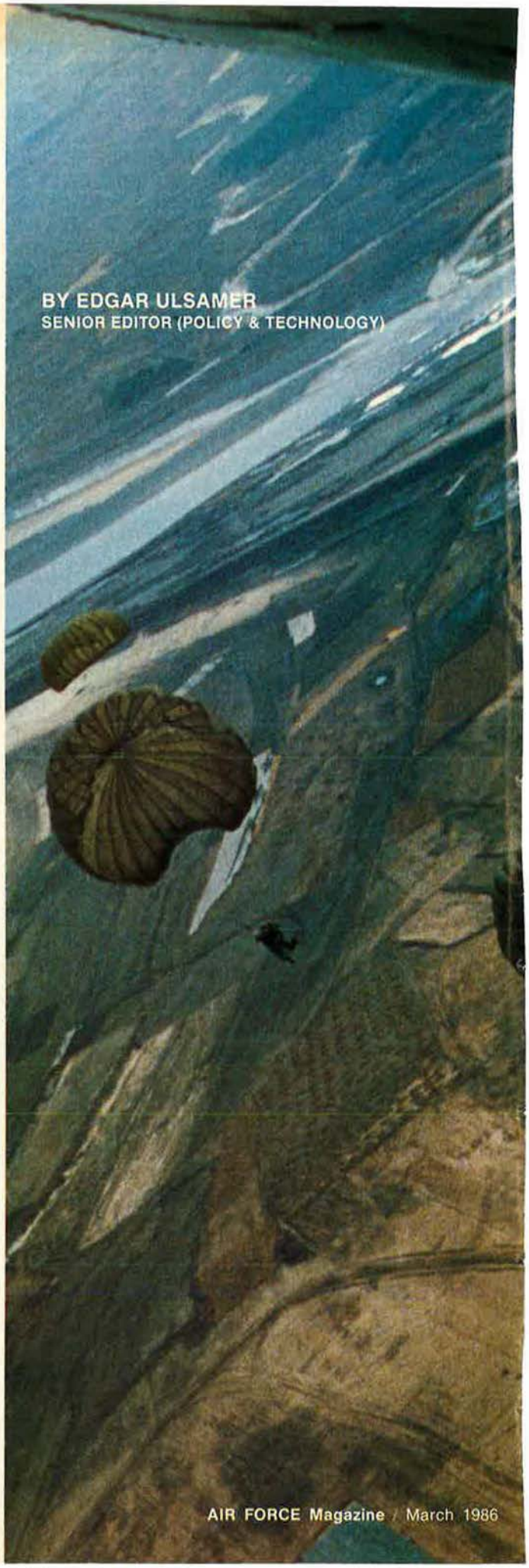
WE RAISE THE WORLD ON OUR FARM.

The services are getting considerable pressure from the White House and Congress to improve their capabilities for low-intensity conflict.

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)



THE Pentagon calls them "low-intensity conflicts" and defines such operations as "limited politico-military struggles to achieve political, social, economic, or psychological objectives." The public thinks of such conflicts as dirty little wars fought by intrepid men in snake-eater suits and with knives in their teeth. Regardless of the supermacho images stirred up by the term "low-intensity conflict," it may well turn out to be the predominant form of warfare for the rest of this century.

Low-intensity conflict (LIC) is hardly a newcomer to the field of military operations and statecraft. Soviet Russia, clearly today's master in the covert extension of politics into various regimes of violence—especially state-sponsored terrorism and wars of "liberation" fought by surrogate forces—arguably can trace its affinity for low-intensity conflict to one of its cultural progenitors, the Byzantine Empire.

The US, in spite of its general preference for aboveboard approaches to military operations, resorted to the use of "irregular forces" when the needs of the moment so indicated. During the Revolutionary War, an American patriot, Francis Marion, the "Swamp Fox," drove British forces to the brink of complete frustration because, as one contemporary account put it, "Marion would not come out and fight like a gentleman and a Christian." During the Civil War, "Mosby's Raiders" similarly bedeviled the Union Army. During World War II, the Office of Strategic Services (OSS) fought or engineered a multitude of "dirty little wars" within the matrix of that global conflagration.

The Air Force's involvement in unconventional warfare dates back to the Air Commandos of World War II, in particular the 1st Air Commando Group created on March 29, 1944, at Hailakandi, India. Called the "Burma Bridge Busters," the air commandos made military history by providing fighter cover, air strikes, and airlift for Wingate's Raiders, who operated behind the Japanese lines. Awarded a Distinguished Unit Citation for extraordinary heroism, the group was disbanded after World War II. Resurrected in stages during the Southeast Asian war, the heirs of the Air Commandos eventually became the Military Airlift Command's Twenty-third Air Force.

In the recent past, Soviet-sponsored insurgencies and the global outcropping of terrorism caused the Reagan

Preparing for Limited Action

The MC-130H Combat Talon II is one of the key elements of the Air Force's $2.9 billion SOF modernization. In the larger photo, Army paratroopers jump from an Air Force transport. Such interservice cooperation is vital in low-intensity conflicts.

Administration to direct major Pentagon emphasis on low-intensity conflict and the Special Operations Forces (SOFs) that often play a role in, but are not synonymous with, such warfare. The Defense Guidance of 1981 and in subsequent years, for instance, directed all the armed services to develop and hone their "special ops" capabilities.

In the wake of this directive, the Air Force's so-called Innovative Task Force proposed, among other measures, the creation of a Center for Low-Intensity Conflict (CLIC). In February 1985, the Chief of Staff of the Air Force ordered the go-ahead, and in September of last year, he and his US Army counterpart, Gen. John A. Wickham, agreed to make the Center a joint Army/Air Force organization. The Center, located at Langley AFB, Va., is in line with a series of initiatives undertaken by the two services to foster joint force developments. The Center, which will probably be broadened by Navy and Marine Corps participation in the near future, may well serve as a catalyst for more comprehensive arrangements that will focus government-wide attention and resources on this form of warfare.

The Chief's Views

USAF's Chief of Staff, Gen. Charles A. Gabriel, at the occasion of the activation of the joint Low-Intensity Warfare Center (LIWC), acknowledged to this writer that "we have to do a better job of getting our arms around the LIC problem." A big step in this direction, he added, is the joint organization "we have just set up with the Army at Langley AFB. The Center will examine LIC in an integrated way, focus on what has to be done, and look into how we can make the best use of the resources we have—including those capabilities designed specifically for special operations."

He explained that the Center is also "the focal point to plan and program for the integration of future forces." At the same time, General Gabriel cautioned against equating low-intensity conflict with SOF because "our Special Operations Forces are trained to fight at all levels of conflict, not just LIC." The Chief of Staff added that, on the other hand, "LIC is much broader than the capabilities associated with the Special Operations Forces."

By way of illustrating the diversity of LIC, he said that "we have been 'countering threats' to Saudi Arabian security since 1980 with four E-3A AWACS airplanes supported by KC-10 and KC-135 tankers. As Grenada showed, airdrop provided by C-130s and C-141s is a major capability in low-intensity warfare."

Lastly, General Gabriel pointed out, "Security assistance programs have a big job to do in low-intensity conflict—they help friendly countries help themselves." He described LIC as a "broad term used to characterize conflicts that occur below the threshold of theater warfare—everything from regional conflicts to guerrilla action and terrorism." The military, he emphasized, "has a definite role in low-intensity conflict, but in many cases the nonmilitary instruments of national power take the front seat."

Likely Reporting Channels

The new Center, USAF's Deputy Chief of Staff for Plans and Operations, Lt. Gen. Harley Hughes, told AIR FORCE Magazine, is headed by a director—a full colonel—who will be picked from the ranks of the Air Force or the Army on a rotational basis. Both services fully agree that the Director will be the head of the organization—staffed initially by fewer than thirty military and civilian personnel—not just in name but in fact, General Hughes stressed.

At this time, the two services have not yet decided on how to fit the Center into existing organizational structures. The predominant notion, however, is to have the new organization report routinely to a triumvirate of general officers—probably at the two-star level—from TAC, the Military Airlift Command (MAC), and TRADOC, the Army's Training and Doctrine Command. But when called into action, the Center is likely to report to the CINCs (Commanders in Chief) involved in a given conflict and, through them, to the Joint Chiefs of Staff, General Hughes suggested. Nevertheless, there will be a secondary reporting channel from the Center to the service chiefs and their deputies for plans and operations, General Hughes said.

In setting up the new organization, the Air Force is concerned with potential misunderstandings about its purpose, according to General Hughes: "There is a tendency to see [its functions predominantly oriented] to counterterrorist activities." That would be wrong, he asserted, because the capabilities and forces earmarked for LIC must also be made available to operations above the level of counterterrorist missions, which usually involve no more than thirty or forty troops. "We can't afford to give the Special Operations Forces total attention under . . . LIC," he emphasized.

He made it clear that LIC, by its very nature, is a "joint effort. The Army, Navy, Air Force, and Marine Corps are in full agreement on this." For that reason, he predicted that the other two services might join the CLIC "before 1987." The Center's ultimate success, he suggested, may also depend on how closely it can be tied to basic "deception doctrines" as well as to good intelligence "so as to place assets in a way that changes the local picture and, hence, can deter" incipient low-intensity aggression.

The establishment of the Center has neither ended the Pentagon's struggles to identify what LIC is—and is not—nor the latent dissatisfaction in Congress and elsewhere with the level of attention paid by the services in the past to this type of warfare. In the first instance, General Hughes pointed out that "the more we examine the LIC issue, the more it becomes clear that to identify low-intensity conflict rigidly would be a mistake." In looking at LIC in a historical context, the tendency now is to define all operations associated with the Vietnam War "prior to the North Vietnamese coming across the border in force" as a low-intensity conflict; after that watershed, the Southeast Asian war should be seen as a full-fledged theater conflict. In terms of looking ahead, US involvement in the Central American turmoil is likely to remain at the LIC level, even though several countries might be involved.

The Air Force elements of the new Center will be working closely with such existing organizations as USAF's Office of History, the Tactical Air Warfare Center, the Special Operations School, the Airlift Center, the Air-Ground Operations School, the Combat Opera-

The Bell-Boeing CV-22 Osprey tilt-rotor design, here shown in artist's concept, will complement the MC-130s in deep "infiltration and exfiltration" missions and will reduce shortfalls in SOF airlift.

tions Staff, the Combating Terrorism Center (CTC), the MAC-TRADOC Airlift Concepts and Requirements Agency, and the General and Special Missions Operational Test and Evaluation Centers.

The Center also will maintain liaison with the Department of State, the United States Information Agency, the Agency for International Development, the Defense Intelligence Agency, the Central Intelligence Agency, and the Defense Security Assistance Agency, among others. Envisioned initially as the Air Force's and the Army's—and eventually as the government's—center of expertise for low-intensity conflict matters, the new organization is to assist other elements of the Pentagon in developing operational concepts, assessing current capabilities, identifying shortfalls, and recommending measures to improve this country's ability to cope with low-intensity conflict.

Its mere existence is likely to bolster congressional and White House confidence in the Defense Department's determination to come to grips with the thorny issue of counterterrorism and unconventional warfare. The main areas of concern that are being assigned to the Center are cadre formation, revolution, insurgency, terrorism, social conflict, civil war, guerrilla warfare, and surrogate forces.

Meeting the LIC/SOF Challenge

At least so far as the Air Force is concerned, there is a general acceptance of the proposition that the "money for a force structure optimally and uniquely tailored for LIC simply isn't there." It follows that the Air Force will have to make the most of existing forces and hardware. General Hughes said that "about ninety percent of what is needed for [effective LIC operations] in terms of weaponry exists in industry or in the combat services." The central imperative, he added, is "modification of existing systems to enhance their utility for low-intensity conflict."

But, he pointed out, aircraft modification takes time. Critics who claim that the Pentagon is tardy in responding to the LIC challenge need to be reminded that all services are stepping up their capabilities in this field and in the related area of special operations forces at a vigorous rate. Some initial increases in capability are just around the corner, and in a few years, when the full enhancement program reaches fruition, "we will have an extremely potent force."

The Air Force alone plans to spend $2.9 billion on SOF modernization over the next five years. Key elements of the program are the acquisition of twenty-one MC-130H Combat Talon II aircraft by 1990 and the modernization of the MC-130Es, AC-130s, several types of helicopters, and associated HC-130 tankers. There is a rock-solid consensus that the C-17 inter/intratheater airlifter will be of crucial importance to this nation's LIC and special ops capabilities in the future. The same is true for remotely piloted vehicles (RPVs), whose contributions to unconventional warfare are great and growing.

The basic Air Force objective behind its SOF enhancement program, according to Maj. Gen. John M. Loh, the Air Staff's Director of Operational Requirements, is "to increase our capability to provide concealment by underflying radars and air defenses in day, night, and through and under the weather; allow for terrain masking at very low altitudes to avoid detection; operate from short and in some cases unprepared strips; and do all of this with higher payloads, at longer ranges—reliably and safely."

Further, he recently told the House Armed Services' Readiness Subcommittee that USAF's gunship force will soon have to be replaced to ensure its future effectiveness. Terming the MC-130H Combat Talon II "our most mature [LIC/SOF] program," he said that of the planned twenty-one aircraft buy, five are in acquisition, and negotiations for two more are about to be completed. Initial problems encountered in the Combat Talon II's radar development have been ironed out. Delivery of the initial five aircraft to the first operational unit experienced a one-year delay because of the need to stretch out the flight-test schedule, he told Congress.

Another LIC requirement brought out by General Hughes is Stealth technology: "There are more and more radars around the world—and more and more countries that can afford them, either with Soviet help or on their own. [As a result], our requirement for low [level flight penetration] and Stealth [in the LIC] context is growing." The choice is between taking out these radars or getting close enough so that "they become inconsequential" operationally. On the other hand, the Stealth option, at least for the foreseeable future, probably is not available in the case of rotor or tilt-rotor vehicles, he suggested.

Over the longer term, the Bell-Boeing CV-22 Osprey tilt-rotor design will be able to complement the MC-130 in deep "infiltration" and "exfiltration" missions, and thereby enhance this country's LIC and SOF capabilities, according to General Hughes. This aircraft is capable of vertical and short takeoff and landing and thus can significantly reduce shortfalls in special operations airlift, especially in long-range exfiltration. The CV-22 can be tailored for LIC and SOF operations by the addition of extended-range fuel tanks, electronic countermeasures, and a dedicated terrain-following/terrain-

The Army is stressing mobility and transportability in its LIC/SOF forces, as this motorized scout of the 82d Airborne Division showed during a recent Gallant Eagle exercise.

avoidance radar. That radar is a derivative of the Air Force's highly successful Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) system navigation pod.

The Air Force's version of the CV-22 is to achieve initial operational capability (IOC) in FY '94, when an initial batch of six airplanes is to enter the inventory. Range of this aircraft will be about 700 nautical miles at a cruising speed of 250 knots. Perceived by the Defense Department as a common vehicle to satisfy various mission requirements for all four services, this tilt-rotor design will be used by the Marine Corps for vertical-lift assault, by the Army for medium cargo lift, by the Navy for combat search and rescue, and by the Air Force mainly for special operations. Assuming a formal go-ahead decision on the program by the Defense Systems Acquisition Review Council (DSARC) early this year, 913 of these tilt-rotor aircraft will enter the US inventory in the 1990s. The Air Force plans to buy eighty CV-22s.

While basically allocated to USAF's LIC missions, these hybrid designs that bridge the gap between helicopters and fixed-wing aircraft might also be used for combat rescue, as light intratheater transports and gunships, as well as for forward air control.

Overcoming Helicopter Shortfalls

For the near term, the Air Force also is modifying a total of nineteen HH-53s to a Pave Low III configuration (HH-53H) to overcome existing long-range-helicopter shortfalls. Also, a recent Air Force review of the SOF's readiness status underscored the importance of enhancing the AC-130 gunships. The FY '87 budget is likely to provide for the acquisition of eleven new gunships and the scrapping of the aging and unsupportable AC-130A gunships in the Reserves. Other initiatives that will benefit the special operations forces and LIC include the retrofit of additional electronic countermeasures and communications equipment, the modification of twenty additional HC-130s and six MC-130Es to a tanker configuration, and measures to increase the survivability of other SOF assets by means of retrofitting improved radar warning receivers and infrared countermeasure pods.

Lastly, relatively low-cost research and development efforts have been initiated by the the Air Force, involving such diverse improvements as 40-mm armor-piercing rounds using tungsten fléchettes for gunships, night vision goggle head-up display devices, and a novel surface-to-air recovery system, called Project 46, that will enable individual Combat Talon aircraft to pick up teams of up to six troops in a single pass without landing.

The majority of low-intensity conflict scenarios suggests an overriding requirement for "smart weapons" that hold collateral damage to a minimum. In many instances of LIC operations, the enemy forces might be interspersed among neutral civilians that the US side would neither want to hurt nor antagonize. The agonizing dilemma of LIC missions is that often there are far more innocent "bystanders" than there are "bad guys." It follows that only highly accurate weapons ought to be brought to bear, with near-surgical precision and on the basis of accurate and timely intelligence. Because of these delicate circumstances, military LIC experts prefer nonmilitary solutions to military ones and, that failing, the use of friendly or covert forces to the commitment of US forces.

As yet there is no element of the Joint Staff specifically in charge of low-intensity conflict matters. But there is a component, the Joint Special Operations Agency (JSOA), that serves as the Joint Chiefs' focal point for special operations staff actions. That agency's mandate is to provide advice on all LIC issues and related military activities, from pertinent strategy formulation and planning to budgeting, readiness evaluation, and employment of forces.

Activated at the start of 1984, JSOA works primarily on psychological operations (PSYOP), research, development and acquisition, combating terrorism, and liaison with the Planning, Programming, and Budgeting System (PPBS). The agency was instrumental in launching a joint PSYOP master plan that is revitalizing military capabilities in this field through such short- and long-term enhancement programs as expansion of the Army's PSYOP battalions and substantial equipment improvements in the Air Force's PSYOP broadcasting aircraft, the EC-130E "Coronet Solo" assigned to the Pennsylvania National Guard. In the R&D sector, the agency helped initiate last year's Defense Science Board analysis of special ops-related communications, mobility, and general technology issues, with special emphasis on low-intensity conflict requirements.

In the hardware arena, the joint agency is working toward greater connectivity and interoperability of all military C^3I (command control communications and intelligence) systems of concern to special operations and low-intensity conflict. Included here are video compression and low data rate voice techniques to enhance the timeliness and reliability of communications.

In the field of terrorism and counterterrorism, JSOA provides liaison with the Vice Presidential Task Force Working Group on Terrorism and represents the Chiefs in efforts to sustain and enhance the Defense Department's counterterrorism capabilities. Recent testimony by the JSOA on the status of the SOFs acknowledges that they are "below" the threshold of what would repre-

The Air Force is modernizing nineteen HH-53 helicopters to a Pave Low III configuration (HH-53H) to overcome existing long-range-helicopter shortfalls.

Midget Subs for Terrorists?

Apprehension is mounting among US national security experts about the potential availability of midget submarines—some bargain-basement priced as low as $3 million per copy—to states and organizations sponsoring international terrorism. These small boats are being "marketed" by several European NATO countries as well as by Yugoslavia. The Soviet Union is also producing and operating midget submarines, but there is no evidence to suggest that Moscow has offered these devices to any states or organizations suspected of sponsoring terrorist activities. There is evidence, however, that the Soviets have equipped some of their large nuclear-powered submarines with the ability to transport and launch midget submarines in a surreptitious fashion while submerged.

Yugoslavia, on the other hand, according to well-placed sources, has trained Libyan nationals as well as Palestine Liberation Organization (PLO) personnel in the operation of midget submarines. None of the Yugoslav midget subs has yet been turned over to Libya or the PLO, according to these sources. The technical sophistication of the Yugoslav midget subs is thought to be impressive, on a par with or even better than their Soviet counterparts. Used in shallow water, subs of this type are thought to be essentially immune to detection by the Navy's antisubmarine warfare (ASW) techniques that are tailored to deep-water operations.

Midget submarines can be used for the infiltration of frogmen, minelaying, and the launching of torpedoes. Some midget submarines are known to be equipped with "closed-cycle engines," meaning that they can remain submerged for several days. US experts point out that in the hands of state-sponsored terrorists, midget submarines could wreak horrendous havoc, especially when used for minelaying and attacks on commercial shipping.

—E.U.

sent an "adequate" capability, but that the individual services are taking steps to correct shortfalls in both the force structure and the SOF-oriented hardware, especially so far as the ability to operate at night is concerned.

New Organizational Approaches?

Current congressional and executive branch enthusiasm for reorganizing both the civilian and military components of the Defense Department extends to the LIC and SOF level and has led to tentative plans for the creation of an Assistant Secretary for Special Operations slot in the Office of the Secretary of Defense as well as formation of a DoD agency dedicated to unconventional warfare.

General Hughes explained that, as part of the proposed Pentagon reorganization, there is talk about setting up a special LIC/SOF element for the Joint Staff, appointing a "super assistant secretary," and forming a special agency to handle these matters in a centralized fashion. The services, he emphasized, "are going to look at any reorganization idea in a balanced fashion, realizing that [the only valid measure of merit] is what is best for the country." The issue is not "what is best for any one organization," but how to deter terrorism or any other form of low-intensity conflict. To date, he said, the services have not yet reviewed the various proposals for organizational change in the LIC/SOF arena, but "I can say that such [an analysis] will get under way shortly. The results remain to be seen."

A senior civilian Pentagon official who asked not to be identified by name told AIR FORCE Magazine that the notion of creating a special service for LIC/SOF has currency on Capitol Hill, but is too radical and lacks sufficient support to reach fruition. At the same time, the idea of creating a special defense agency in charge of special operations and paramilitary activities is likely to be seen by the Central Intelligence Agency as an encroachment on its covert assets and activities. CIA resistance to such an organization, he suggested, would not be assuaged even if it were patterned after the agency in charge of clandestine national space assets that, although located within the Department of the Air Force, reports primarily to the Director of the Central Intelligence Agency.

Because of these factors, the prevailing, albeit tentative, bias in the Pentagon is toward the creation of a special deputy for LIC/SOF at the US Readiness Command, he claimed. Such an arrangement could include two Deputy CINCs, one for "white and other essentially overt operations" and the other for "black order of battle and covert mercenary matters." Subordinating unconventional warfare matters under a unified CINC not only would eliminate the need for a separate, special command but also might reduce the risk of a turf fight with the CIA, he added. The "black" deputy CINC, the official suggested, would have senior CIA staffers—along with representatives from such agencies as USIA—working with him. Embedding the unconventional warfare mission in a specific unified command rather than the "creation of a paramilitary agency" appears to be the most effective long-term solution, especially in terms of ensuring a harmonious working relationship with the CIA, he suggested. ■

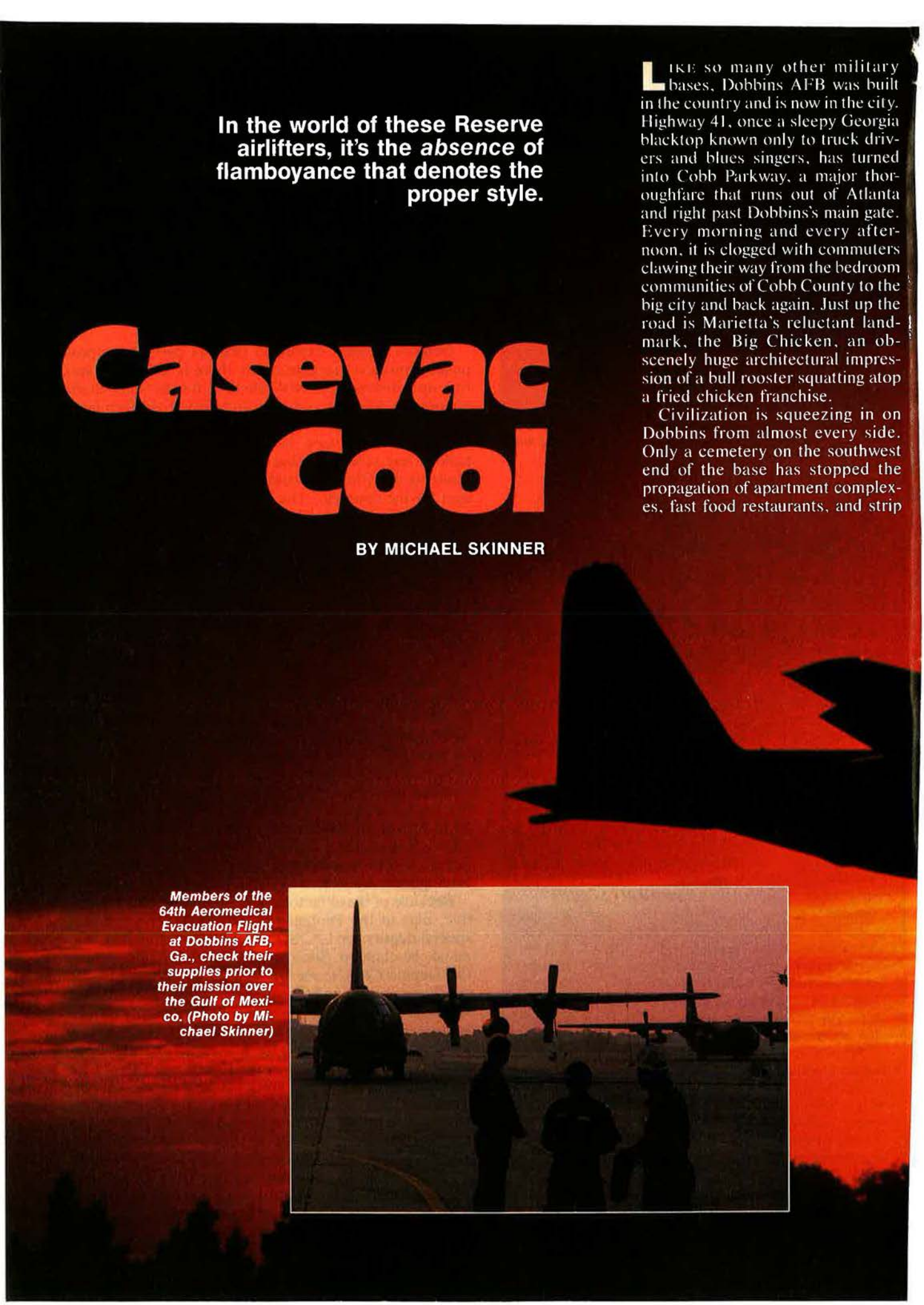
In the world of these Reserve airlifters, it's the *absence* of flamboyance that denotes the proper style.

Casevac Cool

BY MICHAEL SKINNER

LIKE so many other military bases, Dobbins AFB was built in the country and is now in the city. Highway 41, once a sleepy Georgia blacktop known only to truck drivers and blues singers, has turned into Cobb Parkway, a major thoroughfare that runs out of Atlanta and right past Dobbins's main gate. Every morning and every afternoon, it is clogged with commuters clawing their way from the bedroom communities of Cobb County to the big city and back again. Just up the road is Marietta's reluctant landmark, the Big Chicken, an obscenely huge architectural impression of a bull rooster squatting atop a fried chicken franchise.

Civilization is squeezing in on Dobbins from almost every side. Only a cemetery on the southwest end of the base has stopped the propagation of apartment complexes, fast food restaurants, and strip



Members of the 64th Aeromedical Evacuation Flight at Dobbins AFB, Ga., check their supplies prior to their mission over the Gulf of Mexico. (Photo by Michael Skinner)

shopping centers that have risen almost daily from the red Georgia clay. To the north, the green haunches of Kennesaw Mountain mark the frontiers of development. During the Civil War, Johnston dueled with Sherman across the Kennesaw to keep the Northern invaders out. Now, at sundown, the invasion heads the other way, as modern-day workers from the city journey north past Dobbins to their homes in the Piedmont.

Inside the perimeter, members of the Air Force Reserve's 700th Tactical Airlift Squadron are preparing for another kind of journey. Seven of the unit's eight new C-130H aircraft, all sporting the new European I tactical camouflage paint scheme, roost on the ramp next to Dobbins's 10,000-foot runway. In the fading autumn sun, the "lizard" paint jobs take on a somber cast, the grays and greens running together to give the illusion of seven solid little mountains in the shade of the Kennesaw.

Lots of Practice

Into the maw of one of the aircraft, airmen in olive drab load equipment—and each other. This flight is a casualty evacuation (casevac) exercise for the 64th Aeromedical Evacuation Flight. The Air Force has a philosophy of providing as much medical attention to battlefield casualties as quickly as possible. Studies have shown the attention given to a patient on his way *to* the hospital can have as much and in some cases more impact on his chances of survival than the care he gets *in* the hospital.

But it takes practice—lots of practice. Medicine is different at altitude. Pressure causes problems with coagulation and complicates the care of patients with respiratory problems. And, of course, most hospital staffs don't have to deal with a shaking, roaring, crowded aircraft.

So, with great regularity, the flight nurses and medical technicians of the 64th take to the skies to rehearse for war. Lacking any real casualties (the Air Force's passion for realistic training has not stretched to the point of inflicting injury just for the sake of verisimilitude), they practice on each other. There are about two dozen passengers on the flight. On the way out, half of them will play the part of battlefield casualties, feigning symptoms ranging from heart failure to mental disturbance. On the way back, they switch roles.

The passengers—those not strapped on stretchers rigged in the middle of the aircraft—buckle up on the long canvas benches for takeoff, slouching under the blood-red webbing that climbs up the sides of the

"Wheels come up, and a slow turn into the sunset sends red light glaring through the Herk's glass nose. . . ." Eva 02 begins its practice casualty evacuation (casevac) mission. (Photo by Erik Simonsen)

cabin like Georgia kudzu. Up front, the crew goes through the preflight checklist quickly, but without hurry. There's nothing perfunctory about it: the pilot, copilot, and flight engineer actually listen to one another, articulate the calls, and listen for responses. But they don't expect any trouble with the aircraft and don't find any. Dobbins ground crews are known for their proficiency.

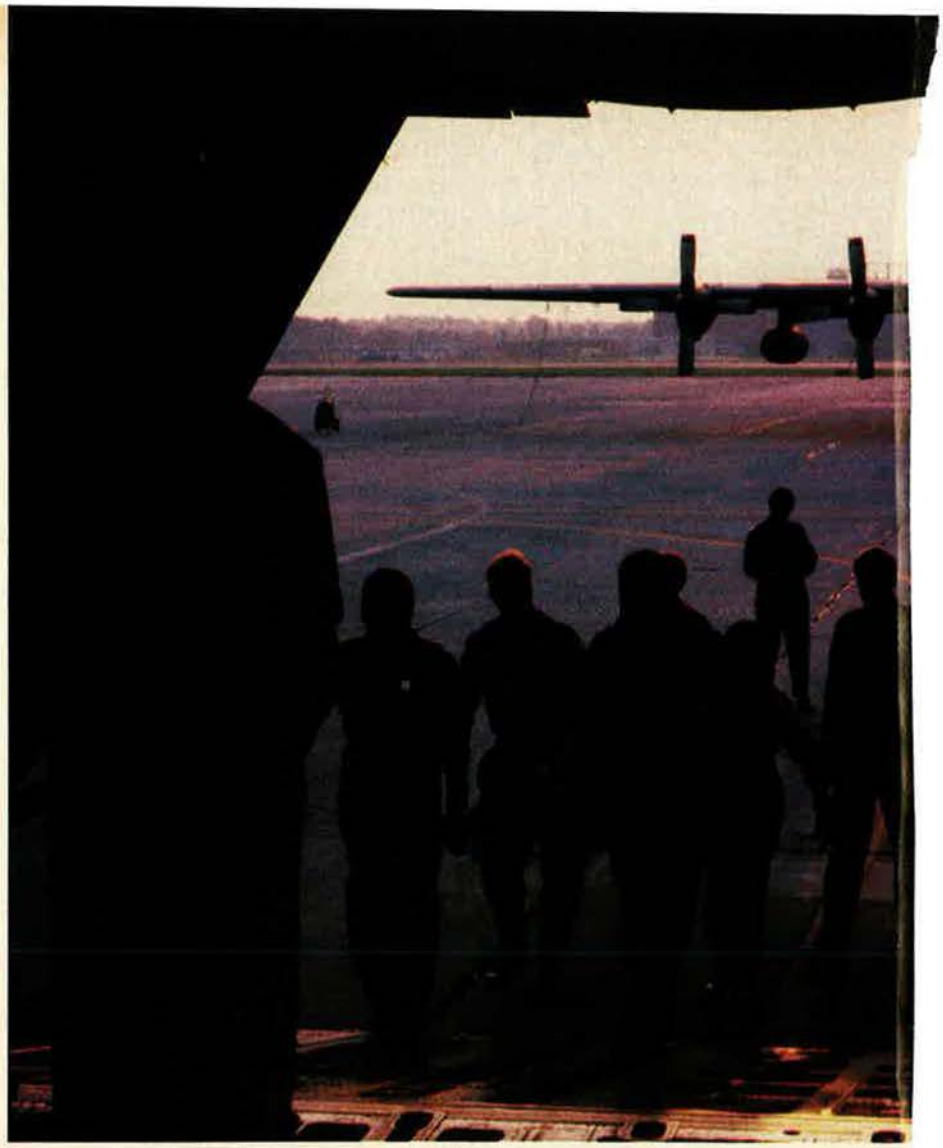
Biggest and Busiest?

The Hercules is soon rolling by Air Force Plant Six, the huge Lockheed facility where the C-130s are hatched. The C-5Bs are made here, too; there's the towering "cathouse" where the Galaxys' tails are grafted to the rest of the aircraft. The Air Force's fleet of C-141 StarLifters was also manufactured at Lockheed-Georgia, in the seventy-six acres of production floor space that make the place one of the largest aircraft manufacturing plants in the world.

Having the factory across the runway is convenient in a number of ways. For instance, in addition to ensuring that a good-sized pool of capable maintenance workers is available, its proximity means that the 700th had the shortest ferry trip in history when it became the first Reserve squadron to receive the new H-model Herky Birds.

The 700th isn't the only unit on the base with new aircraft. The 116th TFW of the Georgia Air National Guard is getting set to trade in their F-4s for F-15 Eagles. Dobbins is also home of the 700th TAS's parent unit, the 94th Tactical Airlift Wing (AFRES), and *its* parent unit, Fourteenth Air Force (Reserve).

There's also an Army National Guard unit (flying OV-1 Mohawks), an Army Reserve aviation unit (flying Huey choppers), a Marine Reserve aviation unit (flying OV-10 Broncos and Sea Cobra attack helicopters), and, as if that weren't enough, an entire Naval air station, complete with its own Reserve A-7 squadron. All of these aircraft cover a considerable amount of ground at the other end of Dobbins's interminable runway. Add to this total the anthill of ground organizations specializing in support, maintenance, security, communications, plant liaison, and just about everything else needed to keep the flying units flying, and it becomes apparent why the traffic on Dobbins's two miles of runway sometimes resembles the gridlock on Highway 41 just over the fence.



The whole thing has sent base public-affairs officers scurrying for statistics to support their belief that this must surely be the biggest and busiest base in the Reserve system. A couple of years ago, they counted an average of about 6,000 launches and recoveries a month. Since then, counting has been tough because of even greater volume.

Into the Sunset

Eva 02 is barely noticed as it lifts off the runway. Wheels come up, and a slow turn into the sunset sends red light glaring through the Herk's glass nose and streaming across the cockpit. Once out of the tentacles of the busy Atlanta air control system, the flight settles down to a steady, throbbing, chilly drone.

The mission is not a complicated one. It's a five-hour flight to nowhere, our destination an imaginary point above the Gulf of Mexico. One of the two navigators on board, a former F-4 WSO, needs some over-the-water navigational air squares filled, so he's spent most of the afternoon plotting a course that will take us across Alabama, past New Orleans, out over the Gulf, and back. The other navigator is an old C-130 hand, just along in case he's needed. As it turns out, the new guy has everything under control.

Where we're going is of no concern to the medical teams in back. They are, literally, along for the ride and are too busy to worry about where Eva 02 is headed. Any messages between the cockpit and cabin can be passed through the loadmaster slouched at the end of the starboard bulkhead. He is seemingly oblivious to the goings-on, yet quietly connected to the flight by means of a long IC umbilical.

Loaded up and ready to go, the medical technicians, nurses, and the "patients" for this exercise board the brand-new C-130H aircraft. Missions such as these provide invaluable experience for the Reservists. (Photo by Michael Skinner)

Some topics for cockpit chatter tonight are, in no particular order, the relative merits of Japanese vs. American cars, Air Force regulations, *Lifestyles of the Rich and Famous,* celestial bodies, Cajun food, and an account of a particularly harrowing exercise mission flying ammunition into an air base in the Italian Alps during a sudden and violent thunderstorm.

Far from being distracting, the conversation keeps the crew alert while Eva 02 drills four holes through the Gulf darkness. The whole thing may seem like a milk run, a flagpole mission. But it's an interesting flight for a couple of reasons.

Plastic-Spoon Pride

For one thing, these guys are the best in the world at what they do. And they've got a trophy to prove it. A team from Dobbins, representing the 94th TAW, took home first place in the most recent Volant Rodeo, a kind of Olympics for airlifters. They beat out thirty-three other entrants, including active-duty units, other Reserve and National Guard teams, and even a half-dozen foreign competitors.

But you wouldn't know it from their low-key manner. Fighter pilots make a big point of drawing the line between "jet jocks" and "trash-haulers," and, in truth, there *is* a big difference. In the fighter business, style is everything.

But with the transport pilots—and it took this writer a while to get a handle on this—it's the *absence* of flamboyance that determines the hipness quotient. Fighter pilots like to rehash the thrill and danger—real or imagined—of their latest exploit. But to the airlifter—even if he has just returned from delivering matchsticks to Hell—any mention of the mission in terms other than "nominal" or "routine" is considered bad taste. They like to be on time. They don't cotton to stress to the airframe or the aircrew. They're fans of safety, and they don't care who knows it.

Yes, they live in their own world, just as the fighter pilots do. And they share the potential of war and death with their faster brothers. If anything, the tactical airlift mission demands more glands than high CAP; most fighter pilots would *not* feel comfortable shoving an unarmed, extremely large aircraft over the rocks in maneuvers that many experts feel could not—or should not—be done. But whereas some fighter jocks try to boost their own egos at the expense of MAC drivers, the transport pilots signal their status by flaunting their complete disregard of what the zoomers may think of them.

Case in point: Consider the plastic spoon traditionally carried in the sleeve pockets of transport pilots, that universal focus of fighter pilot ridicule. The men of the 700th recently got chewed out for sporting the spoons—it didn't look good, said the old man; after all, we *are* champions, etc., etc. But what the CO didn't realize—and what the fighter pilots have never twigged on to—is that the plastic spoon is *never used.* The galley aboard a C-130 is about as extensive as your average recreational vehicle anyway, and certainly the life of the transport pilot, as seen by most fighter pilots—*i.e.,* an airline without stewardesses where one watches the autopilot instead of the in-flight movie—is pure fiction.

The plastic spoon *is* a symbol, but not in the way outsiders think. In the smooth, white spoons, all the manly derision of the fighter pilots is reflected back at them. "Go ahead," the MAC crews say, "have your fun. We don't even care what you think. Now, who's zooming who, ace?"

Depth = Total Force

The second point to be made can be summed up in one word: depth. The same factor that allows some professional football teams to make the playoffs year after year makes the American armed forces the strongest in the world. The Soviet Union has more planes, perhaps, and even more pilots. But they're not as good. And the aircraft and crews of other nations may be just as good as those in the US, but they don't have nearly as many of them. No other country in the world has as many good pilots and good planes as the United States.

Depth is just another word for Total Force. And that's what makes the flight of Eva 02 significant. It's not just this one mission. It's all the missions flown by this plane, and this crew, and all the other aircraft at Dobbins, and all the other American aircraft and crews all around the world.

Depth is not easy to come by. It's an expensive, sometimes dangerous, and not always exciting routine. But history has shown that depth wins wars. It can even help prevent them.

And that's what Eva 02 is doing above the Gulf of Mexico this autumn night, flying in formation with thousands of other unseen aircraft, filling their spot in the mosaic of Total Force. ■

Michael Skinner is an aviation writer and the author of three books: USAFE: A Primer for Air Combat in Europe, Red Flag: Air Combat for the '80s, *and* USN: Naval Operations in the 1980s. *His most recent contribution to* AIR FORCE *Magazine was "Bogies in the Night," which appeared in the February 1985 issue. Mr. Skinner is currently working on his first novel.*

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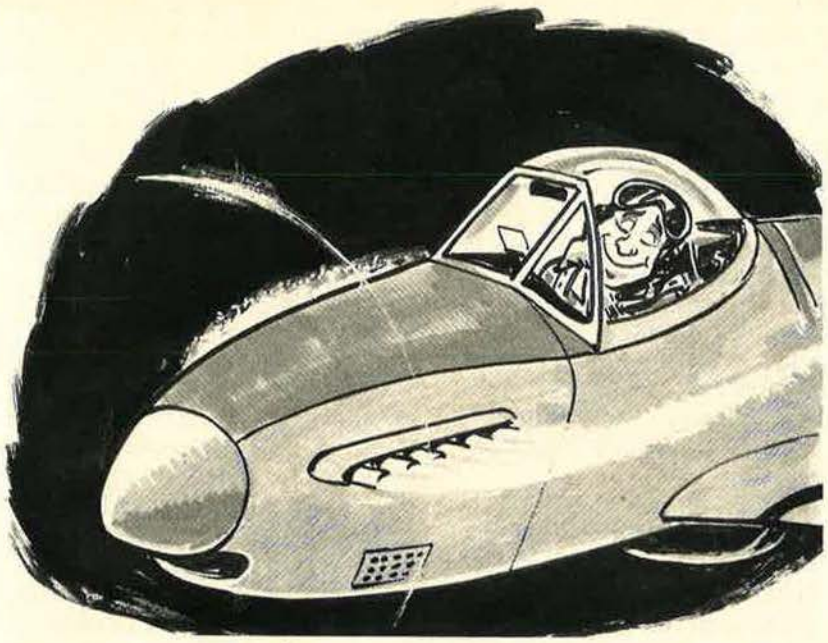

My Old Flame

—Illustrations by Bob Stevens

BY RICHARD EARL HANSEN

THAT old flame of mine was a sight to behold—sensuous but at the same time a comforting sight. She was robust, never quiet, always roaring with life. Most of the time she had a healthy sparkle. Actually, I liked her best when she was bright and glowing. Not only was she a dear friend, but you could even say we had the longest love affair going. She was my constant flying companion and incomparable company. On lonely night flights, I could take strength in looking over to see her there, so warmly reassuring. I thought she was irreplaceable. But she's mostly gone now, gone where old flames go, into fond niches in the memory. She was the beautiful exhaust flame from my old piston-banger airplane.

When she was good, she was very, very good. When she was bad, she was a depressing sight. In the good times, she glowed shades of blue. Actually, I liked her best when she was blue. In the bad times, she took on the distressing yellow pallor of a jaundice victim, which would make me suffer as well. Along with that unhealthy color came a puffing of blue clouds from the exhaust stacks, heralded by coughs and wheezes. When that happened, major surgery was usually indicated.

The exhaust flames on my most recent planes were all far to the stern. Even if I leaned way to the left against the cockpit glass, I couldn't see them. Those potentially comforting flames on my later aircraft were hidden by big nacelles, thick wingroots, or lean businesslike missiles hung on inboard pylons. The only reassuring sight, not in any way approaching the consolation I took from My Old Flame, was a neatly aligned row of exhaust-gas temperature (EGT) gauge needles all in the green. Those streaming cones of roaring blue fire are now mostly pilot's memories.

They are *literally* all behind us.

Some of those recollections are good. Some are not so good, bringing back sweaty palms and an involuntary tendency to pinch an imaginary parachute. A few of us hark back to the hurry-up days of frantically paced World War II pilot training. Flocks of fledglings leaped into the stygian night skies of the western plains. Two great imaginary lines were drawn across the dome of the sky, north-south and east-west, creating four black wedges of pie.

Each solo student was briefed to fly in his quadrant at a specified altitude and to stay there until he was called down. The first cadet off naturally went to the highest altitude and the last to the lowest as the intervening altitudes filled with milling students. "Go up and practice your night-flying technique" was the preflight instruction—the epitome of clipped pedagogical wisdom. The strange and funny part of it was that it worked most of the time!

Those nights when the system didn't work were the nerve-jangling times when the seat-pack chute got pinched and maybe even discolored. One night, a layer of puffy summer clouds drifted across the great pie segments in the Kansas night. The Great Pilot in the Sky had decided to give a No-Notice Check on our instrument flying skill. No one had briefed Him that, for most of us, that aptitude was next to nonexistent! He had waited until there were four student pilots in BT-13 Vultee Vibrators at every 500-foot level up to 9,000!

Noisy frequency caterwauling grew to a crescendo as every student concluded that *he* must be the one to call Ground to advise, "It's IFR up here!" The Supervisor of Flying, not adequately warned by the weather gurus, let a tiny bit of urgency creep into his voice. He boomed in an "All-Aircraft Message" to stay calm and remain at assigned altitudes and added that call-ins for landing would begin immediately. Those of us airborne who up until then had been staring hard into the unrelieved blackness to sort out blue exhausts from the stars were infected by the edgy quality in his voice.

It was probably the "stay calm" that did it. Within seconds, we heard two excited students calling in on final approach—at the same time! I won't say it was bedlam, but it was on the ragged edge. Over the radio came a new calmer voice stroking us with unctuous confidence. We heard the command passed aloft to stay at assigned altitude until called down. His fiction that the cloud layer was only an *isolated phenomenon passing through,* however, received mixed reviews.

We continued our orbits—mostly. When the puffy clouds enveloped me, blotting out the stars as well as the other blue flames and the few ranch lights below, I learned a lot about night instrument flying fast. Things were OK for a while. Suddenly, my very own cloud bloomed with a bright bluish light, creating an eerie glow in the vapor enveloping me. Could it be Him with a message? Would I hear distant trumpets next? There was no way to determine the source. But it was abruptly revealed to me! A gigantic BT-13 with a long trailing blue exhaust flame passed over me so close I could almost touch it! With it came a freight train roar. Inside the canopy, I ducked in a survival reflex response.

"Who the hell was that?" I bellowed into the cloudy night sky. Still shaking, I checked my altitude: OK. I checked my altimeter setting: OK. I checked my heading: OK. My ADF needle told me that I was outbound on my racetrack established on the station at the field. I grabbed for the mike to radio something, but sheepishly put it back, realizing that the culprit wouldn't reply anyway. He probably thought he was in the right place!

For insurance, I sneaked my altitude down 100 feet, hoping to stay under "that nut." I braced myself to hang on and wait for my descent call, strangling the stick with a steely grip. My nerves were still jittering upon landing, and I found that I was still pinching parachute even after I had stowed it on its hooks. At debriefing, nobody mentioned a close call, least of all me. After all, I wasn't *that* sure!

There were better times and more beautiful sights of My Old Flames. Some will remember the noisy short stacks of the North American B-25. The blue cones issuing from those arcs of cherry-red exhaust ports told me that all was well in those smoothly running engines.

In the Pacific, flying the Lockheed P-38, even in the daytime I could see the brightly glowing exhaust-gas-driven turbines of the superchargers. They lay near eye level, flat on the top of each boom behind the engines. By their color, they told me that the cylinders were getting their concentrated blast of air. And at night, that turbine wheel took on charcoal-forge hues ranging from saffron to magenta to plum red with feathering streamers of luminous blue flame—a dazzling and reassuring sight against the backdrop of a satiny black sky.

Many cohorts remember along with me the coughings and sputterings from the long rows of stacks on the North American P-51 while taxiing at idle. They showed few visible flames in daylight. But at night, each short, rearward-curved stack belched its own blue flame with occasional silvery sparks when surrendering carbon blew from the cylinder domes. You had to lean against the cockpit glass to see the

"A gigantic BT-13 with a long trailing blue exhaust flame passed over me so close I could almost touch it!"

exhaust in flight. But on the ground, taxiing that tail-dragger with the canopy slid back, your nose wrinkled at the acrid exhaust fumes. Those two rows of stacks were a blue blaze as you essed on the taxiway, leaning left then right to view the centerline around that looming monster of an in-line engine. A touch of nostalgia stirs me now and then for those growling, snarling, spitting recips. Their noisy, well-defined blue flames were visible assurances telling you that things were A-OK.

I also nurse recollections of my later years in the heavies, when the only flaming, sizzly-colored exhausts I got to see were those of my tanker or of companion Boeing B-47s or B-52s ahead of me in the cell. Some of those nights give me clammy hands even today. My first deployment as an instructor pilot in the back seat of a B-47 from McCoy AFB, Fla., to Sidi Slimane, Morocco, around 1960 was a memorable one. It might have been, like the previous ones, a routine (routine chaos) deployment if the awesome presence of the wing commander hadn't filled the front seat.

You remember that the B-47 had a fighter-type bubble canopy. Visibility from the IP seat in the rear was like trying to see a movie from behind a woman with a fussy hat. We were within ten or fifteen thousand pounds of completing our onload. Except for some rapid throttle transits, the boss was hacking the program. Out of the black came a warning. With more than a tinge of alarm in his voice, our tanker's boom operator advised that we were torching from four and six. The old J47 turbojet engine couldn't take too many idle to 100 percent cycles. It just took its time to spool up. If you hurried it, the beast would stall internally and spit a yellowish, spark-filled, blowtorch flame about the length of the fuselage. It would stubbornly refuse to put out thrust, and the EGT would soar toward unreal, bucket-throwing temperatures.

Well, the boss resisted with every fiber of his O-6 frame any backing off from the Boeing KC-97 piston-banger tanker he was clutching to his heart on this moonless night. I knew he was thinking that a few more pounds would do it. But if he didn't back off, he knew as well as I did that we'd burn up two engines and have to abort. We had to take a disconnect and back off from the tanker into the coal-bin night. The emergency red-bordered-pages drill was to pull the two torching engines back to idle, then slowly ease them forward to normal operating range. No way could that be done and stay on the boom! At heavyweight, we were wallowing around at next-to-stall to begin with.

"The B-47 had a fighter-type bubble canopy. Visibility from the IP seat in the rear was like trying to see a movie from behind a woman with a fussy hat."

The boss was reluctant, but fully understood the problem and my responsibilities as IP. What it meant was that he would have to sweat and stagger back into a hookup at near max gross weight and a few knots above stalling speed. Our tankers in this Mass-Gas formation refueling were pushing their aging recip engines at METO (maximum except takeoff) power with neat and proper blue flames blasting from four places plus two diminutive jets out on the wings. Those tankers were doing everything but pedaling to keep enough speed for us. I punched us off. The wing commander got a breather from his sauna-bath exercise in refueling while I took control to jigger the throttles on four and six to get their EGTs back to normal. To this day, I'll swear on a stack of Dash-Ones that those EGTs never crossed that upper temperature line into the red!

With proper thrust returned and the boomer reporting gorgeous blue cones of flame from all six J47s, my boss took over to challenge the back side of the power curve. He chased our tanker's lights for a few minutes, then wrestled the heavy, uncooperative bird back into a hookup. We took on the fuel to top our tanks so that we could make the night crossing of the North Atlantic. We were again—phew!—like the old Bing Crosby-Bob Hope song, Morocco-bound.

I don't relish thinking of two torching jet engines during refueling over the North Atlantic in an inky black night when I recall My Old Flames. There were more pleasant airborne memories, like the time I carried the USO showgirls in my Lockheed C-130 "Herk" from Hue Phu Bai to—well, another time!

I'll bet I've triggered a few of your recollections, too. And you've probably told a few of those tales when the birdmen gather at the local watering hole. Next time we rub elbows, you can tell me about Your Old Flame. ■

Richard Earl Hansen retired from the Air Force in 1977 as a lieutenant colonel after a thirty-five-year career. A command pilot with more than 6,000 hours, Colonel Hansen has flown a number of different aircraft, including P-38s in World War II, F-51s during the Korean War, B-47s and B-52s, and C-130s during the Vietnam conflict. Prior to leaving USAF, he served as Associate Editor of The Air University Review. *He is now a free-lance writer specializing in aviation and politico-military affairs.*

VIEWPOINT

The Airlift Shortage Continues

By Gen. T. R. Milton, USAF (Ret.), CONTRIBUTING EDITOR

Sufficient airlift is absolutely essential to any meaningful national strategy. But the options aren't limited to the extremes of building brand-new airplanes or doing nothing.

In July 1948, scarcely two weeks after the Soviets blockaded all of the land routes to Berlin, Secretary of Defense James Forrestal was a frustrated man. His attempt to get a statement of national defense policy, one that would determine the size, character, and composition of the nation's military forces, was rejected by President Truman, who brusquely told him to get the services together and come up with a program within the budget limits.

That was the year the Berlin blockade awakened Americans to the fact that, from the Soviet point of view, the Grand Alliance had simply been a liaison of convenience. It was also the year NATO came into being, marking the first time in US history the United States had pledged to go to war on someone else's behalf. The airlift, daily carrying thousands of tons to Berlin, signified the importance airpower would play in this new commitment. As Charles J. V. Murphy wrote in *Fortune* magazine that year, "The lift has been a stunning lesson for strategic airmen. It is now possible to move by air en masse from the continental US to any part of the world. Airpower is now capable of providing its own logistical system."

When he wrote those lines, Mr. Murphy was doubtless under the spell of Gen. William Tunner, the presiding genius of the airlift and an air transport zealot. Tunner truly believed the lessons of Berlin could be applied to our national strategy. Given enough large transports and a capability for the high utilization of those transports, he was right.

For a lot of reasons, principally budget priorities, military airlift continues to be inadequate for the role so confidently assigned to it thirty-eight years ago. So long as our commitments are stable and predictable, as they are in Europe, life goes on smoothly enough. The unanticipated emergencies are the ones that will find the airlift resources lacking. With the world going the way it is, some sort of trouble in a most inconvenient spot seems almost inevitable.

Budget priorities have done their share in limiting airlift capabilities, but there have been other contributing causes. One, it seems to me, is the tendency of the Air Force to complicate an essentially simple machine. Intercontinental air transports need not be designed to land behind the front lines on improvised runways. And as for designing them to carry the Army's heavy equipment, that has sometimes been an exercise in futility. No matter how large the airplane, the Army seems always to come up with something that won't fit. There has to be compromise as to what goes by air. An eminent, if ungrammatical, Confederate tactician, Nathan Bedford Forrest, urged getting there fustest with the mostest. He was unspecific about the composition of the mostest, but presumably he did not mean ponderous, slow-moving, heavy guns.

A capacity for high utilization, which is a way of making one air transport look like three, requires a heavy outlay in spares, including engines, and extra crews. But if a choice must be made between a new transport and providing the means for getting the most out of the present fleet, there is an argument, at least, against the new transport. The C-130, probably the most successful military transport airplane ever built, can do wonders as an intratheater hauler if it is properly supported. Furthermore, transport airplanes—while it would be nice, all things being equal—need not be state of the art. Better by far to have a lot of reliable old birds at high sortie rates than a handful of shiny new ones.

Our national strategy, beyond the now venerable commitment to NATO, is not entirely clear, although one thing is certain. We can contemplate neither a lengthy mobilization period nor leisurely deployments. Whatever may happen, whether in the Persian Gulf, the Pacific, or wherever, is probably going to be an emergency requiring airlift—and lots of it. The airlines constitute an important part of our airlift resources, but at the same time they have become the essential means of transport in the nation at large. It will take a very big emergency to divert any considerable number of commercial transports to a military mission.

The Berlin Airlift succeeded primarily because of high utilization. Pilots were recalled to active duty, fighter pilots were hurriedly retrained in transports, and administrative officers were unchained from their desks and plunked into cockpits. Almost the entire USAF was devoted, one way or another, to supporting the effort. Had anything else come up during that time, we would have had to rely on either the atomic bomb or some diplomatic fast talk.

The means of establishing a high-utilization military airlift capability are hard to come by, but the main ingredient, a sizable transport fleet, already exists. What seems to be lacking, in the enthusiasm for a new airplane, is a campaign to build that utilization capability.

All of which is not to indicate that I wish we had hung on to the Gooney Bird. With hard times ahead for the military budget, the problem now is once more one of priorities. Airlift is an absolute essential to any meaningful national strategy, but that doesn't necessarily have to mean either a new airplane or nothing. ■

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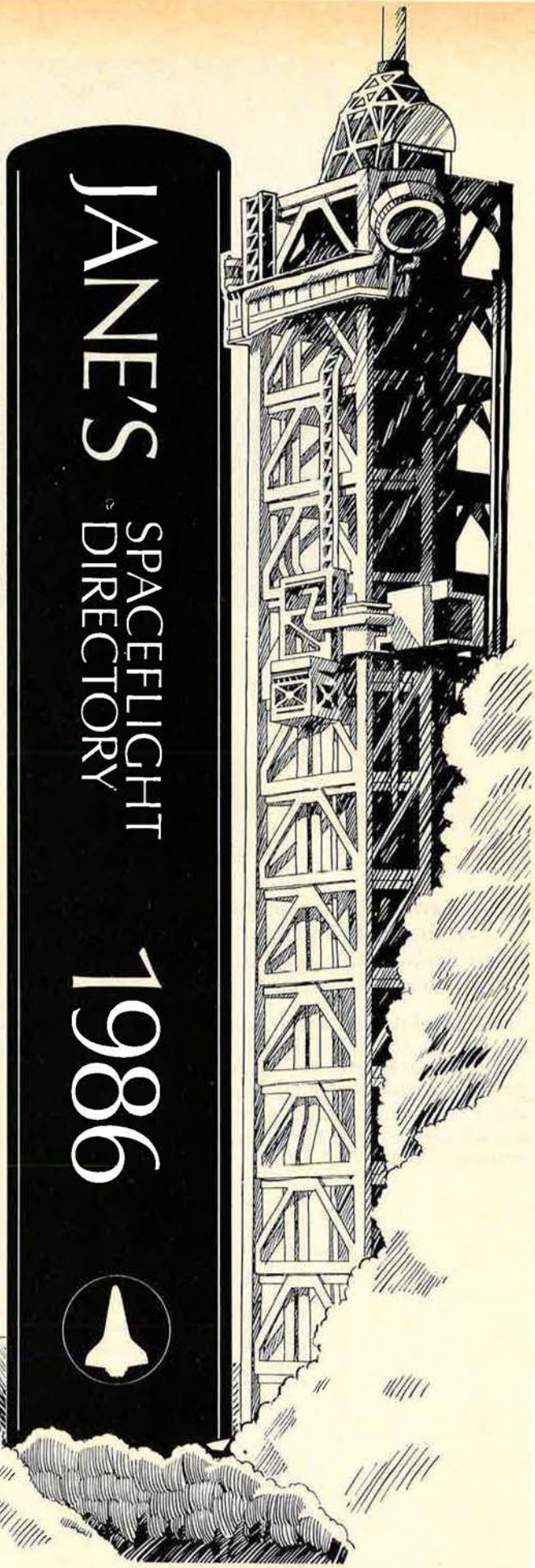

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AIRMAN'S BOOKSHELF

A Man for His Times

Black Eagle: General Daniel "Chappie" James, Jr., by James R. McGovern. University of Alabama Press, University, Ala., 1985. 224 pages with photos, notes, bibliography, and index. $22.50.

To be, one day, an aviator and a four-star general in the American military—few achievements could be more unimaginable for black youths growing up in the Deep South during the early decades of this century. Jim Crow ensured that blacks "knew their place," and coupled with the disadvantages of inferior school systems, black children had little reason to hope to reach the highest levels of military leadership. But Daniel James, Jr., the youngest of seventeen children born to Lillie and Daniel James, Sr., dared to pursue his dreams. He ultimately overcame every obstacle on his way to a truly historical achievement. *Black Eagle,* by University of West Florida Professor James R. McGovern, tells how Gen. "Chappie" James persevered against the odds to rise to the highest ranks of command in the US Air Force.

For most blacks, the South before the civil rights legislation and social changes of the 1960s was a repressive place to live. This was especially so in 1920, the year Chappie James was born. And even though his hometown of Pensacola, Fla., showed outward signs of racial progress—black-owned small businesses and two private schools—the inertia of a nation complacent in its racial inequality severely limited opportunities for its black citizens.

The author begins by sketching what life was like for the more than 1,000 blacks who lived in Pensacola in the 1920s. He describes how Chappie's ambition, hard work, and positive attitude toward education derived from his parents' attitudes. Daniel James, Sr., set the example of hard work by laboring in a municipal gas plant, putting in twelve-hour days for six days a week. He wanted his children to see him at work, so each of the James children took turns delivering home-cooked meals to their father at the plant.

But it was Chappie's mother who influenced him the most. Being a teacher herself, she believed in the advantages of a good education and pride in self. Author McGovern writes: "Lillie James knew from experience that blacks could make progress socially if they were educated and if they desired to improve themselves." Mrs. James, who ran a private school in her backyard, kept a watchful eye on the development of Daniel Jr. She stressed the need to excel at reading, arithmetic, and public speaking—three areas over which Chappie would demonstrate complete mastery throughout his life.

Mrs. Lillie's firmness and dedication to motivating students to succeed would stand Daniel Jr. in good stead when he matriculated at Tuskegee Institute, where he began the initial phase of his military career. At Tuskegee, Chappie learned to fly in the Civilian Pilot Training (CPT) program. He would later enter the Army Air Corps (AAC) cadet program and participate in the "Tuskegee Experiment."

The Tuskegee Experiment was the AAC's program to determine whether or not blacks could be trained as military pilots. Of course, the experiment was a resounding success, and many Tuskegee airmen went on to noteworthy careers. Among the first cadets to earn his wings at Tuskegee Army Air Field was Capt. Benjamin O. Davis, Jr., who later commanded the all-black 477th Bombardment Group and who finally achieved the rank of lieutenant general.

While commanding the 477th, then-Colonel Davis observed Chappie's performance both in and out of the cockpit. The latter displayed skill with a variety of aircraft and was admired by younger pilots, who often sought his advice. Off-duty, the irrepressible Chappie delighted in the limelight and the applause of an audience wanting to be entertained. He enjoyed singing and dancing. Author McGovern speculates that the stoic and conservative Davis must have wondered if Chappie "would ever really become a soldier."

Any doubts about James were put to rest by his outstanding performance during the Korean War. One of two black pilots assigned to the 18th Fighter Group based at Clark AB in the Philippines, James quickly demonstrated his professional ability as a flyer and officer. His likable manner, concern for others, and superior speaking skills won him the esteem and respect of his comrades. Chappie would again prove himself during the Vietnam conflict, firmly establishing his reputation as a leader.

Author McGovern notes that Chappie James's early aptitude for public speaking developed into a most valuable asset during his career. Chappie used his speaking ability to communicate with a generation of young people torn by the turmoil of the 1960s. His message of patriotism, excellence, and moderation was often an unpopular one during that turbulent era. But Chappie James seldom left an audience unconvinced that his message was valid and relevant.

Chappie James proved to be a man for his times. His promotion to four-star general and assignment to command the North American Air Defense Command (NORAD) was due as much to his professional abilities as to the times in which he lived. America in the 1960s and 1970s needed to be reassured that the system worked and that heroes were real. Chappie James proved both.

Black Eagle is a revealing work. Author McGovern brings Gen. Daniel "Chappie" James, Jr., to life, showing him as an American patriot, a crusader against segregation in the armed forces, and a devoted father. His biography is a testament to the durability of the American dream.

—Reviewed by Capt. Napoleon B. Byars, USAF. Captain Byars is Deputy Chief of the Civil Affairs Branch, Community Relations Division, Secretary of the Air Force Office of Public Affairs.

AIRMAN'S BOOKSHELF

NASM's Laser Library

National Air & Space Museum Archival Videodiscs 1 and 2, National Air & Space Museum, Smithsonian Institution, Washington, D. C. 20560.

Leaping headlong into the era of high technology, the National Air & Space Museum (NASM) has recently tasked itself with the creation of a system whereby those of us who are unable to frequent the world's finest aviation history collection on a regular basis can now literally buy a piece of it for our libraries.

In a marvelous stroke of genius, the NASM has funded a program that is designed to provide scholars, educators, researchers, and virtually anyone else access to the Museum's incredibly diverse collection of archival aerospace photographs—all without leaving the comfort of their office or home.

Ten of the state-of-the-art laser-scannable videodiscs are currently planned. Each disc, which is about the size of a conventional 33⅓ rpm record, contains some 50,000 images (*i.e.,* photos) per side, giving an average total of 100,000 images per disc!

The silver-colored discs consist of laser-etched metal foil sandwiched between two pieces of durable clear plastic. They are virtually indestructible. The actual images on the discs consist of microscopic analog etchings that can be translated at 1,800 rpm into visible imagery by the digital electronics of a videodisc player. Each image consists of some 525 lines of analog data, which amounts to about 26,250,000 lines on each side of each disc!

To view the photos contained on each disc, some modestly expensive but relatively commonplace video equipment is required. A black-and-white or color television hooked to a laser videodisc player are mandatory, and a remote changer control is a definite plus. (While researching the mandatory equipment list, this reviewer discovered that not all videodisc players have the ability to stop on individual frames; as this is an absolute must for viewing the NASM videodiscs, users should make sure that current equipment, or that which is being bought, has this capability.) With the proper equipment, users can run thirty frames, or photos, per second, or they can hold one frame for as long as they like. They can go forward, backward, stop, or scan—all in a matter of seconds.

The NASM has released two discs to date. Videodisc 1 was completed in August 1983 and contains 100,000 photographs of aircraft, both US and foreign, in alphabetical order by manufacturer. Videodisc 2, completed in May 1984, contains nearly 100,000 images of major air and space personalities. Videodisc 2 also covers additional aircraft not covered on the first disc as well as balloons, airships, commercial airlines, air meets, trophies, military aviation paraphernalia, aeronautical communications and other equipment, aerospace museums, philatelic covers, and models.

The first two discs represent awesome collections. If they are any indication of what is to come, the total ten-disc collection will be enough to keep a viewer busy for an incredible period of time. This reviewer, during one three-hour session, hurriedly skipped through approximately 10,000 images on Videodisc 1. Assuming that it would take ten times that long to view the entire disc, each disc would therefore require some thirty hours to peruse. All ten discs would require no less than 300 hours of viewing time!

Somewhat surprisingly, image quality is exceptionally good. Of course, individual results will be highly dependent on the quality of the television monitor being used, but on average, a viewer will have no trouble at all in determining a subject and many of its details. In many cases, such small items as serial numbers and registrations are readily discernible.

Fortunately, the NASM has seen to it that this massive collection is shipped with a complete listing of the contents of each disc. As the discs have no audio capability, each frame has been provided with an illuminated number (visible in the upper left segment of the viewing screen). With this, it is possible to look up an aircraft type in the listing and immediately flip to it by punching in its respective frame number on a videodisc player. Conversely, if a photo is unidentifiable to the viewer, the number can be referenced in the list.

For those who need a more tangible version of any of the images found on any disc, an actual photo reproduction can be bought from the Smithsonian by supplying the disc title and individual frame number to the Smithsonian's Office of Printing and Photographic Services. Additionally, special printers can be attached to some videodisc players. Hard copies of modestly good quality can be made in a matter of seconds.

In summary, this is the ultimate portable aviation still-photo reference library and one not to be bettered in the foreseeable future. Buy these discs—they're a bargain, and they'll almost certainly give you an excuse to buy that videodisc player you've always wanted but could never before really justify.

To purchase copies of the videodiscs, send a check or money order for $35 for each disc (plus $1.50 postage and handling) to the Smithsonian Institution Press, P. O. Box 1579, Washington, D. C. 20013.

—Reviewed by Jay Miller. Mr. Miller is Publisher for Aerofax, Inc.

New Books in Brief

Aircraft Design, by Ed Heinemann, Rosario Rausa, and Kermit Van Every. This book is an introductory guide to the basics of building airplanes, from the drawing board to the factory floor. The authors stress "fundamental simplicity" in designing aircraft and sum up this dictum in an inevitable acronym: KISS, or "Keep it simple, stupid!" Topics addressed include propulsion systems, flight controls and stability, and reliability and maintainability considerations. Coauthor Heinemann, "Mr. Attack Aviation," brings decades of aircraft design experience to bear in this enthusiastic guide for the layman. With illustrations, appendix, glossary, and index. The Nautical & Aviation Publishing Co., Baltimore, Md., 1985. 152 pages. $24.95.

Winged Samurai: Saburo Sakai and the Zero Fighter Pilots, by Henry Sakaida. Difficulties of language and the Japanese penchant for self-effacement have conspired to leave untold much of the story of the air war from the Japanese perspective. Author Sakaida here tries to fill that gap by telling the story of one of Japan's premier fighter pilots, Saburo Sakai. Sakai, who was credited with nearly sixty aerial victories, saw action in China in the late 1930s and continued in the cockpit up to the home defense of the Japanese mainland in August 1945. With Sakai's assistance, author Sakaida plumbs the records on both sides of the Pacific in bringing the reader this zesty tale of war from the other side. With illustrations. Champlin Fighter Museum Press, Mesa, Ariz., 1985. 160 pages. $14.95.

INDUSTRIAL ASSOCIATES OF THE AIR FORCE ASSOCIATION

Listed below are the Industrial Associates of the Air Force Association. Through this affiliation, these companies support the objectives of AFA as they relate to the responsible use of aerospace technology for the betterment of society and the maintenance of adequate aerospace power as a requisite of national security and international amity.

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VAC-HYD/Interturbine Companies
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V. Garber Int'l Associates, Inc.
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Western Gear Corp.
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The Los Angeles gala recalls airpower in a pivotal decade and generates money for scholarships and education.

The Thirties Meet the Eighties

BY JAMES A. McDONNELL, JR.
MILITARY RELATIONS EDITOR

THE 1930s—the decade in which America's military airpower began to come of age—was the theme for the 1985 Los Angeles Air Force Ball held last October at the Century Plaza Hotel.

Some 1,200 guests, including Air Force and Air Force Association leaders, representatives of AFA's Aerospace Education Foundation, and Southern California society officials, gathered for the black-tie charity gala that generates funds for the Aerospace Education Foundation and for Scholarships for Children of American Military Personnel (SCAMP). Last year, $81,000 was raised for each of these charities, the largest single donation ever made to either.

The program commentary by television personality Lorne Greene emphasized the development in the 1930s of the airpower tactics and equipment that would, in the next decade, help win World War II. It was a time, he noted, when "the Army Air Corps was beginning to flex its muscles," citing the competition in the early 1930s for a new multiengine bomber as one example. This competition brought forth an entry by Boeing that featured a four-engine design—the Model 299, which, in 1935, became the B-17.

Air Force leaders and their spouses who attended the Ball included military cohosts Lt. Gens. James E. Light and Forrest S. McCartney, Air Force Chief of Staff and Mrs. Charles A. Gabriel, Under Secretary of the Air Force and Mrs. Edward C. "Pete" Aldridge, Jr., and numerous others.

AFA and AEF representatives included Foundation President George D. Hardy, AFA Chairman of the Board and Mrs. Edward A. Stearn, AFA President and Mrs. Martin H. Harris, as well as many other local and national leaders.

Mr. Stearn, who also serves as President of SCAMP, presented the $3,000 scholarship awards with the assistance of television performer Richard Anderson to the four (of the eight) 1985 recipients in attendance. Another eleven awards will be made to past recipients to allow them to continue their academic careers. SCAMP scholars receive funding until graduation so long as they maintain their academic standing.

Susan M. Wright, a graduate student at the University of Connecticut, was the first recipient of the newly designated Martin M. Ostrow Graduate Scholarship Award, named in honor of the man who founded SCAMP and who was a past AFA national president, the late Martin M. Ostrow.

Other highlights of the evening included a special presentation by "The Moods in Blue," an ensemble of the USAF Academy Band. Sen. Barry M. Goldwater (R-Ariz.) was Honorary Chairman of the Ball, and George F. Moody, President and CEO of Security Pacific Corp., served as General Chairman.

This year's Air Force Ball will take place in Los Angeles on the evening of Friday, October 31. ■

USAF Chief of Staff and Mrs. Charles A. Gabriel (left) visit at the 1985 Los Angeles Air Force Ball with AFA President and Mrs. Martin H. Harris. Some 1,200 guests gathered at the Century Plaza Hotel in Los Angeles for the charity gala that generates funds for AEF and SCAMP.

On hand for the Los Angeles Ball were (from left to right) Air Force Under Secretary Edward C. "Pete" Aldridge, Jr., Mrs. Lorne Greene, television personality Lorne Greene, and Mrs. Aldridge. In his commentary, Mr. Greene emphasized the growth and development of airpower in the 1930s.

SCAMP Scholars

This year's attending SCAMP winners, all children of USAF members, were:

- Sherry J. Uyeyama, Austin, Tex., daughter of former POW Col. (then-Capt.) Terry J. Uyeyama, POW from 1968–73.
- Kurt C. Friehauf, Fort Collins, Colo., son of Capt. Charles H. Blankenship, KIA, July 1967.
- Susan M. Wright, Storrs, Conn., daughter of Maj. David I. Wright, KIA, November 1970.
- Christopher D. Marshall, Winter Park, Fla., son of 1st Lt. James A. Marshall, MIA, June 1965.

Those not able to be present included Sheila C. Butler, Calistoga, Calif., daughter of Air Force 1st Lt. William W. Butler; Michael J. Ehrlich, Baltimore, Md., son of Navy Lt. (j.g.) Dennis M. Ehrlich; Christine B. Hess, Arlington, Va., daughter of Air Force Maj. Frederick W. Hess; and Sherri J. Rex, Provo, Utah, daughter of Air Force 2d Lt. Robert A. Rex.

his year's SCAMP scholars receive congratulations from Edward A. Stearn, right, CAMP President and AFA Chairman of the Board. The scholars shown here are, from ft to right, Kurt C. Friehauf, Susan M. Wright, Sherry J. Uyeyama, and Christopher D. arshall. Each of these young people received a $3,000 scholarship award, as did ur others who were not able to be on hand for the presentations.

A Tale of Two Texans

The Mathis brothers, two extraordinary bombardiers, left a legacy of heroism to the men of the Eighth Air Force.

BY JOHN L. FRISBEE
CONTRIBUTING EDITOR

THE winter of 1943 was a grim one for Eighth Air Force bomber crews. The weather was unspeakable. Combat losses were higher than anticipated, the flow of replacements excruciatingly slow. Statistically, a crew had one chance in five of completing its twenty-five-mission tour, and the odds weren't likely to improve right away.

Toward the end of January, the Eighth had begun to hit targets inside Germany itself, far beyond the range of escort fighters in early 1943. By that time, the Luftwaffe had concentrated more than 300 fighters in the west and was rapidly building to a force of 600 planes.

Gloomy though the picture might seem, it wasn't enough to dampen the irrepressible good humor of Lt. Jack Mathis, a bombardier from San Angelo, Tex., assigned to the 303d Bombardment Group. Besides, it was mid-March; winter was almost over. And his bombardier brother, Mark, who had just landed in the UK for duty with another group, was on the way to visit Jack at Molesworth, where the 303d was stationed. It would be a great reunion for the brothers—veteran Jack who had been flying combat missions for nearly five months and new-boy Mark, about to begin what Jack considered the greatest of all adventures.

On March 18, 1943, two days after Mark arrived at Molesworth, the 303d took part in the unescorted 100-plane mission against German submarine yards at Vegesack on the Weser River, a few miles northwest of Bremen. Jack, in *The Duchess,* was lead bombardier of the 359th

One of the Mathis brothers, Jack, a B-17 bombardier, became the first airman in the ETO to earn the Medal of Honor.

Squadron. Their route to target was over the North Sea to the island of Helgoland, thence south to Vegesack.

All went well until the turn at Helgoland, when hell broke loose as fifty to sixty enemy fighters bored in on the formation, continuing their attacks until the B-17s began their bomb run. Then the threat changed from fighters to intense, accurate antiaircraft fire.

A heavy flak shell burst just ahead of *The Duchess,* tearing up the nose of the bomber. Shell fragments shattered Jack Mathis's right arm above the elbow, tore a gaping hole in his side and abdomen, blew off his oxygen mask, and hurled him to the rear of the bombardier's compartment. With the lead bombardier out of action only seconds from the target, the chance of a successful attack was slight, and Jack Mathis knew it.

Fighting shock, pain, and the sure knowledge that he was dying, the mortally wounded bombardier dragged himself back to his bombsight, clinging to a slender thread of consciousness until the run was completed and his bombs released. His last word before he died was, "Bombs . . . " The squadron, dropping on Jack's release, put its bombs squarely on target for a perfect strike.

Lt. Jack Mathis was the first airman in the European theater to earn the Medal of Honor for his heroism on that bitter March day in 1943.

When *The Duchess,* bearing Jack's body, landed at Molesworth, it was met on the ramp by Mark Mathis. The quiet, serious Mark had been close to his ebullient brother. There was one thing he could do to avenge Jack's death. He could replace his lost brother on *The Duchess* crew.

Mark asked the 359th Squadron commander, then Lt. Col. William R. Calhoun, to arrange his transfer to the 303d Group. Colonel Calhoun worked the transfer, but not to the crew of *The Duchess,* which was scheduled to return to the States.

A few weeks after Mark joined the 303d, his B-17 was shot down by enemy fighters over the North Sea. Some members of the crew were seen to bail out, but Mark stayed with the doomed bomber. According to one report, his gun in the nose of the Fortress was still firing at enemy fighters just before the B-17 crashed into the icy waters. Colonel Calhoun remembers the writing of that second letter to the parents of the Mathis brothers as the saddest moment of his war.

The heroism of the Mathis brothers became legendary in Eighth Air Force—an inspiration to the thousands of airmen who followed them in the skies of wartime Germany. Now, more than forty years later, those two intrepid Texans are still remembered when the Bombardier Alumni Association meets each year to renew old friendships and to honor its wartime heroes.

AFA INTERCOM

By Robin L. Whittle, AFA DIRECTOR OF COMMUNICATIONS

AFA Regions Sponsor Conference

Taking advantage of their proximity and long-standing cooperation, AFA's Northeast and New England Regions are sponsoring their first joint leadership conference. Over the past several years, the Northeast Region had sponsored such a conference singlehandedly.

"Site selection and program planning are begun right after the previous conference, so many of the basic elements are in place early. New England has since provided input for the program and will participate as an equal partner in the conference," said Jack Kruse, conference founder and AFA's National Vice President for the Northeast Region.

This first joint conference will be held March 14–16 at the Nichols Village Inn in Clark Summit, Pa. Ken Graves, associate professor of photography at Penn State, will be on hand to help AFAers develop better photo-taking skills, and representatives from Toastmasters International will provide tips on public speaking. Other conference speakers include Dave Noerr, AFA Assistant Executive Director for Field Organizations, who will speak on "Chapter Problems—Problem Chapters," and Robin Whittle, AFA Director of Communications, who will give a presentation on "Effective News Releases and Chapter Promotion." AFA National President Marty Harris or Board Chairman Ed Stearn will provide banquet remarks.

"A unique feature of this conference will be the photo contest we are sponsoring. Conferees are being encouraged to bring their cameras and to put into practice tips they will learn on taking good photos," said New England Region National Vice President Arley McQueen. Following the conference, participants in the photo "shoot-out" will be asked to send their best photo to a panel of judges. The panel will select a winning photo, which will subsequently be featured in this section of AIR FORCE Magazine.

To honor the late Gen. Jerome F. O'Malley, AFA's Langley Chapter commissioned this bas-relief study of the former TAC Commander. Pictured (from left) are Cyd Player, the sculptor, AFA National Vice President H. B. "Buzz" Henderson, Virginia State Vice President (Southeast Region) Don Anderson, and Ray Bottom, Langley Chapter Executive Council member.

Those honored at AFA's Athens Chapter's first annual awards banquet last December included Capt. Steve Talton, Company Grade Officer of the Year; SMSgt. Thomas Galliher, Senior NCO of the Year; TSgt. Millie Borelli, NCO of the Year; Lt. Col. Richard Erikson, Chapter President; TSgt. Patricia Hawkins, STEP Promotion to Master Sergeant; Col. Benjamin F. Fruehauf, Community Service Award; MSgt. Brenda Williams, First Sergeant of the Year; Kenneth Herzig, Civilian of the Year; and SrA. Steven Robinson, Airman of the Year.

Briefing Team Addresses Eugene Community

The Air University's National Security Briefing Team addressed the Eugene, Ore., Rotary Club on December 3, thanks to arrangements made by former Eugene Chapter President Harry Hance.

Col. Calvin Johnson, who heads up the briefing team, gave a twenty-minute, slide-illustrated talk comparing Soviet and American military capabilities and told the audience that his mission was "to open your minds to some new arguments and to try to show a balance of what these debates are on national security issues."

Drawing on his twenty-five years of experience in the Air Force, Colonel Johnson declared, "I can say that in my personal opinion the United States military is in the finest shape it has ever been in its history." But while morale is high in the Air Force, he said the Soviet buildup of military forces is a concern "because in the past fifteen years, there has been an unprecedented buildup of Soviet forces to where we could now say that the mili-

tary balance of power has been tipped in the Soviet direction since about 1981, we figure."

The well-publicized event was co-sponsored by AFA's Eugene Chapter, the Navy League, Pearl Harbor Survivors, the Eugene Defense Education Committee, and the Rotary Club.

INTERCOM

Participants at the Northwest Regional Conference toured the Air National Guard hangar at the Portland (Ore.) International Airport as part of the two-day conclave.

In a letter of thanks to Eugene AFA leader Harry Hance, Colonel Johnson said in part: "Your itinerary, media listings, and scheduled news conference . . . made my travel and briefings extremely easy. . . . My compliments on the turnout, interested audience, and media coverage. . . . You have a strong and organized group of folks. I hope, after our discussion of how we prepare and brief, that you will call on us again."

The National Security Briefing Team was created in 1983 to inform the public about complex national security issues. It is composed of six officers who represent the faculties of the Air Force's top professional military education schools: Squadron Officer School, Air Command and Staff College, and Air War College. Participation is an additional duty for the six.

"There are two benefits from this team," Colonel Johnson said. "First, we share the information we teach at our schools with the American public. Second, and perhaps most important, we bring the public's thoughts and perceptions about the state of their nation back to the very people who protect it."

In other Oregon AFA activities, National Vice President for the Northwest Region Phil Saxton reports several developments. A nuclear-free-zone ordinance was defeated on December 18 at a hearing of the Portland City Council. AFA leaders turned out for the hearing and voiced their concerns. Dr. Clayton Gross, former AFA National Vice President for the Northwest Region and a past Oregon AFA president, participated in a debate at Sunset High School about American involvement and interest in Central America. Also, several AFA leaders were preparing for "Nuclear Awareness Week" activities at Clark College in late January as this issue went to press. Topics included the pros and cons of nuclear proliferation and testing, limited nuclear war, disarmament, and the Strategic Defense Initiative.

SDI Director Addresses Luncheon

AFA's Spirit of St. Louis Chapter teamed up with the Advertising Club of Greater St. Louis to sponsor a luncheon that featured SDI Director Lt. Gen. James A. Abrahamson as speaker. The event was held last December at the Marriott Pavilion Hotel.

General Abrahamson predicted that a decision on whether or not to build a strategic defense system could be made as soon as the early 1990s because of faster technical success than had been predicted.

In comparing Soviet and American strides in what he preferred to call a "space shield," General Abrahamson said the Soviets were probably ahead of the United States in developing a neutral-particle beam weapon—an accelerator that shoots a stream of hydrogen atoms. The Soviets also have larger facilities than does the United States for research into chemical laser beams and have been experimenting with that technology since 1980, he said.

The United States has had success with the development of a "rail gun," a weapon that fires a five-pound p[r]oject[ile] that has been accelerated thro[ugh] series of electromagnetic fields. [The] goal is to have the pellet travelin[g] 50,000 mph when it strikes a miss[ile], he told luncheon attendees.

In a test, a chemical laser has been used to destroy a Titan missile booster in one second. The goal, according to General Abrahamson, is to hit two, three, or four targets in one second.

He predicted that America will build

Dale Shellhorn, B-1B avionics system chief engineer (center), and James J. Selis, B-1B visual systems chief engineer (right), both of the Boeing Co., were the speakers at the Greater Seattle Chapter's recent "B-1B Night." With them is Chapte President Bob Eisenhart.

a powerful electron laser by 1990. A recent experiment in Hawaii proved that the beam can be fired through the atmosphere, despite atmospheric interference. It would then reflect off a mirror in space that would direct the beam at the target.

"We are doing experiments in pointing," he said, and compared the accuracy required to having a mirror on top of a building in Los Angeles direct a beam to a target about the size of a door on a building in New York.

Noting America's advantage over the Soviets in making and using advanced computers, General Abrahamson said a new computer already in use is only about six feet square and could do 15,000,000 operations each second. Computers are possible today that are a few inches square and that can be hooked up in parallel to process billions of operations per second.

As to cost, General Abrahamson said, "My answer is that I can't give an honest and responsible answer in 1985 for a program that is to be decided sometime around 1995."

The event received excellent local newspaper coverage, according to Missouri AFA President Orville Blair, who also reports that the state AFA sponsored the attendance of local Arnold Air Society and AFJROTC cadets at the luncheon.

On the Scene

Portland, Ore., was the site for the Northwest Regional Conference in mid-November. The Conference included presentations by **Craig Lindberg,** AFA Director of Field Operations, and **Ben Catlin,** AFA Assistant Executive Director for Manpower and Reserve Affairs . . . Greater Seattle Chapter officials sponsored "B-1B Night" with **Dale Shellhorn,** Boeing B-1B offensive avionics system chief engineer. Mr. Shellhorn discussed a number of issues, including how the $20.5 billion program is providing the American taxpayer with full value at a fixed price. **James J. Selis,** Boeing B-1B visual systems chief engineer, followed up with an overview of the technology base for computer-generated imagery and Boeing's contribution in the simulator field, reports **Al Lloyd,** Washington AFA Vice President and Communications Director.

"Everywhere I go I see a rekindling of patriotism. I see Americans feeling good about America again. . . . The fact is, the great young people who are getting into the Air Force today are a reflection of a much healthier society than we saw ten years ago," CINCSAC **Gen. Larry D. Welch** told the sell-out crowd at the Red River Valley Chapter's annual fish fry held recently in Grand Forks, N. D. Citing the need to progress with strategic modernization while getting the most from every dollar, General Welch told the community gathering that the Air Force is committed to identifying and correcting any pricing mistakes. Horror stories about overpriced items are only part of the story, he said. "These mistakes are being discovered by Air Force people whose job it is to find those kinds of problems. They were fixed by Air Force people because it is our job to do that," General Welch stressed. USAF saved $500 million in 1984 by making spare parts purchases through competitive bidding. The Air Force matched that figure in 1985 and expects to save at least $600 million in 1986, he said. North Dakota AFA leader **Maury Rothkopf** reports that General Welch enjoyed a good turnout.

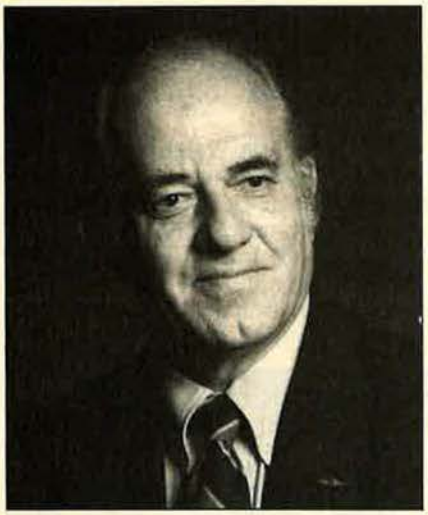
Maj. Gen. Sloan R. Gill, Chief of Air Force Reserve (right), recently presented a $2,500 check to AFA's O'Malley Memorial Trophy Fund. The fund finances two AFA awards honoring the late Gen. Jerome F. O'Malley and his wife, Diane. Accepting the check is AFA Executive Director Russell E. Dougherty and Aerospace Education Foundation Managing Director Ken Goss (center).

"Gen. Jerome O'Malley was a staunch supporter of Air Force Reserve and our programs. He really believed in the Total Force," said **Maj. Gen. Sloan R. Gill,** Chief of the Air Force Reserve, in presenting $2,500 to AFA's General O'Malley Memorial Trophy Fund. This money came from individual contributions that were motivated by sincere, heartfelt appreciation for what General O'Malley, TAC Commander, and his wife, **Diane**—both tragically killed in an aircraft accident last year—often did to help, General Gill said. The fund supports the Gen. Jerome F. O'Malley Award for the Reconnaissance Crew of the Year, which was presented for the first time last year to an SR-71 crew deemed by the Chief of Staff to be the best in the entire Air Force. Majs. Robert F. Behler and Ronald D. Tabor from the 9th Strategic Reconnaissance Wing at Beale AFB, Calif., were honored at AFA's 1985 National Convention. The fund also supports the Diane M. O'Malley Award for the Angel of the Year, which honors an Angel Flight member who best exemplifies the dedication and accomplishment of all Angel Flight members.

"The Air Force Association believes in peace," wrote Carl Vinson Memorial Chapter member **Dan Bullard** in the monthly column on AFA that appears in the Warner Robins *Daily Sun*. "To achieve and maintain that peace, the Association is committed to ensuring we have a strong military force. Costly? Yes. However, if that is what it takes to provide our men and women with the best equipment in the world in keeping peace, then it's worth the price. War costs much, much more. . . ." he wrote. The column was submitted by **Phil Odom,** Vinson Chapter Communications Director.

AFA's 1986 policy book is making the rounds in communities and district congressional offices thanks to the efforts of a number of active AFA leaders. South Indiana Chapter President **Marcus Oliphant** distributed copies to seven Greene County high schools, the Indiana University AFROTC detachment, local AFJROTC units, and to the district offices of the Indiana congressional delegation. Cleveland Chapter President **Leo Johnson** ordered a dozen for local

Far West Region—Where Superla



Richard C. Doom was AFA's Vice President for the Far West Region through September 1985.

Maj. Gen. Aloysius Casey, Commander of AFSC's Ballistic Missile Office at Norton AFB, Calif., makes a point about the Peacekeeper missile program to San Bernardino Area Chapter President Frank DePhillipo (left) and Rep. Jerry Lewis (R-Calif.) at the Chapter's Ballistic Missile Program Recognition Program.

Stretching fro[illegible]e crests of the Rocky Mountains[illegible]nds of the Mariana Islands and[illegible]e Cascades to the Rio Grande, t[illegible]Vest Region, the largest of AFA's tw[illegible]gions, spans a quarter of the globe's[illegible]mference.

Its thirty [illegible]ters are spread across four states—Ariz[illegible]a, California, Nevada, and Hawaii—plu[illegible]an unincorporated US territory, the is[illegible]nd of Guam in the Marianas.

The region's geographical size is matched by the size of its AFA population (about 40,000), which also makes it the most populous of the twelve regions. In fact, one of its four states—California—has a larger AFA membership than ten of the twelve regions, exceeded only by the region it is part of and one other. The Far West Region also contains the largest number of major Air Force installations (nineteen).

The region is dynamic—its AFA membership and number of chapters continue to grow each year. During 1985, a new chapter was added in Arizona, and formation of another was begun in Hawaii. When this chapter is chartered, Hawaii will qualify as an AFA state organization.

The Far West Region's programming, communications, and education efforts are widespread, diverse, and effective. The region is an important part of the nation's aerospace industry and is rich in its history. The Air Force and the Air Force Association are proud of the Far West's past, its current role, and its expanding future.

—By Dick Doom, Past National Vice President/Far West Region.

Arizona

The Grand Canyon State is developing rapidly as an AFA stronghold, reports 1985 President Meryll M. Frost. The state's five chapters have done an outstanding job in carrying out a full schedule of programs in 1985, and these programs have had a favorable impact on membership. This year, Arizona exceeded 100 percent of its membership goal.

The state AFA, in conjunction with the Tucson Community Foundation, established an endowment fund that will be used to provide scholarships for Air Force ROTC and JROTC programs.

The Green Valley Chapter, chartered in January 1985, is supporting the new and only Titan II missile site museum. The Chapter will provide docents to instruct visitors on the historical importance of the Titan II missile in our national defense and also volunteers to man the gift shop.

An effort is under way to establish another new chapter in Sierra Vista.

California

California AFA, led in 1985 by David Graham, has the largest membership (approximately 24,000) of any state in the nation as well as one of the largest complements of chapters (nineteen). California, which contains one of the largest concentrations of Air Force installations of any state (eleven), is the heartland of the country's defense industry. California's effectiveness and importance to AFA are demonstrated by its selection as AFA's outstanding state organization for the second time in four years.

The California AFA convention is a major event that consistently attracts top Air Force and Defense Department officials who participate in national defense symposia that are covered extensively by the news media. National AFA's prestigious Air Force Ball is strongly supported by the California organization and has proven to be a consistent drawing card for top names in the defense, industrial, political, military, and entertainment fields. Proceeds from the Ball are divided between Scholarships for Children of American Military Personnel (SCAMP) and AFA's Aerospace Education Foundation. *(See also "The Thirties Meet the Eighties," p. 120 of this issue.)*

In 1985, California AFA organized a campaign among its chapters to fund individual Doolittle Fellowships for the eight past and present Chief Master Sergeants of the Air Force. This successful campaign resulted in a letter of commendation from the National AFA Executive Director and expressions of gratitude from the eight recipients.

Phil Copeland, California AFA's Education Committee Director, rallied local AFA people to help the Air Force ROTC unit at Cal-State San Diego resolve a facilities problem. Their efforts resulted in a university decision to refurbish an abandoned gymnasium building for ROTC use.

California AFA, in cooperation with the Los Angeles Unified School District, sponsored "A Day With Wings" in 1985. This was the largest and most recent of a number of aerospace education programs put together by the state organization and its chapters. Hundreds of California teachers have attended these workshops and are now using aerospace education materials in their classrooms.

s Abound

Two major annual events that have become popular regional traditions are the General Robert F. Travis Chapter's Vacaville Air Fair and the Fresno Chapter's Gathering of Warbirds Air Show. Both events are important AFA publicity vehicles in Northern California. An average of 12,000 people attends the Travis Air Fair each year; the Fresno show draws about 25,000. Both events receive extensive media coverage. Thousands of dollars in proceeds go to airpower-oriented and related causes.

Four California chapters conduct charity golf tournaments that are also major fund- and profile-raisers for AFA. These tournaments have become annual traditions in their areas and include events sponsored by the San Bernardino Area, Riverside County, General Robert F. Travis, and General Curtis LeMay Chapters.

In Los Angeles, the Air Power Chapter annually sponsors a well-attended Salute to the USAF Space Division that features prominent Defense Department speakers. The General Doolittle Chapter sponsored the USAF Band at the Los Angeles Dorothy Chandler Pavilion last year in an event that drew 2,600 people. The General Robert F. Travis Chapter holds periodic legislative roundtables with the area's US congressmen on key AFA concerns.

California's San Bernardino Area Chapter, in cooperation with local civilian and business communities, organized a Ballistic Missile Recognition Program at Norton AFB. Improvements were made to the grounds of the headquarters building of the new Ballistic Missile Office, and a missile heritage park was established there. A recent Chapter fundraiser featured Congressman Jerry Lewis as speaker. The Antelope Valley Chapter cosponsored an awards banquet with the Lancaster Chamber of Commerce. The banquet featured political commentator Bruce Hershensohn, who discussed the Soviet threat.

Elsewhere, the Redwood Empire Chapter held a "Salute to Youth in Blue" dinner, hosting thirty-seven cadets representing two ROTC detachments, a Civil Air Patrol unit, an Air Force JROTC unit, and ten present and future cadets of the Air Force Academy. The Chapter also led a successful effort to retain an Air Force JROTC unit at a local high school that had planned to drop the unit. The David J. Price/Beale Chapter set up a booth during Guest Day at Beale AFB, distributing AFA literature and membership applications. Chapter members also led forty-five cadets on a tour of NASA's Ames Research Center at Moffett Field.

Nevada

Although it is a sparsely populated state of fewer than a million people, Nevada has two active chapters with a combined total of more than 1,700 members.

Under the direction of President Vern Frye, the Nevada state organization hosted a Far West Region conference in Reno. Maj. Gen. Aloysius Casey, Commander of AFSC's Ballistic Missile Office, Norton AFB, Calif., briefed attendees on the Peacekeeper program. The state convention was held in Tonopah in May.

Nevada AFA assisted TAC in its civic outreach program by arranging for Brig. Gen. Alan P. Lurie, Commander, 836th Air Division, to speak to the Reno Rotary in September.

The Thunderbird Chapter in Las Vegas meets periodically with local civic leaders and presents Air Force briefings on defense-related subjects. A major project was its successful effort to establish an engineering school at the University of Nevada at Las Vegas. AFA awards and complimentary memberships were presented to Nellis AFB airmen and AFJROTC cadets at an Air Force Birthday Dinner hosted by the Chapter. Maj. Gen. Peter W. Odgers, Commander, Air Force Flight Test Center, was featured as dinner speaker.

The Dale Smith Chapter in Reno saluted the Nevada Air National Guard at a dinner attended by the state governor and the adjutant general, among others. The Chapter is sponsoring a scholarship program for dependents of Air National Guard personnel; two scholarships have been awarded to date. The Chapter also held a "Washington Report" dinner, with Brig. Gen. Gerald C. Schwankl, Air Force Competition Advocate General, as speaker.

AFA is alive and well in the Silver State and proud to be a part of the Far West Region.

Hawaii

Hawaii Chapter President Don J. Daley may have the most enviable locale in the nation for an AFA chapter. Yet the relaxed ambience of the island paradise is no deterrent to AFA activity. On the contrary, Mr. Daley is using it to advantage by inviting vacationing VIPs from the mainland to appear at Chapter events. Brig. Gen. Charles E. "Chuck" Yeager, USAF (Ret.), and former Secretary of the Air Force Verne Orr number among distinguished speakers at Chapter functions.

Mr. Daley held a meeting with Kona Coast residents regarding the formation of a new chapter on the Big Island of Hawaii and got support from the First Hawaiian Bank to produce public-service newspaper ads and TV spots highlighting the social contributions of US military personnel in Hawaii. Public response has been positive.

Guam

The Arc Light Chapter on the island of Guam helps to lend AFA an exotic flavor. The Chapter is active, despite the 7,000 miles between it and the mainland. The distance sometimes makes communications difficult, Chapter President Lee Webber reports, but is no real deterrent to AFA activities. The Chapter has more than 650 military and civilian members on this island of 100,000 people.

The Arc Light Chapter is the only active AFA unit named after an actual air combat operation. The B-52s based at Guam's Andersen AFB flew Arc Light missions over Vietnam during the conflict in Southeast Asia. Those and the Linebacker II sorties over Hanoi were instrumental in forcing the North Vietnamese to negotiate.

MSgt. Robert E. Jordan, Jr., receives the Air Power Chapter's NCO of the Year Award from Chapter President Dave Carmer during the annual "Salute to Space Division" program.

This Is AFA

The Air Force Association is an independent, nonprofit, aerospace organization serving no personal, political, or commercial interests; established January 26, 1946; incorporated February 4, 1946.

OBJECTIVES: The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principle of freedom and equal rights for all mankind.

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Dover, Del.

Information regarding AFA activity within a particular state may be obtained from the Vice President of the Region in which the state is located.

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Los Angeles, Calif.
Victor R. Kregel
Dallas, Tex.
Karen M. Kyritz
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Bellevue, Wash.
Russell E. Dougherty
(ex officio)
Executive Director
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Arlington, Va.
Rev. Richard Carr
(ex officio)
National Chaplain
Springfield, Va.
CMSgt. Richard Williamson
(ex officio)
Chairman, Enlisted Council
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(ex officio)
Chairman, JOAC
Offutt AFB, Neb.
Steven T. Hiss
(ex officio)
National Commander
Arnold Air Society
West Lafayette, Ind.

distribution; National Director **Art Kelly** did the same. Tennessee AFA President **Jack Westbrook** sent copies to **Sens. Albert Gore, Jr.** (D-Tenn.), and **Jim Sasser** (D-Tenn.), while former New Jersey AFA President **Gil Freeman** sent copies with personal letters to the New Jersey congres-

INTERCOM

For their part in the successful ASAT test last September, Robert N. Parker, President of LTV Aerospace's Vought Missiles & Advanced Programs Division (right), and Gen. Lawrence A. Skantze, AFSC Commander (left), were honored with Ira Eaker Fellowships in AFA's Aerospace Education Foundation. Also honored with Eaker Fellowships were Col. Brock T. Strom, ASAT Program Manager at AFSC's Space Division [illegible] and the rest of the ASAT team.

egation. Mr. Freeman sub- received personal letters e calls from **Sen. Frank berg** (D-N. J.), **Sen. Bill** (D-N. J.), **Rep. James Courter** J.), **Rep. Dean Gallo** (R-N. J.), **. Jim Saxton** (R-N. J.), **Rep. Matew J. Rinaldo** (R-N. J.), and **Rep. Marge Roukema** (R-N. J.). Texas AFA leader **George Weinbrenner** also covered San Antonio with copies of the policy book.

Rep. Tommy Robinson (D-Ark.) was the featured speaker at the David D. Terry Chapter's recent meeting at Little Rock AFB . . . "Water will be the most critical issue facing the Middle East in the next decade, topping current conflicts among warring religious factions and acts of terrorism," predicted Air Force Academy instructor **Lt. Col. William A. Mitchell,** an expert on Turkey and the Middle East. Colonel Mitchell spoke at a luncheon meeting of AFA's Colorado Springs/Lance Sijan Chapter recently. The event was covered by a reporter for the Colorado Springs *Sun,* **Rosanne Simborski,** who quoted Colonel Mitchell as saying that ninety-nine percent of Saudi Arabia, ninety-seven percent of Egypt, and ninety-five percent of Israel is desert, along with seventy percent of Iraq and fifty percent of Syria. He also

pointed out that the Israeli-occupied West Bank holds forty percent of the water for the area and that Syria and Turkey are now building dams. "Water really means survival, and its unavailability will make countries very vulnerable to military attack," he said. Given the potential for fights over water resources, negotiating for water "will be one of the most critical issues the Middle East has ever faced."

Soviet military capabilities was the topic addressed by **Lt. Col. Harry Sunderland,** Air Force Chief of Public Affairs for the Midwest Region, at a recent joint meeting of AFA's Chicagoland-O'Hare Chapter and the local Armed Forces Communications and Electronics Association (AFCEA). Copies of *Soviet Military Power—1985* were distributed at the meeting.

"If we are to enjoy peace in this world, we must be prepared to go to war," said **Brig. Gen. Joseph K. Stapleton,** Deputy Director of Operations for US Readiness Command based at MacDill AFB, Fla. At a meeting of AFA's Florida Highlands Chapter that commemorated National Pearl Harbor Remembrance Day, he noted that "readiness depends upon several vital elements: providing modern weapon systems and effective logistics, attracting quality people and ensuring they are well trained, exercising our units to keep them proficient, and using our reserve forces to the fullest extent in partnership with their active-duty counterparts." In other news, Florida Highlands Chapter President **Roy Whitton** reports that the Highlands Independent Bank has become the Chapter's fourth Community Partner. The Community Partner plaque was accepted by bank representative **Grant Simmons.** Mr. Whitton also announced that **Roy M. Amos** of Lake Placid, a World War I veteran and former Army Air Service flight instructor, had been made an honorary member of the Florida Highlands Chapter, joining another World War I flyer, **Lowell Allen** of Sebring. Former First Sergeant **Ray McKinley** of Largo, who helped **Glenn Miller** put together the famed Maj. Glenn Miller Air Force band of World War II, is also a Florida Highlands Chapter honorary member.

INTERCOM

At 10:30 a.m. on December 4, AFA National Director **Howard Strand** was surprised by a totally unexpected call from Turkey. The caller, in broken English, asked Mr. Strand what he thought about the Strategic Defense Initiative. "After I gave him my views, I asked where he got my name and telephone number. He told me it was from the November 1982 AIR FORCE Magazine," Mr. Strand said, adding, "It's not every day one of us gets a call from Turkey, especially because of a three-year old copy of AIR FORCE Magazine!" ■

UNIT REUNIONS

Air Weather Service
The Air Weather Service will hold a reunion on May 2–4, 1986, in Cocoa Beach, Fla. **Contact:** Col. Hyko Gayikian, USAF (Ret.), 510 S. River Oaks Dr., Indialantic, Fla. 32903. Phone: (305) 723-4777.

American Ex-POWs
The American Ex-Prisoners of War of S[illegible]

lags Luft Four and Six will hold a reunion on July 18, 1986, in Jackson, Miss. **Contact:** Leonard E. Rose, 8103 E. 50th St., Indianapolis, Ind. 46226. Phone: (317) 546-1860.

Bradley Field
World War II veterans who served at Bradley Field, Conn., will hold a reunion in April 1986. **Contact:** Helen F. Snyder, 1463 Boulevard, West Hartford, Conn. 06119. Phone: (203) 561-3096.

McCoy AFB Personnel
Personnel assigned to McCoy AFB, Fla. 306th and 321st Bomb Wings and 4047th Strategic Wing), are planning to hold a reunion this fall in Orlando, Fla. **Contact:** Col. William G. Walker, Jr., USAF (Ret.), 500 Lake Catherine Dr., Maitland, Fla. 32751.

2d Bomb Wing Ass'n
Members of the 2d Bomb Wing will hold a reunion on May 14–18, 1986, in Shreveport, La. **Contact:** Lee Herridge, 16975 Encino Hills Dr., Encino, Calif. 91436. Phone: (818) 986-4071. Lee Lockwood, 1440 Sherwood Forest Blvd., Baton Rouge, La. 70815. Phone: (504) 272-0246.

6th Bomb Group
Members of the 6th Bomb Group will hold a reunion on August 28–31, 1986, in Omaha, Neb. **Contact:** Newell W. Penniman, Jr., 6 Porter Lane, South Hamilton, Mass. 01982. Phone: (617) 468-2806.

7th Photo Group Ass'n
The 7th Photo Group will hold a reunion on July 3–6, 1986, at the Antlers Hotel in Colorado Springs, Colo. **Contact:** Claude Murray, 1933 E. Marshall, Phoenix, Ariz. 85016. Phone: (602) 274-5871.

Coming Events

April 27–May 1, **AFA's Gathering of Eagles—1986,** Las Vegas, Nev. . . . May 16–17, **Oregon State Convention,** Portland . . . June 6–7, **Tennessee State Convention,** Tullahoma . . . June 6–8, **Idaho State Convention,** Boise . . . June 7, **Alaska State Convention,** Fairbanks . . . June 20–22, **Florida State Convention,** Cocoa Beach . . . June 20–22, **Ohio State Convention,** Cincinnati . . . June 26–27, **New Jersey State Convention,** Cape May . . . July 18–20, **Pennsylvania State Convention,** Wilkes-Barre . . . July 25–26, **Indiana State Convention,** Fort Wayne . . . July 25–26, **Texas State Convention,** Wichita Falls . . . August 9–10, **Arkansas State Convention,** Fort Smith . . . August 15–16, **New York State Convention,** Rome . . . August 21–23, **California State Convention,** Riverside . . . September 15–18, **AFA National Convention and Aerospace Development Briefings & Displays,** Washington, D. C. . . . September 19–20, **Washington State Convention,** Tacoma.

19th Bomb Group Ass'n
The 19th Bomb Group will hold its reunion on September 1–6, 1986, at the Westin Hotel In Denver, Colo. **Contact:** Jim O'Day, 6132 S. Cherrywood Circle, Littleton, Colo. 80121. Phone: (303) 979-2500.

20th Fighter Group Ass'n
Members of the 20th Fighter Group will take a trip to King's Cliffe, England, on June 5–13, 1986, and will hold their reunion on October 12–15, 1986, in Fort Lauderdale, Fla. **Contact:** Jack Ilfrey, 1520 Mossrose Lane, New Braunfels, Tex. 78130. Phone: (512) 629-0391. John Hudgens, 409 University Ave., Apt. 108-S, Lubbock, Tex. 79401. Phone: (806) 763-5576.

38th Repair Squadron
The 38th Repair Squadron of the 38th Air Depot Group will hold a reunion in October 1986. **Contact:** Charles O. Sulkala, 808 Neponset St., Norwood, Mass. 02062.

45th Bomb Squadron
The 45th Bomb Squadron stationed at Smoky Hill/Schilling AFB, Kan., has scheduled its reunion for August 1986 in Salina, Kan. **Contact:** Lyle Gauby, 1111 Dover Dr., Salina, Kan. 67401. Phone: (913) 823-3803.

47th/479th Service Squadrons Ass'n
Members of the 47th and 479th Service Squadrons will hold a reunion on May 2–3, 1986, at the Howard Johnson's Fountain Park Hotel in Kissimmee, Fla. **Contact:** Carl Bevis, P. O. Box 203, Madison, Fla. 32340. Phone: (904) 973-6532.

65th Troop Carrier Squadron
The 65th Troop Carrier Squadron will hold a reunion on July 30–August 3, 1986, in Indianapolis, Ind. **Contact:** Bud Hawkey, 106 Union Dr., New Madison, Ohio 45346. Phone: (513) 996-3851.

F-84 Pilots
F-84 pilots of the 7th Fighter-Bomber Squadron (later renamed the 428th Fighter-Bomber Squadron) will hold a reunion on April 27–May 1, 1986, at the MGM Grand Hotel in Las Vegas, Nev., during the "Gathering of Eagles" event. **Contact:** Randy Presley, Box 1238, Mount Pleasant, Tex. 75455.

90th Bomb Group
The 90th Bomb Group will hold a reunion on April 17–20, 1986, at the Woodlake Hotel and Convention Center in Sacramento, Calif. **Contact:** William M. Martin, 3784 Garnet Rd., Pollock Pines, Calif. 95726. Phone: (916) 644-5116.

99th Bomb Group
Members of the 99th Bomb Group will hold a reunion on June 27–29, 1986, in Dayton, Ohio. **Contact:** Ernest Gentit, P. O. Box 398, Bryan, Ohio 43506. Phone: (419) 636-3959.

304th Fighter Squadron
Members of the 304th Fighter Squadron will hold a reunion in June 1986 in Louisville, Ky. **Contact:** Tracy P. Little, 3011 Westover St., Shreveport, La. 71108. Phone: (318) 635-2426.

INTERCOM

306th Bomb Group Ass'n
The 306th Bomb Group will hold a reunion on September 11–13, 1986, at the Holiday Inn-South in Dayton, Ohio. **Contact:** Jack Grimm, 5085 Morelawn Ct., Apt. 8, Centreville, Ohio 45429.

362d Fighter Group
Members who served with the 362d Fighter Group are invited to a "Get Reacquainted Rally" on April 28, 1986. **Contact:** Ray Breckle, 2101 Sandy Lane, D4, Las Vegas, Nev. 89115. Phone: (702) 459-3690.

364th Fighter Group
Members of the 364th Fighter Group will hold a reunion on September 18–20, 1986, in Dayton, Ohio. **Contact:** Dan Leftwich, 6630 Caldero Ct., Dayton, Ohio 45415. Phone: (513) 890-3641.

388th Bomb Group Ass'n
A memorial monument dedication will be held in England on May 17, 1986, at Station 136 (Knettishall Air Field), the former base for members of the 388th Bomb Group. All 388th Bomb Group personnel or attached units are invited. **Contact:** Edward J. Huntzinger, 1925 S. E. 37th St., Cape Coral, Fla. 33904. Phone: (813) 542-4807.

393d Bomb Squadron
The 393d Bomb Squadron will hold a reunion on March 21–22, 1986, at Pease AFB, N. H. **Contact:** Capt. Randy Nunley, USAF, 393d BMS/DOT, Pease AFB, N. H. 03801. Phone: (603) 430-2171.

556th Bomb Squadron Ass'n
The 556th Bomb Squadron, 387th Bomb Group, has scheduled a reunion for September 25–28, 1986, in Las Vegas, Nev. **Contact:** Paul R. Priday, 7755 Harriott Rd. Plain City, Ohio 43064.

Flying Control Vets Ass'n
I would like to hear from flying controllers of Eighth and Ninth Air Forces who worked in any flying control tower in the European theater of operations during World War II.

Please contact the address below.
Lou Dubnow
1189 Galesmoore Ct.
Westlake Village, Calif. 91361
Phone: (805) 497-1964

Troop Carriers
I would like to hear from former troop carriers for the purpose of planning a reunion.

Please contact the address below.
Robert J. De Maria
3895 Chinchilla
Las Vegas, Nev. 89121
Phone: (702) 458-8039

Eagle Watch

Watch this space each month for notes of interest on the activities planned for AFA's Gathering of Eagles and the people who plan on attending this spectacular event. The Gathering, to be held in Las Vegas, Nev., from April 27 through May 1, 1986, promises to be the aerospace event of the decade—an event you'll not want to miss!

Air Force-oriented groups have responded well to our call to gather together and celebrate the fortieth anniversary of the Air Force Association. Twenty-two groups are now gearing up for the fantastic events AFA has scheduled, and many more are planning their own events to share in the spirit and camaraderie of the Gathering. In addition to those groups listed in last month's issue, the following affinity groups plan on joining us at the Gathering.

Class 41, USMA
Col. B. C. Andrus
505 Hidden Valley Rd.
Colorado Springs, Colo. 80919

UPT Class 52-G
Mr. Randy Presley
Box 1238
Mt. Pleasant, Tex. 75455

94th Bomb Group
Mr. M. Hal Kowal
3 Sugar Hill Rd.
Smoke Rise
Kinnelon, N. J. 07405

362d Fighter Group, 9th AF
Mr. Bill Marles
2838 Bluebrick Dr.
Nashville, Tenn. 37214

368th Fighter Group
Mr. Marvin Rosvold
600 S. 13th St.
Norfolk, Neb. 68701

Night Fighters Association
Solemene and Associates
3316 Oak Grove
Dallas, Tex. 75204

If you belong to one of these groups, we urge you to join them during the Gathering of Eagles. For more information on those groups attending the Gathering, call Rick Harris, AFA Headquarters, (703) 247-5800.

See you in Las Vegas!

The Spirit of Anne Morrow Lindbergh

SOME of the most famous aircraft in history are on display in the galleries of the National Air and Space Museum in Washington, D. C. Experimental jets, exemplifying America's high-technology achievements, and canvas-covered biplanes, more a test of an aviator's mettle than a triumph of mechanical design, inspire as much interest in the aviators as in the aircraft. Yet few visitors get the chance to meet the pilots of these historic airplanes.

Last December, however, friends and supporters of the Aerospace Education Foundation were given such a rare opportunity. The Foundation's Chairman Emeritus, Gen. Jimmy Doolittle, hosted the 1985 Doolittle Salute at the museum, standing just a few feet from the Lockheed Sirius flown by the evening's guest of honor on pioneering flights with her husband, Col. Charles A. Lindbergh. Too often overshadowed, Anne Morrow Lindbergh's own accomplishments as a flyer were recognized and applauded by General Doolittle and his guests.

"There's no one quite like Anne Morrow Lindbergh," her friend Amelia Earhart once said. "Under her gentleness lies a fine courage to meet both physical and spiritual hazards with understanding."

The Lindberghs, with Anne flying as copilot, navigator, and radio operator, surveyed thousands of miles of commercial air routes in the single-engine Lockheed dubbed *Tingmissartoq* ("The Man Who Flies Like a Big Bird") by an Eskimo boy in Greenland. In 1931, they set out in the Sirius to demonstrate the feasibility of the Great Circle route to the Orient. For the flight, which would take them from Maine, over Alaska and Siberia, and on to China, the aircraft was equipped with pontoons and the aviators with electrically heated flight suits.

Charles Lindbergh characterized the flight as "more dangerous than his original Atlantic solo." Flying where no airplane had flown before, the trip tested Mrs. Lindbergh's skills as a navigator and radio operator. "We never knew where we would land," she said. "You were counting on nobody but yourselves."

Mrs. Lindbergh's book, *North to the Orient,* gives a full account of their 10,000-mile journey. An acclaimed author, Mrs. Lindbergh has written thirteen books.

In 1933, the Lindberghs flew their Sirius, equipped with a new, more powerful engine, on the last of their great survey flights. In five months they logged 30,000 miles. The trip took them from the United States to Greenland, northern Europe, west Africa, South America, and back home. On the sixteen-hour leg from the Azores to Brazil, Mrs. Lindbergh would again prove her worth as a crew member by sending a record number of radio transmissions.

At the Doolittle Salute, with the *Spirit of St. Louis* hanging in the background, Mrs. Lindbergh told the guests, "Tonight I feel so moved by the whole occasion and so moved by past history, I really feel rather speechless. Except, I feel among friends, and I feel that very strongly, because General Doolittle was a great friend of my husband."

General Doolittle and Aerospace Education Foundation President George D. Hardy presented Mrs. Lindbergh with a gold watch bearing the seal of the United States Air Force. Mr. Hardy said he hoped the watch would be "an eternal reminder to you of our respect, affection, and appreciation for your contributions to aviation and the free world."

General Doolittle and Mr. Hardy also invested Mrs. Lindbergh as a Doolittle Fellow. The fellowship was sponsored by AFA's Charles A. Lindbergh Chapter, Westport, Conn.

The Doolittle Salute and other projects of the Foundation are made possible in part by the contributions of Corporate Jimmy Doolittle and Ira C. Eaker Fellows *(see box).*

Several other individual fellowships also were presented that evening. The Officers' Wives' Club of Washington, D. C., sponsored the Hon. Clare Boothe Luce as an Ira C. Eaker Fellow. Oklahoma aviation luminary Clarence E. Page was sponsored as a Doolittle Fellow by Maj. Gen. Jess Larson, USAF (Ret.), and Harold C. Stuart.

—BY MARK MOORE

Honor Roll of AEF Corporate Fellows

Corporate Jimmy Doolittle Fellows

(in order of affiliation)

John M. Olin Foundation *(twice)*
Northrop Corp. *(twice)*
General Dynamics Corp.
Mutual of Omaha Insurance Co.
Vought Corp.
Martin Marietta Aerospace
Boeing Co.
United Technologies Corp.
Garrett Corp.
Fairchild Industries
McDonnell Douglas Corp.
General Electric Foundation
Hughes Aircraft Co.
Textron, Inc.
Lockheed Corp.
Ford Aerospace & Communications Corp.
Loral Corp.
American Telephone & Telegraph Co.
Hughes Helicopter
MITRE Corp.
Reader's Digest Foundation
Avco Corp.
The Singer Co.
The Harry Frank Guggenheim Foundation *(three times)*

Corporate Ira C. Eaker Fellows

(in order of affiliation)

Rockwell International Corp.
Pratt & Whitney Aircraft Group
Northrop Corp.
Hughes Aircraft Co. *(five times)*
McDonnell Douglas Foundation
LTV Aerospace & Defense Co. *(twice)*

AFA CHAMPLUS® .... Strong Protectio

When a Single Accident or Illness Could Cost *You* Thousands of Dollars, You Need AFA CHAMPLUS®. . . for *Strong* Protection against Costs CHAMPUS Doesn't Cover!

For military retirees and their dependents . . . and dependents of active-duty personnel . . . more and more medical care is being provided through the government CHAMPUS program.

And, of course CHAMPUS pays 75% of allowable charges.

But today's soaring hospital costs—nearly $550 a day in some major metropolitan medical centers—can run up a $20,000 bill for even a moderately serious accident or illness.

Your 25% of $20,000 is no joke!

AFA CHAMPLUS® protects you against that kind of financial catastrophe *and* covers most of your share of routine medical expenses as well.

HOW AFA CHAMPLUS® WORKS FOR YOU!

WHO IS ELIGIBLE?

1) All AFA members under 65 years of age who are currently receiving military retired pay and are eligible for benefits under Public Law 89-614 (CHAMPUS), their spouses under age 65 and their unmarried dependent children under age 21, or age 23 if in college. (There are some exceptions for older age children. See "Exceptions and Limitations".)
2) All eligible dependents of AFA members on active duty. Eligible dependents are spouses under age 65 and unmarried dependent children under age 21, or age 23 if in college. (There are some exceptions for older age children. See "Exceptions and Limitations".)

EXCEPTIONAL BENEFIT PLAN

(See chart at right)

FOUR YEAR BASIC BENEFIT. Benefits for most injuries or illnesses may be paid for up to a four-year period.

PLUS THESE SPECIAL BENEFITS . . .

1) Up to 45 consecutive days of in-hospital care for mental, nervous, or emotional disorders. Outpatient care may include up to 20 visits of a physician or $500 per insured person each year.
2) Up to 30 days care per insured per year in a Skilled Nursing Facility.
3) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Residential Treatment Center.
4) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Special Treatment Facility.
5) Up to 5 visits per insured per year to Marriage and Family Counselors under conditions defined by CHAMPUS.

YOUR INSURANCE IS NON-CANCELLABLE

As long as you are a member of th Force Association, pay your premiur time, and the master contract rema force, your insurance cannot be celled.

ADMINISTERED BY YOUR ASSOCIATION . . . UNDERWRITTEN BY MUTUAL OF OMAHA

AFA CHAMPLUS® insurance is ac istered by trained insurance professi on your Association staff. You get pr reliable, courteous service from p who know your needs and know detail of your coverage. Your insurar underwritten by Mutual of Omaha largest individual and family health i ance company in the world.

AFA OFFERS YOU HOSPITA BENEFITS AFTER AGE 65

Once you reach Age 65 and are cov under Medicare, AFA offers you pr tion against hospital expenses not ered by Medicare through the *Senior Benefit Plan* of AFA Hospital Inden Insurance. Members enrolled in CHAMPLUS® will automatically rec full information about AFA's Medicare plement program upon attainment of 65 so there will be no lapse in cover However, no Medicare supplement b fits can be issued to residents of state of Georgia.

AFA CHAMPLUS® BENEFIT SCHEDULE

Care	*CHAMPUS Pays*	*AFA CHAMPLUS® Pays*
	For Military Retirees Under Age 65 and Their Dependents	
Inpatient civilian hospital care	CHAMPUS pays 75% of allowable charges.	CHAMPLUS® pays the 25% c allowable charges not covere by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $7.10 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS® pays the $7.10 per day subsistence fee.
Outpatient care	CHAMPUS COVERS 75% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS® pays the 25% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.
	For Dependents of Active-Duty Military Personnel	
Inpatient civilian hospital care	CHAMPUS pays all covered services and supplies furnished by a hospital, less $25 or $7.10 per day, whichever is greater.	CHAMPLUS® pays the greater of $7.10 per day o $25 of the reasonable hos pital charges not covered by CHAMPUS
Inpatient military hospital care	The only charge normally made is a $7.10 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS® pays the $7.10 per day subsistence fee.
Outpatient care	CHAMPUS covers 80% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS® pays the 20% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.

NOTE: Outpatient benefits cover emergency room treatment, doctor bills, pharmaceutic and other professional services.

There are some reasonable limitations and exclusions for both inpatient and o patient coverage. Please note these elsewhere in the plan description.

gainst Costs CHAMPUS Doesn't Cover

PPLY TODAY!
T FOLLOW THESE STEPS

ose either AFA CHAMPLUS® Inpatient rage or combined Inpatient and Out- nt coverage for yourself. Determine coverage you want for dependent bers of your family. Complete the en- ed application form in full. Total the ium for the coverage you select from remium tables on this page. Mail the cation with your check or money for your initial premium payment, le to AFA.

AFA's CHAMPLUS®

CEPTIONS & LIMITATIONS

rage will not be provided for condi- which treatment has been re- ring the 12-month period prior tive date of insurance until n of 12 consecutive months coverage without further *er coverage has been in nsecutive months, pre-* ons will be covered re- treatment. Children over if in college) will continue if they have been declared d and if they were insured AMPLUS® on the date so de- Coverage for these older age n will be provided at slightly higher s upon notification to AFA.

CLUSIONS

plan does not cover and no payment be made for:

utine physical examinations or immu- tions

omiciliary or custodial care

ental care (except as required as a ssary adjunct to medical or surgical ment)

utine care of the newborn or well- care

juries or sickness resulting from ared or undeclared war or any act of

uries or sickness due to acts of inten- l self-destruction or attempted sui- while sane or insane

eatment for prevention or cure of al- lism or drug addiction

e refraction examinations

sthetic devices (other than artificial and artificial eyes), hearing aids, pedic footwear, eyeglasses and con- enses

enses for which benefits are or may ayable under Public Law 89-614 MPUS)

PREMIUM SCHEDULE

Plan 1—For military retirees and dependents (Quarterly Premiums)

Inpatient Benefits

Member's Attained Age	Member	Spouse	Each Child
Under 50	$21.88	$27.35	$14.85
50–54	$32.70	$40.88	$14.85
55–59	$39.78	$49.73	$14.85
60–64	$45.80	$57.25	$14.85

Inpatient and Outpatient Benefits

Under 50	$30.82	$36.98	$37.13
50–54	$42.35	$50.82	$37.13
55–59	$56.01	$67.21	$37.13
60–64	$64.48	$77.38	$37.13

Plan 2—For dependents of active-duty personnel (Annual Premiums)

Inpatient Only	None	$ 9.68	$ 5.94
Inpatient and Outpatient	None	$38.72	$29.70

APPLICATION FOR AFA CHAMPLUS®

Group Policy GMG-FC70
Mutual of Omaha Insurance Company
Home Office: Omaha, Nebraska

Full name of Member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of Birth _____ Current Age _____ Height _____ Weight _____ Soc. Sec. No. _____
Month/Day/Year

This insurance coverage may only be issued to AFA members. Please check the appropriate box below:

☐ I am currently an AFA Member.

☐ I enclose $18 for annual AFA membership dues (includes subscription ($14) to AIR FORCE Magazine).

PLAN & TYPE OF COVERAGE REQUESTED

Plan Requested (Check One)
☐ AFA CHAMPLUS® PLAN I (for military retirees & dependents)
☐ AFA CHAMPLUS® PLAN II (for dependents of active-duty personnel)

Coverage Requested (Check One)
☐ Inpatient Benefits Only
☐ Inpatient and Outpatient Benefits

Person(s) to be insured (Check One)
☐ Member Only
☐ Spouse Only
☐ Member & Spouse
☐ Member & Children
☐ Spouse & Children
☐ Member, Spouse & Children

PREMIUM CALCULATION

All premiums are based on the attained age of the AFA member applying for this coverage. Plan I premium payments are normally paid on a quarterly basis but, if desired, they may be made on either a semi-annual (multiply by 2), or annual (multiply by 4) basis.

Quarterly (annual) premium for member (age _____) $_____

Quarterly (annual) premium for spouse (based on member's age) $_____

Quarterly (annual) premium for _____ children @ $ $_____

Total premium enclosed $_____

If this application requests coverage for your spouse and/or eligible children, please complete the following information for each person for whom you are requesting coverage.

Names of Dependents to be Insured	Relationship to Member	Date of Birth (Month/Day/Year)

(To list additional dependents, please use a separate sheet.)

In applying for this coverage, I understand and agree that (a) coverage shall become effective on the last day of the calendar month during which my application together with the proper amount is mailed to AFA, (b) only hospital confinements (both inpatient and outpatient) or other CHAMPUS-approved services commencing after the effective date of insurance are covered and (c) any conditions for which I or my eligible dependents received medical treatment or advice or have taken prescribed drugs or medicine within 12 months prior to the effective date of this insurance coverage will not be covered until the expiration of 12 consecutive months of insurance coverage without medical treatment or advice or having taken prescribed drugs or medicine for such conditions. I also understand and agree that all such pre-existing conditions will be covered after this insurance has been in effect for 24 consecutive months.

Date _____, 19 _____ _____
Member's Signature

Form 6173GH App.

Application must be accompanied by a check or money order. Send remittance to: Air Force Association, Insurance Division, 1501 Lee Highway, Arlington, VA 22209-1198

3/86

Bob Stevens'

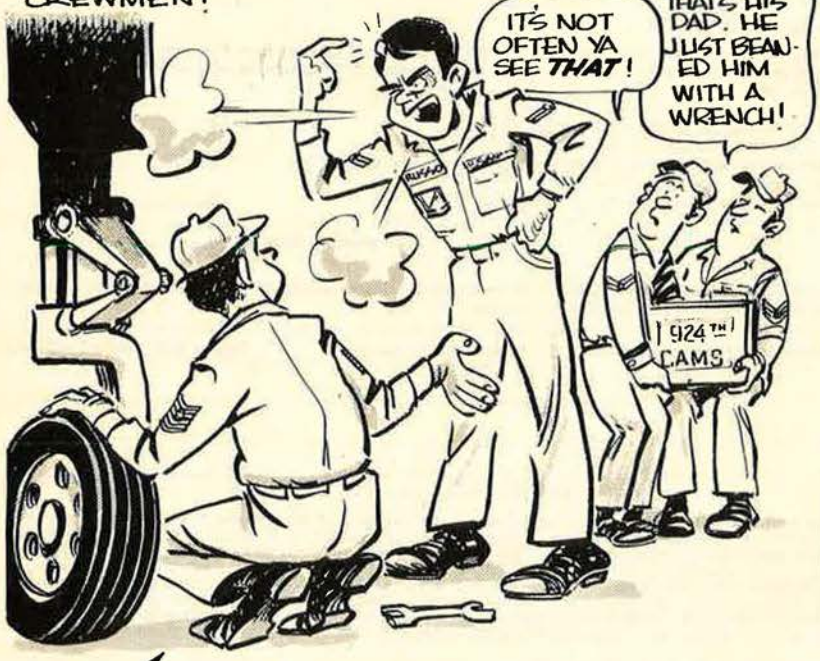
"There I was..."

A PHANTOM II IS MAKING AN IFR APPROACH IN IFFY WEATHER-

* BRAINS IN BACK

...STILL PROWLING AROUND AIR RESERVE FORCES. THE 704TH TAC FTR SQ, 924TH TAC FTR GP (RES), IS A RED-HOT F-4D OUTFIT FLYING OUT OF BERGSTROM AFB NEAR AUSTIN, TEXAS. LIKE THEIR REGULAR BRETHREN, 704TH CREWMEN EXCHANGE A LOT OF FLAK BETWEEN THE COCKPITS and THE GROUND.

LONGEVITY and EXPERIENCE... KEY WORDS... 15 YEARS IS THE ***AVERAGE*** FOR GROUND CREWMEN!

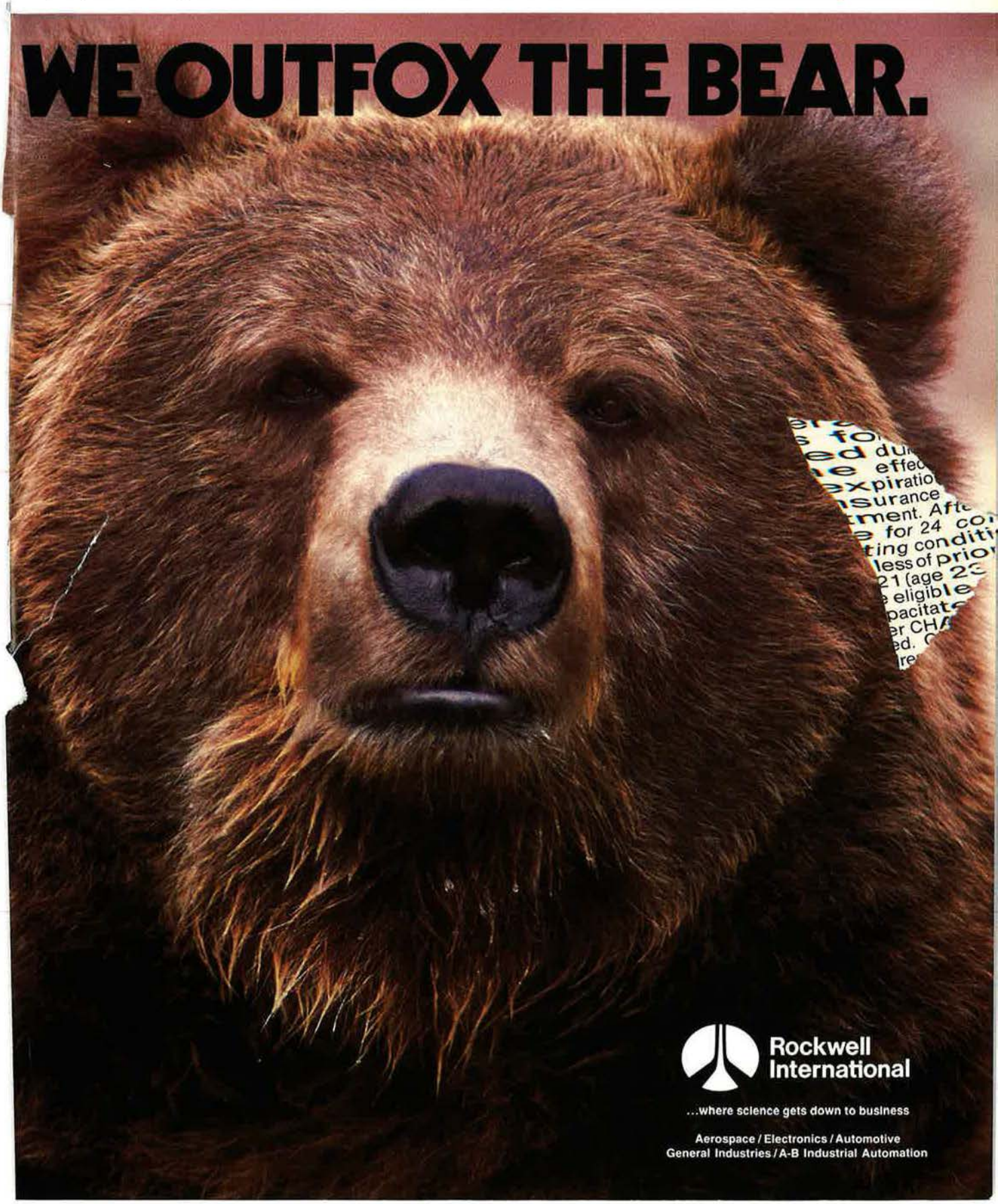


(BEEN IN THE OUTFIT SINCE '69)

ANOTHER GEM FROM - THE 704TH's 'DOOFER' BOOK-

Collins Defense Communications is a major producer and integrator of advanced systems to meet the challenges of electronic combat. ■ We are continually developing and producing a broad spectrum of hardware and software for use in ECM, ECCM and ESM activity. Our experienced engineers utilizing the latest technology can design and vertically integrate systems specifically tailored to meet individual requirements in electronic combat. ■ For more information on our products and systems contact: Collins Defense Communications, Rockwell International, 350 Collins Road N.E., MS 120-131, Cedar Rapids, Iowa 52498, U.S.A. (319) 395-1600. Telex 464-435. ■ **Collins ACCD: The Electronic Combat Specialists.**

WE OUTFOX THE BEAR.



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THE F-15: KEY PLAYER ON THE USAF TEAM.

THE MISSION: AIR SUPERIORITY. SWEEP HOSTILE AIRCRAFT FROM A DESIGNATED AREA. Air superiority is a crucial Air Force mission. Because who controls the skies often controls the outcome of a conflict.

To keep America's defenses strong, the Air Force must be able to maintain air superiority against any adversary. It must be better than any challenge posed in the air, anywhere in the world.

That's why the Air Force relies on the F-15 Eagle, the plane that's earned its reputation as the world's foremost air superiority fighter. The Eagle has the speed and range to reach any destination in the world fast, with a payload to accomplish the mission.

In air-to-air combat, the Eagle's score is 58-0. It has never lost in combat, and has the lowest peacetime loss rate of any U.S. fighter. The Eagle can find and identify enemy aircraft before the enemy knows it is close. Eagle pilots can see targets more quickly and use their weapons with greater accuracy because all attack information is on the head-up display. The F-15 Eagle is the only plane that is fully equipped to meet or beat any threat in the sky–now and through the 1990s.

For a strong defense, America counts on the Air Force. And the Air Force counts on the F-15 Eagle.

SWEEP.

MCDONNELL DOUGLAS