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MARCH 1987
VOLUME 70, NUMBER 3

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About the cover: A commemorative poster recalls the "Great Patriotic War" in honoring Soviet military forces. A special "Soviet Aerospace Almanac" begins on page 46.

Special Section: Soviet Aerospace Almanac

Features

Departments

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AN EDITORIAL

Where the Deficit Didn't Come From

By David L. Gray, PUBLISHER

In 1986, the federal budget deficit reached $220.7 billion, an amount equal to 5.2 percent of the Gross National Product (GNP). The American public is justified in finding this unacceptable and in asking what went wrong and where the fault lies.

A great many people, however, seem to have decided that the main reason for the deficit is increased spending on defense. Wherever they got this idea, it is wrong. Opinion pollsters say that the average citizen overestimates the defense share of the federal budget by seventy-five percent. *(See "What the Public Doesn't Know," October '86 issue, p. 4.)* From there, it is only a short leap to the conclusion that defense spending must be responsible for the nation's economic difficulties.

We believe that it is important for the American public to understand where the deficit *didn't* come from. Furthermore, it is time to lay to rest two other myths—that defense has not done its "fair share" toward reducing federal expenditures and that the proposed defense program is unaffordable. These are misconceptions, spread by people who either don't know what they're talking about or who fiddle with the facts to promote their own set of budget priorities.

• *Rise of the Deficit.* The best index for studying the development of the deficit is federal outlays—the amount of money the government has actually spent year by year—since the deficit is the gap between revenues and outlays. This review should begin in 1969, the last year when the budget was balanced. It was from that point that the deficit level grew, following an erratic but generally upward course in the 1970s and hitting awesome numbers in the 1980s.

When defense spending and the deficit are compared with each other as percentages of federal outlays from 1969 to the present, though, the correlation is more negative than positive. The defense share of federal outlays dropped steadily through the 1970s. Even the Reagan Administration's defense recovery program has not compensated completely for that decline. Defense expenditures today are still a smaller percentage of federal outlays than they were from 1951 to 1972. The hard evidence of two decades is clear: *Defense spending did not cause the deficit.*

Unfortunately, it is not possible to say with equal directness and simplicity what *did* cause the deficit. The deficit is a product not only of government spending and tax policies but also of the nation's general economic health and of such factors as inflation, employment, and interest rates. Nevertheless, some things obviously contributed more to the deficit than others did.

An example is the category of outlays that the Office of Management and Budget calls the "Human Resources Superfunction." It consists of spending for education, training, employment, social services, Social Security, health, Medicare, income security, and veterans' benefits. In 1969, the cost of this Superfunction was $17 billion less than defense outlays. By 1985, it had increased by 617 percent and was still climbing and by then amounted to nearly twice the total of defense outlays.

• *The "Fairness" Issue.* There has been a recurring complaint that as the government struggles to get the budget within Gramm-Rudman-Hollings deficit reduction ceilings, defense has not borne its "fair share" of the cuts. This argument makes sense only to those with short memories. It forgets that defense was taken down by seventeen percent as a share of federal outlays in the 1970s, while nondefense programs gained by a corresponding percentage. When the Fairness in Cutting movement came along in the 1980s, defense had already been through the wringer repeatedly.

Nor was that the end of it. Between FY '82 and FY '87, the Administration's budget request for defense was cut by $176.5 billion. Not a dime of this went to relieve the deficit, though. Congress reallocated all of it to fund nondefense programs more generously than the Administration had requested.

When deficit levels trigger the automatic Gramm-Rudman reduction mechanism, half of the cuts must come from defense—even though defense accounts for less than thirty percent of budgeted outlays. This is because most of the Human Resources Superfunction programs have been declared exempt or partially exempt from reductions.

The President's FY '88 budget seeks growth of three percent, after inflation, for defense. That does not nearly offset the seven percent real decline of the past two years, but when the budget was delivered to Congress, some there declared it "Dead on Arrival."

• *Deciding on "Affordability."* No budgetary exercise alone can establish the level of affordability for national defense. That depends on how much security the nation wants, what risks it is willing to take, and the threat perceived to its interests in the world. In 1945, at the climax of World War II, the United States put 89.4 percent of its federal spending into defense. That was deemed "affordable" in view of the circumstances at the time. As a practical matter, we can assume that the limit of affordability today is somewhere well below that level.

Our best guides to making useful judgments about affordability may be GNP—which measures the nation's economic means—and the precedent of government spending in the postwar era. The biennial budget request for FY '88–89 would set defense expenditures at just over twenty-eight percent of federal outlays and slightly above six percent of GNP. In a postwar historical perspective, that is relatively modest. In 1955, defense spending was 9.1 percent of GNP; in 1960, it was 8.2 percent; and in 1970, 7.8 percent. A defense budget that requires six percent of GNP cannot be regarded as "unaffordable."

Those who want to attack the proposed defense program on economic grounds should find some new arguments or else hide from people who have looked into the truth of the matter. Defense takes less of the tax dollar than the average citizen thinks it does. It did not cause the federal deficit. Defense has been subjected to its share—and then some—of budget reductions.

In terms of GNP and distribution of government revenues, the present program is one of the most "affordable" in the past forty years. The figures are from the public record, open to all who want the facts instead of fiction. ■

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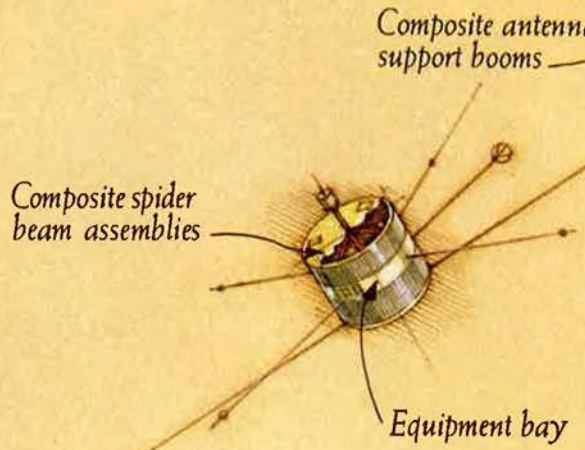

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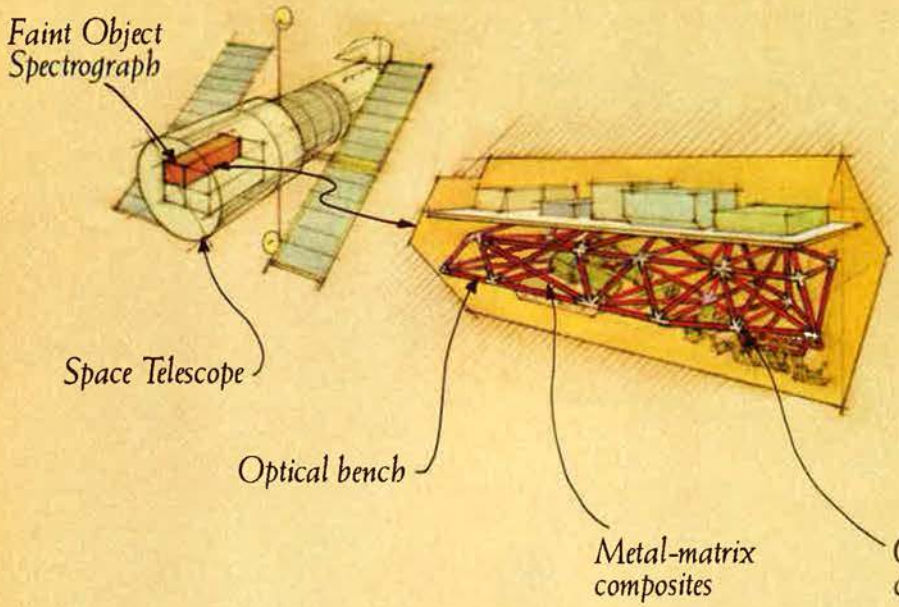

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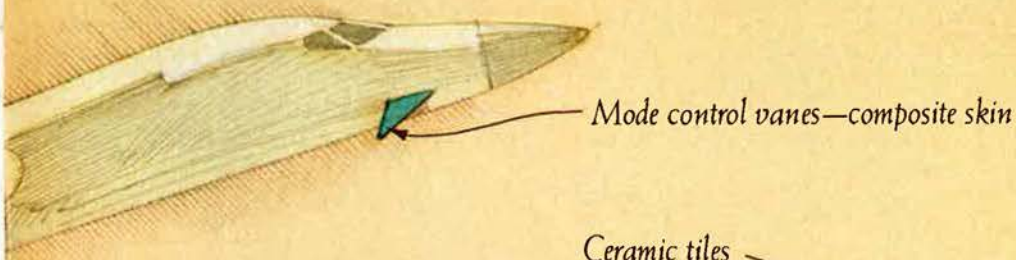

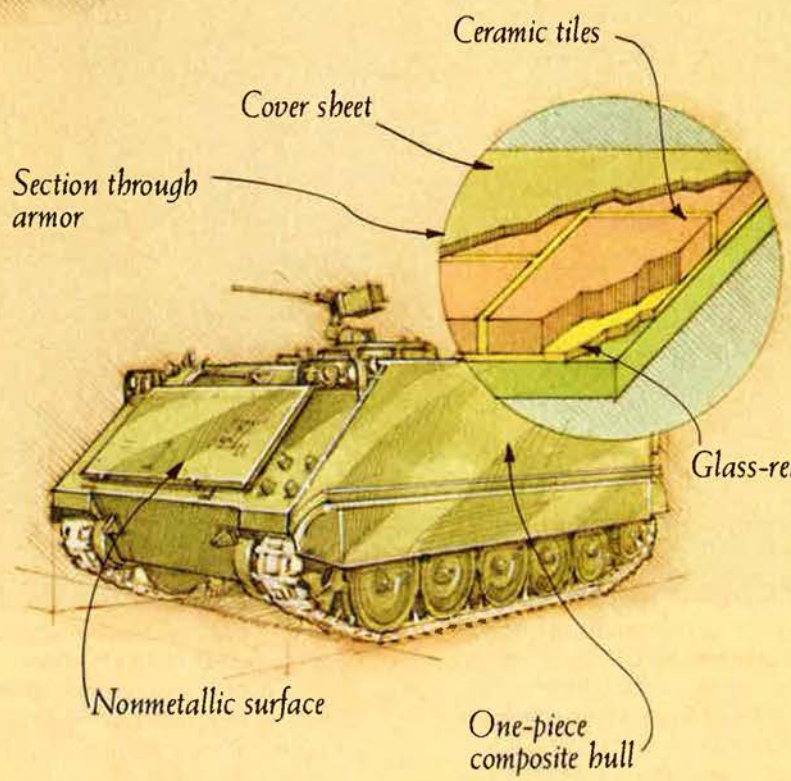

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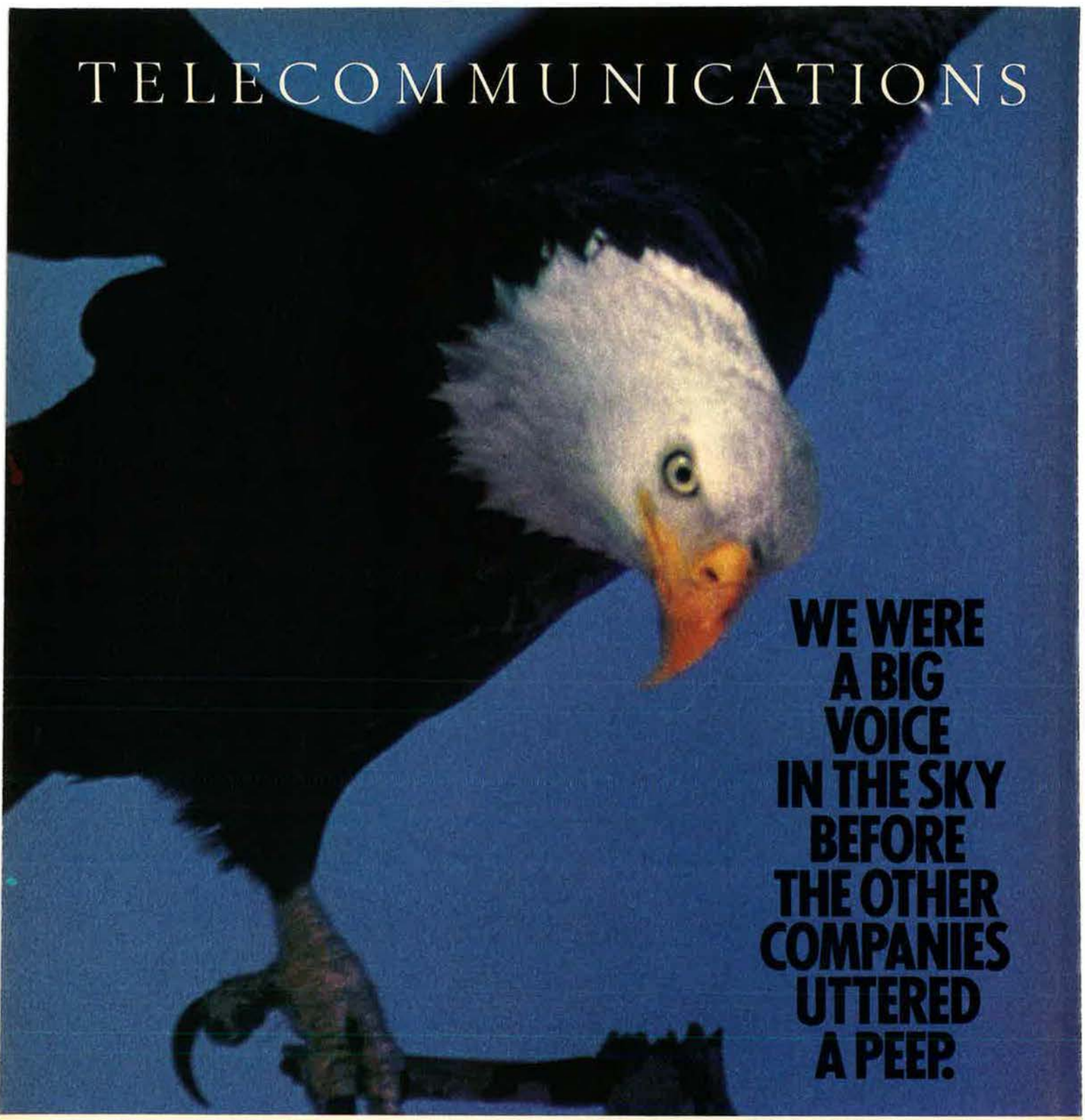

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AIRMAIL

The SDI Debate

As an AFA member and an aerospace engineer who has been occupied with the preliminary design of space weapons for the past six years, the requirements analysis of SDI weapon concepts for the past four years, and the life-cycle cost estimation of SDI architecture elements for the past year, I must take exception to Col. Warren W. Luce's naysaying castigation of myself, my colleagues, the USAF laboratories and commands assigned this problem, and the responsible chain of command leading directly to President Reagan *(see "Ill-Conceived Boondoggle?" January '87 issue, p. 13).*

Colonel Luce makes a number of remarkable statements in the absence of fact. He implies, for example, that the concept of SDI was a political creation exclusively, which the military must now suffer in silence. The history of its genesis, however, begins with a presentation by the Joint Chiefs of Staff to President Reagan in which they argued the case for initiating a strategic defense program. This was what prompted the famous March 23, 1983, speech in which President Reagan revealed the SDI concept publicly. Military advice preceded political popularity. (And the SDI program does enjoy overwhelming public support, as numerous polls have substantiated.)

He further implies that the SDI program incurs "the serious financial detriment of our country." This is clearly not supported by past and current budget allocations. . . .

In his argument, he adduces the datum that "costs are estimated at $750 billion," suggests that the true number is closer to $1 trillion, and proclaims this to be unsupportable.

In the first place, many industry studies have established that a first-order defense system adequate to essentially nullify the prospect of a preemptive nuclear strike could be put in place within a decade for a total cost of between $50 billion and $100 billion.

In the second place, having access to the assumptions and ground rules on which the more awesome cost figures are based, I have to say that the $500 billion to $750 billion range of estimates represents "Cadillac" defense systems designed for stringent population protection without regard for cost optimization. . . .

In the third place, the high-ticket SDI architectures represent systems that would take as much as twenty years to develop and deploy in their entirety. To spend $1 trillion over such a time scale is hardly onerous when compared to the $15 trillion or so that would simultaneously be spent on welfare, Social Security, and the regulation of the marketplace. But the point is that a reasonable system would not cost a tenth of what Colonel Luce so ardently opposes and that "economic collapse" would result more from taxation, inflation, and tariffs than an investment in leading-edge technology (which is what SDI represents).

Colonel Luce then advances the argument that no defense is perfect and concludes that an imperfect defense is worthless. By this logic, we might as well ground all our aircraft, scuttle all our ships, deactivate all our warning systems, and muster out all our soldiers, for they are imperfect also and can be defeated by superior force of arms. . . .

Finally, objecting to SDI on the grounds that it would not protect us from radioactive fallout misses the point that the entire purpose of SDI is to prevent the detonation of any warheads. . . . A spaceborne defensive tier, for example, would be able to intercept ICBMs or other missiles during their boost phase over aggressor territory. The bogeyman of "dirty" warheads is a rather banal invention of science-fiction writers and has no place in the lexicon of Soviet strategic objectives. . . .

I can well believe that Colonel Luce is incredulous and appalled that "knowledgeable people continue to support that fantasy," as he puts it. But this is nothing compared to the frustration and resentment we feel, as workers on SDI, when merely ignorant people conclude that it's not worth the effort.

Michael J. Dunn
Auburn, Wash.

Col. Warren W. Luce's attack on SDI that appeared in the January 1987 "Airmail" is unwarranted. If we embraced Colonel Luce's attitude toward progress, we'd still be pounding sand at Kitty Hawk.

His statement that "SDI can never protect us from all the forms of nuclear attack and is therefore useless" is irresponsible and smacks of emotionalism. If we apply Colonel Luce's argument to seat belts, they would also be useless, since they can never protect us from all forms of vehicle accident injury.

What's even more disturbing to me is that there are more people than I care to admit who are disciples of the Luce philosophy. It'll never work, so why should we even try?

I also think that Colonel Luce's second paragraph was an uncalled-for slam at the majority of active-duty folks. I don't know when Colonel Luce retired, but we on active duty now are not all brain-dead, as he implies. We are encouraged to comment and criticize any program or project until a decision is made, then we execute that decision, whether or not we personally agree with it.

That's how the military works—or has Colonel Luce forgotten?

Lt. Col. Park Owens, USAF
Ellsworth AFB, S. D.

It was refreshing to read Col. Warren W. Luce's letter in the January 1987 issue challenging the validity of

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

SDI. Those with military background and understanding owe it to our country to question every aspect of defense programs that obviously ignore practicalities of cost and effectiveness.

Are we being sold a space equipment bill of goods on the order of DIVAD?

Col. Robert A. Vrilakas,
USAF (Ret.)
Portland, Ore.

A Living Legend

Maj. Gen. Dale O. Smith's article "The Airman Who Shook the World" about Gen. Curtis LeMay in the January '87 issue brought back memories and was quite timely.

Little did I realize during 1945 when I was a P-51 pilot flying out of the Marianas and Iwo Jima that I might someday get to meet the legendary General LeMay. It happened during 1949–51, when I was assigned to Hq. SAC as an engineering representative for the Hamilton Standard Propeller Co. SAC had just received the first of three C-97 aircraft, which had a revolutionary new propeller system installed. It was my job to maintain, service, and instruct personnel in its operation.

During the many trips on which I accompanied the General and his staff to distant places around the world, I developed a keen respect for his judgment, his probing and precise questions, and his technical understanding of the airplane's systems and problems. In addition, he had an uncanny ability to surround himself with competent people. . . .

People may call him cold and aloof, but I found the General to be earthy, warm, and friendly—the living legend of what the United States Air Force is all about.

A. W. Powers
Southbury, Conn.

Maj. Gen. Dale O. Smith's article about General LeMay in the January 1987 issue was interesting and well written.

I was sorry to see, however, that he included the "bombing them back to the Stone Age" remark attributed to General LeMay. Had he read Thomas M. Coffey's biography of General LeMay, ironically reviewed in "Airman's Bookshelf" in the same issue, his article could have included a refutation of the remark instead of one more perpetuation of it.

Edward G. Schultz
Bellevue, Wash.

Whence the Osprey?

Although the article "The Amazing Osprey" by Jeffrey P. Rhodes in the January '87 issue was very informative and interesting, it leaves the reader with the impression that the development of the tiltrotor aircraft was the product of Bell and Boeing and no one else.

The basic research on the tiltrotor was performed by a team at Moffett Field, Calif., that was composed of engineers from NASA-Ames Research Center and the Army Aviation and Technology Activity. Without the basic research, the development of the Osprey would not have occurred. I strongly believe credit should be given to that team (although Bell and Boeing never seem to recognize the contribution).

To that end, the Santa Clara Valley Council of the Navy League recently presented its Distinguished Service Award to the NASA/Army Tiltrotor Project team at its award banquet, based on the adoption of the Osprey by the Marine Corps.

Cmdr. Robert C. Whitten,
USNR (Ret.)
Cupertino, Calif.

McNamara's "Accomplishments"

I read with interest Gen. T. R. Milton's "Viewpoint" in the January '87 issue about former Secretary of Defense Robert S. McNamara's new book *Blundering Into Disaster.* I thought General Milton was very charitable in even giving Mr. McNamara a serious evaluation.

From my high school and college days in the 1960s and '70s, I can remember Mr. McNamara's foreign and military policy accomplishments:

- More than 200,000 Americans killed, wounded, or crippled.
- Billions of US dollars frittered away blowing up jungles, roads, and bridges.
- Civil strife in the US unequaled since the Civil War.
- Tremendous US military power employed so inefficiently that a small enemy military was left undefeated, later seizing control of the country we were defending.

Mr. McNamara did a pretty good job showing us what happens on a "limited" basis or when fighting on the adversary's terms. I remain highly skeptical about his ability to make accurate judgments about anything as complex as SDI or nuclear weapons policy.

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A/C Overhaul to Div Mgr: **In process C-130 D-check proceeding O.T. 707 special mission conversion to be in hangar at 24:00.**

Engine Plant to Div Mgr: **3 J-79's and 4 J-52's in process. 5 T-56's in inspection. 3 J-52's, 2 F-100's, 1 Atar, 2 PT6's and 5 Allison 250's in test cells. F-110 crew chief training accomplished.**

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AIRMAIL

I think that if Mr. McNamara wants to write books, he should go back to writing about something he does know something about—building cars for Ford Motor Co.

Jim Slough
Farmington, Mo.

Bombers Obsolete?

When I read "Bombers for the Battlefield" in the January '87 issue of AIR FORCE Magazine and the article's references to the use of B-52s in a conventional role for future operations, my first reaction was that the article must have been written for the 1960s.

One-way missions in a nuclear catastrophe probably can't be avoided, but to use "Buffs" in the present air defense environment of our only likely adversary, the USSR, is incomprehensible. Bombers are obsolete.

The B-52s had no opposition in South Vietnam and succeeded in North Vietnam because of limited missile and interceptor forces (and there were still losses). The Soviets and the Warsaw Pact nations suffer no such shortages.

The B-52's role in maritime operations is also suspect. The Navy, in a recent Naval Institute *Proceedings* article, indicated real concern about the ability of the P-3 Orion ASW aircraft to survive because of seaborne SAMs.

Certainly, B-52s can carry ALCMs or other standoff munitions, but are they the best vehicle? It is now being accepted that other aircraft can be modified to carry such stores, as the B-52s are now being modified, and that they can perform better at low altitude and exhibit smaller radar returns than the B-52. . . .

Col. Peter Boyes, USAF (Ret.)
Sacramento, Calif.

The Tigershark Mark

Congratulations to the F-20 Tigershark. Although the aircraft did not win the air defense fighter contract, the F-20 did leave its mark.

First, the F-20 forced down the cost of General Dynamics's overpriced F-16. Second, the F-20's avionics and engine raised the standards set by the Air Force for reliability and maintainability in its new fighters.

It's too bad that the Air Force was not smart enough to put the F-20 into service, given its excellent record and Northrop's great deal for purchasing the F-20.

By the way, there is a slight difference of opinion in your January 1987 issue concerning the selection of the F-16 for the ADF job. In his article "Shaping the Force," Edgar Ulsamer writes that the F-16A will offer significant increases in range, radar capability, and armament over the F-106 and F-4. In that same issue, John W. R. Taylor writes in "Jane's Aerospace Survey 1987" that some representatives of the Air National Guard units getting the F-16 are not happy with the selection. They feel the F-16 lacks the range, radar, and punch to deal with Russian cruise missiles.

Whose opinion should we trust?

Louis M. Rapier
Marion, Iowa

Booms and Pods

The letter by 1st Lt. Robert S. Hopkins III on air refueling in the January 1987 "Airmail" was of great interest to those of us in the air refueling business.

Lieutenant Hopkins, while correct in pointing out the current shortfall in tanker assets and the need for more awareness of those deficiences in operational planning, failed to mention the basic but major problem with the existing "boom" system.

Regardless of the tanker type, KC-135 or KC-10, when utilizing a boom system, one can only refuel one aircraft at a time. Therefore, it makes more current economical sense to use one KC-10 per three F-15s than three KC-135s for three F-15s.

The 707 civilian aircraft converted into tankers mentioned in the Lieutenant's letter almost all use the wing-mounted pod system, which makes even more economical sense than the boom system, since one can now refuel two aircraft simultaneously. With a fuselage-mounted reel unit, one could then add a third receiver.

The solution to Lieutenant Hopkins's problem is not to go out and buy up all those old commercial aircraft. Rather, we should increase the utility of the aircraft we now have by adding air refueling pods. This not only increases the refueling capability of our tankers but will also make the US Navy, USMC, and our NATO allies very happy as well.

If Lieutenant Hopkins would like to inquire as to why USAF persists in being almost the only boom-system operator, given its built-in restrictions (*i.e.*, one boom per tanker), I'd be very pleased, since that's one argument I'd personally prefer to stay out of!

Dennis J. Brindle
Manhattan Beach, Calif.

C-47A 42-92841

The newly organized Dover AFB, Del., Museum is attempting to compile the history of our first acquisition, C-47A 42-92841.

We know that it served with the Ninth Air Force in Europe from April 1944. In 1948, it was with the 43d Troop Carrier Squadron at Erding, Germany.

Subsequently, it served in Germany at Rhein-Main and Wiesbaden with the 61st TCS, 7210th MS, 85th MGP, 85th ADW, 60th TCW, 7150th ABG, 85th ADW, and 7100th HS. In June 1954, it served with the 17th HS and 7221st HS in Morocco and the 7272d ABW in Libya. Finally, it served with the 1001st ABW at Andrews AFB, Md., and the 3800th ABW at Maxwell AFB, Ala., during 1959.

Anyone having information that they could share about this aircraft or its mission and units should contact the address listed below. Photos will be copied and promptly returned. In addition, any photos, artifacts, and stories pertaining to Dover AFB would be greatly appreciated.

Michael D. Leister
Museum Project Officer
436th HOX
Dover AFB, Del. 19902-5144
Phone: (302) 678-6628

AIRMAIL

Republic Aviation

As avid enthusiasts of Republic Aviation aircraft, a group of us has finally decided that it is time to recognize the accomplishments of the manufacturer of some of the finest military aircraft ever produced.

The Long Island Republic Airport Historical Society recently held an organizational meeting. The Historical Society will house its pictures, artifacts, and airplane models in the main terminal at Republic Airport in the spring of 1987. This is a beautiful new terminal with lots of wall space and room. The display of products and pictures will be representative of the aviation industry on Long Island and of Republic Aviation in particular.

There are several committees on models, education, membership, research and artifacts, and fundraising.

The curator at the Cradle of Aviation has already offered to help by donating items from the Cradle Remodeling Project. He has also offered items for the Society's display on a rotating basis.

Anyone wishing to make a contribution, financial or of memorabilia, can telephone Ruth Fisher at (516) 752-7707 or can contact the address below. Memorabilia can be donated permanently, temporarily, or on a rotating basis.

Henry Busch, Sr.
133 Kern Rd.
Barryville, N. Y. 12719
Phone: (914) 557-8377

3d Tactical Fighter Squadron

We are in the process of assembling a comprehensive history of the 3d Tactical Fighter Squadron from its origin in 1916 to the present.

The unit has held several designations through the years: 3d Aero Squadron, 3d Squadron, 3d Pursuit Squadron, 3d Pursuit Squadron (Interceptor), and 3d TFS. It moved from the United States to the Philippines in 1919, where it conducted operations during World War II. During the Vietnam War, it staged out of Korat RTAFB, Thailand, returning in 1975 to the Philippines and Clark AB.

We are looking for pictures of the squadron's personnel, aircraft, insignia, and facilities from each of these time periods. Photographs will be copied and returned. We would also greatly appreciate any documents, both official and unofficial, that would lend flavor to the proud heritage of the "Peugeots."

Lt. Col. Alan W. Plotnik, USAF
3d TFS
APO San Francisco 96274-5000

Bird Dog Roundup

Our sincere thanks to AIR FORCE Magazine for printing "The Bird Dog Lives" in the "Airmail" section of the June 1986 issue.

We have been deluged with letters from former Air Force FACs who have flown the O-1. We have reunited many pilots and crews as a direct result of the exposure received by the International Bird Dog Association (IBDA) in AIR FORCE Magazine.

Our association has grown to more than 300 active members. Several of our owners have restored their O-1 aircraft to Air Force configuration and colors. Some of these aircraft will appear at air shows around the country during 1987.

Momentum is growing to coordinate O-1 unit reunions with the IBDA annual meeting and fly-in near Fort Rucker, Ala., on June 5–7. Write to the address below for information.

IBDA
3939 C-8 San Pedro NE
Albuquerque, N. M. 87110


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XC-108A Conversion

I am trying to locate anyone associated with the XC-108A conversion of B-17E 41-2595 in 1943. For those interested, the remains of the aircraft have been located in Maine and have been transported to Illinois for restoration by its new civil owner.

The conversion of the XC-108A was conducted under Project No. 90507 and was apparently done at Fairfield-Suisun Air Base (now Travis AFB) in late 1943 or early 1944. The aircraft was then used in Indochina until August 1944, when it returned to the US via Dow AAF in Maine and was salvaged there for an as yet unknown reason.

Anyone associated with the XC-108A project or having information (particularly photos) is urged to contact me. Any assistance that could be provided would be greatly appreciated.

Scott A. Thompson
1418 Windgate Dr.
Manteca, Calif. 95336
Phone: (209) 239-3553

4th Fighter Group

I am a graduate student at the University of South Carolina and am finishing a graduate degree in aerospace history. My present project is an examination of the evolution of Air Force fighter doctrine during World War II.

I am using the 4th Fighter Group as a case study and would greatly appreciate hearing from those who served in that group as pilots, intelligence officers, or operations officers.

Please contact me at the following address.

Philip C. Cockrell
100 Riverbend A-38
West Columbia, S. C. 29169

Bombing of Oregon

I am researching the bombing of Oregon on September 9 and 29, 1942, by a Japanese flying officer named Nobuo Fujita. Fujita was flying an E 14Y1 monoplane (Allied code name "Glen") launched from submarine I-25.

Any information on the plane, pilot, or submarine and any reports of the bombing or other information as to possible reference material would be greatly appreciated.

J. P. VanVliet
31 Richard St.
New Haven, Conn. 06513

USAF in Thailand

I am writing a book about the Air Force in Thailand, covering the period from 1961 to 1975. I would like to know if any readers have photographs of the various types of aircraft based at Royal Thai Air Force bases during the Vietnam War.

Please contact me at the address below.

Jeffrey D. Glasser
4367 San Jose Lane
Whitehall, Ohio 43213

OA-10 Flying Boats

I am writing in the hope that readers can assist me with a research project currently under way. I am seeking contact with Air Force veterans who flew, were crewmen on, or maintained OA-10 "Canso" flying boats (also known as PBYs or Catalinas) during and after World War II. Information on the use of these aircraft in all theaters of combat would be sincerely appreciated.

Please contact me at the address below.

Andrew C. Robins
1529 Miles Ave.
Kalamazoo, Mich. 49001

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AIRMAIL

Roll Call

I am in search of an old World War II friend of mine. He and I went through pilot training and, after graduation from Ellington Field, were assigned to the 846th School Squadron at the Hondo Navigation School at Hondo, Tex.

This friend is Capt. Ted Royer. He left the Air Force after the war, and I believe he went into the business of growing mint in the state of Washington.

I would appreciate hearing from Ted or anyone who could put me in contact with him.

Walter Zurney
2212 Park Ave.
Ford City, Pa. 16226
Phone: (412) 763-3283

I would like to make contact with any personnel who were stationed at Stead AFB near Reno, Nev. I am especially interested in hearing from anyone who served with the air police squadron there between January 1952 and January 1956.

Please contact me at the address below.

Angelo O. Marinelli
2565 Nottingham Rd.
Upper Arlington, Ohio 43221
Phone: (614) 457-1608

A small group of Californians who were in Class 42-D at the Mira Loma Primary Flying School at Oxnard, Calif., is interested in establishing contact with other classmates.

Anyone from Class 42-D should contact the address below.

Col. Ward T. Olsson, USAF (Ret.)
17149 Cloudcroft Dr.
Poway, Calif. 92064
Phone: (619) 487-2954

Collectors' Corner

I would like to obtain full-color embroidered sew-on patches depicting the 41st Air Division (8th, 13th, and 90th Bomb Squadrons) of the 3d Bombardment Wing (B-26) that was stationed at Johnson AB, Japan. The 3d BW was located at Kunsan K-8 in South Korea in 1953. I was in the US Air Force and stationed at Johnson AB, assigned to the 3d Field Maintenance Squadron from May 1956 to May 1958.

I am now in the process of making a walnut commemorative display case to house my chevrons, unit insignia, awards, ribbons, and patches and would thus like to obtain the patches mentioned above.

Please contact the address below.

Wesley L. Laurie
111 Polar Trail
DeSoto, Tex. 75115

I am trying to obtain various helicraft items from any country and covering the period from 1965 to the present. Of specific interest are helmets, clothing, and patches. Also of interest are various flight manuals for Air Force helicraft.

I would greatly appreciate hearing from anyone with such items or who knows the whereabouts of such items. Please contact me with any information at the address below.

Scott A. Barthelmass
811 Craig Dr.
St. Louis, Mo. 63122

I am just starting to collect patches of the Air Force. I would like to hear from anyone who would be willing to donate any old or new patches to me.

I would especially like to receive squadron and wing patches from fighter and reconnaissance pilots. I would be honored to receive any SR-71 patches.

Anyone having such patches who would be willing to donate them to me should contact the address below.

Jason Beck
17 Trinity Pl.
Amsterdam, N. Y. 12010
Phone: (518) 843-4778

The Pacific Air Forces NCO PME Center is currently in the process of dedicating its academic facility to the five Army/Air Force Medal of Honor recipients. We are just beginning our collection of enlisted memorabilia, which will include such items as pictures, patches, badges, and uniforms.

We would welcome any donations that we might receive, especially anything concerning enlisted heritage.

CMSgt. Paul W. Kasten, USAF
PACAF NCO PME Center
APO San Francisco 96239-5000

I recently acquired a number of items in a private transaction and now have a few pairs of wings that are duplicates in my collection. These are original USAAC aircrew badges from the 1930s and World War II that I am willing to make available to private collectors only. These sterling wings are rare and difficult to come by.

Interested collectors should contact me at the address listed below for more details.

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4706 Hillwin Circle
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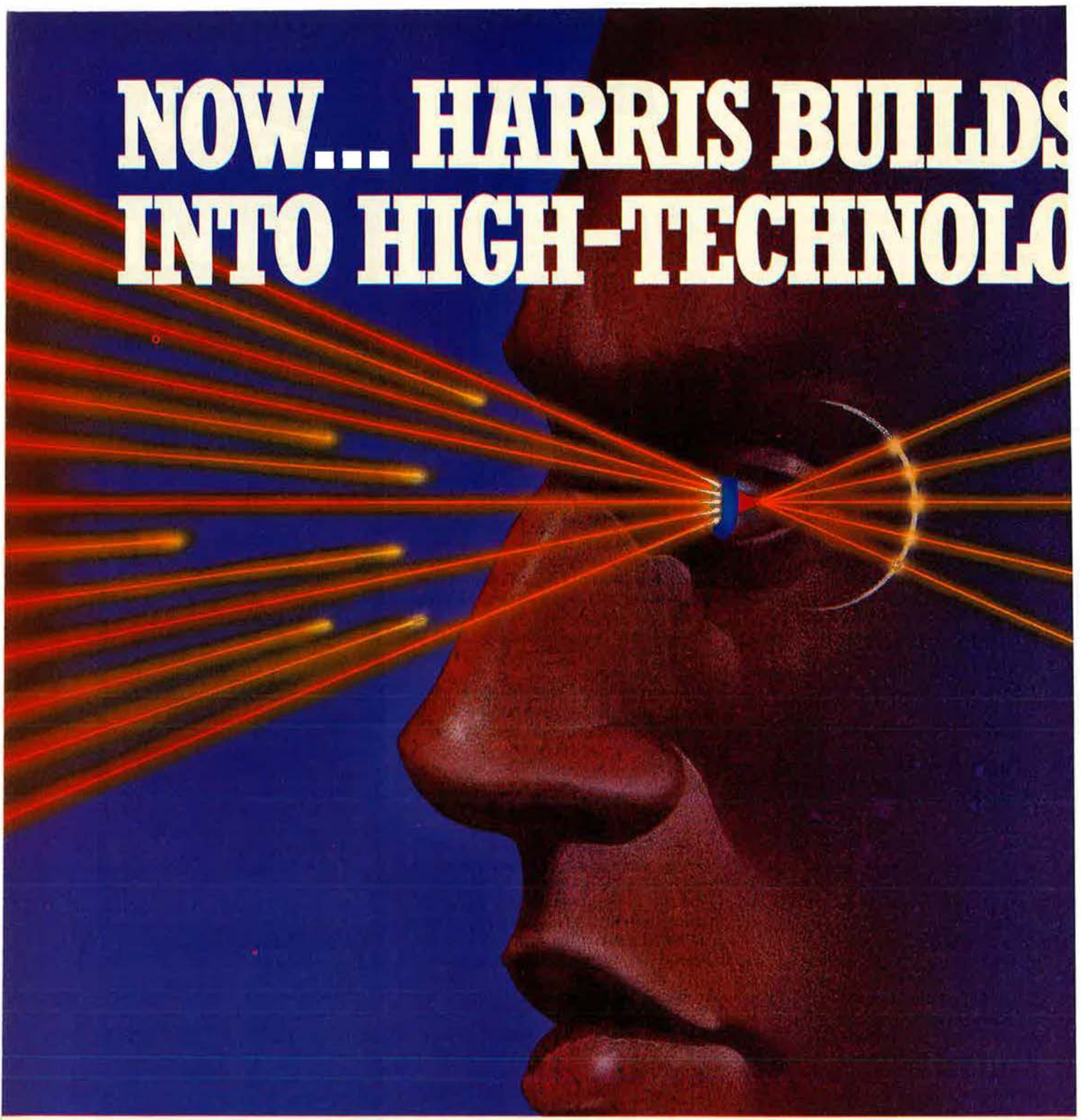

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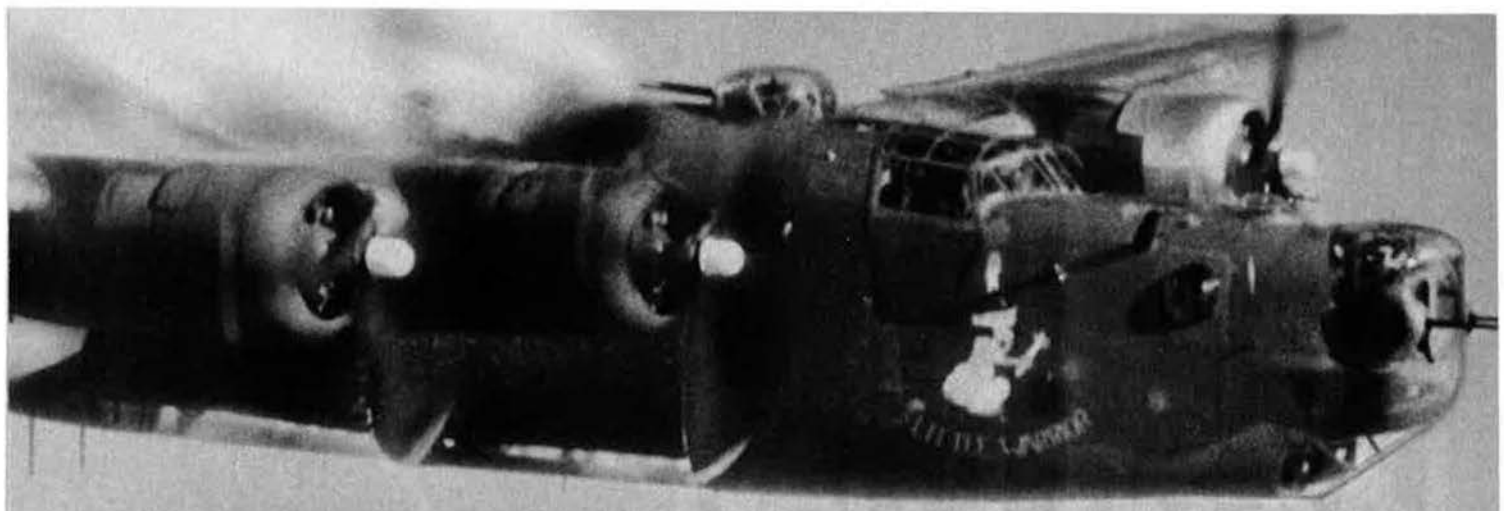

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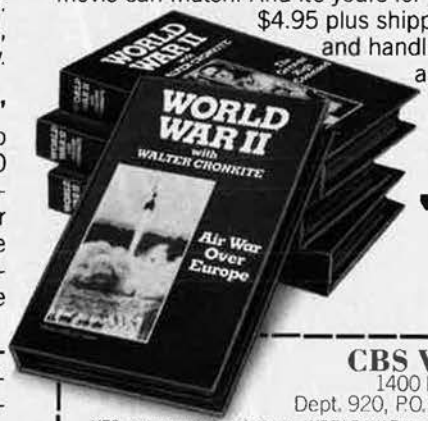

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allies can launch or support penetration bombing missions from a number of locations around the Soviet periphery. Second, the West holds a general advantage over the Soviet Union in aircraft production."

In addition to the technological lead, "for a number of sociological and cultural reasons, Western aircrews typically display a degree of initiative, innovation, and self-reliance not thus far found" in their Soviet counterparts, he told Congress. Low-observable technologies, in particular, "promise to increase further the competitive advantage of our . . . bomber force to such a degree as to make much of the Soviets' air defense infrastructure" ineffective or obsolete.

Citing the Advanced Technology ("Stealth") Bomber, or ATB, as a case in point, he pointed out that the objective behind this weapon system is "to exploit the historic Soviet concern with homeland defense by utilizing the superior low-observable technology we can now embody in our aircraft and missiles." ATB, he suggested, will force the Soviets to "make an enormous investment in new defensive systems over a span of many years, while their existing enormous investment becomes rapidly obsolete."

Moreover, ATB will also obsolete the air defenses of the Warsaw Pact countries as well as Soviet client states in the Third World. At the same time, Moscow will not be able to scrap its existing air defense systems because the B-1B and the advanced cruise missile (ACM) "will maintain the effectiveness of our conventional bomber force well into the 1990s."

In the tactical air warfare arena, the Air Force's Advanced Tactical Fighter (ATF) and the Navy's Advanced Tactical Aircraft (ATA) will embody stealth technologies to steal a march on existing Soviet air defenses, Secretary Weinberger told Congress. (The new budget seeks about $1.24 billion over the next two years toward the development of ATF prototypes. The Navy treats ATA as a "black" program and hence does not publish the associated funding requests.)

ATF's payoff in terms of the competitive strategies concept is that it ought to "render obsolete much of the Warsaw Pact's tactical air defenses, thereby increasing the pressure on the Soviets to build new defensive systems at considerable cost in rubles and time," according to Secretary Weinberger. These defensive systems, he suggested, will probably come at the expense of new investments in offensive systems. "Rather than engaging the huge Soviet air armies primarily over West European territory, the ATF will permit our air forces to fly deep into enemy territory in the face of extensive Warsaw Pact air defenses and attack Soviet strike and fighter aircraft near their main operating bases," he explained.

ATA, in similar fashion, is expected to "negate the Soviets' enormous investment in their fleet and coastal air defenses and the air defenses of military installations in their Third World proxy states." Soviet attempts to defend against the stealthy ATA would exact high costs and thus divert funds from other programs.

The Army is capitalizing on the competitive strategies concept by putting at risk the Warsaw Pact's second-echelon forces, which would thus erode fundamental Soviet theater warfare objectives: "Recognizing the Warsaw Pact's operational reliance on second-echelon forces, the Army's AirLand Battle and NATO's Follow-on Forces Attack doctrines were developed to leapfrog the disadvantages we face at the front line."

Terming this country's ability to apply "smart weapons with precision on an extended battlefield . . . impressive," Secretary Weinberger predicted that the Soviets "will increasingly be forced to doubt the potential effectiveness of their ground combat forces and [the] efficacy of their doctrine for war in Europe." He envisioned a scenario in which any attacking Soviet ground forces would be met immediately by an array of "smart" systems employed in a way that maximizes the advantages of such weapons as well as Soviet vulnerabilities. "In many ways," he said, "it is the Soviet attacker rather than the NATO defender who will be surprised. Further, follow-on Soviet echelons would feel the impact of NATO defenses immediately and directly. These new doctrines and weapons, properly funded and supported, will combine to make NATO's conventional deterrent even stronger over time."

In the Pentagon's view, there are two specific facets to the competitive strategies concept—the development of new technologies, on the one hand, and the formulation of new concepts of operations, on the other. The latter task is purely "intellectual" and in many instances more "formidable" than the former, Secretary Weinberger acknowledged. "I intend to have the Chairman of the Joint Chiefs of Staff and the commanders in chief of the unified and specified commands determine ways to exploit Soviet vulnerabilities using current systems and to begin work on developing operational concepts that fully exploit the capabilities of our new technologies."

The Administration is optimistic that this concept can be "institutionalized" and become ingrained in the nation's defense culture. Toward this end, the civilian and military heads of the services, on a regular basis, are to make recommendations on how weapons development programs under their jurisdiction can be integrated into the competitive strategy concept. These recommendations will be built into the services' proposals for new weapon systems, and "those aspects will be reviewed as part of the new Joint Requirements and Management Board [JRMB] process."

Central oversight on a day-to-day basis with regard to institutionalizing the competitive strategy rests with the Deputy Secretary of Defense. Congressional support of the concept, Secretary Weinberger pleaded, is of pivotal importance. "Working together, we can help the US and our allies develop and field a truly robust deterrent that relies on advanced design, manufacture, and fighting doctrine, rather than on matching the Soviets tank for tank, ship for ship, or aircraft for aircraft."

The imperative of doing more with less by means of such high-leverage investments as the competitive strategies concept, Secretary Weinberger and other senior Pentagon witnesses told Congress, stems from adverse budget trends and the undiminished growth in the Soviet threat. The cumulative difference between what the Administration planned in 1985 to invest in defense programs for the FY '85–89 period and the outlay levels now in force is a staggering $293.7 billion.

In spite of these cuts—imposed by a combination of factors that includes congressional cuts, the Gramm-Rudman-Hollings deficit-reduction legislation, and the Administration's own genuflection to political necessity—the federal deficit problem remains acute. Even though $55 billion was cut from defense outlays in 1985 and 1986, every penny of that "saving," plus another $31 billion, was spent by Congress on domestic programs or to cover budgetary miscalculations. The portion of the Gross National Product

(GNP) going to defense is now considerably less than that provided in 1969, but nondefense spending has grown by about one-half of a GNP percentage point every year since then.

The Soviet Union devotes about two and a half times the percentage of GNP to defense compared to the US level. If the US were to live up to the Soviet spending standard, "we would be submitting a defense budget for 1988 not of $303 billion, but more than $700 billion," Secretary Weinberger pointed out. He added that in the aggregate, the weapons the Soviets have bought during the last fifteen years have an estimated dollar cost of roughly $1 trillion, or "over thirty percent more than the cost of the weapons the US bought in the period."

Strategic Modernization: Fact and Fiction

Because strategic weapon systems—such as the B-1B—need to be brought into the operational inventory relatively quickly to help redress Soviet advantages, they occasionally encounter growing pains. This condition is somewhat analogous to the "shakedown cruises" of naval ships that serve to pinpoint and correct start-up glitches. In the case of the B-1B program, a number of initial problems unearthed by the Air Force have received headline treatment in the media.

Air Force Chief of Staff Gen. Larry D. Welch separated fact from fiction concerning the B-1B and other strategic force modernization programs during a recent meeting with Pentagon reporters. Concerning the B-1B, General Welch pointed out that the aircraft is "performing its intended mission," met its IOC (initial operational capability) on schedule in 1986, and, at this moment, gives no indication that it will exceed Congress's $20.5 billion ceiling limit.

"There is," he emphasized, "nothing that needs to be fixed on the airplane that we don't know how to fix. . . . The fact is that the aircraft *today* can perform the mission that it needs to perform *today* against a threat that it has to face *today* better than any other airplane in the inventory."

Concerning overblown reports about weight growth on the part of the B-1B, General Welch explained that the basic airplane weight, "as we measure airplane weight, went up 8,000 pounds. The payload went up another 50,000 pounds. The fuel load went up 25,000 pounds." There were no performance penalties that mattered, he added.

The performance of the B-1B's defensive avionics, the Air Force Chief of Staff pointed out, is "somewhere between a year and a half and two years [behind] what we hoped to have at this time." The problem, he explained, is not a design flaw. "It's the integration that's causing the difficulty," he asserted. Because of a continually changing threat, electronic countermeasures in general, and defensive avionics in particular, must be modified and updated continually, the Air Force Chief pointed out. Soviet hardware changes and new techniques drive these adjustments and create "a never-ending battle." This cat-and-mouse game, he stressed, is a fact of life in the ECM field.

The B-1B's flight ceiling of 20,000 feet with a full payload is not, contrary to some media reports, a design shortfall: "We designed it to be a low flyer." Stressing that the Air Force doesn't care how high the airplane flies, General Welch said there are only two valid litmus tests: "Can it penetrate at the altitudes and speeds [needed to carry out its mission]? The answer is yes, it can. Can it carry the payload that we designed it to carry to the targets we designed it to go to? The answer is yes, it can."

Turning to the Advanced Technology Bomber (ATB) program, General Welch dismissed speculation that the alleged developmental problems of the B-1B presaged major difficulties for the even more sophisticated aircraft. The ATB is proceeding satisfactorily, "with the normal things you find as you develop a complex airplane." The aircraft, which has not yet flown, "is markedly more efficient [aerodynamically] than its predecessors" and hence requires less tanker support.

Responding to the allegation that the Air Force supports the Small ICBM (SICBM, or Midgetman) program merely for political reasons in order to win congressional approval for deployment of the second fifty MX Peacekeepers, General Welch gave the "most convincing [answer] I know. . . . It's fully funded in the Air Force budget that the Air Force turned in to DoD and fully funded in the DoD budget that we turned in to Congress."

He underscored Midgetman's military utility by pointing out that strategic targets don't necessarily group themselves so that a ten-warhead missile can be used against them in an effective manner. "There are time-sensitive targets that require something other than a ten-warhead [MX Peacekeeper]. That's particularly true of the emerging targets, those targets that pop up during execution that you didn't know were there. . . . The small [ICBMs can] handle that."

He agreed, however, that in terms of cost per target held at risk, MX is clearly more economical. To date, congressional reaction to the Air Force's plan to deploy the second fifty MX Peacekeepers in a garrison/rail-mobile fashion has been "good," according to General Welch.

Washington Observations

★ The Joint Chiefs of Staff, in the FY '88 Military Posture statement, disclosed that the Soviet strategic offensive arsenal now boasts a total of 2,837 nuclear delivery vehicles comprising 2,397 ballistic missiles and 440 nuclear-armed bombers. The corresponding US total is 1,988 strategic delivery systems, of which 1,646 are missiles and 342 are bombers.

Over the past ten years, the Soviets reduced the erstwhile 3:1 US lead in the total number of nuclear warheads to nearly 1:1, built up a 2:1 lead in prompt hard-target kill capability, and changed the balance in equivalent megatons—generally considered the basic measure of merit in the strategic nuclear equation—to one that is now two-to-one in their favor.

In a separate development, the Pentagon reported that the Soviets recently completed facilities for additional SS-25 ICBMs and "can now support about 100 SS-25 launchers." The Soviets have apparently fielded about twenty-eight SS-25s since September 30, 1986. The total of SS-25s known to exist then was only seventy-two missiles.

★ Asserting that elements of SDI ("Star Wars") research are proving successful beyond the expectations of its most optimistic supporters, Defense Secretary Caspar Weinberger suggested recently that "we may be nearing the day when decisions about deployment of the first phase can be made" and "that we now have an unprecedented degree of confidence in the feasibility of defense against Soviet missiles."

In this context, the Chairman of the Joint Chiefs of Staff, Adm. William J. Crowe, Jr., cautioned Congress that even if the decision is made immediately to develop such a phase one system, it could not be fielded before the middle of the 1990s. ■

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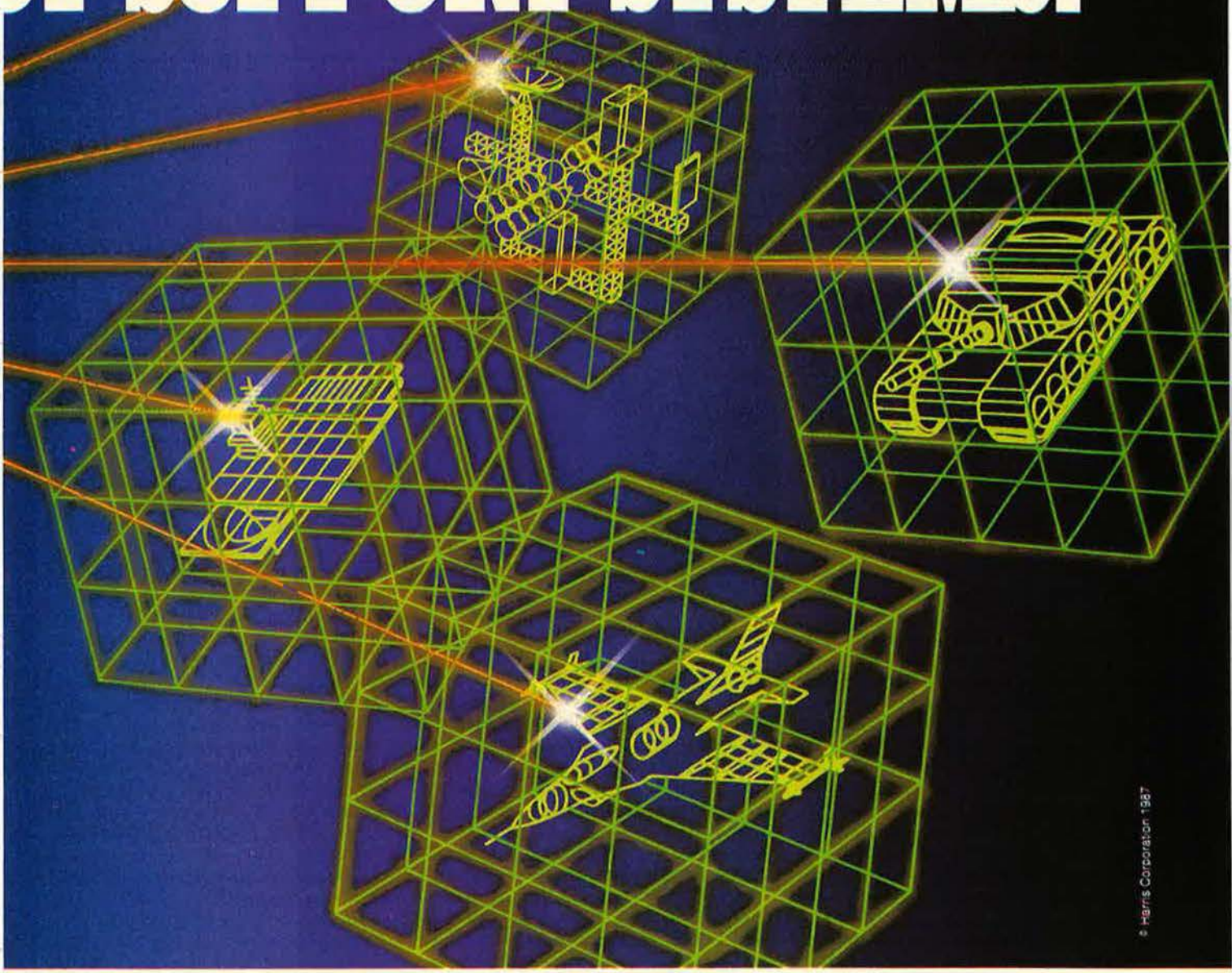

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The First Biennial Budget

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

The Pentagon asks for real funding growth of three percent annually in FY '88–89. Its budget reflects a "competitive strategies" concept—aligning US strengths against Soviet weaknesses.

Washington, D. C., Feb. 3

The Administration's defense budget request for FY '88 and FY '89, submitted to Congress in early January, seeks only modest growth rates of three percent for each of the two years. The funds will not recover the ground lost by a seven percent real decrease in defense spending that Congress imposed in the last two years.

Terming the request "a very modest investment" in national security, Defense Secretary Caspar Weinberger explicitly warned Congress that "in every corner of the globe, America's vital interests are threatened by an ever-growing Soviet military threat." Moscow, he pointed out, "is maintaining its unprecedented pace of military expansion and continues using military might to support its ruthless goals." In the last decade, he added, "the Soviet Union has outstripped us in almost every meaningful category of military production."

The Administration's defense request seeks $303.3 billion in budget authority (BA) for FY '88—an increase of $21.6 billion over this year's level—and $323.3 for FY '89, expressed in current year dollars. The request, in line with Congress's new DoD Authorization Act (PL 99-145), covers two budget years as opposed to the year-by-year process of the past.

The shift to a biennial approach was hailed by Secretary Weinberger as a harbinger of greater funding and program stability and as a step away from picayune congressional line-item review. The two-year funding request is the "up-front" component of the Administration's FY '88–92 defense program, which, expressed in current or "then-year" dollars, envisions an aggregate budget authority for this five-year period of about $1.722 trillion.

In addition to the funds sought by the Administration for the Pentagon, the Department of Energy's defense activities—in the main nuclear weapons and nuclear materials production—are pegged at about $8 billion in FY '88 and at $8.5 billion in FY '89. Of this total, some $480 million goes toward research and development of the Strategic Defense Initiative (SDI). Proposed SDI spending by the Pentagon comes to about $5.231 billion in FY '88 and $6.292 billion in the following year. SDI, Secretary Weinberger told Congress, remains the centerpiece of the Administration's strategic defense efforts.

The central tenet shaping the two-year defense budget remains unchanged from the Administration's defense policy of the past, as pointed out by Secretary Weinberger: "[We] seek to achieve our objectives not by the use of force but rather by deterring an adversary from using his forces against us." Logic dictates, therefore, that the "calculus" of US deterrence allows a sufficient safety margin for the vagaries in Soviet perception of this country's deterrent power and for the dynamics of military technology. In turn, US defense planners face the perennial Hobson's choice "of tradeoffs between investing in today's capabilities or tomorrow's possibilities, with all its attendant uncertainties, risks, and costs, but with the certain knowledge that the USSR never ceases its massive research, development, and deployment of ever-more modern weapon systems."

As a counter to the incessant expansion of Soviet military capabilities, the new budget stresses the fundamental concept of "competitive strategies," which Secretary Weinberger defined as "aligning enduring American strengths against enduring Soviet weaknesses." The idea behind the Administration's competitive strategies philosophy is not totally original, having its roots in the commonsense notion that US technology efforts should seek to inflict technological obsolescence on the Soviets and thereby offset Moscow's lead in defense investments.

What is new in the formulation of the competitive strategies concept underlying the President's five-year defense program is its coupling of the explicit and systematic dedication to this objective with complementary adjustments of operational doctrines. By institutionalizing these strategies, Secretary Weinberger promised, the US will be able to "force the Soviets to perform less efficiently or effectively." The upshot is that this country enhances "deterrence by making significant components of the Soviet force structure or their operational plans obsolete." By extension, the Soviets are forced to make difficult tradeoffs, including "shifting more resources to defensive systems and operations, rather than continuing to structure forces for offensive operations, or they might decide to forgo certain offensive forces because of their inability to overcome our defensive posture."

While SDI is obviously a major player in the competitive strategies approach, it clearly is not the only one. Equally important points of technological or doctrinal leverage include antisubmarine warfare, low-observable air-breathing weapon systems, and the combination of technologies associated with the AirLand Battle and Follow-on Forces Attack (FOFA) doctrines.

In the case of air-breathing strategic and tactical weapons, Secretary Weinberger suggested to Congress that "a number of factors makes our penetrating bomber force [an element] of comparative advantage for the US that needs to be amplified by the new strategies." First, "geography favors us, since the US and its

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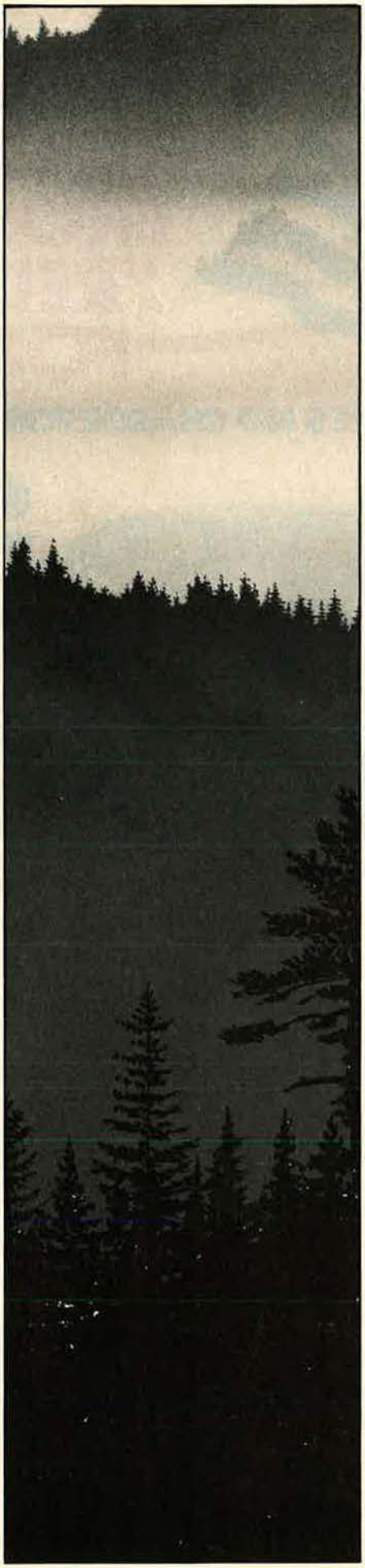

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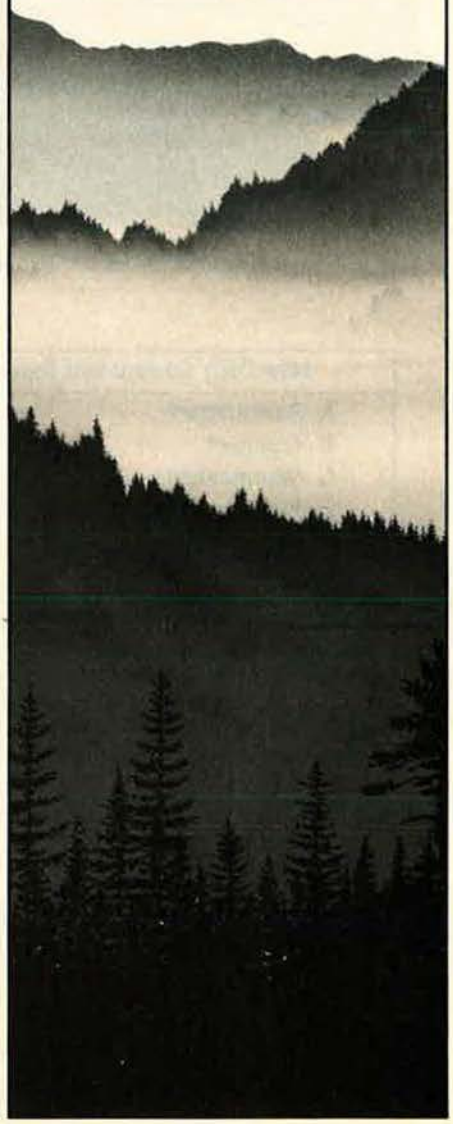

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CAPITOL HILL

By Brian Green, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., Jan. 30

Aspin Renamed HASC Chairman

Rep. Les Aspin (D-Wis.), reversing an earlier defeat, won reelection as Chairman of the House Armed Services Committee (HASC) in a January 22 vote taken by the House Democratic Caucus.

Representative Aspin was challenged by Reps. Marvin Leath (D-Tex.), Nicholas Mavroules (D-Mass.), and Charles Bennett (D-Fla.). He defeated Representative Leath by a tally of 133–116 in the last of three votes. Representatives Mavroules and Bennett had been eliminated as the low vote-getters in the first two votes. Representative Aspin had lost a preliminary vote of confidence in the Caucus two weeks earlier by a margin of 130–124.

Representative Aspin was challenged because of his controversial leadership style as well as for his support of the MX ICBM and funding for the Nicaraguan rebels. These latter stands are unpopular with many liberal Democrats. Many sources suggest that as a result of his earlier defeat and the tough campaigning to regain the chairmanship, Representative Aspin may be more responsive to the liberal wing of his party.

FY '88–89 Defense Budget

The Administration has proposed a two-year spending package for the Pentagon that provides $303.3 billion in budget authority (the legal authority to obligate funds in current and future years) for fiscal year (FY) 1988 and $323.3 billion for FY '89. The budget calls for modest, three percent inflation-adjusted growth in defense spending over the $281.4 billion finally approved in FY '87 and another three percent increase in FY '89. Outlays, or actual expenditures, are projected at $289.3 billion and $303.7 billion, respectively.

Initial congressional reaction to the budget has been skeptical, but not as harsh as it has been in the recent past. Representative Aspin granted that "the figures aren't so crazy as to be irrelevant, as was true the last three years." Sen. Sam Nunn (D-Ga.), Chairman of the Senate Armed Services Committee, expressed the view that something approaching a real freeze of defense spending was likely.

This is the first two-year defense budget submitted by DoD, a congressional mandate supported by the Pentagon. A two-year budget is intended to improve program stability and allow for more rational planning. There are indications, however, that Congress may continue to review and approve the budget on an annual basis. Rep. Bill Chappell (D-Fla.), the chairman of the defense subcommittee of the House Appropriations Committee, has suggested that he might consider annual appropriations based on a two-year authorization. That arrangement is not likely to meet with the approval of the Armed Services Committees that approve defense authorizations.

DoD Budget Highlights

Budget authority in FY '88 for operations and maintenance will increase about four percent in inflation-adjusted dollars over FY '87, procurement will decline about eleven percent, personnel costs will go up about one and a half percent, and research, development, test, and evaluation will go up about seventeen percent. The FY '89 real increases over FY '88 are two percent for O&M, 9.5 percent for procurement, zero for personnel, and a one percent decline for RDT&E.

In budget authority, the Army is slated to receive $80.1 billion in FY '88 and $84.7 billion in FY '89, the Navy $102.3 billion and $108.7 billion, the Air Force $100.4 billion and $107.2 billion, and the defense agencies $19.1 billion and $20.9 billion. FY '88 real increases over FY '87 are 2.7 percent for the Army, 2.7 percent for the Navy, 2.6 percent for the Air Force, and 9.8 percent for the defense agencies. FY '89 increases over FY '88 are slated at 2.2, 2.7, 3.1, and 6.3 percent, respectively.

There are some indications that the Administration might soon seek early deployment of a less than "thoroughly reliable" ballistic missile defense system, based on the results of SDI research, as part of a broader deployment scheme.

Air Force Budget Highlights

The Air Force budget shows a twenty-one percent decline in aircraft procurement in FY '88 followed by an eighteen percent increase in FY '89, an eighteen percent increase in missile procurement in FY '88 and a ten percent increase in FY '89, a thirteen percent decline in "other procurement" in FY '88 and a subsequent eleven percent increase (including munitions), and a seventeen percent increase in research, development, test, and evaluation funding in FY '88 followed by an eight percent decline.

Major budget items include:

- *F-15E and F-16.* While a forty-tactical-fighter-wing force remains the interim Air Force goal, the numbers of F-15Es and F-16s requested (forty-two and 180 respectively in both FY '88 and '89) are not sufficient to sustain the expansion necessary to reach that goal.
- *AMRAAM.* The flight testing of the Advanced Medium-Range Air-to-Air Missile has been very successful. DoD is requesting $833 million for 630 missiles in FY '88 and $933 million for 1,800 in FY '89.
- *ATF.* The Advanced Tactical Fighter, the Air Force's air-superiority fighter of the future, was funded at $248 million in FY '87. FY '88 and '89 requests are $537 million and $703 million, respectively.
- *B-1.* B-1B R&D requests are for $415 million and $387 million. These sums will make up some of the cuts imposed in prior years by Congress and will go a long way toward solving development problems experienced in the early phases of deployment of the B-1.
- *C-17.* The C-17 airlifter is scheduled to move into initial production. Procurement of two aircraft is planned in FY '88 with procurement funding of $724 million and four in FY '89 with $1.1 billion.
- *NASP.* The National Aerospace Plane is an R&D program intended to produce a single-stage-to-orbit aerospace plane that can deliver payloads to space for less cost per pound than current systems. Air Force funding is $236 million for FY '88 and $306 million in FY '89. ■

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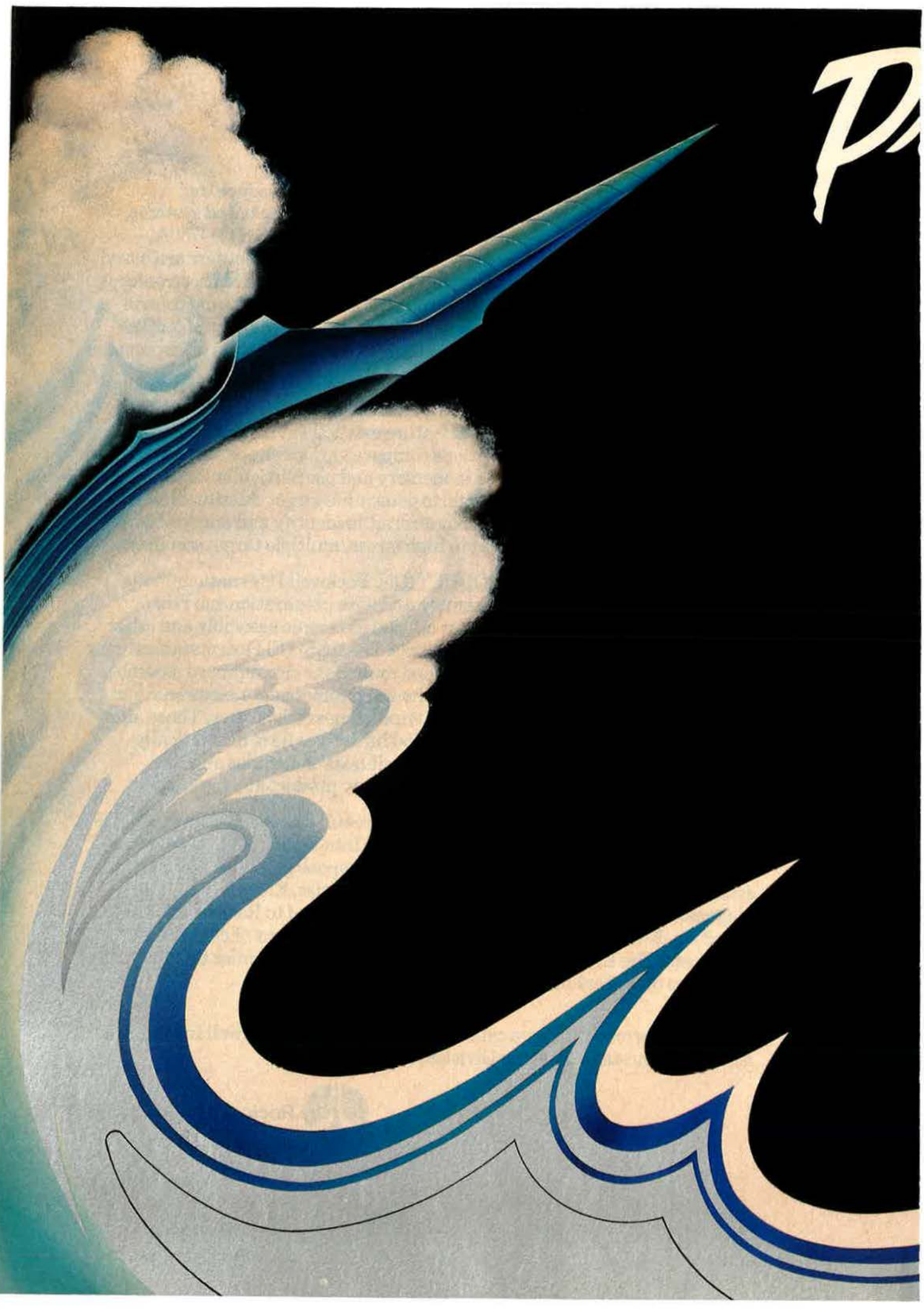

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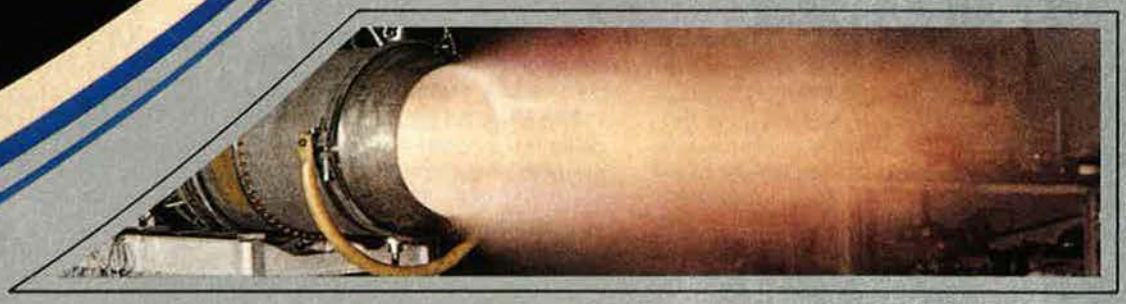

A static test firing of an Aerojet air-breathing propulsion system

AEROSPACE WORLD

. . . PEOPLE . . . PLACES . . . EVENTS . . .

By Jeffrey P. Rhodes, DEFENSE EDITOR

The US Navy's Blue Angels unveiled their new show aircraft, the McDonnell Douglas F/A-18 Hornet, in ceremonies last fall at the team's home, NAS Pensacola, Fla. The only difference between this picture and the final show scheme is that the "F/A-18 Hornet" line on the fuselage spine has been replaced by a stylized logo of the plane's stinging namesake.

Washington, D. C., Feb. 5

★ The American people have greater confidence in the military and its leaders than they do in organized religions and their leaders, according to both the Gallup and Harris polls released in mid-December. In fact, the public has more confidence in the armed services than in thirteen other institutions listed in the Harris poll and nine others in the Gallup tally.

The polls differed somewhat in their approaches, with Harris concentrating on the confidence placed in the leaders of the listed institutions and Gallup surveying confidence in the institutions themselves.

Thirty-six percent of the 1,250 adults surveyed in the Harris poll said they had a "great deal of confidence" in the military's leaders, up from thirty-two percent in 1985, but far short of 1966's record high of sixty-two percent. Following military leaders in confidence levels are leaders of higher education (34%), doctors (33%), US Supreme Court Justices (32%), those running TV news (27%), and leaders of organized religion (22%). Ranking fourteenth on the Harris poll were labor leaders (11%).

In the Gallup survey, sixty-three percent of 1,539 adult respondents said they had a "great deal" or "quite a lot" of confidence in the military as an institution. Churches (57%) were next, followed by the Supreme Court (53%) and banks (49%). Organized labor finished eighth (29%), and television (27%) ranked tenth and last in this poll.

★ The Blue Angels, the US Navy's aerial-demonstration team, are now well along into their training with their new McDonnell Douglas F/A-18 Hornets at their winter home of NAF El Centro, Calif. The team converted to the new planes last fall after flying Douglas A-4F Skyhawk aircraft for the past twelve years.

The Blue Angels will eventually receive ten aircraft—eight F/A-18A single-seat ships and two F/A-18B dual-seat aircraft. These planes were among some of the first Hornets built (Lot IV limited production aircraft) and are not carrier-qualified. In the event of war, the Blue Angels' aircraft would go to fleet replacement training squadrons.

The aircraft have been modified slightly to accommodate Blue Angels-peculiar systems, but are very similar to Hornets in the fleet. The main modification to each of the planes was the replacement of the M61A 20-mm cannon with a smoke-generating system. The gun fits on a palletized assembly that is lowered as a unit from the plane's nose. The smoke system, consisting of an eighty-gallon oil tank, accumulators, and a boost pump, was built to fit on the same pallet. The gun's exhaust ports were filled, and the blast shield was replaced with 258 pounds of lead ballast to compensate for the weight of the removed gun and for when the smoke oil is depleted.

In the cockpit, a modified aircrew restraint system was installed to provide the pilot with a positive lock into the seat. A Collins VOR/ILS (VHF Omnirange/Instrument Landing System) was installed so that the team could operate out of civil airports. The VOR/

ILS is not standard on a Navy F/A-18, but it is on foreign military sales (FMS) airplanes that are being sold to Australia, Canada, and Spain and, as such, is easily tied by a software change to the multifunction displays in the cockpit. Also, because the VOR/ILS needs an external antenna, the gun-bay doors on the team's aircraft were replaced by doors manufactured for the FMS F/A-18s.

The Blue Angels aircraft had nickel-cadmium batteries, but like all F/A-18s, these are being replaced with sealed lead-acid gel batteries. In addition to the plumbing installed for the smoke system, one external engine flap was modified to allow the oil to feed into the exhaust. One F/A-18B aircraft will not have the smoke system.

All the modification work was conducted at the Navy's North Island, Calif., Naval Air Rework Facility (NARF), and the aircraft were painted in the team's traditional blue and gold show scheme at the team's home, NAS Pensacola, Fla.

The F/A-18 is the ninth aircraft type the Blue Angels have used since they were formed at NAS Corpus Christi, Tex., in 1946. The Hornet is the third consecutive McDonnell Douglas-built aircraft the team has flown. The first public show with the new airplanes is scheduled for April 25 at MCAS Yuma, Ariz.

★ Less than a year after the Space Shuttle *Challenger* exploded, the National Aeronautics and Space Administration announced on January 9 that a crew of five astronauts, all with Shuttle experience, would be aboard the Orbiter *Discovery* next February, when Shuttle flights are scheduled to resume. The crew will consist of three servicemen and two civilians.

Navy Capt. Frederick Hauck, who has flown twice previously in the Shuttle, will be Mission Commander. Captain Hauck, Mission Commander of Mission 51-A in November 1984, is currently serving as NASA's Acting Associate Administrator for External Affairs. Pilot for the mission will be Air Force Lt. Col. Richard O. Covey. Colonel Covey served as pilot during Mission 51-I in August 1985.

Serving as Mission Specialists will be John M. (Mike) Lounge, George D. "Pinkie" Nelson, and Marine Maj. David C. Hilmers. Mr. Lounge also flew on Mission 51-I and worked the Shuttle's remote manipulator arm. Mr. Nelson first gained fame on Mission 41-C in April 1984 when he and astronaut James "Ox" Van Hoften captured and repaired the Solar Max satellite while in orbit. He also flew on Mission 61-C in January 1986, the last mission before the *Challenger* accident. Major Hilmers flew on Mission 51-J, during which classified operations were conducted for DoD.

MSgt. Charles D. Proffit (right), a Reservist with the 302d Tactical Airlift Wing at Peterson AFB, Colo., recently received the Order of the Bayonet, the most prestigious security police award given by MAC. It's for significant contributions to the air base defense mission. Sergeant Proffit, shown here instructing SSgt. Carey McGuire, is the first Reservist to win the award. (USAF photo by Lt. Dave Pettinari)

In related news, the auditorium at the Air Force Test Pilot School at Edwards AFB, Calif., has been renamed the Dick Scobee Auditorium in honor of Francis R. "Dick" Scobee, Mission Commander on the fatal *Challenger* (Mission 51-L) flight. A retired Air Force major, Mr. Scobee was a 1972 graduate of the Test Pilot School and served as a test pilot for six years before joining the astronaut program in 1978. Similarly, the Massachusetts Institute of Technology in Cambridge, Mass., recently dedicated its space studies facility to Ronald E. McNair, a Mission Specialist on 51-L who had received his Ph.D. in physics from MIT.

Finally, on January 8, workers began placing 235,840 pounds of wreckage recovered from the *Challenger* explosion in a dormant missile silo at Cape Canaveral AFS, Fla. The silo will be sealed shut.

The auditorium at the Air Force Test Pilot School at Edwards AFB, Calif., was recently renamed in honor of test pilot/astronaut Dick Scobee, who was killed in the Challenger Shuttle disaster. Shown beneath the portrait are Mrs. June Scobee, the pilot's widow, Brig. Gen. John Schoeppner, Jr., a classmate of Mr. Scobee at the school, and Jeanne Pajaras-Barrett, the artist. (USAF photo by SSgt. Dave Souza)

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AEROSPACE WORLD

★ The week before Christmas proved to be a busy and successful one for the AIM-120A Advanced Medium-Range Air-to-Air Missile (AMRAAM) program. Four successful firings were held, and another important step was reached in the missile's development.

Opening the five-day period of activity was the first successful separation test of an AMRAAM from a Grumman F-14. This first test on a Tomcat took place at the Navy's Pacific Missile Test Center at Point Mugu, Calif., on December 16.

Two days later, an AIM-120 scored a direct hit on a low-flying QF-86 drone after being ejector-launched from a McDonnell Douglas F/A-18 Hornet. In this midrange, look-down/shoot-down engagement, the F/A-18 was flying at Mach 0.7 at 21,000 feet above sea level, while the drone was traveling at the same speed at a low altitude. This was the third test to be conducted at the Naval Weapons Center at China Lake, Calif., and the sixth launch from an F/A-18.

The next day, an F-15C launched one of the nearly twelve-foot-long missiles at a QF-100 drone in a low-altitude attack over the Gulf of Mexico. The QF-100, which employed electronic countermeasures after the missile was launched, was flying ahead of the F-15, slightly higher, and 200 knots faster, but the AIM-120 passed within lethal range of the target. This was the first test conducted at Air Force Systems Command's Armament Division's home base of Eglin AFB, Fla. Armament Division manages the joint Air Force/Navy AMRAAM program.

Saturday, December 20, marked the first time two AIM-120s were launched from one aircraft at two separate targets in one engagement. In this test at the White Sands Missile Range, N. M., an F-16C flying at Mach 0.9 at 20,000 feet fired at two QF-100s traveling Mach 0.88 at 30,000 feet. The QF-100s were separated by about two miles. The F-16's radar was in the track-while-scan mode, and after launch, the AIM-120s acquired the two targets. The first missile scored a direct hit, while the other AMRAAM passed within lethal range of the drone.

With these four launches, the AMRAAM scoreboard now reads twenty-one successes out of twenty-four tries.

In related news, Armament Division recently awarded Raytheon Co.'s Missile Systems Division in Bedford, Mass., a $27.5 million long-lead contract for initial procurement of materials to build seventy-five AIM-120s. This completes the contract award for Lot I production of the 335-pound missiles. Hughes Aircraft Co. is the lead AMRAAM contractor, while Raytheon is the follower. The two companies will compete against each other starting with Lot III production.

Capt. Ed Walby (left), a U-2/TR-1 commander with the 99th Strategic Reconnaissance Squadron at Beale AFB, Calif., points out an item of interest to Ernest K. Gann during the author's stay at the base. Mr. Gann is writing about the U-2s of the 9th SRW and the men who fly them. (USAF photo by SrA. Joe Castellino)

The AIM-120A Advanced Medium-Range Air-to-Air Missile (AMRAAM) test program is going smoothly, with a nearly ninety percent success rate. Here TSgt. Michael Stickle checks a fin on the missile prior to a test at Eglin AFB, Fla., last December.

★ The Defense Intelligence Agency, in a recently released report, states that the Soviet Union has a large and ongoing biological and toxin weapons program. This effort puts the Soviets in violation of the Biological and Toxin Weapons Convention of 1972, which prohibits the development, production, and stockpiling of biological weapons. The report also notes that the Soviets, by their use of chemical weapons in Southeast Asia and Afghanistan, are in violation of the Geneva Protocol of 1925, which bars the first use of chemical and biological weapons in war.

The report goes on to say that the Soviets "are continuing to test and evaluate delivery and dissemination systems for these [biological warfare] agents. . . . We also have identified a number of installations capable of producing disease agents and toxins on a large scale and placing them in munitions and delivery/dissemination systems."

The twenty-eight-page report con-

tinues, "One such facility is in the city of Sverdlovsk and has a long history of biological warfare R&D [research and development] and production, with emphasis on the causative agent of anthrax. . . . Anthrax causes a high mortality rate when infection results from ingestion (up to seventy percent fatal) or inhalation (almost 100 percent fatal) if treatment is not begun promptly." A major accident occurred at this plant in 1979, and hundreds of Soviet citizens died from anthrax inhalation within a week. More than 1,000 cases were reported in subsequent weeks. Anthrax spores are resistant to heat, disinfectants, sunlight, and other environmental agents.

DIA also says that the Soviets have developed tularemia, cholera, and the plague for biological warfare purposes, and they have developed botulinum toxin, enterotoxin, and mycotoxins as well. The report also concludes the Soviets have vaccines or antidotes for anthrax, plague, botulism, and tularemia—all diseases they might use in a biological warfare attack. Standard Soviet protective suits would be sufficient to protect most Soviet troops from the effects of those agents.

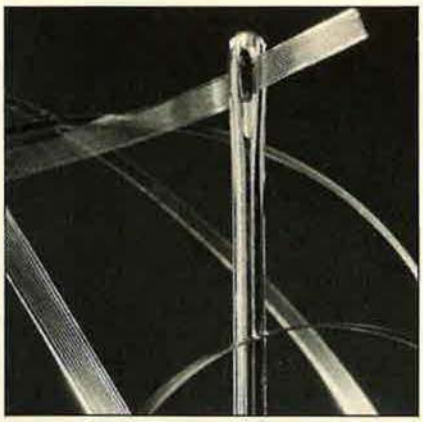
★ While a majority of details surrounding the Advanced Technology Bomber (ATB) program remains shrouded in secrecy, Rep. Ike Skelton (D-Mo.) announced in early January—and the Air Force confirmed—that the first operational ATB wing will be based at Whiteman AFB, Mo.

In order to prepare Whiteman AFB for the arrival of the bombers in the early 1990s, $89.3 million has been budgeted in FY '88 for military construction projects at the base. Whiteman AFB is presently home to the 351st Strategic Missile Wing. The ATBs will be the first strategic aircraft assigned at the base since a B-47 wing was located there in the early 1960s.

No other basing plans for the ATB were announced, but the Air Force is currently planning to buy 132 of the Stealth bombers, or enough aircraft to equip approximately five wings (using the B-1B deployment schedule as a guide). Under the Department of Defense designation system adopted in 1962, the ATB will likely be identified as the B-2.

A little light was also cast into another "black," or classified, project when Secretary of Defense Caspar Weinberger announced that the first operational Advanced Cruise Missiles (ACMs) will be deployed to K. I. Sawyer AFB, Mich., in 1989 or 1990.

AEROSPACE WORLD



Tayco Engineering, Inc., of Long Beach, Calif., has designed and built this tiny, lightweight, nine-conductor flat cable for connecting optical detector cells in satellites. Shown threaded through a needle, the 1/16-inch cable carries 6,000 channels of information.

The ACM is a stealthy follow-on to the AGM-86B cruise missile now in the inventory.

Among the highlights of other announced planned force structure changes are that the 114th Tactical Fighter Training Squadron at Kingsley Field, Ore., and the 123d Fighter Interceptor Squadron at Portland IAP, Ore., will be the first units to receive some of the 270 F-16A/B aircraft to be modified for the air defense mission. The two Air National Guard units will receive their aircraft in early 1989. The F-4C aircraft currently flown by the two units will be retired.

Also, the headquarters of MAC's Twenty-third Air Force will be transferred from Scott AFB, Ill., to Hurlburt Field, Fla., in mid-1987; in addition, the 474th Tactical Fighter Wing at Nellis AFB, Nev., and the 5th FIS at Minot AFB, N. D., will be deactivated in early 1988.

★ **NEWS NOTES**—In late December, the AGM-88 High-speed Anti-Radiation Missile, or **HARM, became the first defense suppression weapon to be operationally deployed on the Navy's EA-6B Prowler** electronic warfare aircraft. The HARMs are a lethal complement to the aircraft's active and passive electronic countermeasures capabilities. Testing and evaluation began last May at the Naval Weapons Center at China Lake, Calif., and concluded in August with a fleet firing of the nearly fourteen-foot missile at the Pacific Missile Test Center at Point Mugu, Calif. Initial fleet deployment began in August. The pro-

SENIOR STAFF CHANGES

PROMOTIONS: To be **General:** James A. **Abrahamson;** Monroe W. **Hatch,** Jr.

To be **Lieutenant General:** James P. **McCarthy.**

To be **ANG Major General:** John A. **Almquist,** Jr.; Harold R. **Hall;** Francis E. **Hazard;** Darrell V. **Manning.**

To be **ANG Brigadier General:** John **Anderson,** Jr.; Ralph W. **Applegate;** Robert E. **Dastin;** Sam F. **DeLitta;** James S. **Forrester;** Theodore F. **Lowe,** Jr.; Charles A. **Machemehl;** Thomas N. **McLean;** Frederick J. **Rittershaus;** Fred D. **Womack.**

CHANGES: M/G Gordon E. Fornell, from Cmdr., Armament Div., AFSC, Eglin AFB, Fla., to Senior Military Ass't to Sec. of Defense, Washington, D. C. . . . **L/G (Gen. selectee) Monroe W. Hatch, Jr.,** from Vice CINC, Hq. SAC, Offutt AFB, Neb., to Vice C/S, Hq. USAF, Washington, D. C., replacing Gen. John L. Piotrowski . . . **Gen. Robert T. Herres,** from CINCUSSPACECOM and CINCNORAD, Peterson AFB, Colo., to Vice Chairman, OJCS, Washington, D. C. . . . **M/G (L/G selectee) James P. McCarthy,** from DCS/Plans, Hq. SAC, Offutt AFB, Neb., to Cmdr., 8th AF, SAC, Barksdale AFB, La., replacing L/G Kenneth L. Peek, Jr. . . . **AFRES B/G William B. McDaniel,** from Cmdr., 452d Air Refueling Wing (AFRES), March AFB, Calif., to Cmdr., 452d Air Refueling Wing (AFRES), March AFB, Calif., and Cmdr., 10th AF (AFRES), Bergstrom AFB, Tex., replacing AFRES M/G Roger P. Scheer.

B/G Eric B. Nelson, from DCS/Plans & Prgms., Hq. AFSC, Andrews AFB, Md., to DCS/Systems, Hq. AFSC, Andrews AFB, Md., replacing M/G Richard E. Steere . . . **L/G Kenneth L. Peek, Jr.,** from Cmdr., 8th AF, SAC, Barksdale AFB, La., to Vice CINC, Hq. SAC, Offutt AFB, Neb., replacing L/G (Gen. selectee) Monroe W. Hatch, Jr. . . . **Gen. John L. Piotrowski,** from Vice C/S, Hq. USAF, Washington, D. C., to CINCUSSPACECOM and CINCNORAD, Peterson AFB, Colo., replacing Gen. Robert T. Herres . . . **M/G Richard E. Steere,** from DCS/Systems, Hq. AFSC, Andrews AFB, Md., to Cmdr., Armament Div., AFSC, Eglin AFB, Fla., replacing M/G Gordon E. Fornell . . . **AFRES B/G David S. Trump,** from IMA to Cmdr., Aerospace Medical Div., Brooks AFB, Tex., to IMA to Dep. Surgeon General of the Air Force, Hq. USAF, Bolling AFB, D. C. ■

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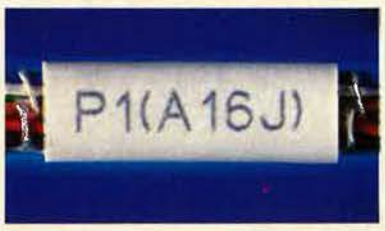

Raytheon

Where quality starts with fundamentals

cess of integrating HARMs with the EA-6B began in early 1985.

The Air Force's **F-16 fleet passed the 1,000,000 flying hour mark** during a training flight from Homestead AFB, Fla., on December 19. Maj. Gen. Marcus A. Anderson, Deputy Chief of Staff for Operations at Hq. Tactical Air Command, Langley AFB, Va., and Lt. Col. Randy Scott, Assistant Operations Officer of the 309th TFS at Homestead, crewed the milestone flight. The F-16, made by General Dynamics in Fort Worth, Tex., is the safest single-engine fighter the Air Force has ever flown. The F-16 has been operational with the Air Force since 1979.

Greece became the latest customer for the F-16 on January 12. Delivery of the first of **forty aircraft to the Hellenic Air Force** will begin in late 1988 and continue into 1989. Part of the agreement calls for GD, Westinghouse (F-16 radar), and General Electric (engines) to establish a $50 million business development center in Greece. F-16s are currently flown in ten countries, and five other countries, including Greece, have F-16s on order.

In mid-December, Secretary of Defense Caspar Weinberger approved the award and wearing of the **Armed Forces Expeditionary Medal** to service members **who took part in Operation Eldorado Canyon** last April against terrorist strongholds in Libya. Those personnel who actually entered the area of operations for Eldorado Canyon, which included the four air routes where Air Force air refueling took place and an area in the vicinity of Libya where US forces were employed, are eligible for the medal.

In mid-January, the Swiss Military Department announced it will recommend the **British Aerospace Hawk** to Switzerland's Parliament **to be the new jet trainer for the Swiss Air Force.** The Hawk and the Dassault-Breguet/Dornier Alpha Jet were the final contenders after a three-year evaluation program that also considered the Aermacchi 339 and the CASA 101. The contract will call for twenty Hawk Mk. 1 trainers and related logistics. Approval from the Swiss Parliament is expected later this year. The Hawks will replace the SAF's thirty-year-old de Havilland Vampire trainers in 1990. The US Navy is planning to buy 302 British Aerospace/McDonnell Douglas T-45As, a variant of the Hawk, as its new undergraduate jet trainer.

After nine years and $1.4 billion in development, **Britain has decided to scrap its Nimrod Mk. 3** airborne early warning (AEW) aircraft program and **buy six Boeing E-3A Sentry** airborne warning and control aircraft (AWACS) instead. British Secretary of State for Defence George Younger, in a speech to the House of Commons on December 18, announced his government's decision to purchase the six aircraft at a cost of $1.2 billion, with an option to buy two more E-3s. Mr. Younger said the Boeing offer was more expensive than the Nimrod (roughly $302 million more than the remaining costs of acquiring eleven Nimrods), but the cost would be offset by lower technical risk. He also cited commonality with the US Air Force and the NATO AEW force as an additional factor in the decision. The first E-3A for the Royal Air Force is scheduled to arrive in 1991.

On January 15, the Navy carried out the **first flight test of the Trident II submarine-launched ballistic missile** with a pad launch from Cape Canaveral AFS, Fla. The Trident II, or D-5 as it is known, is being developed as the first SLBM with enough accuracy to destroy hardened targets. The ten-warhead, forty-four-foot-tall missile carried an instrumented payload, and all three of its stages were tested. The Navy has scheduled twenty pad launches of the D-5, to be followed by tests from a submerged submarine in 1989. ■

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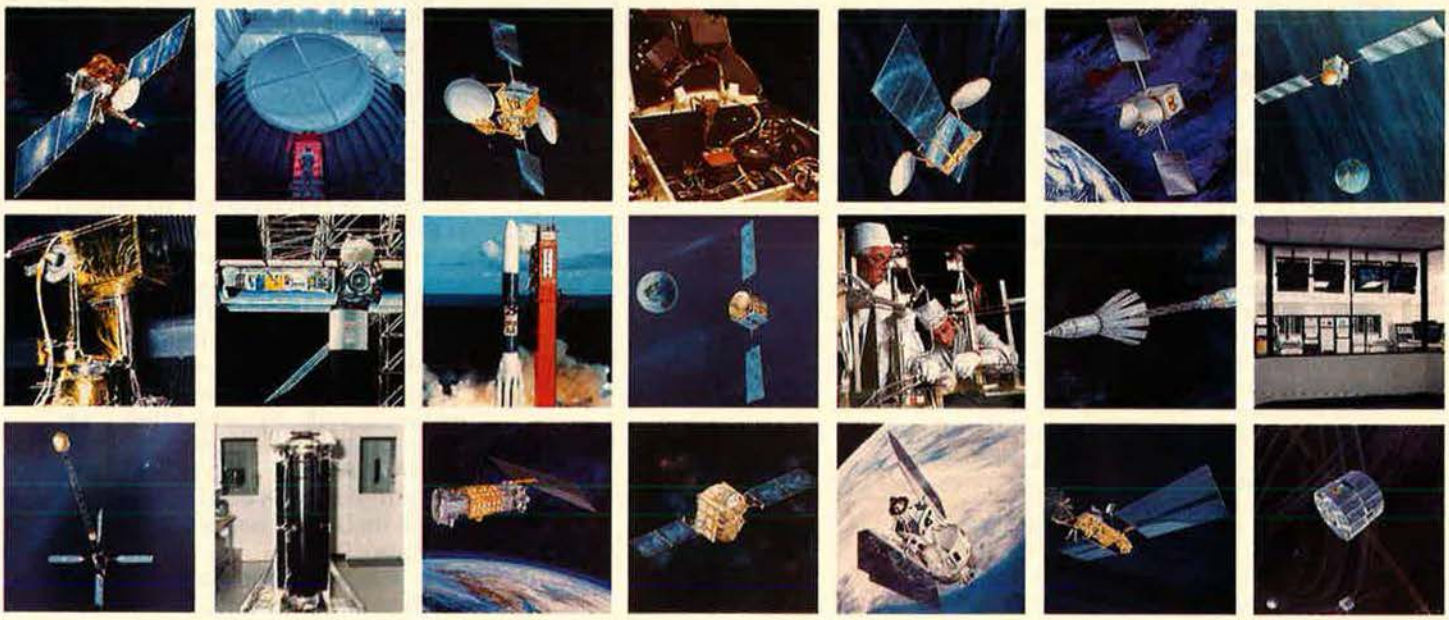

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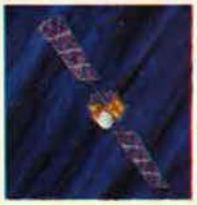

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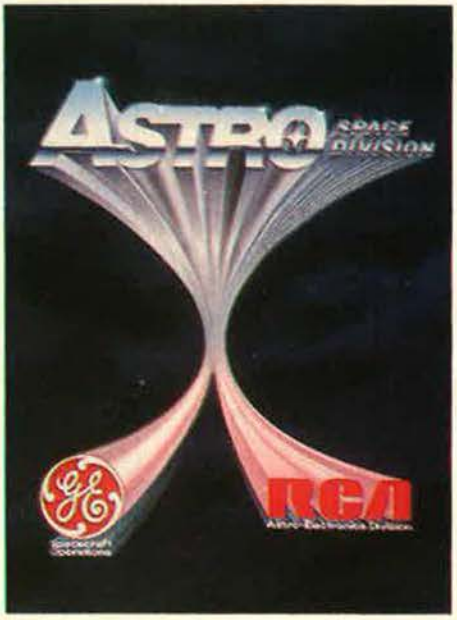

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AEROSPACE WORLD SPECIAL:

The Defense Budget

The Department of Defense funding request sent to Congress in January seeks $303.3 billion in budget authority for FY '88 and $323.3 billion in FY '89. This is the first time the Pentagon has presented its budget on a biennial basis, a change directed by Congress. Two-year budgeting is expected to increase stability, allow better planning, and achieve a degree of coordination and balance among requirements, strategies, and resources. The following charts examine various aspects of the FY '88–89 DoD budget request in historical perspective.

WHERE THE MONEY GOES

Defense Budget Authority in Current Billions

	FY '86 Dollars	% Chng.	FY '87 Dollars	% Chng.	FY '88 Dollars	% Chng.	FY '89 Dollars
Military Personnel	$67.8	8.8%	$73.8	6.2%	$78.3	4.2%	$81.6
O&M	74.9	4.9%	78.5	10.2%	86.6	5.7%	91.5
Procurement	92.5	−7.9%	85.2	−1.4%	84.0	12.7%	94.6
RDT&E	33.6	7.1%	36.0	21.5%	43.7	1.2%	44.3
Military Construction	5.3	−2.8%	5.1	28.6%	6.6	4.6%	6.9
Family Housing	2.8	11.3%	3.1	11.7%	3.5	5.7%	3.7
Other	4.5	—	—	—	0.6	—	0.8
TOTALS	**$281.4**	**0.1%**	**$281.7**	**7.7%**	**$303.3**	**6.6%**	**$323.3**

STRATEGIC FORCE TRENDS

	FY '80	FY '84	FY '86	FY '87	FY '88	FY '89
Land-Based ICBMs						
Titan	52	32	7	—	—	—
Minuteman	1,000	1,000	998	973	954	950
Peacekeeper	—	—	2	27	46	50
Strategic Bombers						
B-52D	75	—	—	—	—	—
B-52G/H	241	241	241	234	234	234
B-1B	—	—	18	58	90	90
Fleet Ballistic Launchers (SLBMs)						
Polaris	80	—	—	—	—	—
Poseidon (C-3 and C-4)	336	384	320	336	368	400
Trident	—	72	144	192	192	192
Strategic Defense Interceptors (Aircraft/Squadrons)						
Active	127/7	90/5	76/4	54/3	36/2	36/2
Air National Guard	165/10	162/10	198/11	195/11	216/12	216/12

SERVICE SHARES

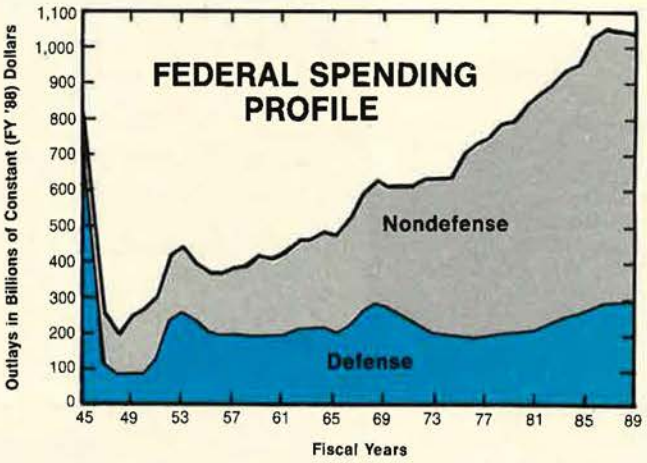
Budget Authority in Current Billions

	FY '87		FY '88		FY '89	
	Dollars	Share	Dollars	Share	Dollars	Share
Army	$74.5	26.4%	$80.1	26.4%	$84.8	26.2%
Navy/Marine Corps	95.3	33.8%	102.3	33.7%	108.7	33.6%
Air Force	93.8	33.3%	100.4	33.1%	107.2	33.2%
Defense Agencies						
Defense-wide	18.1	6.4%	20.5	6.8%	22.6	7.0%
TOTALS	**$281.7**		**$303.3**		**$323.3**	

MANPOWER GAINS AND LOSSES

Year-end Strength in Thousands

	FY '86	FY '87	FY '88	FY '89
Active Duty				
Army	781	781	781	781
Navy	581	587	593	603
Marine Corps	199	200	200	200
Air Force	608	607	599	601
Total Military	2,169	2,174	2,172	2,184
Selected Reserves	1,130	1,157	1,190	1,213
Civilians	1,112	1,124	1,123	1,125



THE DEFENSE PERCENTAGES

Dollars in Millions

Fiscal Year	Federal Outlays as a % of GNP	DoD Outlays as a % of Federal Outlays	DoD Outlays as a % of GNP	Non-DoD Outlays as a % of Federal Outlays	Non-DoD Outlays as a % of GNP
1950	16.0	27.5	4.4	72.5	11.6
1955	17.6	51.5	9.1	48.5	8.6
1960	18.2	45.0	8.2	55.0	10.0
1965	17.5	38.8	6.8	61.2	10.7
1970	19.8	39.4	7.8	60.6	12.0
1971	19.9	35.4	7.0	64.6	12.8
1972	20.0	32.6	6.5	67.4	13.5
1973	19.1	29.8	5.7	70.2	13.4
1974	19.0	28.8	5.5	71.2	13.5
1975	21.8	25.5	5.6	74.5	16.2
1976	21.9	23.6	5.2	76.4	16.7
1977	21.1	23.4	4.9	76.6	16.2
1978	21.1	22.5	4.7	77.5	16.4
1979	20.5	22.8	4.7	77.2	15.8
1980	22.2	22.5	5.0	77.5	17.2
1981	22.7	23.0	5.2	77.0	17.5
1982	23.7	24.5	5.8	75.5	17.9
1983	24.3	25.4	6.2	74.6	18.2
1984	23.1	25.9	6.0	74.1	17.1
1985	24.0	25.9	6.2	74.1	17.8
1986	23.8	26.8	6.4	73.2	17.4
1987	23.0	27.0	6.2	73.0	16.8
1988	21.7	28.2	6.1	71.8	15.5
1989	21.1	28.4	6.0	71.6	15.1

Budgetese

Federal budget totals can be expressed in various ways, but the two used most often are budget authority *and* outlays. *Budget authority is the value of new obligations the government is authorized to incur. Outlays are actual expenditures.*

When funding is described in "constant" or "real" dollars, *the value has been adjusted for inflation in order to make direct comparison between budget years possible. A specific year—often the present one—is chosen as a baseline for "constant" dollars. When funding is described in* "then-year" or "current" dollars, *no adjustment has taken place. The total given is the actual amount spent, budgeted, or forecast.*

AIRLIFT AND SEALIFT

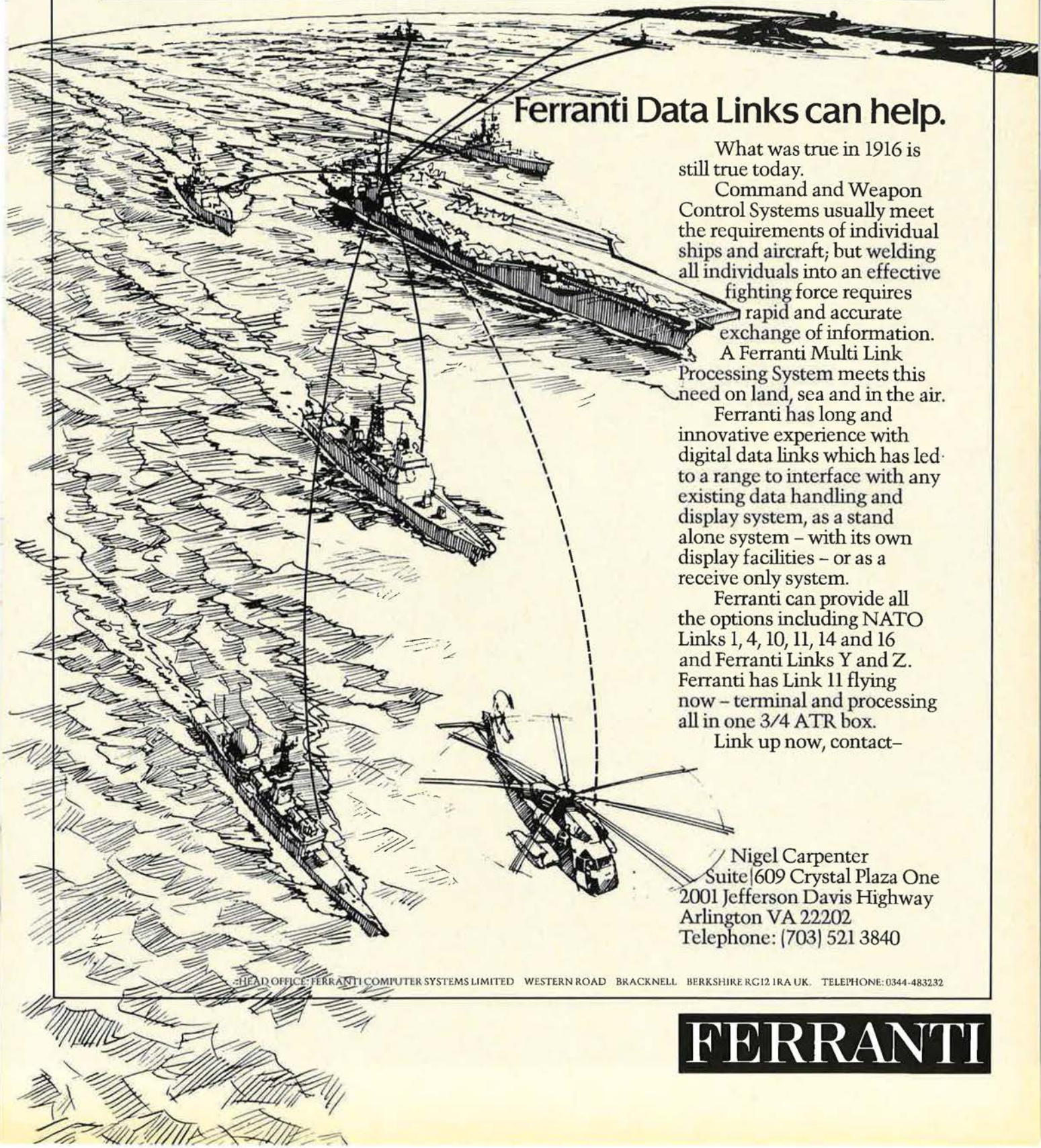
	FY '80	FY '84	FY '86	FY '87	FY '88	FY '89
INTERTHEATER AIRLIFTERS						
C-5A	70	70	66	66	66	66
C-5B	–	–	5	14	32	44
C-141	234	234	234	234	234	234
KC-10A	–	25	48	57	57	57
C-17	–	–	–	–	–	–
INTRATHEATER AIRLIFTERS						
Air Force						
C-130	482	520	504	559	521	513
C-123	64	–	–	–	–	–
C-7A	48	–	–	–	–	–
Navy and Marine Corps						
Tactical Support Aircraft	97	85	88	88	92	92
SEALIFT SHIPS, ACTIVE						
Tankers	21	21	24	20	20	20
Cargo	23	30	40	41	41	41
Reserve Ships	26	106	122	135	144	151

GENERAL-PURPOSE FORCE TRENDS

	FY '80	FY '84	FY '86	FY '87	FY '88	FY '89
LAND FORCES						
Army Divisions:						
Active	16	16	18	18	18	18
Reserve	8	8	10	10	10	10
Marine Corps Divisions:						
Active	3	3	3	3	3	3
Reserve	1	1	1	1	1	1
TACTICAL AIR FORCES (Aircraft/Squadrons)						
Air Force Attack/ Fighter						
Active	1,608/74	1,734/77	1,764/78	1,812/81	1,762/79	1,774/79
Reserve	758/36	852/43	876/43	900/44	894/43	888/43
Navy Attack/Fighter						
Active	696/60	616/63	758/65	752/67	758/67	758/67
Reserve	120/10	75/9	107/10	101/10	120/10	117/10
Marine Corps Attack/ Fighter						
Active	339/25	256/24	333/25	331/25	346/25	351/26
Reserve	84/7	90/8	94/8	96/8	96/8	90/8
NAVAL FORCES						
Strategic Forces Ships	48	41	45	43	43	44
Battle Forces Ships	384	425	437	445	450	463
Support Forces Ships	41	46	55	59	61	66
Reserve Forces Ships	6	12	18	22	28	32
Total Deployable Battle Forces	**479**	**524**	**555**	**569**	**582**	**605**
Other Reserve Forces Ships	44	24	21	21	20	16
Other Auxiliaries	8	9	7	5	5	5
Total Other Forces	**52**	**33**	**28**	**26**	**25**	**21**

"We must have a navy so strong and so well proportioned and equipped, so thoroughly ready and prepared, that no enemy can gain command of the sea and effect a landing in force on either our western or our eastern coast."

REPUBLICAN NATIONAL PLATFORM, 1916.



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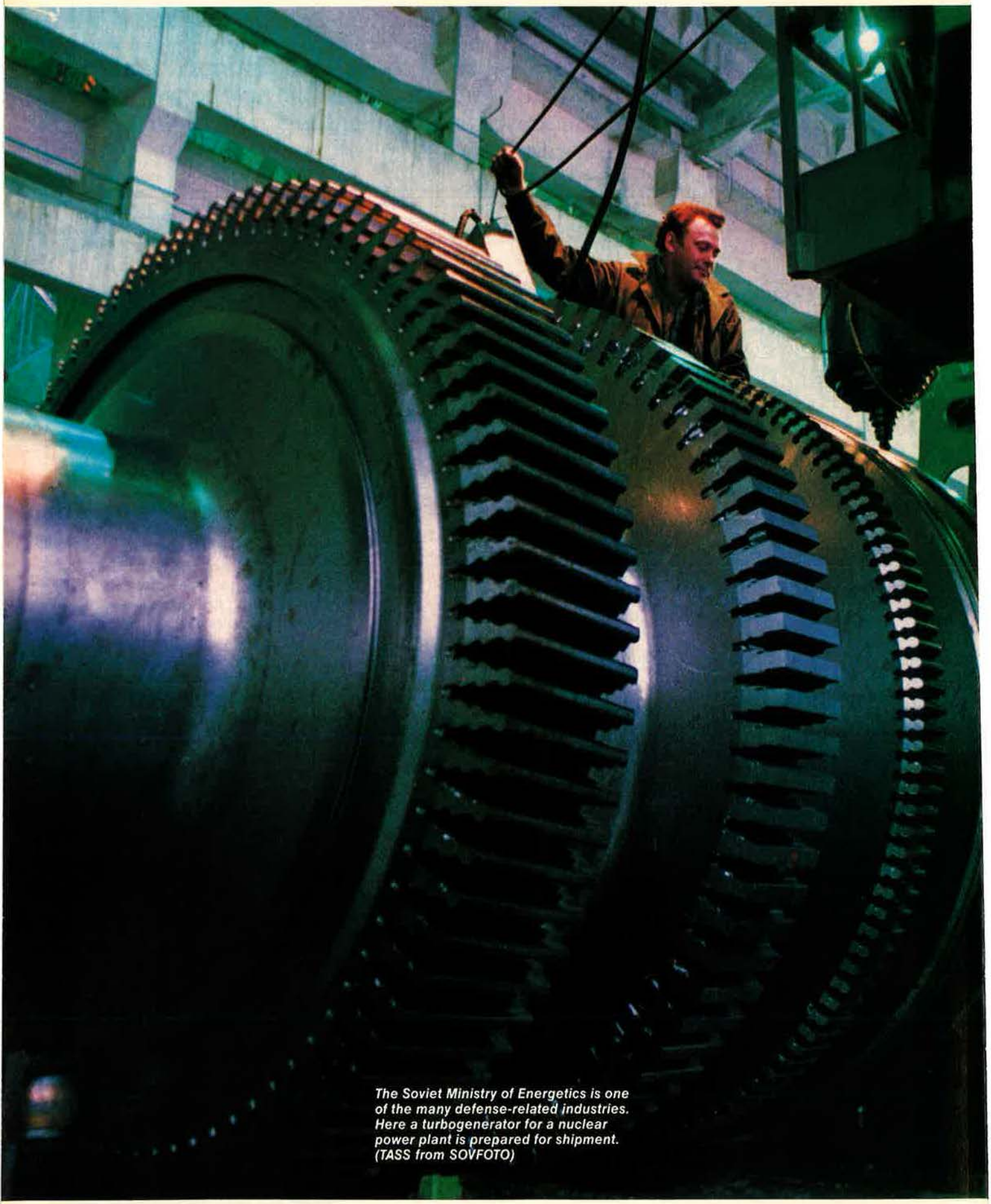


The Soviet Ministry of Energetics is one of the many defense-related industries. Here a turbogenerator for a nuclear power plant is prepared for shipment. (TASS from SOVFOTO)

The choice between guns and butter is easy. Soviet defense industry lags behind on high technology, though, and that worries the Kremlin mightily.

MOSCOW'S MILITARY-INDUSTRIAL COMPLEX

BY WILLIAM F. SCOTT

SINCE the beginning of the Soviet state, its primary focus has been to create and maintain the most powerful military force possible. The purpose of the economy is not to provide for improved living conditions for the population but to increase the power of the Communist nation.

There are two distinct economies in the Soviet Union. One—generally referred to in the West as the "B" sector—is that seen by foreigners. It produces civilian goods to meet quotas prescribed by state planners. There is little quality control. Customers may stand for hours in lines a block long to obtain a single scarce item.

The other economy, referred to as the "A" sector, produces for defense. This is the military-industrial complex. It has one primary customer, the Ministry of Defense. Whatever resources are necessary will be provided. Kremlin leaders recognize that without military power, the Soviet empire would fall apart. For them, the choice between guns and butter is easy.

History shows us that current problems in the Soviet economy and shortages in civilian needs are no indication that the Kremlin will slow its military buildup. In the late 1940s, when hundreds of thousands of its people were near starvation, the Soviet Union exploded a nuclear bomb years ahead of Western expectations. They also produced the MiG-15, then superior to all other Western fighter aircraft except the F-86 Sabre.

In the 1950s, many Soviet hotels lacked indoor plumbing. Yet in that same decade, the Soviet Union was the first nation to develop a hydrogen bomb that could be dropped from an aircraft, deployed the world's first surface-to-air missile system, tested the world's first ICBM, and put the world's first artificial satellite into space.

Military might has made the Soviet Union a world superpower. Without that, it would be only the world's largest underdeveloped nation. At the "free" market in Novosibirsk, the fresh cucumbers may have been flown in the day before from a Central Asian airport a thousand miles away. They would not have been transported, however, in a cargo aircraft, but carried aboard a civilian aircraft in a suitcase by a *kolkhoz* worker.

Soviet Defense Expenditures

The actual cost of its military outlays is one of the Kremlin's most closely guarded secrets. Soviet scholars with whom foreigners are permitted to meet do not have the slightest idea what their Party leaders expend for military purposes. According to official Soviet figures, their defense expenditures for 1986 were 21.4 billion rubles, or the equivalent of $33 billion.

Until the mid-1970s, the prevailing view in Washington was that the published Soviet "defense" budget included most military outlays except R&D. Only in 1975 did US government analysts realize that the Soviets had spent approximately 50 billion rubles for defense in 1970, rather than the 24 billion rubles previously estimated. Our analysts simply had taken the Soviet "official" budget figures and added another seven billion as estimated spending for R&D. We now know that Washington's estimates of Soviet military spending throughout the 1960s were off by similar amounts.

US government analysts, believing Soviet military budgets to be declining, had estimated that expenditures were down to six percent of GNP in 1970. Revised estimates now put Soviet military spending at twelve percent of GNP in the 1960s, rising to fifteen to seventeen percent by 1982.

Even the revised 1982 figure probably falls short of the full cost of Soviet military preparations. Premilitary training for young people, civil defense, and the duplication of industries for defense purposes must also be considered. "Voluntary" support of the Soviet Armed Forces is a "socialist obligation" and may be the equivalent of a billion or more rubles annually.

Furthermore, military production also has first priority on resources, drives the national research and development effort, and gets the best scientists and technicians. The military-industrial complex is making progress on advanced particle-beam and kinetic-energy weapons—but foreign firms must be called in to build truck factories and hotels suitable for tourists.

The Early Years

The present Soviet military-industrial complex was formed in the early years of the Soviet state. By the 1920s, the nation was in economic chaos. Starvation was rampant, industrial output was approximately fifteen percent of the 1914 level, and factories were without power or raw materials. Despite this, reconstruction of the armed forces was given priority.

The best Russian scientists and engineers had fled the country. German engineers were imported to help start new armament industries.

Then, as now, the Communist leaders depended on input from the despised "imperialist" nations, not only for much of their science and technology but also for funding. In 1930, the Ford Motor Co. built an automobile plant at Gorkiy. The tractor plant at Stalingrad, later famous for its tank production, was built by John Calder from Detroit, who also constructed the tractor plant in Chelyabinsk. The world's largest power plant at Dneprostroi was built by US engineers.

The major Soviet goal was to make the Soviet Union self-sufficient in the production of military equipment. The objective of the five-year plan adopted in 1927 and updated in 1931 was to give the Soviets superiority in the three weapons categories they regarded as decisive: aircraft, artillery, and tanks.

At the same time, the Soviets were trying to get their own research and development under way. The design bureaus and research institutes founded in this pre-World War II period have been carefully nurtured and today make Soviet defense industry the leading world producer of armament.

The Industrial Defense Ministries

Designations are often used by the Soviet leadership to confuse rather than to clarify. Officially, there is a "Ministry of Defense Industry." In actual fact, this ministry is only one of nine key Soviet industrial defense ministries. Defense and supporting industries maintain at least 450 military research and development organizations, approximately fifty major weapon design bureaus, and thousands of weapon and weapon component plants. At present, the defense industries oversee 150 to 200 major systems assembled in some 150 major plants.

As with the military-industrial complex as a whole, the present Soviet defense ministries trace their origins to the 1920s, when the Supreme Council for the National Economy (VSNKH) was formed to direct the industrialization drive.

Defense ministries differ significantly in operation from those producing for the civilian economy. In general, they are provided with the materials needed to meet their designated production plan. To prevent slippage in production, each ministry attempts to be as self-sufficient in resources as possible. For example, the aviation industry has its own metallurgical plants and its own stamp presses. It produces its own component parts. Many of the plants have excess capacity. Support industries are frequently situated near the final assembly plants.

Most of the defense industrial production is west of the Ural Mountains. However, there are

Some Military-Related Industries

(As of January 1, 1987)

Ministry	Product
Automotive	Trucks, armored personnel carriers
Civil Aviation	Supports Air Forces
Energetics (Power Machine Building)	Generators
Heavy and Transport Machine Building	Armored vehicles
Instrument Making, Automation Equipment, and Control Systems	Computers and instrumentation control systems
Maritime Fleet	Supports Navy
Petroleum Refining and Petrochemical Industry	Tires, fuels, and lubricants
Tractor and Agriculture Machine Building	Tanks

large plants, especially aircraft plants, located in the Asian part of the USSR. Locations include Novosibirsk, Irkutsk, Tashkent, Komsomol'sk, and Ulan Ude. A deliberate effort is made to disperse high-priority military plants and to build duplicate facilities.

The military-industrial complex is supported both by the Soviet academic world and by all other elements of Soviet industry. Its hub is Moscow. The Kremlin leadership pays close attention to all phases of weapon systems research, development, production, and deployment. Failure of the defense industries could threaten their own positions.

Two Approaches

There are two approaches to the design and production of Soviet weaponry. One is employed for systems based on state-of-the-art technology. The other is reserved for those instances when the Party and military leadership want a technological breakthrough to produce a weapon, as Soviet spokesmen say, "based on new principles."

Most often, the proposal for a new weapon system will be initiated by the Ministry of Defense. If the proposal is accepted, a scientific research institute determines if the weapon is technically feasible. A new weapon system is unlikely to be authorized unless all of the critical technologies are in hand. A commission then develops specifications, and the proposal is sent to a design bureau. On occasion, the same proposal may be submitted to two design bureaus.

The design bureaus are separated from the production process. They do not perform their own research. Instead, they accept the specifications of the scientific research institute. Designers anticipate that technology will not present major problems. Their job is to satisfy military requirements—not sell a new design. Permission must be given in order to incorporate new technology in the design.

Off-the-shelf equipment and standard components are used as much as possible. The same engine may be used in a number of different systems. Parts are kept to a minimum. Tolerances and finishes are only those demanded by performance.

When the design is finished, a factory (or factories) is designated for production. A design bureau team may go to the plant to help set up the production line. Factory engineers are not permitted to deviate from the specifications. Throughout production, the design bureau maintains authority to ensure that the system is produced as specified. Military representatives *(voyenpreds)* are posted at the plant to ensure that production goals are met, that the system is produced as called for in the design, and that proper materials are used.

As a result of this design and production approach, Soviet weapons are relatively easy to manufacture. They are generally less sophisticated than Western weapons and may be limited to single mission functions. On the other hand, they are often simpler to use and maintain. This often makes Soviet weapons attractive to third-world nations, where technical skills are low.

In this conservative approach to design and production, follow-on weapons are developed according to proven models. Foreign weapons are studied to determine what technical advances might be incorporated with little risk. A particular weapon system may be upgraded by introducing complete new subsystems. But, as the designer intended, the newest weapons may have entire subsystems identical to those in previous generations of weapons. Parts from newer systems can be used to upgrade older systems as well.

This "modular upgrading" practice permits use of the old production lines for derivative weapon systems. Another advantage is continuity of personnel.

The Soviets use this low-risk development style for most of their military equipment. Basic weapons are designed to be operated by conscript military personnel, who serve in the armed forces for only two years. In the event of war, the Soviets expect heavy losses. In most of their weapons—tanks, artillery, and certain types of aircraft—they seem willing to sacrifice a certain degree of quality for quantity. Soviet officers are quoted as stating, "The best is the enemy of the good." Many Soviet weapons are designed only

The Soviet Ministry of Tractor and Agriculture Machine Building is also responsible for the construction of tanks. Here one of the 110 tractors built every day by the "Tashkent Tractor Factory" industrial association is readied for shipment. (TASS from SOVFOTO)

Defense Production Ministries

(As of January 1, 1987)

Ministry	Minister	Product
Aviation Industry	A. S. Systov	Aircraft, helicopters, aerodynamic missiles
Communications Equipment Industry	E. K. Pervyshin	EW equipment, radar components
Defense Industry	P. V. Finogenov	Conventional ground force weapons, mobile ballistic missiles
Electronics Industry	V. G. Kolesnikov	Radars, military electronics
General Machine Building	O. D. Baklanov	Missiles and space equipment
Machine Building	V. V. Bakhirev	Munitions, solid propellants
Medium Machine Building	Ye. P. Slavskiy	Nuclear weapons and high-energy lasers
Radio Industry	P. S. Pleshakov	Radars, radios, guidance and control systems
Shipbuilding Industry	I. S. Belousov	Naval ships, naval weapons, submarine detection systems

for limited service life. On the other hand, when high-technology and sophistication are necessary, Soviet weapons are designed and manufactured to the highest standards.

Pressure From the Top

Marshal N. V. Ogarkov, the former chief of the Soviet General Staff, has complained of the reluctance of military officers either to seek or accept new weapons based on new technologies. It appears that present Soviet work in directed energy and other exotic weaponry was instigated not by the Ministry of Defense but by the Party leadership, supported by the Academy of Sciences.

Early research and development of nuclear weapons were kept completely away from the military. The KGB, under Stalin's personal cognizance, managed the program. It was not until after the end of World War II that General A. I. Antonov, then First Deputy Chief of the General Staff, learned that a massive Soviet nuclear program had been under way for years. Soviet nuclear weapons today remain under KGB control.

The ballistic missile program was initially a KGB responsibility, directed by the Politburo. Later, in the 1950s, the military-industrial complex was the leading player, with the military on the sidelines. In 1957, the Politburo dispatched a rising Party star, Leonid Brezhnev, along with D. F. Ustinov, former head of defense industries, to Kazakhstan to ensure Soviet successes in missile and space programs. Participation in these programs was a major factor in taking Brezhnev to the position of General Secretary and Ustinov to Minister of Defense.

The exact status of advanced Soviet weaponry today, in particular their strategic defense weapons and space vehicles, cannot be determined. A massive intelligence effort has been under way for years to acquire Western science and technology by any means possible. In part, Soviet leader Mikhail Gorbachev's new "openness"—including permission for Andrei Sakharov to return to Moscow—is a tactic to promote Soviet-US scientific exchanges. Soviet work on strategic defense today is probably receiving as much attention from the Politburo as the missile and space effort did three decades ago.

Control and Direction

Little hard data is currently available in the West about the control, direction, and extent of Soviet weapon production, as indicated by the past errors made in Washington's estimates of Soviet defense expenditures.

During World War II, the State Committee of Defense (GKO), the predecessor of the present Council of Defense, was formed and became the supreme agency of state power. Next to the immediate task of slowing the German drive, armament production had priority. The military-industrial complex today, with a few modifications, is patterned on the system that brought success to the Soviet leadership in the past.

Control and direction are from the top down. Critical issues must be approved by the Politburo. The Council of Defense, made up mainly of Politburo members concerned with security affairs, is the primary control organization. It is chaired by General Secretary Gorbachev, who also chairs the Politburo.

The Party leadership establishes military policies. Should a major dispute arise over some aspect of defense production, it would be settled by Party members at the Party level. In theory, control and direction over the defense industries are exercised by the Council of Ministers. However, key personnel in the ministries hold their positions as a consequence of their standing within the Party.

The Military Industrial Commission (VPK), the defense-related body under the Council of Ministers, maintains program control over the defense industries. It coordinates and controls research, design, development, testing, and production activities. It also provides its requirements for the acquisition of foreign technologies and ensures that such technologies are assimilated into new equipment. The State Planning Committee (GOSPLAN) serves as the central coordinating body for assigning production targets and allocating resources to the defense industries.

A key player in uniform is the Deputy Minister of Defense for Armaments. He controls the thousands of military representatives *(voyenpreds),* specially trained officers assigned to plants producing military goods or weapons.

The *voyenpred* is paid by the factory. He is responsible for quality control and has the authority to re-

ject any item that does not match military specifications. If an item is found to have flaws, responsibility can be placed directly on the *voyenpred* who approved it.

Despite its bureaucracy and overlapping, the control system has many positive features. It enables the top leadership to keep a close watch. It also holds down interservice rivalry for funds once the leadership provides the necessary funds and resources.

Restructuring the Complex

Even Soviet Politburo members acknowledge that their nation cannot remain a world power without a world-class economy. In particular, this applies to the military-industrial complex, where modernization in key areas is urgently needed. Much attention has been given to Gorbachev's efforts to revitalize the economy through "restructuring" *(perestroyka)*. The leadership appears concerned with the apparent inability of Soviet defense industries to keep up with the West in microelectronics and other high-tech areas. Even with the priority given to improvement, modernization is lagging.

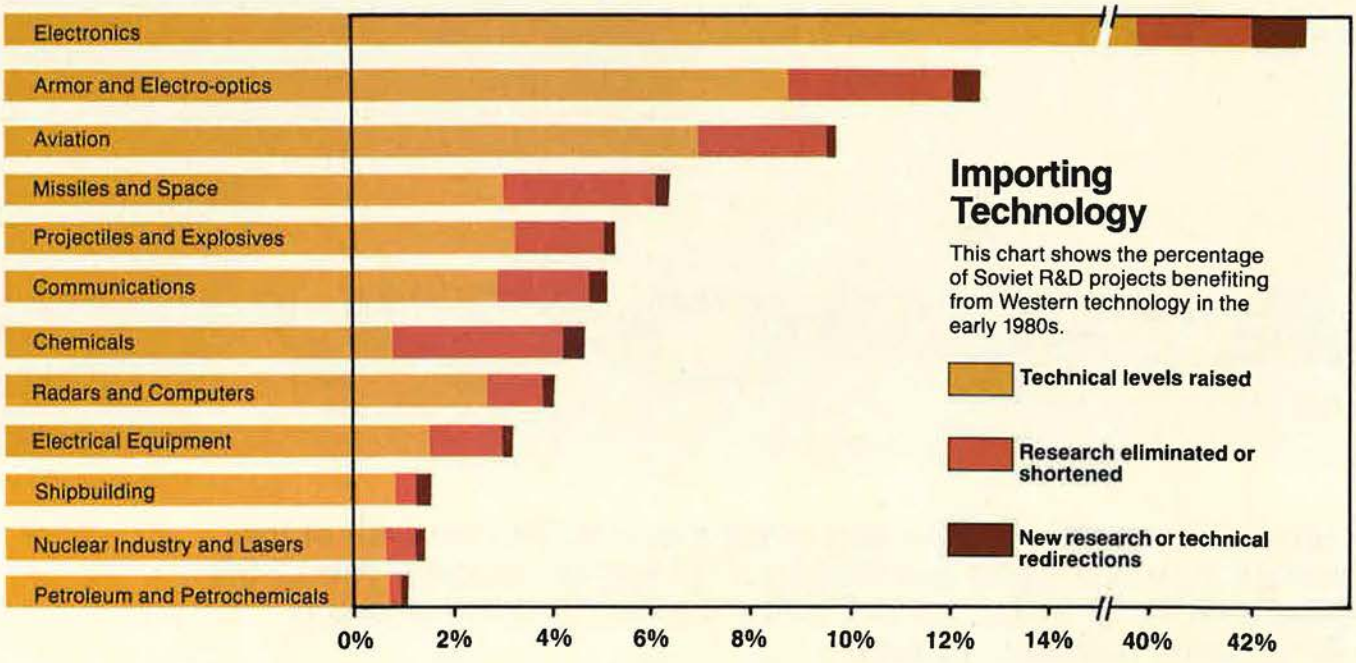
One problem is the age of plants and equipment. Much is of World War II vintage, hauled in by train from Germany and Manchuria between 1945 and 1950. Efforts to introduce new machinery in past years have often been resisted by management, since it disrupted production. Even when new equipment was placed in a plant, managers often were uncertain how it worked and kept the older equipment as a backup. Precision machine tools are in very short supply. The advances in computer technology that have taken place in the West since the early 1980s have bypassed the Soviet Union. Soviet industry is unprepared for rapid changes of this type.

Traditionally, the defense industries have been labor-intensive. They have turned out excellent products that do not require sophisticated design or parts. Now the leadership recognizes that significant advances in their strategic defense and space weapons will require greater use of microelectronics and computer systems.

The Soviet Union seeks to acquire Western technology by every means possible, legal and illegal. Since the mid-1980s, it has legally imported more than $4 billion worth of Western machine tools. The value of high-tech components of military equipment and Western research data acquired by illegal means is probably worth even more. Soviet military equipment frequently looks as if it had been reverse-engineered from NATO systems.

At present, the defense industries appear to be undergoing a housecleaning. A close check of Soviet personnel assignments shows that the top and middle management in key industries has had a major turnover in the past eighteen months. Younger men, apparently handpicked by Gorbachev, are moving into key positions.

Since the early 1960s, Soviet theorists have asserted that neither the offense nor the defense will remain dominant forever. President Reagan's announcement of the US Strategic Defense Initiative, however, startled the Kremlin leaders. They need more time to perfect their own ABM and space weapons. Most of all, they need more time to acquire Western science and technology. ■



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, most recently in 1986. 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 a number of research institutions and is a frequent lecturer at war colleges and universities. He is a regular contributor to the March issue of this magazine.*

Aeroflot, one of the world's largest airlines, performs a host of other missions as well. This is an Mi-26 heavy-lift helicopter in Aeroflot livery. (Photo by John Amrhein)

Aeroflot is an airline unlike any other. It carries one-seventh of the world's air passengers and flies into 122 foreign airports. The USSR regards it as an instrument of national policy, and its head is a Soviet chief marshal of aviation.

AEROFLOT

AEROFLOT, the state-operated airline of the Soviet Union, is like none other. It carries one-seventh of the world's air passenger traffic—but is also active in crop dusting (103,000 hectares of agricultural work in 1984), forest fire patrol, mail delivery, aerial surveying, and a host of other services.

Much of the fresh produce sold on the open market in Moscow, Leningrad, and other northern cities arrives in suitcases carried from Georgia aboard Aeroflot by enterprising gardeners. They still make a tidy profit after paying for their round-trip tickets. On International Women's Day (March 8), tulips and other flowers reach urban areas in this same way.

Aeroflot connects 3,600 cities and towns in the USSR and has landing rights at 122 foreign airports. On its international routes, it operates Il-62, Tu-154, and wide-body Il-86 airliners. Service is generally judged to be inferior to that of Western carriers, but Aeroflot can claim a number of significant "firsts." In 1956, the Tu-104—a variation of the Tu-16 bomber—became the world's first commercial jet airliner to enter service. In December 1968, the Tu-144 supersonic transport made its first flight, two months ahead of the European Concorde.

Few Westerners who have flown on Aeroflot realize that it is headed by one of the Soviet Union's two chief marshals of aviation. Its civil fleet includes several hundred military air transports and 1,400 other aircraft that can be converted quickly to military use. The world's largest airplane, the An-124 Condor, made its first appearance at the 1985 Paris Air Show in blue-and-white Aeroflot markings.

It is difficult to assess Aeroflot's safety record. The Soviet Union does not normally report aircraft accidents unless foreigners are involved. The story is told of a Kiev couple who saw their daughter off on Aeroflot, bound for school in Moscow. She never arrived. Only after a year of impassioned inquiry were they able to learn that the airliner had crashed. Officials warned them not to "spread rumors."

BY HARRIET FAST SCOTT

Friendly Skies?

Since no Soviet citizen can go abroad without KGB clearance, actual Soviet "tourists" are practically nonexistent on Aeroflot flights outside of the USSR. Passengers on Aeroflot international routes are foreigners, Soviet officials, or special groups—for example, dancers on a cultural exchange tour.

Approximately 300 of the largest 400 Soviet cities are "closed" to foreign visitors. Foreigners are permitted only on certain flights, generally those that go directly from one "open" city to another.

Flying on Aeroflot can best be described as an experience. The procedure for internal flights has changed little in twenty-five years. Foreigners are taken to a special waiting room, which usually has a small cafe selling snacks of cheese and bread, cookies, and tea. Sometimes the cafe will close down during breakfast, lunch, and dinner hours while the attendants take their own meals. Delays without meals are not unusual.

There is no smoking or drinking on Aeroflot domestic flights. Passengers are offered mineral water or apple juice. On long internal flights of more than two and one-half hours, a meal is provided. Over the years, these have improved, but the fare is still minimal.

In the August 1986 issue, Aeroflot's journal, *Vozdushnaya Transport* (Air Transport), exposed some examples of food service at its worst. It described the main offering at one meal as "a bluish piece of hairy chicken." Flights had been delayed because of "dirty dishes," the journal complained, citing instances of dishes merely having been rinsed in cool water and then used again.

The pilots, both male and female, appear to be competent. Weather minimums are strictly followed. The only time I have ever been frightened on Aeroflot was years ago when the plane began to taxi down the runway in Vienna with the rear door open. This aircraft was a Tu-104, the passenger version of the Tu-16. Our family and two others made up the entire passenger roster. At our shouts, the stewardess rushed down the aisle, yelling at us to be calm. She managed to close and secure the door and then disappeared into the front cabin of the plane, not to emerge until we reached Kiev.

Major Mode of Transportation

Passengers today have it much better. The Tu-154, a three-engine jet, is the aircraft most frequently used for those internal flights on which foreigners are allowed. The Tu-134, a smaller twin-engine jet, is also in service, but this aircraft has been involved in a number of accidents and appears to be used sparingly. For shorter hauls, the Yak-40 is the standby. For long distances, such as Moscow to Khabarovsk, the wide-body Il-86 may be used. Passengers boarding the Il-86 walk on at ground level, then take a flight of stairs inside the aircraft to the passenger compartment. It is not too bad, only underpowered.

I once foolishly inquired why no instructions were ever given on internal flights for fastening seat belts and using emergency oxygen. Then I found I had only half a seat belt. An emergency oxygen system for passengers must be considered a needless expense.

An Intourist guide calls the flight for foreigners in their special waiting room. Then, no matter what the weather, she leads them toward the distant airplane. Passengers string out behind her like schoolchildren, dragging their carry-on luggage. At the foot of the boarding steps will be a group of shivering Soviet passengers, who have been waiting Heaven knows how long for the foreigners to arrive, for foreigners are boarded first. Few flights have empty seats. Invariably, an argument develops over seating when the Soviet passengers come aboard.

It is against the law for a passenger on Aeroflot to make sketches of anything seen through the windows. Photography is forbidden absolutely. Once, when a number of foreign passengers aboard an Aeroflot plane took pictures out of the windows shortly after takeoff from Moscow's Sheremetyevo Airport, the pilot did a one-eighty turn and landed. Border Guards rushed aboard to confiscate the cameras.

It used to be the custom before takeoff to pass around a tray of candies with "Aeroflot" printed on the wrappers. More than once, suspicious passengers asked how much the candy cost. One babushka, on learning it was free, attempted to empty the tray into her pocketbook.

We recently heard a man berating the Aeroflot attendant in English. Later, we were surprised to hear him speak perfect Russian. We asked him where he was from. Bulgaria, he said. Why was he speaking English? He laughed, "They don't pay any attention to you unless they think you're American!"

Sometimes a vehicle (no seats) will be sent out to the aircraft arrival point to pick up foreigners. Occasionally, an elderly Soviet will make the mistake of thinking it is for him. Intourist will quickly inform him he must walk. The vehicle will then drive to a special waiting room reserved for high Party and government officials and foreigners.

Aeroflot may be lacking in comfort, but the train ride on the Trans-Siberian Express from Moscow to Khabarovsk in the Far East is nearly seven days. There are no roads in some places. Aeroflot gets you there in eight hours. No wonder flying has become the major mode of transportation in many areas of the country.

The Early Years

The Soviet Union regards Aeroflot as an instrument of national policy. Until 1948, it was part of the Soviet Air Forces. The airline was formed officially in 1932, but its roots go deeper than that.

In 1911, Andrey Tupolev, builder of the famous family of military and passenger aircraft, was arrested for participating in revolutionary activity and was exiled from Moscow. He belonged to a small group—students of Prof. Nikolai Zhukovskiy—that was trying to build airplanes at the Imperial Technical School in then-Czarist Russia. After the 1917 Revolution, Zhukovskiy and his pupils would pioneer the construction of the air fleet that became the basis of today's Aeroflot.

The genius of Russian aviation, however, was Igor Sikorsky. His four-engine "Russian Warrior," which boasted a wingspan of twenty-seven meters, made its first flight on July 23, 1913. Two weeks later, Sikorsky took off with seven passengers on board, setting a world record. At this point in history, Imperial Russia was ahead of the United States in aviation.

In 1914, Sikorsky put an even larger four-engine airplane, the *Ilya Muromets,* into the air. It carried eighteen passengers and a dog on its first flight. Some eighty aircraft in this series were built. Many were used as bombers in World War I.

The October Revolution of 1917 took Russia out of the war. Sikorsky and other Russian aeronautical en-

One of the mainstays of the Aeroflot fleet is the wide-body Il-86. It can carry up to 350 passengers, but the usual seating arrangement is for 234. With four turbofan engines, normal range is nearly 2,300 miles. (Photo by Norbert Neuser)

gineers left the country, and the aircraft industry all but disappeared.

In the postwar period, it was revived by a peculiar combination of circumstances. Under the Treaty of Versailles, which ended World War I, Germany was forbidden to build submarines, military aircraft, tanks, and other weapons. To get around the Treaty's restrictions, German leaders made a secret deal with Russia (which had not signed the treaty) to carry out military training and to develop new weapons and equipment there.

Hugo Junkers's all-metal four-passenger monoplane, the F-13, was remarkably successful and flying throughout Europe. Junkers was developing a four-engine model. Work ceased in May 1921, when the "London Ultimatum" extended the Versailles Treaty prohibitions to civil aircraft. Germany was to hand over all existing aircraft and destroy those under construction. German aircraft manufacturers moved abroad. Junkers turned to Russia.

In Russia (it was not yet the Soviet Union), Professor Zhukovskiy formed the Central Aerodynamic Institute (TsAGI). Its first job was to gather up whatever remained of military airplanes and get them flying again.

A Russian-German airline, "Deruluft," was formed in 1921. The next year, with a fleet of fifty Junkers planes, it began international air passenger service between Moscow, Konigsberg, and Berlin.

Junkers was granted a concession to set up a factory in an old plant in the Moscow suburbs. Engineers from the Junkers factory at Dessau were brought to the Soviet Union, where they trained Russian engineers and workers. Junkers opened up the first regular domestic passenger airline in the Soviet Union.

In 1922, ninety percent of Soviet aircraft were purchased abroad. There was little distinction between Soviet military and civilian aviation.

Growth of Civil Aviation

To interest the populace in aviation, the Voluntary Society of Friends of the Air Fleet—ODVF—was created. ODVF organized "agitation" flights throughout the country, giving rides to locals, doing stunt flying, and collecting rubles for the construction of more aircraft.

The Council of Labor and Defense set aside land for airfields near cities and towns. In 1923, civil aviation carried 229 passengers and 1,900 kilograms of freight—mostly mail. However, fifty percent of Soviet aircraft were still being purchased abroad.

"Dobrolet"—the Russian Society of Volunteers of the Air Fleet—was also doing aerial photography, mapping some areas of the country for the first time. In 1924, "Dobrolet" crop dusters helped save the harvest.

By May 1925, Mikhail Frunze, Chief of Staff of the Red Army, was able to report with pride to the Third All-Union Congress of Soviets that "in the last three years, we purchased more than 700 aircraft abroad. This year we have not purchased a single one." This success was probably attributable to the Junkers plant, which, three years into its thirty-year contract, was running smoothly.

Hundreds of Soviet engineers, workers, and even test pilots had been trained at this facility. All the blueprints, models, testing methods, and secret future plans were given to the Russians. The Russians had free access to the parent factory at Dessau as well as the Junkers Swedish factory, where Junkers was building his first twin-engine fighter plane and his first dive bomber. But relations had begun to cool.

Soviet-German cooperation in aviation came to a halt in 1927. The Junkers contract was canceled, but secret military connections with the Reichswehr (the German army after the Treaty of Versailles and before the rise of Hitler) continued for several years. Dozens of Junkers PS-4s (a modification of the F-13), originally purchased for use in Siberia and the Arctic, underwent modification in "Dobrolet" repair shops and continued to fly until 1941. The German "Deruluft" lines continued their services.

Soviet civil aviation was well under way. In 1928, Soviet air routes stretched 10,780 kilometers. That year, 7,022 passengers, sixty-five tons of mail, and eight tons of freight were transported by air.

Tupolev's ANT-9, built for "Dobrolet," was introduced in 1929. Carrying a pilot and eight passengers, it flew from Moscow to Berlin, Paris, Rome, Marseilles, London, and back at a speed of 177 km/hr. An ANT-4, the unarmed version of the twin-engine Tupolev TB-1 bomber, flew from Moscow to New York.

The Formation of Aeroflot

The Main Directorate of the Civil Air Fleet (GUGVF) was formed on February 25, 1932, under the Council of People's Commissars. The following month, the Civil Air Fleet was given the name "Aeroflot." Agencies were organized for transport aviation, agricultural aviation, construction, repair, and supply.

In 1933, 170 million rubles were invested in Civil Aviation in the Second Five-Year Plan. Soviet industry began massive production of passenger planes. Soviet airline routes were soon extended to 32,000 km. In 1933, only 12.5 percent of civil aviation aircraft were of foreign construction; by 1935, only Soviet-produced aircraft flew in Aeroflot. To ensure the reliability of this growing organization, the Party directed that political sections be formed in all Civil Air Fleet offices, enterprises, and schools.

Aeroflot received wide attention. Soviet pilots became national heroes when they helped rescue the passengers of the sinking *Chelyushkin* in the Arctic in 1934.

Aeroflot received obsolete military planes as passenger aircraft. For example, the old TB-1 twin-engine bombers (ANT-4), stripped of their armament, were given to Aeroflot in 1935 to fly as cargo carriers.

In the late 1930s, Aeroflot appeared to be under Soviet Air Forces control. Its civilian aviation pilots were called on during the "Winter War" with tiny Finland in 1939–40. They carried 34,000 passengers, of whom 21,000 were wounded, and 2,700 tons of freight.

In 1941, on the eve of the German invasion, Aeroflot operated a 146,000-km route structure, carrying 400,000 passengers, 15,000 tons of mail, and 48,000 tons of freight.

War With Germany

Germany invaded the Soviet Union at dawn of June 22, 1941. The

Aeroflot by the Numbers

	1940	1950	1960	1965	1970	1975	1980	1984
Total length of air routes (thousands of kilometers)	146.00	300.00	375.00	481.00	773.00	827.00	996.00	1,020.00
Of which:								
International	2.00	–	15.00	46.00	177.00	128.00	261.00	182.00
Total domestic	144.00	–	360.00	435.00	596.00	645.00	780.00	838.00
Of which:								
All Union Service	51.00	–	134.00	158.00	254.00	285.00	364.00	299.00
Freight and mail (thousands of tons)	58.00	–	697.00	1,228.00	1,844.00	2,472.00	2,989.00	3,113.00
Passengers (in millions)	0.40	1.60	16.00	42.00	71.00	98.00	104.00	112.00
Of which:								
International	–	–	–	–	0.90	2.10	2.60	3.20
Percent of seats filled	–	–	–	70%	75%	80%	81%	85%
Passenger movement (billions of passenger-kilometers)	0.20	–	12.00	38.00	78.00	123.00	161.00	184.00
Agricultural support flying (millions of hectares)	0.90	–	20.00	55.00	83.00	85.00	100.00	103.00

next day, the Civil Air Fleet was subordinated operationally to the Commissariat of Defense and put on wartime status. Civil Air Fleet units started supporting the front. In October, they began daily supply flights to blockaded Leningrad.

During the Battle of Stalingrad, Aeroflot made 46,000 flights, carried 30,000 men, and delivered 2,587 tons of military supplies. In 1943, during the Battle of Kursk and the liberation of Kiev, they made 80,000 flights and transported 62,000 men, 21,000 of them wounded.

Pilots, most of whom were from Aeroflot, ferried thousands of American Lend-Lease planes over the Alaska-Siberian air route. Ladd Field, near Fairbanks, even had a special barracks for the Russian pilots. The planes were first gathered at Great Falls, Mont., before going to Alaska. Aircraft types included the P-39, A-20, B-25, and DC-3. US World War II pilots still tell stories of Soviet pilots barrel-rolling B-25s shortly after takeoff.

In 1944, the Soviets "kept" an AAF B-29 Superfortress that had made a forced landing near Vladivostok. It was copied as the Tu-4 bomber and the Tu-70 passenger plane, referred to by Tupolev as "a locally built Boeing product." Some of these aircraft were still flying in 1972.

According to Soviet reports, during the "Great Patriotic War," militarized units of the Civil Air Fleet made 1,600,000 flights (83,000 at night), carried 1,500,000 men (67,000 of them landed behind enemy lines and returned, and 45,000 were dropped by parachute in the enemy's rear), and delivered 122,000 tons of ammunition, weapons, medical supplies, and blood and 16,000 tons of mail.

Regular (nonmilitarized) units carried 800,000 passengers and 156,000 tons of freight domestically. The Civil Air Fleet alone flew 4,500,000 hours and trained 31,000 pilots, two-thirds of whom flew as military pilots at the front, and 9,000 technicians. About 12,000 Civil Air pilots were decorated during the war.

Germany surrendered in May 1945. In the sector of the nation occupied by Soviet troops was located two-thirds of the German aircraft industry.

Within weeks of Germany's surrender, trains loaded with aircraft, jet propulsion units, turbines and machinery, plus captured German engineers and scientists were on their way to the USSR. They ended in various sites near Moscow and in Kuybyshev. Ironically, the complete Junkers Motor Works at Bernburg was part of the loot.

Heads of Aeroflot

Aeroflot has had close connections with Soviet military aviation from the beginning. All of the early directors of Civil Aviation were military figures. Since 1938, all Aeroflot heads have been marshals or generals of aviation.

The current Minister of Civil Aviation is Chief Marshal of Aviation Boris P. Bugayev. He is the first Marshal to head Aeroflot who was not previously a senior officer in the Soviet Air Forces. Except for wartime service, Bugayev's entire career has been in civilian aviation. His predecessors were all career military officers.

Fedor Astakhov, later a marshal of aviation, became Chief of the Main Directorate of the Civil Air Fleet and Deputy Commander of the Red Army Air Forces in 1942. He also served as Deputy Commander of Long-Range Aviation.

The first postwar head of Aeroflot, Georgiy Badyukov, was a former test pilot with several famous first flights to his credit. He commanded an air corps during World War II. After his Aeroflot tour, he returned to regular military service. Marshal Semen Zhavoronkov, wartime commander of Naval Aviation, replaced Badyukov in 1949 and directed Aeroflot until 1957.

Next came Marshal of Aviation Pavel Zhigarev, Commander in Chief of Soviet Armed Forces at the time of his appointment. He had begun World War II as Commander of Red Army Air Forces, but displeased Stalin and was banished to the Far East for the duration. He, too, returned to military duty after heading Aeroflot.

Marshal of Aviation Yevgeniy Loginov, a wartime bomber pilot who rose to Deputy Commander in Chief of Soviet Air Forces, took over Aeroflot in 1959. During his tour, in 1964, the Main Directorate of the Civil Air Fleet became the

Ministry of Civil Aviation, with Loginov as minister.

Aeroflot was and remains heavily staffed by officers from the upper echelons of the Soviet Air Forces. General Colonel of Aviation Aleksey Katrich, for example, was Commander of Aviation in the Group of Soviet Forces, Germany, for five years before becoming First Deputy Minister of Civil Aviation in 1973. In 1975, Katrich became Deputy Commander in Chief of Warsaw Pact Forces for Air Forces, an active-duty posting. Aeroflot marshals and generals continue to wear their military uniforms, complete with campaign ribbons. Even the political officer of Civil Aviation is a General Major of Aviation.

Aeroflot Takes Off

Aeroflot began regular flights from Moscow to Khabarovsk, a distance of 7,000 km, in 1948. In 1950, the Soviet yearbook credited the airline with carrying 1,600,000 passengers, 31,000 tons of mail, and 151,000 tons of freight. Planes and helicopters were used in agriculture and lumbering, aerial photography, geological surveys, restocking fisheries, carrying bees, and reporting fires.

In 1952, Aeroflot continued to use twin-engine Il-12s and Il-14s and the Li-2, a Soviet copy of the famed DC-3 "Gooney Bird." Western airlines in the meantime had gone to four-engine passenger planes with hermetically sealed cabins.

Tupolev's design bureau was busy on the Tu-16 jet bomber, which first flew in 1952 and entered operational service in 1954–55. The Tu-104, a reconfigured Tu-16, started carrying cargo and mail secretly on eastern air routes to train pilots and ground crews for airliner service with Aeroflot. Publicized as the world's first commercial jet airliner, the Tu-104 began regular passenger service in 1956. In reality, it was one of the most uncomfortable passenger aircraft ever put into service—but it did establish a record of sorts, appearing two years before the US Boeing 707 and British Comet-IV.

After Aeroflot got the planes that could fly long distances, the Soviet Union began to make airline agreements with foreign countries. In 1962, there were thirty-two such agreements, and aircraft of twenty-one foreign countries landed in Moscow. By 1964, the Soviet Union had airline agreements with forty-one foreign countries. In 1986, it was operating into nearly 100 nations abroad.

In 1965, the Soviets claimed to have the longest network of airlines in the world and the second highest volume of transportation. Passenger planes with gas turbine engines were in service to capitals of all fifteen republics of the Soviet Union. By 1969, air became the main means of transporting passengers in the Far East, Central Asia, and the Far North. Air transport connected more than 3,500 cities and towns in the USSR. There were also more than 2,000 local air routes. Passengers could fly from Moscow to nearly 200 cities in the USSR.

Aeroflot pilots began to receive "Distinguished Pilot" and "Distinguished Navigator" titles, comparable to the "Distinguished Military Pilot" title. In 1980, in a move to create a distance in perception between the airline and the Soviet military forces, the second Sunday in February was proclaimed Aeroflot Day. Since 1933, Soviet Air Fleet Day had been celebrated by both the military and civil air arms.

In 1970, the Soviet Union joined the International Civil Aviation Organization (ICAO). Aeroflot advertisements in 1986 claimed that the airline's routes extended to nearly 100 countries. Some 115,000,000 passengers flew on Aeroflot in 1986. But for all of this, Aeroflot remains an airline like no other.

The observations of Party Leader V. V. Kuybyshev, speaking at the first All-Union Conference of Civil Aviation Workers, are still valid. "It must be remembered," he said, "that the country as a whole and the government in particular places considerable hopes on the development of the Civil Air Fleet not only because of its role in the development of the country's economy *but also as a base of defense in the event of the arising of military actions.*" ■

In terms of wingspan and maximum takeoff weight, the Antonov An-124 Condor is the world's largest airplane. Though depicted in Aeroflot markings at the Paris Air Show, it is likely to serve with the military. (Photo by John Amrhein)

Harriet Fast Scott, a Washington consultant on Soviet military affairs, is a member of the General Advisory Commission 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.*

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).

General of the Army Pëtr Georgiyevich Lushev. Born 1923. Russian. First Deputy Minister of Defense since July 1986. Entered service in 1941. Commanded infantry company during war. Commander Kantemirov Tank Division, army commander, First Deputy Commander in Chief Soviet Forces Germany (1973–75). Commander of the Volga Military District (1975–77), Central Asia Military District (1977–80), Moscow Military District (1980–85). Commander in Chief, Soviet Forces Germany (1985–86). Member of the Central Committee since 1981. Deputy of the Supreme Soviet 10th and 11th sessions. Malinovskiy Tank Academy (1954). Academy of the General Staff (1966). "Hero of the Soviet Union" (1983).

General of the Army 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). "Hero of the Soviet Union" (1985).

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

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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 USAF 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 IRBMs and 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 **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 200 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. In the early 1980s, air defense aircraft in border regions of the USSR were merged with tactical air units of the Soviet Air Forces. There were also changes in air defense districts. Assets of the troops of air defense of the Ground Forces were transferred to the Troops of Air Defense. Significant changes in the Troops of Air Defense appear to be taking place at present, the extent of which is not known. For example, between October 1985 and September 1986, the First Deputy Commander of Troops of PVO was reassigned as Commander, Troops of Air Defense of the Ground Forces. This suggests a return to the structure that had existed in the late 1970s.

The three major components of Troops of Air Defense are fighter-interceptors (a minimum of 1,300), some 9,600 SAM launchers, and a huge radar network. Two other components—antirocket defense (PRO) and anti-space defense (PKO)—are growing in importance. The PRO facilities around Moscow undergo constant upgrading.

The **Soviet Air Forces** reorganization that started several years ago appears to be continuing. In border regions, aircraft and helicopters have a new organizational designation. "Frontal aviation" is to maintain air superiority and to strike targets in the "operational depth" of an opponent. "Army aviation," attacking primarily mobile targets in the tactical depth, gives direct support to Ground Forces units. (It should be noted that "army aviation" in the Soviet Armed Forces is not the same "Army Aviation" in the United States.) Both frontal and army aviation are in the Air Forces of the Military District, which are subordinate to the commanders of the TVDs (Theaters of Military Action).

Elsewhere in the Soviet Union, bombers and strike aircraft are combined into five air armies. Included in these air armies are about 160 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.

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 fields 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, 1987, show the top members of the USSR's military organization. ■

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

Minister of Defense
Marshal of the Soviet Union
S. L. Sokolov, Chairman

1st Deputy Defense Minister and Chief of General Staff
Marshal of the Soviet Union
S. F. Akhromeyev

1st Deputy Defense Minister and CINC, Warsaw Pact Forces
Marshal of the Soviet Union
V. G. Kulikov

1st Deputy Defense Minister for [General] Affairs
General of the Army
P. G. Lushev

Chief of Main Political Administration
General of the Army
A. D. Lizichev

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

Strategic Rocket Forces
Commander in Chief
General of the Army
Yu. P. Maksimov

Ground Forces
Commander in Chief
General of the Army
Ye. F. Ivanovskiy

Troops of Air Defense
Commander in Chief
Chief Marshal of Aviation
A. I. Koldunov

Air Forces
Commander in Chief
Marshal of Aviation
A. N. Yefimov

Navy
Commander in Chief
Admiral of the Fleet of the Soviet Union
V. N. Chernavin

OTHER SECTIONS (Headed by Deputy Ministers of Defense)

Inspector General
General of the Army
I. M. Tret'yak

Rear Services Chief
Marshal of the Soviet Union
S. K. Kurkotkin

Armaments
General of the Army
V. M. Shabanov

Construction and Billeting Troops
Marshal of Engineer Troops
N. F. Shestopalov

Civil Defense Chief
General of the Army
V. L. Govorov

Cadres
General of the Army
I. N. Shkadov

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

Commander in Chief
General of the Army
Yu. P. Maksimov, Chairman

1st Deputy Commander in Chief and Chief of Main Staff
General Colonel
V. M. Vishenkov

1st Deputy Commander in Chief
General Colonel
Yu. A. Yashin

Chief of the Political Administration
General Colonel
V. S. Rodin

Deputy Commander in Chief for Military Schools
General Colonel
V. S. Nedelin

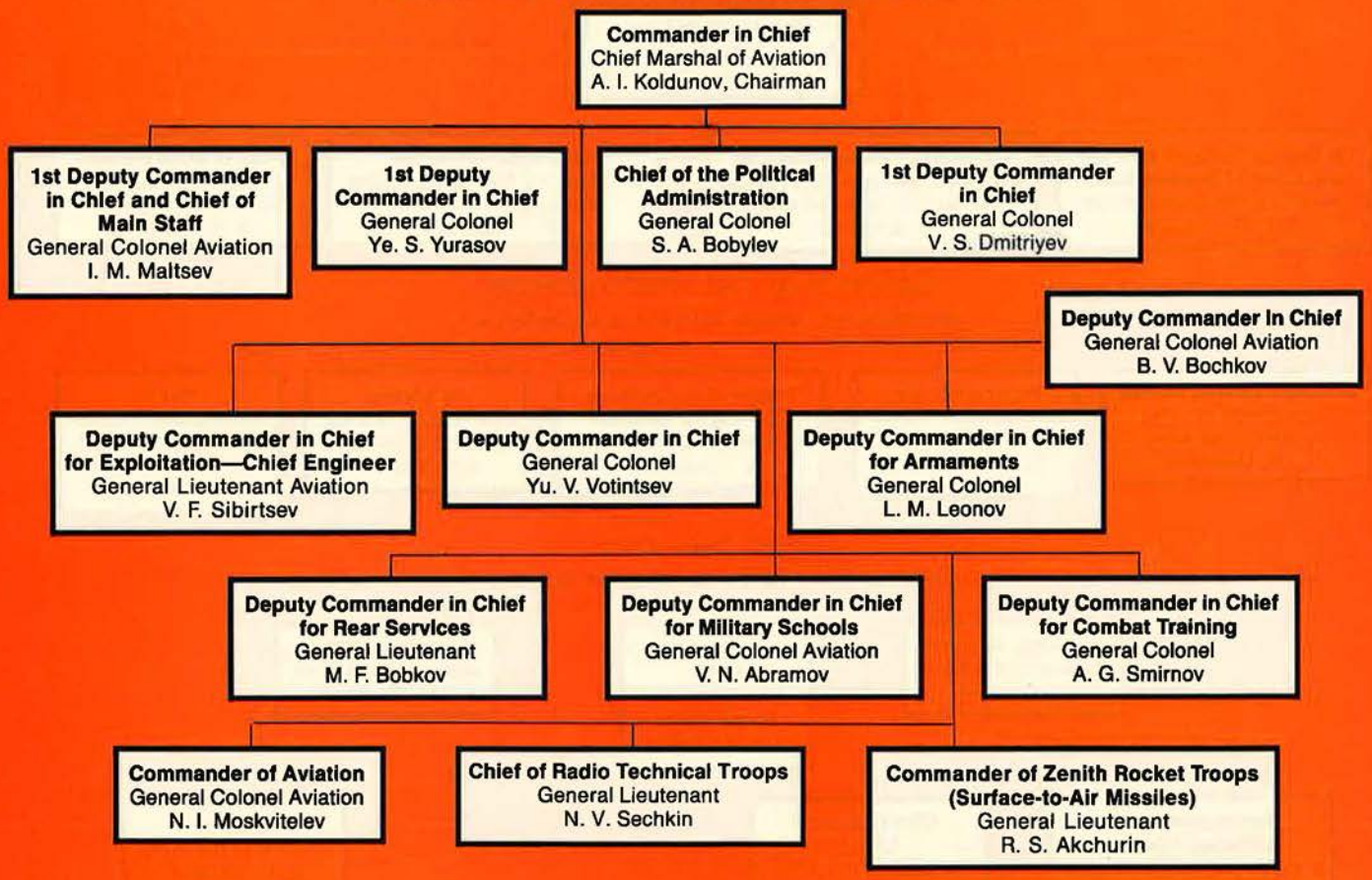
Deputy Commander in Chief for Combat Training
General Colonel
A. D. Melekhin

Deputy Commander in Chief for Armaments
General Colonel
Yu. A. Pichugin

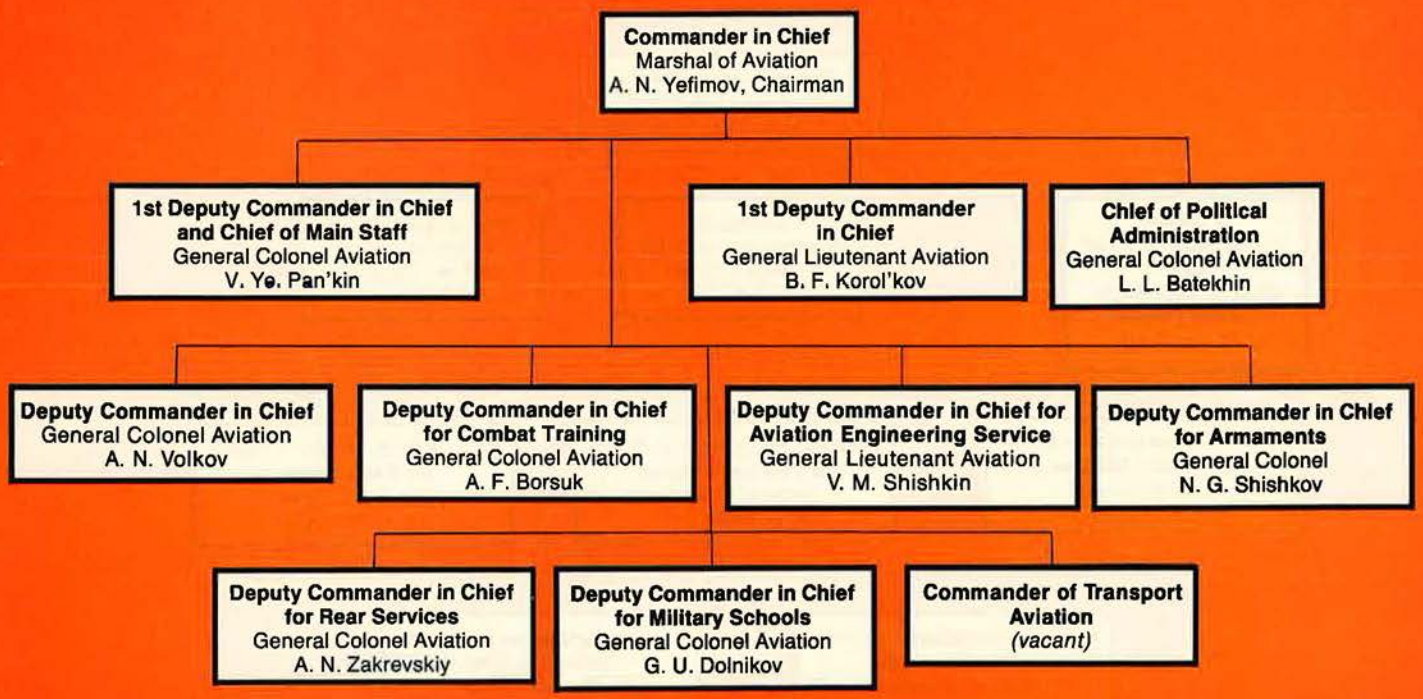
Deputy Commander in Chief for Rear Services
General Lieutenant
Ye. I. Katerukhin

Deputy Commander in Chief
General Colonel
G. N. Malinovskiy

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

SENIOR MILITARY LEADERSHIP CHANGES FOR 1986 ★

PROMOTIONS

To General of the Army:

Lizichev, Aleksey Dmitriyevich. Chief of the Main Political Administration of the Soviet Army and Navy. February 20, 1986.

Snetkov, Boris Vasil'yevich. Commanding General of the Leningrad Military District. May 7, 1986.

Voloshin, Ivan Makarovich. Last known position: Warsaw Pact Representative in Czechoslovakia. May 7, 1986.

Postnikov, Stanislav Ivanovich. Commanding General of the Transbaykal Military District. November 4, 1986.

TRANSFERS

Altunin, Aleksandr Terent'yevich, sixty-five, General of the Army. Released two months after the Chernobyl catastrophe from the post he had held since 1972 as Deputy Minister of Defense and Chief of Civil Defense USSR, perhaps because of the poor performance of his Civil Defense Forces at the time of the disaster. Present assignment not known.

Belikov, Valeriy Aleksandrovich, sixty-one, General of the Army. Appointed Commander in Chief, Soviet Forces Germany. Had been Commander, Carpathian Military District, since 1979.

Govorov, Vladimir Leonidovich, sixty-two, General of the Army. Deputy Minister of Defense. Transferred from his position as Inspector General to Chief of Civil Defense USSR. Son of the late Marshal of the Soviet Union L. A. Govorov, wartime commander.

Petrov, Vasiliy Ivanovich, sixty-nine, Marshal of the Soviet Union. Released as First Deputy Minister of Defense in July 1986. Failed to appear at Armed Forces Day (February) or at the May Day Parade. Present assignment not known.

Tret'yak, Ivan Moiseyevich, sixty-three, General of the Army. Appointed Deputy Minister of Defense and Inspector General in July 1986. Had been Commander in Chief, Troops of the Far East. Tret'yak, a Ukrainian by nationality, is one of the two non-Great Russians in the top military leadership.

FATAL ACCIDENTS

Goncharov, Leonid Mikhaylovich. General Colonel. Born 1925. Commandant of the Vasilevskiy Military Academy of Air Defense since 1983. Professor and Candidate of Military Sciences. Died May 1986 while performing his duties.

Goren'kov, Fedor Ivanovich. Colonel. Born 1943. Acting Military Attaché in Pakistan. Killed on September 16, 1986.

OTHER DEATHS

Anokhin, Sergey Nikolayevich. Retired Colonel. Born 1910. Test pilot. In the 1930s, held several world records in gliders. Was one of the first Soviet pilots to test-fly jet aircraft. Died April 1986.

Antonov, Nikolay Dmitriyevich. Retired General Colonel of Aviation. Born 1909. Military pilot first class. From 1959 to 1969, Chief of Political Directorate of Moscow Air Defense District. Died June 1986.

Goreglyad, Leonid Ivanovich. Retired General Major of Aviation. Born 1917. Hero of the Soviet Union. Worked in the Soviet manned space program. Died July 1986.

Pokrovskiy, Roman Petrovich. General Colonel of Aviation. Born 1917. Deputy Chief of Armaments of the Ministry of Defense. Wartime troubleshooter for the State Committee of Defense (GKO). Radar and electronics specialist. Government prize winner. Died September 1986.

Rybal'chenko, Stepan Dmitriyevich. Retired General Colonel of Aviation. Born 1903. Wartime Commander of the Air Army of the Leningrad Front. Commander of Air Forces of Kiev and Far Eastern Military District. Died January 1986.

Sadovnikov, Anatoliy Sergeyevich. General Lieutenant of Aviation. Born 1925. First Deputy Chief of Staff of Moscow Air Defense District since 1981. Died September 1986.

Tomashevskiy, Aleksandr Nikolayevich. Retired General Colonel of Aviation. Commander of Air Force of Pacific Ocean Fleet (1961–71), Deputy Commander of Naval Aviation (1972–74). Died April 1986.

Ushakov, Sergey Fedorovich. Retired General Colonel of Aviation. Born 1908. Chief of Staff of Long-Range Aviation, First Deputy Chief of the Main Air Staff. Died March 1986.

Yezhkov, Vladimir Ivanovich. Retired General Lieutenant of Aviation. Born 1921. Wartime fighter pilot in Northern and Western Air Defense Districts. Head of Personnel Directorate of the Air Forces (1978–82). Died March 1986.

МЕЛОЧИ

(MELOCHI)

The tools of war and biographies of the leaders tell us something about the Soviet Union. But little things can be instructive, too. In Russian, the word *melochi* means a collection of odds and ends. Here's ours . . .

—Photo by Paul Kennedy

Metroska *dolls are a typical folk art form in the Soviet Union. Open the outer one and you find a smaller doll inside, and still another inside* that. *Experts can tell which region a doll is from by the colors used to decorate it.*

This pop-up book is bound to thrill any young reader. Its title is Our Defenders, *and we've opened it to just one of the colorful displays the book contains. The MiG fighter is ready to leap off the page. The accompanying text tells the reader: "We fly high/We fly low/We fly far/We fly near/If it is necessary/We can fly wherever we want."*

"Without the Osprey, the hostages might still have been with the hijackers."

"First word of the hijacking set a fast chain of events into motion . . .

"Although the airport was many miles away, the Air Force CV-22s slipped up on them quickly, quietly. In fact, we were on top of them before they could react. The Ospreys gave us clandestine precision and surgical accuracy. There was not one casualty among the hostages.

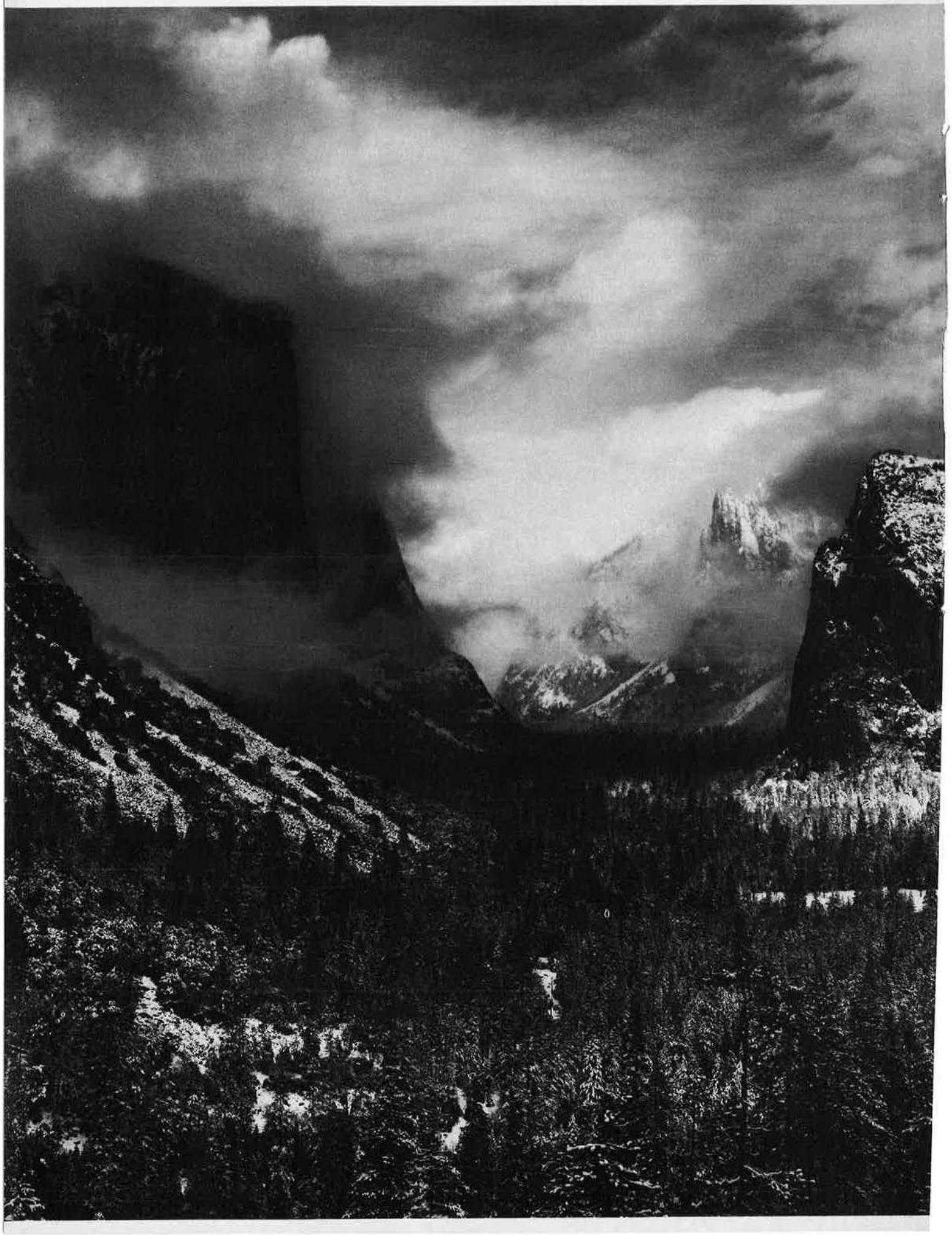
"Maybe, just maybe, this kind of response will send terrorists a message: Using innocent people for your purposes just won't work any more."

It's possible. This Department of the Navy program is producing an aircraft that streaks forward at turboprop speeds, providing unmatched rapid-response capability at very long ranges. Yet, it takes off, hovers and maneuvers like a helicopter.

Credit the Bell Boeing TiltRotor Team for turning a challenging concept into a startling reality. The TiltRotor will bring speed and range you'd need in a fast combat transport. It can reach up high or race across the terrain at treetop level.

And it will rewrite mission profiles like no other aircraft in the world, ushering in a new era in special operations aviation.

Bell Boeing
THE TILTROTOR TEAM



There are thirty-one letters in the Cyrillic alphabet used in Russia. It was partly adapted from Greek, and some of the letters still bear a resemblance to Greek characters. Children use cards like this one to help learn their A-B-Cs (or, in this case, A-B-Vs).

Pepsi-Cola is a popular item in the Soviet Union. There are now seventeen bottling plants turning out Pepsi in the USSR.

Our melochi *includes the inevitable bust of Lenin, the revolutionist and statesman, founder of Bolshevism and of Soviet Russia. His mausoleum in Moscow's Red Square is a Communist shrine.*

The toy plane is a Tu-104 in the colors of Aeroflot, the state airline. The toy truck has a classy missile launcher on top. The magazine is Aviation and Cosmonautics, *a journal for military flyers.*

More melochi *on the next page . . .*

This book, To Space, *is open to the page commemorating the July 1975 link-up of our Apollo Command and Service Module with Soyuz-19, when Astronauts Stafford, Slayton, and Brand spent two days sharing meals and souvenirs with their Soviet counterparts, Cosmonauts Leonov and Kubasov. The exercise demonstrated to the world that it's possible to cooperate in space.*

A favorite American author in the Soviet Union is Mark Twain, whose Tom Sawyer and Huckleberry Finn *appears below. Other American writers whose works are sought out by Soviet readers are Jack London, James Fenimore Cooper, Edgar Allan Poe, and O. Henry.*

—Photo by Paul Kerneoy

Our melochi includes a toy bear who tries to tie his shoe, a smart little (red, naturally) station wagon, and postage stamps honoring the 22d Communist Party Congress. Staff Editor Colleen Bollard and Art Director Guy Aceto had fun putting this collection together.

Clearing Winter Storm, Yosemite National Park. Photograph by Ansel Adams. Courtesy of The Trustees of The Ansel Adams Publishing Rights Trust. All Rights Reserved.

Like Yosemite National Park, the U.S. Air Force B-1B Long-Range Combat Aircraft is a national resource.

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SOVIET AEROSPACE ALMANAC

Pin commemorating the fiftieth anniversary of the establishment of the Union of Soviet Socialist Republics

Information for this 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., for their advice and counsel on this project. We would also like to thank William and Harriet Fast Scott for their review of this material.

—THE EDITORS

Significant Dates in Soviet Military 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 Soviets aid 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 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 (August to February 1943).

1943—The Battle of Kursk is fought (July 5–July 16).

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 USSR announces its first successful ICBM test (August 26). The first Sputnik 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 inadvertently strayed into Soviet airspace (September 1).

Soviet *Znachkii*

Soviet *znachkii* are small plastic or light metal badges that commemorate noteworthy events, people, locations, and achievements. Costing on the average anywhere from five kopeks to fifty kopeks (seven cents to seventy cents), they feature clasps that allow them to be worn on clothing.

Soviet youngsters frequently trade *znachkii* among themselves and to Western tourists for such items as chewing gum and ballpoint pens. Examples of *znachkii* are pictured throughout this "Soviet Aerospace Almanac" section.

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)

Strategic Rocket Forces pin

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 accompanying chart)*.
- The right side of the blouse will display qualifications and classification badges, including aviator wings and elite unit designations.

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

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

Comparative Grades and Insignia

(Bold face indicates equivalent USAF rank.)

Glavnyi Marshal Aviatsii
General of the Air Force

Marshal Aviatsii
General

General-Polkovnik Aviatsii
Lieutenant General

General-Leytenant Aviatsii
Major General

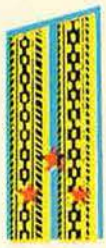
General-Mayor Aviatsii
Brigadier General

Polkovnik
Colonel

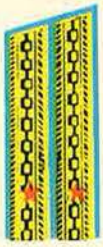
Podpolkovnik
Lieutenant Colonel

Mayor
Major

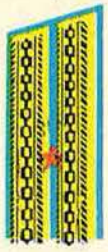
Kapitan
Captain



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

Soviet Theater Estimates

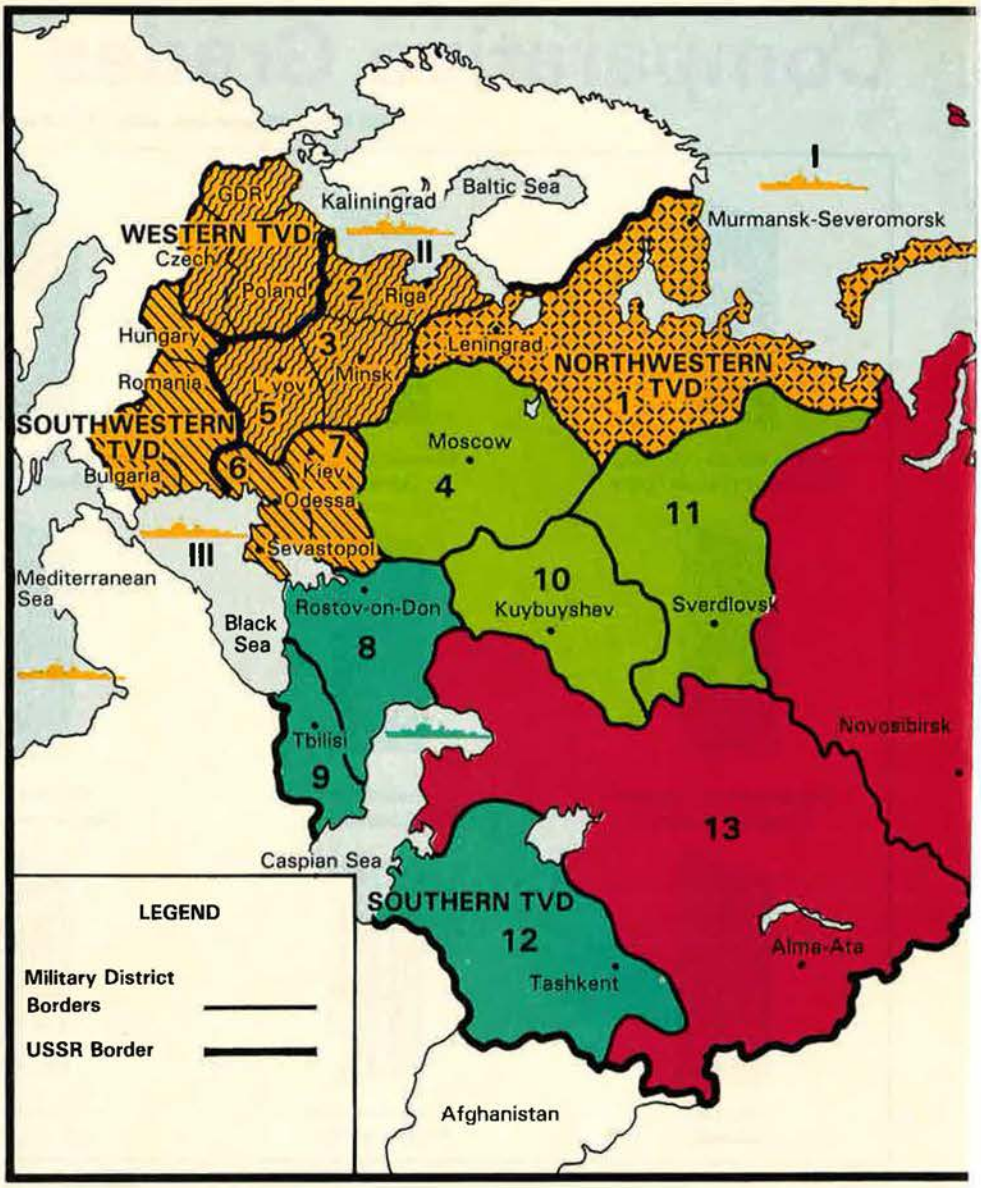
COMBAT ORGANIZATION
(As of October 1, 1986)

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.



Pacific Ocean TVD

Pacific Ocean Fleet

Aircraft Carriers	2
Principal Surface Combatants	84
Other Combatant Craft	395
Auxiliaries	240
Submarines[3]	90
Naval Aviation	515
Naval Infantry Division	1

Indian Ocean Squadron
(most units drawn from Pacific Ocean Fleet)

Ships, average	15–25
Submarines	1–2
Principal Surface Combatants	2–3
Amphibious Warfare Ships	1–2
Mine Warfare Ships	0–1
Auxiliaries	7–9

FAR EAST THEATER

Far East TVD

Divisions	54
Tanks[4]	14,985
Artillery[2]	13,420
Tactical Aircraft	1,720

WESTERN THEATER[1]

Northwestern TVD

Divisions	11
Tanks[4]	1,320
Artillery[2]	1,940
Tactical Aircraft	225

Southwestern TVD

Divisions	28
Tanks[4]	7,030
Artillery[2]	5,900
Tactical Aircraft	940

Western TVD

Divisions	63
Tanks[4]	19,395
Artillery[2]	15,400
Tactical Aircraft	2,380

MILITARY DISTRICTS

1. Leningrad
2. Baltic
3. Belorussia
4. Moscow
5. Carpathia
6. Odessa
7. Kiev
8. North Caucasus
9. Transcaucasus
10. Volga
11. Ural
12. Turkestan
13. Central Asia
14. Siberia
15. Transbaykal
16. Far East

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.

[4]Medium tanks only.

Atlantic TVD

Baltic Fleet

Principal Surface Combatants	42
Other Combatant Craft	323
Auxiliaries	165
Submarines	45
Naval Aviation	275
Naval Infantry Brigade	1

Black Sea Fleet

Principal Surface Combatants	75
Other Combatant Craft	224
Auxiliaries	148
Submarines	35
Naval Aviation	465
Naval Infantry Brigade	1

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

Ships, average	35–45
Submarines	6–7
Cruisers	1–2
Destroyers	2–3
Frigates	2–3
Amphibious Warfare Ships	0–1
Mine Warfare Ships	0–1
Auxiliaries	24–28

Arctic TVD

Northern Fleet

Aircraft Carriers	1
Principal Surface Combatants	75
Other Combatant Craft	138
Auxiliaries	200
Submarines[3]	139
Naval Aviation	445
Naval Infantry Brigade	1

SOUTHERN THEATER

Southern TVD

Divisions	30
Tanks[4]	5,450
Artillery[2]	5,810
Tactical Aircraft	915

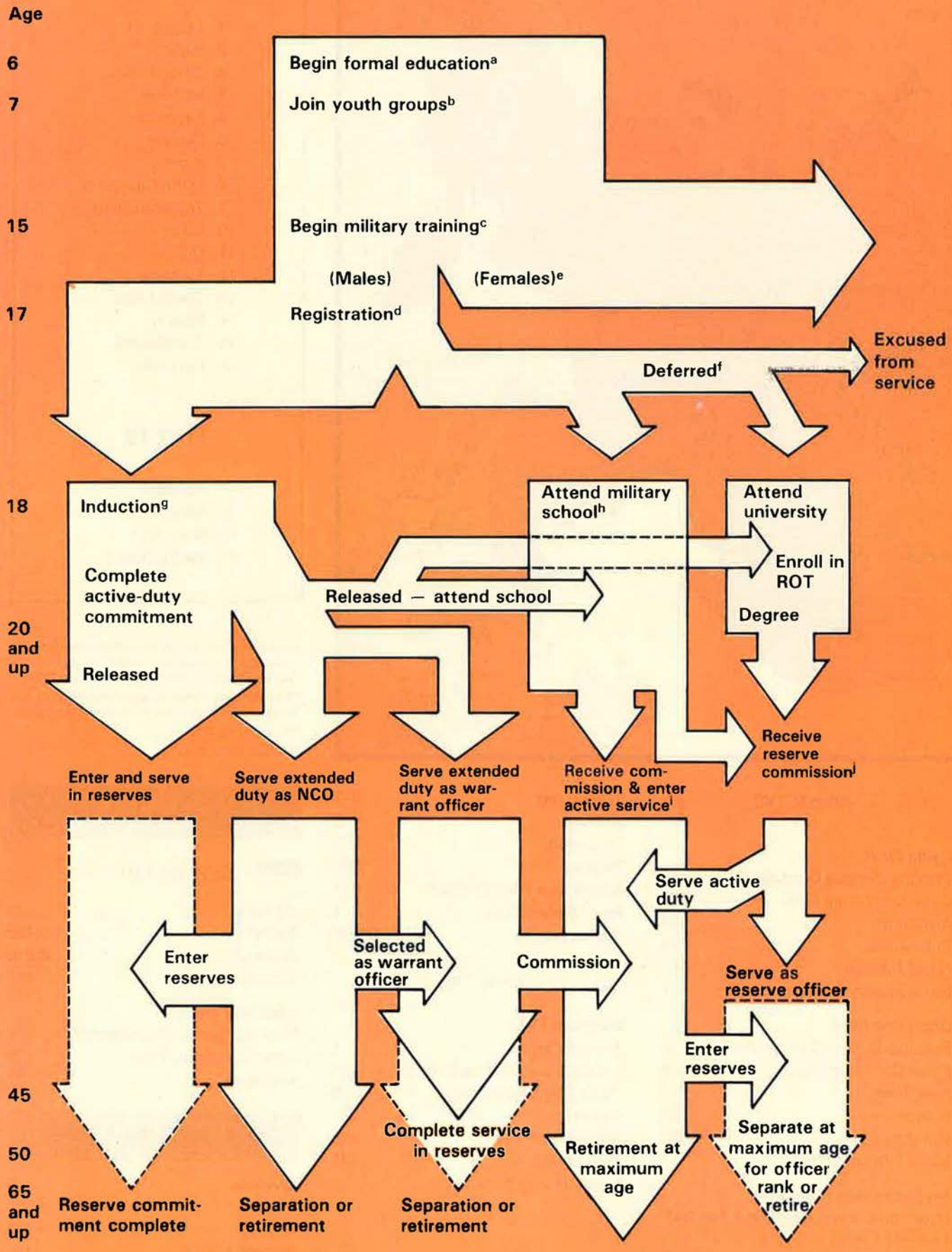
Caspian Flotilla

Principal Surface Combatants	5
Other Combatant Craft	79
Auxiliaries	27

STRATEGIC RESERVES

Divisions	19
Tanks[4]	4,580
Artillery[2]	4,070
Tactical Aircraft	150

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.

Soviet Active Military Population

(As of October 1, 1986)

Ground Forces	1,992,000
Air Forces	454,900
Navy	449,100
Strategic Defense Forces	531,200
Strategic Attack (includes Strategic Rocket Forces and strategic elements of the Air Forces and Navy)	410,500
Command/General Support	1,472,300
Security Forces (KGB/MVD)	570,000
Total	**5,880,000**

Pin honoring Volgograd (Stalingrad), the "hero city" of the "Great Patriotic War"

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.

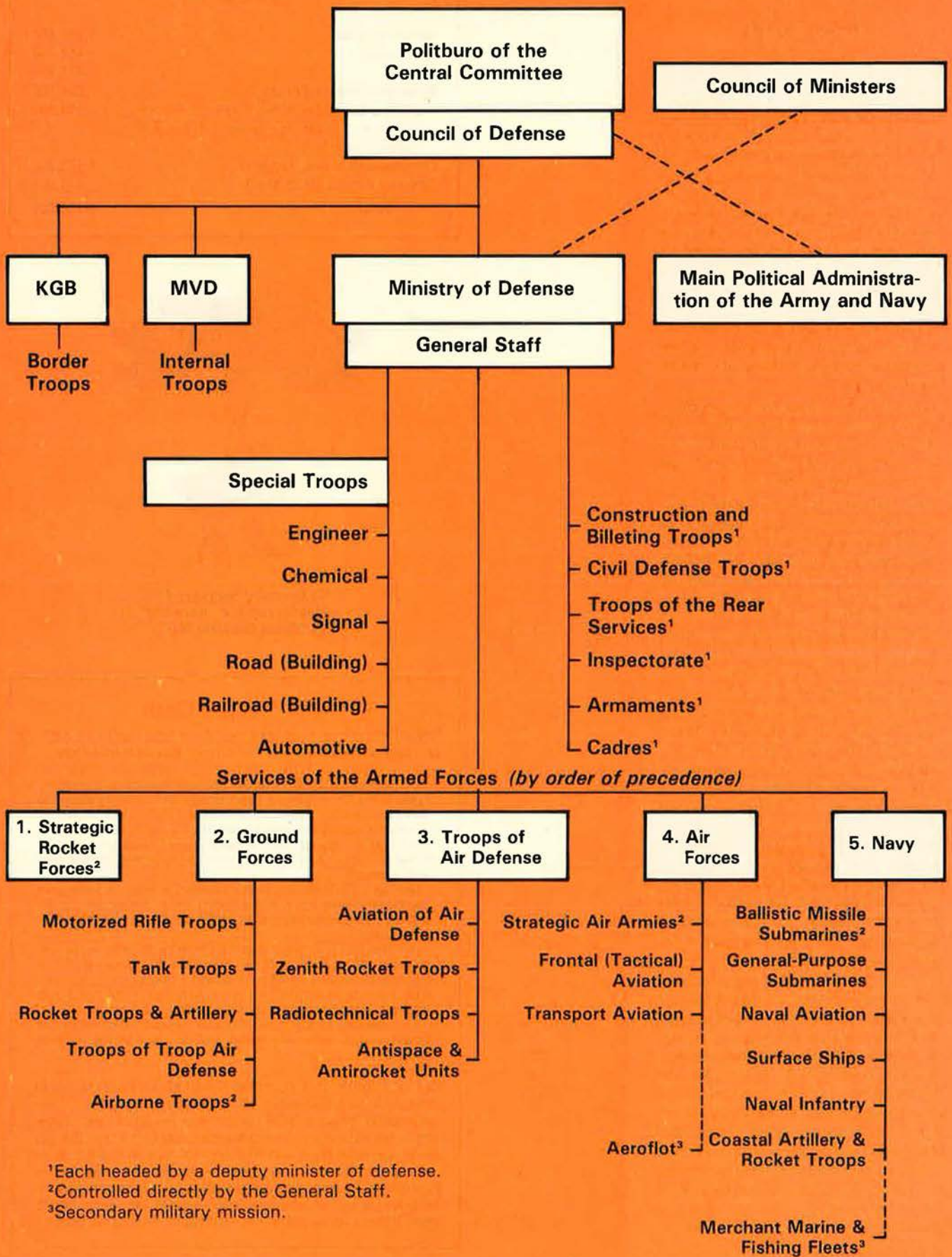
I pledge conscientiously to study military science, to preserve in every way military and public property and to remain devoted till my last breath to my people, my Soviet homeland, and the Soviet government.

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, skilfully, with dignity and honour, 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."

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 October 1, 1986)

Strategic Nuclear Missiles

1,418—Intercontinental ballistic missiles (ICBM). SS-11: 440. 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: 100. (The total ICBM figure does not include ICBMs held in reserve for flight testing.)

999—Submarine-launched ballistic missiles (SLBM). SS-N-5: 39. SS-N-6: 304. SS-N-8: 292. SS-N-17: 12. SS-N-18: 224. SS-N-20: 80. SS-N-23: 48.

553—Intermediate/medium-range ballistic missiles (IRBM/MRBM). SS-4: 112 (all based west of the Urals). SS-20: 441. (Approximately one-third of the SS-20 launchers are deployed in the Far East.)

Air Defense

1,210—Interceptors. MiG-23 Flogger: 420. MiG-25 Foxbat: 305. Su-15 Flagon: 240. Su-27 Flanker: 5. Tu-28/-128 Fiddler: 80. Yak-28 Firebar: 65. MiG-31 Foxhound: 95.

9,000—Strategic surface-to-air missile (SAM) launchers. SA-1: 2,300. SA-2: 2,675. SA-3: 1,135. SA-5: 2,030. SA-10: 860.

4,445—Tactical SAM launchers. SA-4: 1,350. SA-6: 850. SA-8: 765. SA-9: 500. SA-11: 180. SA-13: 800. The SA-X-12 is still under development.

8—Airborne warning and control aircraft. Tu-126 Moss: 7. Il-76 Mainstay: 1.

100—Antiballistic missile launchers. ABM-1B Galosh. (The ABM system is being upgraded to the maximum total of launchers allowed by the ABM Treaty.)

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

Air Forces

165—Long-range strategic bombers. Tu-95 Bear: 150. Mya-4 Bison: 15. Blackjack is still under development.

550—Medium-range bombers. Tu-22M Backfire: 155 (excludes Backfires with Naval Aviation). Tu-16 Badger: 260. Tu-22 Blinder: 135.

2,780—Tactical counterair interceptors. MiG-21 Fishbed: 490. MiG-23 Flogger: 1,570. MiG-25 Foxbat: 105. Su-15 Flagon: 260. Tu-128 Fiddler: 20. Yak-28 Firebar: 20. MiG-29 Fulcrum: 275. MiG-31 Foxhound: 30. Su-27 Flanker: 10.

2,835—Ground attack aircraft. MiG-21 Fishbed: 130. MiG-27 Flogger: 830. Su-7/-17 Fitter: 895. Su-24 Fencer: 770. Su-25 Frogfoot: 210.

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

685—Tactical reconnaissance and electronic countermeasures aircraft. MiG-21 Fishbed: 65. MiG-25 Foxbat: 195. Su-17 Fitter: 165. Su-24 Fencer: 65. Yak-28 Brewer: 195.

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.

3,050—Attack assault helicopters (including Mi-8 Hip and Mi-24 Hind aircraft).

1,500—Training aircraft (including 800 fixed-wing, of which perhaps 600 are combat capable, and 700 rotary-wing aircraft).

575—Military air transports assigned to Transport Aviation (VTA). An-22 Cock: 55. An-12 Cub: 210. Il-76 Candid: 310.

1,300—Transports in other elements of the armed forces. An-12 Cub: 300. Others: 1,000.

1,635—Civil aviation aircraft (Aeroflot). An-12 Cub: 160. Il-76 Candid: 50. Other medium- and long-range transports: 1,425.

—Totals for air defense interceptors, strategic bombers, and tactical aircraft include aircraft in operational units only.

Ground Forces

52,765—Main battle tanks. T-54/-55: 19,855. T-62: 13,335. T-64: 9,550. T-72: 8,500. T-80: 1,525.

1,532—Surface-to-surface missiles. FROG-3/-5: 130. FROG-7: 550. SS-21 Scarab: 110. SS-1 Scud B: 620. SS-23 Spider: 12. SS-12 Scaleboard: 110 (includes more accurate version deployed in 1984).

46,535—Artillery pieces, mortars, and multiple rocket launchers. Artillery pieces: 29,000. Mortars: 10,760. MRLs: 6,775. (Total does not include more than 2,000 antitank artillery pieces.)

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

4,260—Combat and support helicopters. Mi-2 Hoplite: 675. Mi-4 Hound: 20. Mi-6 Hook: 450. Mi-8 Hip: 1,950. Mi-24 Hind: 1,100. Mi-26 Halo: 50. Mi-10 Harke: 15. Mi-28 Havoc and Hokum are still in development. (Total includes 170 Hip E and 1,050 Hind D and E gunship helicopters.)

Naval Forces

78—Ballistic missile submarines. Delta: 39. Hotel: 1. Yankee: 20. Typhoon: 4. Golf: 14.

134—Nuclear-powered general-purpose submarines. Cruise missile attack: 48. Attack: 72. Other: 14.

145—Diesel- and electric-powered general-purpose submarines. Cruise missile attack: 16. Attack: 125. Training: 4.

15—Auxiliary submarines (includes both nuclear-powered and non-nuclear-powered boats).

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

2—Guided missile aviation cruisers (Moskva class).

37—Cruisers. Kirov class nuclear-powered guided missile: 2. Sverdlov class light: 8. Guided missile: 27.

63—Destroyers (including 43 guided missile destroyers).

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

975—Small surface ship combatants. Patrol: 190. Coastal patrol and river/roadstead: 395. Mine warfare: 390.

184—Amphibious warfare ships and craft.

780—Auxiliary ships. Material support: 75. Underway replenishment: 80. Fleet support: 145. Other: 480.

Naval Aviation

340—Strike and bomber aircraft. Tu-22M Backfire: 120. Tu-16 Badger: 190. Tu-22 Blinder: 30.

145—Fighter and fighter-bomber aircraft. Su-17 Fitter: 75. Yak-38 Forger A: 70.

70—Tankers (Tu-16 Badger).

200—Reconnaissance and electronic warfare aircraft. Includes Tu-16 Badgers, Tu-95 Bear Ds, Tu-22 Blinders, An-12 Cubs, and others.

480—Antisubmarine aircraft. Tu-142 Bear F: 60. Mi-14 Haze A: 100. Ka-27 Helix: 60. Ka-25 Hormone A: 115. Be-12 Mail: 95. Il-38 May: 50.

465—Transport and training aircraft.

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).

Pin commemorating the fortieth anniversary of the end of the "Great Patriotic War"

Significant Military Deployments Outside the Soviet Union

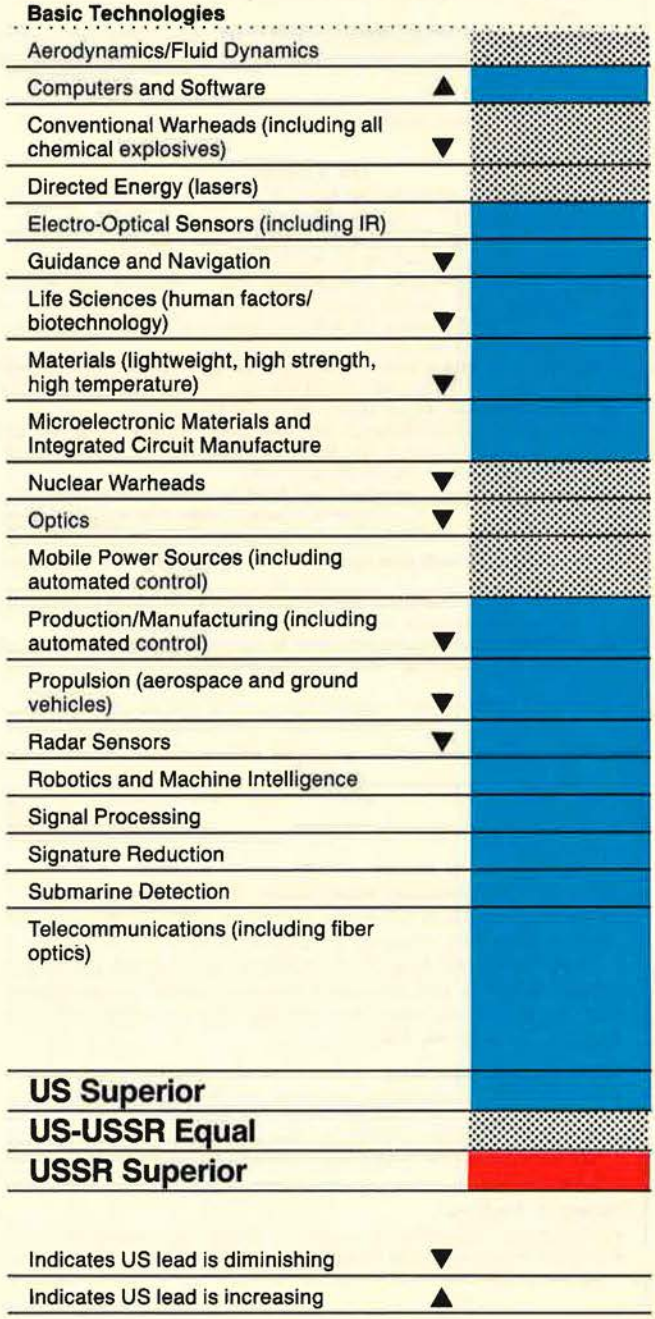
(As of October 1, 1986)

EUROPE	
Warsaw Pact Countries	715,000
ASIA	
Afghanistan[1,4]	118,000
Mongolia	65,000
Vietnam[2]	2,500
Laos	500
India	200
Kampuchea	200
MIDEAST	
Syria	2,500
South Yemen[4]	1,000
Iraq[4]	800
North Yemen	500
AFRICA[3]	
Ethiopia[4]	1,500
Libya[4]	1,400
Angola[4]	1,000
Algeria	700
Mozambique[4]	500
Congo[4]	100
Mali	50
LATIN AMERICA	
Cuba[5]	3,000
Peru	100
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 2,800 Soviet technicians in Cuba.

Comparison of Key Military Technologies

As of September 30, 1986



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.

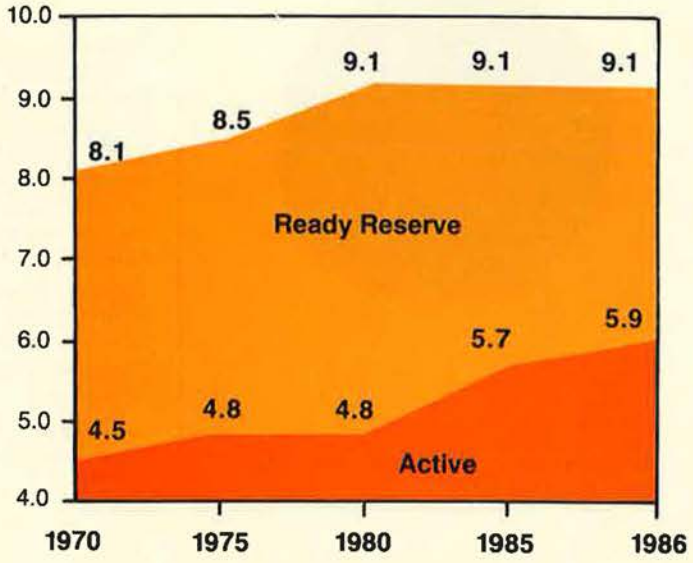
The letter arrangement MF is the progressive development suffix. M stands for modified or modified for export, F for boosted. Other examples are A for aerodynamic refinement, B for attack or bomber version, *bis* for a reinitialized suffix, P for interceptor version, S for boundary layer blowing, and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

Trends in Soviet Military Force Levels

(in millions)



Soviet Aeronautical Milestones

1884—First "hop" by a steam-engine-powered monoplane designed by Alexander Fedorovich Mozhaiski. Short distance and incline-assisted takeoff prevent it from being considered true powered flight.

1904—Nikolai Zhukovsky, "Father of Soviet Aviation," founds Europe's first institute of aerodynamics.

1910—Russian Imperial War Ministry establishes flying school at Gatchina.

1913—(May 13) First flight of the world's first four-engine airplane—*The Russian Knight*, affectionately called *Le Grand*. Designed by Igor Sikorsky.

1913—(August 20) Staff Capt. Peter Nesterov performs history's first inside loop in a Nieuport IV.

1914—(August 26) First air battle of World War I on the Eastern Front. First recorded aerial ramming in combat by Staff Captain Nesterov.

1921—The ANT-1 flies, the first of a record number of more than 100 aircraft designed by Andrei N. Tupolev.

1922—The Germans begin construction of a modern aircraft plant at Fili (near Moscow) under the provisions of the Treaty of Rapallo.

1930—The I-5 flies, the first Soviet-designed and -built fighter.

1934—(May 19) First flight of the ANT-20 *Maxim Gorki*, at the time the world's largest aircraft. Designed by Tupolev.

1937—The Soviets set several record endurance flights, including the first polar flight between Europe and North America.

1946—(April 24) First flight of Soviet-designed and -built jet fighter prototypes—the Yak-15 and the MiG-9.

1947—(December 30) First flight of the MiG-15.

1956—The Tu-104 makes its debut as the world's first commercial jetliner.

1968—(December 31) First flight of the Tu-144, the world's first supersonic transport.

Recipients of Soviet Military Exports

(Ranked by value of Soviet military equipment received, 1985–86)

1. Iraq
2. India
3. Libya
4. Angola
5. Vietnam
6. Poland
7. Syria
8. Cuba
9. Jordan
10. Czechoslovakia

Top Soviet Military Aircraft Exports

(1985–86)

Aircraft Type	NATO Code Name	Primary Role	Number Exported
Su-7/-17/-22	Fitter	Ground attack	170
MiG-23/-27	Flogger	Interceptor/ground attack	115
MiG-21	Fishbed	Multirole fighter	70
An-32	Cline	Short/medium-range transport	50
Su-25	Frogfoot	Ground attack	50
MiG-21U	Mongol	Miscellaneous/trainer	40
MiG-29	Fulcrum	Interceptor	40
An-26	Curl	Short-range transport	10

Pin commemorating Luna 17, first robot vehicle on the moon

Soviet Space Shots by Program

(1957–1986)

Photo Reconnaissance	712
Communications	268
Electronic Intelligence (ELINT)	157
Related to Manned Spaceflight (Manned: 59; Unmanned: 90)	149
Minor Military (Radar calibration, etc.)	144
Navigation/Geodetic	131
Scientific/Developmental (including rocket tests)	104
Weather/Natural Resources	74
Early Warning	53
Venus or Mars Missions	40
ASAT-Related	38
Lunar Missions	30
Fractional Orbital Bombardment System (FOBS)	18
Unknown	4
Total	**1,922**

—Courtesy Teledyne Brown Engineering

Soviet Space Launches to Orbit or Beyond

(As of December 31, 1986)

1957	2
1958	1
1959	3
1960	3
1961	6
1962	20
1963	17
1964	30
1965	48
1966	44
1967	66
1968	74
1969	70
1970	81
1971	83
1972	74
1973	86
1974	81
1975	89
1976	99
1977	98
1978	88
1979	87
1980	89
1981	98
1982	101
1983	98
1984	97
1985	98
1986	91

—Courtesy Teledyne Brown Engineering

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	Voshkod 1	First multiple crew member spaceflight (Cosmonauts Komarov, Yegarov, Feoktistov)
March 1965	Voshkod 2	First space walk (Cosmonaut Alexei Leonov)
January 1966	Luna 9	First soft landing of a probe on the moon
April 1966	Luna 10	First artificial satellite of 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
June 1975	Venera 9	First pictures of surface of Venus
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
March 1986	Vega 1	First close rendezvous with a comet
May 1986	Soyuz T 15	First transfer between operational space stations

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with liberty
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— Francis Bellamy, 1892

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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')

One of the surprises of the past year was the unveiling by mainland China of its PS-5 four-turboprop military amphibian, which appears to have a considerably 'stretched' hull of Beriev M-12 configuration. One day we may discover that the Beriev design bureau at Taganrog itself proposed such a successor to the M-12 (known to NATO as 'Mail'). For the present, the M-12, which entered production in 1964, remains the only seaplane in Soviet first-line service. About 100 were built, of which it is now thought that as many as 95 continue to perform over-water surveillance and antisubmarine duties within a 230-mile radius of shore bases of the Soviet Northern and Black Sea fleets.

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 68,345 lb.
Performance: max speed 378 mph, service ceiling 37,000 ft, max range 4,660 miles.
Accommodation: crew of five.
Armament and Operational Equipment: torpedoes, depth charges, mines, and other 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 shore-based 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; standard equipment includes a large radome under the forward fuselage and a MAD tail-sting, with two internal weapons/stores bays forward and aft of the wing carry-through structure. 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 one aircraft, illustrated in last year's Soviet Gallery, the forward weapons bay is occupied by avionics equipment, under a second, longer, blister fairing.

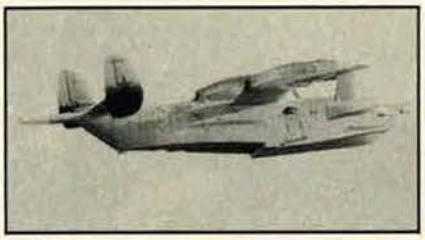
Il-38s of the Soviet Naval Air Force are encountered frequently over the Baltic and North Atlantic. A Soviet Treaty of Friendship and Co-operation, signed with the People's Democratic Republic of Yemen in October 1979, permits patrols over the Red Sea, Gulf of Aden, Arabian Sea, and Indian Ocean from a base in that country. Periodically, deployments are made to Libya, Tiyas in Syria, and Mozambique. About 50 Il-38s are in service with Soviet naval units, plus 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.
Weights: empty 79,367 lb, gross 140,000 lb.
Performance: max speed 448 mph at 21,000 ft, max range 4,473 miles, patrol endurance 12 hr.
Accommodation: crew of twelve.
Armament and Operational Equipment: variety of attack weapons and sonobuoys in weapons bays.

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 Il-76 'Midas' tankers, 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.
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.



Beriev M-12 (NATO 'Mail') (Royal Norwegian Air Force)

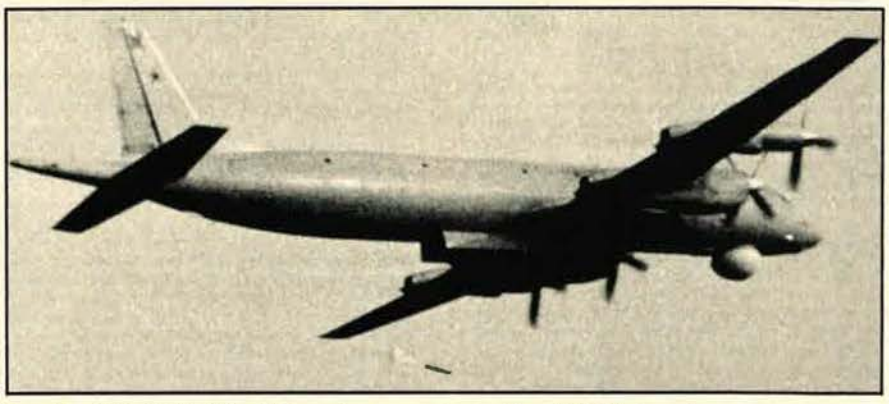
Myasishchev M-4 (NATO 'Bison-B') (Royal Air Force)

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 20 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 240 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:

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 aero-



Ilyushin Il-38 (NATO 'May') dropping a sonobuoy (Swedish Air Force)

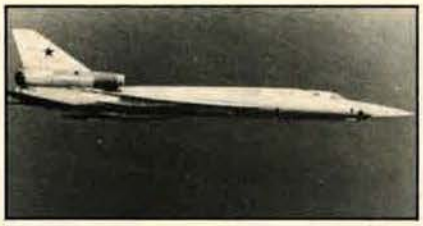
***Crew with hitherto unknown version of Tu-16 with nose radome* (Aviation and Cosmonautics)**

plane-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 ('Badger-C Mod' carries '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 radomes in tandem under bomb bays.

Badger-E. Photographic and electronic reconnaissance version. Similar to 'Badger-A', but with cameras in bomb bay and two additional radomes under fuselage, larger one aft.



Tupolev Tu-22 (NATO 'Blinder') (Royal Norwegian Air Force)

Tupolev Tu-26 (NATO 'Backfire-B') over the Baltic (Swedish Air Force)

Badger-F. Basically similar to 'Badger-E', but with electronic intelligence pod on pylon under each wing. No radomes under center-fuselage.

Badger-G. Converted from 'Badger-B' 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, replacing chin radome. 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 dispensers (max capacity 20,000 lb) are 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. Glazed nose and chin radome.

Badger-J. Specialized ECM jamming/elint aircraft to protect strike force, with some equipment located in a canoe shape radome protruding from inside the weapons bay and surrounded by heat exchangers and exhaust ports. Antiradar noise jammers operate in A to I bands inclusive. Glazed nose as 'Badger-A'. Some aircraft have large flat-plate antennae at wingtips.

Badger-K. Electronic reconnaissance variant with nose like 'Badger-A'. Two teardrop radomes, inside and forward of weapons bay; four small pods on centerline in front of rear radome. *(Data for 'Badger-G' 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 118 ft 11¼ in, height 45 ft 11¼ in, wing area 1,772.3 sq ft.

Weights: empty 82,000 lb, normal gross 165,350 lb.

Performance: max speed 616 mph at 19,700 ft, service ceiling 40,350 ft, range with 8,360 lb bomb load 3,680 miles, max unrefueled combat radius 1,955 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. Two 'Kingfish' missiles; or 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. The Libyan and Iraqi Air Forces each have about seven.

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.

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. Flight refueling probe like 'Blinder-B'.

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 Koliesov 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.

Weight: gross 185,000 lb.

Performance: max speed Mach 1.4 at 40,000 ft, service ceiling 60,000 ft, max unrefueled combat radius 1,800 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. 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. Initial series production version. 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 production version with wedge-type engine air intakes, similar to those of MiG-25. No photograph yet available.

The 1986 edition of DoD's *Soviet Military Power* document suggests a maximum unrefueled combat radius of 2,485 miles for 'Backfire', compared with the earlier estimate of 3,400 miles. It can, nonetheless, "perform a variety of missions including nuclear strike, conventional attack, antiship strikes, and reconnaissance. Its low-altitude capabilities make it a formidable platform for high-speed military operations. Additionally, 'Backfire' can be equipped with a probe to permit in-flight refueling to increase its range. This would improve its capabilities against the contiguous United States."

About 250 'Backfire-Bs and Cs' 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 100 'Backfire-Bs and Cs' 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.)*

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, 78 ft 9 in swept; length 140 ft; height 34 ft 6 in.

Weight: gross 286,600 lb.

Performance: max speed Mach 2.0 at high altitude, Mach 0.9 at low altitude, max unrefueled combat radius 2,485 miles.

Armament: primary armament of one 'Kitchen' air-to-surface missile semirecessed in the underside of the center-fuselage, or two 'Kitchens', carried under the fixed center-section panel of each wing. Multiple racks for 12 to 18 bombs sometimes fitted under the air intake trunks. Alternative weapon loads include up to 26,450 lb of conventional bombs. Soviet development of decoy missiles has been reported, to supplement very advanced ECM and ECCM. Twin 23 mm guns in radar-directed tail mounting.

Tupolev Tu-95 and Tu-142 (NATO 'Bear')

Because the first prototype of Andrei Tupolev's huge four-turboprop 'Bear' was flown in the summer of 1954, it is regarded sometimes as a lumbering relic of the propeller age. In fact, the majority of the 125 'Bears' now serving with the Soviet air armies are of the newly upgraded 'Bear-G' or new-production 'Bear-H' missile carrying versions. Similarly, all but 15 of the 75 Soviet Naval Aviation 'Bears' are of the 'F' model, which differs so greatly from earlier models that its designation was changed from Tu-95 to Tu-142. Long range and endurance are only two of the attributes that have kept these aircraft in continuous production for 33 years. Their high speed, exceeding that once considered practicable for propeller driven aircraft, eclipsed the contemporary four-jet M-4. Their size and payload potential enabled them to accommodate the largest air-to-surface missiles and radars yet carried by combat aircraft. Versions 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, an elint 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 an elint 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 elint fair-

ings 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. About 15 operational.

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. A similar tail is fitted to 'Bear-G'.

Bear-E. Reconnaissance version. Generally as 'Bear-A', but with rear fuselage elint 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, since when four variants have been seen, this much refined antisubmarine version reentered production in the mid-1980s. Originally, it had enlarged and lengthened fairings aft of its inboard engine nacelles, but current aircraft have reverted to standard size fairings. Some have no undernose radar; others have a radome in this position, but of considerably modified form compared with that of 'Bear-D'. On both models the main underfuselage J 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, and no tailplane tip fairings.

Bear-G. Generally similar to 'Bear-B/C', but reconfigured to carry two AS-4 ('Kitchen') air-to-surface missiles instead of one 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' but with a shorter fuselage, is equipped with pylons under the inboard wing panels to carry long-range cruise missiles, including the AS-15 'Kent'. Built at Kuybyshev, it achieved initial operational capability in 1984, and at least 40 are now deployed. Features include a larger and deeper radome built into the nose and a small fin-tip fairing. There are no blister fairings on the sides of the rear fuselage, and the ventral gun turret is deleted.

Duties of the 'Bears' include regular deployments to staging bases in Cuba and Angola, and eight are stationed permanently at Cam Ranh in Vietnam. 'Bears' are encountered frequently off the US east coast during transits between Murmansk and Cuba and during elint missions from Cuba. 'Bear-Hs' also carry out simulated attack and training missions against the USA. The Indian Navy is reported to have ordered three Tu-142M 'Bear-Fs' for maritime reconnaissance. *(Data for 'Bear-F' follow.)*

Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp. Internal fuel capacity 25,100 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 25,000 ft, over-target speed 518 mph at 41,000 ft, unrefueled combat radius 5,150 miles.

New Tupolev Bomber (NATO 'Blackjack')

Satellite photographs taken in 1985 revealed the presence of an air base under construction in the southern part of the Kola Peninsula, Murmansk, with a main runway 15,000 ft long and about 1,600 ft wide. This is assumed to be for the new Tupolev strategic bomber known as 'Blackjack' that is likely to enter service next year as a successor to 'Bear'. 'Blackjack' is longer than a B-52, with a maximum speed 50 percent faster than a B-1B and about the same combat radius. It 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, and the engine installation resembles that of the now-retired Tu-144 supersonic airliner rather than 'Backfire'. However, the two bombers are designed for a similar subsonic cruise/supersonic dash flight profile. So, as 'Blackjack's' gross weight is twice that of 'Backfire', it might have been logical to use four of the latter's turbofans.

Five prototype and preproduction 'Blackjacks' were undergoing advanced flight testing in 1986, and DoD expects the Soviet Union to build a production series of at least 100 in a new complex added to the huge Kazan airframe plant. 'Blackjack's' primary weapons will be the AS-15 'Kent' air-launched cruise missile and supersonic BL-10 missile, each with a range of 1,850 miles; but it will have provision for carrying bombs or a mix of missiles and bombs.

Power Plant: possibly four uprated versions of the 44,090 lb st Kuznetsov NK-144 afterburning turbofan. Provision for in-flight refueling assumed.
Dimensions: span 172 ft spread, 110 ft swept; length 166 ft; height 45 ft.
Weight: gross 551,150 lb.
Performance: max speed Mach 2.0 at high altitude, max unrefueled combat radius 4,535 miles.
Armament: up to 36,000 lb of free-fall bombs or ALCMs.

Tupolev Tu-142 (NATO 'Bear-F') (UK Ministry of Defence)

Artist's impression of Tupolev 'Blackjack' releasing an AS-15 'Kent' ALCM (DoD)

Fighters

MiG-21 (NATO 'Fishbed')

MiG-21s continue to be flown by at least 37 air forces worldwide, but replacement with later fighters has left only an estimated 780 in first-line units of the Soviet tactical air forces, including 60 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, rated at 13,668 lb st, improved radar (NATO 'Jay Bird'; search range 12 miles), and four underwing pylons instead of two. 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 and GSh-23 twin-barrel 23 mm gun. Zero-speed, zero-altitude ejection seat.

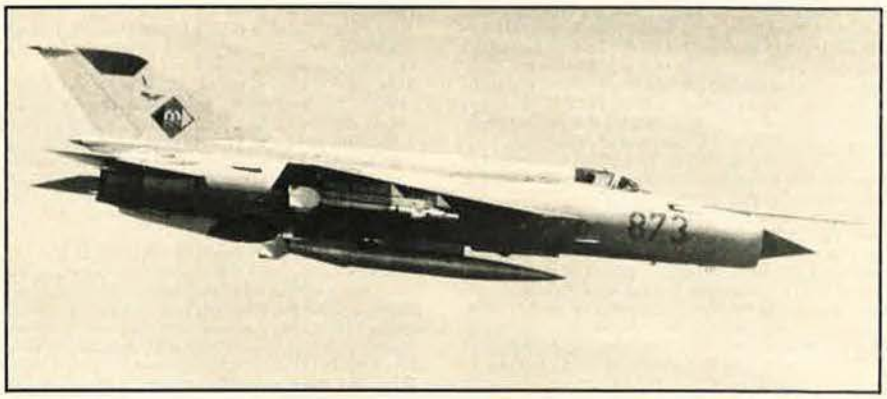
MiG-21MF ('Fishbed-J'). Differs from PFMA in having lighter-weight, higher-rated Tumansky R-13-300 turbojet. Entered service in 1969.

MiG-21SMB ('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. Deliveries believed to have started in 1971.

MiG-21*bis* ('Fishbed-L'). Third-generation multirole air combat fighter/ground attack version, with Tumansky R-25 turbojet engine, rated at 16,535 lb st with afterburning, 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 further improved 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. Internal fuel capacity 687 gallons. Provision for three external tanks with maximum capacity of 471 gallons and for two JATO rockets.
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.



Mikoyan MiG-21bis (NATO 'Fishbed-L') of East German Air Force

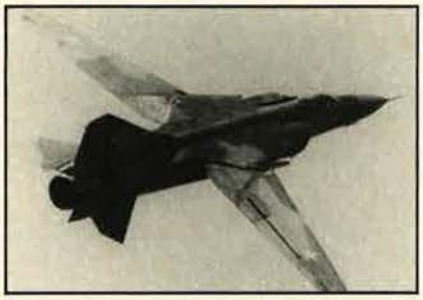
Typical ground attack loads are four UV-16-57 rocket packs; two 1,100 lb and two 550 lb bombs; or four S-24 240 mm rockets.

MiG-23 (NATO 'Flogger')

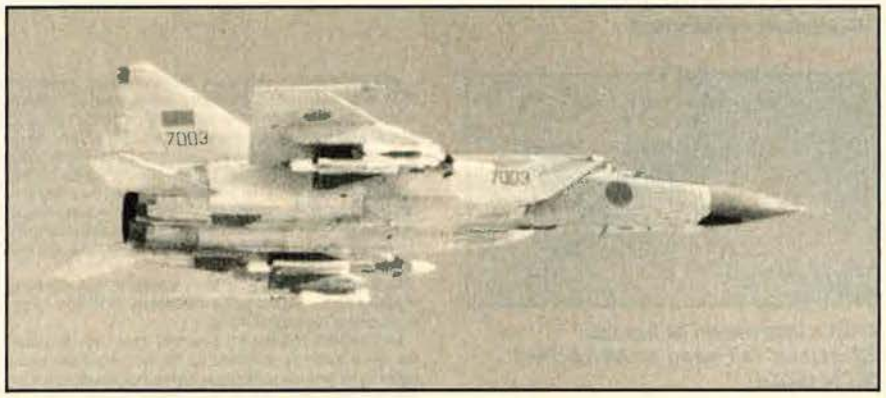
At the present time, MiG-23 interceptors form the backbone of the slimmed-down Voyska PVO air defense force and air combat elements of the tactical air forces. Versions are flown by all of the non-Soviet Warsaw Pact air forces and by twelve other nations. Currently operational MiG-23 variants identified 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, Sirena 3 radar warning system, infrared search/track 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.



Notches in the wing gloves identify the new MiG-23 (NATO 'Flogger-K') (US Navy)



MiG-25M (NATO 'Foxbat-E') of the Libyan Arab Air Force, armed with 'Acrid' and 'Aphid' missiles (US Navy)

MiG-23UM ('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-23MS ('Flogger-E'). Export version of MiG-23M '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-23 ('Flogger-G'). First identified when six aircraft from Kubinka air base made goodwill visits to Finland and France in the summer of 1978. Although basically similar to 'Flogger-B', these aircraft had a much smaller dorsal fin. Absence of operational equipment suggested that only a few aircraft had been modified to this standard for improved aerobatic capability as a display team. 'Flogger-G' has 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.

MiG-23 ('Flogger-K'). Development of 'Flogger-G', identified by dogtooth notch at junction of wing glove leading-edge and intake trunk on each side, to generate vortices to improve stability in yaw at high angles of attack. This compensates for smaller ventral folding fin and small dorsal fin. New IFF antenna forward of windscreen. AA-11 close-range air-to-air missiles on fuselage pylons. Pivoting weapon pylons under outer wings.

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.

It is estimated that about 430 'Flogger-B/G/K' interceptors serve with the 1,250-strong Soviet strategic air defense force and a further 1,750 in tactical air force regiments. *(Data for 'Flogger-G' 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. Two additional 211 gallon tanks may be carried on nonswiveling pylons under outer wings for ferry flights, with wings at 16° sweep. 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; height 18 ft 0½ in; wing area 293.8 sq ft spread.

Weights: empty 18,075 lb, max external weapons 4,410 lb, gross 35,275–41,670 lb.

Performance: max speed Mach 2.35 at height, Mach 1.2 at sea level, service ceiling 65,600 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-25 (NATO 'Foxbat-A, C, and E')

Still the fastest combat aircraft 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, about 300 MiG-25s continue to constitute one-quarter of the 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 in the USSR, and some in Libyan service, have been uprated 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 Ye-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 123,523 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 a pair of AA-11s or AA-8s ('Aphids') can be carried under each wing.

MiG-29 (NATO 'Fulcrum')

Comparable in size to the Navy's F/A-18 Hornet, the MiG-29 results from concerted effort by the Soviet Union to close the technology gap with the West. A large pulse-Doppler lookdown/shootdown radar gives it day and night all-weather operating capability against low-flying targets as well as freedom from the ground controlled interception techniques that formerly restricted Soviet air defense effectiveness. It has an infrared search/track sensor in front of the windscreen. Sustained turn rate is much improved over earlier Soviet fighters, and thrust-to-weight ratio is better than 1. Although intended primarily as a single-seat counterair fighter, it is likely to have a full dual-role air combat/attack capability, and a combat capable two-seater is in parallel production at the assembly plant near Moscow.

More than 150 MiG-29s are operational with Soviet units stationed in East Germany, in the USSR west of the Urals, and in the far eastern USSR. Export deliveries to Syria and India are reported to be imminent.

Comparison of the general configurations of the MiG-29 and Su-27 prompts the thought that some authority, perhaps the TsAGI Central Aerodynamics and Hydrodynamics Institute, may be exerting a greater influence on design than was the case in the era of the late Artem Mikoyan and Pavel Sukhoi. The Sukhoi fighter maintains the tradition of being larger and seemingly less sophisticated than the MiG, but the two designs are strikingly similar in most respects, even in such detail as current tail fin location and the manner in which the mainwheels retract into the wingroots. An innovation on the MiG-29 is that doors close the engine air intakes against foreign object ingestion when the nosewheels are in contact with the ground during takeoff and landing; engine air is then taken in through louvers in the upper surface of the wingroot extensions. All-round view from the cockpit is inferior to that from an F-15 or F-16, and there is no evidence of flight-refueling capability. MiG-29s are expected to replace MiG-21s, Su-21s, and some MiG-23s in Soviet service.

Power Plant: two Tumansky R-33D turbofans, each 18,300 lb st with afterburning. Provision for conformal auxiliary fuel tank under fuselage.

Dimensions: span 37 ft 8¾ in, length 56 ft 5 in, height 14 ft 5¼ 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 715 miles.
Accommodation: pilot only (tandem two-seater to follow).
Armament: six underwing pylons for medium-range radar homing AA-9 or AA-10, and/or close-range AA-8 or AA-11 air-to-air missiles, bombs, rocket pods, or other stores. One six-barrel 30 mm Gatling type gun in port wingroot leading-edge extension.

MiG-31 (NATO 'Foxhound')

First Soviet interceptor to offer true lookdown/shootdown and multiple-target engagement capability, the MiG-31 inherits its general configuration from 'Foxbat' and may have a similar arc-welded nickel steel structure to speed development and production. It is, however, a very different aircraft, with a crew of two and reduced emphasis on highest attainable speed. The large pulse-Doppler radar is said to embody technology found in the Hughes AN/APG-65 digital radar of the Navy's F/A-18 Hornet; its search range is said to be 190 miles, and tracking range 167 miles. Other equipment includes an infrared search/track sensor, radar warning receivers, and active countermeasures dispensers.

Deployment of MiG-31s with Voyska PVO air defense regiments had begun by early 1983, and more than 100 are now operational, at bases from the Arkhangelsk area near the USSR's western borders to Dolinsk on Sakhalin Island, north of Japan. Twenty-four of the aircraft are said to be assigned to strategic reconnaissance missions. Production is centered at the Gorkiy airframe plant.

Power Plant: two Tumansky turbojets; each 30,865 lb st with afterburning. Fuel capacity probably similar to MiG-25.
Dimensions: span 45 ft 11¼ in, length of fuselage (nosecone tip to end of jetpipes) 70 ft 6½ 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: aircraft illustrated has four AA-9 (NATO 'Amos') radar homing long-range air-to-air missiles in pairs under fuselage and twin mounts for smaller stores such as AA-8 ('Aphid') air-to-air missiles on one large pylon under each wing. These pylons, and outer underwing pylons not fitted when photo was taken, can probably increase number of AA-9s to eight.

Sukhoi Su-21 (NATO 'Flagon')

With deployment of the new generation of Soviet counterair fighters gathering pace, the number of 'Flagons' in first-line home defense units has diminished to around 200, as mentioned in last year's Gallery. It now appears that a further 340 may still serve in tactical units. Those remaining are of three variants, so different from early Su-15s ('Flagon-A to D'), that they are believed to be designated Su-21 in the USSR:

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, and additional fuel, 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.

Flagon-G. Two-seat training version of 'Flagon-F' with probable combat capability. Individual rearward hinged canopy over each seat. Periscope above rear canopy for enhanced forward view. *(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')

The only photographs of an Su-27 released to date are thought to show a prototype making its first flight in the second half of the 1970s. Since then, at least 75 production models are reported to have left the plant in Komsomolsk, Khabarovsk territory. The first operational units are deployed in the Kola Peninsula, following a long period of retention at the factory, awaiting acceptable engines, avionics, or other key equipment.

Intended to represent the Soviet counterpart to USAF's F-15 Eagle, the Su-27 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'.

Compared with the prototypes, production Su-27s are thought to have square wingtips, carrying launchers for air-to-air missiles. The twin tail fins are also moved outboard of the engine housings. Together with MiG-31s, they are expected to replace many of the MiG-21, MiG-23/27, Su-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 now fitting out at Nikolayev. This may suggest the eventual manufacture of a navalized version of the Su-27 to equip the ship's carrier air group.

The aircraft designated P-42, which set a new time-to-height record last autumn, may have been an Su-27. Powered by two 29,955 lb st R-32 engines, and with a takeoff weight of 31,110 lb in specially prepared form, it climbed to 3,000 m in 25.4 seconds.

Power Plant: two unidentified turbofans, 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 44,000–60,000 lb.
Performance: max speed Mach 2.0 at height, Mach 1.1 at S/L, combat radius 930 miles.
Accommodation: pilot only.
Armament: six radar homing AA-10 and/or close-range AA-11 air-to-air missiles under 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 with the Voyska PVO home defense fighter force, plus 25 with tactical air forces.

Power Plant: two unidentified afterburning turbojet engines; each estimated at 27,000 lb st. Half-cone shock-body in each air intake.
Dimensions: span 59 ft 4½ in, length 89 ft 3 in.

First picture of a MiG-29 (NATO 'Fulcrum') armed with AA-8 and the new AA-10 missiles (Swedish Air Force)

MiG-31 (NATO 'Foxhound') (Royal Norwegian Air Force)

Sukhoi Su-27 (NATO 'Flanker') prototype

Sukhoi Su-21 (NATO 'Flagon-F') (Swedish Coast Guard/Air Patrol)

Weight: gross 100,000 lb.
Performance: max speed Mach 1.65 at 36,000 ft, ceiling 65,600 ft, combat radius with max internal fuel 930 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 105 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')

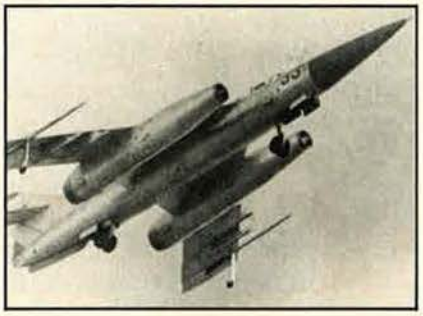
The Yak-38 is the only jet combat aircraft that shares the Harrier's V/STOL capability, but it requires three engines, rather than one, to achieve this. Its single large propulsion turbojet exhausts through a pair of rotating nozzles aft of the wingroots. Two lift-jets are mounted in tandem aft of the 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:

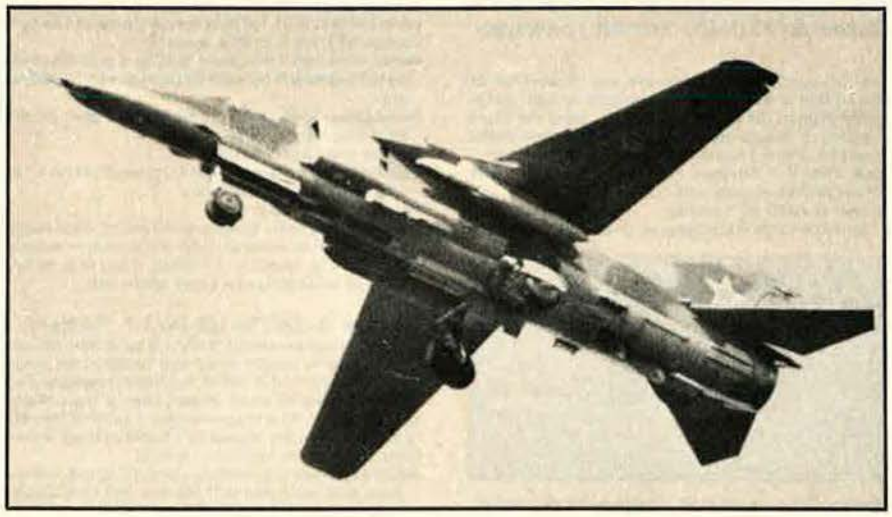
Forger-A. Basic single-seat combat aircraft. Ranging radar in nose. Prototype was completed in 1971, and production began in 1975. Twelve appear to be operational on each Soviet carrier/cruiser, in addition to 'Forger-Bs' and about 19 Kamov Ka-25 or Ka-27 helicopters. Primary operational roles are assumed 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 two are 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, wing area 199 sq ft.
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. Electronic system ejects pilot automatically if aircraft height and descent rate are sensed to indicate an emergency.
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.



***Yakovlev Yak-28P (NATO 'Firebar')* (Flug Revue)**

Yakovlev Yak-38s (NATO 'Forger-A') on the carrier/cruiser* Novorossiysk *(Royal Navy)



Mikoyan MiG-27 (NATO 'Flogger-J')

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 changed to MiG-27. It has the same basic power plant as the Soviet Air Force's MiG-23MF, but with a two-position (on/off) afterburner 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 radar ranging antenna, and a small sloping window covering a laser rangefinder. Doppler navigation radar in nose. Additional armor on flat sides of cockpit. Seat and canopy raised to improve view from cockpit. Wider, low-pressure mainwheel tires. Six-barrel 30 mm Gatling type underbelly gun replaces GSh-23 of interceptor. Bomb/JATO rack under each side of rear fuselage in addition to five pylons for external stores, including tactical nuclear weapons and the air-to-surface missiles known to NATO as AS-7 'Kerry', AS-10 'Karen', AS-12 'Kegler', and AS-14 'Kedge'. Bullet-shape antenna above each glove pylon, associated with missile guidance.

Flogger-J. Identified in 1981. New nose shape, with lip at top and blister fairing below. Antennae above glove pylons deleted. Wingroot 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 790 '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-29-300 engine rated at 25,350 lb st with afterburning.
Dimensions: span as MiG-23, length 52 ft 6 in.
Weights: max external load 9,920 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-7B (NATO 'Fitter-A')

This big single-seat ground attack fighter has been almost phased out of service with the Soviet air forces, but remains operational in some Warsaw Pact and non-European air forces.

Sukhoi Su-17, Su-20, and Su-22 (NATO 'Fitter-C, D, E, F, G, H, J, and K')

The original prototype of this family of aircraft, known to NATO as 'Fitter-B', was simply an Su-7 with 13 ft 9 in 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 1,020 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 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 10 in. Added undernose electronics pod for Doppler navigation radar. Laser rangefinder 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 pilot's view. Deepened dorsal spine fairing, almost certainly providing additional fuel tankage. Port wingroot 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 rangefinder fitted.

Su-17 ('Fitter-H'). Improved single-seater for Soviet Air Forces. Basically as 'Fitter-D', but with wide and deep dorsal fairing aft of canopy, like 'Fitter E/G'. Doppler navigation radar fitted internally in deepened undersurface of nose. Taller fin like 'Fitter-G'. Removable ventral fin. Retains both wingroot guns. 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-29BS-300 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, and Poland.

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 wingroot. 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. *(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 3 in spread, 32 ft 10 in swept; length 61 ft 6¼ in; height 16 ft 5 in; wing area 430.0 sq ft spread, 398 sq ft swept.

Weights: empty 22,046 lb, takeoff clean 30,865 lb, gross 39,020 lb.

Sukhoi Su-22 (NATO 'Fitter-F') of the Libyan Arab Air Force (US Navy)

Sukhoi Su-24 (NATO 'Fencer-D') (DoD)

Performance: max speed Mach 2.09 at height, Mach 1.05 at sea level, ceiling 59,050 ft, combat radius with 4,410 lb external stores (lo-lo-lo) 275 miles, (hi-lo-hi) 425 miles.

Accommodation: pilot only.

Armament: two 30 mm NR-30 guns in wingroots; 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 that were 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. 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 650 are now serving with first-line squadrons, including 450 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.

Four 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. Larger brake parachute housing.

Fencer-C. Introduced in 1981. Important equipment changes. Multiple fitting on nose instead of former simple probe. Triangular fairing forward of each fixed wingroot, on side of air intake (presumably housing ECM equipment of the kind seen on the fuselage sides, forward of the nosewheel doors, of ground attack MiG-23/27 'Floggers') and also on each side of fin, near tip.

Fencer-D. Introduced in 1983, with added in-flight refueling capability. Slightly longer nose (approx 2 ft 6 in); chord of lower part of tail fin extended, giving kinked leading-edge; large overwing fences integral with extended wingroot glove pylons, probably for AS-14 'Kedge' missiles; undernose antennae deleted; blister, probably for electro-optical sensor, added aft of nosewheel bay; and single long noseprobe. A reconnaissance variant of 'Fencer-D' has been reported.

It is likely that an electronic warfare version of 'Fencer' will replace the Yak-28 ('Brewer-E'). Its reported, but unconfirmed, NATO designation is 'Fencer-E'. *(Data for 'Fencer-C' follow.)*

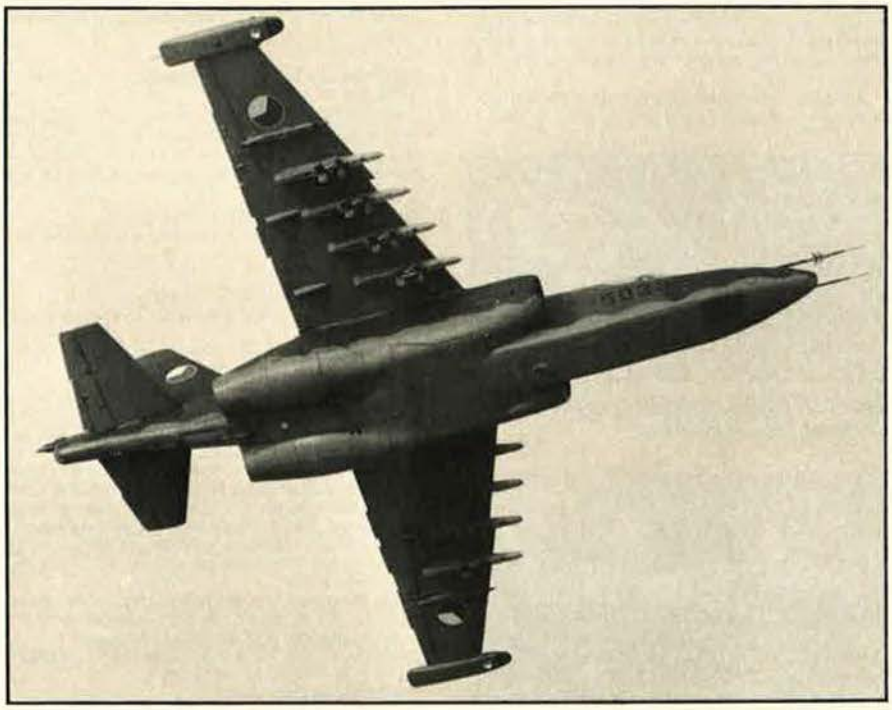
Power Plant: two afterburning turbojets; believed to be related to Lyulka AL-21F fitted in Su-17. Internal fuel capacity estimated at 3,435 gallons. Provision for two or four large external tanks on wing and glove pylons.

Dimensions: span 57 ft 5 in spread, 34 ft 5½ in swept; length excl probe 69 ft 10 in; height 19 ft 8¼ in.

Weights: empty, equipped 41,885 lb, gross 90,390 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 6,615 lb weapons and two external tanks) 805 miles.

Armament: one six-barrel 30 mm Gatling type gun on starboard side of belly; eight pylons under fuselage, wingroot gloves, and outer wings for 24,250 lb of guided and unguided air-to-surface weapons, including nuclear weapons, and such missiles as AS-7 'Kerry', AS-10 'Karen', and AS-14 'Kedge'.



***Sukhoi Su-25 (NATO 'Frogfoot') (copied from* Letectvi + Kosmonautika)**

Sukhoi Su-25 (NATO 'Frogfoot')

After an apparently slow start, Su-25 attack aircraft are now 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 Iraq. The first good photographs of the type, published in Czechoslovakia, 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 chaff/flare dispenser in the tailcone.

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 9,340 lb st. Provision for external fuel tank on each inboard underwing pylon.

Dimensions: span 46 ft 11 in, length 50 ft 6¾ in, wing area 362.75 sq ft.

Weights: empty 20,950 lb, gross 39,950–42,330 lb.

Performance: max speed 608 mph, combat radius (hi-lo-hi with 4,410 lb weapons and two tanks) 345 miles.

Accommodation: pilot only.

Armament: one twin-barrel 30 mm gun in port side of nose. Eight underwing pylons for 9,920 lb of air-to-ground weapons, including 57 mm and 80 mm rockets, and 1,100 lb incendiary, antipersonnel, and chemical cluster bombs. Two small outboard pylons for 'Atoll' or 'Aphid' air-to-air self-defense missiles.

An-12 (NATO 'Cub') modified as test-bed for advanced avionics

Reconnaissance, ECM, and Early Warning Aircraft

New Reconnaissance Aircraft

Among Soviet military aircraft said to have been observed at Ramenskoye flight test center in 1982 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-12s have been modified extensively as test-beds for advanced avionics. One example, shown in an accompanying illustration, has a large box under the rear fuselage, with what appear to be flush dielectric panels covering most of the flat lower face. This aircraft also has a long ogival tailcone that could house MAD equipment.

Ilyushin Il-20 (NATO 'Coot-A')

This electronic intelligence (elint)/reconnaissance 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 has a conventionally located rotating 'saucer' radome, lengthened fuselage forward of the wings, and flight refueling probe. In *Soviet Military Power*, DoD stated that 'Mainstay' improves 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. The first examples are operational, and a production rate of at least five aircraft a year is expected. 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:

MiG-21R ('Fishbed-H'). Basically similar to MiG-21PFMA, but with a pod housing forward-facing or oblique cameras, or elint sensors, on the fuselage centerline pylon. Suppressed ECM antenna at midpoint on dorsal spine, and optional radar warning receivers in wingtip fairings.

MiG-21RF ('Fishbed-H'). Generally similar to MiG-21R, but based on MiG-21MF. Total of 60 'Fishbed-Hs' of both models estimated in service with Soviet tactical air forces.

MiG-25R (NATO 'Foxbat-B') of the Libyan Arab Air Force (US Navy)

Tupolev Tu-126 (NATO 'Moss') (Swedish Air Force)

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.

MiG-31 (NATO 'Foxhound')

According to US official sources, about 24 of the MiG-31s in current Soviet service are assigned to strategic reconnaissance missions.

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.

Sukhoi Su-24 (NATO 'Fencer-D')

A reconnaissance variant of 'Fencer-D' has been reported. No details are available, except that it is operational.

Tupolev Tu-16 (NATO 'Badger-D, E, F, H, J, and K')

Details of these maritime, photographic, and electronic reconnaissance versions of the Tu-16, and ECM chaff-dispensing and jamming versions, can be found under the main Tu-16 entry in the *Bombers and Maritime* section.

Tupolev Tu-22 (NATO 'Blinder')

See main Tu-22 entry in *Bombers and Maritime* section.

Tupolev Tu-95 (NATO 'Bear')

See main Tu-95 entry in *Bombers and Maritime* section.

Tupolev Tu-126 (NATO 'Moss')

The Tu-126 was the Voyska PVO's first counterpart to USAF's Boeing E-3 AWACS (Airborne Warning and Control System). About nine are still 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. Replacement with the Il-76 'Mainstay' is under way.

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 220 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, chaff dispenser, or antiradiation missile can be carried under each outer wing, between the external fuel tank and balancer wheel housing. About 100 estimated in service.

Dimensions, weight, and **performance** should be in the same order as those of the Yak-28P ('Firebar') interceptor (which see).

Transports

Antonov An-12BP (NATO 'Cub')

About 260 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 is entering service, 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')

Until the An-124 'Condor' became available, the An-22 was 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

Antonov An-26 (NATO 'Curl')

Antonov An-22 (NATO 'Cock') (Royal Norwegian Air Force)

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, wing area 807.1 sq ft.
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 reequipped 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 specified as 14,770 lb, but an An-32 lifted 15,996 lb to 2,000 m while setting 14 official records for height, sustained height, and payload to height in the autumn of 1985.

The An-32 can be fitted with 4,195 ehp AI-20M engines

Antonov An-32 (NATO 'Cline') of the Indian Air Force (Franz Knuchel)

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, followed by three closed circuit speed records in 1985–86. Its current production status is not known, although the developed An-74 (which see) could represent the standard production configuration.

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 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 transport aircraft, designated An-74, which had been built for operation in the Arctic and Antarctic regions. Unlike the Il-18D turboprop transports used to carry men and equipment between Leningrad and the Antarctic base of Molodejnaya, the An-74 was said to be available with a wheel-ski landing gear for operation on snow and ice landing strips. It was described as 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. It was assumed to be a development of the An-72, and this was confirmed on July 28, 1986, when an An-74 made its first appearance in the West, at Shannon Airport, Ireland, en route to the Expo 86 exhibition in Vancouver, Canada. It now seems likely that the An-74 represents the standard production configuration of the An-72. Compared with the earlier design, the An-74 has a considerably increased wing span, with new tapered outer panels that lack the leading-edge flaps fitted to the inner wings. The fuselage is lengthened by plugs forward and aft of the wings. Otherwise, the airframe and power plant are little changed.

Power Plant: two Lotarev D-36 high bypass ratio turbofans; each 14,330 lb st.
Dimensions: span 104 ft 7½ in, length 92 ft 1¼ in, height 28 ft 4½ in.
Weights: max normal payload 22,045 lb, gross 76,060 lb.
Performance: max speed 438 mph, normal cruising speed at 26,250–32,800 ft 342 mph, ceiling 34,450 ft, range 2,920 miles with max fuel, or 715 miles with max payload.

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 number of An-124s flown had increased to five by the time of the Farnborough Air Show in September 1986, and operational flying was said to have started in the

previous January when units of a 170-ton dumper truck were transported for use by Yakut diamond miners.

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 51,590 lb st. Fuel capacity quoted as 507,063 lb.
Dimensions: span 240 ft 5¾ in, length 226 ft 8½ in, height 68 ft 2¼ in, wing area 6,760 sq ft.
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 loadmaster and 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 seen to date.

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 is being joined by Il-76 in-flight refueling tankers (see entry on 'Midas').

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.

Ilyushin Il-76 Tanker Variant (NATO 'Midas')

A version of the Il-76 has been under development since the mid-1970s as a probe-and-drogue in-flight refueling tanker to replace the modified Myasishchev M-4 ('Bison') aircraft currently serving in this role. It should achieve initial operational capability this year, in support of both tactical and strategic combat aircraft.

Antonov An-74 (David O'Mahony)

Antonov An-124 (NATO 'Condor') **(Air Portraits)**

Ilyushin Il-76MD (NATO 'Candid-B') in Iraqi service (Peter J. Bish)

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. Nearly 2,000 have been delivered, with production continuing 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, Cuba, Czechoslovakia, the German Democratic Republic, and the USSR. Production continues.

L-39V. Single-seater. As basic L-39C, but with added winch for target towing for antiaircraft artillery training.

L-39ZO. 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. Final 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.

MiG-23UM (NATO 'Flogger-C')

(See page 88.)

MiG-25U (NATO 'Foxbat-C')

(See page 88.)

Mil (WSK-PZL Swidnik) Mi-2 (NATO 'Hoplite')

Among the many military duties for which the Soviet Union utilizes Mi-2 light helicopters (see page ?) is primary training of helicopter pilots.

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 'BM' and 'BMK' respectively.

Power Plant: one Lyulka AL-7F turbojet; 19,840 lb st with afterburning.
Dimensions: span 28 ft 9¼ in, length 58 ft 8½ in, height 15 ft 9 in, wing area 297 sq ft.

Sukhoi Su-17 trainer (NATO 'Fitter-E and G')

(See pages 90 and 91.)

Sukhoi Su-21 trainer (NATO 'Flagon-G')

(See page 89.)

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

(See page 86.)

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 Al-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 Al-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 90.)

Yakovlev Yak-52

In 1975, the Yakovlev Bureau flew for the first time a single-seat aerobatic trainer designated Yak-50, which went on almost to sweep the board in both the men's and women's events at the 1976 World Aerobatic Championships. In 1978, Alexander Yakovlev announced development of a tandem two-seat variant of the Yak-50, known as the Yak-52, which was intended to replace the old Yak-18s of DOSAAF and other training organizations. Externally, the new trainer resembles closely the final Yak-18 designs, but has a more powerful engine, reduced span with no wing center-section, a semi-monocoque rear fuselage instead of the Yak-18's fabric-covered steel-tube structure, and a tricyle landing gear that leaves all three wheels fully exposed when retracted to reduce damage in a wheels-up landing. Large-scale production was entrusted to the Intreprinderea de Avioane Bacau works in Romania. 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

The Yak-53 is a single-seat fully aerobatic version of the Yak-52. It retains the latter's power plant and semi-retractable landing gear, but lacks its spring loaded controls and is stripped of nonessential equipment, such as a radio compass and direction finder, to enhance its agility. Dimensionally it is identical to the Yak-50, but is intended as a 'long life' trainer, whereas the Yak-50 is a maximum-performance high *g* aircraft supplied exclusively to State Cooperatives.

Power Plant: one Vedeneyev M-14P piston engine; 360 hp. Fuel capacity 34 gallons.

Dimensions: span 31 ft 2 in, length 25 ft 2¼ in, height 9 ft 8¼ in, wing area 161.5 sq ft.

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')

By adopting a compact twin-turbine/coaxial-rotor configuration for the Ka-25, 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 Ka-27 is under way, with about 190 Ka-25s remaining in Soviet Navy service and others operational in India, Syria, Vietnam, and Yugoslavia. Versions 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. Most have ESM equipment in the tailboom, under a 'flower pot' housing with a transparent top. 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 for SS-N-3, SS-N-12, and SS-N-19 cruise missiles launched from ships. 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. *(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 7¾ in, length of fuselage 32 ft 0 in, height 17 ft 7½ in.

Weights: empty 11,025 lb, gross 16,535 lb.

Performance: max speed 136 mph, service ceiling 11,500 ft, range 250–405 miles.

Accommodation: crew of two on flight deck; two or three systems operators 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.

MiG-21U (NATO 'Mongol') (Tass)

Yakovlev Yak-52

Kamov Ka-27 (NATO 'Helix')

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.

Photographs of the Ka-27 became available in the West after two had been observed on the stern platform of the Soviet ASW guided missile destroyer *Udaloy* during the *Zapad-81* (West-81) series of exercises in the Baltic. DoD had already stated that what it referred to as "Hormone variant" helicopters could be carried in a telescoping hangar on *Sovremennyy* class destroyers. In 1983, at least 16 Ka-27s were seen on board the *Kiev* class carrier/cruiser *Novorossiysk*, leaving little doubt that the Soviet Navy was replacing its Ka-25s with the new aircraft 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, a Ka-32 was exhibited at the 1985 Paris Air Show, it revealed the basic characteristics of the new military helicopter.

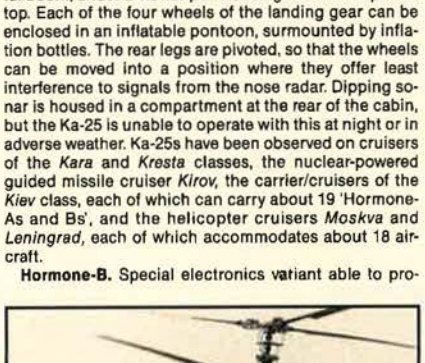
Three versions of the Ka-27 may be identified:

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. Eight ordered for Indian Navy.

Helix-B. Infantry assault transport, with different undernose equipment. No photographs yet released.

Helix-C. Search and rescue and plane guard version.

Sukhoi Su-7U (NATO 'Moujik')



Kamov Ka-25 (NATO 'Hormone-A')

External fuel tank on each side of cabin and winch beside cabin door.

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-? (NATO 'Hokum')

It became known in summer 1984 that the Kamov Bureau had begun flight-testing a new combat helicopter that has the NATO reporting name 'Hokum'. No details are available except that it has coaxial contrarotating main rotors, a takeoff weight in the 12,000 lb class, and two-man crew in tandem, with elevated rear seat. Duties include attack and air-to-air antihelicopter intercept. Survivability is enhanced by use of infrared suppressors, infrared decoy dispensers, and armor.

A crude side elevation drawing of what purports to be 'Hokum' is included in the 1986 edition of DoD's *Soviet Military Power* document. It shows an aircraft with a conventional fuselage, three tail fins, and retractable tricycle landing gear. Wide vertical separation of the contrarotating rotors implies a conventional drive system, as opposed to anything as advanced as Sikorsky's ABC system. However, DoD comments that "Hokum will give the Soviets a significant rotary-wing air superiority capability. The system has no current Western counterpart". Prototype development was still under way in early 1987.

Dimensions: rotor diameter 45 ft 10 in, length excl noseprobe and gun 44 ft 3½ 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 4,700 have been delivered for military and commercial service, with the air forces of East Germany, Hungary, Nicaragua, North Korea, Libya, Poland, Syria, 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.

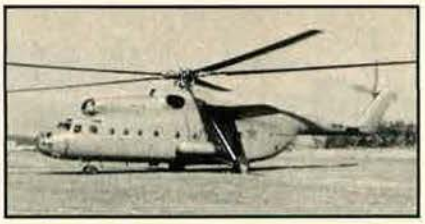
Accommodation: pilot on flight deck; eight passengers, 1,543 lb of freight, or four litters and medical attendant in cabin.

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 (about 450), and Vietnam. The task of these helicopters is to haul guns, armor, vehicles, supplies, freight, or 70 fully equipped troops in combat areas.

Mil Mi-8 (NATO 'Hip-C') of the Hungarian Air Force (Peter J. Bish)



Mil Mi-6 (NATO 'Hook') (Peter J. Bish)

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; normally, 70 combat equipped troops, 26,450 lb of internal freight, or 41 litters and two medical attendants. Max slung cargo 17,637 lb.

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 1,750 Mi-8s and Mi-17s 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 airborne communications role; see page 92.

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 92.

Hip-H. See entry on Mi-17.

Hip-J and K. ECM versions; see page 92.

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, but normal military configuration is for 24 combat equipped troops on tip-up seats along cabin side walls; 8,820 lb of freight internally, 6,614 lb externally; or 12 litters and attendant.

Armament: see individual model descriptions.

Mil Mi-14 (V-14) (NATO 'Haze')

The Mi-14 shore-based amphibious helicopter flew for the first time in 1973. Comparison with the Mi-8, from which it was developed, shows that the Mi-14 has shorter engine nacelles, with the intakes positioned above the midpoint 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, except that the tail rotor is on the port side of the vertical stabilizer. New features to suit it for its primary role as an 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 antisubmarine 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.

About 100 Mi-14s are currently in service with the Soviet Naval Air Force for antisubmarine duties 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 28,660 lb.

Performance: max speed 143 mph, range 575 miles.

Accommodation: crew of four or five in 'Haze-A'.

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. Many are operational in the Soviet armed forces and are known to NATO as **'Hip-H'.** 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.

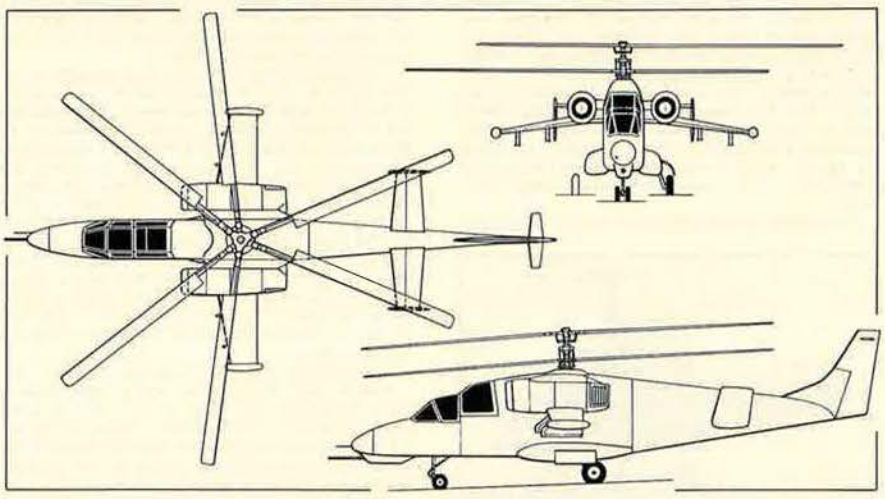
Weights: empty 15,653 lb, gross 28,660 lb.

Performance: max speed 155 mph, service ceiling 11,800 ft, max range 590 miles with auxiliary fuel.

Accommodation and Armament: as for Mi-8 'Hip-E'.

Mil Mi-24 (NATO 'Hind')

The Mi-24 was designed originally to deliver a squad of



***Three-view drawing of Kamov 'Hokum'* (Pilot Press)**

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-8/17s 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 three, and places for up to eight fully-equipped troops in main cabin. Dynamic components and TV2-117 engines of Mi-8 fitted initially. Fully retractable landing gear. Auxiliary wings of this version have considerable anhedral. One 12.7 mm machine-gun in nose, slaved to undernose sighting system; four hardpoints 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. Provisions for firing AK-47 guns from cabin windows. 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. Training version. 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. Air data sensor boom forward of top starboard corner of bulletproof windscreen at extreme nose. Under nose is a four-barrel Gatling-type 12.7 mm machine-gun in a turret, providing air-to-air as well as air-to-surface capability. Undernose packs for electro-optics and missile guidance, including low-light-level TV. Wing armament of 'Hind-A' retained. Many small antennae and blisters, including 'Odd Rods' IFF. Infrared suppressor and decoy flare/chaff dispenser under tailboom forward of tailskid.

Hind-E. As 'Hind-D', for Soviet armed forces, but with modified wingtip launchers and four underwing pylons for a total of up to twelve AT-6 (NATO 'Spiral') radio guided tube-launched antitank missiles in pairs, and enlarged undernose guidance pod on port side.

Hind-F. First shown in service with Soviet forces in 1982 photographs. Generally similar to 'Hind-E', but nose gun turret replaced by a twin-barrel 30 mm gun on starboard side of front fuselage. Bottom of nose smoothly faired above and forward of sensors.

Deliveries of all models of the Mi-24 exceed 2,300, 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 excl rotors and gun 57 ft 5 in, height 21 ft 4 in.
Weights: empty 18,520 lb, gross 24,250 lb.
Performance ('Hind-D'): max speed 192 mph, service ceiling 14,750 ft, combat radius with max military load 99 miles, range with max fuel 466 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 infield testing and development with the Soviet Air Force in early 1983 and was fully operational by 1985. First export deliveries, of ten for India, began in June 1986. 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 11,240 shp.
Dimensions: rotor diameter 105 ft 0 in, length of fuselage 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 85 combat-equipped troops. Other loads include two airborne infantry combat vehicles.

Mil Mi-14 (NATO 'Haze-A') (Royal Norwegian Air Force)

Mil Mi-24 (NATO 'Hind-F') (Tass)

Artist's impression of Mil Mi-28 (NATO 'Havoc') (DoD)

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 1986 edition of DoD's *Soviet Military Power* anticipated deployment of the Mi-28 "soon".

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 LRINF (longer-range intermediate-range nuclear force) ballistic missile that precipitated the Cuba crisis in 1962. An estimated 112 remained operational, near the western borders of the Soviet Union, in early 1986. Replacement with SS-20s has since continued 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, offering CEP of 2.4 km (1.5 miles).
Warhead: single RV; 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 and SS-25s, a total of 420 SS-11 Mod 2/3s and 28 SS-11 Mod 1s remained in early 1986. Differences are as follows:

SS-11 Mod 1. Single reentry vehicle (950 kiloton), with CEP of 1.4 km (0.87 miles).

SS-11 Mod 2. Single reentry vehicle (1 megaton), with added penetration aids.

SS-11 Mod 3. First operational Soviet missile with MRVs (three 100–300 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 1.8 km (1.1 miles).
Warhead: single RV; nuclear (750 kilotons).
Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).
Performance: range 5,840 miles.

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 deployed the SS-16.
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, in converted SS-9 silos. 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 65% to 80% of US ICBM silos, using two nuclear warheads against each silo. After doing so, more than 1,000 SS-18 warheads would still be available for further attacks on US targets. 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-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

The current Mod 2 version of this mobile solid-propellant LRINF ballistic missile 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 441 had been deployed by early 1986, of which some 275 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-24

This fifth-generation Soviet ICBM is in many respects the counterpart to the US Peacekeeper (MX). Moscow claims that it represents its one new type of ICBM allowed under SALT II. DoD has said that preparations for SS-24 deployment were under way a year ago and predicted that a rail-mobile version might be entering service by now, with a silo-based version to follow. Accuracy is believed to be better than that of the SS-18 and SS-19, together with a greater hard target kill capability. Like all modern Soviet ICBMs, except the SS-19, the SS-24 is cold-launched.
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-25

Twelve months ago, according to DoD, the Soviet Union had already deployed more than 70 launchers for this Minuteman-size ICBM at several operational bases. Each base consists of a number of launcher garages with sliding roofs to house the system's massive off-road wheeled transporter/erector/launch vehicles, together with other buildings to shelter the mobile support equipment. Advances claimed for the SS-25 include greater survivability, because of its road-mobile configuration, and an inherent refire capability. The Soviet Union claims that the missile is simply a development of the veteran SS-13 and hence does not infringe the SALT agreements. DoD insists that an increase of more than 5 percent in throw-weight, together with the weapon's greater accuracy, violates the agreements. SS-11 silos are being dismantled in compensation for SS-25 deployments, which may include MIRVed versions in the 1990s.
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 1986. Additionally, a solid-propellant missile that may be larger than the SS-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')

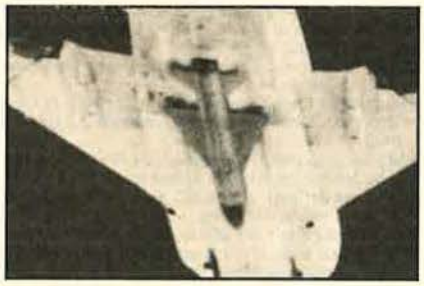
'Kangaroo' is an air-to-surface missile with an airframe similar in size and shape to a sweptwing turbojet-powered fighter aircraft. Guidance is assumed to be by initial beam riding and subsequent preprogrammed flight under autopilot control, without terminal homing. The missile has been superseded by the AS-4 'Kitchen' on Tu-95 'Bear-B/C' bombers upgraded to 'Bear-G' configuration. However, it might be premature to regard 'Kangaroo' as no longer significant, in view of its ability to carry alternative 800 kiloton nuclear and 5,070 lb conventional warheads.
Dimensions: span 29 ft 6 in, length 49 ft 1 in.
Weight: 17,600 lb.
Performance: max speed Mach 1.8, range 400 miles.

AS-4 (NATO 'Kitchen')

Although 'Kitchen' was first seen on a Tu-22 ('Blinder') bomber more than 25 years ago, it remains a highly important Soviet standoff weapon, carried by 'Blinder', the Tu-26 'Backfire', and the Tu-95 'Bear-G'. It has an aeroplane configuration, with stubby delta wings and cruciform tail surfaces, and is powered by a liquid-propellant rocket motor. Several versions have been identified, including a strategic 'Kitchen' with inertial guidance and a 350-kiloton nuclear warhead, needing no terminal homing; an antishipping version with a 2,200 lb high-explosive warhead or a nuclear warhead plus active radar terminal homing; and a defense suppression version with passive radar homing.
Dimensions: span 9 ft 10 in, length 37 ft 0 in.
Weight: 13,225 lb.
Performance: max speed Mach 4.6, range 185 miles at low altitude, 285 miles at high altitude.

AS-6 (NATO 'Kingfish')

This advanced air-to-surface missile 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-4 (NATO 'Kitchen') missile beneath Tupolev Tu-26 'Backfire-B'

AS-15 (NATO 'Kent')

After at least seven years of development testing, including launches from 'Backfire' bombers, the Soviet Union began deployment of its new-generation 'Kent' long-range air-launched cruise missiles on 'Bear-H' strategic bombers in 1984. 'Kent' 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 'Kent' 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.

BL-10

This supersonic cruise missile, with a reported range of 2,000 miles, is being developed as an alternative weapon for the Tupolev 'Blackjack' strategic bomber.

Airborne and Tactical Defense Missiles

AS-2 (NATO 'Kipper')

First seen 25 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.
Dimensions: span 16 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.

AS-7 (NATO 'Kerry')

Carried by the MiG-23BN 'Flogger', MiG-27 'Flogger', 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 transonic, max range 7 miles.

AS-9

This is a reported antiradiation missile, with a range of 50–62 miles at supersonic speed, carrying a 330–440 lb warhead for defense suppression. It is said to arm Su-24, Tu-16, and Tu-26 aircraft.
Dimension: length 19 ft 9½ in.

AS-10 (NATO 'Karen')

The laser homing 'Karen' is a solid-propellant rocket-powered air-to-surface missile resembling 'Kerry', from which it may have been developed. It carries a 220 lb high-explosive warhead and is operational on MiG-27, Su-17, and Su-24 attack aircraft.
Dimension: length 11 ft 6 in.
Performance: max speed transonic, max range 6.2 miles.

AS-12 (NATO 'Kegler')

'Kegler' is described as an advanced version of the AS-9, with a different seeker and improved performance.

AS-14 (NATO 'Kedge')

An accompanying illustration shows this Maverick type tactical air-to-surface missile mounted on a MiG-27 'Flogger'. The aircraft carries an underfuselage data link pod for midcourse guidance of the weapon, which appears to use laser terminal homing. 'Kedge' is approximately 12 ft 6 in long, with a range of up to 25 miles.

AT-2 (NATO 'Swatter-C')

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 radio command guided in flight via elevons on the trailing-edges of its rear-mounted cruciform wings and embodies infrared terminal homing.
Dimensions: span 2 ft 2 in, length 3 ft 9¾ in.
Weight: 65 lb.
Performance: cruising speed 335 mph, range 800–13,125 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 radio command guided. It equips the 'Hind-E and F' versions of the Mi-24 and is said to have a range of up to 5 miles.

AA-2 (NATO 'Atoll')

Designated K-13A in the USSR, 'Atoll' is the Soviet counterpart to the American Sidewinder 1A (AIM-9B), to which it is almost identical in size, configuration, and infrared guidance. It has long been standard armament on home and export versions of the MiG-21 and is carried by the Su-25 as well as 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 (Soviet designations R-23T and R-23R respectively). 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.

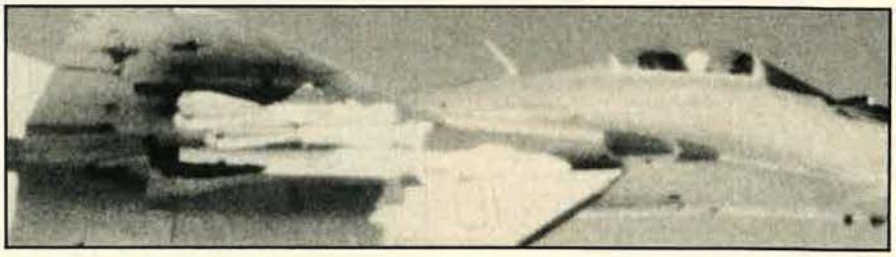
AA-8 (NATO 'Aphid')

Second type of missile carried by the MiG-23, and also by late-model MiG-21s, MiG-25s, MiG-29s, MiG-31s, Su-15/21s, Su-25s, and Yak-38s, 'Aphid' is a highly maneuverable close-range solid-propellant weapon with infrared homing guidance and a 13.2 lb warhead. Its Soviet designation is R-60.
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 (NATO 'Amos')

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 and an alternative weapon for the MiG-29.
Performance: range 25–28 miles at height, 12.5 miles at S/L.

AS-14 (NATO 'Kedge') missile on MiG-27



AA-10 missiles on a MiG-29 'Fulcrum'

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.

AA-11

First mentioned by DoD in 1986, this new close-range air-to-air missile is reported to be an uprated AA-8. It can be carried by the MiG-23, MiG-25, MiG-29, and Su-27.

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')

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 six 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 SAH-08 'Gazelle' interceptors to engage targets within the atmosphere. The launchers will 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.

SAH-08 (NATO 'Gazelle')

This quick-reaction high-acceleration interceptor missile will be deployed in 32 of the modernized ABM-1 silos, at four complexes around Moscow, as the second layer of the capital's antiballistic missile defenses. Similar in general configuration to the long-abandoned US Sprint, it demonstrated a reload capability of much less than a day during test launches at Sary Shagan. When operational, it is expected to carry a low-yield nuclear warhead. Range is estimated at more than 50 miles.

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-12 surface-to-air missiles may have the potential to intercept some types of US strategic ballistic and cruise missiles.

SA-2 (NATO 'Guideline')

This land-transportable surface-to-air missile has been operational since 1959 and continues in first-line service in some 25 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 around 300 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.
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 widely used also by 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 and An-124 military freighters. The SA-4 was first displayed publicly in 1964 and is a standard Soviet weapon 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 current 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, Libya, and Syria. Further deployment and upgrading are expected to enhance the SA-5's capability to work in conjunction with such low-altitude systems as the SA-10.

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, Poland, Romania, Syria, Tanzania, Vietnam, North and South Yemen, and Yugoslavia.

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.
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 more than 40 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 was 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, Iraq, Jordan, Kuwait, Libya, Nicaragua, Poland, and Syria.

Power Plant: probably dual-thrust solid-propellant.
Guidance: command guidance by proportional navigation. Semiactive radar terminal homing.

SA-N-1 (NATO 'Goa') shipboard twin launcher (Novosti)

SA-8 (NATO 'Gecko') (Tass)

Warhead: high-explosive, about 90–110 lb weight.
Dimensions: length 10 ft 6 in, body diameter 8.25 in.
Launching weight: 375 lb.
Performance: max speed Mach 2, 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 19 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 1986, the SA-10 was operational at more than 60 sites in the USSR, with 520 launchers and four missiles per launcher. Work was then progressing on a further 30 sites, with more than 50 percent of all sites located near Moscow. Deployment of a landmobile version, carried on a four-axle truck, had also begun.

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 (NATO 'Gladiator')

This formidable container-launched weapon is considered capable of dual-mode operation against aircraft at all altitudes, as well as cruise missiles and short-range ballistic 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, and DoD is prepared for a demonstrated capability against some types of strategic ballistic missiles.

SA-13 (NATO 'Gopher')

Deployed on a tracked vehicle in the mid-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 6 miles at altitudes between 165 ft and 16,500 ft.

Dimensions: length 7 ft 2 in, body diameter 4.7 in.
Weight: 121 lb.

SA-14 (NATO 'Gremlin')

This uprated version of the SA-7 is replacing the latter in Soviet service. It can engage aircraft pulling up to 8*g* and has an all-aspect capability enabling it to engage targets head-on at ranges up to 13,000 ft.

SA-X-15

Known to NATO as the SA-X-15, a new mobile low-to-medium altitude surface-to-air missile system is under development to replace the SA-8 'Gecko'. No details are available.

SA-N-1 (NATO 'Goa')

Ship-launched variant of SA-3, carried on roll-stabilized twin launchers by 42 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 a 175 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 eleven 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

Around 200 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 cruisers *Kirov* and *Frunze* 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 are 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-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 a total of 128 shorter-range SA-NX-9 missiles. These are 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. The same missile, formerly identified incorrectly as SA-N-8, is carried by *Udaloy* class antisubmarine ships. No details are available. ■

ENHANCED PERFORMANCE: BEECH MQM-107 EP TARGET MISSILE.

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On Alaska's virtually unrestricted ranges, close air support crews tested their skills in an exercise that pitted them against everything but the kitchen sink.

YUKON LIGHTNING

BY CAPT. RANA PENNINGTON, USAF

THE first real snow of the season came in October at Fairbanks—but that didn't stop the lightning. Yukon Lightning, that is—a first-of-its-kind, A-10 tactical exercise held during the first two weeks of October at Eielson AFB, Alaska.

Six A-10 teams from bases around the United States participated in the A-10 tactical competition and gunnery meet, which was sponsored by the Alaskan Air Command. They delivered live ordnance on two separate ranges—one high threat, the other low threat—and worked against manned and remote threat emitters, communications jamming, and "enemy" fighters. The gunnery meet involved ordnance deliveries on a conventional weapons range. Each team had the opportunity to drop bombs, shoot the A-10's 30-mm Gatling gun, use self-defense chaff and flares, and fire two AGM-65 Maverick missiles. Alaska's virtually unrestricted ranges allowed the participants to employ the A-10 in convincingly realistic conditions.

The exercise was the brainchild of Lt. Gen. David L. Nichols, who took command of Alaskan Air Command in September 1985. He was immediately impressed by the quality of the air-to-ground ranges in Alaska. "There are some great training opportunities up here on our ranges," he said, "and they aren't really understood that well by a lot of people. We needed to address that problem, and I thought a turkey shoot at Eielson would do that very well."

A Realistic Scenario

The initial idea for a gunnery meet was quickly expanded into a comprehensive tactical exercise. As General Nichols explains, "We've got so many things here to pull it together—we have FAC [forward air control] aircraft, we have good ranges, we've got good target arrays, and we've got threat emitters out there. We can get an adversary in the air with the F-15. We can have AWACS not only helping the F-15s but also helping the A-10s by giving them warning. We have a communications jamming capability, and there are tankers at Eielson to provide refueling support.

"So there's a lot of tactical things that came together here that would be hard to do in other places. And that was another thing that I wanted to achieve—to be able to pull together all those unique kinds of things that we have here in Alaska to make an exercise interesting and more of a challenge."

The project was turned over to Maj. Lee Smith, chief of weapons and tactics for AAC, who developed the exercise scenario. Capt. How-

A flight of Fairchild A-10 Thunderbolt IIs from the Air National Guard's 104th TFG based at Westover, Mass., forms up above the Alaska Range near Eielson AFB. The 104th was one of six A-10 units that participated in Yukon Lightning, the first-ever tactical competition and gunnery meet held solely for "Warthogs," their drivers, and their keepers. (USAF photo by Sgt. Willie Thornton)

ard "Charlie" Charlton, an AAC standardization and evaluation officer, was in charge of organizing the exercise and handling the complicated logistics of getting all the participants to the right places at the right times. According to Major Smith, "The overriding goal was realistic training—to build a scenario that was optimized for the A-10."

The A-10 was designed specifically for the close air support (CAS) mission. Therefore, Major Smith's goal was for the exercise participants "to be able to fly sorties that contained every possible element of a generic CAS sortie."

In many ways, close air support is the most demanding of all air-to-ground missions. The pilots are required to operate over the Forward Edge of the Battle Area (FEBA), where friendly and enemy troops are in direct contact. Careful coordination is required to avoid hitting friendly forces. Pilots do not work against preplanned targets, but must react to the immediate needs of the friendly ground forces commander. It is only after reaching a contact point, where the pilot talks to either a ground FAC or an airborne FAC, that the flight lead is assigned a target and learns exactly what threats he can expect in the target vicinity. He must then plan his attack and communicate his plan to the other members of his flight.

"No other air-to-ground mission requires folks to walk out the door without having fully planned their attacks," says Major Smith. "In CAS, you can't plan the final attack until you get to the contact point—and you have to be able to communicate to do that. It's a unique problem. So that was one thing we designed into the scenario—to give the participants the normal timing of the CAS information flow."

Utilizing several available ranges, two separate but connected scenarios were conceived. The high-threat scenario made use of a "saturated" environment. It was designed to provide some threats that could be avoided and others that would have to be dealt with before the target could be hit. The target area included unmanned emitters that simulated modern Soviet radar-guided surface-to-air missiles (SAMs) and manned antiaircraft artillery (AAA) simulators. Both emitters gave realistic radar warning indications to the A-10s.

The low-threat range included smoky SAMs, which simulate shoulder-fired SAMs, and a small arms/automatic weapons (SA/AW) threat. The absence of radar-guided threats allowed a greater number of attack options and the use of airborne FACs flying OV-10s.

For both scenarios, Major Smith

set up ingress and egress corridors, simulating a European-style war. Pilots were required to stay in the corridors to avoid friendly fire. They were subject to attacks from "enemy" fighters at certain points on their routes as well as communications jamming. The E-3 AWACS (airborne warning and control system) aircraft monitored the corridors and provided warning to the A-10s of enemy attacks.

Major Smith says that the excellent working relationship between his weapons and tactics shop and Alaskan Air Command intelligence was a key factor in developing the scenario. "Ops-intel interface is critical in designing a realistic exercise—as it is in every aspect of our business. In this case, we had the unique opportunity to start almost from scratch and place targets and threats on the ranges to meet our needs. Good intelligence support was vital in determining realistic threat arrays and target positions." Some restrictions were imposed in order to be able to score the targets, but overall, "the threats and targets were arrayed as realistically as possible."

A New Type of Scoring

Judging the exercise fell to Wing Cmdr. David "Kip" Smith, a Royal Air Force exchange officer and the deputy director of air operations at AAC, and to Maj. Bob Lane, chief of AAC standardization and evaluation. Their task was to develop means of scoring both the scenario events on the tactical ranges and the "turkey shoot" gunnery competition on the conventional range.

One problem they found with the standard Television Optical Scoring System (TOSS) was that it could score hits against only one target within an array. For example, a typical target array might be a convoy of eight vehicles. In wartime, pilots would want to score hits against as many vehicles as possible. However, the original TOSS setup in Yukon Lightning precluded pilots from receiving credit for hitting more than one vehicle in a convoy.

This problem was solved, Major Lane said, by devising "a computer program to score any bomb in the array against all the possible targets." Both the TOSS automatic scoring and the manual backup scoring used versions of the new computer program. To Major Lane's knowledge, this was the first time a TOSS system had been modified to score multiple targets.

The judges also had to devise ways to assess kills against friendly aircraft by the threats being simulated. This was relatively easy for manned threats, such as the AAA sites. Realistic kill criteria were developed based on intelligence inputs, and the criteria could be easily confirmed through the AAA's TV tracking system.

Assessing kills by unmanned threats, such as the SAM simulators, or by area threats, such as SA/AW, was more difficult. Kill criteria were developed for these systems, as for the others, based on intelligence sources. Only "heart-of-the-envelope" criteria were used in order to give the benefit of any doubts to the participants. However, there were no automatic systems available that could determine whether the A-10s were within the lethal envelopes of these threats. This meant that it fell to the on-scene judges to decide whether a given aircraft was "exposed" to the threat.

The Play's the Thing

Wing Commander Smith and Major Lane also recognized that there is always a random element in war—sometimes people get lucky. For each threat, they developed a percentage chance that it would kill an A-10 if it had a valid shot against the aircraft. A very accurate, radar-guided missile would have a high probability of kill (P_k), while small arms and automatic weapons were given a very low P_k. Such odds were applied each time an attacking air-

Realism was the order of the day during the Yukon Lightning exercise. Here an A-10 evades a "smoky SAM," a training aid that simulates the shoulder-fired surface-to-air missile threat. A-10 crews had to cope with simulated small arms and automatic weapons fire as well. (USAF photo by Sgt. Willie Thornton)

craft was exposed to a threat so that survival was possible even in the most lethal environments.

Six teams participated in Yukon Lightning '86. Each included five A-10s, six to eight pilots, and maintenance and weapons loading crews. About 400 visiting personnel were involved. Ninth Air Force (England AFB, La.), Twelfth Air Force (Davis-Monthan AFB, Ariz.), the Air Force Reserve (Richards-Gebaur AFB, Mo., and Barksdale AFB, La.), and the Massachusetts Air National Guard were represented. PACAF and USAFE sent observers. All participating elements also contributed experienced A-10 pilots, from major to colonel in rank, as judges. After two days of familiarization and orientation flights, the competition was under way.

Some participants initially expressed doubts as to whether or not a competition could be successfully combined with good tactical training. They were concerned that some teams would be more concerned with winning—with "gaming" the competition—than with using valid wartime tactics. The setup discouraged such gaming, however. The realistic scenario and target/threat arrays were specifically designed to encourage the use of valid tactics.

For example, if a pilot violated the rule-of-thumb "safe exposure" times specified in the standard A-10 tactics manual, he would not survive. Such kills detracted heavily from competition scores. For each A-10 "killed" during a competition mission, a team lost twenty-five percent of its target points for that mission. All missions were flown with four aircraft, and the emphasis was on their team play. No individual scores were computed. All pilots in a flight needed to stay alive as well as hit targets for their team to do well.

According to Wing Commander Smith, "We made no attempt to determine how well or badly an individual did. What mattered was how well a formation did. That put a different twist on formation leadership and tactics that you wouldn't have in a purely individual competition. For example, it encouraged people to employ decoy tactics—using one or two flight members to distract the enemy while the others attempted to achieve an unobserved kill. This worked well against our threats and is a valid tactic. However, in an individual competition, you wouldn't see that as much—everyone wants to kill the target, not be the decoy."

The Yukon Lightning exercise gave Thunderbolt II crews a rare opportunity to practice their skills using live ordnance. Above, a target on the Yukon Range encounters an A-10-delivered iron bomb. (USAF photo by Sgt. Willie Thornton)

The Lessons Learned

The first day of the tactical competition was telling. Despite intense predeployment preparation, most of the teams took heavy losses on that day. It was especially surprising that there were as many losses on the low-threat range as in the high-threat arena. The judges attributed the attrition to pilots' unfamiliarity with the ranges, problems of communication, and failure to "honor the threat."

Some teams had difficulty maintaining their topographical orientation over mountainous terrain with few man-made landmarks. This taxed their navigational skills. Finding the proper targets was an even bigger problem. At Yukon Lightning, participants had never practiced on the ranges and had no prior knowledge of targets' positions. Even the "home" team from Eielson had little advantage, since targets and threats were still being placed on the ranges only three days before the exercise began.

Communication was difficult for many teams on the first day. In order to get exact fixes on targets and threats, the teams had to be able to talk to the tactical air control system (TACS) during ingress. However, such communications were seriously degraded by jamming at critical points in each sortie, forcing the teams to switch quickly to prebriefed, backup frequencies and eventually to secure modes of communication using "Have Quick" radios. Some teams had trained with the Have Quick system only a few times on their home ranges, and this lack of experience hurt them on the first day of Yukon Lightning.

Effective communication among the flight members of each team was also critical. The dynamic situation on the tactical ranges required participants to react quickly and flexibly while maintaining tactical integrity. Members of some teams had flown together so often that they didn't have to talk much. One team did not have to talk at all. Other teams had standardized their radio procedures so thoroughly that one or two words conveyed a whole concept. But such rapport is beyond most active-duty units because of their frequent personnel rotations and was found to be somewhat lacking in Yukon Lightning.

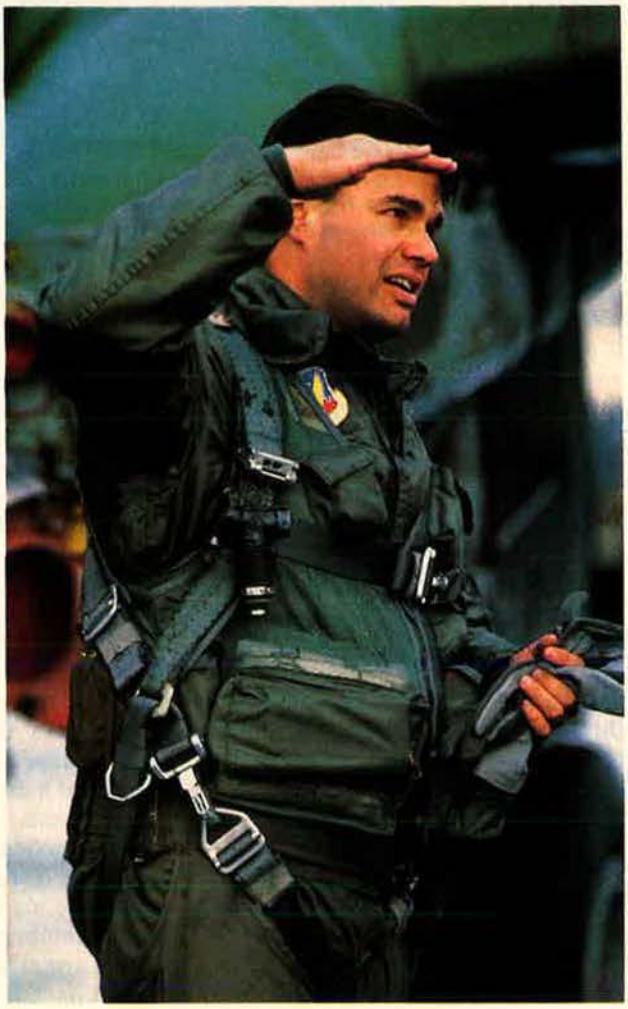
On the first day of the competition, many teams took heavy losses from threats that were designed to

be avoidable. Wing Commander Smith attributed this to their tendency to overexpose themselves to the threats. "When they exposed themselves too frequently, even to a low P_k threat, their chances of getting killed were high," he said.

Major Smith believes that most of the participants simply did not take the threat seriously in the beginning. "They forgot a couple of basic things," said Major Smith, "and there aren't more than three or four basic things that you need to remember. Avoid the threat. Don't be predictable. Kill the enemy. In war, it would be disastrous if people did what some teams did in this competition—which is, on the first day, to relearn all the basic lessons that everyone's been told. People lost a lot of points to learn basic lessons on that first day. If we did that in a war, we wouldn't get to go back the second day."

The teams quickly assimilated the lessons learned, however, and on the second day, very few A-10s were lost. By the third day, the teams had adapted their tactics to fit the scenario and did remarkably well. In the end, tactics and communications were effective, avoidable threats were avoided, unavoidable threats were killed, and all the teams were successful at evading "enemy" air attacks.

The Massachusetts Air National Guard team that won the overall competition showed just how important the learning curve could be. It scored zero points the first day because of losses, but immediately bounced back on day two and went on to win.



Yukon Lightning also afforded the chance for A-10 crews to exchange knowledge and experience. Capt. Gerald "Bluto" Mays from the 333d TFTS at Davis-Monthan AFB, Ariz., describes maneuvers following a sortie. (USAF photo by Sgt. Willie Thornton)

"A-10 Heaven"

The experience level of the pilots who participated was a critical element in their performance, according to Major Smith.

The difficult exercise demonstrated that, altogether, the A-10s and their pilots and maintenance crews were up to the challenge. Maintenance played an important role. Teams lost points if they failed to get four aircraft airborne for each mission.

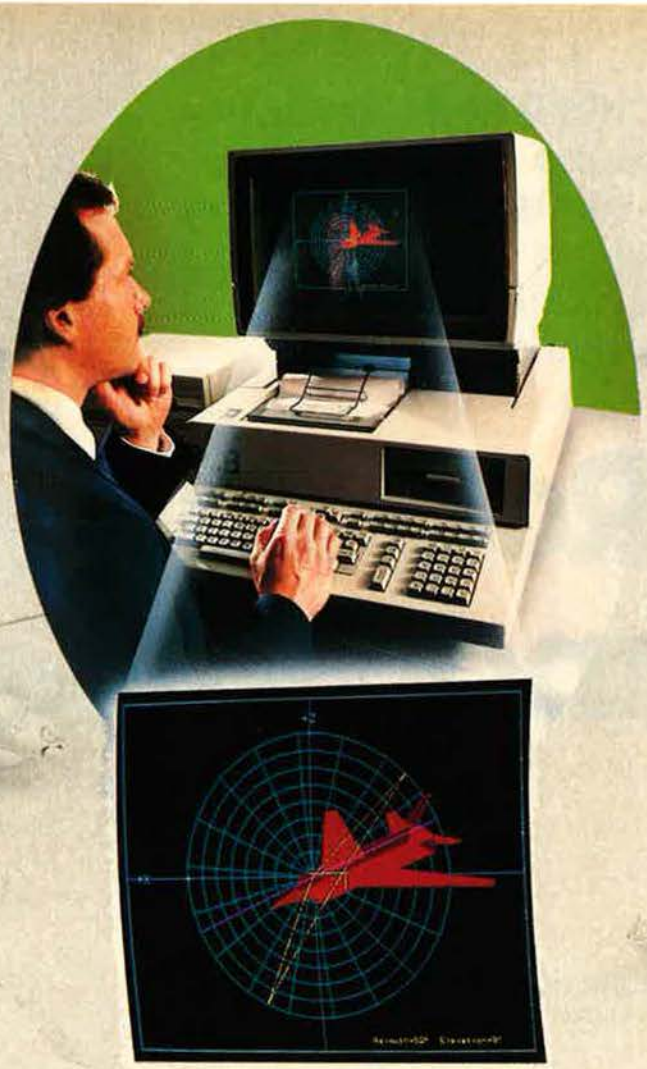
Yukon Lightning's results also reaffirmed the importance of experienced pilots. As Major Smith put it, "The guys who had more experience did better. The guys who had been flying with each other a lot did better. And the folks who had a lot of experience and had also been flying with each other a lot did the best."

He believes, however, that the less-experienced pilots may have received the best training. "Lessons learned varied with the attitudes of the teams and the individual pilots. The teams who came here only to win may not have experienced the full benefits of the training we tried to provide. Other teams brought guys who came to the exercise with a good attitude. They studied the situation, used the intelligence support that was available, and made a serious effort to deal with the scenario just as if it were wartime. These are the guys who took home the most training benefits for their money."

Most of the participants gave Yukon Lightning rave reviews and said it taught them valuable lessons. For example, the Air Force Reserve team from Richards-Gebaur called it "the best A-10 high- and low-threat training we've experienced to date. . . . The primary emphasis of the design of this exercise was clearly on realistic training. . . . The range complexes and range control facilities are outstanding. [It is] the best A-10 training available today."

Yukon Lightning '88 is already in the works. Current plans are to hold the exercise every other year, alternating with USAF's Gunsmoke competition at Nellis AFB, Nev. ■

Capt. Rana Pennington, USAF, is a Soviet specialist who has previously written on Soviet matters for this and other publications. Her assignments have included tours as the Aggressor intelligence officer and as a Soviet air tactics analyst for the Defense Intelligence Agency. She is presently serving as the chief of the threat analysis division for Alaskan Air Command Intelligence. Captain Pennington wrote the intelligence scenario and provided intelligence support for Yukon Lightning.



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As USAF and the Army package their forces for the 1990s, the distinction between close air support and battlefield air interdiction will blur.

New Roadmap for AirLand Battle

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

THE Army and the Air Force—through the former's Training and Doctrine Command (TRADOC) and the latter's Tactical Air Command (TAC)—have agreed on a comprehensive forecast about what the battlefield of the 1990s might look like and what it will take to prevail on it. The dynamics of technology and the predictable growth of the Soviet threat form the basis of this roadmap and have generated new thinking about where tactical airpower is headed and how to get there.

Among the central conclusions to emerge from the TAC/TRADOC analysis is that the battlefield of the 1990s will be dominated by Soviet attack strategies centered on fast-moving, around-the-clock, multiechelon operations linked to coordinated rear actions designed to disrupt US offensive and defensive moves. As a consequence, the separation between close air support (CAS) and battlefield air interdiction (BAI) will become blurred.

Another key finding was that tactical airpower will have to work in concert with and support friendly ground forces that have greater mobility and weapon lethality than in the past. The TRADOC/TAC roadmap to the battlefield of the future also posits that the AirLand Battle doctrine extends the combat zone from close-in and rear areas to deep battle areas. Because of this, the need emerges for improved surveillance with real-time intelligence to find and destroy fixed as well as moving and emitting and nonemitting targets.

Because the ground forces will require close air support well beyond the FLOT (forward line of own troops) during deep maneuvers, CAS and BAI coalesce. Combat effectiveness will have to be bolstered by "force packaging," including force protection with air-to-air fighters and Joint Suppression of Enemy Air Defenses (JSEAD) by employing lethal and disruptive techniques against the surface-to-air threat. The joint roadmap also points out that tactical airpower will have to operate around the clock and under adverse weather conditions in order to exploit the Soviet ground forces' lag in night-fighting capability.

The roadmap forecasts steady qualitative increases in the Soviet tactical air threat along with improvements in Soviet surface-to-air capabilities. The forecast specifically envisions boosts in Soviet multiple-target engagement capability, larger engagement envelopes, and faster gun-slew rates. Predictable quality improvements in the Warsaw Pact's fighter and fighter-bomber forces might well enable the enemy's air-to-air fighters to deny US tactical airpower the traditional low-altitude sanctuary because of the addition of look-down/shoot-down features. Also, the Soviets are well on their way toward providing their fighters with around-the-clock surface attack capabilities, including night and adverse weather weapons delivery capability. Lastly, there is convincing evidence that the Soviets are stepping up the lethality of their already dense electronic warfare environment.

The Case for Modernization

When juxtaposed with these emerging requirements, the aircraft now in the Air Force's tactical air forces

The A-7 Plus—a thorough upgrade of the venerable Corsair II—will help meet the Air Force's close air support needs in the near term.

clearly require major modernization. The A-7 will be "aged out" of the force unless upgraded, and while the A-10, with upgrades, will remain capable of conducting close air support operations in less intense threat environments throughout the 1990s, it will not be able to penetrate and provide support of deep maneuvers at operational depth. In addition, TAC believes that the A-10 is not compatible with force packaging because of its relatively slower speeds.

The Air Force, at present, has assigned the equivalent of 3.8 tactical fighter wings of A-7s and of 6.5 tactical fighter wings of A-10s to the close air support mission on a dedicated basis. This force of 10.3 equivalent TFWs (seventy-two aircraft per wing) is designated to support the US Army. Of the total dedicated CAS force, about 1.5 equivalent wings are bedded down in Europe and about 0.7 equivalent wings in the Pacific and Alaska. The remainder of the force is stationed in the CONUS and is operated predominantly by the Guard and Reserve.

The rule of thumb is that fighters average a life cycle of about twenty years. As a result, the ideal age of the fleet is assumed to be about ten years. An FY '86 snapshot taken by TAC puts the average age of the A-10s at 6.3 years and of the A-7Ds at 13.2 years. Applying the twenty-year rule, TAC projects that the last of the A-7Ds now in the inventory will have to be decommissioned by 1994, while the last of the some 450 A-10s currently operational won't reach that point until about the turn of the century.

In April 1985, the civilian and military heads of the Air Force and the Army signed a memorandum of agreement (MOA)—in fact an extension of the Joint Force Development Initiatives of the previous year—that outlined their joint position on the need to field a follow-on CAS aircraft. Basing its conclusions in part on the age and performance of the existing CAS fleet, the MOA called for the timely fielding of a follow-on CAS aircraft (dubbed CAS-X) and noted that the program should focus "on existing airframes available for procurement in the late 1980s." The CAS-X, the two services agreed, must be able to perform air interdiction (AI) consonant with J-SAK, the concept of Joint Attack of the Second Echelon.

Finally, on August 22, 1986, Deputy Secretary of Defense William H. Taft IV provided official "guidance" on close air support as part of the Pentagon's Program Decision Memorandum, which included the request to "provide funds in FY '88–93 for research, development, test, and evaluation and procurement of follow-on CAS aircraft." OSD's guidance also requested an analysis of the effects on other missions "if multirole aircraft are to be used for the mission."

Enumerating the "Musts"

The obvious first step by the tactical air forces (TAF) commanders—supported firmly by TRADOC—was to look at the requirements associated with the unavoidable replacement of the A-7s. A number of "musts" surfaced quickly and unambiguously.

In the category of responsiveness and flexibility, there is no arguing the need for high sortie rates and effective night systems. Another obvious, central requirement is the ability to locate and identify targets reliably. In turn, this consideration drives the need for jam-resistant communications to coordinate attack operations with friendly forces as well as devices that aid the pilot in visually "acquiring" targets and target areas.

Other fundamental requirements associated with an A-7 replacement hinge on sufficient lethality to destroy or neutralize targets. This, in turn, is predicated on sufficient survivability of the aircraft to carry out the mission in the first place. In the view of the TAF commanders, this translates into a set of specific features, such as precision kill of nearby targets and heavy firepower to delay the advance of enemy forces by creating disruption and confusion. Equally crucial are threat avoidance against the gamut of surface-to-air and air-to-air weapons, self-protection against all aspects of the enemy's air defenses, as well as means to reduce the time of exposure by dint of speed, maneuverability, and surprise.

As Gen. Robert Russ, Commander of Tactical Air Command, points out, the Air Force has three paths it could pursue to ensure adequate close air support. A new aircraft could be developed and acquired, an aircraft now in production could be procured, or the existing A-7 force could be modified.

Past experiences helped the Air Force and OSD in arriving at a decision to initiate an A-7 upgrade. The time from program startup to IOC (initial operational capability) was nine years in the case of the F-16, ten years for the F-15, and eleven years in the case of the A-10. Another pragmatic benchmark that affected the decision was the fact that the development costs for a new aircraft with capabilities similar to the F-16 would come to between $2 billion and $2.5 billion. Helping cement the case for modifying the existing A-7 was an unsolicited proposal by its builder, LTV, to do precisely that in a fashion that extends the airframe life beyond the year 2010.

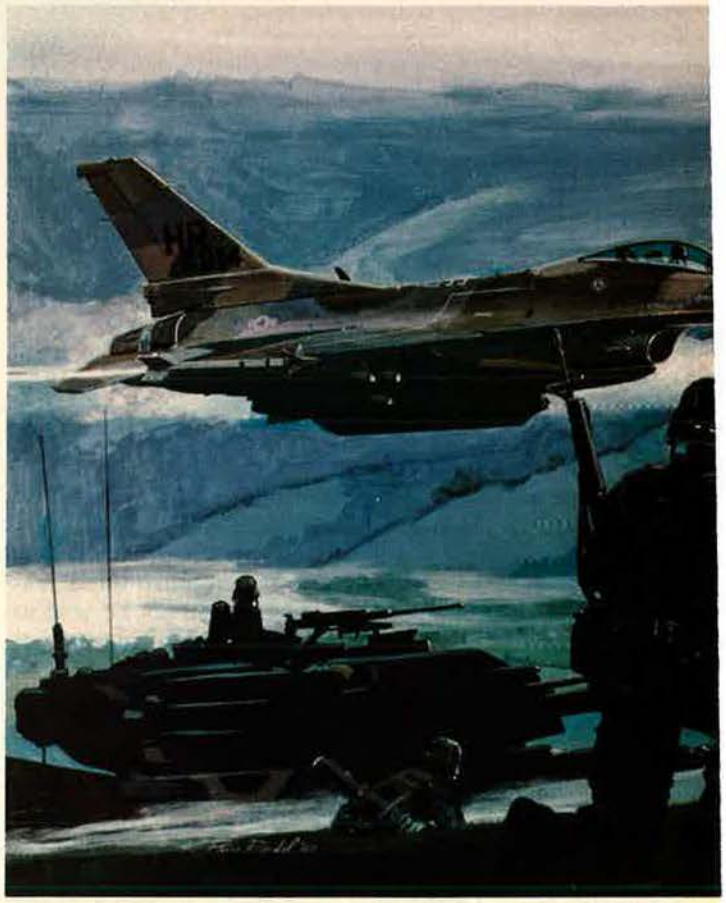
After review of the performance capabilities that result from A-7 modifications already under way, TAC and TRADOC concluded that the added night capabilities—by themselves—"will significantly enhance the ability of the [Air Force] to support ground forces." TRADOC pointed out that the Army considers the current A-7 upgrade program "essential and wants to ensure [that] this capability becomes and remains available to respond rapidly in wartime and in peacetime contingency operations."

The Case for the A-7 Plus

In the fall of 1986, the TAF commanders (TAC, PACAF, USAFE, and AAC)—after a comprehensive review of the modernization program proposed by LTV and designated the A-7 Plus—asserted: "We continue to believe that the A-7 Plus program offers an unprecedented opportunity to preserve and further enhance our [close air support/battlefield air interdiction] aircraft inventory at reasonable cost." The TAF commanders "strongly endorse a [demonstration] program that permits us to preserve the decision option of acquiring [without delay] A-7 Plus aircraft with greatly increased survivability and lethality." The Director of the Air National Guard, Maj. Gen. John B. Conaway, in similar fashion, endorsed the A-7 Plus program as "a logical and cost-effective approach to providing the Air National Guard with a modernized, credible attack capability."

A combination of factors favors the A-7 Plus beyond the fact that the aircraft will apparently come in at about half the cost of new F-16s. Even in its present incarnation, the A-7 is well suited for the CAS/BAI mission in an AirLand Battle environment because of its mature air-to-ground capability, range, survivability, and high payload capacity. Additionally, the A-7 Plus can easily be plugged into the existing maintenance and logistics structure of the Air Force Logistics Command and the Air National Guard.

Further, the $600 million modification program of the A-7 now under way is already enhancing the aircraft's



CAS/BAI capabilities to a major degree. These modifications include the addition of antijam radios in the form of the Air Force's "Have Quick" and the US Army's SINCGARS-V (Single-Channel Ground and Airborne Radio Subsystem).

Equally important are improvements of the aircraft's navigation and attack capabilities that range from the addition of a FLIR (forward-looking infrared) and ring-laser gyro navigation system to a linkup with the Navstar Global Positioning System (GPS). The FLIR system is called LANA, for low-altitude night attack, and is scheduled initially to go on three squadrons of A-7Ds. Other modifications call for the retrofit of state-of-the-art weapons delivery computers and wide-angle HUDs (head-up displays).

The third facet of the A-7 modifications provides for boosts in the aircraft's reliability and maintainability (R&M) through the addition of automatic test equipment, leading-edge flaps, a combined altitude radar altimeter, and a central air data computer.

The Next Step

The next step—the transformation of the upgraded A-7 into the A-7 Plus—pivots on the retrofit of an afterburning turbofan engine and enhanced aerodynamics to provide the aircraft with the speed and maneuverability essential for survival in a high-threat environment. The addition of an afterburning engine requires stretching the airframe by the insertion of two "plugs." Adding on strakes, trailing edge flaps, and lift dump spoilers rounds out the aerodynamic modification. The result is a highly maneuverable aircraft capable of operating in the high subsonic or possibly even the supersonic regime.

Suggested as an A-10 replacement is an attack version of the General Dynamics F-16. In this artist's concept, the attack version—dubbed the A-16—is shown with AGM-65 Maverick missiles, a centerline 30-mm gun pod, and a "shark's fin" UHF antenna on the vertical fin that would be used to talk to the Army troops on the ground.

Three types of engines are under consideration by the Air Force. They are the Pratt & Whitney F100, GE's F110, and an afterburner-equipped version of the Allison TF41. Allison officials believe that the company can retrofit the TF41s powering the A-7Ds with an afterburner from the F100 engine and thereby come in at lower costs than either Pratt & Whitney or GE. Such an approach entails some technical risks compared to buying mature engines. The Air Force has not yet selected from among the three candidate designs.

The A-7 Plus program hews closely to the recommendations of the President's Blue Ribbon (Packard) Commission on Defense Management in such key areas as off-the-shelf acquisition, full-scale development and test of prototypes, and "fly and know cost before buy."

Overall, the TAF commanders believe that the A-7 Plus modification meets central near-term CAS/BAI requirements at a lower cost than other options by providing improved night attack capability, improved aircraft survivability, and a new "twenty-year-equivalent" airframe. In addition, the A-7 Plus program leads to a broad modernization of the Air National Guard force.

The Ninety-ninth Congress authorized $35 million for evaluation of the modified A-7 by the Air Force. With this mandate—and subsequent OSD approval—the Air Force will continue currently programmed and funded modifications of the A-7 as well as startup development of two A-7 Plus prototypes that are to begin flight testing in 1989. Development and test of the two prototypes will be accompanied by the compilation of a data package. If the tests are successful and the data package supports the Air Force's cost criterion—meaning an overall price tag of no more than half of what it would cost to buy such new aircraft as the F-16—then a production decision will be made. Once that decision is made—probably in 1989, according to Maj. Gen. Jimmie V. Adams, TAC's Deputy Chief of Staff for Requirements—requests for competitive production bidding, based on the data package and involving both government-furnished engines and about 335 A-7 airframes, will be issued.

Replacing the A-10

The Army and the Air Force agree that the CAS/BAI modernization requirements, over the longer term, can't be met by the A-7 Plus upgrade program alone. The two services underscored in their MOA the requirement for a more effective and survivable fixed-wing aircraft that can function "across a broad spectrum of combat scenarios and threats, ranging from the friendly rear area to the traditional main battle area and the deep maneuver arena."

Imperative traits of the follow-on aircraft, the two services concluded, involve an airframe and support systems tailored to penetrate and operate within enemy territory under adverse weather day/night conditions. The aircraft, further, must have an armor-killing capability—possibly by means of a gun—and be optimized for the air-interdiction mission. The need for this type of aircraft—basically a more versatile and broadly capable replacement of the A-10—is sufficiently urgent to justify selection of a design that is already in production.

On the basis of longevity considerations, the two services agree that the current A-10 fleet might last until 1998, but have concluded that a replacement aircraft is needed earlier. The reasons are operational, owing to changes in the modern battlefield. Key here are such intrinsic deficiencies of the A-10 as the inability to operate at night and to penetrate enemy defenses to support deep maneuver operations.

These handicaps, General Adams points out, are not the fault of the aircraft, which "is doing exactly what we asked it to do. We put a high-lift wing on the aircraft because we thought we were going to operate out of austere fields. This concept never materialized, and we are paying a large penalty for the big wing."

As in the case of the A-7D replacement effort, the Air Force can choose from among several ways of modernizing the A-10 force. For one, there is the option of

developing and buying new, from-the-ground-up aircraft. But such an approach places two major and possibly insurmountable hurdles in the path of the CAS/BAI modernization drive. It would take about ten years and between $2.5 billion and $3 billion to develop a new aircraft.

The second option—upgrading the A-10 force—was spiked quickly. Because of the big wing and its "draggy" aerodynamics, the A-10 does not lend itself to major upgrades. The addition of advanced engines, the Air Force feels, would enhance the aircraft's speed capabilities only marginally since "we still would be pushing a big desk through the air." The only viable option, apparently, is to procure an in-production aircraft.

The case for the A-16, the TAF commanders believe, is persuasive. For one, it would represent a commonsense approach to acquisition that avoids competition for the sake of competition. The A-16 would capitalize on the economy of scale in the F-16 buy as well as on stable, known costs by obviating developmental risk and long-term contractor investments.

The proposed A-16, General Adams points out, even though operated by the Air Force, "would be an Army airplane with Army communications links," down to being camouflaged by an air-to-ground paint scheme. Many of the features and capabilities that TAC and TRADOC consider essential for a follow-on CAS/BAI attack aircraft are being added to F-16 production aircraft in the future. This includes heavyweight landing gear and other structural improvements pioneered by the Israelis in order to accommodate increases in the aircraft's gross weight. Other programmed mutations of the F-16 that would stand an attack version in good stead include incorporation of OBOGS (an on-board oxygen-generating system that eliminates a cumbersome ground-support requirement), an increased chaff/flare capacity, a wide-angle HUD, and the addition of Navstar GPS transponders.

With condensation trailing off its wings, a Fairchild A-10 Thunderbolt II with Maverick missiles on the inboard pylons pulls up after a low-altitude pass. The Air Force feels the A-10 would be ideally suited to become a forward air control aircraft once its usefulness as a CAS/BAI aircraft is over.

From F-16 to A-16

But for the time being, the fate of the two services' efforts to come up with a long-term solution to the CAS/BAI challenge remains up in the air. The Air Force has been directed to solicit industry proposals for meeting the requirement by either developing and acquiring completely new aircraft or acquiring variants of aircraft now in production. In spite of this directive, TAC and TRADOC see considerable merit in following up the first half of the CAS/BAI modernization program—to wit, bringing the A-7 Plus effort to fruition—by systematically exploring the potential of the "A-16" while at the same time considering use of the A-10s in the future as FAC (forward air control) aircraft.

The TAF commanders, on a tentative basis, recommend that R&D efforts centered on converting production-line F-16s into A-16s get the green light in 1988, that incremental design and production efforts be carried out between 1988 and 1992 to include flight test, and that, on successful completion of these phases, delivery of production A-16s begin in 1992.

Changes Under Consideration

But an attack version of the F-16 would require a number of specific changes, according to General Adams. One change being considered is the addition of a navigation FLIR pod with a wide field of view, low drag characteristics, and ready availability. The benefits of this sensor are that it depicts the "thermal scene" at night, highlights detected hot-spot cues in a cluttered scene, and is designed for hands-off operation. There is no dearth of off-the-shelf navigation FLIR pods, begin-

ning with Martin Marietta's LANTIRN system, with the terrain-following radar feature deleted. Others include systems built by Ford Aerospace, Texas Instruments, and Britain's GEC Avionics.

Other possible add-ons involve a laser spot seeker, a digital terrain system, and a jam-resistant Army data link. All three sensors would "read out" on the A-16's HUD. The laser spot seeker—which facilitates rapid, positive identification of targets designated by airborne or ground-based FACs by displaying target location on the pilot's HUD—could be the A-10's Pave Penny system. This day/night system would be removed from the A-10s and put on the A-16s.

The F-16 will carry out most of the air-to-ground missions for the Air Force in any future conventional conflict. With its advanced avionics, the F-16 can employ iron bombs to their fullest advantage. This F-16 is from the 388th TFW at Hill AFB, Utah.

The digital terrain system would have a threefold function: navigation, terrain following, and ground-proximity warning. The system would use the Defense Mapping Agency's digital map data for both navigation and terrain avoidance. The digital terrain system would display such information as steerpoint corrections and "vertical steering box" on the HUD. The system works somewhat like the ground-launched cruise missile's (GLCM) terrain-contour matching (TERCOM) feature and is available in several existing variants, including one fielded by British Aerospace (BAe). When used to provide ground-proximity warning, the digital terrain system can be set for clearances as low as 200 feet to provide "pull-up cues." TAC expects the system to be a low-cost and effective solution for the A-16 mission.

Maverick missiles for the A-16 can be "cannibalized" from decommissioned F-4s.

If OSD and Congress opt in favor of the A-16s, replacement of the A-10s could start in FY '93 and be completed by the year 2000, meaning that USAF's attack force designated for ground support would number about 800 combat-coded aircraft consisting of both A-7 Pluses and A-16s. If the decision goes against the A-16 and in favor of a totally new aircraft, this schedule would slide by many years.

Whatever the outcome of the current impasse, the Army and the Air Force agree that the US ground forces will continue to require close air support to the tune of about twenty-six wings, or some 1,900 combat-coded aircraft. About ten and a half wings of this "CAS-capable" force must be "CAS-designated," while the remainder would serve in a swing role.

The current inventory of CAS-capable but not CAS-designated aircraft consists of F-16 and F-4 aircraft. Because of aging, the F-4s will be gone from the inventory within four years. Within the CAS-designated category—numbering some 750 combat-coded aircraft—the last A-7Ds will have been replaced by the A-7 Plus by 1999, and the A-10s, one way or another, will be out of the inventory one year later. If there are no A-16 or equivalent aircraft available to replace the A-10s, additional quantities of F-16s configured for CAS/BAI will have to be acquired.

A degree of irony attends the CAS modernization effort. Two years ago, when the Air Force came forward with a CAS-X proposal (a follow-on aircraft to the A-10), the Defense Resources Board killed the request; in FY '87, when for budgetary reasons the Air Force did not include funds for CAS-X, the DRB complained that the service is obviously not interested in having a new close air support aircraft. This contention is at odds with the Air Force's interest in a missionized A-16 to meet CAS and BAI requirements beginning in the 1990s as well as its commitment to maintain support of the Army at current numerical levels but with more capable attack aircraft.

Airborne FACs Not Passé

The TAF commanders averred last year in a formal memorandum that "we continue to see a role for FAC aircraft in the TAF," but acknowledged at the same time that fiscal and mission constraints militate against coming up with a single FAC aircraft for all theaters: "We believe it prudent to tailor our existing resources according to the threat." The TAF commanders, therefore, see a need for a "wide variety of FAC aircraft." Specifically, the need boils down to some 200 aircraft, of which about fifty-five percent should be tailored to low- and medium-threat environments, while forty-five percent need to be capable of coping with medium-high and, if possible, high-threat conditions.

USAF's inventory of FAC aircraft, at the end of FY '86, consisted of sixty OV-10s, seventy-three OA-37s, and twenty-nine OT-37s, totaling 162 combat-coded aircraft. By using T-37s to replace the Vietnam War-vintage O-2 FAC aircraft, the Air Force resorted to a makeshift arrangement. These aircraft were not designed or optimized for this mission, which is of integral importance to the AirLand Battle concept. The FAC fleet today, therefore, is handicapped by an excess of aircraft for low- and medium-level conflict, a shortfall of aircraft for medium-high intensity conflict, and a need for a survivable aircraft for high-intensity conflict.

TAC's commonsense conclusion is that this shortfall for medium-high intensity conflict can be eliminated by converting A-10s from the attack force to OA-10s when a new CAS/BAI aircraft enters the inventory. ■

The Florida Democrat is strong for defense, but says that in the House, it's sometimes better to compromise instead of digging in.

Chappell's Pragmatic Strategy

Rep. Bill Chappell, Jr., of Florida.

BY BRIAN GREEN, AFA DIRECTOR OF LEGISLATIVE RESEARCH

REP. Bill Chappell, Jr. (D-Fla.), may not be one of Capitol Hill's media superstars, but his steady, thoughtful work is important to the formation of national defense policy.

He is Chairman of the Defense Subcommittee of the House Appropriations Committee, and he reviews every line item of the defense budget.

A conservative with a prodefense voting record who leads colleagues who are frequently less inclined than he to support defense programs, he is an ardent devotee of the Strategic Defense Initiative (SDI). Representative Chappell remains noncommittal about the direction and shape of the ICBM modernization, but supports full-scale development of both the Small ICBM (SICBM) and the garrison/rail-mobile basing scheme for the MX Peacekeeper. He is enthusiastic about the B-1B bomber and the Advanced Technology Bomber (ATB). He does not regard problems encountered in B-1 development as serious—"I think that's blown way out of balance"—and he would back the production of additional B-1s if the ATB shows any "real slippages."

Nevertheless, he says, top priority this year must go to conventional forces. Representative Chappell supports the C-17 airlifter, which he says is moving along very well. He also backs the Advanced Tactical Fighter (ATF) and hopes that cooperation between that program and the Navy's Advanced Tactical Aircraft (ATA) program will yield a "carrier-suitable fighter with no sacrifice in land-based performance." He expresses frustration, however, over the cancellation of the T-46 trainer aircraft. "I do think the Air Force needs to get its strategy in line," he says. "I think, personally, it's a mistake, the attitude they're taking on the T-46."

And while he is concerned over fiscal constraints that have led to two years of reduced defense budgets, he praises DoD for much improved management.

The $312 billion in defense budget authority that is being sought for FY '88 (including DoD and Department of Energy defense programs) is a reasonable request, Representative Chappell says, but cautions that "I don't think we can reach that kind of figure" given competing demands for funding and the impact of the Gramm-Rudman-Hollings balanced budget law. Those constraints have led to a decline of nearly seven percent, after inflation, in the defense budget over the last two fiscal years.

"We're awfully marginal as to whether or not we're getting into the muscle now, maybe into the bone, with some of the cuts," Representative Chappell says. The Administration is requesting a three percent real increase for FY '88. Representative Chappell says that "it's going to be a tough year," but he hopes to see at least some real growth in the defense budget.

He believes that the balance between the Army, Navy, and Air Force is about right, but that all the services are hurting because important conventional programs coming into production are being held up because of the tight budget situation. Should the military face a "true" Gramm-Rudman cut—a situation in which the defense budget would absorb fifty percent of the cuts required to reach the deficit target set by the balanced budget law—"then we could suffer tremendously from manpower cuts [reducing total military strength by an amount] almost the size of the Marine Corps." Representative Chappell also believes that "we are marginal on R&D. We have to be careful not to let the emphasis on procurement lead us to [reduce] R&D."

Representative Chappell disagrees vigorously with the contention that research and development

might be better off if less R&D funding were devoted to the Strategic Defense Initiative. He points out that an appreciable amount of the work now identified with SDI was ongoing before President Reagan focused attention on strategic defenses in his March 1983 speech and that the increases over the level of spending when the programs were not linked under the SDI umbrella have been very modest. "I think the payoffs are going to be substantial from SDI. . . . There are so many pluses from the benefits of [SDI] research that we're going to be far better off despite minor reductions [from other R&D programs]."

SDI plays a central role in the Congressman's strategic view of the world. He agrees with Defense Secretary Caspar Weinberger's contention that the goal of SDI is to defend "people and continents," though he freely concedes that there is no such thing as a perfect defense.

The purpose of strategic defense, as he sees it, is to enhance deterrence and to reduce our vulnerability to Soviet power politics. He believes that an open society cannot tolerate indefinitely the tensions created by excessive reliance on offensive nuclear weapons. SDI, he says, is "going to give the opportunity to really gain more confidence in world peace. I hope the world understands."

SDI is intended to provide the technical information by the early 1990s that will permit the US to decide whether or not to deploy strategic defenses and, if so, what systems to use. Representative Chappell is a self-described technical optimist who believes that SDI research has already come a long way toward answering those questions. "I think . . . our research . . . is going to tell us that we can put a very effective defense in place." Deployment, he believes, is a virtual must.

Yet he is reluctant to endorse the calls by some SDI enthusiasts for early deployment. Most of the early deployment plans call for utilization of kinetic kill vehicles, which destroy ballistic missiles or warheads by colliding with them. Representative Chappell believes that SDI research is more appropriately focused on the more exotic—and longer-term—systems, such as laser and particle-beam technologies.

New capabilities embodied in the C-17 airlifter are worth the cost.

While he recognizes the ever-present problem of affordability, he also expresses concern that the large cuts imposed on SDI budget requests over the past two years may lead to cancellation of funding for some higher-risk but potentially high-payoff technologies. Last year, $5.3 billion was requested for SDI, and Congress approved $3.7 billion. The FY '88 request is $5.7 billion.

The benefits the Congressman hopes to see from SDI research are not exclusively derived from its strategic impact. He points out that some technologies will benefit the conventional forces. He approves of the Conventional Defense Initiative, a new program to strengthen conventional R&D efforts and funded with money diverted from SDI, viewing it as an effort to mesh the promise of SDI with conventional force needs.

He also sees a close relationship between the Air Force's antisatellite (ASAT) program and SDI research. While he stresses the importance of ASAT capability, he suggests that the F-15-launched miniature homing vehicle ASAT system, now in development, may not be the best one for the mission. SDI research, he believes, may result in a more effective system.

SDI and Arms Control

Representative Chappell conceives of SDI as the engine driving arms control. "The Soviets are now at the table, in my view, because of SDI. I don't think it's something you just bargain away unless you get total control on [offensive] arms," he says. He evinces an apparently profound skepticism of arms-control negotiations as they have been conducted in the past.

He has, nonetheless, supported legislation that would require the US to comply with the numerical limits of the unratified and now-expired SALT II Treaty. But his vision of Soviet arms-control history indicates that SALT II may be doomed in any event. "They go in cycles. They go through a period of research and development and no testing. And then when they're ready to test, they always break out. [Then] for a short period, they give us a great feeling that now they're ready to stop all testing and [deployment while] they go back into another research and development [phase]. We're lulled into a false sense of security . . . [and] it costs lots of money to play catch-up."

He doubts the utility of President Reagan's attempt at the Reykjavik summit meeting to abolish all ballistic missiles. "If we could all somehow or other stop the causes of war or just get rid of all weapons because we no longer need them, that would be ideal," Representative Chappell says. "But from a practical standpoint, all of us recognize that [a reduction to] zero nuclear [weapons] is not obtainable." Nor does he believe such an abolition desirable so long as US conventional forces are "so much out of balance" with those of the Soviets.

Strategic Modernization

This reasoning is consistent with his support for the Air Force's ICBM programs. Representative Chappell likes the move toward mobility in the ICBM force as a means of enhancing survivability. "I think it's a good move to go mobile. . . . With mobility in our systems, you know it has to keep them busy trying to target." But, he suggests, if

strategic defenses could be made effective enough, the US might not "have to worry about hardening of silos and basing modes that have been so expensive in the past."

The Congressman remains noncommittal about the shape and size of the US ICBM force of the future. He is concerned about the cost of the SICBM in light of budget constraints, but has not come to any conclusions concerning the best number of warheads or the appropriate weight for the small missiles. The Air Force will be developing a 37,000-pound, single-warhead missile, although some argue that a heavier, multiwarhead missile would result in substantial savings.

Representative Chappell has favored the MX throughout its legislative history. He notes, however, continuing strong opposition to the missile in Congress. Although Congress has approved fifty MXs to be deployed in existing Minuteman silos, he remains pessimistic about the chances, even with a more survivable basing mode, for approval of the second fifty Peacekeepers.

He is more positive concerning the bomber force. He expresses strong support for the ATB and sees nothing at the moment that indicates the pace of the program will slow dramatically.

Representative Chappell is also vociferous in defense of the B-1, describing its recently publicized development difficulties as "overblown." He maintains that some B-1 problems (involving its electronic countermeasures systems and the aerodynamics of missile launches) are typical of new systems. The B-1, he insists, has suffered fewer glitches than most new systems. Solving the leaks in the B-1's wet wing—a problem that "appeals to the journalist because it's easy for the reader to envision"—is just a matter of "curing and maturing of the wing." The Congressman's recent visit to the B-1 production facilities convinced him that "the contractors and the Air Force are on top [of the situation and that the problems are] going to be solved in reasonable time."

Tactical Thrust

His enthusiasm for bombers and their capability to carry out conventional as well as strategic missions is consistent with the priority that Representative Chappell places on conventional forces. "The conventional forces need our attention very soon [in terms of] both modernization and force levels," he argues.

SDI will give the opportunity to gain more confidence in world peace.

Balance is important to the Congressman in that endeavor. He refuses, for example, to condemn the decreased production levels planned for Air Force tactical aircraft. A buy of 180 F-16s and forty-two F-15s is being requested for FY '88, compared to 216 and forty-eight, respectively, in FY '87. "I think what you've got to really look at is the balance in the forces, and it may be that we can very well get along with fewer F-16s this year. It depends on . . . whether the need is more urgent [for other programs] than [for] the F-16." Others have noted that the numbers requested this year were those actually approved by Congress last year.

Representative Chappell supports the Advanced Medium-Range Air-to-Air Missile (AMRAAM), a program that has had perennial problems on Capitol Hill, and expresses satisfaction with the success achieved in the AMRAAM test program. And he is a strong proponent of the agreement between the Air Force and Navy on cooperation in the early design phases of the former's Advanced Tactical Fighter (ATF) and the latter's Advanced Tactical Aircraft (ATA).

The intent of the agreement is to allow the Air Force to advise the Navy during the early design of the ATA, with a view toward developing an aircraft that can be adapted for use by the Air Force for ground attack, and conversely to allow the Navy to advise the Air Force on the ATF regarding the Navy's unique requirements in an air-superiority craft. He recognizes the Air Force's reluctance to sacrifice performance to design modifications necessary to make a plane suitable for use on an aircraft carrier, but he believes that new technology might lead to a carrier-suitable fighter with no degradation in land-based performance. He is keen on the idea that the services should share their research and development work with each other.

Representative Chappell also approves of the initial production, scheduled for FY '88, of the C-17 airlifter, a program deemed critically important by both the Army and Air Force. He believes that the new capabilities embodied in the C-17 are worth the cost and argues that delay will only make the program more expensive. Dismissing the urgings of those who would opt for more C-130s, C-5Bs, and refurbished C-141s as a cheaper course, he argues that the combination of older planes is simply "not an alternative to the production of the C-17."

The T-46 trainer, however, seems to be a sore spot for the Congressman. One of the toughest fights on Capitol Hill last session involved this program. The Air Force withdrew its request for the T-46, saying that it could not afford a new trainer under reduced budget levels. Congressmen whose districts were affected by the decision put up a strong fight for the T-46 anyway.

Representative Chappell complains that the Air Force did a great job selling Congress on the idea that a new trainer was urgently needed—and then reversed itself. He argues, just as he does with the C-17, that the lower operational costs of the T-46 will save money and suggests that "we're getting into some decisions that will cost a lot of mon-

ey if we [go] back to the drawing board, and I'm not going to support [that]. . . . The [T-46] has been developed, and it's doing well in the tests. . . . From any standpoint, the Air Force needs a trainer . . . [and] they'd better move on the T-46 or something like [it]."

Reforms and Directions

Representative Chappell waxes enthusiastic about the efficacy of the acquisition reforms instituted over the past several years. "I think we've been doing a lot better job in procurement. . . . We're getting a lot better bang for the buck than several years ago, a lot more efficiency in the programs." He attributes the improvement to multiyear contracting, better program oversight, and close scrutiny given to the services. He does, however, favor a pause in new reform legislation to figure out how well the extensive reforms approved last year will work.

One reform that directly involves the Congressman's subcommittee is the requirement for a two-year defense budget submission. This year, for the first time, DoD has submitted complete budgets for two years, both FY '88 and FY '89.

The Congressman has mixed feelings about this approach. He feels that two-year authorizations might be worthwhile for the Armed Services Committee, but that given the tight budget and "redundancies we need to work out," the Appropriations Committee should still give the budget "a proper review on annual basis." He prefers instead to improve the functioning of the current budget system by approving defense bills in timely fashion and only then to determine what further steps should be taken. He suggests that annual appropriations might be based on a two-year authorization bill.

Representative Chappell intends to direct his subcommittee's focus more toward foreign policy, with an emphasis on the relationship between the US and other NATO members. His approach is in step with that of fellow Democrat Sen. Sam Nunn (D-Ga.), Chairman of the Senate Armed Services Committee, who wants to channel his committee's efforts along mission lines.

How does a defense conservative survive in a sometimes hostile legislative environment? Representative Chappell does it through compromise and a pragmatic sense of support for the positions that result from those compromises. His philosophy is "to support, unless it's a real moral issue, what my subcommittee has done, and I'm going to support what the full committee does, and in conference I'm going to support the position . . . that the House enacted."

By supporting those compromise positions at each step of the legislative process, he can more effectively win the confidence of his colleagues and preserve the influence he needs to promote his own priorities. ■

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VIEWPOINT

A Shortage of Solomons

By Gen. T. R. Milton, USAF (Ret.), CONTRIBUTING EDITOR

An Iranian victory over Iraq would mean the spread of Islamic fundamentalism and peril for moderate Arab states. There seems little chance that wisdom will prevail in the Middle East.

If a suspect memory can be counted on, it was Casey Stengel, the sage of baseball, who proclaimed that an errant ballplayer had so screwed up right field that nobody could play it. With some slight modification, old Casey's aphorism could be applied to our Mideast policy. The only clear fact emerging from our ambivalent behavior in the Iran-Iraq war is that Israel remains the focus and, it sometimes seems, the occasional author of US Mideast initiatives.

There can be no lingering doubt that the US arms sale to Iran was a mistake. As the war with Iraq drags on, the odds lengthen in favor of Iran as the eventual winner. The unexpected ability of the Iranians to manage technically, a population advantage of almost three to one, and the promised free flight to heaven for those killed in battle seem to have given Iran a decided edge. Since an Iranian victory and the consequent spread of the Islamic revolution is the recurring nightmare of those Arab states we would like to have as friends, our weapon shipments to Iran are hard to explain.

The trouble is that Iran is the Persian Gulf's single most important country. Its population of 45,000,000 makes it second only to that of Egypt in the Middle East, and it occupies the most strategic piece of real estate in the repository of the world's most plentiful oil reserves. The USSR is next door and has, we can assume, contingency plans for an Iranian takeover. An Iran so inclined and backed with sufficient military power could shut off the Persian Gulf and its oil. The result would be catastrophic for Europe and for NATO.

Iran, then, is most important, and the Administration is right to consider ways of bringing it back to our side. Plainly, however, the time is not yet, and it will not be so long as that sixteenth-century fanatic, the Ayatollah Khomeini, and his mullahs are in charge. It would appear that our arms sale to Tehran did nothing beyond improving Iranian combat capability—to the apparent dismay of Arab leaders.

Israel, surrounded by enemies, takes a short-range view of matters. On the age-old precept that the enemy of my enemy is my friend, Iran is a friend, albeit a curious and unpredictable one. Iraq is Israel's implacable enemy. So long as Iraq is tied down by its struggle with Iran, it is no threat to Israel.

By Israeli logic, helping Iran is simply an investment in security. Nonetheless, that view is shortsighted, for a triumphant Khomeini could bring chaos to the entire Middle East, and the lonely little land of Israel could become even lonelier.

Although the Camp David accords removed Egypt from the list of Israel's active enemies, the two countries are on cool terms today—nodding acquaintances, but scarcely friends. The principal beneficiaries of the US aid program are Israel and Egypt, in that order, and thus there is a common bond between them, if a loose one. Egypt, having suffered the heaviest casualties in previous wars with Israel, has sworn off further engagement. The Yom Kippur War, in fact, is celebrated in Cairo as a victory, and Camp David did return the Sinai to Egypt.

Egypt has other problems, and they are big ones—a population of 50,000,000 that grows by another million every nine months, appalling poverty, and, for most Egyptians, a future without much hope. The oil glut, together with the Persian Gulf war, has cut back on overseas employment for Egyptians, employment that has provided a safety valve for the social pressures at home. Islamic fundamentalism is a poor alternative to a job and a higher standard of living, but it evidently appeals to the otherwise hopeless.

In any case, an Iranian victory and the consequent spread of Khomeini's brand of Islam would create a grave threat to Egypt.

Meanwhile, Israel is not without its own problems. As young Israelis seek greater opportunities elsewhere, emigration is beginning to surpass immigration. Russian Jewish émigrés appear to be choosing Europe and the United States over Israel, even though Israeli passports await them in Jerusalem. The Lavi fighter, doubtless a first-class airplane custom-designed for Israeli needs, perhaps more importantly, is designed to ensure the continuing good health of Israel Aircraft Industries, a principal employer of the country's engineers and technicians. It is already a billion-dollar-plus drain on the US treasury.

The problems of the Mideast are immense, but then, so have they always been. Iraq's Saddam Hussein might seem an unlikely surrogate for Babylon's King Nebuchadnezzar, but he does appear to have a similar antipathy toward Jews, which makes understandable Israel's bias in favor of Iran. Khomeini, however, is no Persian King Cyrus. An Islamic revolution spreading throughout the Mideast could spell the demise of moderate Arab regimes.

In the best of all worlds, sensible Iraqis would do away with Saddam Hussein and his murderous oligarchy, while equally sensible Iranians would rid Iran of its medieval dictators. Both countries could then concentrate on improving their war-ravaged economies and the lot of their long-suffering citizens. How to bring that about is a puzzle worthy of King Solomon on his best day.

From what we have seen lately, no King Solomons reside in either Jerusalem or Washington. For the time being, it seems, old Casey's dictum will have to stand. ■

MILITARY HERITAGE ON VIDEO

Lowell Thomas Remembers: *America* The War Years #1

America: The War Years #1—Narrated by Lowell Thomas, this film examines the World War II from 1941 - 1943. The sights and sounds of war as well as the sights and sounds of back home are brilliantly documented.
RH 7929 $29.95

Vietnam: The Secret Agent—This film is the first comprehensive look at the history, the effects, and the implications of the deadly containment 2, 4, 5-T —a main ingredient of the defoliant code-named Agent Orange during the Vietnam War.
MP 1352 Color 56 min.
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Heritage of Glory — The United States Marine Corps Story—The events of both world wars has shown the Marine Corps to be a proud and inspirational part of our armed forces. The footage is real and the action dramatic, which makes this the definitive program for followers of the Marines.
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Anchors Aweigh—The United States Navy Story—From its birth more than two centuries ago to its accomplishments in Vietnam, the Navy has been a force to be reckoned with. There's plenty of action in this historical account that will keep both history buffs and lovers of action happy.
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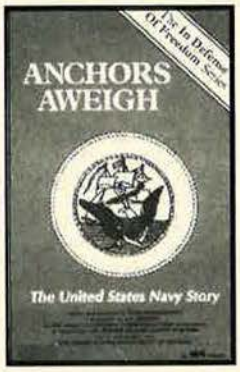

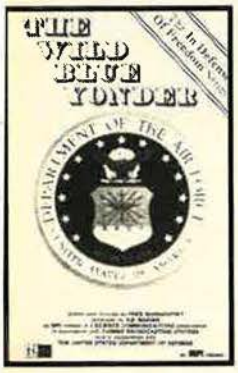

The Wild Blue Yonder—The United States Air Force Story—The story of the American "Flyboys" from the first warplane in 1909 is vividly told in this fascinating program. Real "dogfights" from WWI and WWII, precision bombing, the Enola Gay, and the jet age is all shown with rare footage. A definite collectible.
MP 1184 Color 45 min.
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The Nazi Strike—The Nazis conquer Austria and Czechoslovakia, and invade Poland. Hope is finally abandoned for "peace in our time."
MP 1073 B/W 41 min.
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Patton—Old Blood and Guts—Gain an insight into one of America's greatest military minds with this entertaining and insightful biography. General George S. Patton was a multifaceted man: gruff, abusive, hard driving, brilliant, ambitious, erudite, and compelling. Ronald Reagan narrates Patton's rise from West Point cadet to one of America's greatest warriors.
MP 1355 B/W 25 min.
Not Rated $19.95

Stilwell Road—The U.S. Army fought the Japanese, Mountains, and Jungles in Burma in WWII. This film captures the heroism and struggle to paving the way to victory. Narrated by Ronald Reagan.
RH 7785 $19.95

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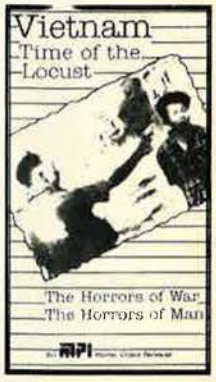
Not Rated $19.95



Vietnam—Time of the Locust—This award-winning compilation on the Vietnam War utilizes footage from numerous sources, including suppressed footage shot by Japanese television, to produce a powerful anti-war statement.
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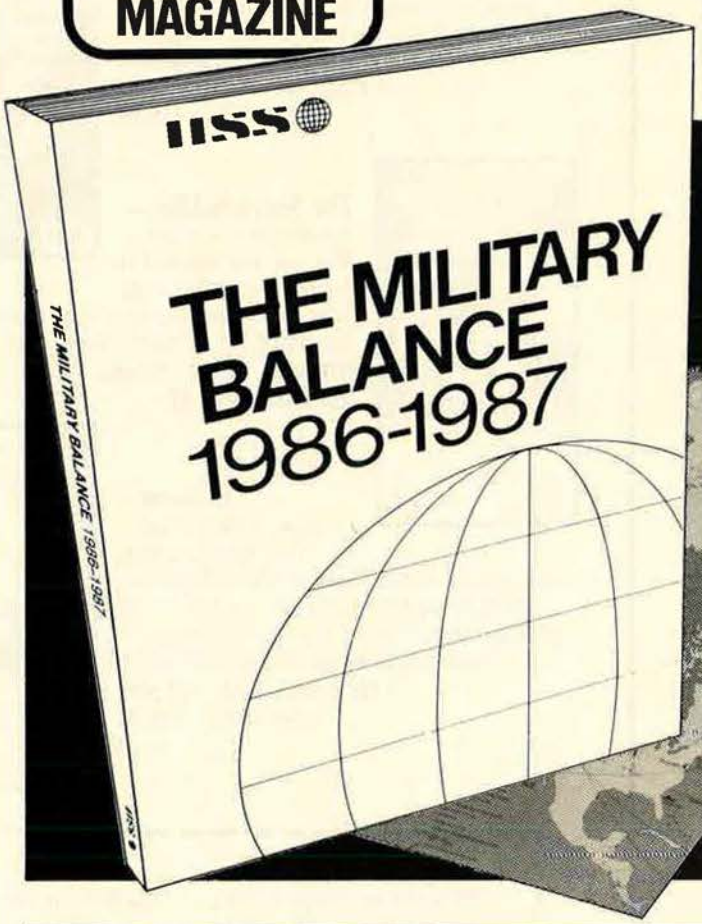

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Long Night at Mo Duc

With little help available because of weather, two captains in an OV-10 took on an enemy regiment and won.

BY JOHN L. FRISBEE
CONTRIBUTING EDITOR

THE night of the sixteenth/seventeenth of September 1972 was not the kind pilots dream about when sleeping peacefully. It was the monsoon season, and some of the aircraft at Danang, where the 20th Tac Air Support Squadron was based, had been evacuated because of a typhoon warning. Only one flight of tac fighters was scheduled for Vietnam that night. Weather or not, the ground war went on. An Army detachment of 120 men at Mo Duc, near the coast about ninety miles south of Danang, was under attack by some 2,000 enemy infantry.

Early that evening, the 20th TASS FAC team of Capts. Richard Poling and Joseph Personnett was alerted for a Quick Reaction Force launch to support the Mo Duc garrison, which had declared a tactical emergency. Since the Army troops could provide their own illumination, Poling and Personnett had their normal OV-10 load of flares replaced with marking, high-explosive, and flechette rockets.

By 2150 hours, the weather had improved enough for launch. Captain Personnett in the front seat was on his forty-fifth combat mission, Captain Poling on his 105th. But neither pilot had worked the recently assigned Mo Duc area. They were informed that there was no safe bailout area in the vicinity.

The situation at Mo Duc turned out to be even worse than the two FACs had anticipated. Its defenders had been forced to abandon a 105-mm howitzer that had been taken over by the enemy, who was shelling the compound with it and with rockets and mortars. Poling and Personnett immediately silenced the 105 with flechettes, then continued to strafe and rocket other targets until the tac fighters they had requested arrived.

Intense antiaircraft fire could not be silenced since most of it came from a refugee center where the enemy had sited his guns. The FACs remained on station until their ordnance was expended. At about 0200 hours, they were forced to return to Danang to refuel and rearm.

While on the ground, they requested Naval and ARVN artillery support, gunships, and whatever tac air could be rounded up. At 0300, they launched again with Captain Poling now in the front seat. Enemy troops had completely surrounded the compound. With no USAF fighters on hand, they requested A-7s from an aircraft carrier, but were told that the Navy planes could not be there until 0630 hours. An ARVN relief force had been ambushed and stopped by enemy forces, with little prospect of reaching Mo Duc in time. It was up to Poling and Personnett to save the 120 Army men with their own ordnance and whatever other fire arrived.

The situation became so desperate that the ground commander requested friendly artillery to fire on his position. Throughout the remainder of the night, Poling and Personnett strafed and rocketed muzzle flashes, directed Navy and ARVN artillery, and marked targets for the Navy A-7s that arrived on schedule at 0630. The FACs' OV-10 was under heavy AA fire on each pass, with one of many hits passing through the canopy, showering both pilots with splinters.

As dawn broke, Captain Personnett in the back seat was directing Naval and ARVN artillery while Captain Poling was working two sets of Navy A-7s, another OV-10 with cluster bombs, and a fast FAC. The hostiles were now attacking in waves.

Shortly after 0700, the ground commander called in desperation for immediate strikes on enemy troops who had broken through the perimeter fence and were within twenty-five feet of his bunker—too close for the faster aircraft to attack. Poling immediately rolled in with a volley of flechettes as all the ground fire focused on the OV-10. He and Captain Personnett made eight passes, taking many hits, but they stopped the enemy assault.

On the final run, with the enemy withdrawing, the OV-10's rudders and right engine were shot out. Both pilots ejected from 2,000 feet as their aircraft rolled into an uncontrollable dive. Both were fired at as they parachuted into a rice paddy that was surrounded by enemy forces. After a tense ninety minutes, they were picked up by Army helicopters. The first chopper that reached Poling was shot down as it lifted off, but a second succeeded under heavy fire.

The ground commander later counted 265 enemy bodies on the perimeter fences and credited Captains Poling and Personnett with saving his troops from annihilation. In seven hours of sustained combat, two gallant captains flying a lightly armed recce plane were primarily responsible for defeating a reinforced enemy regiment. For that extraordinary feat, both men were awarded the Air Force Cross. ■

Thanks to Maj. Jeffrey B. Floyd, author of For Extraordinary Heroism: The Air Force Cross *(privately published), for opening his files to this writer.*—J.L.F.

AIRMAN'S BOOKSHELF

Playing Games?

The Defense Game, by Richard A. Stubbing with Richard A. Mendel. Harper & Row/A Cornelia & Michael Bessie Book, New York, N. Y., 1986. 445 pages with notes and index. $18.95.

The Defense Department is not as efficient as it could be. Interservice rivalry still festers. The defense dollar could stretch further. Congress is often more a hindrance than a help in defense matters.

These and other central points of Richard Stubbing's *The Defense Game* have been repeated in recent years with an almost mind-numbing frequency. Many, as enumerated in this insider's view of the failings of the defense establishment, are valid, and it is important to make them. One may, however, legitimately question the value of repetition. While many readers of this magazine will disagree with his conclusions, Mr. Stubbing does, however, bring the advantages of comprehensiveness and good organization to his effort.

Conceptually, *The Defense Game* has three major sections. The first provides insights on how the nature of the military threat and the defense budget are determined—and how the two relate. The author argues strongly that the US defense buildup of the past several years was based on the false premise of US conventional and strategic inferiority, that weapons programs are not based on any realistic strategy or conception of the Soviet threat, and that the increased resources devoted to defense have not been matched by increases in combat effectiveness. These are all debatable contentions.

The near-dogmatic views expressed by the author are often left unsubstantiated. For example, he appears to maintain that the US is not inferior strategically to the Soviets because more than 500 warheads—the number he identifies as necessary to devastate Soviet society—would survive any Soviet first strike. No further explanation is provided. The reader who believes that deterrence should be founded on more than nuclear city-busting is left with a profound sense of dissatisfaction.

The second section examines the various failings of the military services, the Pentagon, the executive and legislative branches of government, and defense contractors as they struggle with the budget, acquisition of weapon systems and material, and definition of proper roles and missions. Mr. Stubbing worked for the Bureau of the Budget and the Office of Management and Budget for about twenty years, and he brings a wealth of detail to his description of the difficulties involved. The vagaries of the congressional budget process are bemoaned, and the shortcomings of the acquisition process are chronicled.

Yet the author often seems to be reluctant to give credit where credit is due. Excessive interservice rivalry benefits no one. But there is no mention anywhere in the book of the thirty-one initiatives agreed to by Gens. Charles Gabriel and John Wickham, recent Chiefs of Staff of the Air Force and Army, respectively. These initiatives clarified roles and missions and enhanced jointness in terms of planning, acquisition, and operations. This oversight is particularly unfortunate, since the author highlights Air Force and Army wrangles over the air defense mission.

The author also notes that recent legislation encourages competition in defense procurement, but complains that the new law contains "loopholes." But what constitutes a loophole? Should all contracts be competitive, even if conditions indicate that competition would result in higher cost? Hasn't the percentage of contracts awarded through competition gone up over the last couple of years?

To some extent, however, Mr. Stubbing is a victim of bad timing. The book was published in the latter part of 1986, a few months after major acquisition reforms were approved and a few months before passage of major defense reform legislation that stressed jointness and enhanced the power of the Joint Chiefs. These reforms may achieve some of the goals that Mr. Stubbing supports.

The third and best section offers studies of the management styles and accomplishments of the most important Secretaries of Defense of the past twenty-five years, including Secretaries Robert McNamara, Melvin Laird, James Schlesinger, Harold Brown, and Caspar Weinberger. These chapters provide the reader with a more personal perspective not ordinarily found in studies of the defense establishment.

In the earlier chapters, the author focused his military reform critique on bureaucratic interaction. In this view, the Air Force pursues its bureaucratic interests, the defense industries theirs, and so on—sometimes to the detriment of national security, because each bureaucracy tends, to a greater extent than is desirable, to define the nation's interests in terms of its own well-being. But his studies of the Secretaries go beyond the standard critique in showing how one of the central characters in the defense establishment deals with the various bureaucratic elements and pressures.

The lasting value of Mr. Stubbing's book, however, may lie in an examination of the assumptions behind his criticisms of the defense establishment and what that examination might uncover about the mindset of many military reformers. Close scrutiny will reveal some interesting inconsistencies that detract from the cohesiveness of the separate arguments that he makes.

For example, he maintains that the US has overestimated the Soviet threat. Consequently, the Reagan Administration's military buildup was unjustified. Yet he also maintains that it is very difficult to assess the threat with any precision. Thus, it is not easy to match requirements to the threat. The author, though, has made his own assessment—however difficult that is to do—and it is one quite different from that made by DoD.

In spite of its weaknesses, the comprehensiveness and insider's view

make *The Defense Game* a worthwhile effort. The reader should beware, however. It bears *careful* reading and constant attention. The author's obvious inclination to be critical of the military sometimes leads him to downplay the positive strides made by the military. In addition, recent reforms may have overcome some of his criticisms.

But as a review of the military reform critique of the military establishment, for an interesting view of recent Defense Secretaries, and as a case study of military reform literature, *The Defense Game* should prove a useful addition to an airman's bookshelf.

—Reviewed by Brian Green. Mr. Green is a Contributing Editor of AIR FORCE *Magazine.*

The Flying Bear

Aircraft, Strategy and Operations of the Soviet Air Force, by Air Vice-Marshal R. A. Mason and John W. R. Taylor. Jane's Publishing Co. Ltd., London, England, 1986. 278 pages with illustrations, bibliography, and index. $29.95.

The world's foremost aviation expert, John W. R. Taylor, has combined forces with a distinguished Royal Air Force air vice-marshal to compile a factual analysis of the Soviet aerial warfighting machine. This volume, written in two parts, evaluates all elements of the Soviet Air Force (SAF) in the first section and, using a gallery format, reviews Soviet military aircraft and tactical missiles in the second part.

The authors relied on an extensive bibliography to underpin their examination of the functional areas that make up Moscow's aerial armada. Tactical offensive operations, maritime operations, long-range aviation, and transport operations are all treated in depth. In addition, the authors study the Soviet concept of air supremacy and construct an overall evaluation of Soviet Air Force competency.

A chronological approach guides the examination of each of the functional areas, beginning with Communist Party input following the "Great Patriotic War" (World War II). The narrative begins with the embryonic formation of each aviation function and continues to the present day. A particularly interesting feature is the account of the creation of the present-day design bureaus, which produce the specific aircraft desired for stated mission needs. The reader learns how Mikoyan-Gurevich produces top-notch fighter-interceptors and how Tupolev blends Party instruction and aeronautical science to produce heavy transports.

The authors conclude rightly that the Soviet Air Force's contribution of airpower to a combined-arms offensive has matured significantly in recent years. Indeed, they assert that the Soviets would "present severe problems to an opponent if they were ever allowed to conduct operations in the way for which they have planned and trained."

In a similar fashion, the USSR has bolstered its offensive naval air capabilities. The coming deployment of a Soviet aircraft carrier comparable to US *Nimitz*-class boats that would hangar Yak-38 Forger aircraft will give the Soviets a platform from which to extend the paw of the Bear far across international waters for years to come.

Contradictions inherent in the manner of Soviet Air Force operations in the 1980s are also scrutinized in depth. Commanders and aircrews adhere to strict flying discipline and operate under close ground control—as was demonstrated during the Korean Air Lines incident—but see an increasing need to develop personal initiative and flexible combat tactics. Problems with ground support are also examined. Ground personnel are expected to maintain a professional attitude, but they are poorly paid and managed and often have to be taught and retaught basic maintenance and support skills.

However, these weaknesses are offset to a great degree, the authors point out, by the sheer size of Soviet forces and by the Soviet Union's rapid advancements in airframe and avionics technologies in the past fifteen years.

In the second section, the authors apply the familiar format of *Jane's All the World's Aircraft* to catalog the aircraft, helicopters, and tactical missiles of the Soviet Air Force. Well illustrated with photographs and line drawings, this section presents the reader with a thorough accounting of the specifications and equipment of the SAF's air assets.

Though the inner workings of the Soviet Air Force are largely shielded from Western eyes, the authors have here penetrated that shield to provide keen insight into the operations and hardware of the world's largest air force.

—Reviewed by Capt. Ronald A. Lovas, USAF. Captain Lovas is a Contributing Editor of AIR FORCE *Magazine.*

THE WRONG STUFF

The fiery explosion of the space shuttle Challenger shocked the world. Even more shocking, however, is the story of mismanagement, mediocrity, and political meddling that led inevitably to tragedy in the Florida skies. In this hardhitting, behind-the-scenes expose, veteran space journalist Malcolm McConnell penetrates NASA's gleaming high-tech facade to bring you the facts you'll never find in the Rogers Commission report—the startling, terrifying, dramatic tale of a national tragedy.

"I took the book home thinking I would just breeze through it. I couldn't put it down. It has authority and gives the reader a sense of being spoken to by someone who thoroughly understands the subject."—Senator Barry Goldwater

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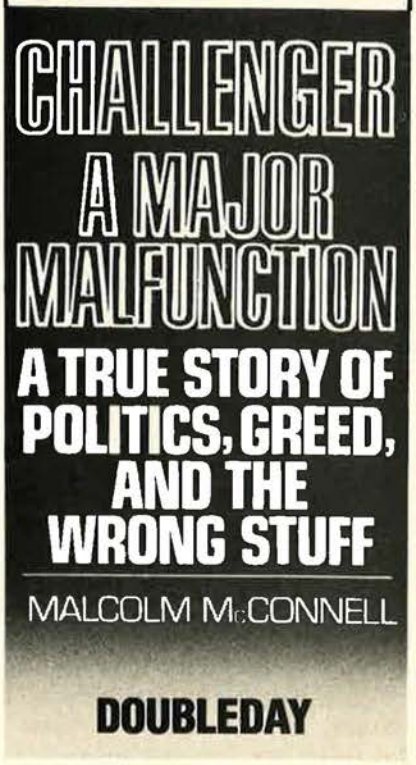

The Doolittle Salute honors the Senator from Arizona for a lifetime of public service.

The Goldwater Connection

At the December Doolittle Salute, Senator Goldwater, wearing his newly received DFC, is congratulated by Gen Lawrence A. Skantze, Commander of Air Force Systems Command.

BY ARTHUR HYLAND

For many years, Sen. Barry Goldwater's support for airpower, the Air Force Association, and the Aerospace Education Foundation (AEF) has been both enthusiastic and effective. Consequently, as the Senator wound up his long and distinguished career in the US Senate, the tributes honoring him at the Foundation's annual Jimmy Doolittle Salute last December were warm.

Secretary of the Air Force Edward C. Aldridge, Jr., awarded Senator Goldwater the Distinguished Flying Cross "for extraordinary achievement," and AEF President Dr. Eleanor P. Wynne presented Senator Goldwater with a mantel clock bearing the seal of the United States Air Force as "an eternal reminder of our respect, affection, and appreciation."

Milton Caniff, the creator of the comic strip "Steve Canyon," surprised his friend with a personal cartoon portrait, declaring, "We shall not see your like again." And George D. Hardy, Foundation Chairman of the Board, read a letter from President Reagan that stated, in part, "In the face of doubters and nearsighted naysayers, your advocacy of a strong defense has paid off for America time and time again."

Senator Goldwater told the guests, "I'm in a helluva fix—this is one of the few times I can't think of anything to say! All the airplanes I've flown are just fun memories, but the thing I remember most is the people. The friendship stays with you."

Senator Goldwater has represented Arizona in the Senate since 1952. During his long career, he has supported the role and mission of the Association and the Foundation by participating in numerous AFA symposia and serving for eleven years as AEF Board Chairman.

Senator Goldwater, an AFA Life Member, received AFA's highest honor—the H. H. Arnold Award—in 1976. In 1958, he was awarded an AFA Citation of Honor for his contributions to the Air Force Reserve. An active participant in the Iron Gate Chapter's annual Air Force Salute, he is the first recipient of its Maxwell Kriendler Memorial Award, the Chapter's highest honor.

The Doolittle Salute annually honors a distinguished aerospace leader and recognizes the Foundation's Corporate Doolittle and Eaker Fellows *(see box)*. Their contributions help to support the Foundation's ongoing programs.

Three Corporate Fellowships were presented at the Salute. General Dynamics Corp., represented by its President, Oliver C. Boileau, and Lockheed Corp., represented by its Chairman and CEO, Laurence Kitchen, were invested as Corporate Ira C. Eaker Fellows. The MITRE Corp., represented by Edward Brady, Vice President, C^{3}I Division, was invested as a Corporate Jimmy Doolittle Fellow. ■

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AFA INTERCOM

By Robin Whittle, AFA DIRECTOR OF COMMUNICATIONS

On the Scene

Greater Seattle Chapter officials welcomed Air Force Vice Chief of Staff **Gen. John L. Piotrowski** as featured dinner speaker for the Chapter's December 11 meeting, reports **Al Lloyd,** Washington AFA Executive Vice President. Despite the whirl of holiday commitments, some 120 people turned out for the General's status report on key Air Force programs and people issues.

"General Piotrowski was highly complimentary of Air Force professionalism and noted that at Gunsmoke '86, F-16 pilots hit targets the size of manhole covers," Mr. Lloyd said. Another program singled out by the Vice Chief was AWACS. He said that since the E-3 went into service, "maintenance hours per flight hour on [it] have been reduced by three-quarters. In addition to its normal roles, the [E-3 has] served on a number of missions directed by the US State Department and was credited with preventing a war in Sudan," the AFA leader reported.

During the evening, Chapter President **Joe Jackson** honored General Piotrowski with a General Jimmy Doolittle Fellowship in AFA's Aerospace Education Foundation. Also honored at the dinner was Mr. Lloyd himself, who received from General Piotrowski an Air Force recruiting plaque for outstanding contributions to the Air Force recruiting mission.

This past December, after his status report on key programs and issues, Air Force Vice Chief of Staff Gen. John L. Piotrowski received a General Jimmy Doolittle Fellowship in AFA's Aerospace Education Foundation from Greater Seattle Chapter President Joe Jackson, a Medal of Honor recipient.

The event was held at the Red Lion Inn in Bellevue and began with a presentation of the colors by AFROTC Detachment 910 from the University of Washington.

"The cadets were able to visit with General Piotrowski and, in fact, spent quite some time talking with him to their delight," Mr. Lloyd said.

AFA's Carl Vinson Memorial Chapter recently honored **Maj. Gen. Cornelius Nugteren,** Commander of the Warner Robins Air Logistics Center at Robins AFB, Ga., with a General Ira C. Eaker Fellowship in AFA's Aerospace Education Foundation. General Nugteren also received the Chapter's "Supporter of the Year" plaque in recognition of "his interest, encouragement, and participation" in Chapter affairs, which "are at the very heart of our successful programs and activities," former Chapter President **Bob Richardson** said.

Also honored by the Chapter were **Jack Maret,** who received the Chapter's Exceptional Service Award, and **Joe Sherrill Stafford,** former Chapter President, named 1986 "Member of the Year." The Chapter also presented $7,500—proceeds from its recent golf tournament—to the Robins AFB Museum of Aviation.

In other Carl Vinson Memorial Chapter news, officials cosponsored with the *Daily Sun* newspaper the annual Christmas concert by the Band

After AFA National President Sam E. Keith, Jr. (second from right), addressed a special holiday meeting of the Mobile Chapter, Mobile Mayor Arthur Outlaw (right), joined by (from left) Chapter Vice President Dr. Frank Lugo and Chapter President Bobby Case, presented him with a token of appreciation.

INTERCOM

of the Air Force Reserve "as our Christmas card to the community," said Chapter President **Dan Bullard.** About 3,000 people attended the two-day concert at the Warner Robins Civic Center.

Also in support of the community, the Chapter recently donated a first prize $100 savings bond for a slogan contest designed to increase awareness of the dangers of drinking and driving. The bond went to a Civil Service employee at Robins AFB for the slogan: "Alcohol is a drug; driving is a sport; mixed together, they equal court." The contest was sponsored by the Social Actions Office at Robins AFB and was base-wide.

Maj. Richard Shelton directed the Band of the Air Force Reserve at the annual Christmas concert at the Warner Robins, Ga., Civic Center. Three thousand people attended the event, which was cosponsored by AFA's Carl Vinson Memorial Chapter and the local Daily Sun newspaper.

Active Alaska AFA leader **Vic Davis** found an editorial that appeared in the Anchorage *Times* on December 29. Entitled "Pride in the Military," it concluded: "It's not just the hardware—airplanes and ships and artillery pieces. It's not just a lot of land—barracks and hangars and headquarters buildings. The military is people. Men and women—mostly young, mostly far from home—in uniform and on duty out of a sense of patriotism. A love of country. A sense of obligation to serve and a willingness to sacrifice. Alaska is blessed by having among its people the men and women of the armed forces. We take pride in them. But we don't tell them that often enough. And we should. Make that one of your New Year's resolutions."

Thanks to AFA's Crawford Chapter in Cleveland, Ohio, which worked in concert with the Cleveland public school district, more than sixty Young Astronaut Councils have been set up in the elementary and intermediate levels for the 1987 school year.

"There isn't a better-organized program in the nation," said **David Jamison,** Director of Program Services for the Young Astronaut Council in Washington, D. C. **"La Wanna White** and **Dan Barringer** of the Cleveland General Education Division and **Leo Johnson** of the Air Force Association have done an outstanding job, and we are going to use their organizing techniques in cities throughout the country," he said.

Mr. Johnson, a former Crawford Chapter President, said that the Chapter provided funding to establish the Councils. Other businesses and agencies, such as TRW, Inc., Rockwell International Corp., and NASA's Lewis Research Center, have signed on through the Cleveland Minorities in Engineering Forum to provide lecturers and other educational resources, such as funding for field trips and travel, to the program.

The program was introduced to participating teachers in December and includes weekly or monthly activities stressing the mathematical, scientific, and technological aspects of the space program.

"We're doing the space program because it's current, kids are interested in it, and it gives teachers a chance to stay up to date on what's happening in the sciences," said Ms. White, who is Cleveland Science Supervisor. The result is that some 2,000 Cleveland school pupils will become Young Astronauts this semester as part of the national program to improve math and science education through understanding space exploration.

"Off We Go!" was the theme for the Greater Pittsburgh Chapter's January 14 meeting, which featured the new AFA film of the same name. "I thought this would be an appropriate way to begin the New Year," said Chapter President **Norm Marous.**

"This film was produced as a tool for bringing attention to and understanding of our Association. This subject is also in keeping with the things I talked about last month—mainly, that we are responsible for getting the word out. 'Off We Go' as in 'into the wild blue yonder' also seems like a great thought with which to start our new year, keeping in mind the challenges we face. Meeting our goals for membership growth and retention as well as self and public education will not be easy, but the reward will be fantastic as we watch our chapter grow and prosper." Mr. Marous's message appeared in the January issue of the Greater Pittsburgh Chapter newsletter.

In California, the Tennessee Ernie Ford Chapter has taken the Oak Grove High School AFJROTC unit under its wing. The JROTC unit is beginning its first year of operation, says **Gerry Chapman,** California AFA Board Chairman. Ford Chapter President **Jack McCarthy** has pledged Chapter support and, for starters, presented the unit with a state flag to accompany the American flag provided by USAF. The presentation was made at a Chapter dinner that included **Guy Klitgaard,** Principal of Oak Grove High School, and **Lt. Col.**

Tom Howard, USAF (Ret.), Aerospace Education Instructor, as special guests.

Eugene, Ore., Chapter President **Harry Hance,** during an interview on the public television show "Front Street," scheduled to air as this goes to press, discussed the Air Force's Ground Wave Emergency Network (GWEN) system and its value, requirements, and configuration. "We spent our time mostly at my horse barn, discussing the merits of GWEN. I think the TV crew took more footage of one of my horses than they did the discussion, but I feel that the background of our small ranch seemed to please them," Mr. Hance recalled.

Mr. Hance and several Eugene Chapter members as well as the Eugene Defense Education Committee have been actively defending the system against a gaggle of anti-GWEN groups that were successful in engineering passage of an ordinance proclaiming Eugene and all of Lane County, Ore., a "nuclear-free zone."

Mr. Hance says that many of those groups are now pressing for a similar ordinance in Klamath Falls that they believe will block erection of the GWEN tower there as well. In addition to interviews, speaking engagements, and appearances before the city council in support of GWEN, Mr. Hance has written a number of letters to the editor that have been published in the Eugene *Register Guard.*

Tennessee Ernie Ford Chapter officials donated a California state flag to the AFJROTC unit at Oak Grove High School in Sunnyvale. Pictured are (from left) Chapter President John T. McCarthy, Oak Grove Principal Guy Klitgaard, Lt. Col. Tom Howard, USAF (Ret.), and California AFA Board Chairman Gerald S. Chapman.

An Eglin Chapter-Fort Walton Beach, Fla., Chamber of Commerce mixer was held in November to honor Eglin Chapter Community Partners, reports Chapter President **Jack Taylor.** On hand were then-Commander of AFSC's Armament Division **Maj. Gen. Gordon E. Fornell,** who has since become Military Assistant to Defense Secretary Caspar Weinberger; members of the 33d Tactical Fighter Wing, which had recently won its second straight William Tell competition; Air Force Armament Museum Executive Director **William W. Lund;** Museum Director/Curator **Russell C. Sneddon; Marnie Tate,** Fort Walton Beach Chamber of Commerce President; **Col. Howard J. Oakes,** Eglin AFB Commander; and Fort Wal-

After keynoting the H. H. Arnold Chapter's military ball in Huntington, N. Y., Lt. Gen. Bernard Randolph accepted a General Jimmy Doolittle Fellowship in AFA's Aerospace Education Foundation from Chapter President Morton Grossman.

From left, Eglin Chapter President Jack Taylor, Armament Museum Director Russell C. Sneddon, Chamber of Commerce President Marnie Tate, and Maj. Gen. Gordon E. Fornell enjoy the Eglin Chapter-Fort Walton Beach Chamber of Commerce mixer.

AFA State Contacts

Following each state name are the names of the communities in which AFA Chapters are located. Information regarding these Chapters, or any place of AFA's activities within the state, may be obtained from the appropriate contact.

ALABAMA (Auburn, Birmingham, Gadsden, Huntsville, Mobile, Montgomery, Selma): **Roble Hackworth,** 206 Dublin Circle, Madison, Ala. 35758 (phone 205-532-4920, ext. 29).

ALASKA (Anchorage, Fairbanks): **Theron L. Jenne,** 2501 Banbury Drive, Anchorage, Alaska 99504 (phone 907-377-3360).

ARIZONA (Green Valley, Phoenix, Sedona, Sierra Vista, Sun City, Tucson): **Robert A. Munn,** 7042 Calle Bellatrix, Tucson, Ariz. 85710 (phone 602-747-9649).

ARKANSAS (Blytheville, Fayetteville, Fort Smith, Little Rock): **Thomas P. Williams,** 4404 Dawson Drive, N. Little Rock, Ark. 72116 (phone 501-758-6885).

CALIFORNIA (Apple Valley, Edwards, Fairfield, Fresno, Los Angeles, Merced, Monterey, Novato, Orange County, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, Sunnyvale, Vandenberg AFB, Yuba City): **Robert L. Griffin,** P. O. Box 5008, Vandenberg AFB, Calif. 93437 (phone 805-866-3501).

COLORADO (Boulder, Colorado Springs, Denver, Fort Collins, Grand Junction, Greeley, Littleton, Pueblo): **Jack G. Powell,** AFAFC/AJ, Denver, Colo. 80279-5000 (phone 303-370-4787).

CONNECTICUT (Brookfield, East Hartford, Middletown, Storrs, Stratford, Torrington, Waterbury, Westport, Windsor Locks): **Joseph Zaranka,** 9 S. Barn Hill Rd., Bloomfield, Conn. 06002 (phone 203-242-2092).

DELAWARE (Dover, Rehoboth Beach, Wilmington): **Horace W. Cook,** 112 Foxhall Drive, Dover, Del. 19901 (phone 302-674-1051).

DISTRICT OF COLUMBIA (Washington, D. C.): **Howard W. Cannon,** 1501 Lee Highway, Arlington, Va. 22209-1198 (phone 703-247-5820).

FLORIDA (Avon Park, Brandon, Broward County, Cape Coral, Daytona Beach, Fort Walton Beach, Gainesville, Homestead, Jacksonville, Leesburg, Miami, Naples, Neptune Beach, New Port Richey, Orlando, Panama City, Patrick AFB, Port Charlotte, Redington Beach, Sarasota, Tallahassee, Tampa, West Palm Beach, Winter Haven): **Donald T. Beck,** 1150 Covina St., Cocoa, Fla. 32927 (phone 305-636-7648).

GEORGIA (Athens, Atlanta, Columbus, Rome, Savannah, St. Simons Island, Valdosta, Warner Robins): **Robert W. Marsh, Jr.,** P. O. Box 542, Springfield, Ga. 31329 (phone 912-964-1941, ext. 254).

GUAM (Agana): **Michael C. Wilkins,** Box CV, Agana, Guam 96910 (phone 671-646-5259).

HAWAII (Honolulu, Puunene): **Don J. Daley,** P. O. Box 3200, Honolulu, Hawaii 96847 (phone 808-525-6296).

IDAHO (Boise, Mountain Home, Twin Falls): **Chester A. Walborn,** 510 E. 13th North, Mountain Home, Idaho 83647 (phone 208-587-7185).

ILLINOIS (Belleville, Champaign, Chicago, Elmhurst, Moline, Peoria, Springfield-Decatur): **Walter G. Vartan,** 230 W. Superior Court, Chicago, Ill. 60610 (phone 312-477-7503).

INDIANA (Bloomfield, Fort Wayne, Grissom AFB, Indianapolis, Lafayette, Marion, Mentone, South Bend, Terre Haute): **Bill Cummings,** 12031 Mahogany Drive, Fort Wayne, Ind. 46804 (phone 219-672-2728).

IOWA (Des Moines, Sioux City): **Carl B. Zimmerman,** 608 Waterloo Bldg., Waterloo, Iowa 50701 (phone 319-232-2650).

KANSAS (Garden City, Topeka, Wichita): **Cletus J. Pottebaum,** 6503 E. Murdock, Wichita, Kan. 67206 (phone 316-683-3963).

KENTUCKY (Lexington, Louisville): **Bryan J. Sifford,** c/o Ronnie W. McGill, 3409 Brunswick Rd., Lexington, Ky. 40503-4310 (phone 606-234-1642).

LOUISIANA (Alexandria, Baton Rouge, Bossier City, Monroe, New Orleans, Shreveport): **Paul J. Johnston,** 1703 W. Medalist Drive, Pineville, La. 71360.

MAINE (Bangor, Loring AFB, N. Berwick): **Alban E. Cyr, Sr.,** P. O. Box 160, Caribou, Me. 04736 (phone 207-496-3331).

MARYLAND (Andrews AFB area, Baltimore, Rockville): **William T. Reynolds,** 11903 Chesterton Drive, Upper Marlboro, Md. 20772 (phone 301-249-5438).

MASSACHUSETTS (Bedford, Boston, Falmouth, Florence, Hanscom AFB, Lexington, Taunton, West Springfield, Worcester): **Leo O'Halloran,** 420 Bedford St., Suite 290, Lexington, Mass. 02173 (phone 617-264-4603).

MICHIGAN (Alpena, Battle Creek, Detroit, Kalamazoo, Marquette, Mount Clemens, Oscoda, Petoskey, Southfield): **William Stone,** 7357 Lakewood Drive, Oscoda, Mich. 48750 (phone 517-724-6266).

MINNESOTA (Duluth, Minneapolis-St. Paul): **Earl M. Rogers, Jr.,** 325 Lake Ave., S., Duluth, Minn. 55802 (phone 218-727-2191).

MISSISSIPPI (Biloxi, Columbus, Jackson): **R. E. Smith,** Route 3, Box 282, Columbus, Miss. 39701 (phone 601-327-4071).

MISSOURI (Kansas City, Richards-Gebaur AFB, Springfield, St. Louis, Whiteman AFB): **Raymond W. Peterman,** 11315 Applewood Drive, Kansas City, Mo. 64134 (phone 816-761-7453).

MONTANA (Bozeman, Great Falls): **Ed White,** 2333 6th Ave., S. Great Falls, Mont. 59405 (phone 406-453-2054).

NEBRASKA (Lincoln, Omaha): **Donald D. Adams,** FirsTier Inc., 17th & Farnam, Omaha, Neb. 68102 (phone 402-348-7905).

NEVADA (Las Vegas, Reno): **Anthony Martinez,** 2156 C Kietzke Lane, Reno, Nev. 89502 (phone 916-836-0614).

NEW HAMPSHIRE (Manchester, Pease AFB): **Robert N. McChesney,** Scruton Pond Rd., Barrington, N. H. 03825 (phone 603-664-5090).

NEW JERSEY (Andover, Atlantic City, Belleville, Camden, Chatham, Cherry Hill, E. Rutherford, Forked River, Fort Monmouth, Jersey City, McGuire AFB, Middlesex County, Newark, Old Bridge, Trenton, Wallington, West Orange, Whitehouse Station): **Jim Young,** 513 Old Mill Rd., Spring Lake Heights, N. J. 07762 (phone 201-449-8637).

NEW MEXICO (Alamogordo, Albuquerque, Clovis): **Louie T. Evers,** P. O. Box 1946, Clovis, N. M. 88101 (phone 505-762-1798).

NEW YORK (Albany, Bethpage, Brooklyn, Buffalo, Chautauqua, Griffiss AFB, Hudson Valley, Nassau County, New York City, Niagara Falls, Patchogue, Plattsburgh, Queens, Rochester, Rome/Utica, Suffolk County, Syosset, Syracuse, Westchester, Westhampton Beach, White Plains): **Maxine Z. Donnelly,** 18 Jackson Place, Massapequa, N. Y. 11758 (phone 516-795-2746).

NORTH CAROLINA (Asheville, Charlotte, Fayetteville, Goldsboro, Greensboro, Kitty Hawk, Raleigh): **J. E. Smith,** P. O. Box 765, Princeton, N. C. 27569 (phone 919-936-9361).

NORTH DAKOTA (Concrete, Fargo, Grand Forks, Minot): **Michael Langlie,** 2901 Columbine Court, Grand Forks, N. D. 58201 (phone 701-772-7211).

OHIO (Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield, Newark, Youngstown): **John Boeman,** 10608 Lake Shore Blvd., Bratenal, Ohio 44108 (phone 216-249-8970).

OKLAHOMA (Altus, Enid, Oklahoma City, Tulsa): **Terry Little,** 4150 Timerlane, Enid, Okla. 73703 (phone 405-234-9624).

OREGON (Eugene, Portland): **Hal Langerud,** 10515 S. W. Clydesdale Terrace, Beaverton, Ore. 97005 (phone 503-644-0645).

PENNSYLVANIA (Allentown, Altoona, Beaver Falls, Coraopolis, Drexel Hill, Erie, Harrisburg, Homestead, Indiana, Johnstown, Lewistown, Mon-Valley, Philadelphia, Pittsburgh, Scranton, Shiremanstown, State College, Willow Grove, York): **David L. Jannetta,** P. O. Box 643, Altoona, Pa. 16603 (phone 814-943-8023).

PUERTO RICO (San Juan): **Fred Brown,** 1991 Jose F. Diaz, Rio Piedras, P. R. 00928 (phone 809-790-5288).

RHODE ISLAND (Warwick): **King Odell,** 413 Atlantic Ave., Warwick, R. I. 02888 (phone 401-941-5472).

SOUTH CAROLINA (Charleston, Clemson, Columbia, Myrtle Beach, Sumter): **Harry E. Lavin,** 28 Little Creek Rd., The Forest, Myrtle Beach, S. C. 29577 (phone 803-272-8440).

SOUTH DAKOTA (Rapid City, Sioux Falls): **Jim England,** Route 8, Box 3980, Rapid City, S. D. 57702 (phone 605-342-2200).

TENNESSEE (Chattanooga, Knoxville, Memphis, Nashville, Tri-Cities Area, Tullahoma): **Jack K. Westbrook,** P. O. Box 1801, Knoxville, Tenn. 37901 (phone 615-523-6000).

TEXAS (Abilene, Amarillo, Austin, Big Spring, College Station, Commerce, Corpus Christi, Dallas, Del Rio, Denton, El Paso, Fort Worth, Harlingen, Houston, Kerrville, Laredo, Lubbock, San Angelo, San Antonio, Waco, Wichita Falls): **Ollie R. Crawford,** P. O. Box 202470, Austin, Tex. 78720 (phone 512-331-5367).

UTAH (Brigham City, Clearfield, Ogden, Provo, Salt Lake City): **Marcus C. Williams,** 4286 S. 2300 West, Roy, Utah 84067 (phone 801-627-4490).

VERMONT (Burlington): **Ralph R. Goss,** 8 Summit Circle, Shelburn, Vt. 05482 (phone 802-985-2257).

VIRGINIA (Arlington, Charlottesville, Danville, Harrisonburg, Langley AFB, Lynchburg, Norfolk, Petersburg, Richmond, Roanoke): **Charles G. Durazo,** 1725 Jefferson Davis Highway, Suite 510, Arlington, Va. 22202 (phone 703-892-0331).

WASHINGTON (Bellingham, Seattle, Spokane, Tacoma, Yakima): **Charles Burdulis,** N. 5715 Sutherlin, Spokane, Wash. 99208 (phone 509-327-8902).

WEST VIRGINIA (Huntington): **David Bush,** 2317 S. Walnut Drive, St. Albans, W. Va. 25177 (phone 304-722-3583).

WISCONSIN (Madison, Milwaukee): **Gilbert Kwiatkowski,** 8260 W. Sheridan Ave., Milwaukee, Wis. 53218 (phone 414-463-1849).

WYOMING (Cheyenne): **Irene G. Johnigan,** 503 Notre Dame Court, Cheyenne, Wyo. 82009 (phone 307-775-3641).

INTERCOM

ton Beach City Councilman **Lee Bobo.**

All told, some 300 civic and military leaders turned out for the event, and one happy result was the addition of four new Community Partners for the Eglin Chapter. The four new partners are the Fort Walton Beach Chamber, Dolphin Cay Realty of Niceville, Fla., First City Bank of Fort Walton Beach, and Program Associates of Fort Walton Beach.

Distinguished guests at the Greater Pittsburgh Chapter's salute to the Air Force included (from left) Rep. Doug Walgren (D-Pa.); AFA National Director Judge John Brosky; Gen. Duane Cassidy, Commander in Chief of MAC: Tillie Metzger, the evening's mistress of ceremonies and Pennsylvania AFA leader; and AFA National Director Bob Carr.

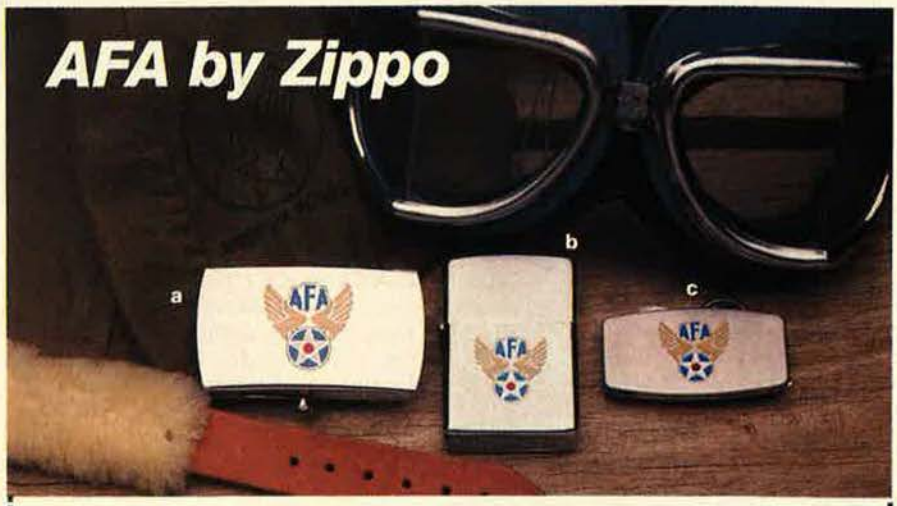
The founding of AFA's new **Charlottesville Chapter** in Virginia, led by President **Wayne E. Whitlatch,** was announced in the Charlottesville *Progress,* thanks to the efforts of the Chapter's Communications Director, **Hartman L. Butler, Jr.** A chartering meeting at the Omni Hotel attracted many of the Chapter's sixty members. Doing the honors was AFA National Secretary **A. A. "Bud" West,** who followed the evening's dinner speaker, **Maj. Gen. Jimmie V. Adams,** Deputy Chief of Staff for Requirements at TAC headquarters.

Another highlight of the evening was the introduction of the Chapter's first Community Partner, the Japanese Steak and Seafood House, represented by owners **Jim and Jeanne Mankie.** Other guests included State Sen. **Tom Michie** and State Reps. **Mitch Van Yahres** and **George Allen** and their wives, AFA National Director **H. B. "Buzz" Henderson,** and Virginia AFA President **Chuck Durazo.** "Virginia ranks fourth in the United States in total number of AFA members," Mr. Butler told the *Progress.* "More than 5,600 people are members of Virginia's ten chapters, the newest of which is the Charlottesville Chapter."

Two Tacoma Chapter Community Partners—the Klauser Corp., a supermarket in the Tacoma, Wash., area, and the Pacific Coca-Cola Bottling Co.—sponsored the Chapter's sixth Howard Scott Pro-Am Golf Tournament, with cash and prizes exceeding $13,000 this year, says Washington AFA Communications Director **Jack Gamble.**

"Our advertisers came through again, enabling us to donate $2,000 to the McChord Youth Activities Fund, $200 to the Western Washington PGA Chapter Junior Golf Program, and $3,500 to the Chapter's 'Big John Anderson' Scholarship Fund," Mr. Gamble said. Tournament Director **Denny Diestler** and his committee helped to ensure a successful event at McChord's Whispering Firs Golf Course.

Another big event for the Tacoma Chapter was the Washington AFA convention, which highlighted the subject of space and featured **Daniel Gregory,** manager of Advanced Space Transportation for the Boeing Co., who spoke on the merits of expendable launch vehicles and returnable launch vehicles, and **Brig. Gen. G. Wesley Clark,** Deputy Chief of



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INTERCOM

Staff for Plans for Air Force Space Command, who discussed future requirements in space.

Thirteen-year-old **Autumn Bourne,** one of two young people selected to represent the Young Astronaut Program on a special visit to Japan, attended the convention luncheon. Honored with national AFA awards during the convention were Washington AFA Executive Vice President **Al Lloyd** and state Communications Director **Jack Gamble.** Other honors went to **1st Lt. Julie Masura,** CAP Cadet Commander of the McChord Composite Squadron; **AFROTC Detachment 895** from Central Washington University, accepted by **Cadet Col. E. Meyers; Capt. Ronald White** of the 3561st USAF Recruiting Squadron; **Maj. Rose Sloan,** CAP Commander of the Sand Point Cadet Squadron; and the AFJROTC program at Medical Lake High School in the Spokane, Wash., area.

Lt. Gen. Bernard P. Randolph, Deputy Chief of Staff for Research, Development and Acquisition, was honored with a General Jimmy Doolittle Fellowship in AFA's Aerospace Education Foundation following a talk he gave to New York's H. H. Arnold Chapter's Military Ball at the Huntington Town House on Long Island in November.

Across the country in California, "Getting to Know You" was the theme of the General Robert F. Travis Chapter's November 13 dinner meeting that featured no speaker, no slide presentation, and no film, but simply allowed for an evening of fellowship and fun, reports Chapter President **Betty Hazeleaf** . . . **Bill Errington,** President of AFA's Mount Clemens, Mich., Chapter, presented a copy of the book *Wings* to **Steve Lutz,** Principal of Anchor Bay Junior High School, as part of the Chapter's continuing program to make copies of the book available to Michigan schools. The book features photographs of aircraft in today's Air Force . . . **Nathan Suarez,** Civil Air Patrol Cadet of the Year, was honored at the annual ball in Fort Wayne, Ind., reports Indiana AFA President **Bill Cummings.**

Doolittle Chapter Executive Vice President C. N. "Bud" Chamberlain presented a Chapter award for extraordinary achievement and meritorious service to Voyager pilot Jeana Yeager immediately following the international press conference held when Voyager landed last December 23. (Photo by Pat Koughan)

Sixteen-year-old **Julie Abel,** a former AFA Civil Air Patrol Cadet of the Year, was the youngest US representative to compete in the world model aircraft competition. She won a place on the US team at the world championships held last summer in Oslo, Norway. She placed tenth, flying a clipped-wing Piper Cub line-control model . . . Southern Indiana Chapter officials heard **Army Spec. 4 James C. Campbell II** discuss the cultural and economic aspects of life in Korea. Specialist Campbell is a Cobra helicopter crew chief and mechanic and was involved in assisting the Republic of Korea Army in the retrieval, transportation, and repair of its helicopter forces. Chapter President **Mark Oliphant** presented the book *Wings* to Specialist Campbell after his talk. ■

UNIT REUNIONS

AFLC/GEEIA-MDA
The Air Force Logistics Command's Ground Electronics Engineering Installation Agency (GEEIA) and Mobile Depot Activity (MDA) will hold a reunion on August 8, 1987, at the Applewoods Restaurant in Oklahoma City, Okla. **Contact:** Sophia Bronson, 13501 S. E. 29th St., Box 83, Choctaw, Okla. 73020. Phone: (405) 736-2511 or 736-3149. AUTOVON: 336-2511 or 336-3149.

Airborne Troop Carrier Forces
Members of the Airborne Troop Carrier Forces (groups, squadrons, and wings) will hold a reunion this year in Las Vegas, Nev. **Contact:** Robert J. De Maria, 1447 S. Arden St., Las Vegas, Nev. 89104. Phone: (702) 438-6752.

Bradley Field
Veterans of World War II who served at Bradley Field, Conn., will hold a reunion in April 1987 at Bradley IAP, Conn. **Contact:** Helen Snyder, 1463 Boulevard, West Hartford, Conn. 06119. Phone: (203) 561-3096.

Cannon AFB
Personnel who were stationed at Cannon AFB, N. M., will hold a reunion on August 14–16, 1987, at Cannon AFB, N. M. **Contact:** Cannon Reunion, 12609 Viewcrest N. E., Albuquerque, N. M. 87109. Phone: (505) 266-6621.

CBI Hump Pilots Ass'n
The China-Burma-India Hump Pilots and support personnel will hold their annual reunion on September 10–13, 1987, at the Registry Resort in Scottsdale, Ariz. **Contact:** Mrs. Jan Thies, 808 Lester St., Poplar Bluff, Mo. 63901. Phone: (314) 785-2420.

Guadalcanal Campaign Veterans
Veterans who served on Guadalcanal will hold a reunion on August 13–16, 1987, in Norfolk, Va. **Contact:** Ted Blahnik, P. O. Box 181, Coloma, Mich. 49038-0181.

5th Fighter Interceptor Squadron
The 5th Fighter Interceptor Squadron "Spitten Kittens" will hold a reunion on October 2–4, 1987, at the Winrock Inn in Albuquerque, N. M. **Contact:** E. K. "Pappy" Jenkins, 12125 Prospect Ave., N. E., Albuquerque, N. M. 87112. Phone: (505) 293-9767.

7th Bomb Wing Ass'n
The 7th Bomb Wing will hold a reunion on April 24–26, 1987, at the Green Oaks Inn in Fort Worth, Tex. **Contact:** Col. Richard S. George, USAF (Ret.), P. O. Box 330279, Fort Worth, Tex. 76163.

7th Photo Group Ass'n
Members of the 7th Photo Group will hold a reunion on October 14–18, 1987, in Pittsburgh, Pa. **Contact:** Claude Murray, 1933 E. Marshall, Phoenix, Ariz. 85016. Phone: (602) 274-5871.

8th Tactical Fighter Wing
The 8th Tactical Fighter Wing is planning to hold a reunion on October 8–11, 1987, in San Antonio, Tex. **Contact:** Col. Philip P. Combies, USAF (Ret.), P. O. Box 16605, San Antonio, Tex. 78216.

13th Bomb Squadron
Members of the 13th Bomb Squadron "Grim Reapers" who served in Korea have scheduled a memorial dedication and reunion for 1987. The memorial dedication will be held on May 9, 1987, at the Air Force Museum in Dayton, Ohio. The reunion will be held on August 27–29, 1987, in Colorado Springs, Colo. **Contact:** Dale Leedy (memorial dedication), 2226 Thurmont Rd., Akron, Ohio 44313. Phone: (216) 836-4322. Ed Nett (memorial dedication), 1449 Ambridge Rd., Centerville, Ohio 45459. Phone: (513) 433-3490. Richard Buchholz (reunion), P. O. Box 247, Saratoga, Wyo. 82331. Phone: (307) 326-5306. Jackie Bugg (reunion), 2006 21st Ave., Greenly, Colo. 80631. Phone: (303) 352-9378.

19th Bomb Group Ass'n
Members of the 19th Bomb Group will

1987 Roundtable Program

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April 22	***Focus On: "The Future of the ICBM–The Thirtieth Anniversary"***
May 13	***Focus On: "Educating for Tomorrow's Global Technology Needs"***
November 5	***Focus On: "Emerging Technologies"***

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- *Roundtable videotapes and transcripts are available on request for your organization's benefit?*
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Now that you know, all you need to do is call (703) 247-5852 to make a reservation to attend the Aerospace Education Foundation programs to be held in coming months in the Washington area.

Aerospace Education Foundation
1501 Lee Highway
Arlington, Virginia 22209-1198

hold a reunion on April 2–4, 1987, at the Howard Johnson's Hotel in Culver City, Calif. **Contact:** Robert E. Ley, 3574 Wellston Ct., Simi Valley, Calif. 93063. Phone: (818) 703-7717.

30th Bomb Group Ass'n
The 30th Bomb Group will hold its reunion on October 8–10, 1987, in Denver, Colo. **Contact:** John Allison, Box 485, Charleston, S. C. 29402-0485.

38th Air Depot Group/Repair Squadron
Members of the 38th Air Depot Group and Repair Squadron will hold a reunion in September or October 1987. **Contact:** Beatram Sullenger, 2214 Crenshaw Dr., Roswell, N. M. 88201. Charles Sulkala, 808 Neponset St., Norwood, Mass. 02062.

39th Fighter Squadron
Members of the 39th Fighter Squadron, 35th Fighter Group, Fifth Air Force, will hold a reunion on October 2–4, 1987, at the Antlers Motel in Colorado Springs, Colo. **Contact:** CMSgt. Nelson Thompson, USAF (Ret.), 9170 E. 8th St., Tucson, Ariz. 85710. Phone: (602) 885-9782.

P-40 Warhawk Pilots Ass'n
The P-40 Warhawk Pilots will hold their reunion on October 8–10, 1987, at the Ramada Hotel in Albuquerque, N. M. **Contact:** Col. John Roth, USAF (Ret.), 1017 Adams, S. E., Albuquerque, N. M. 87108. Phone: (505) 268-2903.

UNIT REUNIONS

Reunion Notices

Readers wishing to submit reunion notices to "Unit Reunions" should mail their notices well in advance of the event to "Unit Reunions," AIR FORCE Magazine, 1501 Lee Highway, Arlington, Va. 22209-1198. Please designate the unit holding the reunion, time, location, and a contact for more information.

47th Bomb Group
The 47th Bomb Group will hold a reunion on May 21–24, 1987, in Long Beach, Calif. **Contact:** Costa Chalas, Rainbow Travel, Inc., 67 Trapelo Rd., Cushing Square, Belmont, Mass. 02178. Phone: (617) 484-5620.

P-47 Thunderbolt Pilots Ass'n
The P-47 Thunderbolt Pilots will hold their annual reunion on May 8–10, 1987, at the Bahia Resort Hotel in San Diego, Calif. **Contact:** Pop Heying, 2888-116 Iris Ave., San Diego, Calif. 92154. Phone: (619) 424-6162.

57th Bomb Wing
Members of the 57th Bomb Wing will hold their annual reunion on July 21–25, 1987, at the Ramada Inn in Grand Forks, N. D. **Contact:** Robert E. Evans, 1950 Cunningham Dr., Speedway, Ind. 46224. Phone: (317) 247-7507.

64th Troop Carrier Group
The 64th Troop Carrier Group will hold a reunion on September 16–18, 1987, in Dayton, Ohio. **Contact:** William Wendling, 913 E. 96th St., Apt. A, Indianapolis, Ind. 46240. Phone: (317) 846-7550.

64th Troop Carrier Squadron
Members of the 64th Troop Carrier Squadron, 403d Troop Carrier Group, Thirteenth Air Force, will hold a reunion on October 10–12, 1987, at the Adam's Mark Caribbean Gulf Resort in Clearwater, Fla. **Contact:** John Hansel, 1501 Gulf Blvd., Apt. 707, Clearwater, Fla. 33515. Phone: (813) 595-5098.

79th Airdrome Squadron
The 79th Airdrome Squadron will hold a reunion on June 5–7, 1987, at the Belvedere Hotel in Baltimore, Md. **Contact:** Fred Hitchcock, 29 Blueberry Hill Lane, Sudbury, Mass. 01776. Phone: (617) 443-6679.

94th Bomb Group Ass'n
Members of the 94th Bomb Group will hold a reunion on October 7–11, 1987, at the Capitol Plaza Holiday Inn in Sacramen-

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Gen. John L. Piotrowski, the new Commander in Chief of the United States Space Command, is scheduled to keynote the event and head a panel of senior Air Force and DoD space experts on Thursday, May 21, 1987, at the Clarion Hotel in Colorado Springs, Colo.

Watch for further details and registration information in the April issue of AIR FORCE Magazine.

Air Force Association
1501 Lee Highway
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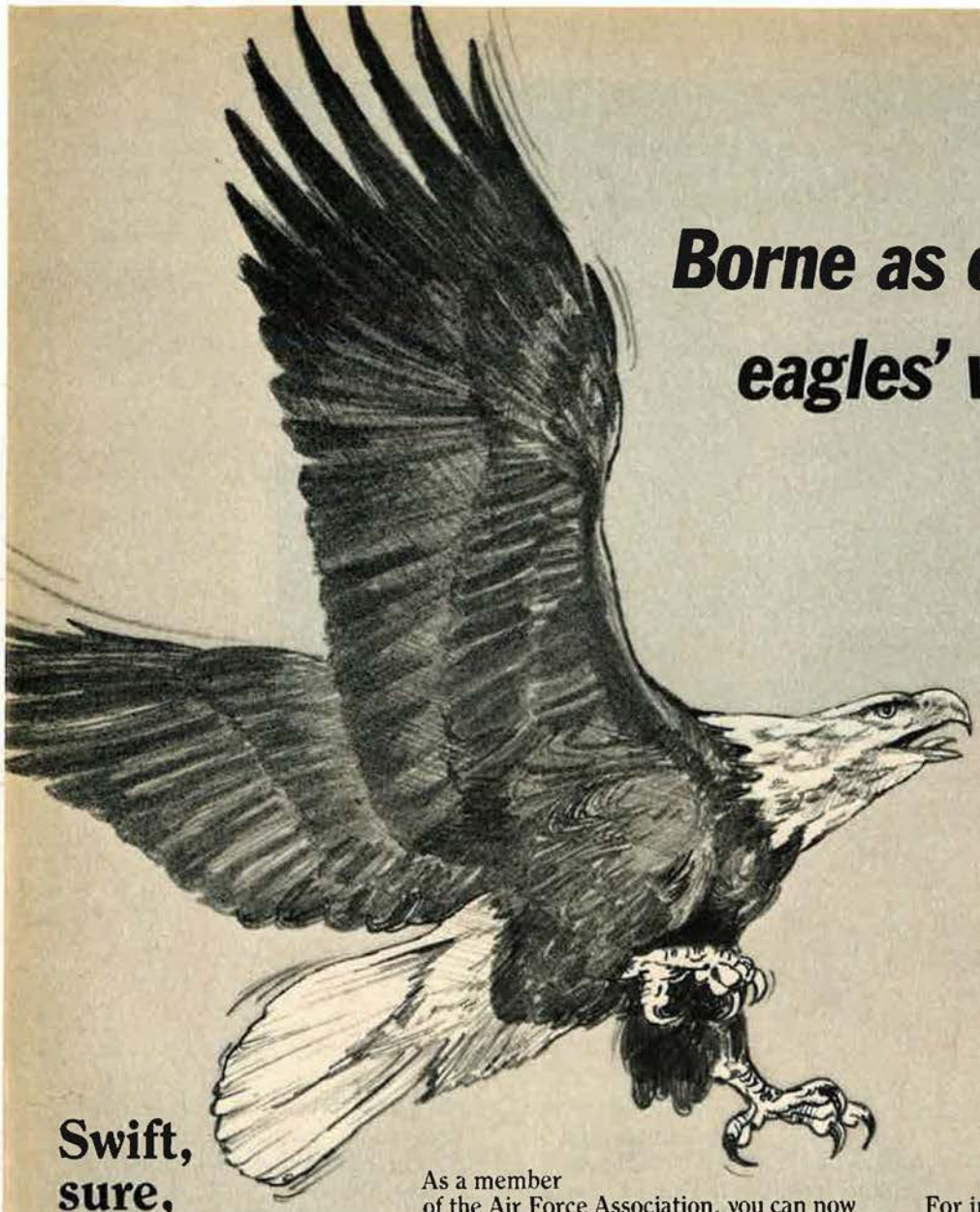

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Address

City State Zip

Credit Card No.

Signature

Expiration date

to, Calif. **Contact:** Wade C. Wilson, 1941 Harris Ave., San Jose, Calif. 95124. Phone: (408) 377-4787.

303d Bomb Group Ass'n
The 303d Bomb Group will hold a reunion on June 3–7, 1987, at the Hilton Hotel in Fort Worth, Tex. **Contact:** Bud Klint, 5728 Walla, Fort Worth, Tex. 76133. Hal Susskind, 2602 Deerfoot Trail, Austin, Tex. 78704. Phone: (512) 441-6475. A. R. Westfall, Jr., 804 Avenue N, Cisco, Tex. 76437.

305th Bomb Wing
Members of the 305th Bomb Wing will hold a reunion on May 14–18, 1987, in Tampa, Fla. **Contact:** Cliff Ball, 5813 David Davis Pl., Ocean Springs, Miss. 39564.

308th Bomb Wing
The 308th Bomb Wing will hold a reunion on May 1–4, 1987, in San Antonio, Tex. **Contact:** Allan T. Stein, 2 Hacienda Lane, Houston, Tex. 77024. Phone: (713) 461-3231.

311th Fighter Squadron Ass'n
The 311th Fighter Squadron and the 58th Fighter Group will hold a reunion on June 5–7, 1987, in Louisville, Ky. **Contact:** Anthony J. Kupferer, 2025 Bono Rd., New Albany, Ind. 47150. Phone: (812) 945-7649.

347th Fighter Wing
Members of the 347th Fighter Wing will hold a reunion on September 17–20, 1987, in San Diego, Calif. **Contact:** Jack Jacobson, 3762 Arnold Ave., No. 2, San Diego, Calif. 92104. Phone: (619) 299-1775.

Coming Events

April 24–25, **Alabama State Convention,** Mobile . . . May 9, **Connecticut State Convention,** Vernon . . . May 16, **Oregon State Convention,** Portland . . . June 5–7, **New York State Convention,** Albany . . . June 13, **Louisiana State Convention,** Barksdale AFB . . . June 19–21, **New Jersey State Convention,** Cape May . . . June 19–21, **Ohio State Convention,** Warren . . . July 17–19, **Pennsylvania State Convention,** Harrisburg . . . July 17–19, **Texas State Convention,** Dallas . . . July 31–August 1, **Colorado State Convention,** Denver . . . July 31–August 1, **Florida State Convention,** Tampa . . . July 31–August 1, **Missouri State Convention,** Kansas City . . . August 19, **Delaware State Convention,** Dover AFB . . . August 20–23, **California State Convention,** Vandenberg AFB . . . August 21–22, **Illinois State Convention,** Chicago . . . August 21–23, **Utah State Convention,** Salt Lake City . . . August 28–30, **Arizona State Convention,** Phoenix . . . September 14–17, **AFA National Convention and Aerospace Development Briefings and Displays,** Washington, D. C.

UNIT REUNIONS

369th Fighter Squadron
The 369th Fighter Squadron will hold a reunion on August 27–29, 1987, in Ogdenburg, N. Y. **Contact:** Anthony Chardella, 105 Mohawk Trail Dr., Pittsburgh, Pa. 15235. Phone: (412) 793-7619. Larry Bouchard, 306 Proctor Ave., Ogdenburg, N. Y. 13669.

455th Bomb Squadron
The 455th Bomb Squadron "Whitetail Marauders" will hold a reunion on September 24–27, 1987, in San Diego, Calif. **Contact:** Charles Anderson, 4214 Quapaw Ave., San Diego, Calif. 92117. Phone: (714) 276-2898. C. R. Owens, P. O. Box 605, Ballinger, Tex. 76821. Phone: (915) 365-2402.

455th Strategic Missile Wing
Members of the 455th Strategic Missile Wing will hold a reunion on August 26–28, 1987, in Minot, N. D. **Contact:** Tom O. Olofson, 4525 Banff St., Annandale, Va. 22003. Raymond T. Cwikowski, 700 Banbury Rd., Dayton, Ohio 45459.

456th Bomb Group Ass'n
The 456th Bomb Group will hold a reunion on September 8–13, 1987, at the Key Bridge Marriott in Arlington, Va. **Contact:** James F. Watkins, 11415 Minor Dr., Kansas City, Mo. 64114.

487th Bomb Group
The 487th Bomb Group will hold a reunion on July 22–25, 1987. **Contact:** Henry Hughey, 1529 Delia Dr., Decatur, Ga. 30033.

574th/565th SAW Ass'n
The 574th/565th SAW will hold a reunion in September 1987 in Chicago, Ill. **Contact:** Angel M. Zaragoza, 1571 9th St., San Bernardino, Calif. 92411.

815th Troop Carrier Squadron
Members of the 815th Troop Carrier Squadron who served at Ashiya AB, Japan, during 1954–57 will hold a reunion on June 28–July 1, 1987, in Las Vegas, Nev. **Contact:** Lt. Col. Robert F. Ambrose, USAF (Ret.), 6204 Cromwell Ave., Las Vegas, Nev. 89107.

825th Radar Squadron
Members of the 825th Radar Squadron who served at Kamloops, British Columbia, on the Cadin Pinetree Line Radar Site will hold a reunion on July 31–August 2. **Contact:** Catherine M. Levins, P. O. Box 4000, Kamloops, B. C., Canada V2C 5R7.

870th Chemical Company
Members of the 870th Chemical Company who served on Saipan during World War II will hold a reunion on September 24–26, 1987, at the General Butler Resort Park in Carrollton, Ky. **Contact:** Edward J. Kleindienst, 41 Judge Lane, Bethlehem, Conn. 06751. Phone: (203) 266-7437.

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Bob Stevens'

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AS "B" FOLLOWS "A":

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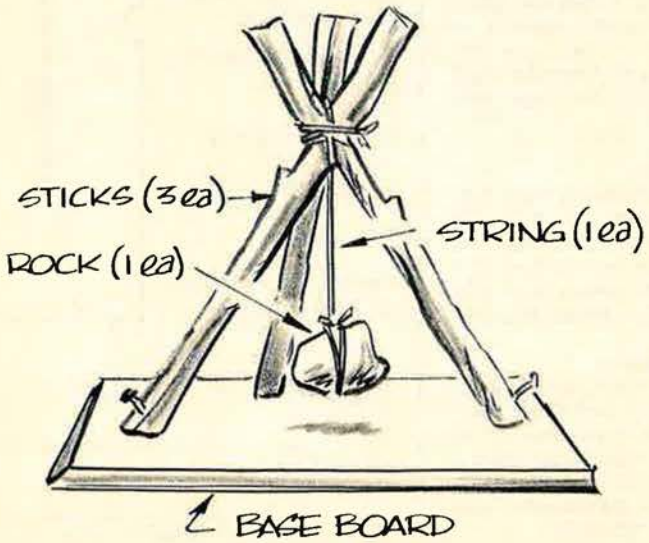

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IF ROCK IS:	IT'S:
WET	RAINING
WHITE	SNOWING
MOVING	WINDY
HARD TO SEE	FOGGY
CASTING SHADOW	SUNNY
COLD	CHILLY OUT
WARM	HOT OUT

PILOTS: TAKE THE GUESSWORK OUT OF WX BRIEFINGS - MAKE YOUR **OWN** STATION!

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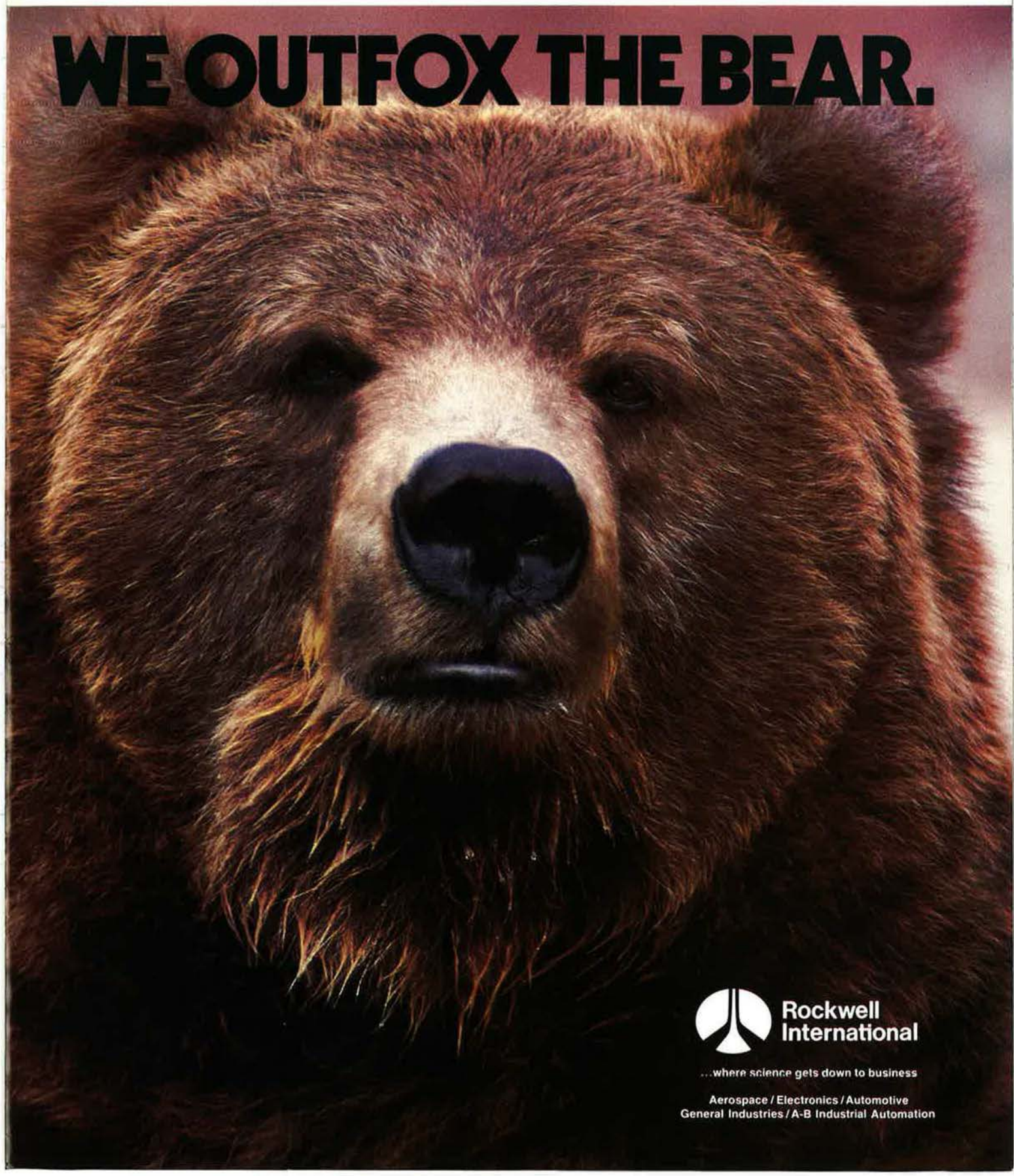

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