MARCH 1983/$3

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

SOVIET AEROSPACE ALMANAC 1983

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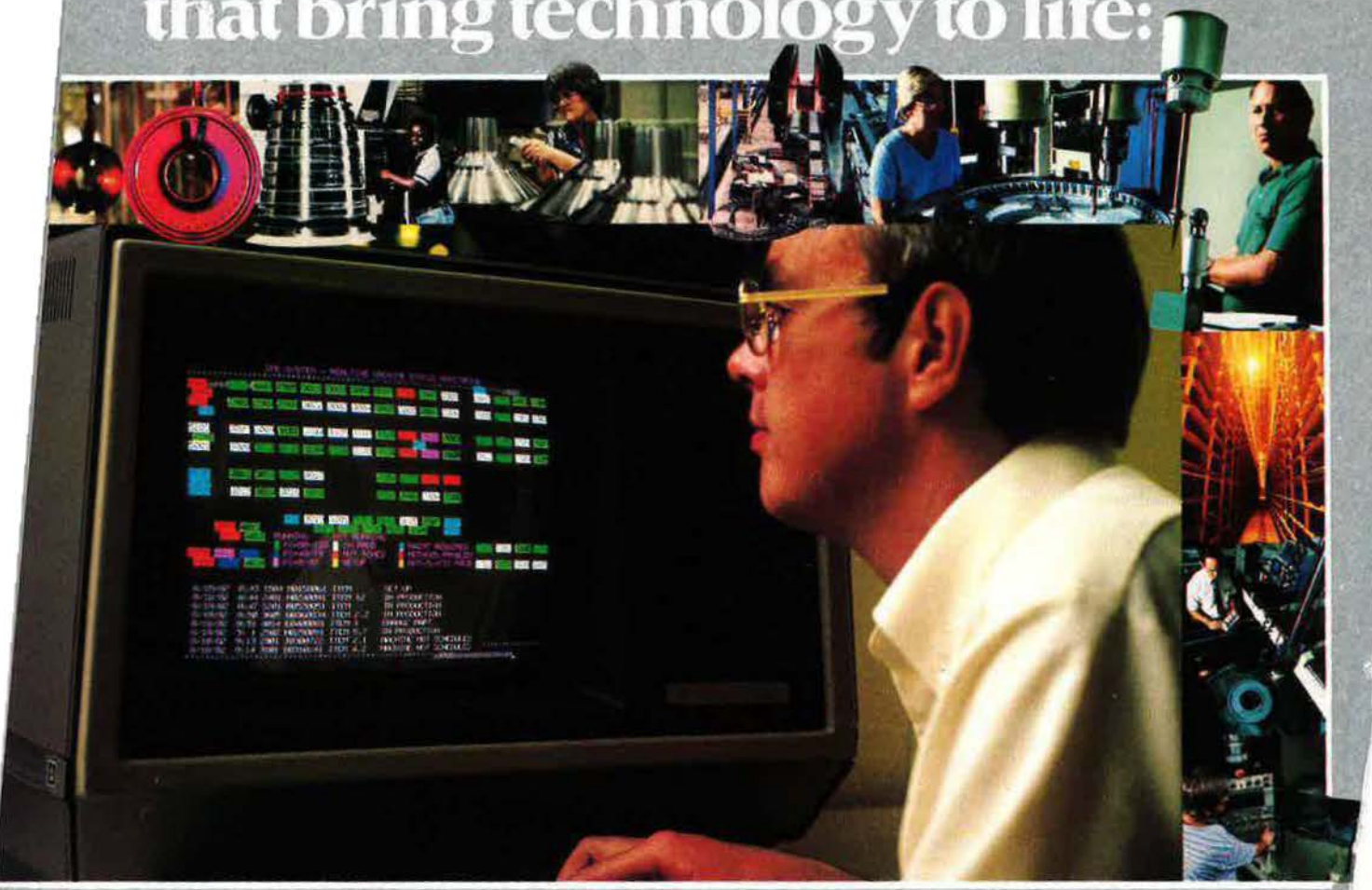

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GENERAL ELECTRIC

FOR THE AIR COMBAT ARENA OF THE 1990's!

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CHECKLIST FOR THE 90's

Technology	*Our status*
Digital fly by wire	✓
1750 processor	*in progress*
J73/ADA software	*in progress*
Fault tolerant architecture	
– in hardware	✓
– in software	✓
Direct drive actuation	*in progress*
VHSIC/VLSI	*in progress*
Fiber optics	*in progress*
Multivariable control	✓
Active control	✓

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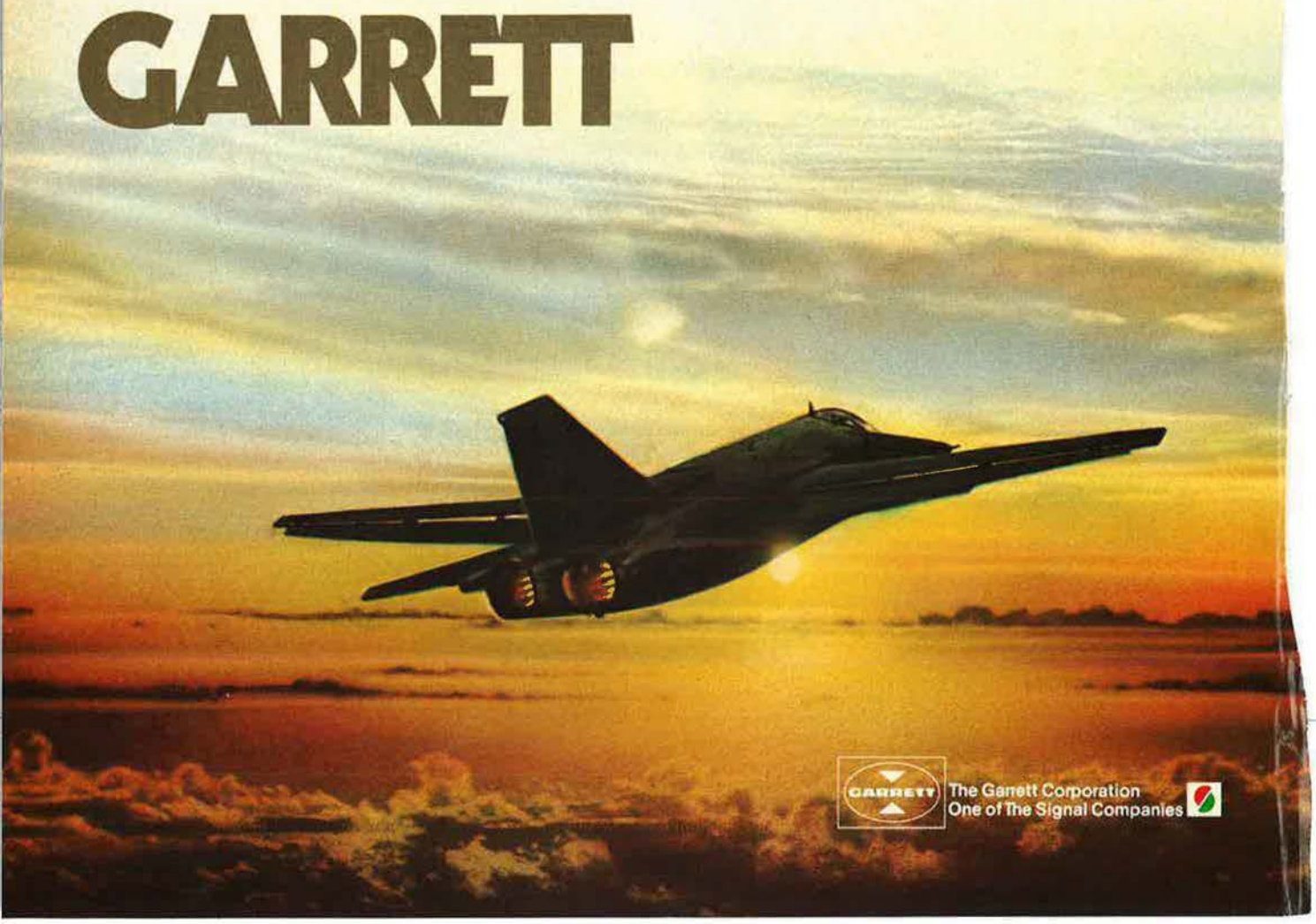

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MARCH 1983
VOLUME 66, NUMBER 3

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

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Page 79

About the cover: An Su-24 Fencer skirts the Tien Shan mountain range along the Soviet/Chinese border in this painting by William S. Phillips.

Special Section: Soviet Aerospace Almanac

Features

Departments

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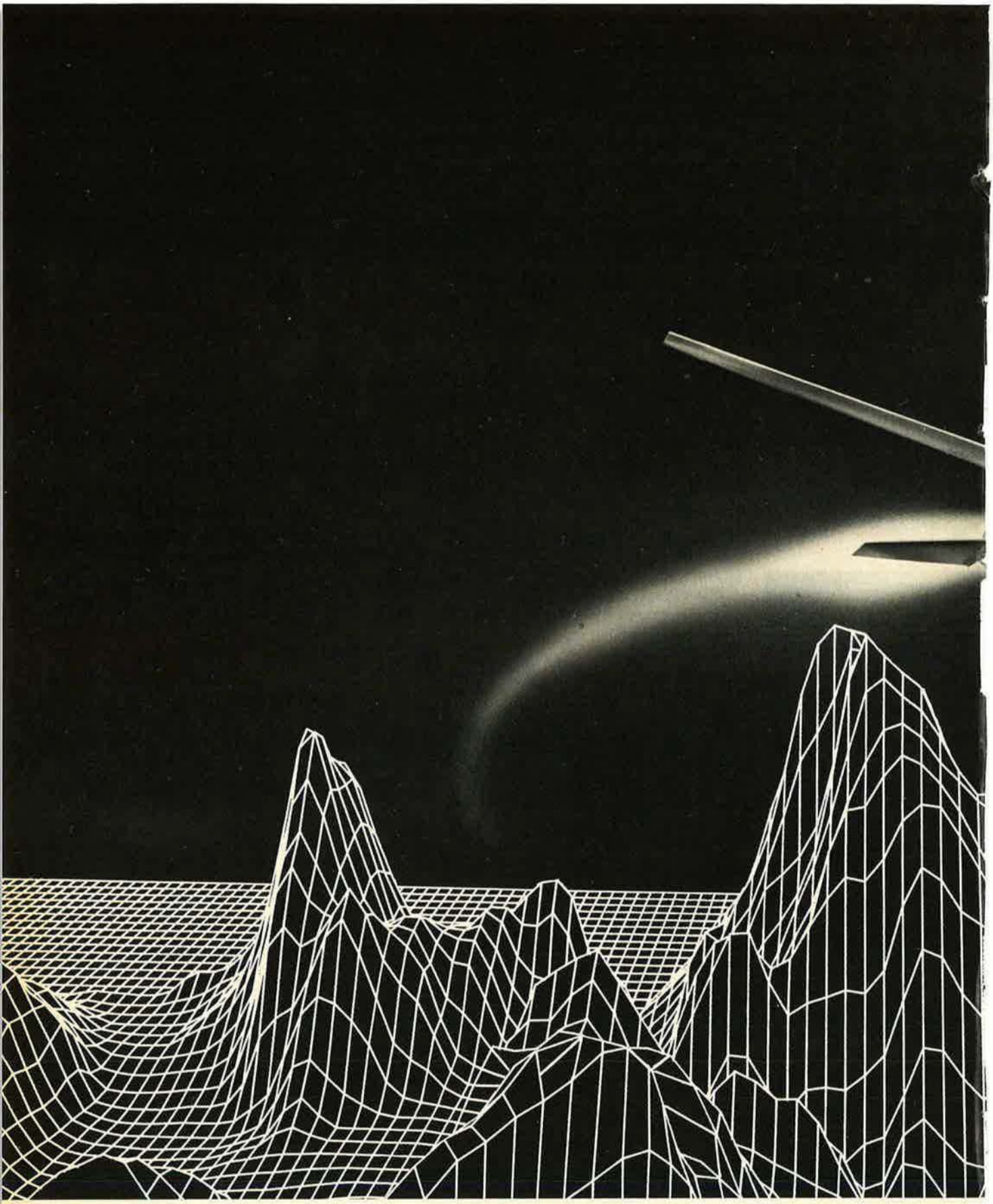

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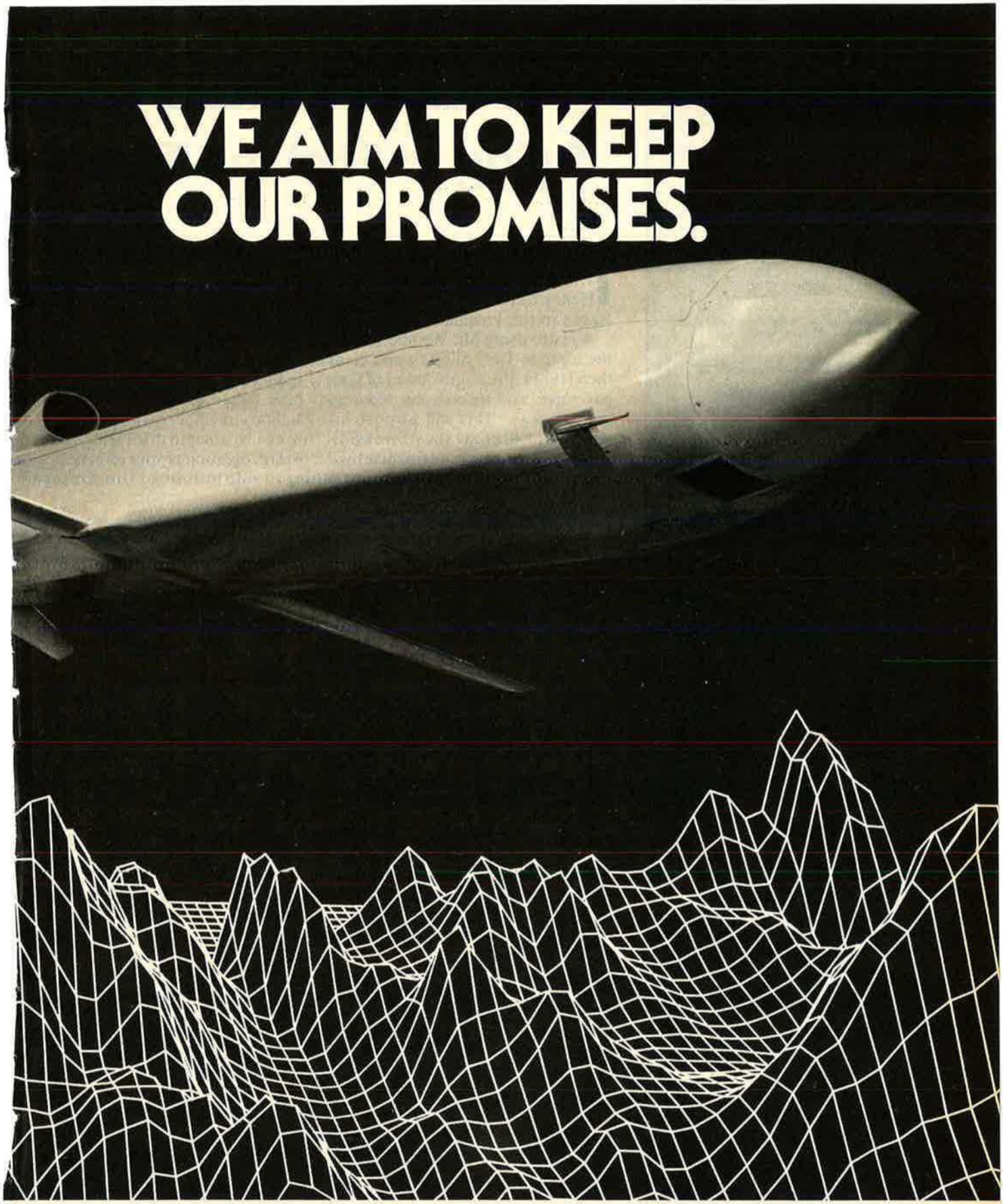

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Advertising Director
Charles E. Cruze
1750 Pennsylvania Ave., N.W.
Washington, D.C. 20006
Tel: 202/637-3330

Director of Marketing Services
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Richard A. Ewin
Overseas Publicity Ltd.
91-101 Oxford Street
London W1R 1RA, England
Tel: 1-439-9263

Italy and Switzerland
Dr. Vittorio F. Negrone, Ediconsult
Internationale S.A.S. Piazzo Fontane Marose 3
16123 Genova, Italy
Tel: (010) 543659

Germany and Austria
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AN EDITORIAL

Trying to Fool the Troops

IT IS time to alert Secretary of Defense Weinberger and his spokesman, Henry Catto. They are compounding the bad effects of the cost of living freeze in the President's proposed 1984 budget.

A jester using Mr. Weinberger's name issued a long-winded statement on the topic to DoD military and civilian employees. Midway, it said, "Since then [1981], the combination of greatly reduced inflation rates, the FY 1983 pay raise, and income tax reductions have halted erosion to the value of military pay." This will surprise many military members who know otherwise. The end of the statement said, "You can be assured that I will continue to press for appropriate financial and moral recognition of your efforts. . . ."

Just try feeding your children or getting an auto loan with "moral recognition of your efforts. . . ."

The troops are easy targets. They can't fight back, except by leaving the service when their time is up, or by dissuading others to join. AFA's leadership urged President Reagan to review his decision on this freeze *(see letter, p. 131)*. The uniformed leaders, especially Air Force Chief of Staff Gen. Charles A. Gabriel, Marine Corps Commandant Gen. Robert H. Barrow, and Gen. John W. Vessey, Jr., Chairman of the JCS, have noted the negative consequences of the freeze. Unfortunately, the civilian leadership failed to consult them before whacking the troops.

Somebody sent a letter to the Washington *Post* in Henry Catto's name after the newspaper lamented the pay freeze and said that US military strength rests "not on the numbers of its weapons but on the quality and morale of the people in uniform." The person using Catto's name suffered from lack of oxygen, saying, "That's true only up to a point, as General Custer found out. The crucial factors are quality weapons and people, not wampum, and our people know it."

This statement is confused. Custer declined General Terry's offer of three Gatling guns before the Little Big Horn. His troops had better weapons than the Indians (7th Cavalry with 1873 Springfield carbines and 1873 Colt revolvers vs. Indians with a little bit of everything, including captured Springfields and bows and arrows), but he only had between 210 and 225 men on the hill against an estimated 1,000 Indians. Custer's men fought dismounted in an exposed position. The Indians outnumbered him four to one, and had some concealment.

Contrary to Catto's writer, the critical factors at the Little Big Horn were recklessness and poor leadership on Custer's part and overwhelming numbers of Indians.

So whoever's trying to fool the troops in Weinberger's and Catto's names ought to stop. Instead, while the freeze is dealt with in Congress, the top civilian leaders should start seeking meaningful ways to help the troops without wasting money.

Opportunities abound for the civilian leaders to do some good here. But first, they should actually consult the uniformed chiefs, who already have a number of reasonable suggestions. We'll compile a list of our own, and urge AFA members to do the same. Meanwhile, we'll keep saying that freezing the cost of living increases of US military and civilian employees is a false economy, fraught with long-term damage probabilities.

F. Clifton Berry

F. CLIFTON BERRY, JR.
EDITOR IN CHIEF

WHEN TOMORROW DAWNED?

If you are a governmental or business leader responsible for planning and executing complex defense, civil, or commercial programs in this complex world of ours, we may have bad news. For many systems and programs, the future got here early. Events outraced timetables. "Tomorrow" came and went.

Major problems arose in national defense, communications, energy, transportation, and other sectors of public policy and private endeavor. Delays. Overruns. Missed targets. Corrective measures that failed to measure up. If any of this happened to you, that's another good reason to seek BDM's help before it happens again.

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CHANGING THE COURSE OF MANAGEMENT

AIRMAIL

The Freeze

I was highly impressed with the attention given to the misguided Catholic minority currently picturing the US as the foremost threat to peace in the world. Colonel Duff's letter *(January '83 issue, "Airmail," p. 11),* Mr. Ulsamer's article *("In Focus . . ." p. 19),* and General Milton's essay *("Viewpoint," p. 67)* were all eloquent pleas for sanity. As a practicing Catholic, I know few other Catholics who share the belief that the Soviets are benign, peace-loving, and not responsible for the arms race. Unfortunately, a very great number of our Catholic leaders, and especially our journalists, appear to have swallowed the Kremlin's line. Although they are in a minority, they have a lot of clout.

The solution: Raise "heck" by writing letters to the editors of your Catholic newspapers, magazines, and leaflets. Protest to your bishop in careful, polite, and factual letters. Object to the use of your Catholic schools as forums for Soviet propaganda. Point out that while the US delayed the Trident, halted the neutron bomb, and canceled the B-1, the Soviets deployed a new generation of MIRV-equipped nuclear subs, fielded a new generation of IRBMs (more than 300) in Europe, and built 200 Backfires—an aircraft one and a half times as heavy as the aging F-111.

It should also be brought to our fellow Catholics' attention that the Soviet Union not only registers for the draft, but in fact drafts everyone for three years of active duty with a reserve obligation to age fifty, and requires hundreds of hours of premilitary training for all youngsters in the schools, including live firing of weapons during summer vacations.

Clearly, the Russians have succeeded in blinding our fellow Catholics. Only we can pull the blinders off. And don't forget—if the leadership gets too far off base in your diocese, you can always pull your financial support. . . . We pro-American and pro-defense Catholics can make a difference, but only if we speak up.

Griffin T. Murphey
Fort Worth, Tex.

A reading of the articles in the January 1983 issue prompts this letter. As a devoted Catholic with a love towards my church, I find myself faced with the decision to follow either my church or my country.

Your article by Gen. T. R. Milton, USAF (Ret.), *("More Harm Than Good," p. 67)* concerns me only because I feel there should be no doubt in the minds of all Catholics that the oath we took to follow our Commander in Chief and to protect our country must take precedence when our church violates the doctrine of the separation of church and state.

I am the Air Force's western engineer representative, and on a day-to-day basis I preach on the ways of the Air Force and the necessity of our existence. My time in research and development has been spent in missiles and missile guidance systems. If I have helped in any way possible in assuring the success of our missile wings and their mission, I am proud. If my church condemns my work, calls it immoral, and perhaps goes to the extreme of excommunicating me, let them have at it. Without my country I would not have the freedom to choose my religion.

Perhaps now is the time to begin looking for one that accepts the protection and freedom that our way of national defense has provided the world.

Capt. Gerardo H. Garza, USAF
Sacramento, Calif.

My congratulations to Col. Robert T. Duff, USAF (Ret.), and *our* magazine for the letter "The Freeze" in the "Airmail" section *(p. 11)* of the January 1983 issue.

I have been trying to draft a similar letter for two months expressing my views on the same subject. Colonel Duff's letter encompassed every point I wanted to present.

I would like to hear from others.

Col. D. R. Taylor, USAF (Ret.)
Austin, Tex.

In reference to your January 1983 issue, and specifically the article by Gen. T. R. Milton, USAF (Ret.), "More Harm Than Good" *(p. 67):* I would like to make the following comment.

If General Milton cannot understand the difference between launching a megaton nuclear weapon on a city and a B-17 or B-24 bomber raid on a defended city, then he does not understand the difference between moral, civilized man and animals.

I pray that the American Council of Catholic Bishops has the courage of its convictions and informs the Catholics of America that there are certain actions, even in a nuclear war, that are immoral and against the basic Judeo-Christian beliefs.

J. R. Kiely
Acton, Mass.

The Defense Budget

The question of affordability is necessarily on the front burner as the new Congress convenes *("Defense Is Affordable—If . . . " p. 8, January '83).* Let's quickly dispose of the givens: (1) a healthy economy is important to national security, (2) national defense was sorely neglected from the height of the Vietnam War until the Reagan Administration assumed office, and (3) the proposed budget will be cut, perhaps significantly.

It may be catchy to talk about the billions spent on advertising and soda pop; that ploy usually generates counteranalogies—the Air Force missile and aircraft expenditures cited in your editorial are almost four times what the people of Wisconsin spend in two years on their university system. Now, unless you propose to sovietize national life . . .

The neglect of our national defense for at least a twelve-year period, while we were fighting a war, has got to be proof positive of the need for a bipartisan defense policy—much as Senator Vandenberg saw the need for a bipartisan foreign policy when the White House and the Senate were controlled by different parties. The need for such a statesman is clear. The defense program looks like it was put together by industry. Its presentation, as you point out, has been less than inspiring.

It looks to me that, for the next bud-

get, the statesmanship will have to be provided by the military leadership. I think that it can be done by proposing to accomplish the program over a little bit longer period, say eight years rather than five.

Maybe the politicians can pick up that clue and rise to the challenge.

Lt. Col. J. L. Schaefer,
USAF (Ret.)
Wauwatosa, Wis.

The MX Debate

For the past few years I have observed with continuing curiosity and confusion the debate over the MX missile. The only conclusion that appears to be widely shared is that the Soviet Union has continued to improve its ICBM force in terms of both accuracy and throw-weight. This in turn has opened a "window of vulnerability" for our own Minuteman force.

Thank goodness the founders of our present nuclear defense system had the foresight to anticipate this problem and developed our strategic doctrine around a nuclear triad. While it is naïve to assume that the remaining two elements of the triad are safe from Soviet countermeasures, it would be an outright lie to say that they do not pose a significant nuclear deterrent. The development and production of the B-1B and Trident submarine will add even more capability to these two elements and will allow time for a careful, well-researched examination of the future of America's ICBM force.

While I am hardly an expert, I do feel strongly in the continued validity of a nuclear triad. However, the vulnerability of our ICBM force does not justify our country spending precious and limited resources on a weapon system that provides such a controversial and questionable solution as is the case with MX. The Defense Department has been unable to convince itself, much less Congress, that either deceptive basing or Dense Pack is the optimum basing mode. Our Congress faces the reality of the largest budget deficit in history and increased pressure to raise national employment. It is asking an awful lot of this Congress to fund an expensive MX basing plan that even the Defense Department appears to endorse half-heartedly.

Yes, the MX missile should continue to be developed so it will be ready when a viable basing and/or ABM system is decided upon. Congress has provided for this in spite of all the publicity proclaiming a major defeat for MX during the last Congress. It is now up to the President's blue-ribbon panel and the Defense Department to solidify their forces and to present to Congress what needs to be done to preserve a credible deterrent against the Soviets. . . .

The point is that the Air Force and the Defense Department have been unable to agree even among themselves, which has led to more skepticism in Congress. This in turn has increased the risk of the Air Force not only losing the MX, but the MX money as well.

1st Lt. James A. Jimenez, USAF
Williams AFB, Ariz.

AIRMAIL

The Pioneers

Your feature article in the January '83 issue on the early days of blacks in US aviation *("The Pioneers," p. 68)* warmed the cockles of my airman heart, in particular the loving words about Mr. Cornelius R. Coffey, pilot instructor number C-36609 in my first civil log book.

In 1943, for the convenience of the US government, I was among many transferred out of AAF cadet pilot training and assigned training and duties on the Martin B-26 Marauder with the ETO's Ninth Air Force. Following the end of the war, I was determined to become a pilot and enrolled under the GI Bill at the Lewis Holy Name School of Aeronautics in Lockport, Ill. My first instructor was dear Mr. C. R. Coffey—God love him.

How well I remember and recall this superbly professional airman! His patience, thoroughness, and diligence in ensuring that I achieved a solid core of pilot training on the ground as well as in the air serve me to this very day. . . .

Starting from Mr. Coffey's early, solid stepping-stones of professional pilot training, I have moved progressively into the realm of turbine-powered jet flight. . . . I am aware, appreciative, and thankful to Mr. Coffey for teaching this white man how to enjoy each and every minute of flight.

Edward Kranch
Los Angeles, Calif.

Your article in the January '83 issue, "The Pioneers," is delightful and refreshing.

As a CPT student, flying cadet, and finally a "Hump" pilot, I remember those rough days—segregated. Fortunately, minds cleared somewhat, and our Negro brothers serve equally in the Air Force.

I look forward to your next issue and the second installment. I hope that you will find it possible to mention the great black leader and airman, Daniel "Chappie" James, Jr.

John E. Most
Lakeland, Fla.

The Military Wife

I would like to request the assistance of readers for a very unique and special study that I am conducting as part of my doctoral dissertation research on the subject of the role of the military wife.

As a military wife and former Air Force nurse, I have long recognized the significant contributions that military wives have made throughout history to the military community, its mission, and, last but not least, to their husbands' career goals and objectives. This oftentimes silent but very supportive role, however, has rarely been researched and documented for the purpose of clearly defining the expectations and experiences commonly shared by military wives in fulfilling that role.

Some have viewed that role as a personal, voluntary one they fulfill out of love and devotion to their husband and country. Others, though no less devoted to their husband or country, have viewed it as an infringement upon their personal life, citing, for example, the numerous and various functions and activities that they feel obligated or are directed to participate in within the military community. One only has to be reminded of the ongoing pension rights controversy over establishing the basis and worth of an ex-military wife's contribution to her husband's military career in order to appreciate the need for a clear definition of her responsibilities as well as for setting a standard of measure in evaluating her contributions in that role.

While in search of that definition over the past three years, I have surveyed and conducted interviews with wives of enlisted personnel and officers in all branches of service, and have determined that this is indeed a subject worthy of in-depth study and careful analysis. This longitudinal study will ultimately include all military wives; however, for the purposes of the dissertation, the role of the Air Force officer's wife will initially be studied. This first study will highlight the experiences and perceptions of Air Force officers' wives on their role and their recommendations for changes in public policies and/or local customs or expectations. . . .

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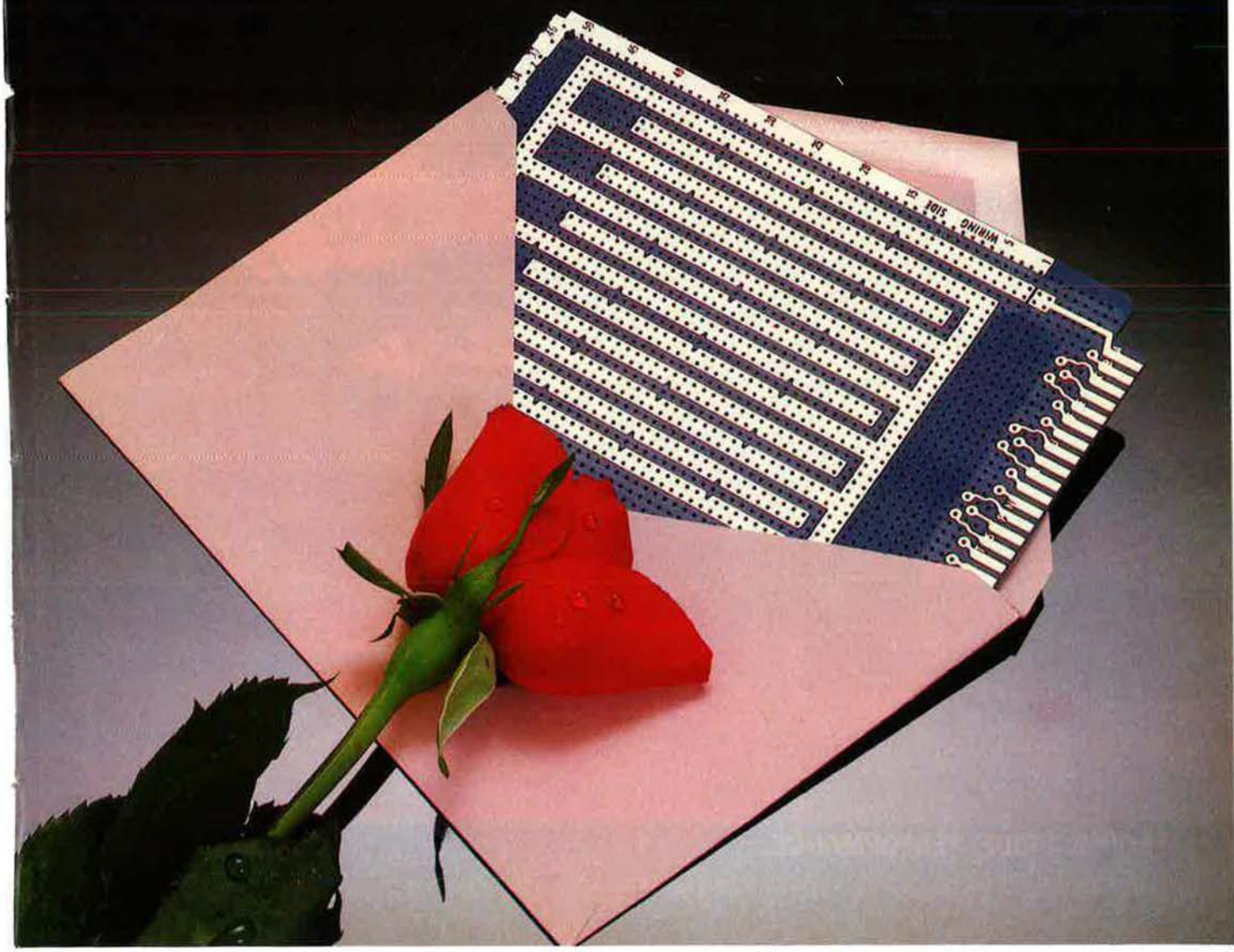

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AIRMAIL

I would greatly appreciate hearing from any Air Force officer's wife who would like to take part in this confidential survey. I may be contacted at the address below.

Maureen R. Degen
571 Buck Ave.
Vacaville, Calif. 95688
Phone: (707) 448-7781

488th Bomb Squadron

The Alamo Wing of the Confederate Air Force has recently completed the restoration of a B-25J medium bomber. Our aircraft is painted in the desert camouflage scheme of the 57th Bomb Wing, 340th Bomb Group, 488th Bomb Squadron, with the field numbers "8U" on the empennage. This particular aircraft was known as *Poon-Tang* during the war. It has been rechristened *The Yellow Rose*. . . .

We would like to hear from any member of *Poon-Tang's* crew. . . . We are particularly interested in buying a copy of the 488th Squadron book, published in 1946 but now long out of print.

Our goal is to build a library with documents and artifacts portraying the war history of the 340th Bomb Group. Our aircraft is based at the old Hondo AAB, forty miles west of San Antonio, and it participates in several air shows with the Confederate Air Force throughout the country. We want to preserve the heritage of that unequaled time in history . . . with real live smoking and firebreathing World War II aircraft that the general public can actually touch and see in action.

Capt. Patrick H. Murphy,
USAF (Ret.)
5819 Bogart St.
San Antonio, Tex. 78240
Phone: (512) 681-6352

Thorsness/Fisher Missions

We are working with Air Force Medal of Honor winners Leo Thorsness and Bernard Fisher to complete paintings of their heroic missions of April 19, 1967, and March 10, 1966. We are searching for anyone with photographs or who was stationed at Takhli AB in April 1967 or Pleiku AB in March 1966 who could assist in obtaining the following information.

Colonel Thorsness was flying F-105F 63-8301 assigned to the 357th TFS, 355th TFW, during his MOH mission. We are looking for any details of this aircraft and of F-105s assigned to the 357th during April 1967.

Colonel Thorsness's aircraft was carrying two AGM-45A Shrike antiradiation missiles on the outboard stations, CBUs on the inboard stations, and a centerline 650-gallon fuel tank. We are looking for any details of those stores and their mounting pylons in those specific positions.

Colonel Fisher's famous A-1E Skyraider, s/n 132649, has been restored at the USAF Museum in Ohio. However, we are looking for any details of his A-1 in its war-worn condition. Any photos taken of the battle damage received during the MOH mission would be invaluable.

Any references loaned to us would be handled with extreme care and returned.

Both paintings will be lithographed and signed on a limited basis by Colonel Thorsness and Colonel Fisher, and the original artwork will be donated to the Air Force to be displayed at the US Air Force Museum.

If you can help, please contact the address below.

Matthew and Mark Waki
353 Scott Ave.
Salt Lake City, Utah 84115

KC-135 Stratotanker

In my quest for articles and books on all aircraft, I have yet to find comprehensive coverage in a book of the venerable Stratotanker—the KC-135. As one having great admiration for this very versatile aircraft, I am collecting data now for a suitable tribute to this grand old lady, which still serves so well today. . . .

For the story to be properly told, it must include photos and anecdotes from every type who has dealt with her, in every role—pilots, copilots, navigators, flight engineers, boomers, crew chiefs, etc., and certainly bomber drivers and fighter jocks who have gratefully sucked fuel from the ubiquitous "Flying Gas Station." Others who must be heard include all the people who keep this hay hauler flying—tin benders, jet shop troops, spark jumpers, and all other ground pounders everywhere without whose skills and services no aircraft would long fly.

All material will be properly credited, then copied and returned, if desired. All variants will be covered. Please contact the address below.

Jim B. Moseley
P. O. Box 1455
Edmond, Okla. 73083

Mighty Eighth Vets

I am presently beginning a sizable research project with the working title *US Bomber Aircrews in Europe, 1942–45*, and plan to utilize sources in the Simpson archives at Maxwell AFB, Ala., photographic and film sources from Norton AFB, Calif., records from the Imperial War Museum in London, and relevant materials from the Library of Congress.

At least one section of my study will be based on responses to a questionnaire and follow-through taped interviews. My initial efforts have found veterans remarkably cooperative and helpful. I would like to contact men attached to the Eighth Air Force during the war. I can be reached at the address below.

Lowell W. Newton
University of Louisville
Belknap Campus
Louisville, Ky. 40292

Early AFROTC Photos

Photographs are needed of Air Service ROTC activities at the Universities of California (Berkeley), Illinois, and Washington, and at New York University, the Georgia Institute of Technology, the Massachusetts Institute of Technology, and Texas A&M. The time period needed is the 1920s and 1930s.

The photographs will be used to supplement a recently completed article scheduled to be published in *Air University Review* entitled "AFROTC—Origins and Early History." All material will be returned.

Col. William C. Stancik, USAFR
P. O. Drawer 156
Montgomery, Ala. 36101

F-100 Markings

I am assisting Dr. René Francillon with a book on the F-100, to be published by Jay Miller's Aerofax of Austin, Tex., and there are some units that twenty-plus years of digging have failed to turn up much of anything on the way these aircraft were marked. If any veteran of the following groups/wings would have any information on colors and patterns used, it would sure come in handy. Any prints or slides loaned would be helpful.

The units are: 4th, 8th, 21st, 31st, 49th, 50th, 83d, 322d, 323d, 366th, 388th, 405th, 413th, 450th, and 506th.

All material to be loaned should be sent insured, and I will pay all costs, and return the same way.

MSgt. David W. Menard,
USAF (Ret.)
5224 Longford Rd.
Dayton, Ohio 45424

RF-84K Thunderflash

I am a member of the Yankee Air Force, a nonprofit museum organiza-

tion, and am in charge of the restoration of an RF-84K Thunderflash. This aircraft, s/n 52-7259, served with the 91st Strategic Reconnaissance Squadron (FICON), Larson AFB; the 67th Tactical Reconnaissance Wing, Misawa AB, Japan; and finally the 171st Tactical Reconnaissance Squadron (ANG), Detroit, Mich.

If anyone has any information about this aircraft, its markings, and missions, we would appreciate hearing from them.

Michael C. Willmann
P. O. Box 1100
Willow Run Airport
Ypsilanti, Mich. 48197

C-124s and C-133s

I would very much like to hear from pilots, crew members, and technicians who flew and maintained the C-124 Globemaster and C-133 Cargomaster transports. I am interested in learning of your experiences, obtaining copies of photographs, and trading patches.

Even years of wasting in the weather and providing homes for the birds doesn't seem to diminish these big birds of burden. Come on, you former MATS members, help a guy who was born fifteen years too late to remember these majestic Dougs.

David C. Freese
915 West 4th St.
Cedar Falls, Iowa 50613

SEA Air Forces

I am researching the histories of the Royal Laotian and Cambodian Air Forces.

Very little has been published on these topics. I would like to correspond with any Air Force personnel who advised the Royal Cambodian Air Force prior to 1963, and any members of the 56th SOW, Det. 1, who trained Laotian and Cambodian pilots.

Ken Conboy
7614 Trailwind Dr.
Montgomery, Ohio 45242

Pacific P-51s

I'm looking for former members of the 7th Fighter Command who were on Iwo Jima from April until September 1945. I'm a collector of P-51 photographs, and my collection lacks photos of Pacific-based P-51s during World War II.

Anyone having photos or negatives that I could borrow for reprints can send them to the address below. All photos will be returned, and I will pay postage.

Ron Witt
4470 Vegas Valley Dr.
Space #77
Las Vegas, Nev. 89121

AIRMAIL

12th Bomb Squadron

In the spirit of Project Warrior, the 12th Strategic Missile Squadron is attempting to collect memorabilia from former squadron members to put in a display depicting squadron history.

If there are any former squadron members who have memorabilia that we could have or borrow, would they please contact us at the address below?

2d Lt. Raymond M. Quick, USAF
12th Strategic Missile Squadron
Malmstrom AFB, Mont. 59402
AUTOVON: 632-2974

AFROTC Det. 770

Clemson University's Detachment 770 is interested in compiling a list and history of its alumni. If you are a Clemson University Air Force ROTC graduate, please contact the Public Affairs officer at the address below.

Please include name, address, graduation class, and details and interesting stories of your military career.

AFROTC Det. 770
Clemson University
Clemson, S. C. 29631

Where Are You?

During the Korean conflict I was assigned to the 91st Strategic Reconnaissance Squadron at Yokota AB, Japan, from June 1951 until April 1952. During that time I was part of the aircrew who flew a B-29, tail number 727, named *So Tired*.

The crew consisted of the following: Norman Anderson, Robert Harder, Mike Daleone, Bob Whiteker, Mike Hammer, Walt Bly, John Orlovsky, Joe Shaw, Hosea Gaberial, Marvin Sinclair, and myself.

I would like to learn the whereabouts of any of these men. Please contact the address below.

Don Rubendall
1601 East 12th Ave.
Spokane, Wash. 99202

I am seeking help in obtaining information about the 29th Bomb Group when it was stationed at Gowen Field in Idaho during World War II. I am looking particularly for any information about Cpl. LaMar E. LaFavers and Sgt. Frank J. LeFevere, who were both members of the 29th Group's 52d Squadron.

I am looking also for any person who has rosters, transfer orders, etc., for any of the 29th Group's squadrons—the 6th, 52d, 411th, 761st, or 43d.

Any assistance would be sincerely appreciated. Please contact the address below.

Eileen Hardy
P. O. Box 39
Challis, Idaho 83226
Phone: (208) 879-4275

I have in my possession a manual entitled *Care and Operation of Aero Motors for Aviators and Mechanics,* by Jack LeCain and published by the Aero Motors Publishing Co. in 1918.

This manual has fifty-one pages and is three and one-half by five and one-half inches in size. Inside the front cover is written the name of "H. Bacon Collamore." It is in fine condition.

Does anyone have any information on Collamore? Is the manual of interest to anyone?

Also, I need to know the whereabouts of J. Harry Wadlow, who flew P-47s during World War II.

MSgt. Frederick J. Webb, USAF (Ret.)
7472 Faculty Dr.
Orlando, Fla. 32807
Phone: (305) 671-6013

I would like very much to learn the whereabouts of Col. Jack Broughton. He is the author of the 1969 publication entitled *Thud Ridge.*

In that publication, the Colonel writes of his love affair with the venerable F-105. I have some material that I would like to share with him. In fact, I would like to hear from any former -105 driver who's willing to share his experiences flying that wonderful workhorse.

Please contact the address below.

Frank A. Carberry
4 Knollwood Dr., RR #3
East Hampton, Conn. 06424

I would like to hear from any former members of the 13th Antisub Squadron based at Grenier Field near Manchester, N. H., from January 1942 to September 1943. Most of the officers and enlisted personnel lived in the northeast, and the time has come when it would be interesting to get together and swap yarns of our doings after the squadron was broken up and we became part of Second Air Force.

Please contact the address below.

Dan Winston
P. O. Box L
Inwood Station
4951 Broadway
New York, N. Y. 10034

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AIRMAIL

Looking for . . .

I am trying to locate the following B-17 crew members from the 535th Bomb Squadron, 381st Bomb Group, Eighth Air Force: Gayle Messenger, Robert McFarlane, and John "Andy" Curran.

Also, I would like to hear from other former members of the 535th, including ground crews, who were at Ridgewell from September 1943 to January 1944. My purpose is research for a book.

Please contact me at the address below.

Allen Crosson
P. O. Box 441
Atascadero, Calif. 93422

I would like to hear from anyone who may have known my husband, Olof Nelson Tevander. He died in July 1982.

He served with the 96th Bomb Group of Eighth Air Force in England in 1944, and was stationed in Ansbach, Germany, after the war.

Please contact me at the address below.

Roseadele Tevander
RR #17, Box 590
Hot Springs, Ark. 71901

I am trying to locate Capt. Fred Leverett. We served together in the 351st Strategic Missile Wing at Whiteman AFB, Mo., from 1977 to 1981. We are planning a reunion and would like to hear from him.

Please contact me at the address given below.

Capt. Robert K. Duncan, USAF
Los Angeles AFS, Calif. 90009
Phone: (213) 374-4466
AUTOVON: 833-0773

I am interested in contacting anyone who may have served with my father, Hughs S. Dinsmore. He was assigned to the 462d Bomb Group during World War II.

I am interested in the activities of his unit during the time he was assigned to it. Any information on his decorations, flights, or anecdotes about his personality would be very appreciated by our family.

I may be contacted at the address below.

Barbara Dinsmore
14605 North 42d St.
Omaha, Neb. 68112

IN FOCUS...

The Pitfalls of a Pay Freeze

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

The Joint Chiefs might have proposed other options—had they been consulted.

Washington, D. C., Feb. 1

Gen. Charles A. Gabriel, USAF Chief of Staff, recently told a group of Pentagon correspondents that the Reagan Administration—which otherwise maintains extremely close and constructive relations with the Joint Chiefs of Staff—neither informed nor consulted the nation's top military leaders when it decided to scale back the FY '84 Defense Budget request by $11.3 billion in spending authority, or about $8 billion in outlays.

Included in the cutback is a pay freeze for government and military personnel that "bothers" the Chiefs because it would cause obvious disappointment for the men and women in uniform, he said. General Gabriel added he knew that "several" of the Chiefs would have been willing to consider cuts in the program and procurement sectors rather than on the people side.

Acknowledging that "these are hard times economically," he explained that if all civilian government employees along with the military are included in the Administration's one-year pay freeze proposal, "we will have to see if there is something else we can do to ease the pain of the troops."

The "bottom line" of the Administration's plan to freeze military pay is that there will be "concern, but if this is what we have to do, we will do the best we can, hoping that we will have a commitment at the end of the freeze that we will come back to pay comparability for the troops," the Air Force Chief told the press.

Even though stressing that the Chiefs will be "team players" on measures taken by the Administration to solve the nation's economic problems, he pointed out that a number of pitfalls might ensue from a military pay freeze at this time. For one, demographic trends point toward an era of declining numbers of eighteen-year-olds, which, combined with predicted upturns in the economy, could reverse the currently bright recruiting and retention picture, he suggested.

In the case of the Air Force, General Gabriel recalled, the effect of two pay caps in a row in the late 1970s was the loss of about 4,000 pilots, along with large numbers of ground crews. That loss, he added, was ameliorated by the fact that "at that time we had a cushion [in the form of residual skills on the part of Vietnam War veterans still on active duty] that we don't have now." On the other hand, he pointed out that the inflation rate is now much lower.

Even though the Chiefs would have preferred to be consulted on the pay freeze and other cutbacks, General Gabriel acknowledged, "I don't know that the decision would have been any different." He explained that the Administration already was fully aware of the fact that the Joint Chiefs consider "people our top priority." He added that he was "sure that pay will be discussed" in the Chiefs' next meeting with the President in February.

Turning to the other facets of the planned budget reduction, General Gabriel termed them understandable. There is likely to be a cutback in airlift funds for travel in connection with exercises and, as a result, "we might exercise closer to home," he suggested. Other scaling back is possible because fuel costs have dropped somewhat and inflation decreases have exceeded forecasts.

Asked about another Joint Chiefs issue that generated considerable headlines—the allegation that three out of the five JCS members were opposed to the closely spaced Dense Pack basing mode for MX—General Gabriel said there were "some inaccuracies about what the Joint Chiefs did, and did not, do. There was no vote, no discussion. The technical concerns were over the hardness level."

The crux of the concerns was whether the relatively high degree of hardness that CSB requires could be attained by the time of the system's initial deployment in 1986, he said. Stressing that there was no "formal vote," he acknowledged that Gen. Robert H. Barrow, USMC, "needed more time to study hardness." General Gabriel added that hardening was a civil engineering matter that "we have a pretty good handle on. That's not exotic technology."

Commenting on the Ninety-seventh Congress's refusal to fund MX/CSB production, General Gabriel termed the underlying concept of turning nuclear weapons' "fratricide"—meaning their inability to detonate near one another in the sense of time and place without destroying themselves—into a defensive shield "the most innovative idea that we have seen in the strategic business in the last twenty-five years."

But he conceded that the "hard part about [CSB] is that it is difficult to understand, [that] even the best scientists say there are uncertainties about it, and that you can't test it." But these difficulties and the need to go back to the "drawing board with the Presidential Commission," (which is reevaluating various MX basing modes), don't help solve the basic problem that makes MX such a crucial requirement. All the Chiefs agree that MX is vital, he said, because without it the Soviet Union "needs only one-fourth of [its] ICBMs to get about ninety percent of ours if we ride out" an attack.

Because the new Soviet ICBMs are "harder, have more yield, and are more accurate" than the aging US Minuteman force, an intolerable vulnerability has developed, and "we can't put any pressure on [Soviet]" ICBMs. While bombers could be used to neutralize the worrisome Soviet ICBM "refire capability," these aircraft don't get to the targets until after the "second or third wave of their ICBMs has come down on us," he said.

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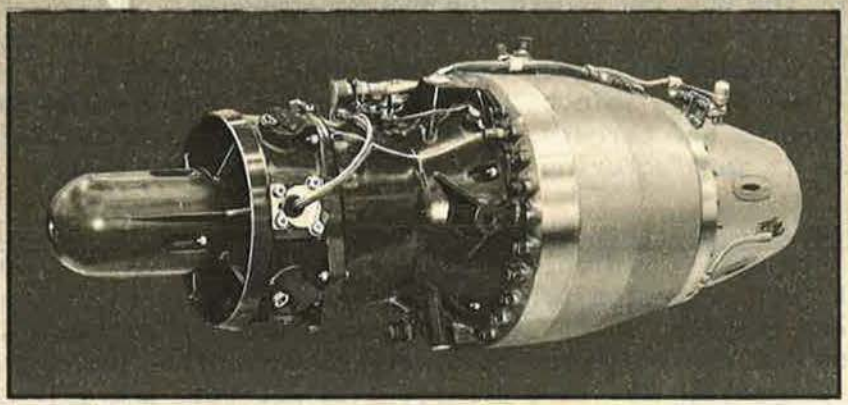

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SCIENCE/SCOPE

A modified F-15 Eagle is proving its potential as a cost-effective, dual-role fighter that can serve as a strike aircraft without sacrificing its air superiority capabilities. The U.S. Air Force is testing the Advanced Fighter Capability Demonstrator F-15 equipped with a radar enhanced with high-resolution mapping modifications. The aircraft has shown it's versatile enough to strike ground targets at night or in bad weather with the accuracy of a daytime attack aircraft. Because the radar changes involve minor new hardware and some new computer software, the F-15 keeps its air-to-air features. It sees long ranges, searches large volumes of the sky, detects targets at all altitudes and aspects, and has a "look-down, shoot-down" capability to spot low-flying targets in heavy ground clutter. The demonstrator is co-sponsored by Hughes Aircraft Company, supplier of the AN/APG-63 radar, and McDonnell Douglas, builder of the F-15.

The millimeter-wave seeker for the Wasp air-to-ground missile, the first ever to find and track military targets all by itself, achieves its breakthrough by using advanced subminiature hardware and innovative application of the data it gathers. Wasp is intended to let a pilot release swarms of missiles in the general direction of a known enemy force without having ever actually seen it. Special data-processing techniques allow each missile to autonomously detect and hit a separate target, thus making the most of the swarm's effectiveness. Hughes is building eight flight test missiles for the U.S. Air Force.

A modern air defense system for protecting North American skies is undergoing final operational tests. The U.S. Air Force is conducting tests of the Hughes Joint Surveillance System (JSS) at Tyndall Air Force Base in Florida, the first of eight regional centers in the improved air defense network. JSS will integrate existing Air Force radars and many commercial air traffic control radars and Canadian radars into a shared system. It will monitor skies over North America and 200 miles beyond its borders. Should unknown aircraft be spotted, fighter interceptors would be sent aloft to make visual identification and, if need be, take defensive action. JSS is due to be fully operational by mid-1984. It is expected to reduce U.S. air defense costs $100 million annually.

A new era in sonar for U.S. Navy antisubmarine ships has begun with the first installation of the SQS-53B aboard the USS Moosbrugger. This surface-ship sonar is far more powerful and capable than existing systems. It detects, tracks, and classifies many submarine targets simultaneously. The SQS-53B's sonar bulb is built into the bow of the ship below the waterline. It creates sound waves and detects their echoes off targets. The system also is used to listen for unusual sounds. Hughes is manufacturing systems for more than 40 ships.

Tactical displays at military command centers are now easier to read, thanks to a device that projects vivid color pictures in sizes up to five meters square. The Hughes HDP-4000 projector is used in ground stations to display maps, status information, and computer data. An exclusive component called a liquid-crystal light valve enables the projector to create pictures that are much brighter than ordinary home projection TV. The projector is portable and self-contained.

IN FOCUS...

For the time being, only the ICBMs, based in a survivable mode, provide the prompt hard-target kill capability to checkmate Soviet ICBMs kept in reserve, and hence are essential for credible deterrence, he stressed.

MX is essential also in terms of current efforts toward strategic arms reduction, known as START. General Gabriel stressed, "If we ever want to see reductions in strategic nuclear forces, we must make sure that we have the kind of systems [that make it safe for the US] to reduce. START, to my mind, is based on having an MX because the Soviets are not likely to trade SS-18s for Minuteman ICBMs."

He alluded to similar views expressed by Ambassador Edward L. Rowny, Chairman of the US START Delegation, who recently told Congress that the Soviets possess "650 missiles comparable to MX" while criticizing the US for "a missile yet to be tested."

Ambassador Rowny added that a "survivable MX is a key ingredient of, and consistent with, our efforts in START to achieve a more stable military balance at substantially reduced and equal force levels." Conversely, the absence of such a system "would not only undercut my negotiating leverage but would require a reassessment of our START proposal. We were able to make a proposal that called for substantial reductions because [it] was based on the assumption that MX in a survivable basing mode would be part of the force structure."

General Gabriel explained that MX is essential even if "START is signed tomorrow." Not only is the US permitted one new missile under the terms of SALT II, but the Soviets have already tested one or two new missiles, thus making modernization of the aging Minuteman force all the more compelling, he said.

A nuclear freeze, therefore, would not be to "our advantage. One of the reasons why the Soviets suggested it first is that we haven't done a darned thing about our strategic forces—at least so far as bombers and ICBMs are concerned—for twenty years. We have a twenty-year-old missile and a twenty-five-year-old bomber [that faces] defenses that have been improved continuously over the years. We have had a nineteen percent [decline] in defense spending" while the Soviets boosted theirs.

While launch on warning of the US ICBM force is an "option available to us," he stressed that it doesn't represent national policy: "I am not advocating it. It is destabilizing." Hinting that launch on warning "has been exercised," General Gabriel cautioned that "it can be done, [but] the [limited] information you are going to have will make it very uncomfortable, if you were in our shoes, to tell the President, 'Go now!'"

In assessing the Air Force's strategic bomber program, General Gabriel stressed that the timing of the B-1B and the Advanced Technology Bomber (ATB) remains unchanged. "The B-1Bs are coming in between 1986 and 1989 and early in the 1990s is the IOC [initial operational capability] of the ATB." The Air Force, he said, is doing a "deliberate wrap-up of the R&D for ATB. We . . . are not throwing money at it." Disclosing that no major technical problems have been encountered in the field of stealth technologies, General Gabriel admitted that "this is an area we don't know a lot about. We are learning some things that we are applying to existing systems," including the B-1B. ATB is essential because of the growth in Soviet look-down/shoot-down capability envisioned for the 1990s and beyond, he said.

Soviets Pirating Western Defense Technology

The US intelligence community recently issued a sobering analysis of Soviet acquisition of Western technology culminating in this conclusion: "The massive, well-planned, and well-coordinated Soviet program to acquire Western technology through combined legal and illegal means poses a serious and growing threat to the mutual security interests of the United States and its allies. In response, the West will need to organize more effectively than it has in the past to protect its military, industrial, commercial, and scientific communities."

While the West's performance in the past was poor, the prospects for the future, according to the intelligence analysis, are worse: "Given the dynamic nature of their collection program, it is expected that the Soviets will continue their attempts to acquire a broad range of Western technologies. Certain areas, however, represent priority collection targets for them; those areas are critical to the Soviets' enhancement of their weapons capabilities."

In an organizational sense, the analysis discloses, it is the "Soviet intelligence services—the Soviet Committee for State Security [KGB—until recently headed by Party Boss Yuri Andropov] and the Chief Intelligence Directorate of the Soviet General Staff (GRU)—[that] have the primary responsibility for collecting Western classified, export-controlled, and proprietary technology, using both clandestine and overt collection methods. They in turn make extensive use of many of the East European intelligence services; for their efforts in acquiring Western technologies, these countries are paid in part with Soviet military equipment and weapons."

These Soviet bloc intelligence organizations have been so successful at acquiring Western technology that the manpower levels they allocate to this effort have increased significantly since the 1970s to the point where there are now several thousand collection officers assigned to the pirating of US and allied technology. These specialists, the US report discloses, are assigned throughout the world, "under various covers ranging from diplomats to journalists."

The US intelligence analysis cited as a textbook case of how Soviet bloc operatives acquire Western technology that of William H. Bell, a radar project engineer of a US defense firm who was recruited by an intelligence officer operating under the cover of a Polish firm—a subsidiary of the Polish Government Corporation—operating under the name of Polamco.

Bell, who was in financial straits, passed on over a three-year period more than twenty highly classified reports on advanced US weapon systems to the Polish spymaster. He was paid $100,000 for providing crucial information on such items as the F-15 look-down/shoot-down radar system, the "quiet" radar system for the B-1 and Stealth bombers, an all-weather radar system for tanks, an experimental radar for the US Navy, the Phoenix air-to-air missile, a shipborne surveillance radar, the Patriot surface-to-air missile, a towed-array submarine sonar system, a new air-to-air missile, the improved HAWK surface-to-air missile, and a NATO air defense system. As the US report warned, "The information in these documents put in jeopardy existing weapons and advanced future weapon systems of the United States and its allies.

"The acquisition of this information will save the Polish and Soviet governments hundreds of millions of dollars in R&D efforts by permitting them to

implement proven designs developed by the US and by fielding operational counterpart systems in a much shorter period. Specifications on current and future US weapon systems will enable them to develop defensive countermeasure systems." Bell is currently serving an eight-year term, following a conviction for espionage.

High-priority target areas for Soviet technological piracy, according to the US intelligence community, include, in the field of aeronautics, materials technology, particularly composite materials to allow weight-efficient designs, and high-bypass turbofan engine technology and accurate airborne inertial navigation systems for long-range navigation and weapons delivery. Other key targets are the advanced guidance systems of the MX ICBM and Trident SLBM. Soviet deficiencies in solid-rocket propulsion technology also drive them toward the acquisition of information on solid-propellant production procedures and motor case and rocket nozzle technologies.

US intelligence experts see evidence of a Soviet "shopping list" for the illegal acquisition of US defense technologies that spans the gamut from large aircraft design to artificial intelligence, although the major espionage efforts probably will continue to be reserved for various electronic technologies.

Western equipment and technology, the US intelligence experts reported, "have played a very important, if not crucial, role in the advancement of Soviet microelectronic production capabilities. This advancement comes as a result of over ten years of successful acquisition . . . of hundreds of pieces of Western microelectronic equipment worth hundreds of millions of dollars to equip their military-related manufacturing facilities. These acquisitions have permitted the Soviets to systematically build a modern microelectronics industry which will be the critical basis for enhancing the sophistication of future Soviet military systems for decades."

Washington Observations

★ The Threshold Test Ban (TTB) treaty concluded during the Moscow summit meeting in 1974—that the US and the USSR consider in effect though the US Senate has yet to ratify it—is headed for special attention from the Reagan Administration and Congress. TTB, in concert with the subordinated PNE (peaceful nuclear explosions) accord, limits underground nuclear testing to an individual test yield of 150 kilotons.

IN FOCUS...

A protocol appended to the accord calls for the exchange of certain types of information to assist the signatories in verifying compliance. One of the accord's loopholes is the mutually agreed-to difficulty of predicting the precise yield of nuclear tests and, hence, the implied willingness to tolerate occasional excesses.

As reported in this space previously, the USSR tested devices with at least twice the permitted yield while the US holds its tests to yields significantly below the permitted level to avoid "overruns." Currently stirring in the Administration and Congress is the notion of tightening up the treaty—assuming Soviet willingness to do so—and then submitting it to the Senate for ratification. Included in the tightening-up process would be the creation of a standing consultative commission patterned after the joint arbitration mechanism of SALT, on-site inspection provisions, and closing the loopholes.

★ There is strong circumstantial evidence that the Soviets are using their manned Salyut space station to calibrate and refine the targeting and tracking mechanism of ground-based military lasers. Crews aboard the space station are instructed routinely to put on their "goggles" when Salyut overflies Soviet territory where these laser devices appear to be located.

While the energy levels that are being beamed up to the space station are kept at a safe level, the difficult steering and tracking task, one of the preconditions for engaging space-borne targets with ground-based high-energy laser weapons, can be aided significantly by tests of this type. A detailed analysis of the Soviet space program by the Congressional Research Service meanwhile documents the military's pervasive role in all Soviet space activities. Most of the senior officials of the Soviet space program have a strong military or defense industry background, the study points out.

Also, "the Air Force is responsible for cosmonaut training and vehicle recovery. The Strategic Rocket Forces conduct all space launches. The three major launch sites are administered by the military."

The Congressional Research Service study also suggests that there are several versions of the somewhat mysterious "G" class booster identified by the Defense Department as being similar in performance to the Apollo program's Saturn V and potentially capable of launching "very heavy payloads into orbit, including even larger and more capable laser weapons."

The study postulates "at least two versions of the very large vehicle: One would be G-1e, intended for flight to the moon; the other would be G-1, intended for launching a space station core into earth orbit. Later versions might substitute high-energy fuel upper stages, enhancing the performance over the levels estimated to be similar to the Saturn V."

★ A just released Brookings Institution study, entitled *Soviet Strategic Forces: Requirements and Responses,* provides significant details of the Soviet ASAT satellite killer weapon, including its linkages to the capability to destroy US navigation satellites "and thereby degrade the effectiveness of US SSBNs on patrol."

ASATs are launched by a modified SS-9 ICBM, weigh 2.5 tons, and are equipped with five main rocket engines for maneuverability, according to the Brookings study. The Soviet ASAT closes on its target at nearly thirteen miles a minute and, when less than 100 feet from the target, can explode on ground command, destroying the target with debris, according to this report.

★ The Investigations Subcommittee of the House Armed Services Committee has refuted claims by the General Accounting Office and others that the Defense Department and the Air Force had engaged in improper lobbying activities on behalf of the C-5B program. The Department of the Air Force Legislative Liaison Office took the brunt of GAO's philippic that the subcommittee found "unsupported by relevant evidence." Overall, the subcommittee found "no violations of existing law."

It also found that "the complaining member of Congress [Norman D. Dicks, a Democrat from Washington] presented insufficient evidence to support his charges. Those charges against the Department of Defense arose from an erroneous perception of the multiple meetings between the Department of Defense and the contractor to plan strategy to influence members of Congress. This procedure is frequently followed in varying degrees." ■

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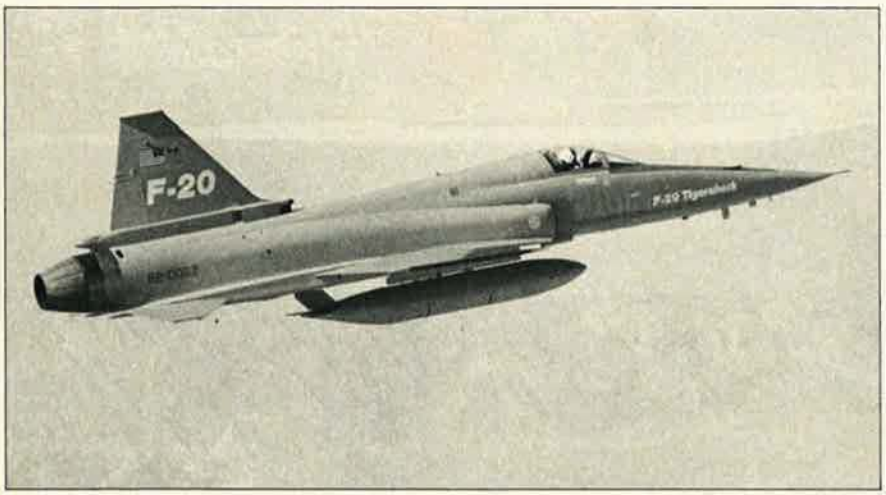
AEROSPACE WORLD
News, Views & Comments

By William P. Schlitz, SENIOR EDITOR



Northrop's new F-20 Tigershark tactical fighter carries an external fuel tank on its centerline station during a verfication test to validate specific fuel consumption. As of late January, the F-20 had logged 124 sorties in its Flight Demonstration Program that started in August 1982 at Edwards AFB, Calif.

Washington, D. C., Feb. 4

★ A new unified command—US Central Command for Southwest Asia—has been activated to improve US response capabilities, Pentagon officials announced.

After last year's review of the situation in that part of the world, it was decided that the Rapid Deployment Joint Task Force currently charged with operational planning for the region should evolve into a separate unified command.

The area of responsibility will include Southwest Asia, the Horn of Africa, and the Persian Gulf. The 230,000-strong USCENTCOM will include eleven tactical fighter squadrons; elements of the Army's 18th Airborne Corps, including the 82d and 101st Airborne Divisions; three Navy carrier battle groups; a Marine amphibious force; and the 7th Marine Amphibious Brigade.

Headquarters of the new unified command is at MacDill AFB, Fla.

Army, Navy, and Air Force component headquarters are to be assigned to USCENTCOM and US forces operating in or deployed to the command's area of responsibility will be under the operational direction of the new command's Commander in Chief. These will include such forces as the Middle East force in the Persian Gulf and Red Sea area.

When required and authorized, USCENTCOM will also be able to draw on the reservoir of rapidly deployable forces located primarily in CONUS, Pentagon officials said.

★ Air Force special operations and combat rescue resources have been consolidated under Military Airlift Command as of March 1.

The action has required no transfer of flying units, no major new construction, and minimal personnel adjustments. The move was made, according to officials, "to increase efficiency and combat capability by centralizing the budgeting, training, manning, organizing, and equipping of these forces."

Overseas, operational control has been retained by air component commanders.

Principal features of the reorganization by base:

- At Scott AFB, Ill., headquarters of Aerospace Rescue and Recovery Service has been slimmed down and a new numbered MAC air force has been established.
- At Hurlburt Field, Fla., host command has switched from TAC to MAC and the 1st Operations Wing has become a MAC unit. A special operations forces air division has been established.

The new MAC numbered air force is to be comprised of Aerospace Rescue and Recovery Service headquarters and the new SOF air division.

The new special operations division at Hurlburt is to be responsible

Paris Air Show . . . Shaping Up

Organizers of the 35th Paris Air Show tell AIR FORCE Magazine that a record number of exhibitors—740—had signed up for exhibit space as of late January. Because the demand was so great from new exhibitors and new national groups, the authorities found it necessary to reduce each allotment of exhibit space by up to ten percent.

The exhibition is held at Le Bourget Airfield north of Paris, from May 26 through June 5. Although several major US prime aerospace companies have decided to forgo exhibiting or to scale back their participation, others—particularly second- and third-tier subcontractors—have decided to exhibit at the show. Officials in charge of the US Pavilion reported that almost all of its space was allocated by the end of January, with a high percentage of new-to-show companies represented.

US Air Force plans for participation were not firm at the end of January. However, congressional sources expect a large delegation of members of House and Senate and committee staffers to attend. The total of congressional and staff attendees may reach more than 100.

The Soviet Union plans to exhibit several aircraft, types not yet revealed. One of the show authorities said that USSR officials forecast sending "several types of civil aircraft" for exhibition. He noted, "Of course, those are the only kind they make, aren't they?"

—F.C.B., Jr.

for the 1st SOW there; the 1st SOS, Clark AB, the Philippines; 7th SOS, Rhein-Main AB, Germany; and the helicopters at Howard AB, Panama.

In terms of equipment, the special operations forces have sixty-six fixed-wing and rotor aircraft. Active and reserve rescue forces have 121 combat rescue aircraft. In addition, ARRS has 109 aircraft assigned to survival schools, ranges, missile support sites, and weather recon duties.

MAC is to provide logistics support of the rescue and special operations activities.

★ The first in-flight checkout of a futuristic voice command system that may allow fighter pilots of tomorrow to control aircraft by voice was successfully conducted late last year at Edwards AFB, Calif.

A joint Air Force/NASA/Navy team undertook the test.

The voice command system is one of several revolutionary concepts being tested and evaluated by the AFTI F-16 Combined Test Force based at NASA Dryden Flight Research Facility at Edwards and funded by the three participants.

AFTI is the acronym for Advanced Fighter Technology Integration, a program that is flight-testing unique flight and fire-control concepts and systems for possible use in future aircraft.

The test of the voice command system was made by CTF's Director, Air Force Lt. Col. Harry H. Heimple, during an hour-plus mission during which he activated a "unit" ten times.

The simple checkout did not activate any flight or fire control systems and only tested the voice system's ability to accept word response. But the flight did mark the start of a six-month program that will evaluate the use of voice electronics in a real-world, cockpit environment.

The voice tests will increase in complexity as words are spoken in flight during ever-increasing noise and vibration, and at higher speeds and maneuvers where G loads soar to five or six times that of gravity.

The tests will culminate next summer when an AFTI F-16 test pilot flies a mission and uses a full vocabulary of thirty-six words to make the voice command system activate various controls and switches to help fly the aircraft and fire weapon systems.

Voice command is being explored for potential use on future aircraft because Air Force engineers believe the system can help ease pilot workload in a combat environment and allow the pilot to "keep his eyes out of the cockpit."

In the system now being tested here at Edwards, developed for the Air Force by Lear Siegler, Grand Rapids, Mich., each AFTI F-16 pilot will have a personalized voice cassette containing the thirty-six command words now in the system's vocabulary. The cassette is loaded into a tape recorder-like unit in the cockpit from which the words are sent to the voice command computer and stored as individual word templates. Each template serves as a master for the voice recognizing system. The template matches words spoken by the pilot with the "stored" words and as soon as the words are matched, the command to arm a weapon, fire a gun, or activate some other system is carried out.

Other unique and futuristic concepts being tested on the one-of-a-kind aircraft include unconventional flight control surfaces that will allow the aircraft to turn "flat" without banking, aim the nose right or left without changing flight direction, and climb or descend without changing the aircraft's pitch. *(Also see January '83 issue, p. 40.)*

Phase I testing will last until next summer when the aircraft will be returned to its builder, General Dynamics, Fort Worth, Tex., for a three-month modification period. It will then fly back to Edwards for a fifteen-month Phase II test program.

A team of five government pilots is assigned to the AFTI F-16 program:

MAC's Hurricane Hunters Save Lives and Property

The old saying about a time and a season for all things doesn't hold true for the Military Airlift Command's 53d Weather Reconnaissance Squadron's "Hurricane Hunters" and the Air Force Reserve's 920th Weather Reconnaissance Group's "Storm Trackers" at Keesler AFB, Miss. Although hurricane season is from June 1 through November 30, their work lasts the entire year.

During the hurricane season, the units provide advance warning that enables people in hurricane-prone areas to prepare for the storms before they strike.

Flying WC-130 Hercules aircraft and working with Detachment 5, Air Weather Service, also at Keesler, men and women of the reconnaissance units fly into hurricanes and tropical storms to measure their intensity and obtain data crucial to course predictions.

MAC's 54th WRS at Andersen AFB, Guam, handles similar duties with typhoons in the Pacific, MAC officials said.

The idea of hurricane hunting was conceived as early as 1941 by Brig. Gen. Muir S. Fairchild, one of Gen. H. H. "Hap" Arnold's key staff officers during World War II. But it wasn't until 1943 that the first Caribbean missions began—with six B-17s. The squadron, formed in 1943, was called by a long list of names, receiving the designation 53d WRS in January 1962.

One of its members, 1st Lt. Dennis Cassidy, made the unit's first planned penetration of a hurricane's eye wall when he flew a B-25 into one in 1945. The next day a similar mission flown in an aircraft known as *St. Elmo's Fire Wagon* caused the world to take note. Fenwick P. Cole, reporter for the Miami *Herald*, coined the name "Hurricane Hunters" when writing of the group's exploits. The nickname remains with the squadron to this day.

A pilot with the 53d, 1st Lt. Steven Allshouse, describes a typical hurricane-reconnaissance flight:

"Each crew consists of a pilot, copilot, navigator, weather officer, flight engineer, and dropsonde operator."

Dropsondes, he explained, are eighteen- by 3.5-inch cylinders that are dropped from the aircraft to the water below. The cylinders contain sensitive instruments that measure temperature, air pressure, and humidity.

"Going into and coming out of the storms, the weather officer makes horizontal observations every fifteen minutes, looking at the surface to help determine wind speed and direction at that level, and observing cloud formations to spot areas of heavy weather.

"The navigator measures wind speed and direction at altitude," the lieutenant said, "and once we fly into the eye, the dropsonde operator starts the vertical observations.

"The dropsonde operator records the data run through an on-board computer and transmitted to the National Weather Hurricane Center in Miami. At the Center, this information is used with satellite photographs to help the National Weather Service forecast storm movements and intensity, and issue warnings if necessary.

"The whole crew is involved," Lieutenant Allshouse said, "either in gathering or relaying the information or actually flying the aircraft."

At the end of the hurricane season, the weather reconnaissance units fly other missions, the pilot said.

Hunting hurricanes, the lieutenant said, is a challenging and exciting job.

"But the best part is the personal gratification that comes from knowing we're saving lives."

—BY SSGT. JOHN BANUSIEWICZ, USAF

two Air Force, two from NASA, and one Navy pilot. Some flights are also flown by a General Dynamics contractor pilot.

The AFTI F-16 aircraft entered Phase I testing last summer.

The aircraft is a highly modified F-16 Fighting Falcon fighter, the same type now in operational use by the Air Force and allied European and Middle East nations.

Management of the AFTI program is the responsibility of the Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Dayton, Ohio.

★ A number of Air Force manning requirements are currently being highlighted.

For example, officials at the Air Force Manpower and Personnel Center, Randolph AFB, Tex., have announced a program to reenlist some 5,000 prior service people with a wide range of critical skills.

A need exists for former service members trained in aircraft maintenance, and in systems, avionics, weapons, and ammunition specialties. Also on the list are people with experience in the fields of intelligence, computer programming, and site development, among others.

Specialists in these jobs will be offered their former rank if they have been out of service less than four years and meet other requirements, officials said. Air Force recruiters have additional details.

AEROSPACE WORLD

For its part, Electronic Security Command is seeking eighteen highly qualified senior airmen through master sergeant for retraining in specialty field 209XX—defensive command control and communications countermeasures.

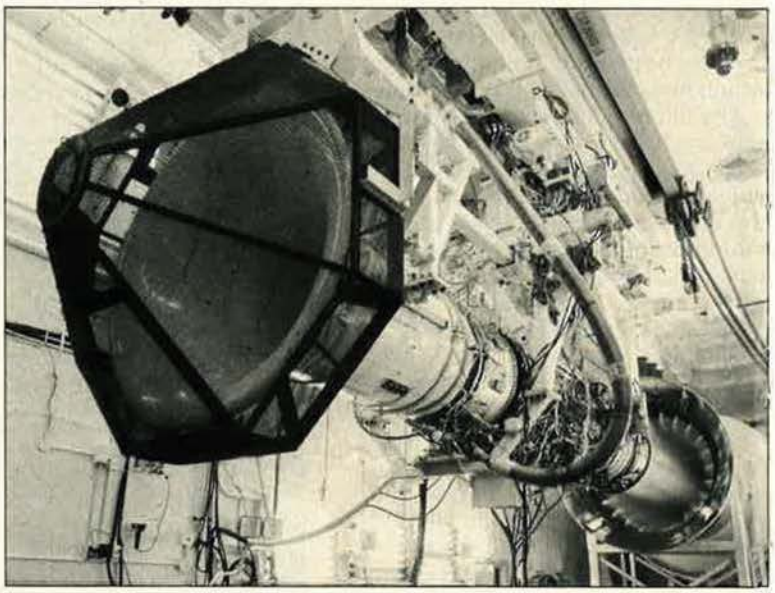
According to personnel officials at Randolph, retraining in the field is open to all specialty codes, and positions need filling in many Stateside and overseas locations. "The career field uses the newest technology in electronic warfare deception and intelligence and conventional warfare to train US forces in modern electronic battlefield concepts," officials said, adding that promotion to staff, technical, and master sergeant is five percent more likely than in other noncritical fields.

Local personnel offices have additional details on eligibility requirements and applications procedures.

Finally, staff through master sergeants in administration specialty codes 702XO and 702XOB are needed for defense attaché positions at US embassies worldwide. *(Also see "Air Attachés Answer the Questions," p. 182 of the September '82 issue.)*

The main landing gear on this Space Shuttle vehicle is perched atop a platform of Goodyear air springs that serve as an isolation device, allowing the vehicle to "float free" from ground interference during tests.

Randolph personnel officials announced one opening in 1983 for a



LEFT: New-design combustor of United Technologies' Pratt & Whitney PW 2037 engine is inspected during assembly operations. Development testing of the PW 2037 combustor has shown that the pattern of gas temperatures exiting the section meets the design goal, a critical factor in assuring long turbine airfoil life. The engine has been ordered for Boeing 757 aircraft. ABOVE: The General Electric F110 engine undergoes a series of accelerated mission tests at GE's Evendale, Ohio, testing facility. The F110, formerly the F101 DFE, demonstrated a hot section life of 5,000 TAC cycles. According to GE, this achievement is equivalent to 2,500 flight hours, or more than ten years of fighter operations. The F110 is being developed as an alternate powerplant for the F-14, the F-15, and the F-16.

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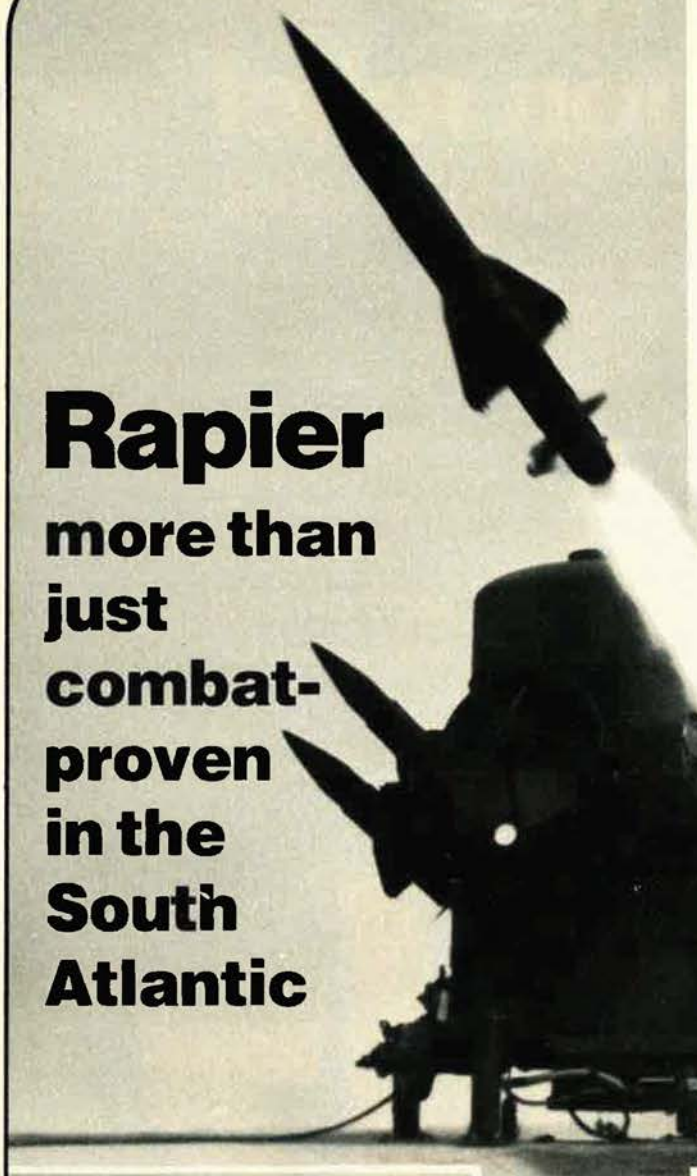

The Falklands campaign proved far more about the Rapier ultra-low-level surface-to-air missile system than its combat kill capabilities. The operation proved again and again all the fundamental advantages of the system – serviceability . . . transportability . . . mobility . . . speed into action . . . ease of operation . . . versatility . . . the accuracy and lethality of the hittile concept . . .

■ throughout the 8-weeks sea voyage through the tropics and into the high seas and foul weather of the South Atlantic, equipment was totally inaccessible for servicing, yet Rapier was ready for action within 25 minutes of being put ashore in the Falklands.

■ with equipment and crews experiencing action for the first time, Rapier successfully defended the beach-head through 7 days of repeated attacks by aircraft flying fast and often as low as 10m above water, and making skilful use of ships and terrain to avoid detection and interception.

■ as ground troops advanced, Rapier was moved forward swiftly across atrocious terrain offering few options for siting or concealment.

■ despite the absence of early warning radar, the operational hazards of confined and crowded zones, and lack of time or facilities for servicing, Rapier destroyed at least 14 aircraft.

■ throughout the action, Rapier maintained over 90% availability.

■ ease of training and operation was typified by the fact that one aircraft was destroyed by a soldier who received his first training on the sea voyage south.

TOWED RAPIER is at combat readiness with the British Army and RAF Regiment, in the UK, with NATO forces in Germany, and elsewhere overseas. It is also operational with defence forces in Australia, Africa, the Middle East and Far East and has been ordered by the USAF to defend UK air bases and by Switzerland.

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technical or master sergeant at Islamabad, Pakistan, with a July reporting date. Volunteers are also needed for 1984 openings in Burma, China, Czechoslovakia, Egypt, Finland, Greece, Hong Kong, India, Israel, Malaysia, Norway, Oman, Singapore, Sweden, Thailand, Turkey, and the UK.

All assignments include travel for married members, civilian clothing allowance, and language training if required.

For additional details, contact the customer service section of the local personnel office or TSgt. Gary Gentry, AFIS/INH, Fort Belvoir, Va. 22060, or call: AUTOVON 354-6036; (703) 664-6036.

★ This year begins the second decade of an FAA regulation that all airline passengers and their carry-on luggage be screened for weapons. The requirement resulted in a decrease in the average number of attempted hijackings from an annual twenty-seven to eight.

AEROSPACE WORLD

severely wounded. The aircraft survived a harrowing twenty-nine-hour ordeal of flying from airport to airport up and down the east coast before the hijacking ended in Cuba. In that year, there were twenty-six other hijacking attempts in the US. Following implementation of the regulation, during 1973 there was one.

Another early measure—the use of large numbers of armed Sky Marshals to ride shotgun on US airliners—was dropped once the mandatory screening was put into effect.

Throughout the decade the FAA has worked closely with both federal and local law enforcement agencies, airports, the airlines, pilot and flight attendant unions, and other groups in developing and implementing standard procedures and tactics for the safe conclusion of hijackings.

As a result, no passengers have been killed or seriously injured in an airline hijacking in this country in the past ten years. Five hijackers were killed in the course of hijackings during the period and two committed suicide.

Meanwhile, 151 persons have been convicted of hijacking or hijacking-related charges in this country since the late 1960s. Another twenty-seven have been committed to mental institutions.

The three men involved in the November 1972 hijacking that led to the screening requirement were convicted and sentenced to prison in Cuba. They returned to this country in October 1980 and were tried, convicted, and sentenced again—one to twenty-five years and the other two to twenty years each.

Hellfire, the US Army's newest antiarmor missile, during its first launch from a ground vehicle. Designed for the air-to-ground antiarmor mission, Hellfire is usable for surface-to-surface antitank missions. The missile was fired from behind a hill and used its lock-on-after-launch capability to acquire the target after clearing the hill.

★ Following a series of sea trials, the battleship *New Jersey* was recommissioned late in December at the Long Beach Naval Shipyard in California.

This marks the fourth time that the vessel has joined the Navy's active fleet. *New Jersey* was originally commissioned in May 1943 and earned battle stars during World War II, in the Korean conflict, and in the Southeast Asia war, where it was used to shell inland positions.

The ship's nine sixteen-inch and twelve five-inch guns have been supplemented by eight armored box launchers for Tomahawk cruise missiles, four quad launchers for Harpoon cruise missiles, and Vulcan-Phalanx close-in weapon systems for defense against aircraft and missiles.

In the modernization program that began in 1981, *New Jersey* was also equipped with electronic countermeasures systems, a cruiser-style communications system, facilities for

According to FAA, in only one instance since the regulation went into effect was a firearm slipped through the screening process. In the others, the would-be hijackers were either bluffing and had no weapons or used a ruse with which the screening system was not designed to deal.

During the decade, almost 4.5 billion passengers and more than 5.5 billion pieces of luggage were screened. In this period, *more than 25,000* firearms were confiscated and more than 10,000 related arrests made.

The problem had plagued the country for several years before coming to a head in late 1972 when a copilot aboard a hijacked jetliner was

Thunderbirds 1983 Show Schedule Changes

The 1983 Thunderbird show schedule will start three weeks later than reported on p. 54 of the February '83 issue of AIR FORCE Magazine.

The first show now is planned for Nellis AFB, Nev., on April 2. According to Tactical Air Command officials, the reason for the change is the extra time needed to train a replacement for one of the team pilots who encountered medical problems.

All civilian-sponsored shows will be flown as previously scheduled. Three other military show sites have new dates, while five bases have been removed from the schedule.

The three new dates are: Sheppard AFB, Tex., April 3; Davis-Monthan AFB, Ariz., September 24; and George AFB, Calif., September 25.

Shows dropped from the schedule are: England AFB, La.; Langley AFB, Va.; Laughlin AFB, Tex.; Moody AFB, Ga.; and Shaw AFB, S. C.

For a complete 1983 season schedule, write to: REQUEST FOR SHOW SCHEDULE, Thunderbirds Public Affairs Office, P. O. Box 9733, Nellis AFB, Nev. 89191.

—M.B.P.

AEROSPACE WORLD

the operation of SH-60B helicopters, and advanced air and surface search radars.

The ship's crew tallies sixty-seven officers and 1,460 enlisted personnel.

★ Two Americans have joined the cream of World War II's RAF leaders on a committee to raise funds to establish a Bomber Command Museum in Great Britain.

The two—James H. Doolittle and Ira C. Eaker—were top commanders there during the war. Aircraft representing the US Eighth and Ninth Air Forces would be exhibited in the museum.

RAF Bomber Command, made up of British Commonwealth and allied airmen, lost 126,000 killed in the war. The Bomber Command Museum would join such other institutions as the Royal Air Force Museum and the Battle of Britain Museum in rounding out the historical picture, officials said.

The plan is to raise £2.5 million by subscriptions. Contributions in excess of £10 (about $16) will earn benefactors a "Harris Certificate," named for the air marshal who led Bomber Command during World War II.

Contact the Bomber Command Museum Appeal Fund, RAF Museum, Aerodrome Road, Hendon NW9 5LL England.

★ A test program of a new infrared-guided version of the GBU-15 weapon is to conclude in March at Eglin AFB, Fla.

The weapons were launched from AFSC Armament Division's F-4s and F-111s, but are being developed for use on a variety of other aircraft, officials said.

The GBU-15 Modular Guided Weapon System is in the 2,000-pound (907 kg) class and is manufactured by the Missile Systems Division of Rockwell International, Columbus, Ohio. It is designed for use against high-value, fixed targets.

The GBU-15 Modular Guided Weapon System and its data link pod (located in center of the F-4's undercarriage) during flight tests at Eglin AFB, Fla. (See item below.)

The TV-guided GBU-15 is a proven weapon that has the advantages of great accuracy and standoff capability. It is currently being delivered to operational units. The infrared target seeker will give the GBU-15 night capability, further enhancing aircraft survivability.

★ The ANG and AFRES are seeking officers to compete in international military sports events in Belgium, July 16–22.

The program is open to officers in ready-pay positions, on extended active duty, or on special-duty assignment.

Sponsored by the Interallied Confederation of Reserve Officers, the competition features events of running and swimming obstacle courses, marksmanship, and orienteering. Six three-man teams of US reserve component officers are to compete against teams from eleven allied nations.

To prepare for the event, some forty people will train for three weeks at Fort Sam Houston, Tex. Eighteen of the best will then represent the US in July.

For details, contact Hq. USAF/REL, Attn: Ann Wood, Washington, D. C., 20330. AUTOVON: 227-5844 or (202) 697-5844.

★ AFSC's Electronic Systems Division, Hanscom AFB, Mass., has given the nod for production of communications to link the E-3A Airborne Warning and Control System aircraft with tactical control stations on the ground.

IBM's Federal Systems Division, Owego, N. Y., was awarded a $28.9 million contract to supply eleven links known as Adaptable Surface Interface Units (ASITs). When operational, ASIT units will be sited in CONUS, Europe, and Asia.

An earth-sheltered home for SAC's tanker alert crews at Fairchild AFB, Wash., is the winner of an Air Force "Design Excellence" award. The 15,000-square-foot, one-story building is situated for immediate access to tanker planes. The earth-shelter design improves security, reduces intrusion of jet noise, and is one element in the facility's energy-saving design. The facility may become a prototype for SAC bases.

ON TARGET TO THE TARGET WITH AUTOMATIC TERRAIN-FOLLOWING RADAR

Getting pilots to the target is a Texas Instruments specialty. Take TI's Automatic Terrain-Following Radar (TFR) pod, for instance. This radar will provide F-16 and A-10 pilots with day/night low-altitude operation with adverse weather and ECM capability and is readily adaptable to the F-15E and HH-60D.

TI TFR systems are currently flying on F-111, RF-4C, A-7D/E, C-130, HH-53 and the European Tornado aircraft. In addition, TI produces sea surveillance radars for the S-3A/B, P-3C, SH-60B, HU-25A, and several international customers.

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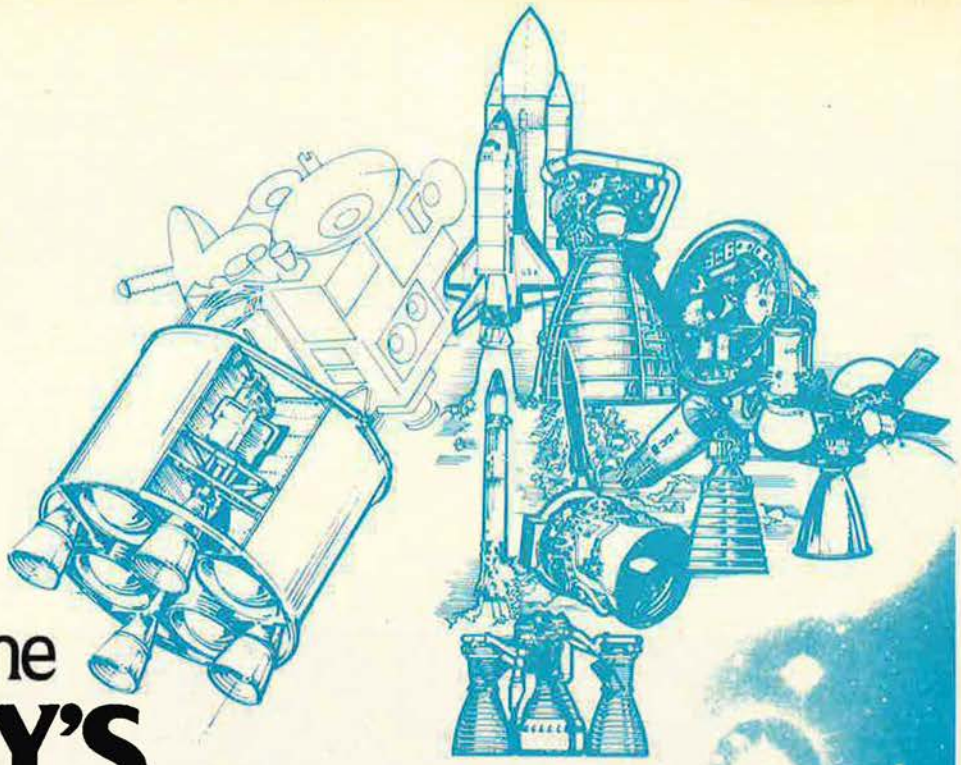

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This advanced technology will have several applications, including: orbital transfer from the Space Shuttle, vehicle maneuvering for satellite positioning and defense, and advanced boost glide strategic missile propulsion.

Rocketdyne provides the highest quality in rocket propulsion for past, present, and future achievements in space and defense. The sky's not the limit, it's only the beginning.

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Advanced Storable Pump-Fed Engine

In contract options, the Army may order up to ten systems and USAF an additional fourteen.

ASITs are key elements of USAF's new Joint Tactical Information Distribution System (JTIDS) that Electronic Systems Division is developing.

"The unit is the essential air-to-ground link between an E-3A JTIDS and ground tactical control facilities," said Air Force program manager Dave Spang. Enclosed in mobile tank-sized S280 shelters, they consist of a JTIDS Class I transmitter/receiver terminal, a translator processor computer, and security equipment. After a message is received from an E-3A, it is translated into digital language, encrypted, and then sent via land lines to ground control facilities.

ASIT production deliveries will begin in late 1984. The contract award follows a five-year Electronic Systems Division development and test program.

AEROSPACE WORLD

★ **NEWS NOTES**—With Japan's defense agency purchasing two more, **orders for the C-130 have topped 1,700,** Lockheed-Georgia announced. The propjet transport has appeared in forty versions flown by more than fifty nations.

TAC has added another—Copper Flag—to its series of realistic training exercises. Initiated in February, **Copper Flag is aimed at increasing the readiness of strategic air defense forces.** Directed by the Air Defense Weapons Center, Tyndall AFB, Fla., the exercise involved ANG as well as TAC aircraft. Eventually, planners noted, air defense forces from other services or allied nations, such as Canada, may also join in Copper Flag. ADWC is to host three such exercises a year at Tyndall.

Japanese and NASA officials recently met to **discuss joint cooperation in the development of an orbital US space station** in the latter half of the 1980s. European countries and Canada have also been invited to participate in planning for the Space Operation Center program from the earliest stages. Japan's aerospace industry has already expressed high interest in the SOC.

Implemented this year will be the **Air Force Academy's Gerhart Scholar Program** to finance graduate fellowships. The program, to be administered by the Association of Graduates, was made possible by the **donation of $190,000** from the estate of the **late Gen. John K. Gerhart,** former NORAD CINC.

Aerospace Rescue and Recovery Service active-duty, ANG, and AFRES units **saved 488 lives in 1982,** MAC announced. Rescue coordination centers worldwide **oversaw 2,142 missions during which 1,038 lives were saved** for the year.

The late Gen. Maurice A. Preston led the October 14, 1943, "Black Thursday" raid on the German ball-bearing plant at Schweinfurt in Bavaria. (See below.)

Died: Gen. Maurice A. Preston, who flew forty-five missions in B-17s during World War II and who later commanded US forces in Japan, of cancer at Bethesda Naval Medical Center in January. Former CINCUSAFE, General Preston, at the age of fifty, became the first Air Force general to earn paratrooper wings. He was seventy at the time of his death. ■

INDEX TO ADVERTISERS

CAPITOL HILL

By Kathleen G. McAuliffe, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., Jan. 24

Cutting the Defense Budget

Administration cuts of $11.3 billion in FY '84 defense spending authority brought the President's original budget estimate in line with that projected by Congress in the FY '83 budget resolution—about $273 billion. Hence, it probably will not be enough to satisfy those in Congress looking to trim the deficit on the back of defense. Congressional sources believe additional cuts of $10 to $12 billion may be recommended by the Appropriations Committees to the Budget Committees on March 15 when they are required to provide the Budget panels with their views. Such additional reductions may be found in the operations and maintenance (O&M) account in the form of reduced flying and steaming hours, and by a stretch-out of procurement programs. Despite congressional concern recently with readiness of US forces, O&M is the one area easy to cut because it lacks a constituency.

If additional cuts of $20 billion are made, as some members want, the reductions would have to include some major programs, which could mean loss of jobs in numerous congressional districts—a politically unpalatable choice. A cut of that magnitude would bring the Reagan FY '84 defense total down to that projected by the Carter Administration.

The Administration's own gloomy economic forecast could serve only to drive defense cuts deeper. Thirty-one House Republicans put the President on notice that unless the Administration provides Congress with a guideline of weapons priorities for budget-cutting purposes, "uninformed and inappropriate" cuts may be made. However, key congressional staff believe it is essential for the GOP leadership to unify all Republicans on the President's budget and defense plans in order to avoid further reductions in defense. A stall in budget action until late May or June by the Republicans could be the key to the President's budget. By then better economic news is anticipated and a better defense budget could result.

Strict Accountability for IR&D

Industry's independent research and development (IR&D) programs will be limited to $2.1 billion in FY '83—a cut of $386 million. The reductions will be made against various procurement accounts, with DoD having discretionary authority to allocate those reductions.

Added restrictions direct that, beginning in FY '85, IR&D and bid and proposal (B&P) costs must be made separate line items in the budget. DoD must submit to the Appropriations Committees no later than April 1 an annex to the FY '84 budget proposing the total ceiling for FY '84 for estimated IR&D and B&P costs.

The restrictions, Congress believes, will bring greater visibility and accountability to costs that contractors previously allocated against procurement contracts.

IR&D provides a cost-effective means of acquiring advanced technology and lowering the chance of technological surprise by an adversary. DoD, therefore, is not happy with the new restrictions. It is felt they will prevent industrial engineers and scientists from pursuing unplanned developments and breakthroughs in technology because of limited funding. Industry and DoD undoubtedly will try to get the provisions overturned in the new Congress.

GAO to Study MX Again

Everyone is restudying MX, and the General Accounting Office (GAO) is no exception. At the request of a bipartisan group of senators, GAO is to conduct an independent review of the program. The group, including Sens. Ernest Hollings (D-S. C.), David Durenberger (R-Minn.), and John Glenn (D-Ohio), among others, wants GAO to give Congress "objective" information on MX and Closely Spaced Basing (CSB) by March 11 in order to make an informed decision on the production funding in the FY '84 DoD Authorization and perhaps an FY '83 supplemental request.

The examination of MX/CSB must focus on accuracy of cost estimates, testing quality of CSB survivability, timing of possible future Soviet countermeasures to CSB, technical deficiencies remaining in development of a ballistic missile defense system to be used as a growth option for CSB and its impact on current treaties, and the number of land-based ICBMs required to survive to meet national nuclear targeting goals.

Based on past GAO analyses of MX, MX/CSB critics probably will get more ammunition from the study's findings to oppose the program.

Arms-Control Approaches

Sen. William Cohen (R-Me.) thinks a possible solution to the arms-control problem may be to abide by the level of strategic weapons contained in SALT II and require that for every new weapon added by either side, two older weapons be dismantled.

The Senator believes such a "guaranteed build-down" would put the nuclear threshold at a safer level, reassuring the public that the government recognizes the dangers of arms escalation. The proposal piqued the interest of the President immediately and found other Administration officials enthusiastic, according to a spokesman for Senator Cohen. Undoubtedly, what appeals to the White House is the formula's recognition of the need for modernizing US strategic nuclear forces to ensure credible deterrence while forcing a cut in the actual number of systems.

Meanwhile, Rep. Jack Kemp (R-N. Y.) wants the President to consider suspension of the START and Intermediate-Range Nuclear Forces (INF) negotiations in light of congressional denial of production funds for MX and the Pershing II. The Congressman blames the "liberal-left" for damaging arms-control negotiations by undercutting vital defense programs.

The President, expressing his belief that both systems will ultimately be approved by Congress, said that an arms-control agreement wherein all Soviet missiles allowed are newly deployed and those of the United States are far older would be unacceptable; he did not embrace the suspension idea. ■

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RAYTHEON

Winston Churchill's comment about the difficulty of forecasting the actions of Soviet Russia—which he termed a riddle wrapped in a mystery inside an enigma—is as valid today as it was in 1939. The central question for this decade is . . .

Will Economic Weakness Increase Soviet Militancy?

BY EDGAR ULSAMER, SENIOR EDITOR (POLICY & TECHNOLOGY)

THE evidence is compelling that the Soviet Union will be a more formidable, more tenacious, and more cunning adversary under the rule of ex-KGB Boss Yuri V. Andropov than ever before. There are many good reasons why the majority of Western Kremlinologists feels this way. For one, none of his predecessors had his manipulative skills, including his understanding of Western-style public relations that he practices with gusto.

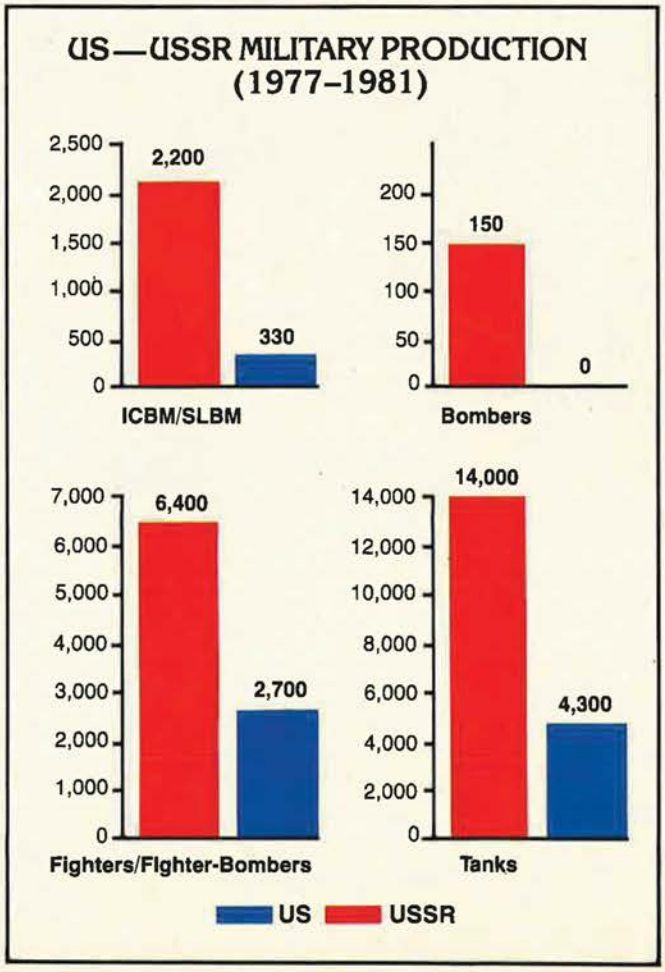
Presumably Andropov acquired these skills during his fifteen-year tenure at the KGB where, for instance, he was instrumental in setting up in the late 1960s the affiliated "USA Institute" and expanding and fine-tuning the Novosti Press Agency that serves as the USSR's foreign propaganda arm. As Ambassador Edward L. Rowny—a keen observer of the Moscow scene and the senior US START negotiator—remarked with dark humor, "We are in for a trial by Yuri." He described the new Soviet party boss as an international affairs expert who "really understands us, and he knows how to twist words."

Twisting words, in the time-honored Soviet tradition of agit-prop (agitation and propaganda) and disinformation—the art of sowing dissension based on the classic formula of "divide and conquer"—is clearly the new Secretary General's strong suit. In an internationally circulated speech he asserted, for example, that "we offer what is suggested by common sense: to freeze the strategic arsenals of the two sides." He then followed through with a fine Machiavellian touch: "The US government does not want this, and now everyone can understand why: It has embarked on a new, considerable buildup of nuclear armaments."

There were a few salient facts that the Soviet leader failed to mention. For one, the Soviet Union is in the midst of an unprecedented armament drive that includes development of four brand-new ICBMs. Moreover, the USSR is in the throes of testing two of them, one a possibly mobile solid-fuel rocket and the other a liquid-fuel design, even though SALT permits only one new missile. Also, these tests involve such flagrant violations of SALT's prohibition against encryption, meaning the concealment of telemetered test data on which the US depends for assessing the performance of the missile and hence Soviet compliance with the terms of SALT II, that even staunch US SALT supporters believe the USSR has scuttled this accord.

Lastly, of course, the Soviet leader ignored the fact that a freeze now would lock the US into a precariously tilted imbalance in terms of strategic nuclear as well as theater nuclear forces. Rectifying this tilt indeed demands the modernization of the aging and numerically inferior US strategic and theater nuclear forces, which will take many years.

Stopping the US nuclear modernization program through an agit-prop campaign aimed at selling the West



on the palliative of "peace at any price" has clearly emerged as a central objective of the Andropov team. Ancillary gambits, such as Andropov's offer in Prague to disband the Warsaw Pact—an empty gesture since one way or another the satellites remain subservient to Moscow—if NATO did the same, are obviously similarly motivated. In the struggle for the hearts and minds of Europe, and other areas of the free world, Andropov is clearly willing to play hardball.

Military Power Is the USSR's Top Priority

While the KGB's stock in trade—the so-called "active measures" that include propaganda, blackmail, forgery, and fifth column operations along with espionage, subversion, intimidation, and repression—is likely to gain added emphasis under the new leadership, the bedrock of Soviet strength and stability continues to be military power.

The influence of the Soviet military within the Kremlin's power structure goes beyond a totalitarian state's intrinsic need to extend its frontiers, control its satellites, and save itself from internal disintegration by armed force. The Soviet military is not averse to act in the role of kingmaker to increase its hold over the USSR's top leadership or to perform other "services."

In 1953, the Red Army and its General Staff gave Nikita Khrushchev the backup he needed to arrest, and subsequently liquidate, Lavrentiy Beria, longtime secret police chief under Joseph Stalin, and in the process bring the MVD, as the KGB was known then, back under direct control of the Secretary General and the Politburo. At that time, two tank guard divisions were brought to Moscow to support Khrushchev's power play. Not surprisingly, they are still there.

As Soviet historian Roy Medvedev points out, the Soviet Armed Forces played a key role again in 1957 when Stalinist loyalists tried to oust Khrushchev, but were stopped cold in their tracks by then-Defense Minister Georgy Zhukov. But Khrushchev, apparently fearing that Zhukov, a revered war hero, might call in this IOU, callously purged him that same year.

Seven years later, Zhukov's successor, Marshal Rodion Malinovsky, turned the tables on Khrushchev by playing a key role in his ouster, mainly because of Khrushchev's move to reduce the power and budget of the "iron eaters," his derogatory term for the Soviet military-industrial complex.

One year later, in 1965, the Soviet Armed Forces under Malinovsky backed Leonid Brezhnev against then-KGB Boss Alexander Shelepin, who was eventually succeeded by Andropov in 1969. Malinovsky's successor, Marshal Andrei Grechko, saw fit to backstop Brezhnev once more against a challenge by Mikhail Suslov, the dour high priest of Communist ideology who died last year.

The most recent chapter in the Byzantine story of the Kremlin's intramural power struggles and "wars of succession" and the Armed Forces' predeliction toward kingmaking contains an ironic twist. In a reversal of the military's past role of shortcircuiting the careers of overly ambitious KGB heads, Defense Minister D. F. Ustinov, in 1982, was instrumental in first moving KGBer Andropov into the post of Central Committee Secretary, replacing the late Suslov—thus thwarting Brezhnev who wanted to place his protégé Konstantin Chernenko into the Soviet Union's heir-apparent slot—and then, following Brezhnev's death, nominating Andropov for the top job of Party Secretary.

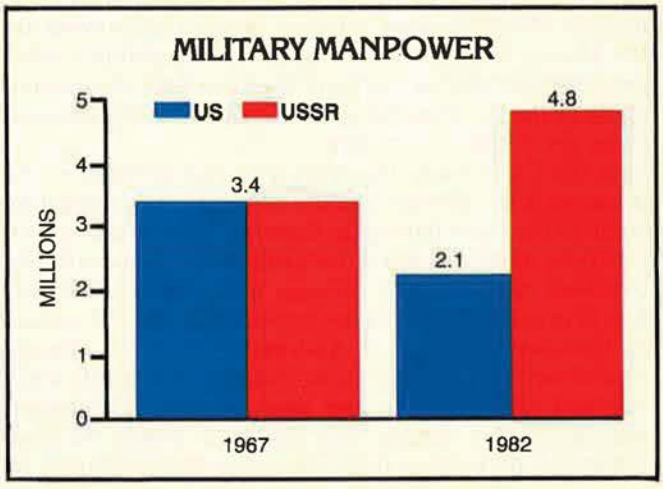
Kremlin watchers see hard-nosed, pragmatic reasons for the military's decision to back Andropov in his unusually smooth and swift ascent to power. Both the state of the Soviet national economy and of public morale in general are issues of deep concern to the Soviet military, since they affect directly and broadly the effectiveness of Soviet military power. On both scores there is evidence that the General Staff, in the waning years of Brezhnev's rule, saw serious deficiencies that begged redress. Andropov presumably got the military's cachet by pledging that he would do better in stamping out the unbelievable, by Western standards, degree of alcoholism and corruption and other breakdowns of public discipline and motivation while, at the same time, reinvigorating the listless economy.

It would seem to follow that, for the time being, the relationship between Andropov and the military leadership will be harmonious, with the bottom line that within certain limits the Armed Forces will get the budget and resources they want. These limits, most Western experts agree, are set by economic performance.

Economic Trends and Influences

Even when applying the benefit of doubt generously, Western analysts see the Soviet economy in a state of marked decline. Richard Pipes, until recently the White House's resident expert on Soviet affairs, put it this way: "The decline of Soviet economic growth can best be conveyed by figures which show that the Gross National Product, which in the 1950s had grown at an average rate of nearly six percent annually, has been steadily dropping until today it is two percent, or one-third the earlier figure. Projections by American specialists indicate that in the coming decade the growth of Soviet GNP is likely to decline to an annual rate below two percent. The Soviet economy as now organized is able to meet current military requirements only by robbing the consumer sector and drastically cutting back the growth in capital investments—actions which cannot be without long-term social and economic consequences."

The root cause of the problem, Professor Pipes believes, is the Soviet regime's inability to cope with a chronic nationwide passive resistance: "The fall in pro-



ductivity observable in the Soviet Union, in the final analysis, is the revenge of the modern serf on his master, the State."

The Chairman of the CIA's National Intelligence Council, Henry Rowen, testified before a Senate panel recently that the results of the past two years "must have been most disappointing to Soviet leaders. It is already clear that most of the important goals of the eleventh Five-Year Plan cannot be met." GNP growth this year, the CIA expert believes, will be about 1.5 percent, with even the industrial sector exhibiting serious sluggishness that will have a long-term ripple effect on all phases of the economy.

Because of the peculiar centralized and dictatorial structure of the Soviet Union there is little likelihood of an economic collapse or even a loss of viability or dynamism, according to the CIA official and other experts. But there is a quandary that sooner or later might require adjustments. As William G. Hyland, President Ford's Deputy Assistant for National Security Affairs, notes, the military burden on the Soviet economy keeps mounting in step with the declining GNP growth rate.

Here is why: Measured by any yardstick, real defense spending has been growing at a steady four to five percent a year since the 1960s; in the 1960s the Soviet economy grew at a rate of between five and six percent. Even in the 1970s, until 1978, the rate was about four percent. In short, the growth in defense spending was in phase with overall economic growth, and defense spending represented a reasonably stable slice of GNP. But since 1979 Soviet defense spending has grown at a rate more than twice the economic growth rate. If these divergent trends are plotted out over the long term, some wits in the US intelligence community have figured out that early in the next century the entire Soviet GNP will go toward defense, an obvious impossibility.

In a practical sense, one of two things could happen. Overall GNP growth could be made to return to the higher, previous levels, which the CIA experts rule out: "We expect annual growth rates to average one to two percent for the foreseeable future." Or defense spending could be scaled back to be in line with GNP growth.

The CIA views such a change as unlikely in the near term. Cosmetic cutbacks of a few billion rubles in any one year won't cure the problem. It would require significant cutbacks over a long period to solve the dilemma. Yet it is highly unlikely that the Politburo will throttle back in the one area where the Soviets have been enormously effective—raw military power. Yet staying on the present course of boosting military spending at rates greater than GNP growth will lead inevitably to a deepening of the economic disparity and to increasing hardships for the Soviet people.

In the CIA's view, the one factor that could ease the dilemma is if "efficiency could be boosted by mitigating some of the most damaging features of the system. Productivity might be raised, for example, without a drastic overhaul of the system through more balanced allocation of investment to end the neglect of such vital sectors as transport." Also, "if Andropov—his rule securely established—undertook basic changes that significantly reduced centralization and gave substantially greater play to market forces, the prospects would be even better. Such a reform, however, would be constrained by the imperatives of maintaining political control in a large multinational society. Furthermore, attempts to implement reform would encounter stubborn noncompliance by party and economic bureaucrats."

Goulash Communism or Neo-Stalinism?

The pressures that are being generated by growing military spending, a listless economy, and an acute manpower shortfall in the decade ahead are likely to trigger reforms of one kind or another.

One option—the traditional Communist approach—is to revert to Stalinism, meaning, as Professor Pipes puts it, "a system of government whose operating principle is fear" and where savage punishment is meted out to those who shirk their duty. "Peasants who do not work for the state can go hungry. Workers who abandon their jobs or who are late for work or absent or report drunk end up doing forced labor. Corrupt officials are severely punished. Dissidents are . . . liquidated. In foreign relations, there is decreased dependence on imports and striving for economic autarky. Commitments to the Third World are scaled down, while tension is increased along the borders [between] the Soviet Union and its East European possessions."

Such an option is not only feasible, he and other Soviet affairs experts argue, but holds a great deal of attraction within orthodox Marxist-Leninist circles, especially the KGB, which fears that staying on the present course will eventually undermine the regime. The trouble with such a solution, most Western analysts believe, is that it won't work over the long pull.

A good case can be made for the proposition that a complex and industrially advanced society such as the Soviet Union can't easily revert to autarky. Nor is it likely that skilled labor engaged in the production of technically advanced products can be motivated to perform better by resurrecting the unbridled terror of the Stalin era, during which industrialization was paid for with human lives.

Today, reforms that are likely to boost the Soviet Union's productivity include decentralization, greater material rewards, more private farmplots, and tacit acceptance of the "second economy"—meaning a private black or gray market.

The liberal economic reform that proved so successful in Communist Hungary seems to appeal to some officials responsible for managing the Soviet economy, according to Professor Pipes and other analysts. They point out that two of the most servile and hardline Communist dependencies, Czechoslovakia and Bulgaria, are adopting the so-called Hungarian New Economic Mechanism, a development that obviously could not have occurred without Moscow's approval.

The appeal of this type of "goulash communism" is that it enhances productivity without a formal abrogation of Communist doctrine. Still, there is little question that in one form or another it undermines Communist dogma and party control. Also, liberal reform might eventually prompt a diversion of resources from the military to the investment and consumer sectors as well as reductions in military and other commitments to the Third World.

Lastly, as Professor Pipes argues convincingly, "by decentralizing the system of economic management and

offering greater scope to private initiative, it would enhance the influence of people who have less of a vested interest in the policy of expansionism. All experience indicates that economic pluralism inevitably brings with it a certain measure of political pluralism which, in turn, intensifies pressures on politicians to concentrate on domestic concerns. A Russia that turns inward, that seeks greatness not in conquest but in constructing a self-assured and vital society, will be less of a threat to itself and its neighbors."

The real question is probably not whether the Soviet Union is headed toward some radical change, but rather how soon. The developments in Poland will almost certainly have a significant impact on the Andropov team. For the first time in the Bolshevik era, a workers' movement was formed and brought about the virtual collapse of a ruling Communist Party and its replacement by a military regime. This clearly strikes at the legitimacy of not only the regimes in Eastern Europe but of that of the Soviet Union itself.

The Polish sea-change might induce repercussions in the Soviet political structure, including yet greater expansion of the military role in the Soviet system. This potential catalyst aside, it is becoming evident that the role of the Soviet military is growing, in part because the Politburo simply isn't up to coping with the technological sophistication of a modern military force. But there are other reasons.

The Soviet officer corps provides the state with an instrument of loyalty, intelligence, relative honesty, and cohesion not available elsewhere within Soviet society. Soviet military officers, of course, have reason to be a happy lot; they receive high salaries by Russian standards, generous perks, and, eventually, good retirement pay. With few exceptions, military professionals in the USSR are completely loyal to the Communist state and the ideology they help shape. As Medvedev points out, basic military doctrine, which by necessity involves or even drives industrial and economic policy, can't be formulated without the officer corps' full participation.

Secondly, the armed forces play a major role in the education and indoctrination of the younger generations. The Soviet Union has universal military service. Preliminary military education begins at the high school level and continues in the majority of institutions of higher education. Every year somewhere between one and a half and two million young people are called to military service that lasts from one to three years.

Lastly, of course, the Soviet Armed Forces' political clout stems to a significant degree from the military establishment's talent for backing "winners" during crises of authority and struggles for succession within the Kremlin.

Naturally enough, the area of activity the Soviet military establishment is concerned with influencing most is foreign policy.

Trends in Soviet Foreign Policy

The politico-military policy of the Soviet Union differs from that of most other major powers because it looks for "foreign enemies" for reasons other than that they may represent threats in a political, economic, or military sense. The main reason the Soviet Union looks for trouble is ideological. When things don't go well domestically, artificially created "foreign enemies" can serve as a convenient vent for drawing off the frustrations of the Soviet populace and rallying the people behind a nationalistic cause. Then, of course, there is the messianic tilt of communism to create global hegemony by political or military means as exemplified by the "wars-of-liberation" strategy.

Recent Soviet history would seem to support this theory. During the Vietnam War—when the US neglected such general military requirements as modernization and its policies took on an inward-looking tint—the Soviets put into effect three consecutive Five-Year Plans. Beginning with the Ninth Five-Year Plan in 1970, the USSR stepped up military spending and foreign subsidies of surrogates and allies while cutting back capital spending and the civilian sector in a major and deliberate way.

As Professor Pipes points out, "The fact that such a shift in favor of military expenditures occurred at the precise time when the United States curtailed its own military expenditures should put to rest the contention that the Soviet Union's military preparations are a mere reaction to American moves. In fact, they seem to be determined by the lure of opportunities for aggression. Taking advantage of America's inward turn, the Soviet Union began to pursue a global imperialism that in its intensity and reach has no precedent in Russian history."

One obvious consequence of this imperialist wave is that today, for the first time since 1917, Soviet troops are assisting military operations on four continents, including their involvement in a full-fledged shooting war in Afghanistan.

The Western Cassandras who equate the Afghanistan experience of the Soviets with that of the US in Southeast Asia, and hence predict an eventual withdrawal and indirect defeat, are probably wide of the mark. Most information coming out of the Soviet Union suggests that the Soviet leaders, especially the military, are determined to achieve victory regardless of how many years of fighting it might take.

For the past 200 years Russia has wanted to annex Afghanistan, and the Soviets aren't likely to be denied their prize because of high casualties or world pressure, in the view of many Sovietologists. Contributing to this determination seems to be a general shift in Soviet politico-military emphasis toward the southern flank—Afghanistan, Pakistan, and South Asia—as well as the Pacific.

One reason is that the political and military opportunities—and in the case of China, the challenges—in these areas are greater than in Europe at this time. Secondly, Western analysts believe that Western Europe—although by no means less of a political target in the sense of the KGB's black arts than in the past—over the next few years will be earmarked for détente to facilitate commercial and technological gains.

For the time being, the intractability of the Iranian theocracy seems to have stymied Soviet ambitions in that direction. Nevertheless, the Kremlin sees the Iranians as basically anti-American and thus likely to turn eventually to the Soviet Union. Also, the Soviets, since 1921, have had a treaty with Iran that in their view allows them to intervene in Iranian affairs during crises.

This Soviet view persists even though every Iranian government since the signing of this accord has denounced it. The prospect of a Soviet-Iranian alliance, along with Moscow's inroads in South Yemen, would pose a crucial threat to the Persian Gulf and cast a long shadow over Pakistan and India.

The East-of-the-Urals Trend

The Soviet shift toward the east started in the 1960s and keeps intensifying. Soviet ground forces east of the Urals—most of whom are on the Sino-Soviet border—have increased from 150,000 to almost half a million today. US intelligence officials estimate that an additional 120,000 Soviet troops are positioned to face Southwest Asia, while close to 100,000 are fighting in Afghanistan. These troops were recently provided with modern equipment to boost mobility and firepower and to enhance their command-and-control systems.

As Defense Department Under Secretary for Policy Fred Iklé recently told the Senate, Soviet air forces in the four easternmost districts are equipped with more than 3,000 combat aircraft, including air defense fighters, attack aircraft, bombers, and combat-support aircraft. These forces have been upgraded with significant numbers of the newest and most modern Soviet aircraft, including Foxbat interceptors, Flogger fighters, Fencer fighter-bombers, and supersonic Backfire bombers.

By way of a benchmark, the Soviets, in each of the last two years, have allocated more new fighters and interceptors to their Far East forces than the entire PACAF inventory. In addition, the Soviets also have put some 100 SS-20 MIRVed intermediate-range ballistic missiles in position in Asia where they can strike US and allied installations throughout the region.

Equally alarming is the growth and modernization of the Soviet Pacific Fleet, the Soviet Union's largest. It contains roughly one-third of all Soviet submarines, one-fourth of all principal surface combatants, and one-third of all naval aircraft.

The striking power of this force of more than eighty principal surface combatants, about 120 submarines, and massive dedicated land-based aviation—the latter including the nuclear-capable Backfire bomber—sends an unambiguous message about Soviet intentions in the region. The Backfire, for instance, can deliver varied ordnance—including bombs and cruise missiles—to extended ranges.

The most modern ships in the Soviet Pacific Fleet, such as the V/STOL aircraft carrier *Minsk* and three *Kara*-class guided missile cruisers, are fast, sophisticated, and equipped with the latest weapon systems, such as standoff cruise missiles.

Soviet warships and aircraft regularly use Vietnamese ports and airfields to aid their deployments in the Indian Ocean and to improve surveillance capabilities in the Pacific. This access is not cheap for the Soviets, according to Secretary Iklé: "Soviet economic and military assistance, estimated to exceed $3 million per day, sustains Vietnam's economy and coincidentally permits upward of 200,000 Vietnamese troops to occupy Kampuchea. Vietnamese efforts to suppress the Kampuchean resistance threaten and occasionally do spill over into Thailand.

"The Vietnamese—with the largest, strongest, and most battle-tested force in Southeast Asia—must be considered a significant threat, independent of the Soviets. Having unified Vietnam under its Communist regime, the rulers in Hanoi are not content to devote their efforts to solving their country's formidable economic problems, but insist on more war, more upheaval."

The situation in North Korea is similar, Secretary Iklé told the Senate Foreign Relations Committee. That

Soviet aircraft, like the Su-24 Fencer shown above, have become a common sight in Far Eastern skies. More than 3,000 Soviet combat aircraft are stationed in the area.

country "maintains a large, formidable, highly trained military establishment supported by continuing defense expenditures totaling at least twenty percent of GNP. It maintains significant advantages over the South in most aspects of combat strength, including more ground troops and over twice as many tanks, artillery pieces, and antiaircraft guns. These forces are offensively configured and forward-deployed. Like Vietnam, we must consider North Korea a substantial independent threat."

The importance of Soviet and surrogate threats to the Pacific Basin and contiguous areas is hard to overstate. It is the region with which the US conducts most of its trade—nearly $130 billion in 1981, consistently more than with all of Western Europe. Further, many critical strategic resources, including $200 billion each year in oil, come from or transit the Pacific.

As far as Japan is concerned, Soviet activities are becoming increasingly ominous. A Soviet mechanized division of some 14,000 troops is stationed on the four Kurile Islands off Hokkaido, Japan's northernmost island. Also located on these islands is a Soviet headquarters installation tailored to control the operations of an entire army corps, as well as a significant number of combat aircraft.

Soviet motives for reinforcing their military presence in the Kuriles are probably twofold. On the one hand, it serves to cow Japan, whose airspace the Soviet fighters invade frequently. On the other hand, these forward-based Soviet forces provide an umbrella behind which Soviet SSBNs can operate safely and conveniently and launch their long-range SLBMs against the United States.

The China Question

The East-West power equation in general, and the politico-military balance in the Far East in particular, could obviously be revamped dramatically by a full rapprochement of the Soviet Union and mainland China, with the two Communist giants making common cause against the free world. Since coming to power, Secretary General Andropov has struck a consistently conciliatory tone in his references to the PRC.

On the other hand, there is little doubt that traditionalist elements in the Soviet regime are not likely to agree to scale back Moscow's military structure in the Far East. Among the stickier issues that would have to be settled is Soviet support of Vietnam, clearly one of the thorns in the PRC's side. This entails, from the Soviet point of view, a Hobson's choice since Soviet access to Vietnamese ports and airfields is dependent on Soviet arms and economic aid.

Other likely preconditions for an eventual resurrection of a Sino-Soviet alliance, from the PRC's point of view, would probably include: reduction of Soviet forces along the 10,000-km-long common border, withdrawal of Soviet forces from Afghanistan, and cessation of Soviet support of Vietnam's invasion of Kampuchea. The likelihood that the Soviets would accede to these conditions is remote.

Further complicating the problem for the Soviets is the strong possibility that Chinese military power—after some fits and starts—will grow significantly and consistently in the years ahead. The prospect of large numbers of Chinese intermediate-range ballistic missiles available for deployment against the USSR, most Western analysts believe, causes nightmares in the Kremlin. The likelihood of a close alliance between the Soviet Union and the PRC in the near future, therefore, is probably nil. But the distance—or proximity—the PRC will keep with regard to the Soviet Union will most likely be determined by the state of US-Chinese relations.

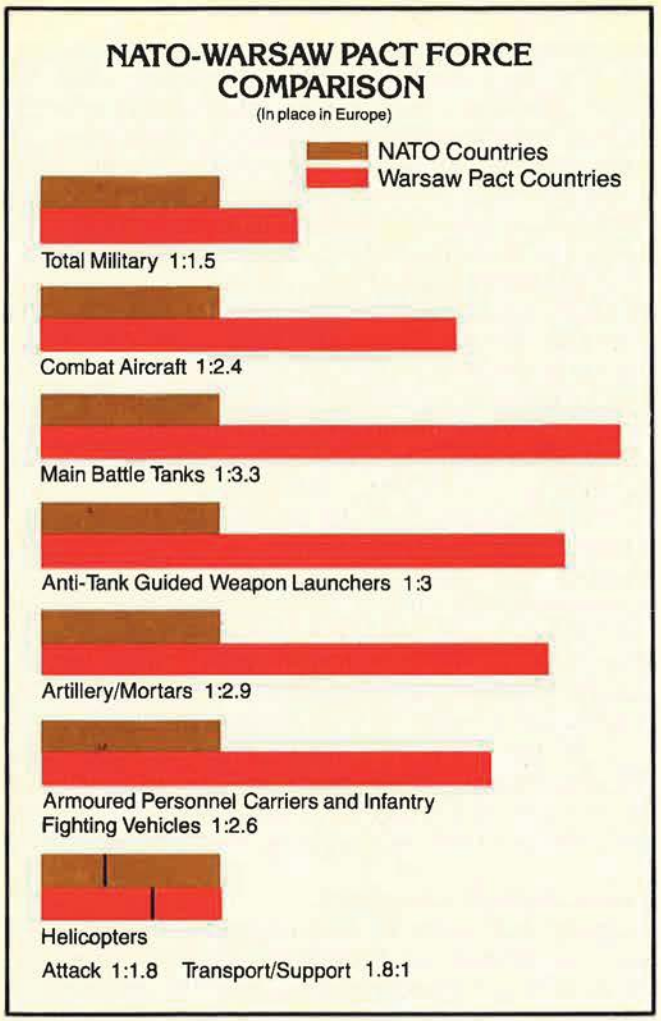
Soviet Military "Strategy"

In the sense of the Soviet military professional, "strategy" as opposed to "operational art" is a comprehensive, cohesive entity encompassing the principles of preparing for and waging war to win. US military intelligence experts point out that undergirding Soviet military strategy and general thinking is the Marxist-Leninist commitment to an unremitting struggle with the West to shift the so-called "correlation of forces," meaning the attainment of politico-military superiority in the broadest sense in favor of the Soviet Union. The eventual goal is global political and military hegemony.

In line with these objectives, Soviet military thinking—and force structure—evolved from some clearly discernible principles. Central is the belief that in any type of combat success depends on having superior forces at the point of attack, taking the offensive, seizing and maintaining the initiative, surprising the enemy, keeping the enemy off balance, and maintaining control. The ensuing requirement is to seize—and hold—the strategic initiative early by prompt and coordinated action of all available forces based on a combined-arms concept of combat. There is heavy reliance on massive reserves, and in the case of nuclear war, the intent to launch decisive offensive strikes rapidly.

The Soviets seem to believe that victory in any war, including nuclear conflict, will go to the side that gets in the first, decisive blow. War is a continuum in which surprise, initiative, mass, and maneuver apply with equal validity at all levels. Therefore, Soviet military doctrine treats preemption as the preferred attack option.

Soviet military writings suggest that the critical steps in escalation occur between the levels of conventional conflict and between tactical nuclear and strategic nu-



clear war. Soviet analysts do not make a clear distinction between theater strategic and intercontinental strategic conflict. Their theorists focus instead on the types of targets being attacked. If a target is determined to have a strategic value, it is fair game for a nuclear attack. It is also clear that they believe they must plan for the possible use of nuclear weapons at all conceivable levels of conflict.

Soviet military writings suggest two principal conditions for the employment of nuclear weapons. The first would be selective battlefield use to redress an unfavorable conventional situation. The growth in Soviet conventional capabilities makes such a Soviet first-use unlikely. The second condition for Soviet first use would be to preempt a NATO decision to escalate to nuclear weapons. Soviet military writings continually stress the need to "frustrate" or "repel" an enemy attack, the former a euphemism for preemption.

Russia's goal in a nuclear war would clearly be victory. Determining the Soviet definition of what would constitute victory in a nuclear war is relatively easy, although the attainment of such a victory is still problematic from the Soviet perspective. The primary wartime objective of the Soviet Armed Forces is to preserve Party control over society. Soviet forces must destroy the enemy's warfighting capability through decisive nuclear strikes against his military forces and those economic assets capable of sustaining the war effort.

Consequently, the Soviets make no clear distinction between counterforce and countervalue approaches. They would attack all those targets that can contribute to the enemy's military capabilities. These nuclear strikes support the ability of the other Soviet forces, principally the ground troops, to seize and occupy enemy territory as necessary. Nuclear strikes would also demoralize the enemy because of the overwhelming destruction they inflict on society. All this would be geared toward attaining unchallenged postwar Soviet power and influence.

Whereas the US seeks to guard against the threat of nuclear war, the Soviets believe superior nuclear warfighting capabilities will lead to Western politico-military paralysis. They reason that such superiority would leave the West at the mercy of vastly superior Soviet conventional warfighting capabilities. Their peculiar concept of deterrence, therefore, is based upon the attainment of superior military forces that would permit the Soviets greater influence and expansion of the "socialist commonwealth."

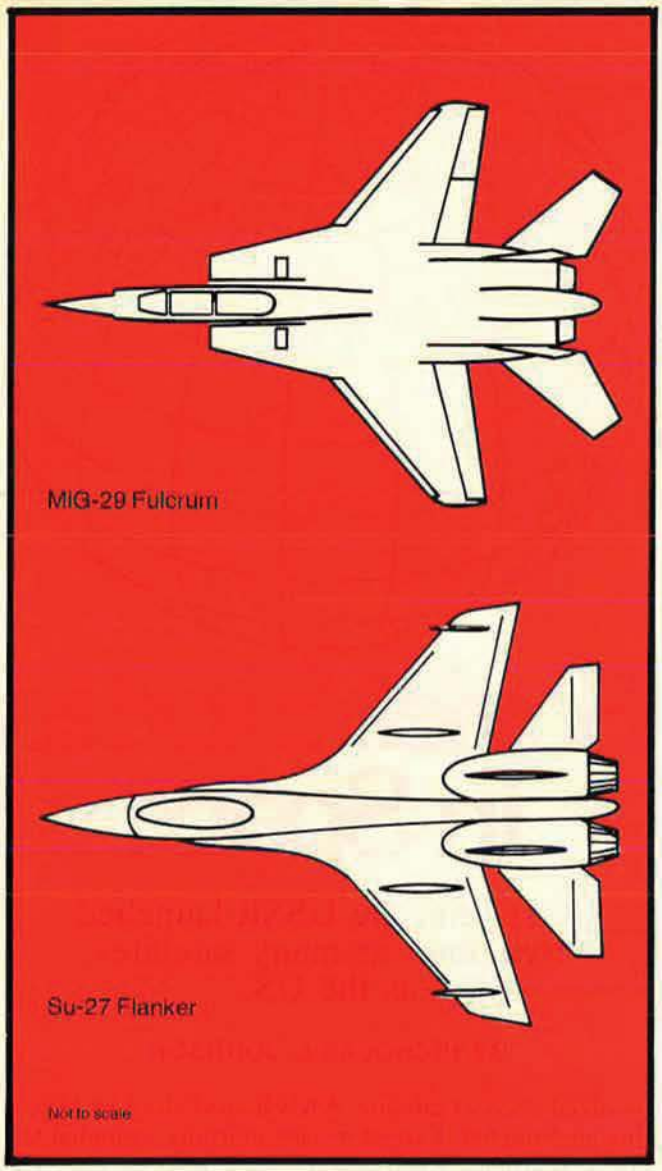
Victory at the conventional level of conflict necessitates early destruction of NATO's nuclear assets. This requirement has spawned the "air operation, a massive coordinated air attack against NATO air defenses, airfields, control centers, and fixed as well as mobile nuclear arms. Such an attack would involve several thousand aircraft and [would] require extremely efficient command and control on the part of the Soviet air forces and their ground controllers."

Not only would such an operation—if successful—destroy NATO's nuclear capability, it would virtually guarantee Soviet air supremacy and thus assure a conventional victory on the ground. NATO's only recourse in this scenario would be to initiate intercontinental nuclear war, which is not a rational act if the Soviets can maintain strategic superiority.

The Soviets also have improved their capability for nuclear conflict at the theater level, should such a conventional strategy prove ineffective. The deployment of nuclear-capable artillery, improved tactical nuclear missiles, and such longer-range MIRVed theater missiles as the SS-20 give them the ability to engage in a wide range of conflict scenarios without resorting to central nuclear systems. This, potentially, gives them the ability to decouple a theater nuclear conflict in Europe from intercontinental nuclear war between the US and the Soviet homeland.

Although the Soviets appear to be developing forces compatible with conducting limited nuclear war in central Europe, it is likely, nevertheless, that they remain pessimistic over the prospects for controlling escalation.

A relatively recent shift in Soviet doctrine came to light last year with the publication of Marshal Ogarkov's book *Always in Readiness to Defend the Fatherland*, in which he asserts that "a profound, and in the full sense, revolutionary turn in military affairs is taking place. . . ." This revolution, he makes clear, pivots on increasing Soviet confidence in advanced conventional weapons—such as smart standoff weapons—and the resultant capability to raise the nuclear threshold. Recent improvements in the Soviet arsenal underscore their determination to boost the effectiveness and lethality of their conventional weapons to the point where they approach the level of battlefield nuclear weapons.



MiG-29 Fulcrum (top), which resembles our F-15, and the Su-27, newly code-named Flanker, which is slightly larger than our F-18, are among the USSR's latest crop of fighters. Both have look-down/shoot-down capabilities.

Present Capabilities

According to recent CIA testimony in Congress, "Since the mid-1960s the USSR has increased its arsenal of intercontinental nuclear delivery vehicles nearly sixfold—overturning US quantitative superiority—and giving itself an assured nuclear retaliation capability. During the same period, Moscow has more than tripled the size of its battlefield nuclear forces, reducing the credibility of NATO's nuclear weapons as a counterweight to the Warsaw Pact's larger conventional forces.

"Meanwhile, the Soviet Union has more than doubled the artillery firepower of its divisions, increased ninefold the weight of tactical ordnance that tactical air forces can deliver in NATO territory, and reduced the West's qualitative lead in such key areas as tank armor. At sea, the USSR has introduced new, heavily armed surface ships, nuclear-powered submarines, and naval aircraft, and has quadrupled the number of missile launchers on ships and submarines."

In a purely statistical sense, the strategic nuclear score card is tilted heavily in the Soviets' favor. Their total in ICBMs is 1,398 (not counting stored weapons) vs. 1,051 for the US. The SLBM tally is 989 vs. 496. About 760 of the Soviet ICBMs represent new, "fourth-generation weapons," while the US force is obsolescent. The accuracy of the new Soviet ICBMs is greater than that of the best US ICBMs. In terms of ICBM throw-weight, the Soviets lead the US with a total of almost 10,000,000 pounds vs. slightly more than 2,000,000 pounds. Measured in terms of ICBM-deliverable equivalent megatonnage, the Soviets lead with about 4,200,000 to 1,500,000 megatons. In strategic bombers, the score is 415 for the Soviets against 371 for the US.

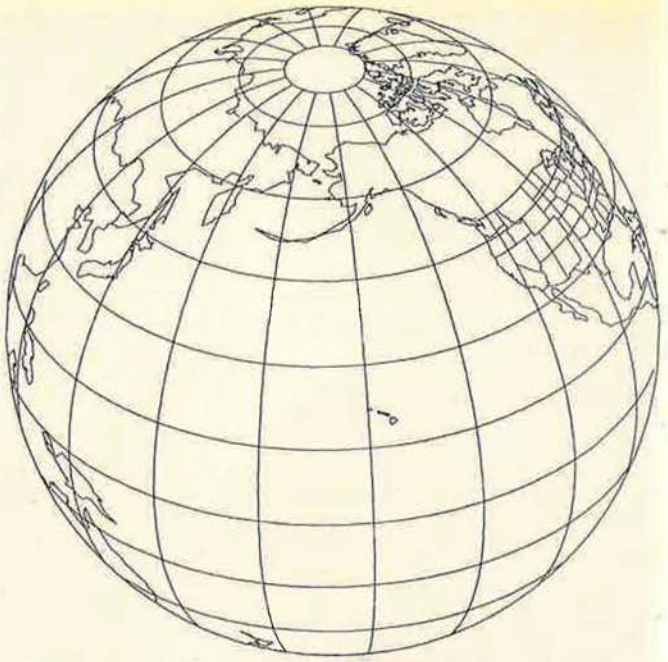
The picture in the theater nuclear arena is equally grim. A new, well-documented study published by the United States Strategic Institute suggests that the Soviet/Warsaw Pact lead over all NATO forces in theater nuclear forces involves the following ratios: In surface-to-surface missile launchers, approximately six to one; in surface-to-surface missiles, four to one; in surface-to-surface warheads, five to one; in aggregate yield of missiles, five to one; in the so-called forward-based systems, including aircraft and launchers, four to one; and in the number of all available warheads, two to one.

In the aircraft sector, a recently issued study by the White House's Office of Science and Technology Policy asserts that "the numerical superiority of our principal military adversary, the Soviet Union, is unquestioned, as is the fact that Soviet production rates for all classes of military aircraft continue to be much higher than their Western counterparts."

Explaining that Soviet production rates for tactical aircraft alone are twice those of the US, the presidential report discloses that the "nine Soviet research institutes working with the eight design bureaus under centralized direction continue to significantly improve existing production aircraft and a range of new aircraft concepts, some of which appear to be nearing production status. Recent introduction into the Soviet military fleet of such aircraft as the Yak-36 (Forger) vertical takeoff and landing (VTOL) combat aircraft, the Mi-24 (Hind) helicopter, and the identification of a new variable sweep-[wing] bomber [the Blackjack], larger than either the Tu-26 (Backfire) or the US B-1, all indicate an intense concentration on the continued improvement of military capability. Soviet dedication of substantial resources to improved aeronautical research capabilities is evidenced by major high-Mach-number facility construction projects at several Soviet research institutes."

In terms of overall research and development, the USSR outdistances the US by a factor of two, and it leads by a similar ratio in terms of available scientists and engineers. Overall, the juggernaut of the Soviet military rolls on at a rate exceeding any reasonable defensive requirements, with last year's production including thirty bombers, about 1,300 fighters and fighter-bombers, 200 ICBMs, and 175 SLBMs.

In the last analysis, though, these numbers are probably less decisive than the intent and mind-set of the Soviet civilian and military leaders who control these forces. There is little doubt that most of them climbed to power by stepping over corpses. The apocalyptic question is, given the incentive, might they be willing to do it again on a grander scale? ■



Soviet Strides in Space

Last year, the USSR launched five times as many satellites as the US.

BY NICHOLAS L. JOHNSON

As THE result of a decade-long enhancement of space-based resources, the Soviet Union now possesses a formidable array of space assets clearly designed to support a multitude of terrestrial requirements, both military and civilian. After flirting with the 100-launch record in 1981, the USSR finally broke through this psychological propaganda barrier in 1982 with 101 successful space launches. More importantly, however, Soviet activities during the year vividly illustrated the depth of their tactical space capabilities and gave a glimpse of what lies ahead in the near term.

Little Interest in Falklands War

The response of Soviet satellites to the two major world crises that erupted in 1982 was enlightening. Despite a plethora of media reports to the contrary, the Soviets showed little overt interest in the conduct of the Falkland Islands war. None of the high-resolution photographic satellites in orbit during the conflict exhibited orbital parameters that would indicate dedicated surveillance of the South Atlantic. Specifically, none of these satellites was placed in ground-stabilized orbits that regularly traversed the Falklands, nor were their points of perigee shifted to the southern latitudes to improve the resolution of potential observations.

The most likely candidate for photographic surveillance of the Falklands—weather permitting—was Kosmos-1,368. During its last few days (late May and early June) in orbit, it passed near the Falklands at an altitude of about 240 km around 11:00 a.m. local time. Presumably, some of the medium-resolution satellites flown during this period on worldwide surveillance missions could have returned information of lesser utility.

There are probably two reasons for the apparent lack of Soviet interest. First, until the final stages of the war, the Argentines, whom the Soviets were reportedly helping, held the Falklands and were in no need of the type of intelligence for which Soviet photographic satellites are best suited. Secondly, the weather conditions in the region were for the most part unfavorable, reducing the probability of successful reconnaissance. Most of the other Soviet satellites launched during the war—navigation, communications, worldwide ELINT, early warning, and radar calibration missions—were normal replacements for older satellites.

Of the twenty-nine Soviet launches that took place during the Falklands war, only three are assessed to have been of significant *potential* utility in the conflict. These were the ocean surveillance satellites Kosmos-1,355 (passive ELINT), and Kosmos-1,365 and -1,372 (active radar). When the British fleet was assembled and started its southward trek, the Soviets were without a space-based ocean surveillance network. Consequently, Soviet trawlers and reconnaissance aircraft were drafted to keep track of the British armada during the trip to the Falklands. Only after the fleet had arrived off the Falklands was Kosmos-1,355 launched, followed by Kosmos-1,365 and -1,372 on May 14 and June 1, respectively. Particularly in recent years, new ocean surveillance spacecraft have regularly appeared in the March-April time frame, strongly implying that the 1982 ocean surveillance satellites were *not* reactive to the Falkland Islands war.

One important incident early in the war may have involved a Soviet satellite. A few hours before an Argentine air-launched Exocet missile mortally wounded the HMS *Sheffield*, Kosmos-1,355 flew directly over the Falklands and then continued north toward Soviet territory. Circumstantially, Kosmos-1,355 appears to have been capable of detecting the task force that the *Sheffield* was trying to protect. One reputable report hinted that an Argentine SP-2H Neptune patrol plane was actually responsible for directing the Super Etendard fighter that fired the deadly missile. Unfortunately for the *Sheffield*, she was standing picket duty for the task force at the time, *i.e.*, emitting powerful radar beams to detect approaching enemy aircraft. The potential data from Kosmos-1,355 would have been in all probability superfluous, since the Neptune aircraft already knew or could have guessed from a wide variety of sources the general location of the *Sheffield* and her sister ships.

Finally, it should be noted that the Soviet ocean surveillance network appears to be one of the Soviet Union's front-line tactical space systems, and disclosure of information from it to as unlikely a recipient as Argentina is doubtful.

Eye on the Middle East

More obvious were Soviet observations of the Lebanon war in June and July. Kosmos-1,370—one of the

The drawing on the facing page shows the vantage point of Soviet early warning satellites near their Pacific Ocean apogee.

new generation of long-duration Soviet reconnaissance satellites—was already circling the earth when the Israeli army crossed into Lebanon on June 6. Two days later the satellite had maneuvered into a position to view the escalating engagements. Kosmos-1,370 maintained its daily patrol over the region until June 12, when it was relieved by Kosmos-1,377 (launched June 8).

Between June 12 and June 16 Kosmos-1,377 followed a virtually identical path over the Middle East, dipping to an altitude of only 170 km. Kosmos-1,377, like Kosmos-1,370, was one of the type of satellites that reportedly carries small recovery capsules for the dispatch of time-urgent intelligence data. The Soviets could then relay the information to their Syrian allies, who were unable to mount any battlefield air reconnaissance. Kosmos-1,384, another advanced photographic satellite, also appeared to be watching over Lebanon, particularly in mid-July.

When Iraq launched a new offensive against Iranian territory on November 1, Soviet spy satellites were quickly diverted to the region. Kosmos-1,419 maneuvered on November 5 to retard its drift across the battlefield and to permit observation opportunities on the next two days. After resuming its global surveillance mission, Kosmos-1,419 returned to the area on November 13; this time the spacecraft maneuvered into a stabilized ground track and made identical passes over the region for three consecutive days. Kosmos-1,419 was then recovered on November 16. Kosmos-1,421 also exhibited behavior conducive to surveillance of the Persian Gulf.

Soviet ASAT Test

June witnessed an unprecedented display of strategic weaponry employment, apparently designed to integrate the various command control and communications (C^3) functions necessary for full-scale nuclear warfare. Reportedly, the test included firings of two SS-11s, an SS-20, two ICBM targets later intercepted by ABM-X-3 missiles, and an SLBM from an operational ballistic-missile submarine. In the midst of this hectic exercise, the only Soviet antisatellite (ASAT) test of the year was conducted. Kosmos-1,379 was launched from the Baikonur Cosmodrome on June 18 and at about 1423 GMT passed close by its target, Kosmos-1,375, at an altitude of about 1,000 km.

The significance of the ASAT test, which was almost identical to the two tests performed in 1981, was its relation to the strategic weapons simulation and the other space activity being conducted simultaneously. A little more than three hours elapsed from the launch of Kosmos-1,379 until its interception of Kosmos-1,375. During this time two other satellites were launched: One a navigation satellite from Plesetsk (Kosmos-1,380), and a medium-resolution photographic satellite from the Baikonur Cosmodrome (Kosmos-1,381). There had never before been a space launch from any Soviet facility during the course of an ASAT test, let alone two. The two satellite launchings may well have imitated the orbiting of replacement satellites for residents destroyed by the US during the wartime scenario. (In a footnote to the navigation satellite replacement, the second stage of the launch vehicle shut down prematurely. Nine days later Kosmos-1,380 was incinerated as it fell back to earth.)

The timing of the comprehensive strategic exercise was also noteworthy. The United Nations disarmament talks had just gotten under way. In addition, the fourth Space Shuttle flight—the first DoD Shuttle mission—was only nine days away and was already receiving heated criticism from the Kremlin. Finally, the imminent announcement of the formation of a US Space Command was, of course, anticipated. Thus the extent and timing of the exercise may have been intended as a signal to the US of Soviet displeasure with American moves to counter the growing Soviet threat.

Surveillance of US Operations

Unexpectedly, the Soviets have shown a keen interest in space-based surveillance of Space Shuttle landings. Fourteen hours after the liftoff of STS-1 in April 1981, Kosmos-1,262, a week-old high-resolution reconnaissance satellite, maneuvered into a new orbit with a lower average altitude. As a result, Kosmos-1,262 flew directly over the STS-1 California landing site at an altitude of about 220 km less than ten minutes before STS-1 touched down.

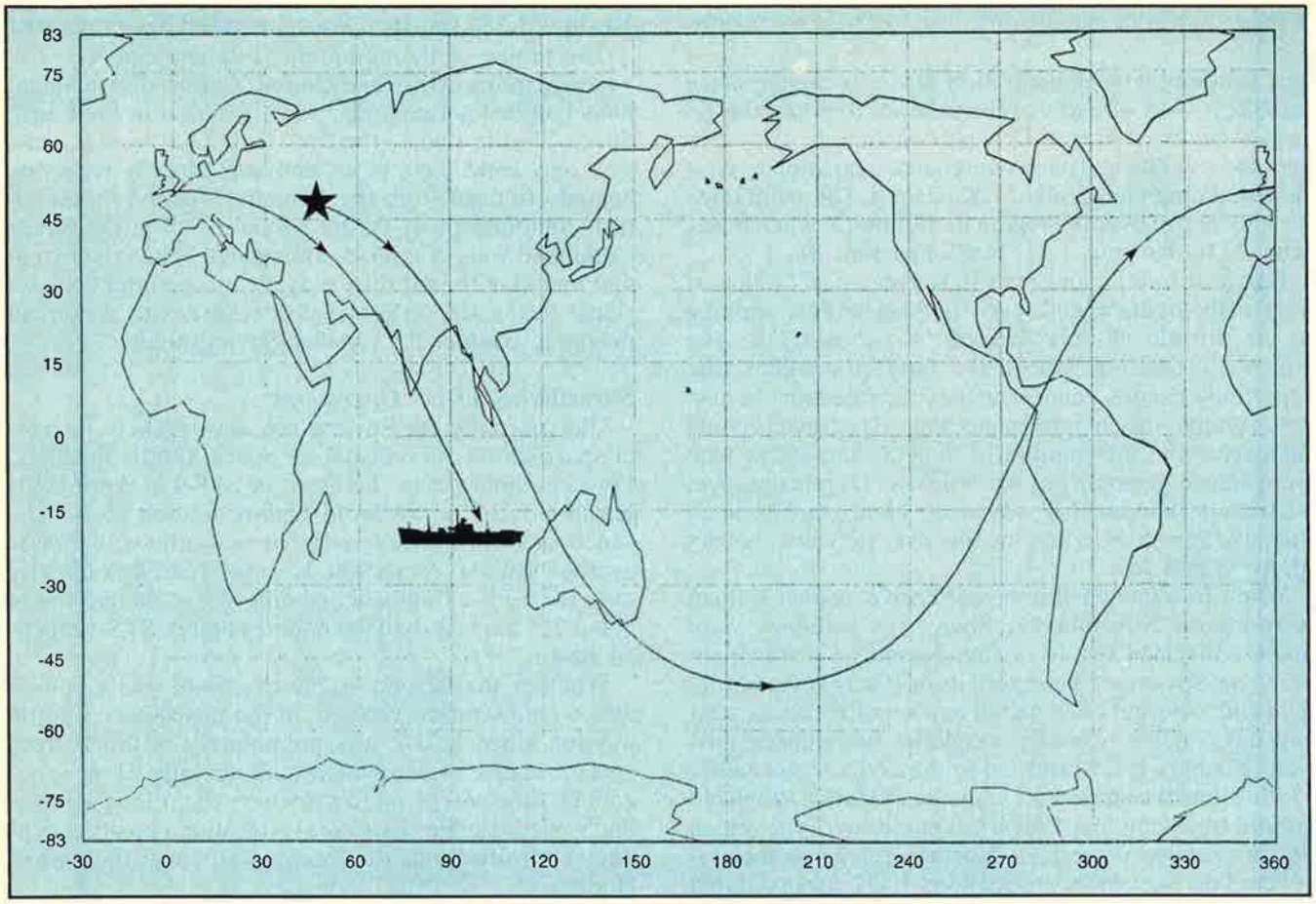
Whether the Kosmos-1,262 overflight was a coincidence could not be verified on the next Space Shuttle mission since STS-2 was prematurely returned from space because of equipment malfunctions. Hence, not enough time was given to maneuver the principal orbiting Soviet satellite, Kosmos-1,318, into a position conducive for observing the recovery site near the time of landing.

Soviet intentions regarding STS-3 in March 1982 were seemingly transparent. STS-3 lifted off from the Kennedy Space Center on March 22 with a scheduled touchdown at White Sands, N. M., for March 29. In the very early morning hours of March 25, Kosmos-1,343, another Soviet high-resolution photographic satellite, maneuvered into a slightly higher orbit. Consequently, on March 29 Kosmos-1,343 passed over White Sands just fifteen minutes before the planned landing of STS-3. However, because of excessive winds, STS-3 was commanded to delay reentry until the next day.

But the story does not end there. The orbit of Kosmos-1,343 would not pass as close to White Sands on March 30. During the night of March 29 (US time), Kosmos-1,343 performed an unusual (under the circumstances) maneuver that altered its orbit from 320 km by 225 km to 243 km by 220 km. The result of this maneuver was twofold.

First, the ground track of Kosmos-1,343 on March 30 was shifted back to the east, where the satellite passed close to White Sands at an altitude of 230 km about forty minutes before the safe landing of STS-3. The reason why the Soviets would want to photograph the landing sites so soon to recovery is not entirely clear, but the orbits of Kosmos-1,262 and Kosmos-1,343 appear to be more than coincidental. Although all landings have been open to the public and media coverage has been extensive, a possible explanation for the Soviet actions is a desire to get a satellite's view of the site for reference in assessing potential future landing fields.

The second benefit of Kosmos-1,343's orbital maneuver was associated with the Gallant Eagle '82 war games



This illustration shows the flight profile of Kosmos-1,374, the test of a small Shuttle-like vehicle last June.

then under way at Fort Irwin, Calif. On the morning of March 30, 2,300 men and 266 tons of matériel from across the country were air-dropped onto the military reservation in a test of the Rapid Deployment Joint Task Force (RDJTF). Besides substantially lowering the satellite's apogee, the orbital maneuver shifted Kosmos-1,343's perigee from its ascending trek through the northern hemisphere to its descending passage. Therefore, the satellite passed at an altitude of about 220 km just to the east of Fort Irwin and Twenty-nine Palms where the war games were being staged just twelve hours after the main parachute drop. This afforded the Soviets an excellent opportunity to survey the initial staging deployment by the RDJTF.

Even more intriguing was the recovery of Kosmos-1,343 in the Soviet Union within three hours of its passage over the California desert. Hence, the Soviets could test the swiftness of their photographic intelligence teams under a mock tactical situation. The apparent ability of the Soviets to overcome unexpected obstacles—*i.e.*, the delayed STS-3 landing—in real time and still meet other objectives attests to a substantial maturity in the Soviet system.

Weather, Communications—and a Soviet Shuttle?

New Soviet spacecraft and operational changes to older ones were evident in 1982. The test of a small Shuttle-like vehicle in June caused quite a furor in the West. The spacecraft, Kosmos-1,374, flew a normal flight profile out of the Kapustin Yar launch facility atop a small SL-8 (SS-5 derivative) vehicle, but mistaken assumptions in the initial media reports regarding the size of the satellite implied a much larger vehicle never before seen at Kapustin Yar.

In retrospect, Kosmos-1,374 seems to have been in the 1,000-kg class, obviously not capable of ferrying cosmonauts but possibly a subscale model of a larger design. Kosmos-1,374 was successfully recovered in the Indian Ocean by a Soviet naval task force after slightly more than one orbit about the earth. The nature of the mission was reminiscent of American tests performed in the 1960s. The inference is that the Soviet reusable spacecraft program, much debated in the West, is still far from operational flights.

The first of a new series of improved Meteor-2 weather satellites also made its debut during this year. Meteor-2/8 was lifted into orbit apparently by a SS-9 derivative launch vehicle, in contrast to the SS-6 class vehicle that has been used on all other Meteor missions. In

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Nicholas L. Johnson is Principal Technologist and Manager of Antisatellite Systems at Teledyne Brown Engineering. He served four years with USAF and saw action in Vietnam. He later attended the US Naval Nuclear Power School and was commissioned in the Navy, serving four years. Mr. Johnson holds a bachelor's in physics from Memphis State University, and has done graduate work in space science at the University of Houston. He has recently completed a book concerning Soviet military strategy in space.

addition, the spacecraft entered a higher orbit (960 km by 940 km) than the earlier Meteor-2 satellites (900 km by 850 km). This marks the initiation of a new three-satellite constellation—to be deployed by 1985—that will employ steady-state plasma thrusters to synchronize the three vehicles and increase system efficiency.

In a related project, the Soviet Union announced that development work continues on the long-delayed Geostationary Operational Meteorological Satellite (GOMS). Consideration is also being given to placing weather satellites in polar orbits with twenty-four-hour periods to observe better the extreme northern and southern latitudes.

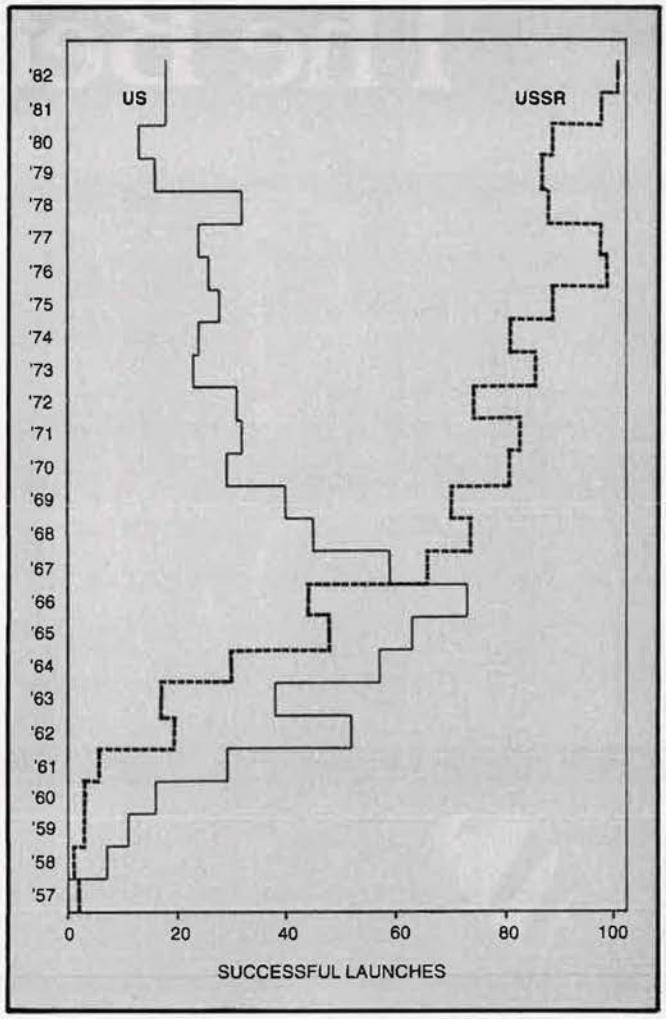
In the field of communications satellites, the Soviets experimented with three new superhigh frequency (SHF) transponders during 1982. The geostationary Gorizont-5 finally tested the Luch (11–14 GHz) and Volna (1.5–1.6 GHz) transponders that are scheduled for wide distribution in the geostationary ring. Molniya-3/19, launched in August, carried a new SHF payload, possibly another Volna transponder (designed for maritime and aeronautical links) that the Soviets had tied earlier with future Molniyas. Another experimental SHF satellite, Kosmos-1,366, was placed in geostationary orbit on a less publicized mission and is still maintaining its position at 80°E, which is an announced location for the forthcoming Potok satellites.

Navigation and Early Warning Satellites

Improvements in the Soviet navigation network were also revealed. Kosmos-1,383, the first Soviet navigation satellite to carry the new COSPAR search and rescue equipment, was instrumental in locating quickly the survivors of a downed aircraft in Canada and aided in several other rescues by the end of the year. An application filed with the International Telecommunications Union (ITU) disclosed that the Soviet Union will soon deploy a new generation of navigation satellites. Although designated GLONASS (Global Navigation Satellite System), a more appropriate name might be NAVSTARsky since the satellite will not only possess orbital parameters virtually identical to the present American NAVSTAR spacecraft, but will also transmit on nearly the same frequencies! A test launch of three satellites into this new orbital regime on October 12 appeared to be a partial failure.

The Soviet early warning satellite network continues to mature, and in 1982 completed a shift in satellite coverage. The nine-member constellation has been moved to the east, providing more complete coverage of the US on the satellites' Pacific Ocean passes. On their Atlantic Ocean orbits the early warning satellites are still afforded an excellent view of possible SLBM staging areas and launches from the People's Republic of China.

Despite their absence during the first part of the Falkland Islands war, Soviet ocean surveillance satellites experienced another record-breaking year with seven successful launches—four of the nuclear-powered radar class and three of the conventionally powered passive ELINT variety. A familiar surge of activity was again detected in late summer and early fall, when both NATO and Warsaw Pact maneuvers were under way. During this period (for the very first time in the history of the program) the Soviets had a pair of each type of satellite operational simultaneously. Unfortunately, one of the radar satellites (Kosmos-1,402) launched at this time failed to maneuver its radioactive power supply to a higher storage orbit after its mission was terminated on December 28. Consequently, the nuclear payload began a gradual descent toward reentry in late January 1983.



This chart dramatizes the volume of space-launch activity by both the US and the USSR during the last twenty-five years.

The biggest surprise of the year in this program was the fragmentation of four inactive solar-powered types (one broke up twice three months apart). Occurring on a seemingly regular schedule (one a month from May to September), each event may have created as many as 100 pieces of space debris. Furthermore, an analysis of all such events—ten to date—revealed a pattern of apparently deliberate break-ups for reasons yet to be determined.

During 1982, the Soviets continued unabated their formidable earth satellite programs, conducting more than five times as many launchings as the US. Significant improvement of the operational utility of all space systems remains the dominant theme of Soviet activity. Moreover, there is no evidence that this trend—with its obvious implications for American national defense—will change in the foreseeable future. ■

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TOP LEADERS OF THE SOVIET ARMED FORCES

Marshal of the Soviet Union Dmitriy Fedorovich Ustinov. Born 1908. Russian. Naval artillery engineer who became wartime armaments production chief. From 1946 to 1957 he was Minister of Armaments, then Minister of Defense Industry. He worked with Brezhnev expediting missile production and the space program (1957) as Deputy Chairman of Council of Ministers, then First Deputy Chairman to 1965, Secretary of Central Committee CPSU (1965–76), Candidate Member of Politburo (1965 to March 1976), then Member of Politburo since March 1976. Minister of Defense (April 1976). Twice "Hero of Socialist Labor." Also a "Hero of the Soviet Union" (1978).

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

Marshal of the Soviet Union Viktor Georgiyevich Kulikov. Born 1921. Russian. In January 1977, appointed Commander in Chief of the United Armed Forces of the Warsaw Pact. First Deputy Minister of Defense since 1971. Member of the Central Committee CPSU since 1971. Deputy of the Supreme Soviet 7th through 10th sessions. Commander of the Kiev Military District (1967–69), then Commander in Chief, Soviet Forces Germany (1969–71). Chief of the General Staff (1971–77). Frunze Military Academy (1953), Academy of the General Staff (1959). "Hero of the Soviet Union" (1981).

General of the Army Alekseyevich Yepishev. Born 1908. Russian. Chief of the Main Political Directorate since May 1962. Yepishev was in political work in the Armed Forces during World War II. Deputy Minister of State Security (MGB) (1951–53). Ambassador to Romania (1955), then to Yugoslavia (1961). Candidate (1952–64), then Member of Central Committee CPSU since 1964. Deputy of the Supreme Soviet 1st, 3d, 4th, and 6th through 10th sessions. Military Academy of Mechanization and Motorization (1938). "Hero of the Soviet Union" (1978).

Marshal of the Soviet Union Sergey Leonidovich Sokolov. Born 1911. Russian. First Deputy Minister of Defense for General Affairs since 1967. Served on the Western and Karelian Fronts during World War II. First Deputy Commander (1964–65), then Commander of the Leningrad Military District to 1967. Candidate (1966), then Member (since 1968) of the Central Committee CPSU. Deputy of the Supreme Soviet 7th through 10th sessions. Military Academy of Armored and Mechanized Troops (1947). Academy of the General Staff (1951). "Hero of the Soviet Union" (1981).

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

General of the Army Vasiliy Ivanovich Petrov. Born 1917. Russian. Commander in Chief of Ground Forces and Deputy Minister of Defense since December 1980. In World War II, commanded a cavalry platoon, then chief of operations of a rifle division. In 1957, commanded a motorized rifle division. After 1961, various command posts. In 1966, First Deputy Commander and Chief of Staff of the Far Eastern Military District, and in 1972, Commander. In 1976, First Deputy Commander in Chief of Ground Forces. Commander in Chief of Troops of the Far East, 1978–80. Full Member of the Central Committee CPSU since 1976. Deputy of the Supreme Soviet 9th and 10th sessions. Frunze Military Academy (1948). Graduate of General Staff Academy's Higher Academic Courses (1969). "Hero of the Soviet Union" (1982).

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

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

Admiral of the Fleet of the Soviet Union Sergey Georgiyevich Gorshkov. Born 1910. Russian. He has held his present post as Commander in Chief of the Navy since 1956. Gorshkov took an active part in World War II landings in the Black Sea area, and supported fighting in Hungary and Yugoslavia. In July 1955, he became First Deputy Commander in Chief, then, in January 1956, Commander in Chief of the Navy and Deputy Minister of Defense. From 1956, he was Candidate, and from 1961, a Member of the Central Committee CPSU. Deputy of the Supreme Soviet 4th through 10th sessions. Graduate of Frunze Naval School (1931) and higher commanders' courses at the Naval Academy (1941). Twice "Hero of the Soviet Union" (1965, 1982).

—HARRIET FAST SCOTT

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.

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

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

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

The **Ministry of Defense** and the **General Staff** provide centralized command and control. Immediately subordinate to the Minister of Defense, who is roughly comparable in authority to both the US Secretary of Defense and the Chairman of the JCS, 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 600 IR/MRBMs. Little is known about the SRF outside the Soviet Union, but it is first among services, with its commander taking precedence over those of the other services, regardless of his actual rank. *The Military Balance,* published annually by The International Institute for Strategic Studies, London *(see December '82 issue of* AIR FORCE *Magazine),* credits the Strategic Rocket Forces with 325,000 personnel. Strength figures for the services below are from *The Military Balance* for 1982–83.

The **Ground Forces,** numerically the largest of the five services, are divided into three major branches: motorized rifle, tanks, and rockets and artillery. Airborne Forces (the USSR now has eight airborne divisions) are a special branch directly subordinate to the High Command. The 172 Ground Forces divisions, with tanks, armored personnel carriers, self-propelled artillery, and personal equipment all are designed for a CBR environment, and equipped and trained for combat with or without nuclear, chemical, and biological weapons. Ground Forces personnel, combined with Troops of Civil Defense, Troops of the Rear Services (logistical support), and various other support personnel that serve all the other services, number about 1,825,000.

The **Troops of Air Defense** (Voyska PVO) was formed in 1948 as PVO-Strany. Its three major components are its 2,250 fighter-interceptors, 10,000 SAM launchers, and huge radar network. Two other components are antimissile defense (PRO) and antispace defense (PKO). Exceeding NORAD's capabilities several times, PVO has some 620,000 troops.

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

Frontal Aviation is comparable to USAF's Tactical Air Command. Its 4,480 combat aircraft plus 2,300 armed helicopters are assigned to military districts within the USSR, somewhat analogous to US joint commands, and to four "Groups of Forces" in Eastern Europe. Operational control over joint commands remains with the General Staff. However, the Air Forces commander in chief has major responsibilities for Frontal Aviation, which is charged with maintaining battlefield air superiority and working with the Ground Forces.

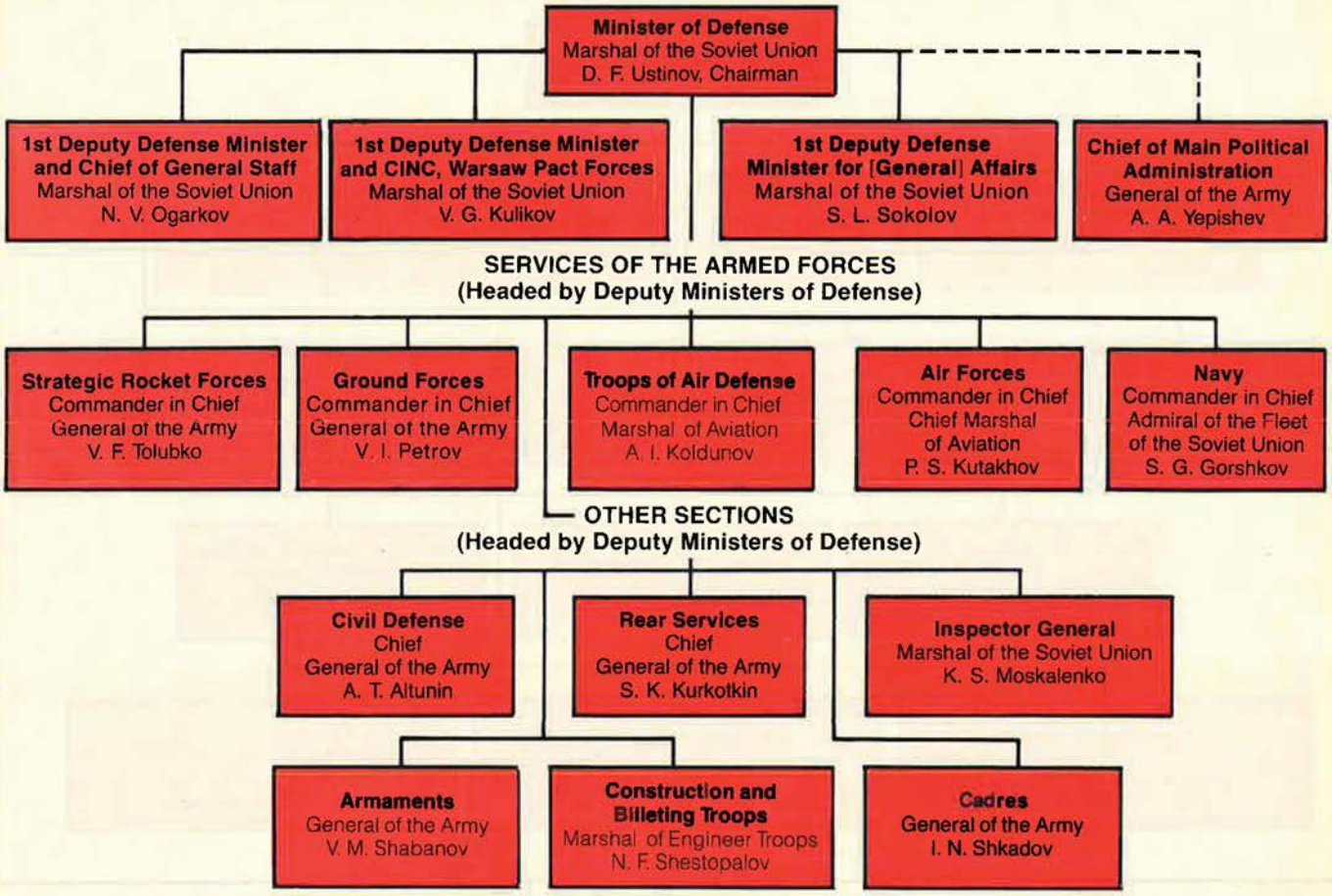
Long-Range Aviation has about 809 long-range (Bear, Bison, and Backfire) and medium-range (Badger and Blinder) bombers. Backfire and Blinder are supersonic, but the bulk of the bomber force is still subsonic. Capable of air-to-air refueling by LRA's small tanker force, the bombers can carry either nuclear or conventional weapons, including air-to-surface missiles. This component of the Soviet Air Forces is comparable to USAF's Strategic Air Command, less SAC's ICBMs.

Transport Aviation includes some 600 fixed-wing aircraft. The transport aircraft of the Soviet airline, Aeroflot, must also be included in this component essentially as a full-time reserve.

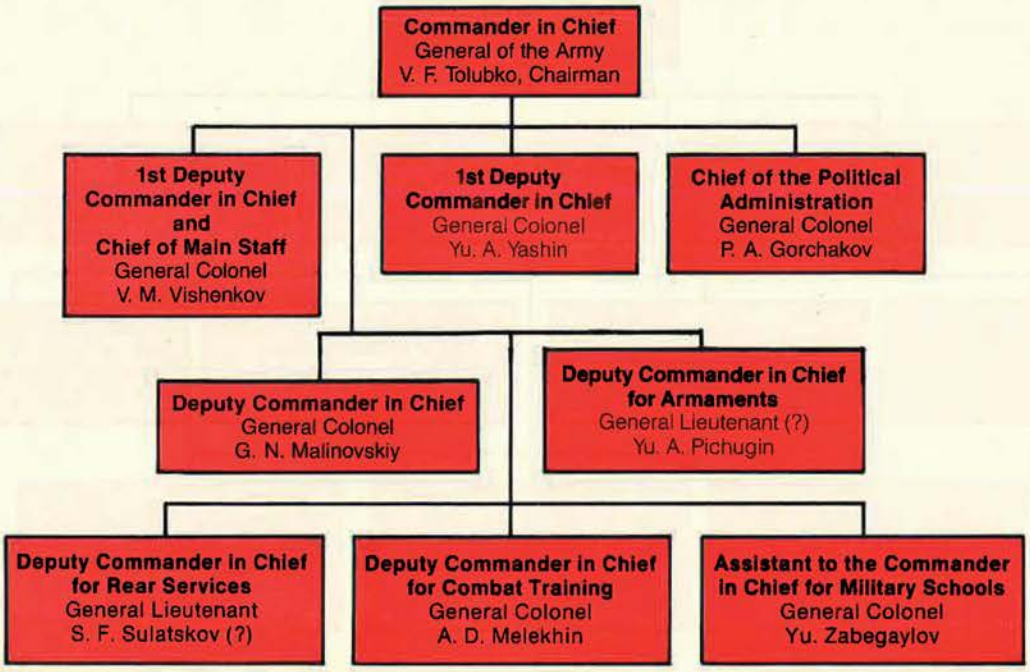
The **Soviet Navy** is now a maritime superpower. With its aircraft carriers of the *Kiev* class, Soviet Naval Aviation has a mix of carrier-based helicopters and V/STOL aircraft. Naval Aviation also has land-based and reconnaissance fighters, a limited transport force, bombers, and surveillance aircraft. Navy personnel strength is about 450,000, including 59,000 in Naval Aviation.

The accompanying charts, prepared by Harriet Fast Scott and current as of February 1, 1983, show the membership of the top military organization. ■

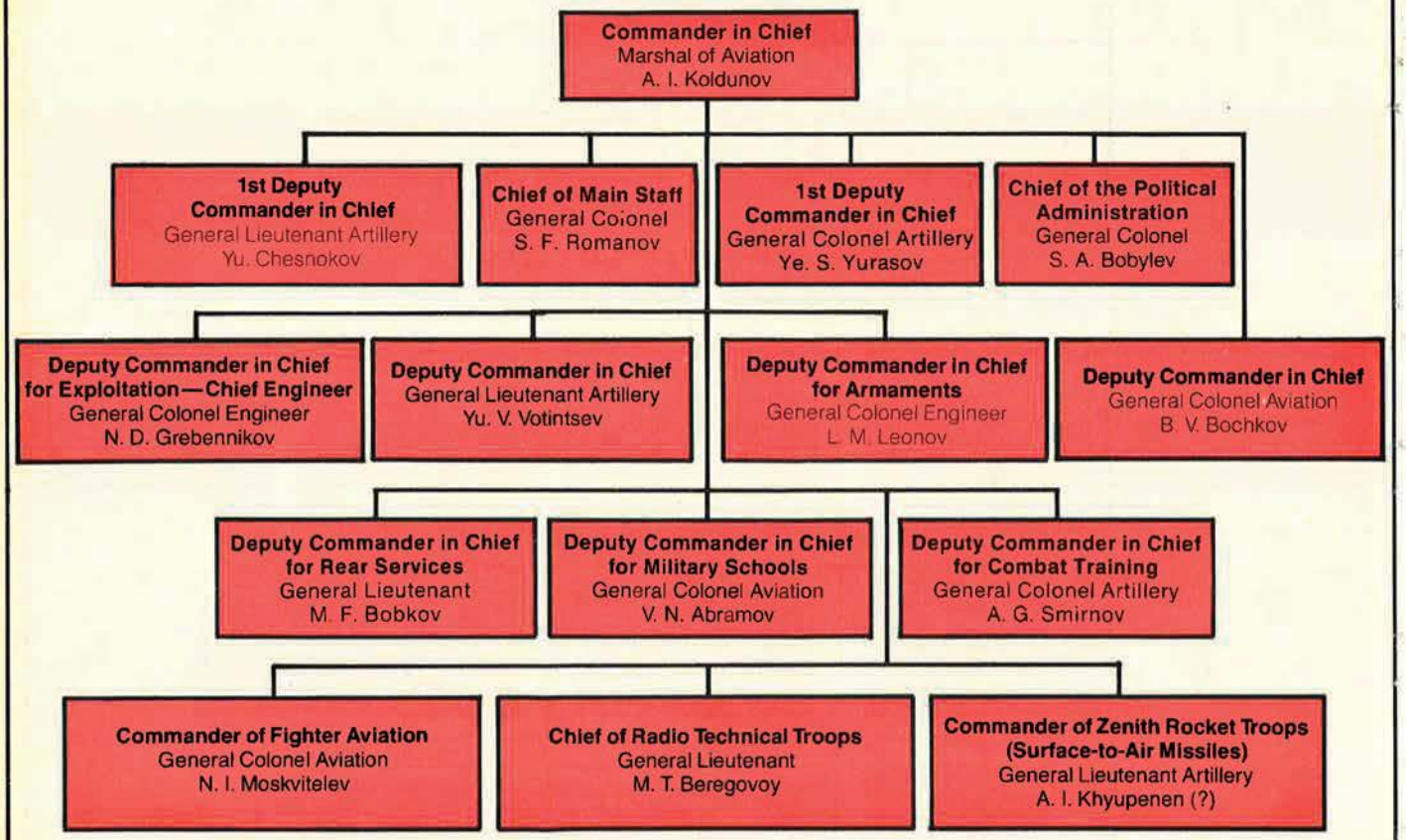
MEMBERS OF THE MAIN MILITARY COUNCIL *(KOLLEGIYA)* OF THE MINISTRY OF DEFENSE



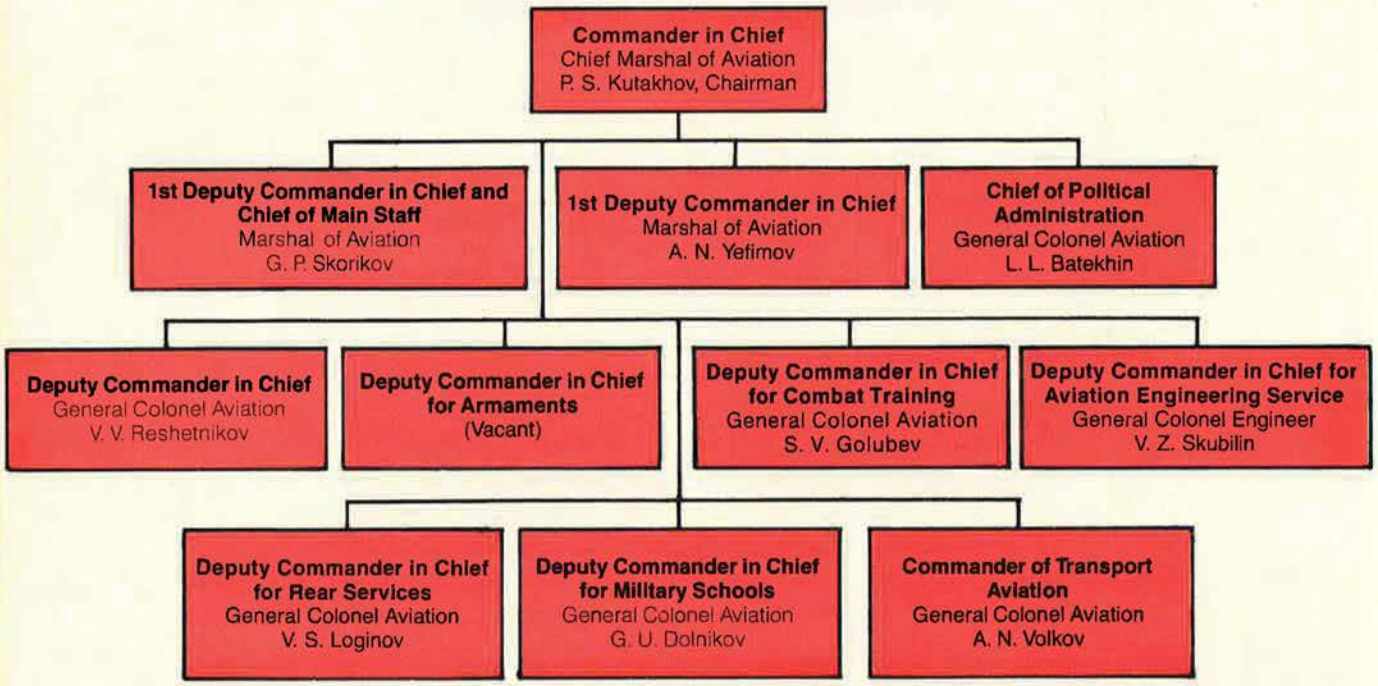
MEMBERS OF THE MILITARY COUNCIL OF COMMAND AND STAFF OF THE STRATEGIC ROCKET FORCES



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



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



—CHARTS COMPILED BY HARRIET FAST SCOTT

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The Strategic Rocket Forces and Their Five Elites

Rather than parcel out long-range missiles to the various services, the Soviets chose to create a new organization, first among equals.

BY HARRIET FAST SCOTT

NEARLY three years before the Cuban missile crisis of October 1962, the Soviet Union made strategic missiles the centerpiece of its Armed Forces. The Rocket Forces were formed in December 1959, as an independent service, to join the Soviet Ground Forces, National Air Defense Forces, Air Forces, and Navy. From its inception, the Rocket Forces (designated the *Strategic* Rocket Forces in 1961) were first among equals, with its commander in chief taking precedence over the commanders in chief of the other four services.

Formation of this new service was the culmination of what Soviet military strategists refer to as the revolution in military affairs. The revolution had three distinct parts: first, development of the nuclear weapon; next, the creation of powerful rockets able to deliver the nuclear warhead at intercontinental ranges; and, finally, the elaboration of guidance systems to control flight. At that time, Soviet military doctrine stated that, in any future war between nuclear powers, nuclear weapons would inevitably be employed.

The Strategic Rocket Forces to date have had five commanders in chief. Their stories will tell at the same time the history of this Soviet service.

The first commander in chief of the Rocket Forces, Mitrofan Ivanovich Nedelin, was the officer most instrumental in the service's development. However, within a year of assuming command, he was killed. The Ministry of Defense's daily newspaper, *Krasnaya Zvezda (Red Star)*, covered up the cause of his death. "Chief Marshal of Artillery Mitrofan Ivanovich Nedelin," it read, "candidate member of the Central Committee of the Communist Party, Deputy of the Supreme Soviet USSR, Deputy

Top of page: A rare photo taken in 1965 of the Military Council of the Strategic Rocket Forces (from left): General Lieutenant A. G. Karas; General Lieutenant of Aviation P. B. Dankevich, Deputy for Combat Training; General Lieutenant of Aviation I. A. Lavrenov, Political Officer; Marshal of the Soviet Union N. I. Krylov, Commander in Chief; General Lieutenant Engineer Technical Service N. F. Chervyakov; and General Lieutenant Engineer Technical Service A. V. Gelovani, later Deputy Minister of Defense for Construction and Billeting Troops.

Minister of Defense, Commander in Chief of the Rocket Forces, was killed 24 October 1960 as a result of an aviation catastrophe while performing his duty."

Two versions of what really happened have surfaced over the years, both indicative of a major disaster. Oleg Penkovskiy, who was later shot for spying for the West, reported that Nikita Khrushchev was anxious to produce a nuclear-powered missile in time for the celebration of the October Revolution (which now falls on November 7 because of changes in the Russian calendar after the Revolution). Nedelin, along with dozens of nuclear specialists and representatives of various government ministries, was on hand for the countdown of a missile that failed to fire. After twenty minutes or so, Nedelin, anxious to see what had happened, left the shelter and started across the launch area, trailed by others. In the explosion that followed, more than 300 top Soviet scientists were killed, including Marshal Nedelin.

A second version of the incident comes from Dr. James E. Oberg, author of *Red Star in Orbit*. Oberg spent twenty years piecing together what he thinks really happened. Of three rockets earmarked for an unmanned flight to Mars, two had failed. The countdown on the third reached zero with no detonation. Normal practice dictated that before investigation of the failure, the 1,000,000 pounds of highly explosive fuel should be extracted. But Nedelin, impatient with the lack of success, ordered an inspection. Thus, he and as many as 200 top Soviet space scientists were killed in the explosion that followed.

Born November 9, 1902, in the city of Borisoglebsk, 400 miles southeast of Moscow, Nedelin joined the Red Army in 1920 at age seventeen. He was assigned to an artillery regiment and took part in various Civil War campaigns. In 1928, after completing a six-month course for artillery battery commanders, he was given his first command. In 1933, Nedelin took a short artillery refresher course and for the next three years commanded a training battalion instructing in these same courses.

"Volunteer" in Spain

In 1937, at the outset of Stalin's purges that resulted in the deaths of thousands of officers, Nedelin was chief of staff of a training regiment. He escaped the purges and at year's end, along with hundreds of other Soviet officers, was sent as a "volunteer" to fight in the Spanish Civil War. He served there for the next fifteen months.

His orders took him first to Paris, then to Madrid, where he was posted as advisor to the chief of artillery of the Madrid Army. The Republican Army was running out of ammunition, and Nedelin was given the task of organizing its production. He was credited with getting ammunition production started, but by then the tide was running against the Republican forces. The opposing side was getting newer equipment and greater support from Hitler and Mussolini, The Spanish Civil War soon ended.

Ordered back to the Soviet Union, Nedelin arrived in March 1939. Many of the Soviet officers who had also "volunteered" in the Spanish Civil War returned at about the same time, only to face arrest and execution. Nedelin was lucky. He was decorated with the Order of the Red Banner and, at age thirty-six, promoted to colonel ahead of most of his remaining contemporaries.

Mitrofan Ivanovich Nedelin was the first Commander in Chief of the Strategic Rocket Forces.

His first posting was to the Moscow Military District as commander of an artillery regiment in the crack Moscow Proletariat Division. Fresh from the battlefields of Spain, Nedelin was horrified to learn that the division's main training task consisted of preparing for the two yearly parades through Red Square. According to his biographer, he took his unit on maneuvers where they marched at night, learning to cross rivers and to take up firing positions.

In late 1940, while serving as chief of artillery of the 160th Rifle Division, Nedelin completed a six-month refresher course at the Dzerzhinskiy Military Academy. The overwhelming success of the German tank armies in France had surprised Soviet military strategists. At the time, the Red Army had no formalized method of antitank defense. Nedelin's unit had experimented with direct fire from howitzers against tanks with some success. He reported this in a military journal and soon found himself presenting his new ideas to Stalin. As a result, at the end of April 1941 Nedelin was named commander of the 4th Artillery Antitank Brigade of the Reserve of the High Command, stationed near the German border.

Nedelin survived the initial German attack on July 22, 1941, and was later named chief of artillery of the 18th Army. In March 1942, he was promoted to general major (one star) and became deputy commander of artillery of the North Caucasus Front. Later, he became commander of artillery of the 3d Ukrainian Front. That Front was under the command of a comrade from the Spanish Civil War, R. Ya. Malinovskiy, a future Minister of Defense (1957–67). For his part in the Jassy-Kishinev operation, Nedelin was made a Hero of the Soviet Union. After Germany's surrender, he took part in the Moscow victory parade in June 1945. At a reception in the Kremlin, Stalin toasted the Red Army artillery, calling it the "God of War."

In the immediate postwar period, Nedelin commanded artillery in the Southern Group of Forces stationed in Romania and Bulgaria. In less than a year, he was called to Moscow to become Chief of Staff of Artillery of the Soviet Army.

The Soviet Missile Program

At the time of Nedelin's return to Moscow, Soviet military specialists were critically examining captured German rockets. The Soviets had removed almost in their entirety the test and production plants at Peenemünde and Nordhausen where the V-2 weapons had been built. They also took into captivity hundreds of German rocket specialists to go with the treasure they had set up in various regions of the Soviet Union.

While the US leaned toward bombers to carry nuclear weapons, with eight to ten hours of flight if intercontinental targets were considered, the Soviet Union had decided by 1946 to concentrate on long-range rockets in addition to bombers. While research and development of rockets was funded on a shoestring in the US, Stalin established a top-level group of experts to develop rockets and atomic weapons. On the team were Sergey Korolev, the "Chief Designer" of the rockets that took Yuri Gagarin into space and who remained a mystery man until his death; Dmitriy Ustinov, Stalin's whiz-kid arms czar and Minister of Defense Industry; Nikolay Voronov, from 1943 to 1950 Commander of Artillery of the Soviet Armed Forces and President of the Academy of Artillery Sciences until 1953; and Mitrofan Nedelin.

Nedelin reportedly worked with Korolev nonstop to develop the Soviet rockets, visiting the new rocket complexes, and then reporting directly to the Minister of Defense and to GOSPLAN (State Planning Committee), and frequently to Stalin. On October 18, 1947, the first of the German rockets was launched. At this time Nedelin was Chief of Staff of Artillery. In 1948, he was designated chief of the Main Artillery Directorate (GAU).

The GAU (now GRAU, the Main Rocket and Artillery Directorate) was the heart of artillery of the Soviet Armed Forces. It had full responsibility for overseeing the numerous establishments that ordered armaments and ammunition.

On the eve of the Korean War, Nedelin was appointed Commander of Artillery of the Soviet Army. In this post, he dealt with the combat readiness and future development of Soviet artillery. Responsibilities also included the development of missiles. From mid-January 1952 until Stalin died in 1953, Nedelin was Deputy Minister of War for Armaments. In August 1953, he was promoted to Marshal of Artillery and once again was named Commander of Artillery of the Soviet Army. In March 1955, he was again appointed Deputy Minister of Defense for Armaments.

In the mid- and late-1950s, Soviet successes with both nuclear weapons and missiles resulted in major decisions by Kremlin leaders. In their view, rockets and nuclear weapons were becoming the new means of waging war. The revolution in military affairs was in full swing. In 1953, before the US did so, the Soviet Union dropped a thermonuclear bomb from an aircraft. Within two years, Soviet missiles launched in Central Asia were able to cover distances of several hundred miles.

The Soviets tested the world's first ICBM in August 1957. In October of that year, the world was stunned when Russia put into orbit the first artificial satellite.

At about this time, the late Leonid I. Brezhnev and the present Minister of Defense Dmitriy F. Ustinov were designated by the Party's Politburo to accelerate the Soviet missile and space programs. As Deputy Minister of Defense for Armaments, Nedelin formed a "Special Staff" to work out organizational plans and form strategic bases for rocket units.

Establishing a New Service

At the end of the 1950s, rockets and nuclear warheads had been created in sufficient quantity to raise the question of which service would control the new weapons. There were several avenues of thought. One school of strategists wanted to divide the weapons among the four services: Ground Forces, National Air Defense, Air Forces, and Navy. Another believed only the Navy and Air Forces should control them. A third group argued that a new service should be formed to have control of strategic nuclear rockets, on a level with the other services. Nedelin is reported to have advocated the latter view.

The final decision came at the highest level: The majority of the members of the Politburo, the government, and the high command of the Ministry of Defense were in favor of creating a new service. As a result, on December 17, 1959, the Rocket Troops were officially formed. Included were all intercontinental and medium-range missiles, their supporting troops, and a number of schools and other facilities. On January 14, 1960, Nikita Khrushchev announced the formation of the Rocket Troops to the fourth session of the Supreme Soviet.

Nedelin, promoted to Chief Marshal of Artillery, became the first commander in chief of the new service. He faced a formidable task in organizing deputies, a main staff, directorates, and support services. Simultaneously, he had to form a cadre of officers and determine operational procedures.

General Colonel (three star) V. F. Tolubko, a forty-five-year-old Ukrainian tank officer, was picked as his First Deputy. (Tolubko commands the Strategic Rocket Forces today.) General Lieutenant of Artillery M. A. Nikolskiy was designated Chief of the Main Staff, with General Colonel P. I. Yefimov serving as the senior political officer. Other deputies were Generals F. P. Tonkikh and P. S. Degtyarev.

Nedelin directed General Tolubko to commandeer the best officers to serve in the new service. With a special mandate from the Ministry of Defense, Tolubko tapped the Main Cadre Directorate, the military districts, and the military academies for candidates. The final selections were made personally by Nedelin.

Deployment of missiles was undertaken on a crash basis. Little advance preparation went into the establishment of launch sites. In 1960–62, the newly formed missile units were housed in tents and sod huts. But construction troops were soon to provide permanent facilities. Dmitriy Ustinov, then Deputy Chairman of the USSR's Council of Ministers, made special tours to check on progress of site construction and missile deployments.

With organization of the Rocket Troops under way, Nedelin was killed in October 1960, as previously noted.

Kirill Semenovich Moskalenko replaced Nedelin as Commander in Chief of the Strategic Rocket Forces.

Sergey Semenovich Biryuzov commanded the Strategic Rocket Forces during the Cuban missile crisis.

Only fifty-eight years of age and a young officer by Soviet standards, he was buried in the Kremlin wall in Red Square.

Nikita Khrushchev himself might have had a hand in the selection of Nedelin's replacement, Kirill Semenovich Moskalenko, who, although past eighty, is still serving in the Soviet Armed Forces.

Moskalenko was born on May 11, 1902, the same year as Nedelin, at Grishino in the southeastern part of the Ukraine. At seventeen he joined the Red Army and during the Civil War fought in the 6th Cavalry Division of the legendary 1st Cavalry Army.

At the end of the war, Moskalenko was assigned to a school for Red commanders located in Kharkov. From there he returned to the cavalry for eleven years. In 1939, he completed the course at the Dzerzhinskiy Military Academy and in 1940 took part in the Winter War with Finland. Retrained as a tank commander in 1940, he commanded the 2d Mechanized Corps until May 1941. By this time, on Stalin's orders, antitank units were being formed. Moskalenko, promoted to general major of artillery, was given command of the 1st Motorized Antitank Artillery Brigade near the Ukrainian city of Lutske. His chief of staff was Major N. I. Krylov, later also to become commander in chief of the Strategic Rocket Forces.

Moskalenko's unit saw combat from the first day of Hitler's invasion, and he was to remain at the front for the remainder of the war. He fought in the Battle of Moscow in December 1941, and later the Battle of Stalingrad as commander of the 38th Army. He also fought in the famous Kursk Battle, considered by the Soviets the crucial turning point of the war.

The Soviet Military vs. the Secret Police

In the first three postwar years, Kirill Moskalenko commanded an army, and for the following five years the Moscow Air Defense District. While serving in this post, his career took an unusual turn: involvement in the power struggle to determine Stalin's successor.

Immediately after Stalin's death in March 1953, the notorious Lavrentiy Beria, head of the secret police, made his bid for power. In December 1938, Beria had replaced N. Yezhov as head of the secret police and continued the purges. By 1953, Beria had packed the Moscow Military District with supporters. However, he had been unable to crack the Moscow Air Defense District, commanded by Moskalenko. In an effort to stop Beria and perhaps a new era of purges, such Party leaders as Khrushchev and Malenkov called upon World War II hero Marshal Georgiy K. Zhukov, then First Deputy Minister of Defense, to arrest Beria. Zhukov, in turn, called for help from the only troops in the Moscow area he could trust—those under Moskalenko's command.

The Presidium (now Politburo) of the Central Committee, led by Khrushchev and Malenkov, proposed stripping Beria of his authority. However, before calling for a vote, a nervous Malenkov pushed a hidden button to summon Zhukov and other senior officers. Here the story becomes confused, with one version claiming that Zhukov shot Beria, another that it was Moskalenko. At any rate, it appears that Moskalenko was entrusted with guarding the wounded Beria until his trial. Some reports claim that Beria then died before the trial or that he was executed by a firing squad after a secret trial.

Shortly afterward, Moskalenko was promoted to General of the Army—four-star rank—and given command of the Moscow Military District replacing Beria's henchman. In 1955, he was made Marshal of the Soviet Union. And, in October 1960, Moskalenko was named Nedelin's replacement.

In April 1962, several significant changes took place in the Soviet high command. Aleksey A. Yepishev was summoned from his post as Ambassador to Yugoslavia and placed in charge of the Main Political Administration of the Soviet Army and Navy, a position he retains more than twenty years later. He had been close to Khrushchev in the Ukraine and in 1951 was brought to Moscow as Beria's deputy, some say at Khrushchev's direction, to keep track of Beria's dealings. A second change was the reassignment of Moskalenko as Chief Inspector, a post he still holds.

Marshal Biryuzov Takes Over

Sergey Semenovich Biryuzov succeeded Moskalenko as head of the Strategic Rocket Forces and was in command during the Cuban missile crisis.

Biryuzov was born August 21, 1904, in Skopin, southeast of Moscow. At fifteen he was a lumberjack in the Urals. In 1922, at age eighteen, he joined the Red Army. At the 48th Infantry Machine Gunners' Command Courses, he was rated a top student. Afterward, he attended the Moscow Combined Military School, at that time located in the Kremlin. There, the best *kursants* (cadets) were singled out to stand guard over Lenin's quarters.

In 1929, Biryuzov was posted to the elite Moscow Proletariat Division. His ascension in the Red Army was steady, and in 1937 he graduated from the three-year course at the Frunze Military Academy. From there he

went to the Kharkov Military District as Chief of Staff, and on to command the 132d Division.

When the Germans attacked in June 1941, Biryuzov's division was camped by the River Psel, near Mirgorod. Once the unit gained its wartime strength, General Major Biryuzov loaded his 15,000 men and 3,000 horses on trains and headed for the front. Soon they were overrun by German tanks. Biryuzov was knocked unconscious by an artillery burst, but he soon returned to action. While leading the fight out of the German encirclement, Biryuzov was hit in the legs by machine-gun fire.

He was evacuated to a hospital in Alma-Ata, deep in Central Asia, and in May 1942 had recovered sufficiently to return to duty. Because of the critical situation at Stalingrad, Biryuzov was assigned to train the 2d Guards Army, a reserve of the High Command. General R. Ya. Malinovskiy was commander, and Biryuzov became his Chief of Staff.

At war's end, Biryuzov became deputy commander of the Southern Group of Soviet Forces, where Nedelin was commander of artillery. In May 1946, he returned to Moscow as Deputy Commander in Chief of the Ground Forces. Within a month, he was sent to Bulgaria as deputy chairman of the Allied Control Commission.

In June 1947, Biryuzov was assigned to the Far East. Because of the tense situation in China, the High Command of the Far East was reestablished, under command of Marshal Malinovskiy. Biryuzov was given command of the Primorskiy Military District. N. I. Krylov, who would later succeed Biryuzov as commander in chief of the Strategic Rocket Forces, assumed command of the Far Eastern Military District. These two future heads of the Strategic Rocket Forces worked in adjoining military districts until 1953, following the death of Stalin.

For a short time from 1953 to 1954, Biryuzov, newly promoted to general of the army, commanded the Central Group of Soviet Forces, Austria. Afterward he served as first deputy commander in chief, Troops of National Air Defense and, from 1955 to 1962, as commander in chief.

As noted, Biryuzov was reassigned from the Troops of National Air Defense to head the Strategic Rocket Forces in April 1962. Whatever role he might have played during the Cuban missile crisis and afterward, he clearly was rewarded in March 1963 when he replaced Marshal M. V. Zakharov as Chief of the General Staff. At the time this was the third highest post in the Soviet Armed Forces.

Biryuzov's new position was announced in a typical Soviet way. A press report had casually noted that Marshal Zakharov was commandant of the Academy of the General Staff. It was not until the end of March that *Red Star* carried a brief announcement in the sports section that the Soviet hockey team, returning from international competition, had been met by the *Chief of the General Staff,* Marshal of the Soviet Union. S. S. Biryuzov.

On October 14, 1964, Khrushchev was ousted from the Party leadership. On October 19, a high-level delegation of Soviet officers, headed by Marshal Biryuzov, undertook a trip to Yugoslavia. The Il-18 carrying the delegation crashed. It was one of those events in the Soviet Union that appear to be coincidences but, in light of traditional Soviet secrecy, one can never be certain.

Nickolay Ivanovich Krylov brought a period of stability as head of the Strategic Rocket Forces.

Vladimir Fedorovich Tolubko is the present Commander in Chief of the Strategic Rocket Forces.

The crash occurred four years less five days after Nedelin was killed at the launch pad in Central Asia.

Next Up: Nikolay Krylov

Nikolay Ivanovich Krylov took over as commander in chief of the Strategic Rocket Forces when Biryuzov became Chief of the General Staff. As already noted, Krylov had served under Marshal Malinovskiy, the Defense Minister, during the late 1940s and early 1950s in the Far East.

Krylov was born April 29, 1903, in the village of Galyayevka near the city of Penza. In 1919, he joined the Red Army, and shortly thereafter volunteered to take an infantry course for Red commanders. Near the end of the Civil War he saw combat in the Far Eastern Republic in the vicinity of Vladivostok.

After the war, Krylov remained in the Far East for sixteen years, twelve of them with the 1st Pacific Ocean Division. On one occasion he returned to Moscow to take the "Vystrel" course, field training for Ground Forces officers.

Soon after the German invasion, Krylov was posted to Odessa where he became Chief of Staff of the Primorskaya Army. He helped evacuate troops from Odessa before it fell to the Germans, and then took part in the defense of Sevastopol. In September 1942, Krylov

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

was made Chief of Staff of the 62d Army, then located at Stalingrad. It was this army, under command of General V. Chuykov, that bore the brunt of the fighting. Later in the war, Krylov took part in the Belorussian campaign and fought in East Prussia.

After the defeat of Germany when the Soviet Union entered the war against Japan, Krylov was transferred to the Far East with his army, which became part of the Far Eastern Front. At the end of the war, he became deputy commander of the Primorskiy Military District and in 1947 took over as commander of the Far Eastern Military District. In 1955, he was promoted to General of the Army.

In 1956, Krylov was made commander of the Ural Military District and a year later commander of the Leningrad Military District. In 1960, when Marshal Nedelin was killed and Marshal Moskalenko took over the Rocket Troops, Krylov was transferred to replace Moskalenko as commander of the Moscow Military District. While in this job, in 1962, he was promoted to Marshal of the Soviet Union.

In light of Krylov's previous record and association with Marshal Malinovskiy, it was no surprise that, when Biryuzov became Chief of the General Staff in March 1963, Krylov replaced him as head of the Strategic Rocket Forces.

With the naming of Krylov as commander in chief, the Rocket Forces of Strategic Designation lost the turbulence that had characterized the service, with four commanders in less than four years. Krylov was to remain at its head until he died in February 1972.

Vladimir Fedorovich Tolubko followed Marshal Krylov as commander in chief of the Strategic Rocket Forces, a post he holds today. He was born on November 25, 1914, in Krasnograd, near Kharkov. In 1932 he joined the Red Army and in 1937 graduated from the Ul'yanovskiy Armored Military School. He completed the Military Academy of Mechanization and Motorization in 1941, and in the first months of the war served on the Leningrad and Kalinin Fronts. By February 1942 he was commander of the 104th Tank Brigade. In March 1943 he was wounded. On recovery he was posted to instruct at the military academy from which he had graduated in 1941. By February 1944 he had healed sufficiently to be assigned as chief of operations of the 4th Guards Mechanized Corps on the 3d Ukrainian Front. General Colonel S. S. Biryuzov and General Colonel of Artillery Nedelin were also serving there.

At war's end, Tolubko handled a variety of assignments, and graduated from the Academy of the General Staff in 1950. Later he served on the staff for combat training, Soviet Group of Forces, Germany. From 1957 to 1960 he commanded an army in this Group of Forces. In early 1960, he was selected by Nedelin to become the First Deputy of the Rocket Forces.

Tolubko remained as First Deputy under Moskalenko, Biryuzov, and Krylov. In 1968, he was transferred from the First Deputy position to command the Siberian Military District. In May 1969, after the clashes with the Chinese on the border at Damanskiy Island, Tolubko was given command of the critical Far Eastern Military District. A year later, he received his fourth star. When Krylov died in 1972, Tolubko was moved back to Moscow as commander in chief of the service in which he had served so long as First Deputy. The Strategic Rocket Forces were formed twenty-three years ago. Except for the period from 1968 to 1972, Tolubko, now sixty-eight, has served with them from the very beginning.

Summing Up

General Tolubko is ten years younger than the four commanders in chief of the Strategic Rocket Forces who preceded him. The others had all joined the Red Army early enough to fight in the Civil War. Tolubko did not join until the early 1930s.

There are other differences. Neither Nedelin, Moskalenko, nor Krylov had what the Soviets call a "higher military education." Only Biryuzov had attended a military school, and later graduated from the Frunze Military Academy. But Tolubko graduated from a military school, completed a military academy in 1941, and after the war graduated from the Soviet Union's highest professional military institution, the Academy of the General Staff. Even as a general officer, he attended (1968) the Higher Academic Courses offered by this Academy.

Moskalenko and Biryuzov were listed as general majors in a promotion list published in 1940. Nedelin and Krylov made general in 1942. The rapid promotions came about partly because so many senior officers had been killed during Stalin's 1937–38 purges. Tolubko ended the war as a lieutenant colonel. Moskalenko and Biryuzov both made Marshal of the Soviet Union in 1955. Nedelin became Chief Marshal of Artillery in 1959. Krylov was promoted to Marshal of the Soviet Union in 1962. Tolubko did not even make General of the Army (four stars) until 1970, and has never been promoted in the eleven years he has headed the Rocket Troops. (It should be noted, however, that the only five-star promotions since 1968 have been to Brezhnev and the Minister of Defense, along with the three First Deputy Ministers of Defense.)

The year 1983 marks the fiftieth anniversary of the first Soviet liquid-fueled rocket, the GIRD-X, which was successfully tested in the outskirts of Moscow. Sergey Korolev, designer of the first Soviet ICBM, was the leader of the Group to Study Jet Propulsion (GIRD) at the time. During World War II, the most successful rocket was the BM-13, dubbed "Katyusha" by Red Army soldiers. In 1946, the first rocket units were formed from the Guards Regiments of Rocket Artillery. After the successful testing of an ICBM and the launch of the first Sputnik in 1957, the Rocket Troops became a separate—and preeminent—service of the Soviet Armed Forces.

The Soviet space program is closely tied to the Strategic Rocket Forces. It is the "rocketeers" who conduct space launches. The Soviet Union uses its space program to demonstrate its military prowess to the world. Nearly one hundred space shots are made by the USSR each year. As they put it, "Successes in space, as a mirror, reflect successes in strengthening the defense capability of our Motherland."

Tolubko has seen his forces grow to nearly 1,400 ICBMs and more than 600 IRBMs and MRBMs. The Soviet Union is now a military superpower. This is the legacy he will pass on to his successor in the Rocket Forces of Strategic Designation. ■

The Myth of Free Travel in the USSR

"Reciprocity" is an unknown word when it comes to travel in the Soviet Union by American diplomats and tourists. Compared with the freedom their people have to travel in the United States, almost ninety-nine percent of the Soviet Union is closed off and never seen by foreigners. This article compares and contrasts the situation in both countries.

BY WILLIAM F. SCOTT

Soviet secrecy has long been a destabilizing factor in international relations, especially in military affairs. It is a primary obstacle to détente, in the Western sense, and to meaningful negotiations of any type. If the Kremlin's efforts to maintain secrecy were better known in the West, Washington might have a more realistic appreciation of how to deal with the Soviet Union, and might have avoided some of the pitfalls of the past.

In August 1973, Andrei Sakharov, the well-known Soviet dissident and designer of the Soviet hydrogen bomb, held a news conference in Moscow. At considerable personal risk, he tried to warn the West of conditions in the Soviet Union. He urged newsmen to speak out against "closed countries where everything that happens goes unseen by foreign eyes. . . . No one should dream of having such a neighbor, especially if that neighbor is armed to the teeth."

Sakharov's words received little attention. At the time of his statement, both the Congress and the United States public were basking in the warmth of détente and SALT I. Years later, after the continued Soviet military buildup, the invasion of Afghanistan, and the crushing of Solidarity in Poland, the West might have accepted Sakharov's warning more readily. But by then he was in exile in Gorkiy, a city closed to all foreigners.

Others had warned of Soviet secrecy and the closed nature of its society. Winston Churchill, speaking in Fulton, Mo., in 1946, declared that "an iron curtain has descended across the Continent." This was more than a figure of speech. A curtain of sorts still exists today.

On land and at sea, the periphery of the Soviet Union is patrolled day and night by more than 250,000 Border Guards, an elite military group under the control of the KGB. Crossing into the Soviet Union from any point—Finland, Turkey, China, Iran, Poland, or any other nation, whether independent or a Soviet satellite—the visitor sees the same depressing sight: plowed ground, watchtowers, and barbed wire.

Foreigners permitted inside the Soviet Union are restricted as to where they may travel, what method of travel may be used, where they may stay, and with whom they may meet. Those seeking to do business with the Soviet Union find that Soviet secrecy places them at a disadvantage. What would appear in practically any other nation as open information is regarded in the Soviet Union as a military or state secret. Excessive secrecy in a very small nation such as Albania might be regarded with amused tolerance. Excessive secrecy by a military superpower is another matter.

Areas Closed to Travel

Each year, thousands of US citizens visit the Soviet Union as students, tourists, businessmen, or as members of delegations. Few realize that of the 272 Soviet cities with populations of 100,000 or more, approximately 200 are closed to foreigners. Nor will they be aware that travel into rural areas is seldom permitted. Of the total Soviet land area, almost ninety-nine percent is never seen by foreign travelers. The extent of Soviet secrecy is incomprehensible to most Americans, even to those who frequently visit the Soviet Union.

Officially, only twenty to thirty percent of Soviet territory is closed to foreign visitors. Forbidden portions are specified in notes sent by the Soviet Foreign Ministry to embassies in Moscow. The notes identify those areas which are "closed to foreigners." In fact, however, almost all of the remaining Soviet territory either is *de facto* closed, or in remote or inaccessible areas through which there is no way a foreigner may find a means of travel.

Requests to visit the *de facto* closed areas are simply ignored by Intourist, the Soviet official foreign tourist agency. (Intourist is short for *Inostrannyy* [Foreign] *Tourist*.) Foreign diplomats in the Soviet Union must submit an advance "intent-to-travel" notice to the Ministry of Foreign Affairs. When a member of the US Embassy submits the required advance travel note to a *de facto* closed area, Soviet authorities reply that "the trip cannot be registered for reasons of a temporary nature," that tickets are not available, that hotels are full, or some equally shallow excuse. Refusals to visit supposedly open Soviet areas have continued for decades.

There are no places in the Soviet Union to which travel by foreigners may be taken for granted. For no apparent reason, Soviet authorities may deny travel to even such major Intourist centers as Kiev, Tallinn, or Alma-Ata. On one occasion in 1972, the entire area east of the Volga River, encompassing the greater part of the USSR, was closed to foreign travel. On another, the entire southern part of the nation around the Black Sea was denied to foreigners. Reasons are seldom given. Moscow's foreign community is forced to speculate whether the refusals to travel are due to a plague in the area, a shortage of food, a riot, or movement of secret military equipment.

In contrast to the closed areas in the Soviet Union, the US government places no travel restrictions on Soviet citizens assigned to the United Nations staff in New York. They may travel throughout the entire US as they please, by any method desired, over tens of thousands of miles of roads—turning down interesting byways, pausing at military installations, proposed MX sites, or in-

dustrial concerns producing advanced military equipment. Certain travel restrictions, in an attempt at some reciprocity for the manner in which US personnel in Moscow are treated, are placed on Soviet diplomats in Washington. Such restrictions, however, are in no way comparable to the controls found in the Soviet Union.

Travel by Road, Rail, and Air

Travel by private automobile or bus in the Soviet Union, when permitted, is extremely limited. There are fewer than 6,000 miles of highways over which foreigners may drive. The routes begin with only five of the many roads leading from Moscow. There also are a few other roads in the southwestern part of the Soviet Union over which foreigners may be authorized to travel.

Passage along all roads is carefully controlled. A detailed itinerary must be provided in advance to Soviet authorities, and the motorist is required to keep to the approved schedule. One is not permitted to leave the main road to sightsee in an interesting village. A military attaché assigned to the US Embassy will likely be followed by one or more tail cars. For those rare tourists who drive from Western Europe into the Soviet Union, license numbers will be checked by militiamen, stationed at one key intersection after another.

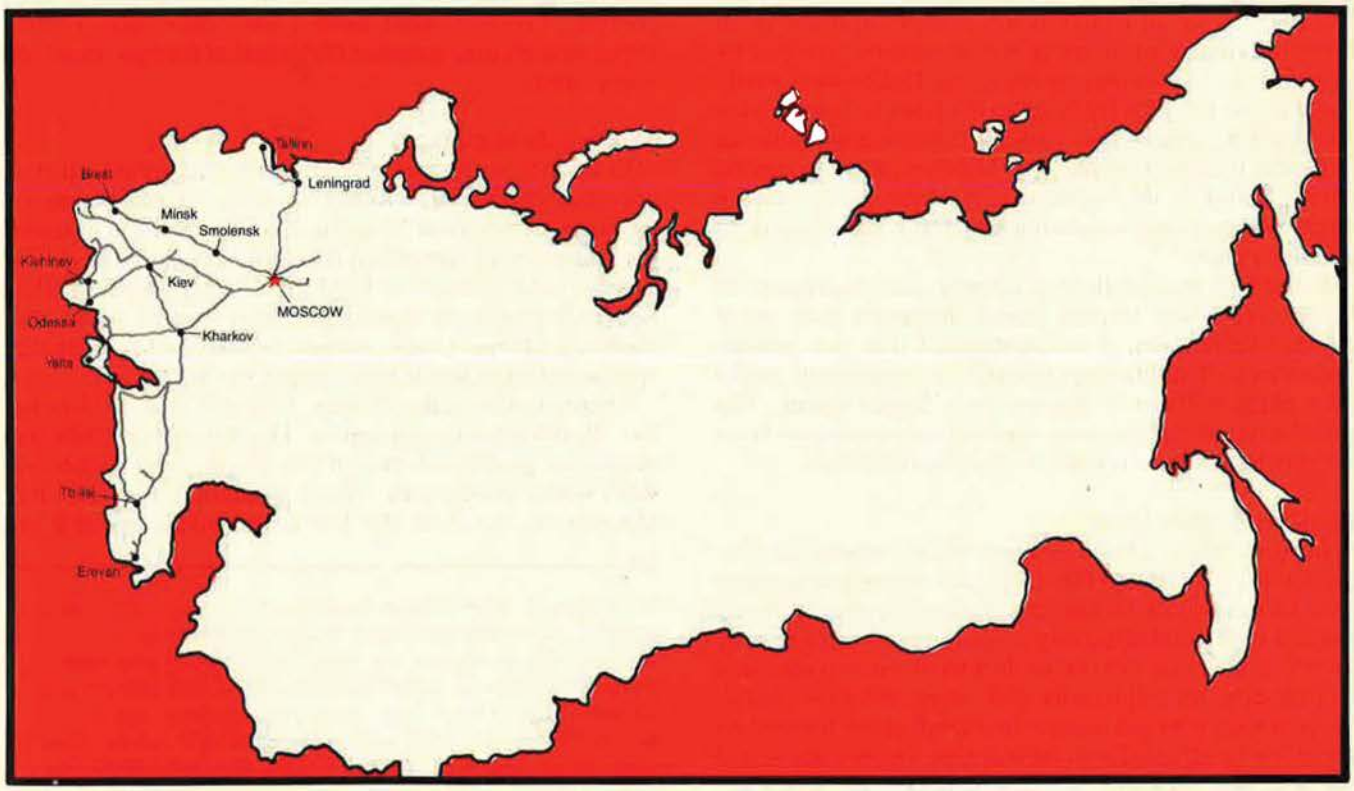
Travel by rail also is strictly limited and controlled. With few exceptions, foreign travelers are permitted only on certain trains, in assigned railway compartments or seats. Like all other means of travel, a rail trip must be approved in advance by Soviet authorities, tickets obtained from those Soviet agencies charged with dealing with foreigners, and an exact schedule followed.

Tourists may take the 6,800-mile rail trip from Moscow to the Pacific port of Nakhodka, and from there by ship on to Japan. (Members of the US Embassy in Moscow generally are denied travel over the full route.) Foreigners, however, are permitted on only one train, which leaves Moscow daily at approximately 10:00 a.m. and follows the northern Trans-Siberian route through Kirov, Perm, and Sverdlovsk. Along the entire route, which crosses part of Europe and all of Asia, foreigners may request advance permission to stop in only three cities: Novosibirsk, Irkutsk, and Khabarovsk. (On at least one occasion Ulan Ude has been visited.)

On rare occasions a foreigner may be granted a rail trip to Syktyvkan, a city northeast of Moscow. Travel further along the rail line to cities such as Pechora and Vorkuta, made infamous by Alexander Solzhenitsyn's *Gulag Archipelago* series, is prohibited. Southeast of Moscow travel by train at times is permitted to Penza, Voronezh, or Volgograd and on to Rostov. A number of rail routes also may be permitted west of Moscow: to Leningrad, Pskov, Riga, Brest, and a few other cities. Train travel also has been authorized to Odessa, Yalta, and Baku.

Most travel by foreigners within the Soviet Union is by air. As with road and train travel, foreigners are permitted only on certain flights. Travel by air affords excellent control by Intourist. A foreign tour group can be sent by bus to an airport, remain in a special Intourist waiting room while boarding preparations are made, and then be seated in a special section of an aircraft while flying from one city to another. Upon landing, the group can be herded into a bus and taken en masse to the designated Intourist hotel.

In most instances, due to the vast distances in the Soviet Union, air travel is preferable. Practically all of



The map shows the few main highways that tourists in the USSR may use and some of the cities that can be reached by auto. For travel to the relatively few areas open to foreigners east of Moscow, travelers must rely on air transport or the railroad.

the places serviced by train or automobile can also be reached by air. Travel to some areas in the Soviet Union, such as the Central Asian cities of Tashkent, Alma-Ata, and Frunze, is permitted by air only. Foreigners have been permitted to travel by rail between Tashkent and Alma-Ata.

The Impact of Closed Areas

To the casual tourist, the number of cities in the Soviet Union that can be visited may seem inexhaustible. Only a few will notice that six Soviet cities with populations of more than 1,000,000—Gorkiy, Kuybyshev, Sverdlovsk, Dnepropetrovsk, Chelyabinsk, and Omsk—are closed to foreign travel. (These cities are comparable in size to Dallas, Baltimore, Indianapolis, Memphis, San Francisco, and Cleveland.) Nor will the tourist recognize that travel generally is limited to the two major cities, Moscow and Leningrad, the capitals of the fifteen republics, and a few other special places of interest such as the ancient cities of Samarkand and Bukhara in Central Asia.

The Soviet land area east of Moscow and north of the northern route of the Trans-Siberian Railroad encompasses an area much larger than the United States. In this vast region foreigners are permitted to visit only two places with any frequency: Yakutsk and Bratsk. Foreigners are less frequently given permission to visit Arkhangel'sk and Syktvykar. Reportedly three other cities in the area may have been visited: Salekhard, Mirnyy, and Alden.

If the Soviet cities that foreigners can visit are placed on a map of the USSR, and the road and rail routes identified on which they can travel, the little access that Westerners have to that nation will quickly be appreciated. When it is further considered that travel into the cities and over all routes is controlled carefully at all times, Sakharov's remark of Soviet actions "unseen by foreign eyes" takes on new meaning. Helicopters easily could move missiles from defense plants to launch sites disguised as grain bins, without detection by national technical means of inspection. Military attachés may be denied travel in the western part of the Soviet Union while preparations are being made for an invasion of another nation.

In the US, practically every county is crisscrossed by roads over which trained Soviet observers may travel without restriction. It is improbable that any sizable movement of military personnel or equipment could take place without detection by a Soviet agent. The travel asymmetry between the two nations makes for a serious imbalance in arms-control verification.

Controls Within Cities

In most industrialized nations visitors assume an easy availability of detailed city maps and telephone directories. In the Soviet Union, access to telephone directories is a rarity and often city maps of any type cannot be found. If a Soviet citizen wishes to locate a friend in a strange city, he will inquire at a *"spravochnoye byuro"* (information bureau), normally a small stand located on a major city street. First, he will give his own name and address. For a charge of a few kopecks, the attendant will provide the address of the friend, telephone number if available, and directions by foot, bus, trolley, or subway. For control purposes, a *"spravochnoye byuro"* is much more efficient than a telephone directory or map.

A foreign visitor to the Soviet Union must pay Intourist in advance for the trip. He will be met at the airport or railroad station by an Intourist representative and taken to his hotel, which is selected by Intourist. If a member of a delegation, the host will make hotel arrangements. The foreign visitor will be issued meal coupons, valid only in the hotel where he is staying. To enter his hotel lobby he must have a special access card. Should he wish to visit a friend in another hotel, the hotel administrator or Intourist must arrange permission.

Often tourists are assigned to hotel rooms specifically designated for foreigners. NATO military attachés traveling outside Moscow find they are generally assigned the same rooms that previous visiting attachés had occupied. It is safe to assume that such rooms are equipped both for audio and visual monitoring. Room assignments for important foreign visitors follow the same pattern.

Foreign tourists often are surprised to find themselves relatively unrestricted in moving about within the city. Soviet authorities are aware that without being able to read signs and without a detailed city map few tourists will stray far from their hotel. They may travel freely by subway, bus, or trolley. Taxi drivers, however, are not supposed to pick up foreigners, although they frequently do. Should a visitor know the Russian language and indicate familiarity with a city, he will probably be placed under some type of surveillance.

City and resort areas foreigners may visit must meet certain standards. There must be suitable hotels and restaurants; streets must be clean and closely policed. There must not be a shortage of food or other conditions that might cause the inhabitants to show excessive discontent. The city must have a low crime rate. These requirements may account for denial of foreign travel to many areas.

Meeting Soviet People

In the US, a group of Soviet visitors may show up at a university gathering, invited by some faculty member. At many meetings of Western scholars, Soviets participate in seminars along with individuals engaged in sensitive security matters in Washington. A member of the Soviet Embassy in Washington may appear on a talk show at a Midwest radio station, or take part in a debate sponsored by a small high school in Ohio.

There are few actual Soviet "tourists" in the US or in any Western European nation. The Kremlin permits its people to go abroad only if the Soviet state benefits. With some exceptions, those Soviets authorized by Moscow to travel in the US have good command of

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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 as Air and Defense Attaché (1970–72). Since then he and his wife, Harriet Fast Scott, have made several trips across the Soviet Union and have traveled in China. They have coauthored a number of books, their next titled The Soviet Control Structure. *Dr. Scott presently is an adjunct professor at Georgetown University and a consultant to a number of research institutions.*

English and are experts in some field of specific interest, such as US industry, business activities, agriculture, science, or military forces. In most cases, Soviets have more invitations to visit American homes and offers of speaking engagements than they can possibly fill.

In the Soviet Union, foreigners are treated in an entirely different manner. Contacts between Soviet citizens and foreigners are discouraged and often made impossible. Western tour groups may meet with carefully selected Soviet groups, under controlled conditions. But it is impossible to meet with Soviet citizens on an informal basis, as Soviet visitors meet with people in the US, except in rare circumstances.

During the first few months in Moscow, a new arrival may feel he can meet with unlimited number of Soviets. He will soon find, however, that the numbers are actually few and meetings are carefully controlled. Selected Soviet officials in the Ministry of Foreign Affairs and from other Soviet agencies may attend formal functions. Certain individuals from the theater and other arts are permitted some contact with foreigners. Members of Soviet research institutes, such as Moscow's Institute of the USA and Canada, who are permitted to travel abroad may also meet with foreign visitors as part of their job. Even a few marshals, generals, and admirals, both active-duty and retired, are authorized to attend specified embassy functions. After a year or so in Moscow, a member of a foreign embassy will realize that the same Soviets are seen at virtually all non-Communist bloc affairs.

A somewhat different situation applies for Western exchange students in Soviet institutes and universities. They stay in the same dormitories as do Soviet students, and generally are accepted as members of the student body. They are, of course, severely restricted in the research they can pursue. Their fields of study may involve research of some aspect of Russian literature, or a historical event of a Czarist regime. The presence of Western students at Soviet universities is a price the Kremlin is willing to pay in order to place Soviet experts in US and Western European universities studying the hard sciences: physics, chemistry, and so on.

At a restaurant or perhaps while waiting for an aircraft, a foreigner occasionally may have an unplanned conversation with a Soviet citizen. When this does happen, one wonders why the KGB is so concerned. Soviet people are basically friendly, primarily interested in providing for their families, and show great loyalty to their country. They give a much more favorable impression of the Soviet Union than do the carefully staged performances that Soviet authorities attempt to put on for foreigners.

Secrecy and Trade

Many businessmen in the West are anxious to trade with the Soviets, believing their vast nation to be an untapped reservoir of markets. Even if the Soviets wished to spend hard currency, which they guard very carefully, Soviet security practices make it very difficult to conduct business in a meaningful manner.

According to Soviet law, "Important economic information on the wealth of our [the Soviet Union] country—on discoveries, inventions, and improvements of a nonmilitary nature in all areas of science, technology, and the economy—is a government secret." After careful screening and manipulation, certain economic information is released by Soviet authorities, but restated in a way that conceals as much as it reveals.

Soviets with whom members of Western business firms must deal are employees of the state. A certain number will be specialists on the US economy. They will know the history of the Western firm with which they are negotiating, its top management, financial position, and any other data considered necessary for careful bargaining and contract negotiations. In contrast, the United States firms trying to do business in Moscow will know very little, if anything, about those with whom they are dealing. Should a Western business firm attempt to keep in Moscow an individual who is fluent in the Russian language and who knows Soviet industry, there is a good possibility that Soviet security agencies will attempt to compromise him.

Western scientists visiting the USSR as guests of the state may be shown selected technological items that are far advanced, in order that they will be impressed with the status of Soviet science. On the other hand, depending on the purpose, they may be shown equipment that is poorly designed or obsolete, in order to give the impression that Soviet technology is much behind that of the West. Whichever approach is used, the program for visiting scientists and business leaders is carefully orchestrated. The visitors see only that which their hosts wish them to see, and for specific purposes. Should a Western scientist wish to seek even elementary information about a matter not on the approved program, the request will be deftly sidestepped.

The Kremlin maintains good relations with a few wealthy and powerful Westerners who show sympathy for Soviet foreign policy objectives. These individuals may be given concessions for which they are certain to profit, and have access to high Party leaders. This provides excellent advertising for Moscow, showing how profits can be made in dealing with the Soviets.

Trade with the West is not to improve the life of the Soviet people, or to produce more consumer goods. Rather, it is to increase the power of the Soviet state, primarily military. For a given product, all foreign businessmen must deal with one centralized Soviet agency. This permits the USSR to play one group against another while maintaining complete secrecy about its own negotiating. Except under special circumstances, Western businessmen are in a no-win situation. Secrecy and centralized state control of Soviet industry preclude normal trade relations.

Isolated Embassies

The same secrecy that limits normal trade relations with Moscow also affects diplomatic relations. Members of foreign embassies in Moscow literally live in an isolation ward. Only on rare occasions will the US ambassador meet with high Soviet officials. All Western diplomatic personnel in Moscow, as well as most newsmen, are deliberately kept apart from the Soviet people. Foreigners must live in their own embassies or special apartment buildings, surrounded by fences, with Soviet guards posted at the gates to prevent unauthorized contact with Soviet citizens.

In contrast, members of the Soviet Embassy in Wash-

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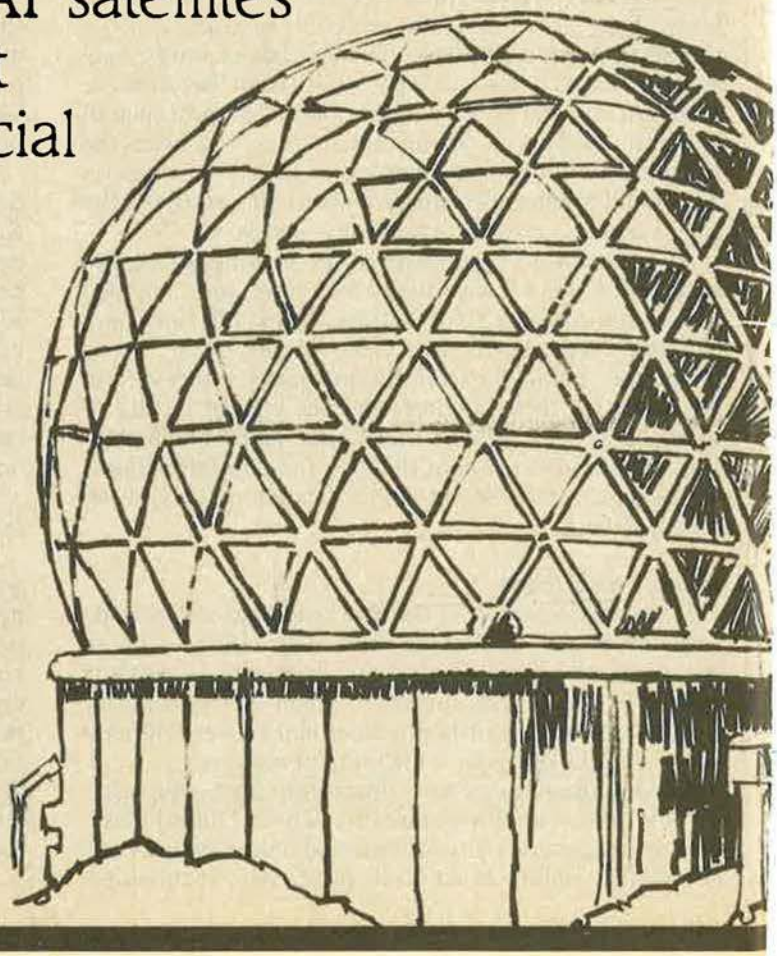

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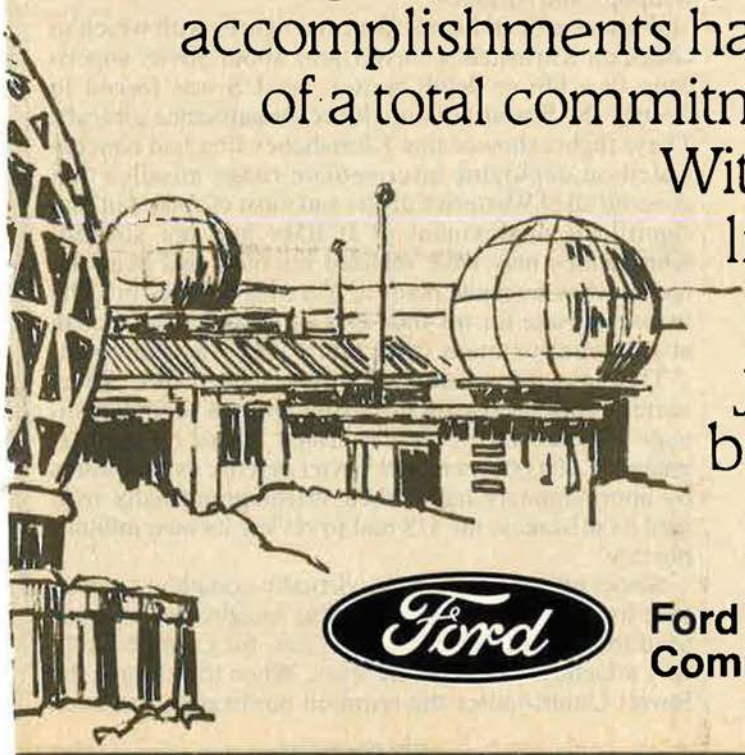

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ington have opportunities to mix with members of the US Congress, businessmen, education leaders, and members from all groups. The Soviet Embassy successfully lobbies the Congress and White House, as well as special interest groups. The current Soviet Ambassador, a fixture in Washington society after more than twenty years in this assignment, has relatively easy access to the President and to the Secretary of State. For years he was permitted to enter the Department of State building through a private entrance.

In Moscow, the Soviets attempt to isolate all foreigners, especially diplomats who know the language and the country and who will remain for any length of time. Political, economic, and agriculture attachés in the US Embassy are supposed to report on the status of conditions in their respective fields. Soviet security practices seriously limit the effectiveness of their work. Too often they can do little more than read Soviet newspapers. Despite agreements to travel, Soviet authorities frequently restrict the movement of agriculture attachés when attempting to see for themselves the status of Soviet crops and livestock—a most important factor with respect to sales of grain to the USSR. It is most difficult for any attaché to gain firsthand knowledge on his subject.

Prominent Americans visiting the Soviet Union, either at their own expense or on invitation from Soviet officials, may be reluctant to contact the US Embassy, believing this might taint them somehow in the eyes of their Soviet hosts. The visitors may be wined and dined by high-level Soviet officials to whom members of the US Embassy can seldom, if ever, gain access. This makes it possible for the Soviets to deal with those who do not have any detailed knowledge of the Soviet Union, who seldom know the language, and who can be manipulated in various ways. The Soviets would prefer to keep trained and experienced Embassy officials out of the picture, isolated behind Embassy walls.

The United States recognized the Soviet Union in 1933—half a century ago—and diplomatic relations were established shortly thereafter. The Soviet Embassy in Washington and the US Embassy in Moscow have traditional and legitimate roles to play in keeping their respective governments advised. Embassy members are in critical positions to analyze and to report any possible evidence that might pose a threat to their respective nations. They could be equally valuable in building confidence in the motives of their governments, in seeking to improve relations, and in serving as a focal point for negotiations.

However, as shown, Soviet secrecy limits normal diplomatic relations with any nation. The Kremlin seeks to obtain for its Embassy members in Washington full diplomatic privileges and rights while at the same time attempting to keep US diplomats isolated from contacts with the Soviet people and from accomplishing traditional embassy tasks.

An Obsession With Military Secrecy

Maintaining secrecy about certain activities of its armed forces is an understandable act by any nation. However, when practically everything about a military superpower's armed forces is classified, other nations have cause for concern. According to Soviet law, "Information on the organization of the Armed Forces, their number, location, combat capability, armaments, equipment, combat training, the moral-political state of troops, their material and financial support, is a military secret." The above covers practically all aspects of a nation's military structure.

In the US, practically every county is crisscrossed by roads over which trained Soviet observers may travel without restriction.

In the past, Soviet secrecy about its military forces has led to increased international tension, increased arms expenditures on the part of NATO nations, and even to serious and dangerous miscalculations. For example, in the 1950s Nikita Khrushchev boasted that his strategic nuclear forces were superior to those of the West. There was no way the US could check on these forces, and there was reason for concern. In the late 1940s, for instance, the speed with which the Soviet MiG-15 was produced astounded the West. A Soviet atomic bomb was exploded years ahead of Western estimates, and in 1953 the Soviet Union was the world's first nation to drop a hydrogen bomb from an aircraft. In the summer of 1957, the Soviets successfully tested the world's first intercontinental ballistic missile and within months put into orbit the world's first artificial satellite. Soviet secrecy had been successful in denying to the outside world information on how far Soviet nuclear capabilities had progressed. The US had no choice but to start an accelerated production of its own nuclear weapons and missiles.

Without official Soviet facts and figures with which to check on Khrushchev's assertions about Soviet superiority in a life or death matter, the US was forced to overfly the Soviet Union with reconnaissance aircraft. These flights showed that Khrushchev first had concentrated on deploying intermediate-range missiles that covered all of Western Europe and most of Asia, but that significant deployment of ICBMs had not started. Khrushchev may have realized his bluff had been detected when he made plans to place his missiles in Cuba to compensate for his then-lack of ICBMs. The Cuban missile confrontation of October 1962 was the result.

Throughout the 1960s and into the early 1970s, Soviet secrecy was successful in causing the US to underestimate the size of the Soviet armed forces by approximately 1,000,000 men, and Soviet defense expenditures by approximately half. When Washington finally realized its mistakes, the US had to review its own military posture.

Soviet efforts to maintain virtually complete secrecy over its armed forces may defy the imagination of those used to an open society. In Moscow, for example, military attachés are treated as spies. When traveling in the Soviet Union—after the required notification has been

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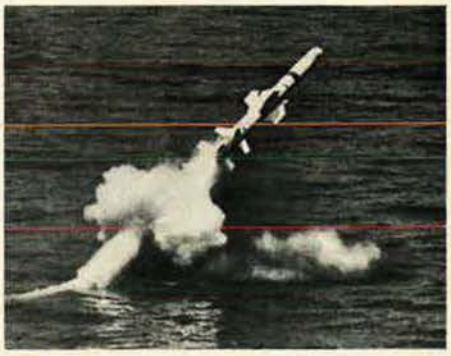
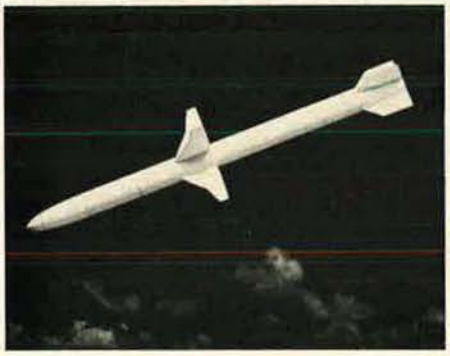

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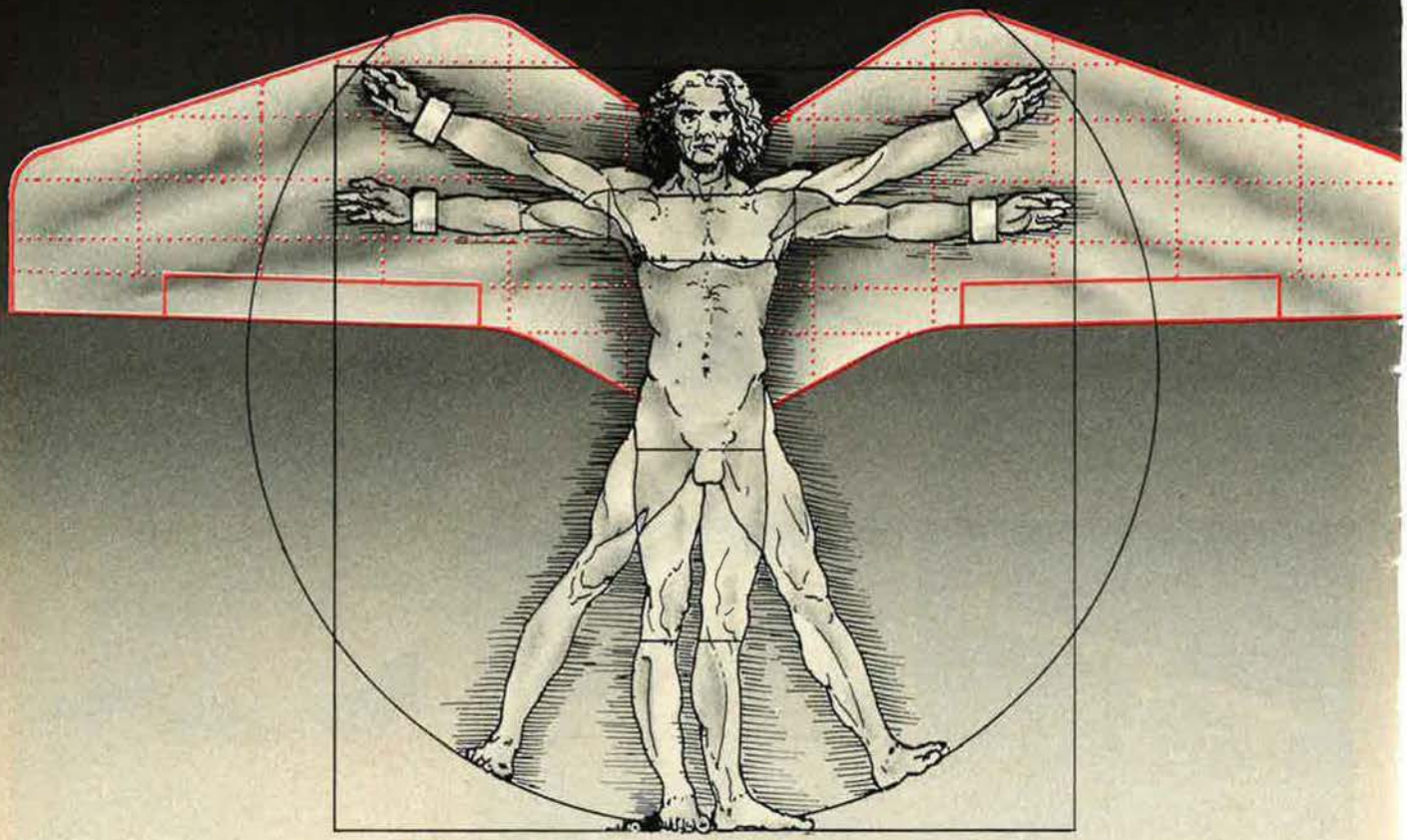

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given to Soviet authorities—attachés are harassed in ways that would be undreamed of in the US. As shown earlier, all foreigners, including diplomats assigned in Moscow, are restricted both in ways in which they can travel and areas that can be visited. For military attachés, such restrictions are only the beginning. While on trips they have been drugged and beaten by "vigilant citizens" under KGB control. Efforts are made to entrap them by every possible method, including sex.

According to time-honored custom and tradition, military attachés are assigned to observe and report on the status of a nation's armed forces. In the US, foreign air attachés are given tours of many critical USAF installations, including SAC and NORAD Headquarters. They are given opportunities to meet and to exchange views with senior Air Force officers. In the past, Soviet air attachés were included in this program, including the tours to USAF bases.

There are three or four military schools in the Soviet Union to which foreign attachés on rare occasions might be taken as a group. Prior to the visit, the schools are carefully sanitized and virtually emptied of students. About the only opportunity to see military equipment is during the November parades, when the Kremlin puts on a carefully calculated military display for the benefit of its own news media and Western observers. During those times when Western attachés may chance to meet senior Soviet military officials at receptions, Soviet officers will often not even reveal their names.

The Soviet people themselves know very little about their own armed forces. It was found during the SALT I negotiations that Soviet participants knew only those facts about their own forces that they absolutely needed to know. Reportedly, Soviet military personnel did not wish Soviet civilians to have data on Soviet military strengths; that was provided by US negotiators.

In bookstores throughout the USSR, one can find books giving details about the armed forces of NATO nations, including names of commanders, organizational structure, and details on the latest weaponry. Nothing comparable, however, is available to the Soviet people about their own armed forces. A Soviet reader can easily find drawings and photographs of the USAF B-1. He will find it very difficult, however, to locate photographs or published performance figures on either the Backfire or Fencer, two Soviet aircraft that have been flying for at least a decade.

When Western books are translated into Russian, all references that might tell the Soviet people details about their own military forces are carefully deleted. For example, Herbert York's book, *The Road to Oblivion*, was serialized in a Soviet journal. In the original text, there were a number of tables showing comparative Soviet and US weapon systems, numbers, and capabilities. In the Russian translation, data about US weapon systems remained, but comparable reference to Soviet weaponry and military forces were omitted.

When questioned about this omission, a Soviet scholar who was privileged to read Western publications replied with a straight face: "Our publications must be accurate. We felt safe in assuming that Dr. York had access to data on US weapons. However, we were not certain about his information about our own force. Therefore, in the interest of providing only accurate information to our readers, this data was removed."

The Soviet scholar could not admit that meaningful information about Soviet defense expenditures, size of the armed forces, information about current Soviet weapon systems, and other military data—of a type unclassified in the West—is carefully kept from the Soviet public. Statements by Kremlin spokesmen about the "imperialists fanning the arms race" or "the United States planning for a surprise nuclear strike on the Soviet Union" would not be believed by anyone if information about Soviet military forces was made available.

Implications

The excessive secrecy that permeates all the Kremlin's activities is largely responsible for the general feeling of hostility toward Moscow. This makes it difficult, if not impossible, for the USSR to maintain good relations with any nation.

Soviet spokesmen warn that the US must learn to accept the Soviet Union as an equal. Without question, the Soviet Union is a military superpower, with great natural resources. But its distrust of all foreigners, its closed borders, and its attempts to keep the Soviet people from actual knowledge of the outside world prevent it from being a nation of stature, except in a military sense. Representatives of Sri Lanka, Luxembourg, the US, Iceland, Japan, and Denmark, for example, accept each other as equals, since all subscribe to certain international standards. Russian xenophobia keeps the Soviet Union in a class by itself.

Moscow wants it both ways. The Kremlin leaders would like the nation to be accepted in the international system, and at the same time retain their secrecy. But to become a part of the world order they will have to allow the world to see them as they really are. Will they have enough confidence in themselves to do this?

In the past, the prevalent US policy has been to be patient with the Soviets. It was felt that few, if any, restrictions should be placed either on Soviet diplomats or visitors, since it would be instructive for them to experience a free society. In time, so the theory went, the Soviets would realize the benefits of freedom and would change their views. Only recently has the US government realized this approach was not having any effect, and insisted that Moscow's diplomats in Washington expect the same treatment given to US diplomats in the Soviet Union.

The Soviet Union has existed for more than sixty years. It leads the world in its possession of ICBMs, tanks, and military equipment of many types. Its leadership seeks to use the free and open institutions in the West for its own purposes, corrupting them whenever possible. At the same time, it maintains the most stringent security measures over its own citizens and visiting foreigners that probably has ever been achieved by any nation in history.

Soviet leaders now state that a general nuclear war could bring about an end to civilization. If they are serious they will meet the West halfway in trying to prevent a nuclear war. They might seek to understand why their own secrecy could be a major reason for the buildup of armaments, and the primary impediment to measures that could provide security for all nations, including themselves. ■

Ivan Is Only About 5'8"

Far from being ten feet tall, the individual Ivan is typically a bored and inexperienced draftee, anxious for his hitch in the military to be over.

BY CAPT. ALAN J. BERGSTROM, USAF

LENIN believed that a large standing army was an instrument of class oppression. Thus conscription—on which the czars had relied to raise their military manpower—was abolished soon after the 1917 Bolshevik revolution. It soon became apparent, however, that the armed forces of the new Soviet state were not going to attract enough voluntary recruits, so conscription was reinstituted in 1918.

It has been in effect ever since, and the Soviet military of today is about eighty percent manned by conscripts. Undeniably, the Soviet Union maintains an awesome number of men under arms. From time to time, there has been debate about whether Ivan is really ten feet tall. That proposition has often been debunked, but most observers have given inadequate attention to the most basic element of all: Ivan himself, as an individual military man.

He is distinctly different from his Western counterparts. In many ways, his military experience reflects the broader nature of the regime he serves. His service in uniform is formally linked with the concept of Soviet citizenship, and he begins preparing for it when he is quite young.

Premilitary Training

Preschool children whose parents both work receive regimented life-style training in their nurseries. The Soviet psyche is formed at an early age through the subordination of individualistic tendencies to those of the group or collective. Military-patriotic fervor is instilled in youngsters through the singing of patriotic songs, the planting of gardens around military graves and monuments, visits to "Combat Glory Museums" and various battle sites, and lectures on communism and the Great Patriotic War, as World War II is known there. In fact, military-partriotic training is considered to be one of the most important elements in the entire system of Communistic education. The Soviet Union has emphasized the need for a purposeful ideological and moral-political training program "to defend the homeland" for all students from the first through the tenth grades.

Several premilitary youth groups are funded by the Soviet government and the Communist Party in a concerted effort to develop a basic military orientation. Under the 1967 Law of Universal Military Service, the overall responsibility for premilitary training was levied upon a nationwide Communist Party organization known as DOSAAF (The Voluntary Society for Assistance to the Army, Air Force, and Navy), in coordination with the Soviet Ministry of Defense. DOSAAF membership is estimated at about 80,000,000 citizens between the ages of fourteen and twenty-seven.

DOSAAF-sponsored indoctrination and training for children five to seven years old is provided through a variety of military clubs, such as the Young Soldiers, Young Aviators, Young Friends of the Soviet Army, and Red Pathfinders. From ages six to nine, young people can participate in the Little Octoberists. Those ten to fifteen years of age are eligible to join the Young Pioneers.

Each year at summer camps, 16,000,000 Young Pioneers take part in a military game called "Summer

Lightning." While at camp, Young Pioneers become familiar with Army equipment while competing in team sports. Those over fifteen years of age can join KOMSOMOL (the Communist Youth League), and reports indicate that about seventy-five percent of those eligible do join. KOMSOMOL, like the Young Pioneers, has a summer sports camp program, "Eaglet," which provides extensive military training. In addition to the study of military regulations, "Eaglet" features training in grenade throwing, automatic weapons use, decontamination procedures, and civil defense. Active military units sponsor these groups, often providing instructors and equipment.

In theory, all of these groups are voluntary, but in reality, public and social pressures remove most of the choice. These organizations offer the only activities available to youth who want to participate in organized games, outings, or field trips. The Soviet government prohibits other youth groups. Most institutions of advanced learning give priority to applicants who have taken part in these organizations.

Probably the most important and extensive premilitary training administered by DOSAAF is the 140 hours of compulsory preinduction training for youth aged sixteen to eighteen. For the better part of two years, these teen-agers spend about two hours a week in training. Several weeks of summer military field training supplement the program. Participants often bivouac close to regular military units and follow the same routine as the unit. Training is provided in cartography, civil defense, flying, parachuting, skin diving, marksmanship, driving, and radio communications. After two years of initial training, qualified youth can participate in DOSAAF specialist programs.

The supplementary programs also include labor training beneficial to the national economy. Both sexes participate, but the curriculum for females includes more hours spent in civil defense and first-aid training than in practical military training. All secondary schools, trade schools, factories, offices, and collective farms are required by law to support this preinduction training by providing facilities and equipment, as well as by granting leaves of absence for field training.

This compulsory preinduction training provides the future conscript with the equivalent of initial basic training, which had previously been conducted after the conscript reported for active duty. With less active-duty basic training required, conscription has been reduced from three to two years for the Army and Air Force and from four years to three for the Navy. Although there is no official Soviet explanation for the difference in terms of service, it is most likely the result of more technical training required for sailors going to sea and a longer term of active duty to take advantage of that training.

Conscription System

At age seventeen, Soviet males must report to their local conscription centers to register and receive physical examinations. Inductees are assigned to the various branches of the armed forces on the basis of military needs, the conscripts' abilities, premilitary training, and occupational specialties. Normally, the cream of the crop—the standouts from premilitary training—go to the Rocket Troops or the Airborne Forces. Personal preferences are said to be considered, but they carry little weight.

Conscription applies to all Soviet eighteen-year-old males, regardless of race, nationality, or social status. About ninety percent of those eligible are actually inducted; the others are deferred from active duty and placed in the reserves. Permanent exemption from active or reserve duty is rare, except for medical reasons. Family circumstances, continuation of education, and physical problems are the most common reasons for deferments. Draft evasion—in the form of forged medical documents and false educational deferments—does occur, but only to a very limited degree. Nationalist sentiments or religious beliefs are not reasons for exemptions from military service, but they may influence where the conscript will serve. Individuals not called to active duty by age twenty-seven remain in the reserves until they are fifty. Those recommended for active service are called up either during May and June (the close of the spring planting season) or November and December (the close of the fall harvest season).

The law also provides for the conscription of women during war or emergency. While women are not normally inducted into the peacetime Soviet military, they may enlist if between nineteen and thirty and unmarried. Many young females participate in the various premilitary programs, but fewer than 10,000 women are currently on active military duty. Most of them serve in the communications, clerical, and health fields. Although Soviet society proclaims equality of sexes, women in the armed forces are cast in well-defined occupational roles.

After induction, the conscript receives the remainder of basic military training at his assigned tactical unit. (There are no centralized Soviet basic military training camps.) This basic training lasts for up to three months, depending upon the effectiveness of the conscript's premilitary training. Thereafter, military training is combined with technical training.

When physically fit males complete their service commitment, they continue in the reserves until age fifty, and may be recalled for refresher training. Priority for refresher training goes to the youngest and to those with the least amount of active service. Refresher training can last up to three months, and reservists may be recalled more than once. This provides the Soviets with a trained, available reserve force of some 60,000,000 men, with about 8,500,000 servicemen having served on active duty within the past five years.

Capt. Alan J. Bergstrom, USAF, is currently serving as Team Chief of the Air Staff's Intelligence Alert Center at Hq. USAF. Commissioned from AFROTC in 1977, he holds a bachelor's in political science from the College of St. Thomas and a master's in international studies from the Monterey Institute of International Studies. His active-duty career has included training at the Armed Forces Air Intelligence Training Center and intelligence staff positions with SAC. His assignment before coming to Hq. USAF was Chief of the Political Analysis Branch at Hq. SAC.

The first weeks of conscripted service are intense, restrictive, and marked by a high degree of repetition. Classroom instruction is minimal; most training is in the field. Physical conditioning is stressed. The conscript spends considerable time listening to lectures by the political officers *(Zampolit)* assigned to each unit. The conscript gets at least five hours of political indoctrination per week. Regimentation is the daily routine, and care is taken that not even leisure time be wasted. A conscript's off-duty hours are channeled into such productive activities as labor or harvest assistance.

Two Grades for Conscripts

There are only two grades for conscripts—private and private first class. Promotion to private first class during the first two years of service is common, but it means little in terms of pay, benefits, or privileges. Career service or noncommissioned officer status for the conscript may begin upon completion of the conscription service period. Those who "reenlist" do so for two, four, or six additional years. Only a small percentage of conscripts actually reenlists. Less than five percent of the enlisted force are career NCOs. Civilian job opportunities for ex-servicemen and the harshness of Soviet military life are responsible for this low retention rate. Those who do reenlist become junior sergeants, and it is not unusual for them to be promoted to master sergeant during their first two years of career service.

The rank of warrant officer was added recently to provide an additional reenlistment incentive. Those selected for this rank are sent to a special school and incur an additional five-year commitment. At the end of this additional commitment, a warrant officer is eligible for a commission as a junior lieutenant provided he meets the academic and professional requirements. Women enlistees may also extend their service and remain on active duty, but few are promoted to the officer ranks.

The Soviet system of military compensation is structured to retain and motivate careerists while providing minimal support for conscripts fulfilling their terms of service. The Soviet Armed Forces currently number more than 4,800,000 men, and, to keep personnel costs to a minimum, conscripts—the bulk of the force—are poorly paid. A conscript's pay equals about $10 per month.

Conscripts are not normally granted leave during their two- or three-year service periods. However, as a reward for military and political loyalty, a small percentage earns ten days' leave with up to ten additional days' travel time. Typically, a conscript will not leave his duty assignment during his service period. Conscripts have access to base facilities, including a library, movie theater (open weekends only), gymnasium, and service clubs. Activities, however, are closely scrutinized, and most are organized by higher officials.

Problems and Weaknesses

The problems affecting the capabilities of the Soviet conscript, and hence the Soviet Armed Forces, are numerous. Although the premilitary training is extensive, the results are somewhat mixed and often ineffective in terms of what was originally desired. Despite the overall increase in the level of education of the Soviet conscript and his compulsory preinduction training, Soviet commanders frequently complain about the lack of experience or qualifications among new personnel.

The quality of premilitary training varies from place to place in the USSR, and in some instances training papers are falsified. Such problems are symptomatic of ineffective management of premilitary training. Factory and farm managers find it difficult to devote the necessary attention to the preinduction training while also worrying about production and profit quotas. The introduction of complex equipment and weaponry into the various branches of the Soviet Armed Forces puts a strain on the already tight active-duty training schedule. Every six months, twenty-five percent of the conscripts leave and are replaced, so the training cycle begins again.

Even though Soviet young people accept military service as a responsibility of citizenship, few actually look forward to it. Most view it as a waste of time and an interruption of their careers. An exception may be the rural conscript, who sees military service as a passport to learning a skill, eventually leading to an urban job and a higher standard of living. For the most part, morale among conscripts is low.

Whereas in most Western military forces the noncommissioned corps is the backbone of the force, in the Soviet Union this role falls on the officer corps. The Soviet officer is involved in the training and supervisory functions normally assigned to NCOs. The gap between officers and conscripts is wide. Class privileges do not officially exist, but Soviet officers clearly hold a privileged status and a serious class attitude problem exists between the ranks. Desertion, insubordination, and excessive use of alcohol are chronic.

The military and the civilian work force compete for eighteen-year-olds at a time of overall declining birthrates and projected shortages of draft-age youth. During the 1970s, some 2,000,000 males a year reached the military registration age of seventeen. This number will decline to about 400,000 annually by the mid-1980s. Still, a large standing army and a labor-intensive economy require continued large population growth. The Soviet government is concerned and has implemented programs in attempts to reverse the trend. Among them are maternity payments to Russians, as well as further limits on the number of military induction deferments granted for education.

The ethnic imbalance created by declining Russian births has other serious implications for the Soviet Armed Forces. Traditionally, minority conscripts—*i.e.*, those from the non-Russian republics—were utilized only as noncombatants. Unless the population trend is reversed, though, minority conscripts may represent a majority in the Armed Forces by the late 1980s and measures will have to be taken to "absorb" them. Language and cultural differences will continue to exacerbate the situation.

These problems and weaknesses affect the capabilities and performance of the Soviet conscript and, ultimately, the Soviet Armed Forces. The Soviet military machine is formidable, but the notion that Ivan—as an individual military man—is ten feet tall is clearly wide of the mark. Ivan is only 5'8", 6'1", 5'10". . . . ■

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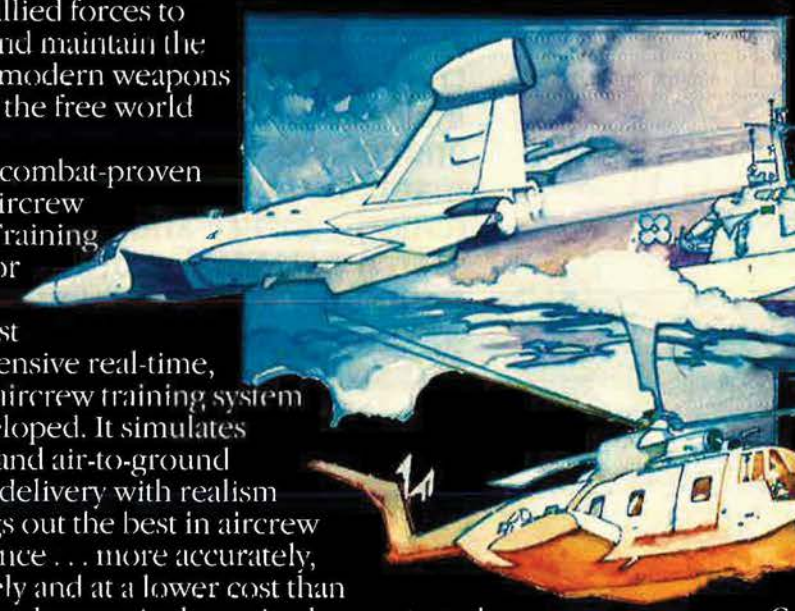

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GALLERY OF SOVIET AEROSPACE WEAPONS

BY JOHN W. R. TAYLOR, Editor, JANE'S ALL THE WORLD'S AIRCRAFT

Bombers and Maritime

New Tupolev Bomber (NATO 'Blackjack')

Allocation of the NATO reporting name 'Blackjack' to Tupolev's new strategic bomber seems to confirm that it is the long-awaited replacement for the intercontinental attack versions of the Tu-95 'Bear'. The only visual evidence of the aircraft's existence yet available publicly is the single poor-quality reconnaissance photograph taken over Ramenskoye flight test centre on November 25, 1981. Showing the aircraft parked alongside two Tu-144 supersonic airliners, this enables its length to be calculated as around 180 ft. What this implies in terms of weapon load and fuel tankage is alarmingly apparent. 'Blackjack' is nearly 40% bigger than Tupolev's last operational bomber, the supersonic 'Backfire', 20% larger than USAF's forthcoming B-1B, and 12% longer than even the mighty B-52. It is in no way a simple scale-up of 'Backfire'. Common features include low-mounted variable-geometry wings, and large vertical tail surfaces with a massive dorsal fin; but 'Blackjack's' horizontal tail surfaces are mounted higher, at the intersection of the dorsal fin and main fin. The fixed root panel of each wing seems to be long and very sharply swept, like the inboard section of the Tu-144's delta wing. The engine installation also seems to resemble that of the airliner rather than 'Backfire', leading to suggestions that 'Blackjack' might be powered by four Koliesov single-shaft turbojets of the kind that have given the developed Tu-144D a greatly increased range. Such assessments should be regarded with caution, as the Tu-144D is designed to cruise at around Mach 2 throughout its flight, whereas the bomber would need to cruise at subsonic speed to conserve fuel, and accelerate to supersonic speed only as it approached and left the target area. Major differences in flight profile normally call for different engines. However, it is Soviet policy to uprate or adapt an existing engine for a new aircraft, rather than develop a new design, whenever this is possible. If the engines are mounted in pairs, inside two divided underwing ducts, as on the Tu-144, the gap between the ducts will determine the type and size of weapons that 'Blackjack' can carry. Unofficial sources have calculated that the maximum weapon load might be 36,000 lb, unrefuelled range 8,400 miles, and over-target dash speed Mach 2.3. The DoD expects the Soviet Union to build a production series of about 100, with an initial operational capability in 1987.

Beriev M-12 (NATO 'Mail')

About 80 of these 1960-vintage maritime patrol amphibians continue to operate from coastal bases of the Soviet Northern and Black Sea fleets for antisubmarine and surveillance duties out to some 230 miles from shore. Their uniqueness in a landplane age, as well as their capability, is emphasised by the fact that M-12s have continued to set new records, and raise existing records, during the past two years. As a result, they now hold 24 FAI records listed in Class C3 Group II for turboprop amphibians, and 21 Class C2 Group II records for turboprop flying-boats. No other aircraft holds records in these categories, and only the big Japanese Shin Meiwa PS-1 could conceivably challenge the M-12's supremacy.

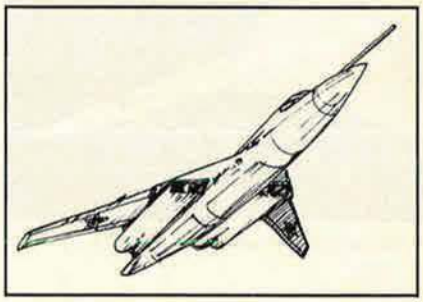
Power Plant: two Ivchenko AI-20D turboprop engines; each 4,190 ehp.
Dimensions: span 97 ft 6 in, length 99 ft 0 in, height 22 ft 11½ in, wing area 1,130 sq ft.
Weight: gross 64,925 lb.
Performance: max speed 378 mph, service ceiling 37,000 ft, max range 2,485 miles.
Accommodation: crew of five.
Armament and Operational Equipment: variety of weapons and stores for maritime search and attack carried in internal bay aft of step in bottom of hull, and on four pylons under outer wings. Radar in nose 'thimble'; MAD (magnetic anomaly detection) tail-sting.

Ilyushin Il-38 (NATO 'May')

Surveillance and reconnaissance are the basic duties allotted by the Soviet Navy to the crews of its 60 or so Il-38s. The airframe was developed from that of the Il-18 airliner in the same way that the US Navy's P-3 Orion was based on the Lockheed Electra. Its lengthened fuselage retains few cabin windows. Added equipment includes a large radome under the forward fuselage and a MAD tail-sting, with an internal weapon/stores bay aft of the radome. To compensate for the effect on the CG position of these changes, and equipment inside the cabin, the wing had to be moved forward.

Il-38s are encountered frequently over the Atlantic and Mediterranean, together with longer-range Tu-142s. A Soviet Treaty of Friendship and Co-operation, signed with the People's Democratic Republic of Yemen in October 1979, permits patrols over the Indian Ocean from a base in that country. Also to be seen are the first three of six Il-38s ordered for No. 315 Squadron of the Indian Navy, based at Dabolim, Goa.

Power Plant: four Ivchenko AI-20 turboprop engines; each 4,250 ehp.
Dimensions: span 122 ft 8½ in, length 129 ft 10 in, height 33 ft 4 in.
Performance: max cruising speed 400 mph at 27,000 ft, max range 4,500 miles.
Accommodation: crew of twelve.

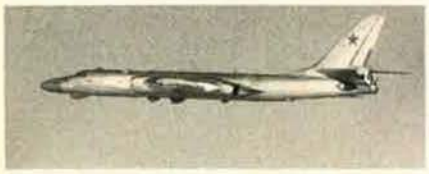


Artist's concept of 'Blackjack'

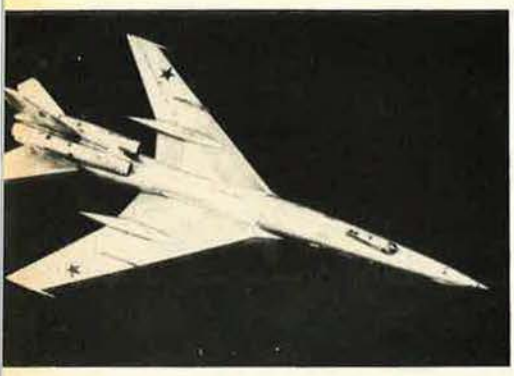
Beriev M-12 (NATO 'Mail') (Tass)

Ilyushin Il-38 (NATO 'May') (Royal Norwegian Air Force)

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



Tupolev Tu-16 (NATO 'Badger-D') (Royal Norwegian Air Force)



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

Myasishchev M-4 (NATO 'Bison')

Last year's Gallery noted that 'Bison' had disappeared from the Pentagon listing of types operational with the Soviet Naval Air Force. Soon afterwards, Royal Air Force interceptors encountered over international waters the maritime reconnaissance 'Bison-B' shown in the accompanying illustration. Others have been seen subsequently by pilots of other NATO air forces. Clearly, a few Naval M-4s remain operational, in addition to the estimated 43 'Bison-A' long-range bombers and 30 inflight refuelling tanker conversions still serving with the Dalnaya Aviatsiya strategic bomber force. The tankers each carry an internal probe-and-drogue hose-reel unit, making them compatible with 'Backfire' as well as the DA 'Bear-Bison' attack force. The prototype of the M-4 flew thirty years ago, making it only one year younger than the original B-52. The basic bomber version carries only free-fall weapons. *(Data for 'Bison-A' strategic bomber follow.)*

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

Dimensions: span 165 ft 7½ in, length 154 ft 10 in.

Weight: gross 350,000 lb.

Performance: max speed 620 mph at 36,000 ft, service ceiling 45,000 ft, range 4,970 miles at 520 mph with more than 12,000 lb of bombs, max unrefuelled combat radius 3,480 miles.

Armament: ten 23 mm guns in twin-gun turrets above fuselage fore and aft of wing, under fuselage fore and aft of weapon-bays, and in tail. Three weapon-bays in centre-fuselage.

Tupolev Tu-16 (NATO 'Badger')

First put into production in the Soviet Union in 1953, the basic strategic bomber version of the Tu-16 is still coming off an assembly line in China, as the Xian H-6, thirty years later. DoD's 1981 document on *Soviet Military Power* stated that "The 600 intermediate-range Tu-16 and Tu-22 aircraft represent a significant capability for use in theater strike operations" by the DA, adding that the Tu-16 is by far the most numerous aircraft in the force. The same source commented that "The prime strike force of Soviet Naval Aviation consists of over 300 twin-jet 'Badger' and 'Blinder' aircraft which are fitted to carry one or two of several types of anti-ship cruise missiles with 'standoff' ranges varying from 90 to over 300 km. Some missiles have variable flight paths and various homing techniques to help penetrate ship defenses. All these missiles are assessed to carry either a nuclear or a high explosive warhead of about 1,000 to 2,000 lb. . . . In addition to naval aircraft armed with anti-ship missiles, certain 'Bear' and 'Badger' bombers of Soviet Long Range Aviation can be used for attacks against ships, and these aircraft regularly participate in naval exercises." The DA bombers are supported by a small number of Tu-16 tankers, more than 90 of various versions equipped for ECM duties, and 15 for reconnaissance. Naval units have about 70 tankers, and 40 reconnaissance and ECM models. The eleven versions identified to date are as follows:

Badger-A. Basic strategic jet bomber, able to carry nuclear or conventional free-fall weapons. Crew of six. Glazed nose, with small undernose radome. Armed with seven 23 mm guns. Some equipped as inflight refuelling tankers, using a unique wingtip-to-wingtip transfer technique. More than 80 operational with Chinese Air Force (built in China as H-6).

Badger-B. Generally similar to 'Badger-A', but equipped originally to carry two turbojet-powered aeroplane-type anti-shipping missiles (NATO 'Kennel') underwing. Still serves with DA as conventional free-fall bomber.

Badger-C. Anti-shipping version, first shown in 1961 Aviation Day flypast. 'Kipper' winged missile carried under fuselage, or new 'Kingfish' missiles underwing. Wide nose radome, in place of glazing and nose gun of 'Badger-A'. No provision for free-fall bombs.

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

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

Badger-F. Basically similar to 'Badger-E' but with electronic intelligence pod on pylon under each wing.

Badger-G. Similar to 'Badger-A' but fitted with underwing pylons for two rocket-powered air-to-surface missiles (NATO 'Kelt') which can be carried to a range greater than 2,000 miles. Free-fall bombing capability retained. Majority serve with anti-shipping squadrons of the Soviet Naval Air Force. One photographed by pilot of Japanese F-86F in 1977, about 50 miles north of Noto Peninsula, carrying a 'Kingfish' missile on port underwing pylon; others seen subsequently with a 'Kingfish' under each wing. About 16 form main strike element of Egyptian Air Force.

Badger-G modified. Specially equipped carrier for 'Kingfish' air-to-surface missiles, of which first photograph was released, by Swedish Air Force, in mid-1981. Large radome, presumably associated with missile operation, under centre-fuselage. Device mounted externally on glazed nose might help to ensure correct attitude of Tu-16 during missile launch.

Badger-H. Stand-off or escort ECM aircraft, with primary function of chaff dispensing. The chaff dispensers are probably located in the weapons-bay area. Hatch aft of weapons-bay. Two teardrop radomes, fore and aft of weapons-bay. Two blade antennae aft of weapons-bay.

Badger-J. Specialised ECM jamming aircraft, with at least some of the equipment located in a canoe-shape radome protruding from inside the weapons-bay.

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

Power Plant: two Mikulin RD-3M (AM-3M) turbojet engines; each 20,950 lb st.

Dimensions: span 108 ft 0½ in, length 114 ft 2 in, height 35 ft 6 in, wing area 1,772.3 sq ft.

Weights: empty 82,000 lb, normal gross 158,730 lb.

Performance: max speed 616 mph at 19,700 ft, service ceiling 40,350 ft, range with max fuel 4,470 miles.

Armament: seven 23 mm guns; in twin-gun turrets above front fuselage, under rear fuselage, and in tail, with single gun on starboard side of nose. Up to 19,800 lb of bombs in internal weapons-bay.

Tupolev Tu-22 (NATO 'Blinder')

As the Soviet Union's first operational supersonic bomber, the Tu-22 caught the attention of the world press when it made a surprise appearance at the 1961 Aviation Day display in Moscow. However, production was limited to about 250 aircraft. Of these, about 125 are said to remain operational with medium-range units of Dalnaya Aviatsiya, plus about a dozen for reconnaissance duties. The Soviet Navy has around 40 for maritime reconnaissance and ECM duties, based mainly in the Southern Ukraine and Estonia to protect the sea approaches to the USSR. Versions identified by NATO reporting names are as follows:

Blinder-A. Original reconnaissance bomber version, with fuselage weapons-bay for free-fall nuclear or conventional bombs. Limited production only. 12 supplied to Iraq.

Blinder-B. Similar to 'Blinder-A' but equipped to carry air-to-surface missile (NATO 'Kitchen') recessed in weapons-bay. Larger radar and partially-retractable flight refuelling probe on nose. Major version for Dalnaya Aviatsiya. A few serve with Libyan Air Force.

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

Blinder-D. Training version. Cockpit for instructor in raised position aft of standard flight deck, with stepped-up canopy.

Power Plant: two unidentified turbojet engines in pods above rear fuselage, on each side of tail-fin; each estimated at 27,000 lb st with afterburning. Lip of each intake is extended forward for take-off, creating annular slot through which additional air is ingested.

Dimensions: span 90 ft 10½ in, length 132 ft 11½ in, height 35 ft 0 in.

Weight: gross 185,000 lb.

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

Accommodation: three crew, in tandem.

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

Tupolev Tu-22M (NATO 'Backfire')

Among the more sinister developments of the past year has been a reported massive buildup of the force of Tu-22M supersonic strategic bombers based in the far east of the Soviet Union. The Japan Defence Agency estimates the total at 90. On September 14, 1982, five were intercepted by Phantoms of the JASDF over the Sea of Japan, 250 miles northwest of Tokyo; another six were located by radar but not intercepted. About 70 Tu-22Ms are believed to serve with medium-range bomber squadrons of the Soviet Strategic Nuclear Forces opposing NATO in Europe and over the Atlantic. A similar number (including probably some of those in the far east) are deployed by Soviet Naval Aviation in a maritime role, which caused the DoD to comment: "There is increasing evidence that the Soviet bomber and cruise missile force may be overtaking their submarine force as a threat to our fleet and to our forces necessary for the resupply of Europe. They can concentrate aircraft, coordinate attacks with air, surface, or submarine-launched missiles, and use new technology to find our fleet units, jam our defenses, and screen their approach."

Three versions of the Tu-22M can now be 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. Believed to equip a

single Dalnaya Aviatsiya squadron.

Backfire-B. Extensively redesigned, with increased span and with landing gear pods eliminated except for shallow underwing fairings, no longer protruding beyond the trailing-edge. Main wheels retract inward into bottom of intake trunks.

Backfire- . Advanced version with wedge-type engine air intakes, similar to those of MiG-25. No photograph yet available. *(Data for 'Backfire-B' follow.)*

Power Plant: two unidentified engines, reported to be uprated versions of the 44,090 lb st Kuznetsov NK-144 afterburning turbofans used in the Tu-144 supersonic transport. Optional in-flight refuelling nose-probe.

Dimensions: span 113 ft spread, 86 ft swept; length 132 ft; height 33 ft.

Weight: gross 270,000 lb.

Performance: max speed Mach 2 at high altitude, Mach 0.9 at low altitude, max unrefuelled combat radius 3,400 miles.

Armament: twin 23 mm guns in radar-directed tail mounting. Nominal weapon load 26,450 lb. Primary armament of one 'Kitchen' air-to-surface missile semi-recessed in underside of centre-fuselage. 'Backfire' can also carry the full range of Soviet free-fall nuclear and conventional weapons, and most aircraft photographed since 1978 have carried multiple racks for external stores under the front of their air intake trunks. Soviet development of decoy missiles has been reported, to supplement very advanced ECM and ECCM.

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

Many Western critics failed to appreciate the unique capabilities of Tupolev's huge four-turboprop strategic bomber when it first flew in 1954. The switch from turboprops to turbojets for high-performance aircraft was under way; but the Tu-95 was soon flying at speeds more than 100 mph faster than anyone had expected a propeller-driven aircraft to achieve. As the years passed, and production numbers grew, the size and payload potential of the Tu-95 and its maritime reconnaissance counterpart, the Tu-142, enabled them to accommodate the largest air-to-surface missiles and radars that have yet been carried by operational aircraft. So, production to balance attrition has now entered its 29th year. Dalnaya Aviatsiya still has more than 100 Tu-95s, which will form the backbone of its long-range force until 'Blackjack' enters service. Soviet Naval Aviation units operate about 75 Tu-142s for overwater reconnaissance and antisubmarine warfare. Flying from places like Cuba and Angola, they have demonstrated their ability to cover the North and South Atlantic from the Mediterranean approaches westward to the US east coast, and southward to the Cape of Good Hope. Six major versions, with constantly-updated equipment, can be identified by unclassified NATO reporting names, as follows:

Bear-A. Basic 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 forward dorsal and rear ventral turrets, and manned tail turret.

Bear-B. As 'Bear-A' but able to carry large air-to-surface winged missile (NATO 'Kangaroo') under fuselage, with associated radar in wide undernose radome replacing glazed nose. Defensive armament retained. A few 'Bs' operate in maritime reconnaissance role with Naval Air Force, with large flight refuelling nose probe, and, sometimes, a streamlined blister fairing on the starboard side of the rear fuselage. Some 'Bears' are equipped to carry 'Kitchen' air-to-surface missiles. One was photographed in 1978 with a pointed canister under each wing, presumably for air sampling.

Bear-C. Third strike version, with ability to carry 'Kangaroo', first observed near NATO ships in 1964. Differs from 'Bear-B' in having a streamlined blister fairing on each side of its rear fuselage.

Bear-D. Identified during harassment of US Coast Guard icebreakers in the Soviet Arctic in 1967, this was the first version fitted with X-band radar in large blister fairing under centre-fuselage, for reconnaissance and important anti-shipping missile role. Tasks include pinpointing of targets for missile launch crews on board ships and aircraft which are themselves too distant to ensure precise missile aiming and guidance. Glazed nose like 'Bear-A', with undernose radome and superimposed refuelling probe. Rear fuselage blisters as on 'Bear-C'. Added fairing at tips of tailplane. I-band tail-warning radar in enlarged fairing at base of rudder. About 35 serve with Soviet Naval Air Force.

A 'Bear-D' photographed in the second half of 1978, after intercept by US Navy Phantoms, had in place of the normal tail turret and associated radome a faired tail housing special equipment.

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

Bear-F. Much-refined antisubmarine version, identified in 1973. Smaller X-band radar fairing, further forward than that of 'Bear-D'. Large blister fairings absent from rear fuselage. Lengthened fuselage forward of wings, with shallow undernose radome on some aircraft only. Enlarged fairings aft of inboard engine nacelles on a few early aircraft, to improve aerodynamics; later 'Fs' have standard size nacelles. Armament reduced to two guns, in tail mounting. Two stores bays in rear fuselage, one replacing ventral gun turret. Bulged nosewheel doors, over larger or low-pressure tyres. About 40 operational in 1982, with production continuing to balance attrition of 'Bear' force.

Individual aircraft photographed by NATO interceptors, over international waters, during the past three years have displayed significant new equipment configurations additional to those listed. They include an unidentified projection from the rear of the fin tip of most currently-observed 'Bear-Fs', which lack the fairings seen at the tailplane tips of earlier 'Ds' and 'Fs'.

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

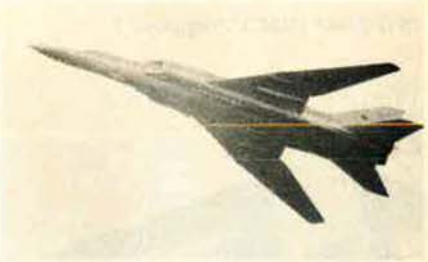
Dimensions: ('Bear-A'): span 159 ft 0 in, length 155 ft 10 in, height 39 ft 9 in.

Dimensions: ('Bear-F'): span 167 ft 8 in, length 162 ft 5 in, height 39 ft 9 in.

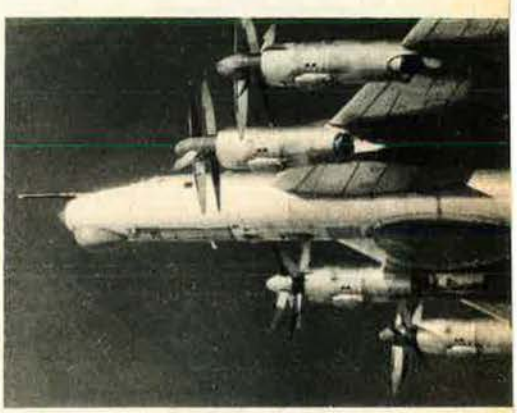
Weight: ('Bear-A'): gross 340,000 lb.

Weight: ('Bear-F'): gross 414,470 lb.

Performance: ('Bear-A'): max speed 575 mph at 41,000 ft, range 7,800 miles with 25,000 lb of bombs, max unrefuelled combat radius 5,150 miles.



Tupolev Tu-22M (NATO 'Backfire-B') (Swedish Air Force)



Tupolev Tu-142 (NATO 'Bear-D') (US Navy)

Fighters

MiG-21 (NATO 'Fishbed')

Inevitably, in an aircraft designed on the basis of jet-to-jet combat experience during the Korean War, the MiG-21 cannot match fully the standards of IFF, navigation and other systems, and missile firepower of modern fighters. But what other jet fighter has been flown by at least 36 air forces? We may never know how many have been built in the Soviet Union, Czechoslovakia, India, and China (as the J-7). Replacement with the MiG-23 and other types has been so rapid that only about 700 are still deployed by the Soviet tactical air forces, including 130 of the reconnaissance models known to NATO as 'Fishbed-H'. Most of those remaining are multi-role "Fishbed-J/K/L/N' variants, of which the last two represent such an advance over their predecessors in terms of constructional standards that they can almost be regarded as new types. Pilots of the Egyptian Air Force told representatives of *Jane's* and AIR FORCE Magazine that their late-model 'Fishbed-Js' could be airborne in under three minutes from an order to go, could maintain six sorties a day per aircraft for a two/three-day emergency period, and could be operated for 300 hours before engine change. Major versions flown by the Warsaw Pact air forces are as follows:

MiG-21F ('Fishbed-C'). Short-range clear-weather fighter, with 12,676 lb st Tumansky R-11 afterburning turbojet, internal fuel capacity of 618 gallons, and radar ranging equipment in small air intake centrebody of movable three-shock type. Armed with one 30 mm gun and two K-13 (NATO 'Atoll') air-to-air missiles or sixteen-round pods of 57 mm rockets. Pylon for 130 gallon fuel tank under belly. Semi-encapsulated escape system, in which pilot is protected by canopy, ejected with seat as shield against slipstream. Pitot boom under nose.

MiG-21PF ('Fishbed-D'). Basic model of second series, with R1L search/track radar (NATO 'Spin Scan A') in enlarged intake centrebody to enhance all-weather capability. R-11 uprated to 13,120 lb st with afterburning. Internal fuel increased to 753 gallons. Gun deleted. Late production PFs have provision for two JATO rockets, and a flap blowing system (SPS) which reduces landing speed by 25 mph. Pitot boom above nose.

MiG-21PFM ('Fishbed-F'). Successor to PF, with SPS, wide-chord fin to improve stability, conventional ejection seat, windscreen with quarter lights, and sideways-hinged canopy. R2L radar ('Spin Scan B') with reported lock-on range of 12 miles but ineffective below 3,000 ft because of ground clutter. Max permissible speed at low altitude is 683 mph.

MiG-21PFMA ('Fishbed-J'). Multi-role development of PFM, with improved radar (NATO 'Jay Bird') and four underwing pylons instead of two. Armament can include GP-9 underbelly pack, housing GSh-23 twin-barrel 23 mm gun, instead of external fuel tank. Deepened dorsal spine fairing above fuselage contains some tankage, but internal fuel totals only 687 gallons. Two additional pylons carry either 130 gallon fuel tanks or radar-homing 'Advanced Atoll' missiles to supplement infra-red K-13As on inboard pylons. Above-nose pitot boom offset to starboard. Zero-speed, zero-altitude ejection seat. Later pro-

MiG-21PFMs (NATO 'Fishbed-F') of Polish Air Force

MiG-23MF (NATO 'Flogger-G')

MiG-23BN (NATO 'Flogger-H') of Czechoslovak Air Force

MiG-25 (NATO 'Foxbat-A')

duction PFMAs can have GSh-23 gun installed within fuselage, with shallow underbelly fairing for the barrels, and splayed cartridge ejection chutes to permit retention of centreline tank.

MiG-21MF ('Fishbed-J'). Differs from PFMA in having lighter-weight, higher-rated Tumansky R-13-300 turbojet. Rearview mirror above canopy. Entered service in 1970.

MiG-21SMT ('Fishbed-K'). As MiG-21MF, but deep dorsal spine extends rearward as far as parachute brake housing to provide maximum fuel tankage and optimum aerodynamic form. Provision for ECM equipment in small removable wingtip pods. Deliveries believed to have started in 1971.

MiG-21*bis* ('Fishbed-L'). Third-generation multi-role air combat fighter/ground attack version, with wider and deeper dorsal fairing, updated avionics, and generally improved construction standards. Internal fuel capacity increased to 766 gallons.

MiG-21*bis* ('Fishbed-N'). Advanced version of 'Fishbed-L' with Tumansky R-25 turbojet engine, rated at 16,535 lb st with afterburning. Enhanced avionics indicated by 'bow and arrow' antenna on nose. Radar detection range 18 miles. Rate of climb at T-O weight of 15,000 lb, with 50% fuel and 2 'Atoll' missiles, is 58,000 ft/min. Armament uprated to 2 radar-homing 'Atolls' and 2 'Aphids'. *(Data for MiG-21MF follow.)*

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

Dimensions: span 23 ft 5½ in, length 51 ft 8½ in, height 13 ft 5½ in, wing area 247 sq ft.

Weight: gross 20,725 lb.

Performance: max speed Mach 2.1 above 36,000 ft, Mach 1.06 at low altitude; practical ceiling about 50,000 ft; range 683 miles on internal fuel, 1,118 miles with three external tanks.

Accommodation: pilot only.

Armament: one twin barrel 23 mm GSh-23 gun, with 200 rounds. Typical underwing loads for interceptor role include two K-13A ('Atoll') and two 'Advanced Atoll' air-to-air missiles; two K-13As and two UV-16-57 (sixteen 57 mm) rocket pods; two drop tanks and two missiles. Typical ground attack loads are four UV-16-57 rocket packs; two 1,100 lb and two 550 lb bombs; or four S-24 240 mm rockets.

MiG-23 (NATO 'Flogger')

The Soviet Union has built more than 600 MiG-23/27 fighters and fighter-bombers each year since 1978. As a result, this family of multi-role variable-geometry aircraft now forms the backbone of the Soviet Frontal Aviation tactical air forces and the Voyska PVO interceptor force. Others, usually equipped to a lower standard, are flown by all of the Warsaw Pact air forces except that of Romania, and have been exported to at least nine other air forces. The 22,485 lb st Tumansky R-27 afterburning turbojet used in early production aircraft has been superseded by the R-29 in all versions except the training two-seaters. The full list of MiG-23 variants identified by unclassified NATO reporting names is as follows:

MiG-23 ('Flogger-A'). Prototype, shown in 1967 Aviation Day flypast, and small initial production series to equip one or two development squadrons from 1970. Experience with these dictated almost total redesign of the major production versions which followed.

MiG-23MF ('Flogger-B'). Single-seat air combat fighter for Soviet Air Force. Compared with prototype all tail surfaces except ventral fin moved rearward, increasing gap between wing and tailplane; size of dorsal fin increased; and fixed inboard wing leading-edges introduced. Equipment includes J-band radar (NATO 'High Lark'; search range 53 miles, tracking range 34 miles) in nose, ECM in fairings forward of starboard underwing pylon and above rudder, undernose laser rangefinder, and Doppler. Described as the first Soviet aircraft with a demonstrated, but rudimentary, ability to track and engage targets flying below its own altitude.

MiG-23U ('Flogger-C'). Tandem two-seater for both operational training and combat use. Identical to early MiG-23MF (with R-27 engine), except for slightly raised second cockpit to rear, with retractable periscopic sight for occupant, and modified fairing aft of canopy.

MiG-23 ('Flogger-E'). Export version of 'Flogger-R', equipped to lower standard. Smaller radar (NATO 'Jay Bird'; search range 18 miles, tracking range 12 miles) in shorter nose radome. No laser rangefinder or Doppler. Armed with 'Atoll' missiles and GSh-23 gun.

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

MiG-23MF ('Flogger-G'). First identified when six aircraft from Kubinka Air Base made goodwill visits to Finland and France in the Summer of 1978. Although basically similar to 'Flogger-B', these aircraft had a much smaller dorsal fin. Absence of operational equipment suggested that only a few aircraft had been modified to this standard for improved aerobatic capability as a display team. 'Flogger-G' has, however, been seen subsequently with an undernose sensor pod of new design, and is an operational variant.

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

Further versions can be expected, and it is likely that a seagoing variant of 'Flogger' will equip any future large aircraft carriers built for the Soviet Navy.

There are believed to be about 850 'Flogger- B/G' interceptors in the 2,250-strong Voyska PVO air defence interceptor force, and a total of 1,300 'Flogger-B/G' variants in Frontal Aviation regiments. Other Warsaw Pact air forces operate mainly 'Flogger-B/C/H'. Algeria, Cuba, Iraq, and Libya have 'Flogger-E/F'; Egypt, Ethiopia, Syria, and Vietnam have 'Flogger-F; India has 'Flogger-C/H'.

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, and collectively after touchdown. Leading-edge flap on outboard two-thirds of each main (variable-geometry) wing panel. Horizontal tail surfaces operate differentially and collectively for aileron and elevator functions respectively. Conventional rudder. *(Data for current Soviet AF MiG-23MF follow.)*

Power Plant: one Tumansky R-29 turbojet engine, rated at 27,500 lb st with max afterburning. Variable-geometry air intakes and variable nozzle. Provision for external fuel tank on centreline pylon.

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

Weight: gross 28,000–35,275 lb.

Performance: max speed Mach 2.35 at height, Mach 1.2 at sea level, service ceiling 61,000 ft, combat radius 560–745 miles.

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun in belly pack. One pylon under centre-fuselage, one under each engine air intake duct, and one under each fixed inboard wing panel, for rocket packs, air-to-air missiles, or other stores. Aircraft seen during past year have twin launchers under air intake ducts, enabling them to carry four AA-8 (NATO 'Aphid') missiles, in addition to two AA-7 (NATO 'Apex') on underwing pylons.

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

The MiG-25 remains, so far as we know, the fastest armed combat aircraft ever introduced into squadron service. The fact that it is sighted routinely in the hands of pilots from India, and those who fly under the national markings of Algeria, Libya, and Syria, reflects great credit on the team headed by the late Artem Mikoyan which succeeded in making a Mach 3 aeroplane so manageable. Five versions have been identified:

MiG-25 ('Foxbat-A'). Basic interceptor designed to attack high-flying targets. Built mainly of steel, with titanium only in places subject to extreme heating, such as the wing leading-edges. Slightly reduced wing sweep towards tips, which carry anti-flutter bodies housing CW target-illuminating radar. Nose radar (NATO 'Fox Fire') of MiG-25 examined in Japan in 1976, 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 anti-jamming capability rather than range. ECCM standards were high. Armament comprises four air-to-air missiles on underwing pylons. Known also in USSR as E-266. Over 200 operational with Voyska PVO, others with air forces of Algeria, Libya, and Syria. Production cut back in 1977–78, reflecting new emphasis on interception of low-flying targets.

MiG-25R ('Foxbat-B'). Reconnaissance version. Described separately in Reconnaissance, ECM, EW Section.

MiG-25U ('Foxbat-C'). Trainer, of which first photographs became available in late 1975. New nose, containing separate cockpit with individual canopy, forward of standard cockpit and at a lower level. No search radar or reconnaissance sensors in nose. The aircraft designated E-133 in which Svetlana Savitskaya set a women's world speed record of 1,667.412 mph on June 22, 1975, and three subsequent speed and height records, is believed to have been a MiG-25U.

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

E-266M. Soviet designation of aircraft which recaptured two time-to-height records from the McDonnell Douglas F-15 *Streak Eagle* on May 17, 1975, and set a further record by climbing to 35,000 m (114,829 ft) in 4 min 11.7 sec. Subsequent flights set an absolute height record of 123,523 ft and a record for climb to 121,654 ft with a two-ton payload. The engines of this version, which is probably related to the MiG-25M ('Foxhound'), are uprated to 30,865 lb st each. *(Data for 'Foxbat-A' follow.)*

Power Plant: two Tumansky R-31 (R-266) turbojet engines, each 24,250 lb st with afterburning. Internal fuel capacity approx 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 79,800 lb.

Performance: never-exceed combat speed, with missiles, Mach 2.8, service ceiling 80,000 ft, max combat radius 900 miles.

Armament: four air-to-air missiles. These may comprise one infra-red and one radar homing example of the AA-6 (NATO 'Acrid') under each wing. Alternatively, it is believed that one AA-7 (NATO 'Apex') and one AA-8 ('Aphid') are carried under each wing.

MiG-25M (NATO 'Foxhound')

The first suggestion that an updated interceptor version of the MiG-25 was under development came from Lt Viktor Belenko, the Soviet pilot who defected to Japan in a 'Foxbat-A' in September 1976. He stated that the airframe of the new fighter had been strengthened to permit supersonic flight near the ground; the engines had been uprated to give 30,865 lb st with afterburning; the avionics had been improved; and two fuselage attachments had been added to make possible the carriage of a total of six air-to-air missiles. It seemed likely that the new aircraft, which became known unofficially as 'Modified' or 'Super Foxbat' in the US, was related to the E-266M, which had set the first of a series of world height records in the previous year *(see MiG-25 entry)*. The engine rating quoted for the E-266M was the same as that given for the interceptor by Lt Belenko. Reports in the technical press described 'Super Foxbat' as a tandem two-seater with an armament of four radar-homing AA-X-9 air-to-air missiles and a lookdown/shootdown pulse-Doppler radar that could display 20 targets and track four of them simultaneously. Installation of a heavy calibre gun also seemed likely.

An indication of the potential of the new aircraft came in a 1978 Soviet official announcement that, during tests against simulated cruise missiles, a 'MiG-25' flying at around 20,000 ft had detected a target flying below 200 ft at a range of 12.5 miles, fired an unarmed missile against it, and achieved a theoretical kill. In a later test, a UR-1 target operating at 70,000 ft was attacked successfully by a 'modified MiG-25' flying at 55,000 ft. In mid-1982 it became known that NATO had allocated the reporting name 'Foxhound' to the modified 'Foxbat', which appears to be designated MiG-25M in the Soviet Union. About 100 are said to have been deployed so far with two Soviet regiments.

MiG-27 (NATO 'Flogger')

This single-seat ground attack aircraft has many airframe features in common with the MiG-23, but differs in such important respects that its Soviet designation was changed to MiG-27. It appears to have the same basic power plant as the Soviet Air Force's MiG-23MF, but has a fixed nozzle and fixed engine air intakes, consistent with the primary requirement of high subsonic speed at low altitude. Two versions are known to be operational in Frontal Aviation regiments:

Flogger-D. Basic version, with forward portion of fuselage completely redesigned by comparison with interceptor versions of MiG-23. Instead of having an ogival radome, 'Flogger-D' nose is sharply tapered in side elevation, with a small sloping window covering laser rangefinder and marked target seeker at the tip. Additional armour on flat sides of cockpit. Seat and canopy raised to improve view from cockpit. Six-barrel 23 mm Gatling-type underbelly gun replaces GSh-23 of interceptor. Bomb rack under each side of rear fuselage in addition to five pylons for external stores, including tactical nuclear weapons and, probably, the air-to-surface missile known to NATO as 'Kerry'. Provision for external fuel tank for ferry flights under each outer wing, which must be kept fully-forward when tanks are in place. Bullet-shape ECM antenna above each glove pylon.

Flogger-J. Identified in 1981. New nose shape, with lip at top and blister fairing below. ECM antennae above glove pylons deleted. Wing-root leading-edge extensions on some aircraft. Armament includes two gun pods on underwing pylons, with gun barrels that can be depressed for attacking ground targets.

A total of about 550 'Flogger-Ds' and 'Js' is deployed with Frontal Aviation, plus at least one squadron with the East German Air Force. Other air forces have received the 'Flogger-F/H' export counterparts, which are members of the MiG-23 series, equipped to lower standards. *(Data for 'Flogger-D' follow.)*

Power Plant: generally similar to MiG-23MF, but R-29B engine rated at 25,350 lb st with afterburning.

Dimensions: span as MiG-23, length 52 ft 6 in.

Weights: max external weapon load 6,615 lb, gross 39,685 lb.

Performance: max speed Mach 1.5 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.

MiG-29 (NATO 'Fulcrum')

Reports of completely new fighter designs, emanating from both the Mikoyan and Sukhoi Bureaus, took on substance last year when official NATO and US sources began referring openly to the MiG-29 and Su-27. The former type has already received the NATO reporting name 'Fulcrum', suggesting that it is approaching initial deployment. In the continued absence of any authentic details, the provisional drawing of the MiG-29 that accompanied last year's Gallery offers an impression as good as any other. Carrying across experience with the MiG-25, one might expect the rear fuselage to be wider and flat-topped, with a larger gap between the engine nozzles. This would put the tail fins farther apart; the engine intakes might also be of a wedge type, like those of 'Foxbat'. But this is supposition. More firm are suggestions that the MiG-29, which was first spotted by satellite at Ramenskoye flight test centre in Spring 1979, is a single-seat air superiority fighter in the class of the F/A-18 Hornet. T-O weight is estimated in the 37,500 lb class, requiring each of the two engines to be rated at around 19,000 lb st with afterburning for the kind of performance credited to the pre-series aircraft. Washington sources have stated that an instantaneous turn rate of 16.8°/s and a sustained turn rate of 8.26°/s have been achieved during flight testing. Other, less reliable, reports have mentioned speeds up to Mach 2.8. Armament is said to include a 30 mm gun and up to eight air-to-air missiles, with lookdown/shootdown radar capability.

Dimensions: span 36 ft 0 in, length 54 ft 0 in.

MiG-27 (NATO 'Flogger-J'). Note restyled nose, leading-edge extensions, and depressed barrel of gun in pod

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

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

Sukhoi Su-15 (NATO 'Flagon')

The economy of Soviet design was well demonstrated by the initial production version of this single-seat twin-jet interceptor, which entered service with the former PVO-Strany in the late sixties. Its wings, tail surfaces, and cockpit section were inherited from the now-retired Su-11; main innovations were the two side-by-side engines and large conical nose radome, which necessi-

Tupolev Tu-28P (NATO 'Fiddler')

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

Yakovlev Yak-36MP (NATO 'Forger-A'). Note new fences on each side of lift-jet intake door (Tass)

tated side intake boxes with splitter plates. Continuous refinement through the seventies, through modernisation of the avionics and added armament, led to identification of five production variants by NATO reporting names, as listed below. About 700 of the 'Flagon-D/E/F' models remain in service.

Flagon-A. Basic single-seater, first shown publicly in the Aviation Day display at Domodedovo in 1967. Simple delta wings, identical in form to those of Su-11, with constant sweep of approx 53° and span of about 30 ft. Conical nose radome. Turbojets reported to be Tumansky R-11F2-300s, as used in some of MiG-21 series, each rated at 13,668 lb st. Probably limited to small initial quantity.

Flagon-C. Two-seat training version of 'Flagon-D', probably with combat capability. Individual rearward-hinged canopy over each seat.

Flagon-D. Generally similar to 'Flagon-A' but with longer-span wings of compound sweep, produced by reducing the sweepback at the tips via a very narrow unswept section. Conical radome. First major production version.

Flagon-E. Wings similar to those of 'Flagon-D'. New R-13F-300 turbojets, each rated at 14,550 lb st, increasing speed and range. Uprated avionics. Major production version, operational since second half of 1973.

Flagon-F. Latest version in service, identified by ogival nose radome. Generally similar to 'Flagon-E', but with uprated engines. *(Data for 'Flagon-F' follow.)*

Power Plant: two afterburning turbojets, reported to be Tumansky R-13F2-300s; each 15,875 lb st.
Dimensions: span 34 ft 6 in, length 68 ft 0 in.
Weight: 35,275 lb.
Performance: max speed Mach 2.5 above 36,000 ft, service ceiling 65,600 ft, combat radius 450 miles.
Accommodation: pilot only.
Armament: no guns; two missiles (NATO 'Anab') under wings, one radar homing, one infra-red homing. Two further pylons for weapons or fuel tanks under centre-fuselage.

Sukhoi Su-27 (NATO 'Flanker')

Second of two new Soviet fighters which have been under observation by satellite at the Soviet flight test centre of Ramenskoye for several years, the Su-27 was given the temporary US designation Ram-K. Its Soviet designation was confirmed by NATO last year, at the same time as that of the MiG-29 (Ram-L). Insufficient reliable information is available to permit preparation of a three-view drawing. Earlier reports of a variable-geometry configuration are now discounted, and the Su-27 is believed to be in the same category as the F-15 Eagle, with a maximum speed of Mach 2.3. An IOC in 1984 has been suggested.

Tupolev Tu-28P/Tu-128 (NATO 'Fiddler')

The Russians have had a predilection for giant aircraft since Igor Sikorsky built and flew the world's first four-engined aeroplane at St Petersburg in 1913. This may not explain the longevity of 'Fiddler', the largest purpose-designed interceptor yet put into squadron service; but an estimated 120 still equip first-line units of the Voyska PVO while lesser types come and go. These are generally designated Tu-28P in the press, but the Department of Defense prefers Tu-128. When **'Fiddler-A'** was first displayed in public, at Tushino in 1961, it carried two missiles (NATO 'Ash'), each 17 ft long, had a large blister fairing under its fuselage, and was fitted with two ventral fins. The production **'Fiddler-B'** dispensed with the fairing and ventral fins, but appeared at Domodedovo in 1967 with armament increased to four missiles.

Power Plant: two unidentified afterburning turbojet engines; each estimated at 27,000 lb st. Half-cone shock-body in each air intake.
Dimensions: span 65 ft 0 in, length 85 ft 0 in.
Weight: gross 100,000 lb.
Performance: max speed Mach 1.75 at 36,000 ft, ceiling 65,600 ft, range 3,100 miles.
Accommodation: crew of two in tandem.
Armament: four air-to-air missiles (NATO 'Ash') under wings, two radar homing, two infra-red homing.

Yakovlev Yak-28P (NATO "Firebar')

Even by highly economical Soviet standards, the Yak-28 proved a remarkably versatile aeroplane. The same basic airframe was adaptable to a wide variety of roles, enabling the Yak-28 to take over most of the tasks performed by the earlier Yak-25/26/27 family, and add a few of its own. About 200 Yak-28P transonic all-weather interceptors remain operational in the Voyska PVO fighter force. The much longer dielectric nosecone fitted retrospectively to some aircraft does not indicate any increase in radar capability or aircraft performance, but simply a change of material and shape.

Power Plant: two turbojet engines, related to the Tumansky R-11 fitted in some MiG-21s; each 13,120 lb st with afterburning. Each intake houses a centrebody shock-cone.
Dimensions: span 42 ft 6 in, length 71 ft 0½ in, height 12 ft 11½ in.
Weight: gross 35,000 lb.
Performance: max speed Mach 1.1 at 35,000 ft, service ceiling 55,000 ft, combat radius 575 miles.
Accommodation: crew of two in tandem.
Armament: two air-to-air missiles (NATO 'Anab') under outer wings, with alternative infra-red or semi-active radar homing heads.

Yakovlev Yak-36MP (NATO 'Forger')

Soviet fixed-wing VTOL technology appears to have been stagnant since the Yak-36MP made a spectacular début on board the carrier/cruiser *Kiev* during the ship's maiden voyage through the Mediterranean and North Atlantic in July 1976. The aircraft seen on that occasion were almost certainly from a pre-production series, operated by a development squadron. Detail differences were noted between aircraft; these had been standardised on the Yak-36MPs carried by the *Kiev's* sister-ship *Minsk* in 1979, and there is no reason to anticipate more advanced aircraft on the third ship of the class, *Novorossiisk*, launched in December 1978, or the fourth which was expected to be launched in 1982. It would, however, be surprising if Soviet Frontal Aviation failed to show any interest in a type of combat aircraft which offers independence from fixed and easily-damaged runways.

The two currently-operational versions of the Yak-36MP are as follows:

Forger-A. Basic single-seat combat aircraft. Twelve appear to be operational on each Soviet carrier/cruiser, in addition to about 19 Kamov Ka-25 helicopters. Primary operational roles are assumed to be reconnaissance, strikes against small ships, and fleet defence against shadowing, unarmed maritime reconnaissance aircraft.

Forger-B. Two-seat trainer, of which one is deployed on each carrier/cruiser. Second cockpit forward of normal cockpit, with its ejection seat at lower level, under a continuous canopy. Rear fuselage lengthened to compensate for longer nose. No ranging radar or weapon pylons. Overall length about 58 ft 0 in.

The Yak-36MP has a single large turbojet, exhausting through a pair of rotating nozzles aft of the wing roots. Two lift-jets are mounted in tandem aft of the cockpit, inclined at an angle so that their thrust is exerted both upward, and slightly forward. As the main vectored-thrust nozzles turn up to 10° forward of vertical during take-off and landing, the total of four effluxes can be envisaged as forming a V under the fuselage. Only vertical take-offs were observed during operations from the *Kiev* and *Minsk*. It is difficult to conceive how STOL take-off could be effected with such a power plant arrangement, which also seems to rule out the possibility of thrust vectoring in forward flight, which has proved such an advantage on the Harriers of the US Marine Corps. Puffer-jets at the wingtips and tail help to give the Yak-36MP commendable stability during take-off and landing. During the past year, fences have been added on each side of the hinged door above the lift-jets to restrict ingestion of reflected exhaust efflux.

Power Plant: one unidentified turbojet, without afterburner, based possibly on the Lyulka AL-21; thrust estimated at 17,500 lb. Two Koliesov lift-jets; each estimated at 8,000 lb st.
Dimensions: span 24 ft 0 in, length 50 ft 0 in, height 14 ft 4 in.
Weights: basic operating (incl pilot) 16,500 lb, gross 25,500 lb.
Performance: max speed Mach 1.1 at height, Mach 0.8 at S/L, service ceiling 39,375 ft, combat radius 115–230 miles.
Accommodation: pilot only.
Armament: four pylons under inner wings for estimated 3,000 lb of stores, including short-range air-to-surface missiles, air-to-air missiles, gun pods each containing a 23 mm twin-barrel GSh-23 cannon, rocket packs, bombs, and auxiliary fuel tanks.

Attack Aircraft

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

This big single-seat ground attack fighter can still be seen in action in support of Soviet forces in Afghanistan; and about nine other air forces continue to fly Su-7s. However, the number deployed with Frontal Aviation regiments has diminished to about 130, in the following versions:

Su-7BM. Compared with the original Su-7B of the late fifties, this introduced two slim duct fairings along top of fuselage, and had an offset (to starboard) pitot boom. Progressive changes included switch to a zero-altitude ejection seat, addition of Sirena tail-warning radar, a second pair of underwing stores pylons, larger blast panels forward of wing-roots, JATO attachments under

rear fuselage, twin brake-chutes in a container at base of rudder, and an uprated engine.

Su-7BKL. Introduced low-pressure nosewheel tyre, necessitating bulged doors to enclose it when retracted, and small extensible skid outboard of each main wheel, for operation from short, unprepared fields.

Su-7BMK. As Su-7BKL, but with further equipment changes. *(Data for this version follow.)*

Power Plant: one Lyulka AL-7F-1 turbojet engine; 22,046 lb st with afterburning. Internal fuel capacity 777 gallons. Provision for two external tanks under belly, combined capacity 317 gallons. Two JATO rockets can be fitted under rear fuselage to shorten take-off run.

Dimensions: span 29 ft 3½ in, length 57 ft 0 in, height 15 ft 0 in.

Weights: empty 19,000 lb, gross 29,750 lb.

Performance: max speed Mach 1.6 clean or Mach 1.2 with external stores at 36,000 ft, or 530 mph at sea level without afterburning, service ceiling 49,700 ft, combat radius 155–215 miles.

Accommodation: pilot only.

Armament: two 30 mm NR-30 guns in wing roots, each with 70 rounds; underwing pylons for two 1,650 lb and two 1,100 lb bombs, including nuclear weapons, or rocket pods. External weapon load reduced to 2,200 lb when two underbelly fuel tanks are carried.

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

The original prototype of this family of aircraft, known to NATO as 'Fitter-B', was simply an Su-7 with about 13 ft of each wing pivoted, outboard of a very large fence. By the time the Sukhoi Bureau had introduced also a more powerful engine and improved avionics, the variable-geometry 'Fitter' was seen to be in a completely different class from 'Fitter-A'. A doubled external load could be lifted from strips little more than half as long as those needed by the original fixed-wing aircraft; it could then be carried about 30% further and delivered with greater accuracy. The resulting ground attack fighter now serves with Frontal Aviation regiments, which have about 800 in first-line units, and Soviet Naval Aviation, which deploys about 40 in the Baltic Sea area for anti-shipping strike and amphibious support roles. Differences between the various versions identified to date are as follows:

Su-17 ('Fitter-C'). Basic single-seat attack aircraft for Frontal Aviation, with Lyulka AL-21F-3 turbojet. Manual wing sweep control. Fuselage diameter constant between wing and tailplane. Curved dorsal fin between tail fin and dorsal spine fairing. Equipment said to include SRD-5M (NATO 'High Fix') I-band centrebody ranging radar, ASP-5ND fire control system, Sirena 3 omni-directional radar homing and warning system, and SRO-2M IFF. Serves also with Soviet Navy.

Su-17 ('Fitter-D'). Generally similar to 'Fitter-C', but forward fuselage lengthened by about 1 ft 3 in. Added undernose radome for terrain avoidance. Laser marked target seeker in intake centrebody.

Su-17 ('Fitter-E'). Tandem two-seat trainer for Soviet Air Force. Generally similar to 'Fitter-C' but entire fuselage forward of wing drooped slightly to improve view from rear seat. Port wing-root gun deleted.

Su-17 ('Fitter-G'). Developed two-seater, with combat capability. Deepened dorsal spine fairing. Drooped front fuselage like 'Fitter-E'. Taller fin with straight top. Shallow ventral fin. Starboard gun only. Laser target seeker fitted.

Su-17 ('Fitter-H'). Improved single-seater for Frontal Aviation. Basically as 'Fitter-C', but with wide and deep dorsal fairing aft of canopy, almost certainly providing additional fuel tankage. Taller fin of 'Fitter-G', with curved dorsal fin. Shallow ventral fin. Retains both wing-root guns. Small additional pylon for external store under wing centre-section on each side.

It was deduced for some years that certain export versions of the variable-geometry 'Fitter' series had different engines from the five Su-17 variants listed above. 'Fitter-C/D/E/G/H' 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 Libya, Peru, Syria, and North and South Yemen were seen to have a more bulged rear fuselage, which is now known to house a Tumansky R-29B turbojet, as fitted in the MiG-27. This change of power plant, together with variations in equipment standard, is covered by the following changes to the Soviet type designation:

Su-20 ('Fitter-C'). Generally similar to Soviet Air Force 'Fitter-C', with Lyulka engine, but with reduced equipment standard. Supplied to Algeria, Czechoslovakia, Egypt, Iraq, Poland, and Vietnam.

Su-22 ('Fitter-F'). Export counterpart of 'Fitter-D', with undernose radome. Tumansky R-29B turbojet, rated at 25,350 lb st with afterburning, in increased-diameter rear fuselage. Gun in each wing-root. Weapons include 'Atoll' air-to-air missiles. Aircraft supplied to Peru had Sirena 2 limited-coverage radar warning receiver, virtually no navigation aids, and IFF incompatible with that nation's SA-3 (NATO 'Goa') surface-to-air missiles.

Su-22 ('Fitter-J'). Generally similar to 'Fitter-H' but with Tumansky engine. More angular dorsal fin. 'Atoll' air-to-air missiles.

In early 1980, a photograph of an unidentifiable tandem two-seat version was published in the Soviet press. This has the increased-diameter rear fuselage and fin shape of 'Fitter-F', and the front fuselage droop of 'Fitter-E'. The width and depth of the dorsal spine are increased aft of the rear canopy. Other features include a ventral fin, and a laser seeker in the intake centrebody like that of 'Fitter-D'. *(Data for Su-17 'Fitter-C' follow.)*

Power Plant: one Lyulka AL-21F-3 turbojet, rated at 24,700 lb st with afterburning. Internal fuel capacity 1,200 gallons. Up to four 211 gallon drop-tanks under fuselage and wings.

Dimensions: span 45 ft 11¼ in spread, 34 ft 9½ in swept; length 61 ft 6¼ in; height 15 ft 7 in; wing area 431.6 sq ft spread, 400.4 sq ft swept.

Weights: empty 22,046 lb, take-off clean 30,865 lb, gross 39,020 lb.

Performance: max speed Mach 2.17 at height, Mach 1.05 at sea level, ceiling 59,050 ft, combat radius (lo-lo-lo) 224 miles, (hi-lo-hi) 391 miles.

Accommodation: pilot only.

Armament: two 30 mm NR-30 guns in wing-roots; eight pylons under fuselage and wings for up to 8,820 lb of bombs, including nuclear weapons, rocket pods, and guided missiles such as the air-to-surface AS-7 (NATO 'Kerry').

Sukhoi Su-24 (NATO 'Fencer')

Although smaller and lighter than USAF's F-111, this variable-geometry attack aircraft brought entirely new capability to Soviet Frontal Aviation. Lt Gen Donald R. Keith (then US Army Deputy Chief of Staff for Research, Development and Acquisition) said that 'Fencer' is credited with having terrain-avoidance radar, in addition to nav/attack radar, and "has the capability to deliver ordnance in all weather within 180 ft of its target". The radar dish appears to have a diameter of at least 49 in, and is reported to be of the pulse-Doppler type. Equipment includes a laser rangefinder and marked target seeker.

'Fencer' entered squadron service in December 1974, as a replacement for the Yak-28 ('Brewer'). At least 575 are now serving with first-line squadrons, including two full regiments at Tukums in Latvia, near the Gulf of Riga, and at Chernyakhovsk, near Kaliningrad on the Soviet Baltic coast. There are two more at Starokonstantinov and Gorodok in the Ukraine, and a single regiment in the Soviet Far East. No 'Fencer' was allowed to fly outside the Soviet Union or its home waters until July 1979, when an Su-24 regiment was deployed briefly with the 16th Air Army at Templin Air Base, north of Berlin in East Germany. Not until 1982 was the first fully-operational unit of 30 Su-24s deployed to East Germany as a regular component of the Frontal Aviation air forces stationed in Europe.

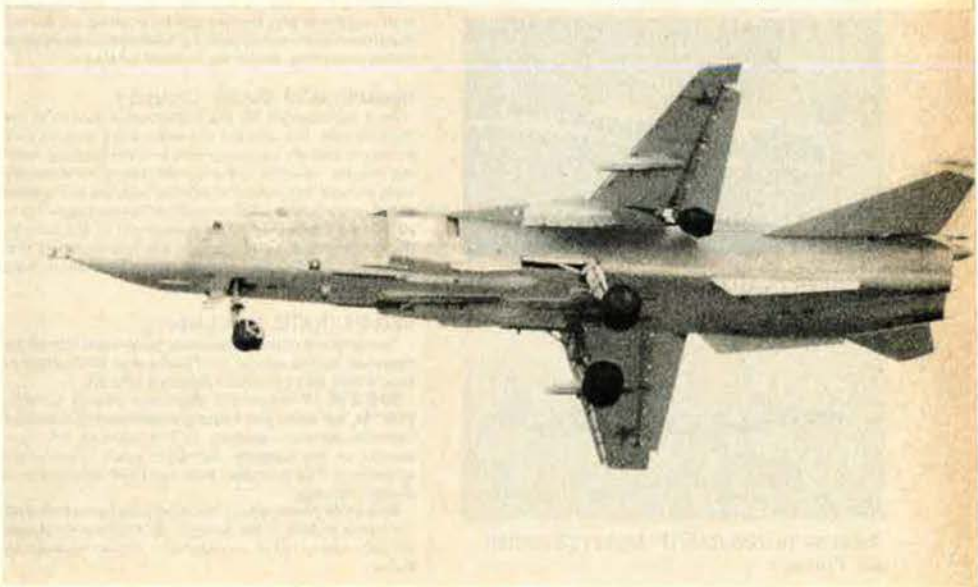
The Su-24 was the first modern Soviet fighter designed specifically for ground attack and the first to carry a weapon systems officer, in the side-by-side two-seat cockpit. Wing sweep appears to be about 16° in the fully spread position, and 68° fully swept. The outer panels carry the first pivoting pylons seen on a Soviet variable-geometry aircraft. RAF assessment suggests that it has five times the weapon load and five times the range of its immediate predecessor, enabling it to reach any target in England from East German advanced bases.

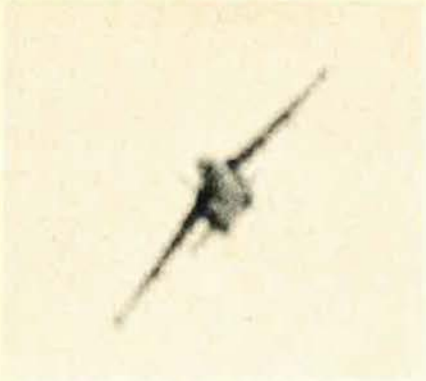
Power Plant: two afterburning turbojets; believed to be related to Lyulka AL-21F fitted in Su-17. Internal fuel

Sukhoi Su-7BM (NATO 'Fitter-A') of Egyptian Air Force (Denis Hughes)

Sukhoi Su-17 (NATO 'Fitter-C') (Flug Revue)

Sukhoi Su-24 (NATO 'Fencer')





Sukhoi Su-25 (NATO 'Frogfoot')

capacity estimated at 3,435 gallons. Provision for large drop-tank on each glove pylon.

Dimensions: span 56 ft 3 in spread, 31 ft 3 in swept, length 69 ft 10 in, height 18 ft 0 in.

Weight: gross 87,080 lb.

Performance: max speed above Mach 2 at height, service ceiling 57,400 ft, combat radius (lo-lo-lo) over 200 miles, (hi-lo-hi, with 4,400 lb weapons and two external tanks) 1,115 miles.

Armament: one gun on port side of belly; eight pylons under fuselage, wing-root gloves, and outer wings for 17,635 lb of guided and unguided air-to-surface weapons, including nuclear weapons.

Sukhoi Su-25 (NATO 'Frogfoot')

First photographs of this Soviet counterpart to USAF's A-10 Thunderbolt II became available in December, following deployment of Su-25s to Afghanistan to support the Russian ground forces fighting in mountain terrain. As predicted in last year's Gallery, and despite contrary reports in the aviation press as recently as January, the configuration of the Su-25 is more like that of the Northrop A-9A *(see 1972–73 Jane's)* than the A-10. In particular, the engines are not mounted in pods above and behind the wings, but in very long nacelles at the wing-roots. Their rating is believed to be lower than that of the Tumansky R-13-300 non-afterburning turbojets suggested last year. Even so, the Su-25 can be expected to have a slightly higher overall performance than the larger A-10. Features evident from available photographs include a single fin and rudder, and ten hardpoints for external stores under the 20° swept wings, in addition to a heavy-calibre Gatling-type gun.

First observed by satellite at Ramenskoye flight test centre in the late seventies, the Su-25 was given the provisional US designation Ram-J. The NATO reporting name 'Frogfoot' was released in 1982, and the Su-25 is expected to reach full operational capability during the next twelve months. Meanwhile, the emphasis in Afghanistan is said to be on techniques for co-ordinating low-level close support by fixed-wing aircraft and Mi-24 helicopter gunships.

Dimensions: span 50 ft 10 in, length 47 ft 6 in.

Weight: gross 36,050 lb.

Reconnaissance, ECM, and Early Warning Aircraft

Antonov An-12 (NATO 'Cub-B') escorted by F-104G of Royal Norwegian Air Force

Ilyushin Il-18 (NATO 'Coot-A') (US Navy)

MiG-21R (NATO 'Fishbed-H') (Flug Revue)

MiG-25R (NATO 'Foxbat-B') (Flug Revue)

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

New Reconnaissance Aircraft

Among new Soviet military aircraft said to have been observed at Ramenskoye flight test centre 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-B and C')

The large hold of this four-turboprop transport can accommodate a wide variety of equipment for special duties. Two such variants may be identified by NATO reporting names:

Cub-B. Conversion of 'Cub-A' transport for electronic intelligence (elint) missions. Examples photographed over international waters by the crews of Norwegian and Swedish combat aircraft each had four additional blister fairings under the forward- and centre-fuselage, plus other antennae. Few produced.

Cub-C. ECM version. Glazed nose and undernose radome of the transport version are retained, but an ogival 'solid' fuselage tailcone, housing electronic equipment, is fitted instead of the usual gun position. Additional electronic pods are faired into the forward fuselage and ventral surfaces. About 30 in service with Soviet Air Force and Navy.

Ilyushin Il-18 (NATO 'Coot-A')

This ECM or electronic intelligence (elint) aircraft appears to be a conversion of the standard Il-18 four-turboprop transport (see under *Transports* heading). An under-fuselage container, about 33 ft 7½ in long and 3 ft 9 in deep, is assumed to house side-looking radar. Smaller containers on each side of the forward fuselage each contain a door over a camera or other sensor. About eight antennae and blisters can be counted on the undersurface of the centre and rear fuselage, plus two large plates projecting above the forward fuselage.

Ilyushin Il-76 (NATO 'Candid')

As a replacement for the limited-value Tu-126 in the AWACS role, the Soviets are evaluating several Il-76 transport aircraft equipped with an over-fuselage rotating 'saucer' radome. Other modifications to these aircraft include installation of AWACS avionics in the main cabin, and addition of an in-flight refuelling probe. Up to 30 Il-76s are expected to be operational in this form by the mid-eighties, by which time the shortcomings that make the Tu-126's radar of little use overland should have been overcome.

MiG-21 (NATO 'Fishbed-H')

Two versions of this supersonic single-seat fighter are operated by the Soviet Air Forces and their allies as specialised tactical reconnaissance aircraft:

MiG-21R ('Fishbed-H'). Basically similar to MiG-21PFMA, but with a pod housing forward-facing or oblique cameras, infra-red sensors, or ECM devices, and fuel, carried on the fuselage centreline pylon. Suppressed antenna at mid-fuselage; optional ECM equipment in wingtip fairings.

MiG-21RF ('Fishbed-H'). Generally similar to MiG-21R, but based on MiG-21MF. Total of 125 'Fishbed-Hs' of both models estimated in service with Soviet tactical air forces.

MiG-25 (NATO 'Foxbat-B and D')

Although generally similar to the basic MiG-25 interceptor, the reconnaissance variants have a modified wing and, carrying no external weapons, are not limited to Mach 2.8. Two versions have been identified in service, as follows:

MiG-25R ('Foxbat-B'). Basic reconnaissance version, with five camera windows and various flush dielectric panels aft of very small dielectric nosecap for radar. Equipment believed to include Doppler navigation system, and side-looking airborne radar (SLAR). No armament. Slightly reduced span. Wing leading-edge sweep constant from root to tip. Total of about 160 'Foxbat-Bs and Ds' estimated in service with Soviet tactical air forces. 'Foxbat-B' also operational in Algeria, Libya, Syria, and with No. 106 Squadron of the Indian Air Force.

MiG-25R ('Foxbat-D'). Similar to 'Foxbat-B', but with larger SLAR dielectric panel, further aft on side of nose, and no cameras. Supplied 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 680 miles.

Mil Mi-8 (NATO 'Hip-D')

This medium-size helicopter has been adapted for electronic duties, under the following NATO reporting name:

Hip-D. Generally similar to 'Hip-C' transport, but with canisters of rectangular section on outer stores racks, and added antennae.

Sukhoi Su-17 (NATO 'Fitter-H')

About 160 of the Su-17 ('Fitter-H' model) fighters serving with Soviet Frontal Aviation units are thought to be equipped for tactical reconnaissance duties.

Tupolev Tu-126 (NATO 'Moss')

The Tu-126 is the Voyska PVO's counterpart to USAF's Boeing E-3A AWACS (Airborne Warning and Control System). About ten are operational, with airframe and power plant based on those of the now-retired Tu-114 turboprop airliner rather than the smaller-fuselage Tu-95 bomber. The 36 ft diameter rotating radar "saucer" above the fuselage is 6 ft larger than that of the E-3A; however, the Tu-126 is believed to have only limited effectiveness in the warning role over water and to be ineffective over land.

Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp. In-flight refuelling probe standard.

Dimensions: span 168 ft 0 in, length 181 ft 1 in, height 52 ft 8 in, wing area 3,349 sq ft.

Weight: gross 374,785 lb.

Performance: max speed 528 mph, normal operating speed 404 mph, max range without flight refuelling 7,800 miles.

Accommodation: crew of twelve.

Armament: none.

Yakovlev Yak-28 (NATO 'Brewer')

The original 'Brewer-A, B, and C' versions of the Yak-28 were two-seat tactical attack aircraft, with the navigator/bomb-aimer stationed in the glazed nose. Most have been switched from first-line attack to support roles, and

Yak-28s still operational include the following two versions:

Brewer-D. Reconnaissance aircraft, carrying cameras instead of weapons in its internal bomb-bay. About 200 operational.

Brewer-E. Deployed in 1970 as the first Soviet operational ECM escort aircraft, with an active ECM pack built into its bomb-bay, from which the pack projects in cylindrical form. No radome under front fuselage, but many other additional antennae and fairings are apparent. A rocket pod can be carried under each outer wing, between the external fuel tank and balancer wheel housing. About 40 estimated in service.

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

Transports

Antonov An-12BP (NATO 'Cub')

It would be thoroughly misleading to state simply that some 400 An-12BP (NATO 'Cub-A') paratroop and freight transports continue to form the mainstay of the Soviet VTA (Military Transport Aviation) service. The tenuous borderline between the VTA and the vast, always-available reserves of aircraft and men in the state airline, Aeroflot, is seldom camouflaged. Even when the Soviet transports encountered at foreign airports, worldwide, display a fascinating variety of antennae, and a disarmed tail gun turret, their markings are often those of Aeroflot. So, the assets of VTA can quite properly be boosted on paper by another 200 An-12s and Il-76s, about 1,100 medium- and long-range passenger transports, and several thousand short-range transports and helicopters belonging nominally to the airline. An-12s also serve with 12 other air forces, and are in production in China, as Y-8s.

Now in its 24th year of operational service, the An-12BP has a conventional freighter configuration, with access to the hold via a ramp-door which forms the bottom of the upswept rear fuselage when closed. This ramp-door is made in two longitudinal halves, which can be hinged upward inside the cabin to permit direct loading from trucks on the ground, or airdropping of supplies and equipment. A full load of 100 paratroops can be despatched via this exit in under one minute. The 'Cub-B and C' elint and ECM versions are described separately.

Power Plant: four Ivchenko AI-20K turboprop engines, each 4,000 ehp.
Dimensions: span 124 ft 8 in, length 108 ft 7¼ in, height 34 ft 6½ in, wing area 1,310 sq ft.
Weights: empty 61,730 lb, gross 134,480 lb.
Performance: max speed 482 mph, service ceiling 33,500 ft, range 2,236 miles with max payload.
Accommodation: crew of six; 44,090 lb of freight, vehicles, or 100 parachute troops. Built-in freight handling gantry with capacity of 5,070 lb.
Armament: two 23 mm NR-23 guns in manned tail turret.

Antonov An-22 (NATO 'Cock')

The prototype of this giant turboprop freighter flew for the first time on February 27, 1965; more than 50 production An-22s remain in service with the military air transport force and Aeroflot. Each can carry a payload of up to 176,350 lb, including missiles like 'Ganef' on their tracked launchers; and the An-22 is the only current Soviet transport capable of lifting a T-62 tank, although Antonov is reported to be developing an aircraft in the class of USAF's C-5 Galaxy. Production of the An-22 ended in 1974.

Power Plant: four Kuznetsov NK-12MA turboprop engines; each 15,000 shp.
Dimensions: span 211 ft 4 in, length 190 ft 0 in, height 41 ft 1½ in, wing area 3,713 sq ft.
Weights: empty 251,325 lb, gross 551,160 lb.
Performance: max speed 460 mph, range 6,800 miles with 99,200 lb payload.
Accommodation: crew of five or six, 28–29 passengers in cabin forward of main freight hold. Four travelling gantries and two winches to speed freight handling.
Armament: none.

Antonov An-26 (NATO 'Curl')

This extremely useful twin-turboprop freighter was the first aircraft to feature Oleg Antonov's new-type rear-loading ramp. This forms the underside of the rear fuselage when retracted, in the usual way, but can be slid forward under the rear of the cabin to facilitate direct loading on to the floor of the hold, or when the cargo is to be airdropped. An OPB-1R sight is available, to ensure pinpoint delivery into the dropzone. Max payload is 12,125 lb; conversion of the standard freighter to carry troops or litters takes 20 to 30 minutes in the field. More than 50 Aeroflot An-26s are available to the Soviet Military Transport force; others are flown by about 27 foreign air forces.

Power Plant: two Ivchenko AI-24VT turboprop engines; each 2,820 ehp. One 1,765 lb st RU 19A-300 auxiliary turbojet in starboard nacelle, for turboprop starting and to provide additional power for take-off, climb, and cruising flight, as required.
Dimensions: span 95 ft 9½ in, length 78 ft 1 in, height 28 ft 1½ in.
Weights: empty 33,113 lb, gross 52,911 lb.
Performance: cruising speed 273 mph at 19,675 ft, service ceiling 24,600 ft, range 683 miles with max payload.
Accommodation: crew of five, plus station for load supervisor or despatcher. Electrically-powered mobile hoist, capacity 4,409 lb, and conveyor to facilitate loading and airdropping. Provision for carrying 40 paratroops or 24 litters.
Armament: none.

Antonov An-32 (NATO 'Cline')

Only the Indian Air Force is known to have ordered this specialised "hot and high" short/medium-range transport. The basic airframe is similar to that of the An-26, with much more powerful turboprops, a slotted tailplane, and enlarged ventral fins. The An-32 is able to operate from airfields 13,000 to 14,750 ft above sea level in an ambient temperature of ISA + 25°C, and can transport 3 metric tons of freight over a 683 mile stage length, with fuel reserves. Maximum payload is 6 metric tons.

Power Plant: two Ivchenko AI-20M turboprop engines; each 5,180 ehp.
Dimensions: as for An-26.
Weight: gross 57,320 lb.
Performance: normal cruising speed 317 mph, service ceiling 31,150 ft, max range 1,367 miles.
Accommodation: crew of five; freight, or 39 troops, 30 paratroops, or 24 litters and a medical attendant.
Armament: none.

Antonov An-72 (NATO 'Coaler')

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 problems caused by 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, and a completely automatic Doppler-based navigation system is standard. Production is believed to be under way, and a brochure distributed at the 1981 Paris Air Show suggested that a special "slide-forward" ramp of the kind fitted to the An-26 will be standard also on the An-72.

Power Plant: two Lotarev D-36 high bypass ratio turbofan engines; each 14,330 lb st.
Dimensions: span 84 ft 9 in, length 87 ft 2¼ in, height 27 ft 0¼ in.
Weights: max payload 22,045 lb, gross weight 72,750 lb.
Performance: max cruising speed 447 mph, service ceiling 36,100 ft, range 2,360 miles with max fuel, or 620 miles with max payload.
Accommodation: crew of two or three on flight deck. Folding seats for 32 passengers along walls of freight hold. Provision for carrying 24 casualties and attendant in ambulance role.
Armament: none.

Ilyushin Il-18 (NATO 'Coot')

As its airline service drew to a close, this four-turboprop transport found important new military roles, of which the elint operations of 'Coot-A' (see under *Reconnaissance, ECM, and Early Warning Aircraft* heading) are typical. About six air forces still fly passenger versions, mostly in a VIP configuration; but few remain in the Soviet air forces in a transport role.

Power Plant: four Ivchenko AI-20M turboprop engines; each 4,250 ehp.
Dimensions: span 122 ft 8½ in, length 117 ft 9 in, height 33 ft 4 in.
Weights: empty 76,350 lb, gross 134,925 lb.
Performance: max cruising speed 419 mph, range 3,230 miles with max fuel, or 1,990 miles with max payload.
Accommodation: crew of five; up to 122 passengers.
Armament: none.

Ilyushin Il-76 (NATO 'Candid')

The Il-76 is the Soviet counterpart to USAF's C-141 StarLifter. Its designers, led by G. V. Novozhilov, were given the task of producing an aircraft able to transport 40 metric tons of freight for a distance of 3,100 miles (5,000 km) in under six hours, in the harsh operating conditions of the USSR's Siberian regions. This implied

Antonov An-12 (NATO 'Cub-A') (Tass)

Antonov An-22 (NATO 'Cock')

Antonov An-26 (NATO 'Curl')

Antonov An-72 (NATO 'Coaler')

Ilyushin Il-76 (NATO 'Candid')

that the new aircraft would carry twice the payload of the An-12BP that it was intended to replace, over five times the range. The prototype flew for the first time on March 25, 1971. An indication of the capability of the type was given in July 1975, when Il-76s set a series of 25 official records, including a payload of more than 70 metric tons (154,590 lb) lifted to a height of 38,960 ft, and a speed of 532.923 mph around a 1,000 km circuit with the same load.

Design features include rear-loading ramp/doors, a T-tail, full-span leading-edge slats, and triple-slotted flaps for good field performance, a navigator's station in the glazed nose, with ground-mapping radar in a large undernose fairing, and a unique and complex 20-wheel landing gear. The entire accommodation is pressurised, making it possible to carry 140 troops as an alternative to freight. Advanced mechanical handling systems are fitted for containerised and other freight. Equipment for all-weather operation includes a computer for automatic flight control and automatic landing approach.

Deliveries of military Il-76Ms to a development squadron began in 1974. To date, about 250 have been delivered to the VTA transport force as An-12BP replacements. Aeroflot has more than 40 Il-76Ms, and Il-76Ts without a rear gun turret. The air forces of Iraq, Czechoslovakia, and Poland operate Il-76Ms. Others are expected to enter service with the Soviet Air Force in AWACS and flight refuelling tanker roles. *(Data for Il-76M follow.)*

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 10½ in, height 48 ft 5 in, wing area 3,229.2 sq ft.
Weight: gross 374,785 lb.
Performance: cruising speed 466–497 mph at 29,500–39,350 ft, nominal range 3,100 miles with maximum payload of 88,185 lb, max range 4,163 miles.
Accommodation: crew of seven, incl two freight handlers; up to 140 passengers.
Armament: gun turret in tail.

Aero L-39 Albatros

MiG-21U (NATO 'Mongol') of East German Air Force

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

Sukhoi Su-7UM (NATO 'Moujik') of Egyptian Air Force (Denis Hughes)

Yakovlev Yak-18PS (NATO 'Max') (Air Portraits)

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 standardised use by the air forces of all Warsaw Pact nations except Poland, which preferred its own TS-11 Iskra, and for export. Replacement with another Czech-designed trainer, the L-39, has been under way since 1974, but L-29s can still be seen in the markings of 15 air forces.

Power Plant: one M701c500 turbojet engine; 1,960 lb st.
Dimensions: span 33 ft 9 in, length 35 ft 5½ in, height 10 ft 3 in.
Weights: empty 5,027 lb, gross 7,804 lb.
Performance: max speed 407 mph at 16,400 ft, service ceiling 36,100 ft, range 555 miles with external tanks.
Accommodation: crew of two, in tandem.
Armament: provision for two bombs of up to 220 lb, eight air-to-ground rockets, or two 7.62 mm machine-gun pods under wings.

Aero L-39 Albatros

The first prototype of the L-39 flew on November 4, 1968, and series production began in 1972 to replace the L-29 as the standard trainer of the Soviet and other air forces. Well over 1,000 have been delivered, and the eventual production total is expected to match that of the L-29. There are three current versions:

L-39C. Basic and advanced flying trainer; operators include the air forces of Afghanistan, Czechoslovakia, the German Democratic Republic, and the USSR.

L-39Z0. Weapon training version, with four underwing weapon stations. Strengthened wings. Exported to Iraq and Libya.

L-39Z. Weapon systems training/ground attack and reconnaissance version, with underfuselage gun and underwing weapon stations. Strengthened wings and landing gear.

Power Plant: one Ivchenko AI-25-TL turbofan engine; 3,792 lb st. *(Data for L-39C follow.)*
Dimensions: span 31 ft 0½ in, length 39 ft 9½ in, height 15 ft 7¾ in, wing area 202.36 sq ft.
Weights: empty 7,859 lb, gross (trainer, clean) 10,028 lb.
Performance: max speed 485 mph at 19,700 ft, service ceiling 37,730 ft, range 683 miles on internal fuel.
Accommodation: crew of two, in tandem.
Armament (L-39Z): underwing bombs, rockets, air-to-air missiles, or reconnaissance packs, on four hardpoints, and a 23 mm GSh-23 twin-barrel cannon in an underfuselage pod.

MiG-15UTI (NATO 'Midget')

After completing their basic and initial advanced training on the L-29 or L-39, pupil pilots of the Soviet Air Force graduate to this tandem two-seat version of the MiG-15 jet fighter. The airframe differs from that of the original single-seater mainly in having a rear cockpit for an instructor in place of some fuselage fuel tankage. Armament is reduced to a single gun on most of the trainers, which continue in service with more than thirty air forces. Next stage of training after the MiG-15UTI is normally on one of the two-seat adaptations of current operational aircraft listed after this entry.

Power Plant: one Klimov VK-1 turbojet engine; 5,952 lb st.
Dimensions: span 33 ft 0⅞ in, length 32 ft 11¼ in, height 12 ft 1⅝ in.
Weights: empty 8,818 lb, gross (clean) 10,692 lb.
Performance: max speed 631 mph at sea level, range 590 miles (clean) or 885 miles (with two underwing tanks) at 32,800 ft.
Accommodation: crew of two, in tandem.
Armament: normally one 23 mm NS-23 gun or one 12.7 mm UBK-E machine-gun under port side of nose.

MiG-21U (NATO 'Mongol')

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

MiG-23U (NATO 'Flogger-C')
(See page 82.)

MiG-25U (NATO 'Foxbat-C')
(See page 83.)

Sukhoi Su-7U (NATO 'Moujik')

The Soviet and nine other air forces use this tandem two-seat adaptation of the Su-7B as an operational trainer for their ground attack pilots. Changes are minimal. The forward fuselage fuel tank is deleted, and the fuselage lengthened slightly, to make room for the second ejection seat, the occupant of which has a periscopic sight for improved forward view. The aft cockpit is fitted with a slightly-raised canopy, from which a prominent dorsal spine extends back to the base of the tail-fin. Versions in service are the **Su-7UM** and **Su-7UMK,** corresponding to the single-seat "M" and "MK" respectively.

Sukhoi Su-15 trainer (NATO 'Flagon-C')
(See page 84.)

Sukhoi Su-17 trainer (NATO 'Fitter-E')
(See page 85.)

Tupolev Tu-22U (NATO 'Blinder-D')
(See page 80.)

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 centres. The original tandem two-seat Yak-18 had a 160 hp M-11 radial engine and tailwheel landing gear. The **Yak-18U** introduced a nosewheel and longer fuselage. **Yak-18A** switched to a 300 hp AI-14RF engine and was generally cleaned up. The **Yak-18P** and **PM** were refined single-seat aerobatic variants of the -18A, and the **Yak-18PS** a tailwheel counterpart of the PM. All can still be seen. *(Data for Yak-18A follow.)*

Power Plant: one Ivchenko AI-14RF piston engine; 300 hp.
Dimensions: span 34 ft 9¼ in, length 27 ft 4¾ in, height 11 ft 0 in, wing area 183 sq ft.
Weights: empty 2,259 lb, gross 2,910 lb.
Performance: max speed 186 mph, service ceiling 16,600 ft, max range 435 miles.
Armament: none.

Yakovlev Yak-28U (NATO 'Maestro')

Although the operational Yak-28P ('Firebar') is a tandem two-seater, it was not possible to adapt the existing rear cockpit in order to produce a dual-control training version. Instead, the Yakovlev Bureau had to design a

completely new front fuselage for the Yak-28U. This has two individual single-seat cockpits in tandem, each with its own blister canopy. The front canopy is sideways hinged, to starboard. The higher rear canopy is rearward-sliding. A very large conical probe projects forward of the nosecone.

Yakovlev Yak-36 trainer
(NATO 'Forger-B')
(See page 84.)

Yakovlev Yak-50
The Yak-50 single-seat aerobatic trainer flew for the first time in 1975 and virtually swept the board in both the men's and women's events at the 1976 World Aerobatic Championships. Its configuration is almost identical to that of the earlier Yak-18PS, but it has a more powerful engine, a reduced span with no wing centre-section, and a semi-monocoque rear fuselage instead of the Yak-18's fabric-covered steel tube structure.
Power Plant: one Vedeneev M-14P piston engine; 360 hp.
Dimensions: span 31 ft 2 in, length 25 ft 2¼ in.
Weights: empty 1,686 lb, gross 1,984 lb.
Performance: max speed 199 mph, service ceiling 18,045 ft, max range 307 miles.
Armament: none.

Yakovlev Yak-52
Announced in 1978, the Yak-52 is a tandem two-seat variant of the Yak-50, with generally similar overall dimensions but with a tricycle landing gear that leaves all three wheels fully exposed when retracted, to reduce damage in a wheels-up landing. Large-scale production has been centred at the Intreprinderea de Avioane Bacau works, in Romania, to provide replacements for the old Yak-18s of DOSAAF and other training organisations.
Power Plant: one Vedeneev M-14P piston engine; 360 hp.
Dimensions: span 30 ft 6¼ in, length 25 ft 5 in, height 8 ft 10¼ in, wing area 161.5 sq ft.
Weights: empty 2,205 lb, gross 2,844 lb.
Performance: max speed at 1,650 ft 186 mph, econ cruising speed 118 mph, service ceiling 19,685 ft, max range 341 miles.
Armament: none.

Yakovlev Yak-53
This fully-aerobatic single-seater is identical dimensionally to the Yak-50, and has the same power plant, but utilises the semi-retractable tricycle landing gear of the Yak-52. After a period of initial manufacture in the Progress Factory at Arsenyev in the USSR, production is expected to be transferred to Bacau, alongside the Yak-52.
Weights: empty 1,985 lb, gross 2,337 lb.
Performance: max speed 186 mph, cruising speed 143 mph, max endurance 50 min.


Yakovlev Yak-50 (Tass)


Yakovlev Yak-52

Helicopters

Kamov Ka-25 (NATO 'Hormone')
The cluttered inelegance of Kamov helicopters should not be allowed to disguise the ingenuity of their designers. By adopting a compact twin-turbine/coaxial-rotor configuration, the Kamov Bureau has been able to package extensive equipment permutations into aircraft that can operate from small platforms on naval and merchant ships. The resulting versatility of the Ka-25 is cloaked further by Western security, which allows only three versions to be identified by NATO reporting names, as follows:

Hormone-A. Basic ASW version, with large flat-bottomed housing for undernose search radar, and racks for small stores, including canisters of sonobuoys, on the starboard side of the fuselage. Other equipment varies from one aircraft to another. Some have an underfuselage weapon bay, which is much enlarged on one recently photographed Ka-25, as a container for wire-guided torpedoes. A few have a streamlined blister fairing built into the base of the central tail-fin; others have a fairing of flower-pot shape, with a transparent top, above the central point of the tailboom. Each of the four wheels of the landing gear is usually enclosed in an inflatable pontoon, surmounted by inflation bottles. The rear legs are pivoted, so that the wheels can be moved into a position where they offer least interference to signals from the nose radar. Dipping sonar is housed in a compartment at the rear of the cabin, but is said to be inoperable at night or in adverse weather. An electro-optical sensor and a towed magnetic anomaly detector are carried. Ka-25s fly from cruisers of the *Kara* and *Kresta* classes, the nuclear-powered guided missile cruiser *Kirov*, the carrier/cruisers *Kiev* and *Minsk*, each of which carries 16 'Hormone-As' and 3 'Bs', and the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 18 aircraft.

Hormone-B. Special electronics variant, able to provide over-the-horizon targeting information for SS-N-12 'Sandbox' cruise missiles launched from the ship on which it is deployed. Larger undernose radome with more spherical undersurface. Cylindrical radome under rear of cabin. Data link equipment.

Hormone-C. Utility, and search and rescue model, generally similar to 'Hormone-A' but with inessential operational equipment and weapons removed. This version sometimes has a yagi aerial mounted on the nose: it has been photographed in non-operational red and white paint finish.

About 460 Ka-25s were built, in 1966–75, to replace Mil Mi-4s in the Soviet Navy's ship- and shore-based force of around 250 helicopters, and for export in small numbers to countries such as India, Syria, and Yugoslavia. Some are reported to be armed now with small 'fire and forget' air-to-surface missiles. *(Data for 'Hormone-A' follow.)*
Power Plant: two Glushenkov GTD-3 turboshaft engines; each 900 shp (later aircraft believed to have 990 shp GTD-3BMs).
Dimensions: rotor diameter (each) 51 ft 8 in, length of fuselage 32 ft 0 in, height 17 ft 7½ in.
Weights: empty 10,500 lb, gross 16,500 lb.
Performance: max speed 130 mph, service ceiling 11,500 ft, range 405 miles.
Accommodation: crew of two on flight deck; other crew members in main cabin, which is large enough to contain 12 folding seats for passengers in transport role.
Armament: ASW torpedoes, nuclear depth charges, and other stores in underfuselage weapon bay, when installed.

Kamov Ka-32 (NATO 'Helix')
Last year's Gallery included a brief note concerning a 'Hormone variant' mentioned in DoD's 1981 document on *Soviet Military Power*. At the time, all that could be added was that the new helicopter was carried in a telescoping hangar on the new *Sovremennyy* class of Soviet guided missile destroyers, for secondary ASW missions. First photographs of the helicopter were released after two of them had been observed on the stern platform of the *Udaloy*, first of a new class of Soviet ASW guided missile destroyers, during the Zapad-81 (West-81) series of exercises in the Baltic. Identification of the type as the Ka-32 followed, when a civilian flying crane version was demonstrated at Minsk Airport during the fourth CMEA scientific/technical conference on the use of aircraft in the national economy. It was claimed to be able to lift an 11,000 lb slung load, and to have a range of 115 miles with such a load. Soon afterwards, two military versions were given NATO reporting names:

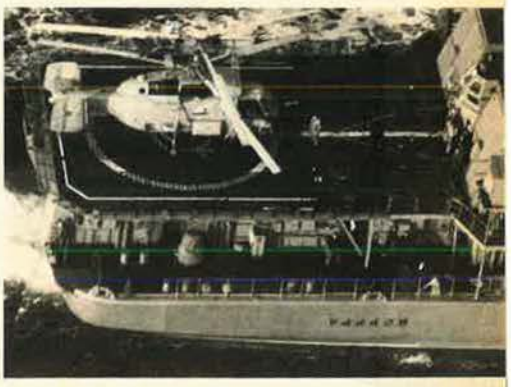
Helix-A. Basic ASW version.

Helix-B. Missile targeting version to replace 'Hormone-B'.

'Helix-A' follows closely the configuration of 'Hormone' but has a longer fuselage pod, only two tail fins, and a smaller undernose radome. Some components, such as the main units of the four-wheel landing gear and the sliding cabin door on the port side, look identical to their counterparts on 'Hormone'. Overall dimensions of the two types also appear to be similar, enabling 'Helix' to use hangars and deck-lifts built for its predecessor. The Ka-32's twin turboshafts are mounted above the cabin, as on the Ka-25, and are probably derivatives of the latter's GTD-3BMs; the three blades on each contra-rotating rotor fold rearward in the same way for stowage, but differ in form. Features include an 'inverted flower pot' fairing, similar to that of 'Hormone-A', above the rear of the power plant cowling; a box under the tailboom which could house a towed MAD 'bird'; and a rectangular container, probably for sonobuoys, on each side of the centre-fuselage. The increased volume of the cabin could provide an answer to the Soviet Navy's long-time need for an infantry assault and vertical replenishment shipboard helicopter.
Dimensions: rotor diameter 54 ft 11½ in, length of fuselage 36 ft 1 in, height 18 ft 0½ in.

Mil (WSK-PZL Swidnik) Mi-2
(NATO 'Hoplite')
More than 13,000 turbine-powered helicopters of Mil design have been manufactured, with production in the USSR continuing at a rate of more than 1,000 a year. They include the largest, fastest, and most-heavily armed types in the world; and a total of at least 3,500 are deployed with first-line units of the Soviet tactical air forces. Only type not built in the USSR is the small Mi-2, of which manufacture was transferred to the WSK-PZL at


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


Kamov Ka-32 (NATO 'Helix-A') (US Navy)


Mil Mi-2 (NATO 'Hoplite') (Tass)

Mil Mi-6 (NATO 'Hook') of Egyptian Air Force (Denis Hughes)

Mil Mi-8 (NATO 'Hip-E')

Mil Mi-14 (NATO 'Haze')

Mil Mi-24s (NATO 'Hind-D') of Czechoslovak Air Force

New version of 'Hind' with twin-barrel cannon in place of nose turret

Swidnik in Poland in 1964. More than 3,500 have been delivered for military and commercial service, with the air forces of Czechoslovakia, Poland, Romania, and the Soviet Union among known operators. The USSR has received over 2,000, and production is continuing.

Power Plant: two Polish-built Isotov GTD-350P turboshaft engines; each 400 or 450 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' air-to-surface missiles, on each side of cabin.

Mil Mi-6 (NATO 'Hook')

When announced in the Autumn of 1957, the Mi-6 was the world's largest helicopter. It was also the first Soviet production helicopter fitted with small fixed wings to offload the main rotor in cruising flight. These wings are normally removed when the aircraft operates in a flying crane role, carrying external freight. More than 860 production Mi-6s are believed to have been delivered for commercial and military service, the latter with the air forces of the Soviet Union (about 400 currently operating with the tactical air forces), Algeria, Egypt, Ethiopia, Iraq, Peru, and Vietnam. Task of these helicopters is to haul guns, armour, vehicles, supplies, freight, or 65–90 troops at a time, in combat areas.

Power Plant: two Soloviev D-25V turboshaft engines; each 5,500 shp.

Dimensions: rotor diameter 114 ft 10 in, length of fuselage 108 ft 10½ in, height 32 ft 4 in.

Weights: empty 60,055 lb, gross 93,700 lb.

Performance: max speed 186 mph, service ceiling 14,750 ft, range 385 miles with 17,637 lb payload.

Accommodation: crew of five; up to 90 passengers, 26,450 lb of freight, or 41 litters and two medical attendants.

Armament: some aircraft have a 12.7 mm gun in the nose.

Mil Mi-8 (NATO 'Hip')

Production of the Mi-8, for military and commercial use, passed the 7,500 mark two years ago. Since then, the uprated Mi-17 has gone into production (see separate entry). Teamed with the Mi-24 gunship, these aircraft make up the most formidable helicopter attack force in the world. Primary combat task of the Mi-8, for which the crews are well trained, is to put down assault troops, equipment, and supplies behind enemy lines, within 15–20 minutes of a nuclear or conventional bombardment/strike. Versions serving with about 40 air forces are as follows:

Hip-C. Basic assault transport. Twin-rack for stores on each side of cabin, able to carry 128 × 57 mm rockets in four packs, or other weapons.

Hip-D. For electronic duties; see page 86.

Hip-E. Described by DoD as the world's most heavily armed helicopter. Standard equipment of Soviet tactical air forces. One flexibly-mounted 12.7 mm machine-gun in nose. Triple stores rack on each side of cabin, able to carry up to 192 rockets in six suspended packs, plus 4 'Swatter' homing anti-tank missiles on rails above racks.

Hip-F. Export counterpart of 'Hip-E'. Missile armament changed to six 'Saggers'.

Power Plant: two Isotov TV2-117A turboshaft engines; each 1,700 shp.

Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 59 ft 7¼ in, height 18 ft 6½ in.

Weights: empty 16,007 lb, gross 26,455 lb.

Performance: max speed 161 mph at 3,280 ft, service ceiling 14,760 ft, range 311 miles as passenger transport.

Accommodation: crew of two or three; up to 32 passengers, 8,820 lb of freight, or 12 litters and attendant.

Armament: see individual model descriptions.

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

Comparison of photographs of this aircraft and the Mi-8 transport helicopter shows that the Mi-14 has shorter engine nacelles, with the intakes positioned above the mid-point of the sliding cabin door. Such nacelles, found also on the Mi-24 'Hind' and Mi-17, house TV3-117 turboshaft engines in place of the lower-rated TV2s of the Mi-8. Overall dimensions and dynamic components of the Mi-14 are generally similar to those of the Mi-8 from which it was derived, except that the tail rotor is on the port side of the vertical stabiliser. New features to suit it for its role as a shore-based anti-submarine aircraft include a boat hull of the kind used on the Sikorsky Sea King, and a sponson on each side at the rear to confer a degree of amphibious capability. The landing gear is fully retractable. Operational equipment can be seen to include a large undernose radome, and a towed magnetic anomaly detection (MAD) 'bird' stowed against the rear of the fuselage pod. About 100 Mi-14s are currently in service with the Soviet Naval Air Force, which has been able, in consequence, to retire the last piston-engined Mi-4s from its shore-based ASW units. A few are reported in service for mine countermeasures duty; 12 Mi-14s have been exported to Bulgaria.

Mil Mi-17 (NATO 'Hip')

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.

Power Plant: two Isotov TV3-117MT turboshaft engines; each 1,900 shp.

Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 60 ft 5¼ in, height 15 ft 7¼ in.

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

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

Mil Mi-24 (NATO 'Hind')

The Mi-24 was designed originally to deliver a squad of eight assault troops into a battlefield. Its weapons were intended then to clear a path past any tanks, guns, or other obstructions to its progress, but it was not long before training exercises caused a major change in tactics. Today, the Mi-24 is regarded as not only an anti-tank weapon, but capable itself of functioning as a high-speed, nap-of-the-earth 'tank', and of destroying enemy helicopters in air-to-air combat. During exercises, Mi-24s have operated usually as escorts to troop-carrying Mi-8s, with responsibility for suppressing anti-aircraft defences en route. A report in *Red Star* has claimed that they are "superior to other anti-tank weapons in terms of field vision, manoeuvrability and firepower; and capable of hitting armoured enemy targets while remaining out of reach of anti-aircraft weapons. The correlation between tank and helicopter losses is 12:1 or even 19:1 in the helicopter's favour." To exploit 'Hind's' proven potential, steel and titanium have been substituted for aluminum in critical components, and glassfibre-skinned rotor blades have replaced the original blade-pocket design. Variants identified to date are as follows:

Hind-A. Armed assault transport, with large enclosed flight deck for crew of four, and places for up to eight fully-equipped troops in main cabin. Dynamic components based on those of Mi-8. Fully-retractable landing gear. Auxiliary wings of this version have considerable anhedral. One 12.7 mm machine-gun in nose; four hardpoints under stub-wings for 32-round packs of 57 mm rockets, or bombs; four AT-2 (NATO 'Swatter') homing anti-tank missiles on wingtip launchers. Anti-torque rotor, originally on starboard side of offset tail pylon, repositioned to port side on later and converted aircraft. Initial production Mi-24s were of this model.

Hind-B. Similar to 'Hind-A' except that auxiliary wings have neither anhedral nor dihedral, and carry only the two inboard weapon stations on each side. This version preceded 'Hind-A' and was not built in quantity.

Hind-C. Generally similar to late-model 'Hind-A', but without nose gun and undernose blister fairing, and no missile rails at wingtips.

Hind-D. Basically similar to late-model 'Hind-A', with tail rotor on port side, but with front fuselage completely redesigned for primary gunship role. Tandem stations for weapon operator (in nose) and pilot have individual canopies, with rear seat raised to give pilot an unobstructed forward view. Probe fitted forward of top starboard corner of bulletproof windscreen at extreme nose may be part of low-airspeed sensing device, to indicate optimum conditions for minimum dispersion of 57 mm rockets. Under nose is a four-barrel Gatling-type 12.7 mm machine-gun in a turret with a wide range of movement in azimuth and elevation, providing air-to-air as well as air-to-surface capability. Undernose pack for sensors including possibly radar and low-light-level TV. Wing armament retained. Many small antennae and blisters. Nosewheels semi-exposed when retracted.

Hind-E. As 'Hind-D', for Soviet armed forces, but with four laser-homing AT-6 (NATO 'Spiral') anti-tank missiles instead of 'Swatters', and enlarged undernose sensor pod on port side. More than 100 of this version deployed in Warsaw Pact forward areas in Europe by early 1981, with others in Far East.

Hind-. Generally similar to 'Hind-E', with 'Spiral' missiles, but nose gun turret replaced by a twin-barrel cannon mounted inside a semi-cylindrical pack on starboard side of fuselage. Bottom of nose smoothly faired above and forward of sensors. First shown in operational use in 1982.

Under the Soviet designation A-10, the Mi-24 has set a number of major FAI-approved records, including the current world speed record for helicopters of 228.9 mph over a 15/25 km course.

Deliveries of all models of the Mi-24 exceed 1,000, 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, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Iraq, Libya, Poland, and South Yemen.

Power Plant: two Isotov TV3-117 turboshaft engines; each 2,200 shp.
Dimensions: rotor diameter 55 ft 9 in, length of fuselage 55 ft 9 in, height 14 ft 0 in.
Weight: gross 22,000 lb.
Accommodation ('Hind-A'): crew of four; eight combat-equipped troops.
Armament: see individual model descriptions.

Mil Mi-26 (NATO 'Halo')

Design of the Mi-26 heavy-lift helicopter began in the early 1970s to meet the requirement for an aircraft of greater capability than the Mi-6. 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 which are adjustable individually in length to permit landing on a slope. The Mi-26 is understood to be in production, and has obvious military applications. In the course of establishing five world helicopter payload-to-height records, in 1982, it lifted a total mass of 125,154 lb to a height of 2,000 m, including a payload of 25,000 kg (55,115 lb).

Power Plant: two Lotarev D-136 turboshaft engines; each 11,400 shp.
Dimensions: rotor diameter 105 ft 0 in, length of fuselage 110 ft 8 in, height to top of main rotor head 26 ft 5¼ 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 14,760 ft, range 497 miles.
Accommodation: crew of five; about 40 tip-up seats along side walls of hold.

Mil Mi-26 (NATO 'Halo') (Tass)

Strategic Missiles

SS-4 (NATO 'Sandal')

This is the 24-year-old medium-range ballistic missile (MRBM) that precipitated the Cuba crisis in 1962. Its development, via the earlier SS-3 ('Shyster'), drew heavily on wartime German V-2 technology. About 265 remain operational, mostly near the western borders of the Soviet Union but some east of the Urals, targeted on China. Replacement with SS-20s is being maintained at a steady pace. About 12 tractors with special trailers, and 20 men, are needed to transport, erect, and fire the SS-4.

Power Plant: one four-chamber RD-214 liquid-propellant (nitric acid/kerosene) sustainer; 163,142 lb thrust in vacuo.
Guidance: inertial.
Warhead: alternative nuclear (1 megaton) or high-explosive.
Dimensions: length 68 ft 0 in, diameter 5 ft 3 in.
Launching weight: 60,000 lb.
Performance: max speed Mach 6.7, max range 1,200 miles.

SS-5 (NATO 'Skean')

About a dozen of these intermediate-range missiles supplement SS-4s and SS-20s in the 600-strong Soviet IRBM/MRBM force. All are thought to be in the western USSR, some in silos. The SS-5 represented a further development of the SS-3/SS-4 concept, with control by vanes acting on the motor exhaust rather than by external fins.

Power Plant: single-stage liquid-propellant engine with four chambers.
Guidance: inertial.
Warhead: nuclear (1 megaton).
Dimensions: length 72 ft 0 in, diameter 8 ft 0 in.
Performance: max range 2,500 miles.

SS-11 (NATO 'Sego')

About 570 of these 'light' ICBMs remain in their silos. Replacement of a proportion of the original force with new SS-17s appears to have been completed; others are expected to make way for SS-19s. No photograph of an SS-11 has ever been identified. It is believed to be about 3 ft shorter than the SS-13, with no space between its liquid-propellant stages. Two versions remain operational:

SS-11 Mod 2. Differs from now-retired Mod 1 in being fitted with penetration aids. Single re-entry vehicle, of slightly higher yield than that of the comparable US Minuteman, but considerably less accurate, with CEP of 1.4 km (0.87 miles). Range about 6,500 miles.

SS-11 Mod 3. First operational Soviet missile with MRVs (three 300 kiloton). Tests began in 1969, and greater targeting flexibility and accuracy led to rapid deployment; more than 60 emplaced. Range about 5,450 miles. CEP 1.1 km (0.7 miles).

SS-13 (NATO 'Savage')

In the Minuteman category; only 60 SS-13s are deployed.

Power Plant: three-stage solid-propellant.
Guidance: inertial, offering CEP of 2 km (1¼ miles).
Warhead: nuclear (750 kilotons).
Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).
Performance: range 6,200 miles.

SS-17 (Soviet designation **RS-16**)

Known in the Soviet Union as the RS-16, this two-stage "light" liquid-propellant ICBM (which the US designates SS-17) is designed for cold launch. This means that it is "popped" out of its silo by a gas generator before the main booster motors are fired. As a result the silo is not heavily damaged and could be reloaded, although this would be a slow process. Since 1975, a total of 150 SS-11 silos have been modified to accept SS-17 missiles, of which deployment is believed to be complete. Two versions are operational, as follows:

SS-17 Mod 1. With four 750 kiloton MIRVs, shaped for high-speed atmospheric re-entry to ensure greater accuracy.

SS-17 Mod 2. With single large (6 megaton) re-entry vehicle, for capability against hard targets. Few only.

DoD believes that some of the silos modified for these and other modern Soviet ICBMs have been hardened to resist very high over-pressure.

Dimensions: length 66 ft 0 in, max diameter 8 ft 6 in.
Performance: range Mod 1 6,200 miles with CEP of around 450 m (0.3 mile), Mod 2 6,800 miles.

SS-18 (Soviet designation **RS-20**)

Replacement of the SS-9 (NATO 'Scarp') with 308 of these cold-launched "heavy" two-stage liquid-propellant missiles has been completed. Each has a greater throw-weight capability than any other Soviet or US ICBM, coupled with greater accuracy and flexibility than the now-retired SS-9 at the cost of a slightly reduced maximum range. Four versions are deployed:

SS-18 Mod 1. Some operational, each with single 20 megaton warhead, for use against deep underground shelters. CEP 1,500 ft.

SS-18 Mod 2. Major current operational version, with eight relatively large (900 kiloton) MIRVs dispensed by a post-boost vehicle (PBV) similar to that employed on the US Minuteman III and Poseidon missiles.

SS-18 Mod 3. Longer-range version, with single 20 megaton warhead in re-entry vehicle lighter and more accurate than that of Mod 1, which it may ultimately replace. Deployment began 1979. CEP 1,150 ft.

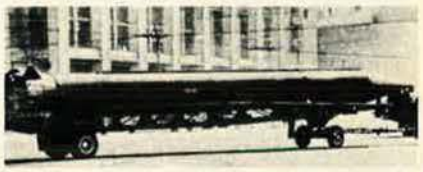
SS-18 Mod 4. Similar to Mod 2, but with ten 500 kiloton MIRVs and CEP of under 1,000 ft. Mod 2 vehicles may be converted.

Dimensions: length 104 ft 0 in, max diameter 10 ft 0 in.
Performance: range Mod 1 7,450 miles, Mod 2 6,800 miles, Mod 3 9,950 miles, Mod 4 5,600 miles.

SS-19 (Soviet designation **RS-18**)

Like the SS-17, the SS-19 is rated as a "light" ICBM, and is replacing older SS-11s. It is a hot-launched two-stage liquid-propellant missile, with a range of 5,950–6,200 miles. Being longer than the SS-11 and SS-17, it requires more extensive modification to existing silos in which it is emplaced; yet about 310 are already operational. This lends weight to DoD's belief that the SS-19's combination of accuracy and yield makes it the most capable of the current generation of Soviet ICBMs, although it carries fewer re-entry vehicles than the SS-18 Mod 2. Testing began in 1974, leading to rapid deployment of the **SS-19 Mod 1,** with a MIRVed payload of six re-entry vehicles (each 550 kilotons yield). This version has been replaced by the **SS-19 Mod 3,** with similar payload but a CEP of under 1,000 ft. A **Mod 2** version, with a single large (5 megaton) re-entry vehicle, also offers a CEP of under 1,000 ft, but few have been deployed. Under the terms of SALT II, all SS-17, SS-18, and SS-19 silos would have counted as MIRVed missile launchers.

Dimension: length 75 ft 0 in.
Performance: range Mod 1 5,950 miles, Mod 2 6,200 miles.



SS-4 (NATO 'Sandal')

SS-13 (NATO 'Savage')

Artist's concept of SS-20 IRBM

AS-6 (NATO 'Kingfish') on Tu-16 (Swedish Air Force)

SS-20

This mobile solid-propellant IRBM represents the most formidable Soviet threat to NATO nations in Western Europe. It would not have been subject to any restrictions under SALT II, as its range is less than 5,500 km (3,417 miles); but it is the subject of a further major round of strategic arms limitation talks in early 1983. About 335 are currently deployed, each with a MIRVed payload of three re-entry vehicles (yield of each 150 kilotons). CEP is reported to be about 2,500 ft when the SS-20 is fired from its tracked carrier/launcher at a pre-surveyed site, and the vehicle offers a multiple reload capability. SS-20s could reach the Aleutian Islands and western Alaska from present and likely deployment areas in the eastern USSR, but could not reach the contiguous 48 States.

Dimension: length 55 ft.
Performance: range 3,100 miles.

AS-3 (NATO 'Kangaroo')

When comparing the range of Soviet air-to-surface and submarine-launched cruise missiles with their US counterparts, it is important to remember that the Soviet requirement for long range is minimal. Fifty-five important US cities with some 74,000,000 inhabitants are within 530 miles (850 km) of the 100 fathoms depth curve in the Atlantic and Pacific Oceans. Only six of the major cities in the Soviet Union, with some 2,200,000 people, are located within a similar distance of the 100 fathoms depth curve. Largest current Soviet air-to-surface missile is the AS-3, which resembles a sweptwing jet fighter in size and configuration, and was displayed for the first time under its Tu-95 carrier aircraft on Aviation Day 1961. It is known still to be operational with alternative nuclear (800 kiloton) or high-explosive (5,070 lb) warhead on Tu-95 'Bear-B' and 'C' bombers.

Guidance: initial beam-riding; subsequent pre-programmed flight under autopilot control.
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')

Developed as a stand-off weapon for the Tu-95 and Tu-22 strategic bombers, and now carried also by the variable-geometry 'Backfire', the AS-4 was first seen on a single Tu-22 ('Blinder-B') in 1961. Most of the 22 Tu-22s which participated in the 1967 Aviation Day display at Domodedovo carried an AS-4, semi-submerged in the fuselage, and production by 1976 was stated by the UK Defence Minister to be around 1,000. The missile, which has been seen in more than one form, has an aeroplane configuration, with stubby delta wings and cruciform tail surfaces. Propulsion is believed to be by liquid-propellant rocket motor. Alternative nuclear (350 kiloton) or 2,200 lb high-explosive warheads can be assumed.

Guidance: inertial, with radar terminal homing.
Dimensions: span 9 ft 10 in, length 37 ft 0 in.
Weight: 13,225 lb.
Performance: max speed above Mach 2, range 185 miles at low altitude.

AS-6 (NATO 'Kingfish')

First sighting of this air-to-surface missile was by the pilot of a Japan Air Self-Defence Force F-86F, in late December 1977. When scrambled to investigate a Tu-16 ('Badger') flying 50 miles to the north of the Noto Peninsula, he was able to photograph the aircraft which was carrying a 'Kingfish' under its port wing. The missile has a cylindrical body with ogival nose; two short-span, long-chord wings; and a cruciform tail unit with folding ventral fin. Propulsion is said to be by liquid-propellant rocket motor, with inertial midcourse guidance, and active radar terminal homing, giving an exceptional degree of accuracy. The warhead can be either nuclear (200 kiloton) or 2,200 lb high-explosive. Primary carrier was expected to be the variable-geometry 'Backfire'; there has been no evidence of this, but Tu-16s have been seen frequently with 'Kingfish' under one or both wings.

Dimensions: span 8 ft 2½ in, length 34 ft 6 in.
Weight: 11,000 lb.
Performance: max speed Mach 3, range 135 miles at low altitude.

AS-5 (NATO 'Kelt') (Denis Hughes)

Sukhoi Su-17 (NATO 'Fitter-H') with unidentified air-to-surface missiles under wing gloves

Airborne and Tactical Defence Missiles

AS-2 (NATO 'Kipper')

First seen 22 years ago, at the 1961 Aviation Day display, this aeroplane-configuration missile, with underslung turbojet engine, was described by the commentator at Tushino as an anti-shipping weapon. Radar is carried in the nose of the Tu-16 carrier aircraft, and guidance is believed to comprise initial beam-riding, subsequent pre-programmed flight under autopilot control, and active radar terminal homing. A 2,200 lb high-explosive warhead is fitted.

Dimensions: span 16 ft 0 in, length 31 ft 0 in.
Weight: 9,260 lb.
Performance: max speed Mach 1.2, range 130 miles.

AS-5 (NATO 'Kelt')

According to the UK Minister of Defence, well over 1,000 AS-5s had been delivered by the Spring of 1976. About 25 were used operationally during the October 1973 war between Israel and the Arab states, when Tu-16s from Egypt launched them against Israeli targets. Only five eluded the air and ground defences.

The transonic AS-5 has a similar aeroplane-type configuration to that of the turbojet-powered AS-1 ('Kennel') which it superseded. The switch to liquid rocket propulsion eliminated the need for a ram air intake, and permitted the use of a larger radar inside the hemispherical nose fairing. Guidance is said to be by autopilot on a pre-programmed flight path, with radar terminal homing which can be switched from active to passive as required. A 2,200 lb high-explosive warhead is standard.

Dimensions: span 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 Su-17 'Fitter'and Yak-36 'Forger', this tactical air-to-surface missile is said to have a single-stage solid-propellant rocket motor, radio command guidance system, and 220 lb high-explosive warhead.

Dimension: length 11 ft 6 in.
Weight: 2,640 lb.
Performance: max speed Mach 0.6, max range 7 miles.

AS-X-9

A reported anti-radiation missile, with a range of 50–56 miles, to arm the Su-24 ('Fencer').

New air-to-surface weapons

Several new Soviet air-to-surface weapons have been reported in recent years, some of which are already operational. The designation AS-8 appears to have been misapplied to the AT-6 (NATO 'Spiral') described below; but AS-10, AS-11 and AS-12 are believed to include a Mach 0.8 laser-guided solid-propellant missile, about 9 ft 10 in long, with a range of 6 miles, and the weapon shown under the wing gloves of an Su-17 in an accompanying illustration. Longer-range cruise missiles are almost certainly under development, not least as armament for the new 'Blackjack' strategic bomber.

AT-2 (NATO 'Swatter')

This standard Soviet anti-tank weapon formed the original missile armament of the Mi-24 ('Hind-A and D') helicopter gunship, and is carried by the 'Hip-E' version of the Mi-8. 'Swatter' is steered in flight via elevons on the trailing-edges of its rear-mounted cruciform wings, and embodies terminal homing.

Dimensions: span 2 ft 2 in, length 3 ft 9¾ in.
Weight: 65 lb.
Performance: cruising speed 335 mph, range 1,640–11,500 ft.

AT-3 (NATO 'Sagger')

In conformity with the Soviet practice of not supplying advanced equipment on its export aircraft, the wire-guided 'Sagger' replaces 'Swatter' on the 'Hip-F' version of the Mi-8, as well as arming the Polish-built Mi-2, and Gazelles of the Yugoslav services.

Dimensions: span 1 ft 6 in, length 2 ft 10¼ in.
Weight: 25 lb.
Performance: speed 270 mph, range 1,650–9,850 ft.

AT-6 (NATO 'Spiral')

Unlike previous Soviet helicopter-launched anti-tank missiles, 'Spiral' does not appear to have a surface-launched application. Few details are yet available, except that it is tube-launched, and homes on targets illuminated by a laser designator. It equips the 'Hind-E' version of the Mi-24, and is said to have a range of 4.3 to 6.2 miles.

AA-2 (NATO 'Atoll')

Designated K-13A in the USSR, 'Atoll' is the Soviet counterpart to the American Sidewinder 1A (AIM-9B), to which it is almost identical in size, configuration, and

infra-red guidance. It has long been standard armament on home and export versions of the MiG-21, and is carried by export models of the MiG-23 and Sukhoi Su-22. A solid-propellant rocket motor is fitted.
Dimensions: length 9 ft 2 in, body diameter 4.72 in, fin span 1 ft 8¾ in.
Weight: 154 lb.
Performance: cruising speed Mach 2.5, range 3 to 4 miles.

AA-2-2 (NATO 'Advanced Atoll')

The multi-role versions of the MiG-21 (NATO 'Fishbed-J, K, L, and N') can carry a radar homing version of 'Atoll' on the outer stores pylon under each wing, in addition to a standard infra-red homing 'Atoll' on the inboard pylon. The radar version is known as 'Advanced Atoll'. Length is increased to at least 9 ft 10 in.

AA-3 (NATO 'Anab')

The UK Ministry of Defence estimates production of this solid-propellant air-to-air missile as being "in the thousands". It was first observed as armament of the Yak-28P all-weather fighters which took part in the 1961 Aviation Day display at Tushino. Subsequently, it became standard on Sukhoi Su-15 interceptors. Each aircraft normally carries one 'Anab' with an I/J-band semi-active radar seeker and one with an infra-red homing head.
Dimensions: length 13 ft 5 in (IR) or 13 ft 1 in (SAR), body diameter 11 in, wing span 4 ft 3 in.
Performance: range over 10 miles.

AA-5 (NATO 'Ash')

Several thousand of these large air-to-air missiles have been produced as armament for the Tu-28P interceptors of Voyska PVO. The version with infra-red homing head is normally carried on the inboard pylon under each wing of the Tu-28P, with an I/J-band semi-active radar homing version on each outboard pylon.
Dimensions: length 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 is the air-to-air missile that was identified during 1975 as one of the weapons carried by the 'Foxbat-A' interceptor version of the MiG-25. Its configuration is similar to that of 'Anab' but it is considerably larger, with a 220 lb warhead. Photographs suggest that the version of 'Acrid' with an infra-red homing head is normally carried on each inboard underwing pylon, with a radar homing version on each outer pylon. The wingtip fairings on the fighter, different in shape from those of 'Foxbat-B', are thought to house continuous-wave target illuminating equipment for the radar homing missiles.
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 likely to exist in both infra-red and radar homing versions. Warhead weight is 88 lb.
Dimensions: length 15 ft 1¼ in, body diameter 8.75 in, wing span 3 ft 5½ in.
Weight: 705 lb.
Performance: range 20 miles.

AA-8 (NATO 'Aphid')

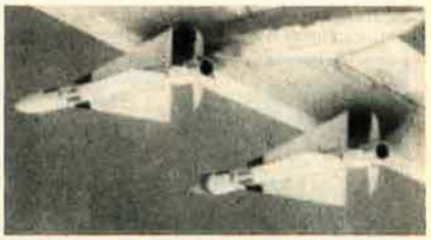
Second type of missile carried by the MiG-23, and also by late-model MiG-21s, 'Aphid' is a highly-manoeuvrable close-range solid-propellant weapon with infra-red homing guidance, and 13.2 lb warhead.
Dimensions: length 7 ft 2½ in, body diameter 4.75 in, wing span 1 ft 3¾ in.
Weight: 121 lb.
Performance: range under 1,650 ft min, 3–4.3 miles max.

AA-X-9

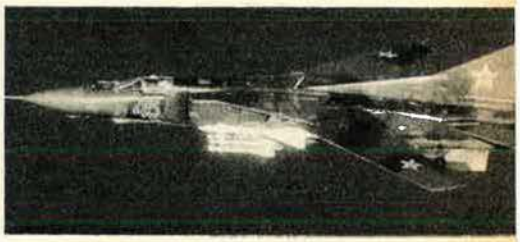
The missile known in the West as AA-X-9 is reported to have achieved successes against simulated cruise missiles, after 'look-down/snap-down' launch from a MiG-25M interceptor. No details are yet available.

Anti-helicopter 'Grail'

In addition to AT-3 anti-tank missiles, Gazelle helicopters licence-built by SOKO for the Yugoslav Air Force carry SA-7 'Grail' tube-launched IR homing missiles for use against other helicopters.



AA-5 (NATO 'Ash') on Tu-28P



AA-7 (NATO 'Apex') missiles under wing glove of MiG-23, and AA-8 (NATO 'Aphids') under fuselage (Swedish Air Force)

Surface-to-Air Missiles

ABM-1B (NATO 'Galosh')

The Soviet Union deactivated half of the 64 operational launchers of its 'Galosh' ABM (anti-ballistic missile), defence system, which were deployed around Moscow during 1980. Under the terms of the SALT I agreement, the USA and USSR were each permitted a total of 100 ABMs on launchers for the defence of their national capital and 100 more for defence of an ICBM launch area. ABM deployment was further reduced to one site for each country at the Moscow Summit meeting of late June and early July 1974. The 64 'Galosh' sites were considered to be capable of protecting Moscow adequately against small attacks using unsophisticated missiles without penetration aids; but no attempt was made to add the other 36 launchers to the system, although Soviet ABM R&D has been continued at a high priority. It is possible, therefore, that the launcher deactivation may be a prelude to updating of the system, of which few details have ever been released. Missiles purported to be 'Galosh' have been paraded through Moscow, inside containers 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 over 200 miles.

SA-1 (NATO 'Guild')

This missile was first displayed in a Moscow military parade on November 7, 1960. Although subsequently reported to be deployed as a standard anti-aircraft weapon, it took no further part in the regular Moscow parades until 1968, when it appeared on May Day. The SA-1 is not thought to have been supplied to any country outside the USSR, and its phase-out there has probably started.
Dimensions: length 39 ft 0 in, body diameter 2 ft 3½ in.
Performance: range 31 miles.

SA-2 (NATO 'Guideline')

This missile is a standard anti-aircraft weapon in about 20 countries and has been operational since 1959. It was used extensively in combat in North Vietnam and the Middle East, and has been improved through several versions as a result of experience gained. One variant, first exhibited in Moscow in November 1967, has an enlarged, white-painted warhead without the usual small canard surfaces. It was claimed to be far more effective than earlier versions, and may have a nuclear warhead. About 3,500 SA-2 launchers are thought to remain operational in the Soviet Union, although the number declines annually. Data for export version:
Power Plant: liquid-propellant sustainer, burning nitric acid and hydrocarbon propellants; solid-propellant booster.
Guidance: automatic radio command, with radar tracking of target. Some late versions employ terminal homing.
Warhead: normally high-explosive, weight 288 lb.
Dimensions: length 34 ft 9 in, body diameter 1 ft 8 in, wing span 5 ft 7 in.
Launching weight: 5,070 lb.
Performance: max speed Mach 3.5, slant range 28 miles, effective ceiling 82,000 ft.

SA-3 (NATO 'Goa')

Soviet counterpart of the American HAWK, the SA-3 is deployed in increasing numbers by the Soviet Union, its allies, and friends as a mobile low-altitude system (on two-, three-, and four-round launchers) to complement the medium/high-altitude SA-2. As the **SA-N-1**, it is also the most widely-used surface-to-air missile in the Soviet Navy, fired from a roll-stabilised twin-round launcher.
Power Plant: two-stage solid-propellant.
Guidance: radio command, with radar terminal homing.
Warhead: high-explosive, weight 132 lb.
Dimensions: length 22 ft 0 in, body diameter 1 ft 6 in, wing span 4 ft 0 in.
Launching weight: 1,323 lb.
Performance: max speed Mach 2, slant range 21.75 miles, effective ceiling 49,200 ft.

SA-4 (NATO 'Ganef')

Ramjet propulsion gives this anti-aircraft missile a very long range. Its usefulness is further enhanced by its mobility, as it is carried on a twin-round tracked launch vehicle which is itself air-transportable in the An-22 military freighter. The SA-4 was first displayed publicly in 1964, and is a standard Soviet weapon for defence of combat areas. It is reported to be operational also with the East German and Czech forces.
Power Plant: ramjet sustainer; four wrap-around solid-propellant boosters.

SA-1 (NATO 'Guild') on parade

SA-2 (NATO 'Guideline')

SA-3 (NATO 'Goa')

Guidance: radio command, with semi-active radar terminal homing.
Warhead: high-explosive.
Dimensions: length 28 ft 10½ in, body diameter 2 ft 8 in, wing span 7 ft 6 in.
Launching weight: 3,975 lb.
Performance: slant range 43 miles, effective ceiling 80,000 ft.

SA-5 (NATO 'Gammon')

There is reckoned to be a total of 13,000 missiles on 10,000 surface-to-air missile launchers operational at 1,400 fixed sites throughout the Soviet Union. However, deactivation of SA-2 sites has been under way for some time, at a slightly faster rate than the commissioning of new SA-3 and SA-5 sites. The SA-5 is described by the US Department of Defense as providing long-range, high-altitude defence for Soviet targets, and about 1,200 are deployed at more than 100 sites.

Power Plant: two-stage solid-propellant, possibly with terminal propulsion for warhead.
Guidance: semi-active radar homing.
Dimensions: length 54 ft 0 in, body diameter 2 ft 10 in, wing span 12 ft 0 in.
Launching weight: 44,090 lb.
Performance: max speed above Mach 3.5, slant range 185 miles, effective ceiling 95,000 ft.

SA-4 (NATO 'Ganef')

SA-6 (NATO 'Gainful')

SA-7 (NATO 'Grail')

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

SA-9 (NATO 'Gaskin') in Poland

SA-6 (NATO 'Gainful')

This mobile low-altitude weapon system took an unexpectedly heavy toll of Israeli aircraft during the October 1973 war. Its unique integral all-solid rocket/ramjet propulsion system was a decade in advance of comparable Western technology, and the US-supplied ECM equipment which enabled Israeli aircraft to survive attack by other missiles proved ineffective against the SA-6. First shown on its three-round tracked transporter/launcher, in Moscow, in November 1967, the missile has since been produced in very large quantities. Export models have been acquired by Algeria, Angola, Bulgaria, Czechoslovakia, Egypt, East Germany, Hungary, India, Iraq, Libya, Mozambique, Poland, Romania, Syria, Vietnam, 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; semi-active radar terminal homing.
Warhead: high-explosive, weight 176 lb.
Dimensions: length 20 ft 4 in, body diameter 1 ft 1.2 in.
Launching weight: 1,212 lb.
Performance: max speed Mach 2.8, range 18.5 miles, effective ceiling 59,000 ft.

SA-7 (NATO 'Grail')

This Soviet counterpart of the US shoulder-fired, heat-seeking Redeye first proved its effectiveness in Vietnam against slower, low-flying aircraft and helicopters. It repeated the process during the 1973 Arab-Israeli war, despite countermeasures, including the use of decoy flares, and deflecting upward the exhaust of helicopters. In addition to being a standard weapon throughout the Warsaw Pact forces since 1968, it has been supplied to about 20 other nations, and is used by various guerrilla/terrorist movements. Designed for use by infantry, the SA-7 is also carried by vehicles, including ships, in batteries of four, six, and eight, for both offensive and defensive employment, with radar aiming. Some are deployed on helicopters, for anti-helicopter combat use. An uprated version has a more powerful motor, giving higher speed and an effective ceiling of about 14,000 ft. *(Data for basic version.)*

Power Plant: solid-propellant booster/sustainer.
Guidance: infra-red homing with filter to screen out decoy flares.
Warhead: high-explosive, weight 5.5 lb.
Dimensions: length 4 ft 3 in, body diameter 2.75 in.
Launching weight: 20 lb.
Performance: max speed Mach 1.5, slant range 2.15 miles, effective ceiling 5,000 ft.

SA-8 (NATO 'Gecko')

First displayed publicly during the parade through Moscow's Red Square on November 7, 1975, this short-range, all-weather system is unique among Soviet tactical air defence weapons in that all components needed to conduct a target engagement are on a single vehicle. Missile configuration is conventional, with canard foreplane control surfaces and fixed tail-fins. Fire control equipment and four- or six-round launcher are mounted on a rotating turret, carried by a three-axle six-wheel amphibious vehicle. Surveillance radar, with an estimated range of 18 miles, folds down behind the launcher, enabling the weapon system to be airlifted by Soviet transport aircraft. The tracking radar is of the pulsed type, with an estimated range of 12–15 miles. The SA-8 is believed to use the same missile as the well-established but enigmatic naval SA-N-4 system. Each vehicle carries up to six reload missiles.

Power Plant: probably dual-thrust solid-propellant.
Guidance: command guidance by proportional navigation. Semi-active radar terminal homing.
Warhead: high-explosive, about 90–110 lb weight.
Dimensions: length 10 ft 6 in, body diameter 8.25 in.
Launching weight: 440 lb.
Performance: range 1.8–7.5 miles, effective ceiling 32,800 ft.

SA-9 (NATO 'Gaskin')

This weapon system, deployed initially in 1968, comprises a BRDM-2 amphibious vehicle, carrying a box launcher for two pairs of infra-red homing missiles. The launcher rests flat on the rear of the vehicle when not required to be ready for launch. Four re-load rounds are stowed in the BRDM-2. (See also the SA-13 entry.)

Dimensions: length 5 ft 9 in, body diameter 4.33 in.
Launching weight: 66 lb.
Performance: range 4.35 miles, effective ceiling 16,400 ft.

SA-10

If 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 in the 1,000–16,500 ft height band is suggested, with active radar terminal homing. Reported dimensions are a length of 23 ft and body diameter of 17.7 in. Predicted IOC varies from 'about now' to the mid-1980s. Full deployment is likely to be protracted, as the DoD considers that an effective anti-ALCM defence system would need between 500 and 1,000 sites, each with ten launchers, and would cost $50 billion if manufactured in the US.

SA-11

This new weapon system comprises a four-rail launch vehicle for Mach 3 radar-guided missiles with a reported ability to deal with targets at altitudes between 100 and 46,000 ft, at ranges up to 17 miles. SA-11s are said to be deployed already alongside SA-6s, and may represent an improved version of the latter.

SA-13

Deployed on an MT-LB tracked vehicle in the late seventies, the SA-13 is a replacement for the SA-9, providing improved capability in rough terrain and increased storage for re-load missiles. Together with the ZSU-23-4 tracked gun vehicle, it equips the antiaircraft batteries of motorised rifle and tank regiments. Range is about 5 miles at altitudes between 165 ft and 32,000 ft.

New Infantry SAM

To overcome the limitations of shoulder-fired, infra-red homing missiles like the SA-7, the Soviet Union has been developing improved infantry SAMs for some years. One type, of which deployment is about to start, uses a laser beam for beam-riding guidance.

SA-N-1 (NATO 'Goa')

Ship-launched variant of SA-3, carried on roll-stabilised twin launchers by 43 ships of 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 the carrier/cruisers *Kiev* and *Minsk*, helicopter cruisers *Moskva* and *Leningrad*, and *Kara* and *Kresta II* cruisers, carry a new and more effective missile than the SA-N-1 ('Goa'). This is said to have an anti-ship capability, and to carry a 132 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

Little is known about this naval close-range surface-to-air weapon system, although SA-N-4 installations are operational on eight classes of ships of the Soviet Navy. The retractable twin-round 'pop-up' launcher is housed inside a bin on deck. The missiles are similar to those used in the land-based mobile SA-8 system.

SA-N-5

A variety of small Soviet ships have this simple air defence system, which carries four SA-7 'Grail' launch-tubes in a framework that can be slewed for aiming.

SA-N-6

This new missile is housed in 12 vertical launch tubes under the foredeck of the new Soviet battle cruiser *Kirov*. It is assumed to deal with the same multiple threats as the US Navy's Aegis area defence system. No authentic information on the SA-N-6 missile is available. 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 new *Sovremennyy* class of guided missile destroyers. The sophistication and rapid-fire potential of the weapon system is indicated by the requirement for six associated fire control/target illuminating radars. The SA-N-7 itself is thought to be a naval equivalent of the landbased SA-11.

VIEWPOINT

Communism in Film and Fact

By Gen. T. R. Milton, USAF (Ret.)

Privileged kids ought to take some time to read the accounts of a firsthand expert on the seamier side of the revolution.

"In its inhumanity, communism has no historical precedent."
—Alexander Solzhenitsyn

An expensive liberal-arts college invited me to a movie the other day. Its title is *El Salvador: Another Vietnam,* and it is doubtless a marvelous epic, for it has won, among other kudos, the Golden Dove Award at the Leipzig Film Festival and a Special Prize at a similar affair in Havana. We should not allow our suspicions to tarnish these artistic triumphs, nor should we spoil the fun by calculating how many hard-earned dollars it takes to support the earnest student sponsors of this film.

Instead of going to the movies, these privileged kids might consider doing some reading on another, and seamier, side of world revolution. I have in mind, for starters, anything by Alexander Solzhenitsyn, a man who became an expert on communism the hard way, not by watching the flicks. In the January 21 issue of *National Review,* this survivor of the Gulag has a piece titled "Communism at the End of the Brezhnev Era." It is a stark recital of the workings of a vicious system, one that puts the maintenance in power of the Communist Party above everything else, including the Russian people. Solzhenitsyn recalls the systematic slaughter that marked the Communist Party's first years in power, beginning with the extermination of social classes—officers, clergy, merchants—and ending with the annihilation of more than 12,000,000 peasants.

The periodic famines that have marked Russian history in the years since the Bolshevik Revolution are, according to Solzhenitsyn, simply a logical manifestation of Soviet corruption and inefficiency. Since the state is viewed as corrupt, the citizens in turn must become corrupt and steal from the state in order to get by.

Solzhenitsyn recalls the remarkable defections of several hundred thousand Soviet citizens to the German side even after Hitler's defeat became certain. Those of us who were around then can remember, as Solzhenitsyn does, the joyous welcome Ukrainians gave to the conquering Germans, a welcome that turned sour only when Hilter's proconsuls showed that they were as bad as the oppressors from Moscow.

Solzhenitsyn goes on to relate the almost incredible mismanagement of Soviet natural resources: forests uprooted without replanting, rivers and lakes hopelessly polluted, mindless planting schemes without regard to season or suitability of the land. His brief and thoroughly believable account amounts to a criminal indictment of the Soviet oligarchy, one that should send a shudder of relief through everyone lucky enough to live outside that despotic system. The wonder is that it does not, as witness the numbers in this land and in Europe who can somehow put Afghanistan, or Cambodia, out of mind while equating El Salvador to Vietnam.

When I visited El Salvador in March of last year, our total military advisory effort there amounted to forty-nine junior officers. It was just before the election, and the world press in attendance, most apparently hoping for an insurgent victory, outnumbered the American military by about twenty to one. The restrictions on our advisors, moreover, were such as to prevent their doing more than instructing in tactics well away from the action.

When election day came, the people turned out in record numbers despite ominous threats from the insurgents, and, as we all know, they voted overwhelmingly conservative instead of spoiling their ballots in the traditional Latin American way of indicating dissidence. Among other reasons, the Nicaraguan experiment going on next door was evidently a persuasive argument for something other than communism. There can be no question, incidentally, that the Salvadoran insurgent movement has hard-core Communists in its leadership, however many innocents it may have in the ranks.

We in the non-Communist world find ourselves in a strange contest, one that on the face of it should be no contest at all. The USSR, badly managed, literally unable to feed itself, run by an unpopular minority that depends on terror for its authority, is nonetheless a superpower intent on world domination and never mind the shambles at home. To this end, it has fashioned a giant military apparatus and with it, a military elite. The Warsaw Pact, created in response to NATO, is a pretense rather than an alliance, with Moscow holding all the strings. Members of the Warsaw Pact who entertain thoughts of withdrawing do so at their peril.

All things considered, the odds seem clearly in favor of our side. If they are not, it can only be our own fault as our minds wander from momentary enthusiasm for national defense to other preoccupations. The Communist mind does not wander. As Solzhenitsyn says ". . . it is always ready to strike, to seize, to expand militarily—that is an indispensable mode of Communist existence." ■

Alexander Solzhenitsyn
(Drawing by Leslie Dunlap)

STANDARDS AND LEADERSHIP: New Emphasis on Old Topics

A new version of AFR 30-1 is about to appear.

An Interview With Maj. Gen. Kenneth L. Peek, Jr., USAF
By James A. McDonnell, Jr.

At press time the Air Force was about to publish a revised AFR 30-1, a pocket-sized guide for all Air Force members concerning individual roles, standards, and conduct. Not revised since 1977, the regulation's tone recognizes that almost sixty percent of the force has less than six years' service. It's a young force grown up in the cultural milieu of the 1970s, and its institutional memory might need jogging on such concepts as open-mess membership, avoidance of officer-enlisted fraternization, drug and alcohol abuse, and personal grooming, among others.

In other words, all things having to do with Air Force standards, environment, traditions, and responsibilities—as Chief of Staff Gen. Charles A. Gabriel points out in a foreword—"are the subjects of the regulation." General Gabriel's message stresses that "duty in the United States Air Force is more than just a job. It is a way of life, marked by service to our country and total dedication to the Air Force mission. . . . Our way of life is also governed by a high set of standards. . . ."

The Air Force's Director of Personnel Plans, Maj. Gen. Kenneth L. Peek, Jr., is responsible for implementing many of the recent initiatives to reinforce traditional military standards. AIR FORCE Magazine asked General Peek for his thoughts on standards and their relationship to leadership.

AIR FORCE Magazine: General Peek, what is the significance of this renewed emphasis on standards and how does it tie in to leadership?

General Peek: It is a new emphasis on a rather old topic. I think there is a growing awareness within the Air Force that we have drawn away from some basics. People choose an Air Force career because of the appeal of the institutional as opposed to the occupational approach to military service. And adherence to standards is what defines an institution.

To answer the rest of your question, let me just give you some personal observations, and why I believe that it's important that we're doing what we're doing. First of all, I don't think the basic fundamentals of leadership have changed over the

years. They apply today as they did ten years ago, fifty years ago, 100 years ago.

But today, with the advent of a massive capability to handle information, we have become very, very technologically oriented, and more decisions are made today based upon a quantitative kind of information than back when it used to be more of a personal judgment. There is a tendency for decisions to be made way up the chain, driven by information availability. But, with understandable standards, people can make decisions as far down in the organization as possible. And that develops good leaders.

One of the problems we have today is the perception that it's a one-mistake Air Force. One mistake and that's it. Listen, if people make decisions, they are going to make mistakes. Show me someone who has never made a mistake and I'll show you someone who has never made a decision. If we're going to give these young men and women the opportunity to exercise some of this responsibility, we've got to expect [that] from time to time they may make a mistake. We hope they'll profit from those mistakes.

AFM: This certainly ties into the institutional approach.

General Peek: Yes. And military service *is* an institution. We have certain standards that are different than civilians. We do require people to have their hair cut a certain way, wear their uniforms a certain way. There are good reasons why fraternization doesn't work and for all those other kinds of things that are part and parcel of military service. We're emphasizing things like rising when a senior officer walks into the room, walking on the left of someone senior, someone senior normally enters an aircraft last and exits the aircraft first—some of the basics that in the last few years we've really kind of gotten away from. Each one is perhaps a small thing in itself, but taken together, they're all an important part of a professional and disciplined pattern.

On a related topic, one of the other unfortunate aspects that I think prevails today is an unwillingness to say "no" when dealing with subordinates. For example, an individual has been recommended for something and we've called that recommending commander and said, "We must be missing something here. Why did you recommend this individual with this record?" and the commander said, "I didn't think you'd seriously consider him."

We have seen cases where individuals have been given low APRs yet allowed to reenlist, or allowed to be promoted, because someone didn't bite the bullet and remove that name from a promotion list, or deny that reenlistment.

You don't have to be an SOB to be a good leader or commander, but somewhere along the line I believe we have confused taking care of people, and being sensitive to your people—which is important—with don't ever say "no" to your people. A leader has to be able, on occasion, to say, "No, that isn't right."

Some people have great difficulty telling someone to get a haircut. I stop people in the hallways here in blue suits and I say, "I don't know who your supervisor is, but your supervisor should have told you before I did that you need a haircut." And that supervisor in turn, will say, "Well, I don't want to bother so-and-so about a haircut." That's not bothering, that's just all part of what goes with wearing the uniform and meeting the standards and meeting the supervisory responsibility, and that's so important. Supervisors and leaders are sometimes too concerned about their advancement rather than concerned about executing the responsibilities in the position they occupy right here and now.

AFM: You're saying, don't punch tickets?

General Peek: Don't punch tickets, that's right. And I'll just give you an aside here. There are young officers who have told me. "General Peek, I've already got SOS by correspondence, so why should I go to SOS?" I tell them, "You've missed the point, you've missed the point of why there's a Squadron Officer School. You know, if you could get out of a correspondence course all that's necessary, we'd close the school down and say everyone just take the correspondence course. There's a great difference between SOS by correspondence and SOS in residence. The reason you go to SOS is to improve yourself, not to fill a square."

AFM: How would you sum all this up?

General Peek: I'm not going to try to define leadership or anything like that. But to me, being a leader doesn't necessarily go with any particular rank or grade. When you have supervisory responsibilities because of position or rank, you are in a leadership position, and you have to exercise the responsibilities that go along with that. To do that, you need common standards to help you see your responsibilities clearly, and those you are leading need an understanding of standards so they know where you're coming from.

We also, I think, have to emphasize to the people who are in positions of command and leadership and responsibility that they must set the example. Leadership by example based on mutually understood standards. That is the cornerstone of our institution. ■

Maj. Gen. Kenneth L. Peek, Jr., is Director of Personnel Plans for the Deputy Chief of Staff, Manpower and Personnel. A veteran of 101 combat missions in B-52s over Southeast Asia, General Peek is a graduate of the Armed Forces Staff College and the Army War College. Prior to assuming his present position, General Peek served as Commander of the Air Force Manpower and Personnel Center at Randolph AFB, Tex.

The Many Battles of MAVERICK

The AGM-65D is a heat seeker, and it has been finding plenty of heat in Washington. Still, the Air Force believes this is a missile it can go to war with.

BY JOHN T. CORRELL
SENIOR EDITOR

THE Air Force urgently needs a better weapon to counter massive armored assaults in the event of a conventional war in Europe. The cannon on the A-10 attack aircraft is a certified tank-buster, but cannot be used from standoff range. The TV-guided AGM-65A Maverick missile is limited to the daylight hours.

The best answer, USAF believes, is the Hughes AGM-65D, an imaging infrared (I^2R) variant of the battle-tested Maverick line. Whereas the TV Maverick picks up visual target images, the I^2R version senses the heat given off by a target. The Pentagon has not announced what the effective standoff range of the IR Maverick against a tank is, but published estimates of five to six miles sound reasonable. That would be a substantial improvement over what's possible with the TV missile.

In a test program completed last year, the IR Maverick scored twenty direct hits out of twenty-six launches. The Air Force leadership firmly believes it has a good missile and wants to proceed with fielding it, hoping eventually to have 60,000 IR Mavericks in its inventory.

But in Washington, the heat-seeking IR Maverick is running into about as much heat as it can handle. The Washington *Post* has repeatedly attacked the program, calling it a "Fiasco in Weaponsland." The General Accounting Office charges that "evidence is lacking that the IR Maverick can be effectively used by US military personnel in combat." And Capitol Hill has doubts, too. So far, the Air Force has only been able to get funding for a limited pilot production of 200 missiles.

Among the allegations are that the IR Maverick won't perform in bad weather, that it can't acquire a valid target from standoff range, and that it has been tested under unrealistically benign conditions. The Air Force and the Department of Defense reject these conclusions and feel the critics are either misinterpreting or overlooking significant data.

"I think IR Maverick suffers somewhat from its history," says Lt. Gen. Lawrence A. Skantze, Air Force Deputy Chief of Staff for Research, Development and Acquisition. "If you go back to the mid- to late-1970s when we were initially developing the program, we had problems with it. Infrared tracker development at that time was not as sophisticated as we needed, and it could be spoofed by cannon fire and hot rocks and what have you. What I would now call ancient history tends to persist, though, and a lot of the critics are going back to that, not necessarily looking at what we've

The Infrared Maverick takes out a truck on the Eglin test range. Usually thought of as an antitank weapon, the AGM-65D has also demonstrated its effectiveness against a variety of other targets, including vans, hangarettes, and boats.

accomplished, say, in the last six months to a year in the program."

Responding to a June 1982 GAO report critical of the IR Maverick, for example, the Defense Department said the GAO analysis was based largely on 1977 and 1978 data and had not considered most of the recent test results in full-scale development. This is especially significant, because after those early tests the IR tracker was redesigned from an analog system to a digital one.

Slipped schedules and cost overruns have hurt the IR Maverick's reputation, and there have been problems with reliability and maintainability. The R&D contract was for a fixed-price incentive-fee, so after costs exceeded the ceiling, further expenses were borne by Hughes. Production costs grew, too, and for three reasons: inflation, increased complexity—such as the conversion from analog to digital—and restructuring of the acquisition, leading to program delays and less than efficient rates of production. It now appears the unit cost for IR Maverick will be $100,000.

"I think our concern for the cost now is to get an efficient production rate," General Skantze says. "That's what's going to bring the cost down for us."

The decision to go into limited pilot production was postponed for several months last year to allow for completion of the initial operational test and evaluation process after a series of launch failures. However, long-lead funding for the IR Maverick was provided.

Only two of the six failures in the launch program were guidance-related. Two were caused by simple solder joint failures, another by inadvertent grounding of the g-bias signal, and a fourth by a software coding error. No problem was found with the basic integrity of the system.

The Air Force says it has a correction for every technical problem discovered in development and operational testing, and in December began flying reliability and maintainability validation tests to demonstrate those corrections. While acknowledging that the program has not been a model acquisition, the Air Force believes the IR Maverick is a missile it can go to war with.

TV and Its Limits

The first Maverick, the TV-guided A model, has been in use since 1973. It was among the first of the "smart" missiles that revolutionized air-to-ground warfare. One hundred Mavericks have been launched in combat—most of them by the Israelis—and eighty-seven of these were direct hits. Another five were deliberate near misses that disabled their tank targets, as intended, rather than destroying them. (By contrast, one study finds that the probability of hitting a tank with an iron bomb is less than four percent, and that with a nonprecision guided munition, the probability is twenty-eight percent.)

Despite this, critics have indicted the TV Maverick along with the IR Maverick in the present controversy, contending that the whole family of missiles is unworthy. The main complaints about the TV Maverick are that it cannot find a camouflaged tank if the target melds into green vegetation, and that it does not work in darkness or in low-visibility conditions. These accusations are true, but they do little more than define the limits of electro-optical technology. A black-and-white television sensor requires a reasonable amount of light and contrast to produce an image. As for tanks blending into the vegetation, that should not be much of a factor on a European battlefield, with armored vehicles moving by the thousands.

The inability of the TV Maverick to function in darkness or under conditions of poor contrast is more serious, and is a prime reason why the infrared system is needed.

The IR seeker in the nose of the AGM-65D senses minute differences in temperature. A vehicle that has not been operating for hours, or even a building, will give off enough heat for Maverick to spot. The tracker can lock onto objects either hotter or colder than their surroundings. A mechanical scanning system converts these infrared readings to a TV-like image on a screen in the cockpit of the launching aircraft. Darkness does not hamper the IR seeker. In fact, it may work even better after the sun goes down, since the temperature difference—

The IR Maverick, here mounted on an A-10 aircraft, is just over eight feet long and weighs about 500 pounds. Its digital centroid tracker picks up heat generated by a target, calculates the target's center, and guides the missile. The A-10's cannon and the IR Maverick complement each other. The gun is a certified tank-buster, but does not have the missile's standoff range.

and thus the IR signature—between a tank and the landscape is likely to be sharper.

Night and Weather

"The IR Maverick is a major new factor in nighttime fighting," says Lt. Gen. Thomas H. McMullen, Commander of the Aeronautical Systems Division. "We know we're going to have to fight at night. The enemy is going to fight at night. We cannot afford the penalty of operating only during the daytime and in VFR conditions, because in Europe that would sometimes keep the Air Force out of the game for extended times. In fact, in the winter it would leave us out, on the average, twenty hours each day."

The AGM-65D is now billed as having a "limited adverse weather" capability, which GAO notes is a change from the previous wording of "adverse weather." The extent to which foul weather degrades the IR Maverick's performance has been a major point with some of its critics.

"The majority of the DT&E and IOTE tests we ran were in humidity conditions representative of European winter or European summer," says Col. Thomas R. Ferguson, Maverick program director at the Aeronautical Systems Division. "In all of those cases, we found that the missile performed satisfactorily. We do not see the humidity conditions you could expect to see in Europe as having any kind of operational impact on the missile. The effect of very high humidity is that you have to drive in a little closer to the target. It doesn't mean the missile is not effective.

"As far as heavy rain is concerned—yeah, it's a limitation. But it's not a *Maverick* limitation—it's a limitation that you have in any kind of a target acquisition system that uses an IR signature. You're going to have degraded performance in any kind of condition that knocks down the signal, and obviously heavy rain is a very bad condition. You have the same situation in heavy fog or a very heavy snowstorm. On the other hand, there will also be some conditions of rain, fog, and snow where the missile *will* be effective."

Given all this, General Skantze says that "in the central region of Europe, the IR Maverick triples the amount of time you have available to use your aircraft effectively against armored vehicles."

Operational Concept

IR Maverick can acquire targets in a variety of ways. It can be cued, for example, by the Pave Tack infrared sensor or the electronic sensor of the Wild Weasel defense suppression system. Compatibility with these systems was proved during operational testing.

"The predominant method of attack, however—certainly predominant if you're talking about the A-10—begins with pilot pre-briefings of targets in a pilot's normal area of attack, an area he's already familiar with," says Colonel Ferguson, the Maverick program director. "Intelligence sources are going to say there are armored vehicles in such and such a location. Prebriefed, the pilot goes in to his initial point, heads to the target area, uses the Maverick to look, and if he has targets in the kinds of formations he would expect to see, he can assume that's his target.

"A critical assumption here is that you're going to be operating in a very target-rich environment. The misconception, I think, has been that the pilot will be operating against very few targets in areas for which he will not have very much familiarity, and not knowing where the target is, he will have to use Maverick to search a fairly wide area to find his target. That is not the operational scenario as we see it."

The method of attack—and the choice of weapon, for that matter—depends on the situation. The missile and the gun complement each other.

"If you can get close enough, then you might as well shoot 'em in the eyes with the gun," says Maj. Nick Nicolai, a pilot with more than 1,100 hours in the A-10 and who flew many of the IR Maverick tests. "The gun is cheaper, and it's more reliable. In cases where you have friendly troops in extremely close contact with the enemy, you probably wouldn't use an IR Maverick except in a dire emergency. There are minimum distances established for all weapons in our inventory.

"I think the IR Maverick is

great—but it's not always great. Just like the TV Maverick and the gun are sometimes good and sometimes not good. I have to take a given situation on a given day, with given weather constraints, the way I feel, the way the airplane has been performing, what the enemy has been doing. Then I dig into my bag of tricks and apply the ones that I need to defeat a target and survive. Tactical flexibility is the key to my survival."

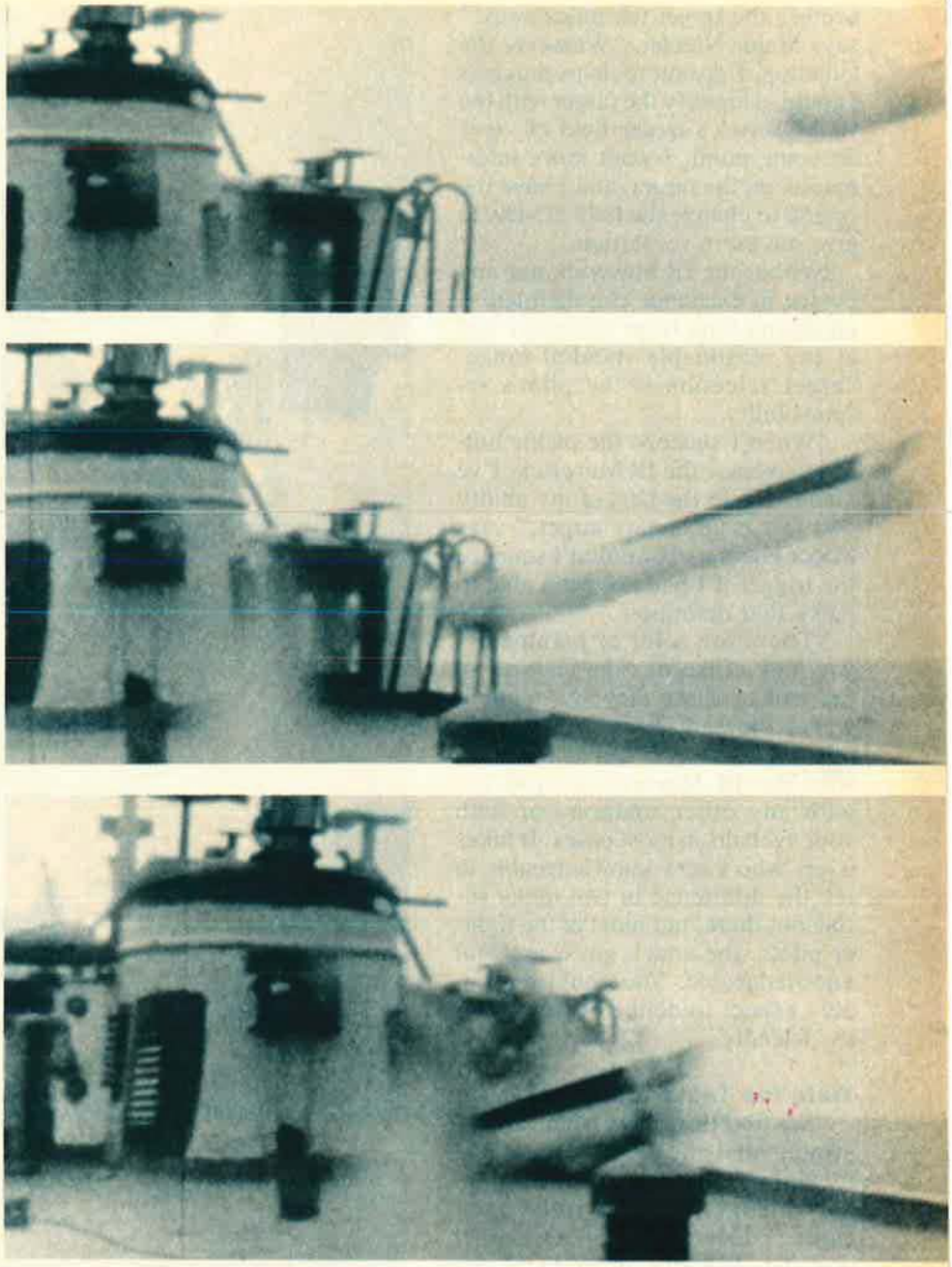
Quality of the Image

The pilot will have a great deal of information in addition to what he can see on his cockpit screen, but the quality of the image on that screen has been central to much of the criticism of IR Maverick. Variously, it has been charged that all a pilot can see on his display is "a bunch of bright spots," that he cannot pick a valid target out from thermal clutter on the battlefield, that the sensor's narrow field of view is like "looking at the world through a drinking straw," and that Maverick cannot tell an enemy tank from a friendly one.

In a series of videotapes of Maverick engagements shown to AIR FORCE Magazine, even an untrained eye could distinguish tanks at a considerable range, and fine details became clear as the sensor moved closer in. An experienced pilot can, of course, read much more from those images. Program officials are taken aback by the "bright spots" accusation, because the picture on the screen is pretty good.

The Air Force says that in IR Maverick operational testing, pilots found they were able to lock onto armored vehicle targets with a high degree of confidence. They had no difficulty in sorting out armored vehicles from other vehicles. Nor were they confused by burning hulks or such thermal clutter as burning oil barrels set out on the range. Even in earlier testing, the missile's breaking lock after acquisition—a problem since fixed—was more of a concern than its locking onto objects other than valid targets.

Last year, Dr. Alton G. Keel, Jr., Assistant Secretary of the Air Force for Research, Development and Logistics, told Congress that in operational testing the IR Maverick had demonstrated a sixty to eighty percent probability of acquiring a valid target.



The IR Maverick scores a direct hit on a sixty-five-foot moving utility boat target in the Gulf of Mexico near Eglin AFB, Fla.

The IR Maverick has a three-degree angle of view, which can be focused down to one and a half degrees for better resolution. While this does not provide a panoramic view, three degrees takes in a fair amount of real estate when the angle begins spreading out from a standoff distance. An ample stretch of the target area was visible on the tapes shown to this magazine.

"In tests at Fort Riley, we saw columns of tanks with at least nine vehicles in the line of attack," says Major Nicolai.

The pilot will seldom be patrolling a broad area with nothing but the Maverick seeker to point him toward the target. Most of the time, intelligence sources, forward air controllers, and various cuing aids will have gotten him in the proper vicinity. The standoff acquisition range and the desired field of view depend on the circumstances.

"If tanks are rolling across sand or dirt or something, or if there's been a battle going on and I can see smoke and flames, I might visually

acquire the target ten miles away," says Major Nicolai. "Whatever the situation, I'd want to do as much as I could to identify the target with the IR Maverick's larger field of view. At some point, I want more information on the target, and I have the option to change the field of view to give me more resolution."

Neither the IR Maverick nor any device in existence can distinguish an enemy tank from a friendly one at any reasonable standoff range. Target selection is the pilot's responsibility.

"When I squeeze the pickle button to release the IR Maverick, I've made sure to the best of my ability that this is an enemy target," says Major Nicolai. "I wouldn't squeeze the trigger if I had not been able to make that definition.

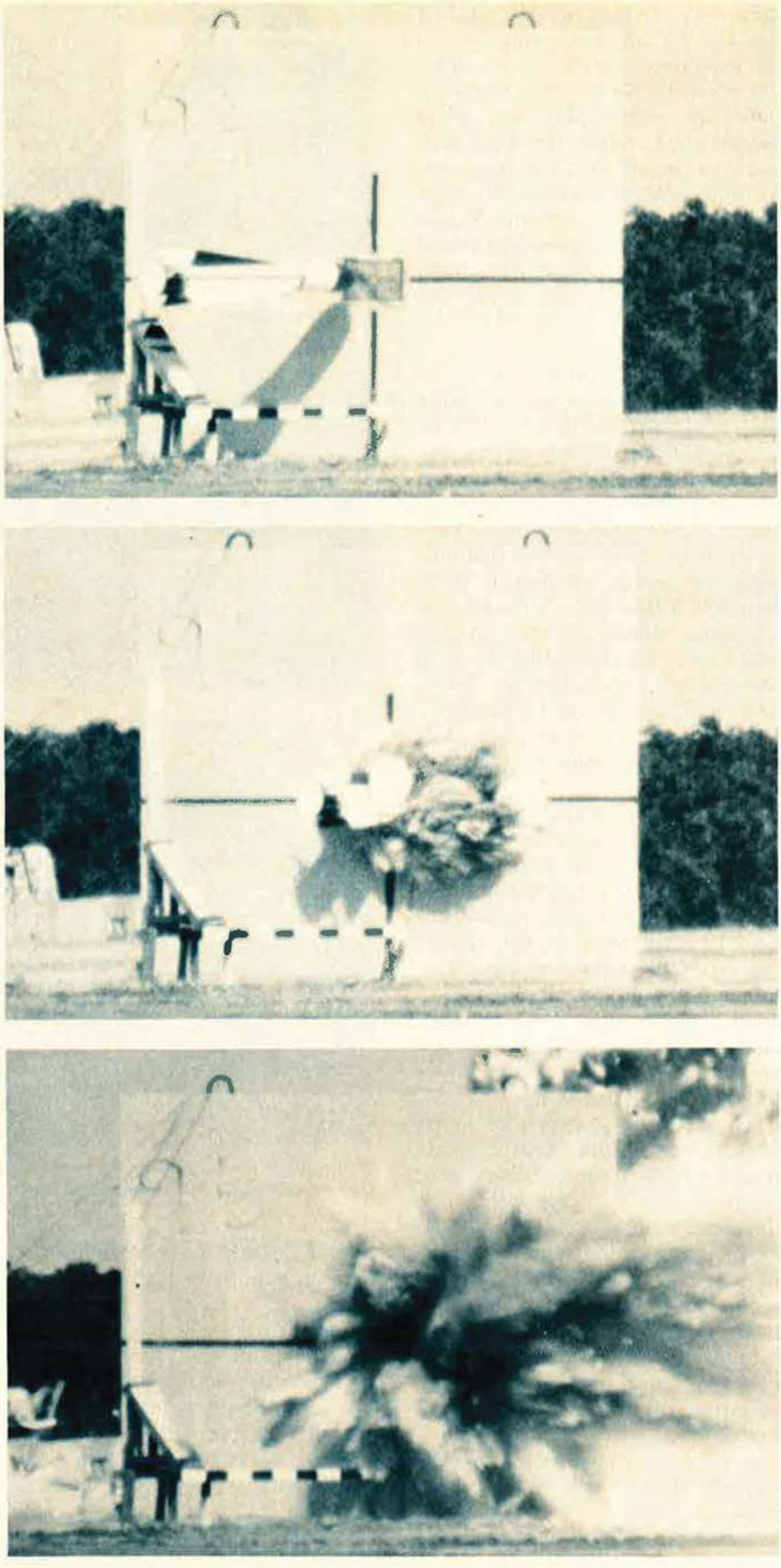
"There are a lot of parameters you look at besides the features of the tanks: where they are pointed, where they are in respect to each other. I think you can tell as well with the IR Maverick as you can with any other weapon—or with your eyeballs in most cases. It takes a guy who's very knowledgeable to tell the difference in two tanks sitting out there, but most of the fighter pilots, the attack guys, are *that* knowledgeable. You could reasonably expect to define Soviet armor vs. friendly."

Were the Tests Too Easy?

"We find that it has been demonstrated that the IR Maverick had limited success when operating under relatively benign test conditions," last year's GAO report charged. "On the other hand, we find that it is not known whether the IR Maverick can work well under less-than-favorable test conditions, as may happen in combat."

The main shortcomings cited by GAO were that the pilots quickly became familiar with the test ranges and visual landmarks because they flew repeated missions in the same small areas, that target briefings had told them what to look for, that "potentially serious operational constraints were omitted from the testing," and that the environment did not adequately simulate a battlefield.

The Air Force does not regard these criticisms as valid. Pilots do learn a test range after awhile, but



In this sequence, an AGM-65E Laser Maverick scores a devastating bull's-eye on a reinforced concrete target at Eglin. It has a blast/fragmentation warhead, more powerful than the shaped-charge warhead in the television and infrared versions of the missile.

during wartime they would also be flying repeated missions in the same areas of attack, and they would have substantial knowledge of those areas ahead of time. Certainly, they would have been briefed in detail on targets and cues to watch for.

The test ranges are relatively small because the areas available for live firing of ordnance are limited. This was partially compensated for by vectoring aircraft in from longer distances and from varying orientations. The lengthy test program included not only launches but also hundreds of hours with the missile in airborne captive carry—during which much larger test areas were used and in which target acquisitions were run.

Early developmental tests—on which the bulk of the GAO commentary was based—were designed to test specific attributes of the system. Complexity and operational realism increased as the program moved toward full-scale development and operational testing.

Launch velocities and altitudes were consistent with the battle tactics of the five types of aircraft—F-4s, A-10s, A-7s, F-16s, and F-111s—that flew the tests. "Environmental test conditions ranged from hot and humid at Eglin AFB, Fla., to snow background at Fort Drum, N. Y.," the Air Force says. "Realistic battlefield clutter such as disabled vehicles and burning hulks, countermeasures, as well as smoke camouflage were used to simulate expected conditions."

Reliability and Maintainability

Two major reliability and maintainability standards were set for the IR Maverick. It has already met one of them, demonstrating a thirty-six-hour mean time between failures.

The other is more elusive. The requirement is that the missile have an eighty-five percent probability of working properly after fourteen hours in captive carry. So far, the test results have fallen short of that. Program officials say the standard would work out to a mean time between maintenance of eighty-six hours, which may be unreasonable to expect. The TV Maverick, a mature system on which reliability has been good, averages only sixty-six hours between maintenance.

"I think a mistake we made was to establish a threshold for reliability and maintainability that was based on the current TV Mavericks out in the field," General Skantze says. "That system has a degree of maturity that we're not at yet with the IR. I don't see any reason to change the standard at this point. I think a lot of people recognize that it's a mature standard. We're going to get as close to it as we can. The trend data's there that says we are now moving up the curve."

Alternatives

There has been some suggestion that the Air Force cancel IR Maverick and go instead with the AGM-65E laser-guided Maverick, which is being built for the Marine Corps. That missile has a blast/fragmentation warhead, more powerful than the shaped-charge warhead in the TV and IR versions. Accuracy of the laser Maverick in operational evaluation tests has been sensational—fifteen hits in fifteen shots.

The Air Force was once in the laser Maverick program, and is still acquiring it for the Marines, but plans to buy none for itself. The main problem is that the AGM-65E requires a designator, either on the ground or airborne, to continue playing a laser beam on the target up until the missile impacts. The Air Force wants a weapon that it can launch and leave.

Looking ahead—beyond electro-optical, laser, and infrared technology—the next generation of anti-tank weapons will possibly employ millimeter wavelength radar. That could overcome some of the limitations of the older technologies, but millimeter wave weapons are still several years into the future. The Soviet and Warsaw Pact armored threat to Europe is in place now.

The Air Force sincerely believes the IR Maverick is a good system, and wants the capability it can add for operating against armor at night and under the weather.

It is not a perfect weapon, but much of the criticism made against it appears ill-founded. Nothing else that might do the job better is in sight. ■

The Laser Maverick homes on a moving tank target. Its accuracy is impressive, but requires that a laser beam be played on the target until impact. The Air Force is acquiring Laser Maverick for the Marines, but does not plan to buy any for itself.

AIRMAN'S BOOKSHELF

An Air Force Reborn

Red Phoenix: The Rise of Soviet Air Power 1941–1945, by Von Hardesty. Smithsonian Institution Press, Washington, D. C., 1982. 288 pages, including appendices, bibliography, and index. $22.50.

On June 22, 1941, Hitler launched "Operation Barbarossa," the surprise attack against his erstwhile ally, the Soviet Union. A key element of the attack was a preemptive air strike by the Luftwaffe.

That this air strike was a success is an understatement. By the end of the first week, almost fifty percent of the Soviet Air Force had been destroyed, and Germany held firm control of the air. Most of the approximately 4,000 Russian aircraft lost were destroyed on the ground. And yet by 1945 the Soviets "had built huge air armies, had shrewdly adapted [their] operational art to serve the Soviet Army . . . and had narrowed, if not closed, the technological gap with the Luftwaffe." These assertions, and an examination of a neglected aspect of what the Soviets call the "Great Patriotic War," is what this book is about.

Author Hardesty feels strongly that the heretofore little-known "resurrection" of the Soviet Air Force is worthy of attention. A specialist in Soviet airpower, Hardesty is an associate curator of the National Air and Space Museum. His expertise, coupled with his academic credentials—a doctorate in Russian history—lends credibility to his account. The book is thoroughly documented, with an exhaustive bibliography and a strong array of appendices covering such matters as the organizational makeup of the Soviet Air Armies, sortie records, aircraft production figures, aces, and so on. The use of imaginative maps and illustrations and some 150 photographs—many rare and appearing here in their first publication—adds immeasurably.

This look at the air war in the East of necessity focuses on key battles, such as Moscow, Stalingrad, and Kursk. But it also examines development and execution of doctrine, the life of an air force member in both training and combat, and the pervasive influence of the Communist Party. The author also incorporates personalized reflections of pilots, commanders, and others—many from Russian memoirs—which add verisimilitude.

For example, one of the little-known aspects of this air war—the *taran,* or ramming technique used by the Russians—is described fully. Readers, especially pilots, should find interesting the explanation of the three variants of this technique. More than 200 ramming attacks were made on the Luftwaffe, and although at first blush the techniques seem similar to the Japanese kamikaze attacks, the author explains how they differed. (One obvious difference is that some twenty pilots were credited with multiple *taran* downings.)

Women in the Soviet Air Force during this period flew an unrestricted gamut of missions from light-plane sorties to night-bombing missions in open-cockpit biplanes. The book notes that several women were cited for combat prowess. One woman pilot, Lilya Litvyak, downed twelve German planes before her death in 1943.

Good coverage is given the sometimes uneasy alliance between Allied and Soviet forces. The Soviets, of course, were eager to obtain supplies via Lend-Lease. More than 14,000 aircraft eventually traveled this route, many being turned over at Alaskan bases where American and Soviet crews and ground personnel had fairly friendly relations.

Not so smooth, the author tells us, was the plan to base American bombers on Russian soil. The Soviets showed little interest in cooperating. Yet, fearful of disruption of the flow of Lend-Lease material, they finally made available three air bases. How this effort foundered makes for interesting reading. The author makes a strong case that it was primarily due to the Russian failure to protect the airfields from the Luftwaffe—for example, forty-seven B-17s were destroyed on the ground at Poltava in an action that saw no Soviet night fighters launched and only sporadic anti-aircraft fire from Soviet batteries.

The author puts forth the thesis that the lessons of the "Great Patriotic War" remain "powerful conditioning and limiting factors on developments in the Soviet Air Force." Exactly how true that may be is, of course, open to debate. But in any event, this book—well researched and eminently readable—should be of interest to anyone seeking an insight into the Soviet Air Force of today.

—Reviewed by James A. McDonnell, Jr., Military Relations Editor.

Space Flight for the Ground-Bound

The Space Shuttle Operator's Manual, by Kerry Mark Joels and Gregory P. Kennedy, designed by David Larkin. Ballantine Books, New York, N. Y., 1982. 160 pages, with illustrations and glossary. $9.95.

"You are about to embark on a spectacular adventure, blazing a trail for future space travel in the world's greatest flying machine." So state the authors of this innovative book, an unclassified manual for flight aboard the Space Shuttle.

The book is arranged so that the reader, as the mission commander, can easily follow the progress of a flight from boarding to landing. The book, detailed superbly with diagrams and illustrations throughout, is divided into seven sections. The first three sections guide the reader from earth to orbit and explain how to live and work aboard the Space Shuttle.

The reader is presented a typical flight mission profile that starts with prelaunch checks—making sure all switches are set correctly—and ends with landing the Orbiter. Joels and Kennedy even list general computer codes for using the five on-board computers during the mission.

Crew information—such as location and size of crew compartments

and storage areas, and how to enter and leave flight deck areas—is described and illustrated.

A special treat is the detailed countdown checklist that starts at T minus five hours from takeoff and ends when orbit is reached at T plus forty-six minutes and thirty-four seconds. The checklist even includes a dialogue between you, the Shuttle commander, and the ground controller.

Once in orbit, data is provided on how to accomplish such everyday activities as eating (typical crew menus are listed) and sleeping. Also included are chapters on personal hygiene and waste management. The reader learns how to operate the remote manipulator arm, the space telescope, and the data relay satellite.

Section Four details possible malfunctions and explains what to do if an emergency should occur. Launch aborts, in-flight vehicle and medical emergencies, and entry and landing problems are covered. This section also details, in case you have to transfer to a rescue craft, use of the personal rescue enclosures—the thirty-inch-diameter one-man fabric spheres.

Entry and landing procedures are outlined in Section Five. Critical instructions are boldly labeled "READ BEFORE LEAVING ORBIT." Section Six takes a look at the future of spaceflight. Readers can anticipate missions that are still on NASA's drawing boards, such as satellite repair, Spacelab, space telescope deployment, and earth resources satellite deployment. A special fold-out, four-color orbital map is available to track the missions.

Section Seven includes technical information on the Orbiter, tank, and boosters.

Since seats for any Shuttle enthusiast on a live mission will be scarce for years, this book is the next best thing. The manual is an ambitious effort that will quench the thirst of those who want to learn more about the remarkable Space Shuttle system.

—Reviewed by Capt. Michael B. Perini, USAF, Contributing Editor.

New Books in Brief

The American Military and the Far East, edited by Joe C. Dixon. A record of the proceedings of the Ninth Military History Symposium held at the Air Force Academy in 1980, the papers and discussions in this book range beyond the narrow boundaries of "military history" to address the larger question of American objectives and strategies in Asia. The salient consensus of the Symposium is that an American orientation toward Europe and a concomitant American ignorance of Asian affairs and culture have resulted in misperception on both sides of the Pacific and an American tendency to improvise policy in dealing with the Far East. Whether one agrees or not with this theme is a secondary consideration, for the value of this book lies in its stimulating discussion and analysis of a subject too often neglected by military historians. With notes and index. Available from Superintendent of Documents, US Government Printing Office, Washington, D. C. 20402, 1982. 318 pages. $7.

Dust Off: Army Aeromedical Evacuation in Vietnam, by Peter G. Dorland and James S. Nanney. US Army helicopter ambulance "Dust Off" units—the name deriving from the units' tactical call sign—evacuated about 900,000 injured and sick American and allied personnel and civilians in Vietnam from 1962 to 1973. Though helicopter evacuation had been used during the Korean conflict, it was in Vietnam that the potential for battlefield aeromedical evacuation was fully realized. Relying on histories of Dust Off units and more than fifty interviews with former Dust Off pilots and commanders, the authors have produced the full story—from the supply problems in the early days to the final maturing of a workable system and withdrawal. With map, bibliographical note, and index. Available from Superintendent of Documents, US Government Printing Office, Washington, D. C. 20402, 1982. 134 pages. $5.50.

Intelligence Requirements for the 1980s: Clandestine Collection, edited by Roy Godson. Based on the proceedings of the fifth colloquium of the Consortium for the Study of Intelligence, this book seeks to define the sort of intelligence information the US will need in this decade, examines which conditions are likely to affect US collection efforts in the coming years, and scrutinizes the question of how best to obtain the necessary information. Though directed toward the intelligence specialist, the general reader should find this book of value in charting current thinking on the intelligence challenge of the 1980s. Published by the National Strategy Information Center, 1730 Rhode Island Ave., N. W., Washington, D. C. 20036, 1982. 232 pages. $8.50.

Jet Planes of the Third Reich, by J. Richard Smith and Eddie J. Creek. This remarkably definitive work should stand as a respected reference on the subject for years to come. In addition to the highly detailed and comprehensive text, this volume contains 500 photographs, 260 line drawings, forty color photos, several technical and historical appendices, and even a "survivors' manifest" of German jets still existing in the West. Of special interest is the story of the *Volksjäger,* or people's fighter—a small, simple jet that was to be mass-produced and flown by unskilled pilots near war's end. Perhaps the only drawback to this book is its rather steep price. With index. Monogram Aviation Publications, 625 Edgebrook Dr., Boylston, Mass. 01505, 1982. 400 pages. $69.95.

Science Fiction and Space Futures, Past and Present, edited by Eugene M. Emme. Though possibly a bit esoteric for the average reader, the science-fiction fan is sure to enjoy this examination of the historical role and effects of speculative scientific fiction and film on real-world attitudes and achievements in space exploration. Topics include a historical survey of space literature, space fiction in art and film, the relation of science fiction to attitudes toward technology, the reality of science vs. science fiction, and a look at religion and ethics in science fiction. This book is the result of the proceedings of the third American Astronautical Society History Symposium. With illustrations, appendices, and index. Published for the American Astronautical Society by Univelt, Inc., P. O. Box 28130, San Diego, Calif. 92128, 1982. 270 pages. $35 hardcover, $25 softcover.

Yours to Reason Why: Decision in Battle, by William Seymour. Have you ever imagined that, in a different time and under different circumstances, you could have been a great field marshal, matching wits with a Henry V, Napoleon, or Lee? Here's your chance. The author recreates famous battles and campaigns,describing the opposing forces, personalities, background, and particular situations, and then pauses during crucial stages of each action to explain the options available to each commander. The reader is then invited to choose an option and see if the choice agrees with that of the real commander. This device certainly enlivens a subject that, for the general reader, can often prove quite tedious. With illustrations and maps, bibliography, and index. St. Martin's Press, New York, N. Y., 1982. 338 pages. $17.95.

—Reviewed by Hugh Winkler, Ass't Managing Editor.

THE LESSONS OF VIETNAM

BY GEN. T. R. MILTON, USAF (RET.)

It has been a decade since the United States signed the Paris Peace Accords. That agreement signaled the American withdrawal from Vietnam. It did not end the influence of that undeclared war on this nation.

OUR failed adventure in Vietnam continues to cast its shadow on events today. The very name Vietnam has become a code word meaning, to a substantial vocal element in this land of ours, any exercise of military power—however small—in support of national policy. Because we are faced with grave threats, perhaps the gravest ever, in Latin America, the Mideast, the west Pacific, wherever we look, we must exorcise the Vietnam ghost if we are ever again to assert ourselves with confidence. It will not be easy.

Vietnam was our longest war. It is difficult to say just when it started or even, for that matter, when it ended, for Vietnam was a war we never declared. It was our first guns *and* butter war, with no declaration of hostilities, no mobilization of reserves, just a business-as-usual war with only the combatants inconvenienced.

It was a war in which the aberrant behavior of a young misfit with lieutenant's bars attracted far more attention than daily acts of heroism, most of which will remain forever unnoticed. The fact that Lt. William Calley of My Lai infamy was commissioned at all is a reflection of national attitudes. Too many of our better-educated young men had figured out ways to beat the system, thus making it necessary to commission the Calleys.

It was a war we never declared, never supported by even the slightest national denial, and, if we did not win it, we didn't lose it either. We simply quit.

Finally, just to leave a lasting bad taste in the mouths of those who did go to that war and who performed honorably, President Carter welcomed home the deserters with what seemed more warmth than had ever been shown the veterans, welcomed Tom Hayden to the White House, and rewarded Ramsey Clark by making him a special envoy. It was, all in all, a sorry era.

It is difficult to mark a beginning date for the Vietnam engagement.

USAF B-52s like this one brought the North Vietnamese back to the bargaining table. (USAF photo)

Reprinted by permission of the Eaker Lecture Fund, Association of Graduates, US Air Force Academy.

Perhaps it began with the French surrender at Dien Bien Phu in 1954 and the Geneva accord that followed later that year. As has so often happened in the history of diplomatic settlements—we need look no farther back than the divisions of Europe and Korea for evidence—the demarcation line negotiated by the diplomats in Geneva made no sense, either ethnic or geographic. More than a million Vietnamese came south below that new and artificial boundary, and a considerably lesser number headed north to the promised joys of communism, leaving behind well-trained Communist cadres. The United States, meanwhile, began taking on new responsibilities in Saigon from the French. Our military assistance efforts in the late '50s were almost totally ground-force oriented. It was to be an army modeled after our own, capable of turning back a formal invasion by regular forces from the North. Little attention was given to developing either an Air Force or a Navy. The Army was where the money went. Meanwhile, the Viet Minh, supported from the outset by the Ho Chi Minh regime, had begun its work.

Humiliating Setback

Here at home, a new and glamorous young President had received a humiliating setback at the Bay of Pigs only a few months after a stirring inaugural speech in which he had promised we would go anywhere and do anything in the defense of liberty. What he would not do, it turned out, was to provide the air cover necessary for the success of that little excursion, but that is another story. What we are concerned with here is Vietnam, and that came into focus for John Kennedy in the fall of 1961.

Alarmed by the increasing success of the Viet Minh, he dispatched, in September 1961, Gen. Maxwell Taylor—then retired and serving as a White House advisor—along with Walt Whitman Rostow and an assorted group of experts, aspiring experts, and bureaucratic opportunists to Saigon. The purpose of this expedition was to find out what America needed to do to prop up President Diem's South Vietnam: not whether we should do anything, you understand, but what we should do.

Along the way, the Taylor group picked me up. I was then commanding the Thirteenth Air Force in the Philippines, but whether I was added to the party as the representative of Admiral Felt, Commander in Chief, Pacific, or as that of General LeMay, Air Force Chief of Staff, was never clear. Both these gentlemen informed me separately I was their man, along to keep the game honest.

Maxwell Taylor was an object of suspicion, particularly in the Air Force. He had left the Army after a distinguished career, bitter over the Eisenhower Administration's reliance on a strategy that left the Army in an inferior position at budget time. His book, *The Uncertain Trumpet,* a well-written denunciation of that strategy, became a best-seller. It also attracted the attention of John Kennedy and resulted in Taylor's appointment as Presidential Military Advisor, an appointment that made the active-duty establishment distinctly uneasy.

Anyway, General Taylor accepted me as an addition to his group without questioning my sponsorship. And, it is fair to add here, I soon became an admirer of Maxwell Taylor's formidable intellect, whatever his service bias—a bias, incidentally, that did not surface during our Vietnam survey.

Walt Rostow was the number-two man in this expedition, a noted economist, all-around academic intellectual, and New Frontier star. Fortified with unbounded self-confidence, he was never in doubt about anything, at least not to my knowledge. Rostow had theories about counterinsurgency, and never mind his total lack of practical experience. He was eager to put these theories into practice. And so the disenchanted retired General with his deputy, the ebullient academician who "knew everything," in the words of Norman Podhoretz, led us into Vietnam.

It was the beginning, as closely as we can put a finger on it, of our Vietnam War.

President Diem received us cordially, if somewhat shyly, for he was not an outgoing man, and he spoke no English. His French, however, was fluent and, happily for our small group, so was General Taylor's. Thus we negotiated the first uneasy steps of an enlarged involvement in Vietnam's struggle against a Communist insurgency. It was clear to us that day that President Diem was an exceptional man, educated, dedicated to his country, and essentially selfless in that dedication. It also became clear, quickly enough, that he was out of touch, a mandarin isolated in his palace and subject to the manipulations of his Rasputin brother, Nhu, and Nhu's beautiful dragon-lady wife.

The First Crossroad

In retrospect, this was our first crossroad, and we took the wrong route, for we plunged ahead in our planning for American military involvement without first getting a political hold on Diem. That was the time to put our own *éminence grise* in the Saigon Palace. In fact, we had such a man who could have pulled it off. He would doubtless have been acceptable to Diem on the basis of a past close relationship, but he was anathema to our own State Department. I am referring, of course, to the then recently retired Maj. Gen. Edward Lansdale, USAF, the behind-the-scenes hero of Magsaysay's triumph over the Philippine Huks, and the "Quiet American" of Graham Greene's sardonic novel about Saigon in the early '50s. Ed Lansdale's methods, however successful, were too unorthodox for the diplomats.

At any rate, we chose to work through accepted channels, depending on cooperation and persuasion to get our way. In the judgment of at least one expert at the time, a key British figure in the Malayan insurgency, we were destined to fail in Vietnam unless we held a firm political grip on the country. He put it to me in more colorful four-letter language, but that was the idea. If the British expert was right, we had

made our first mistake. Perhaps, in view of what happened to Diem and the steady downhill run of successive South Vietnam governments, it was also one of our most costly ones.

It is difficult now, at this growing distance, to realize the arrogance, the almost incredible self-assurance, of our civilian leaders in those early and heady days of the Vietnam adventure. This was to be the great experiment in counterinsurgency, the vindication of President Kennedy's inaugural promise. The same people who viewed themselves as members of an elite intellectual establishment became the strategists, and even the tacticians, of this battle against the Viet Minh.

For all their intellectual superiority, however, they were blind to one simple fact: The United States was engaging itself in Southeast Asia without a strategy. We were concentrating on a place called South Vietnam, and there were maps to prove its borders existed. In real life, the borders did not exist, and Ho Chi Minh knew it. He, unlike our intellectuals, did have a strategy, one designed to win Indochina.

So that is how we started out, with the best intentions in the world, honorable intentions by any standard, but wholly innocent of the realities. We were determined to put down an insurgency within an artificial state. Ho Chi Minh had in mind the consolidation of all of Indochina—Vietnam, Cambodia, and Laos—under Hanoi's rule. He must have had trouble believing his luck when we declared North Vietnam, Laos, and Cambodia out of bounds.

That is not to say we didn't do some interesting things in Laos, but they were peripheral, mainly clandestine, and, in the end, of no real importance. The point is still this: Our initial efforts in Indochina were to be confined within the borders of South Vietnam. In all likelihood, we were the only people in Southeast Asia who really believed those borders existed.

The first cadres under the revitalized Vietnam military assistance effort, as recommended by General Taylor, were an impressive lot. On the Army's part, they were regular and highly trained professional soldiers, and they came willing and able to straighten out the bedraggled Vietnamese Army. As for the Air Force, we put in our first special forces unit, nicknamed Jungle Jim, and they too were there to do a job. The Vietnamese Air Force had never amounted to much: its commander, for instance, was a lieutenant colonel and thus too far down the pecking order to get even a word in at the palace. Besides, President Diem did not trust his aviators, a suspicion confirmed only a few weeks after we had gotten him to loosen the ties on his Air Force, when two of his pilots bombed the palace, then flew off to Phnom Penh.

Stage Set for Diem's Downfall

As it happened, this event took place while a Southeast Asia Chiefs-of-Mission Conference was taking place at Baguio in the Philippines. Out of curiosity, I had sent two reconnaissance airplanes over the Saigon Palace to photograph the damage. Averell Harriman, the Assistant Secretary of State for Far Eastern Affairs and a man not noted, shall we say, for humility, was excited when he saw our pictures. "There," he said, "is our proof of Diem's unpopularity. Don't you agree?" I could only say that the pictures proved that two pilots had bombed the palace. Diem's downfall began that day in Baguio.

So there are two more of our initial mistakes: No strategy, and engineering a coup against Diem without realizing the level of incompetence among those who would succeed him.

Events in the Gulf of Tonkin the evenings of August 2 and 4, 1964, changed the nature of the war radically, but not nearly enough. Following the Gulf of Tonkin Resolution of August 7, 1964, by the Congress, the President was empowered to make retaliatory air strikes against the North. In other words, we now had two wars: One in the South, essentially supervised by the US Army, and an air war in the North under the auspices of the Navy and the Air Force. And here was a great Vietnam turning point. The targeting, the bomb loads even, became the fascinating preoccupation of the highest Washington officials. Our strategy, as devised by these politicians, became one of giving signals.

In those critical years between 1964 and 1968, before American public opinion had become mesmerized, the truly crucial targets were given sanctuary. Haiphong harbor, for instance, through which eighty-five percent of North Vietnam's imports passed, was off limits, as was the mining of that harbor. We had a plan to sink the dredge which kept Haiphong's channel clear. It was a simple and straightforward job for a few fighters, and it would probably have tied the harbor in knots for a long time. That plan was disapproved. Instead, our airplanes were to go on giving signals. The places where the signals were to be given soon became predictable to the North, and our pilots paid the price.

Those four years ending in 1968 were almost certainly the years of opportunity lost. Even the first air strike in retaliation for the Tonkin Gulf incidents was a single effort. Nothing more would happen until we had another reason to retaliate. Our purpose in making air strikes, as announced by Secretary of State Dean Rusk that August, was to prevent a Communist "miscalculation." It accomplished just the opposite, for it allowed North Vietnam a few months' time to get its air defenses in order.

Meanwhile, the war in the South became more and more our war, with an ever-increasing flow of US troops to the now curiously named Military Assistance Command, Vietnam. President Johnson, in the spring of 1965, had authorized the

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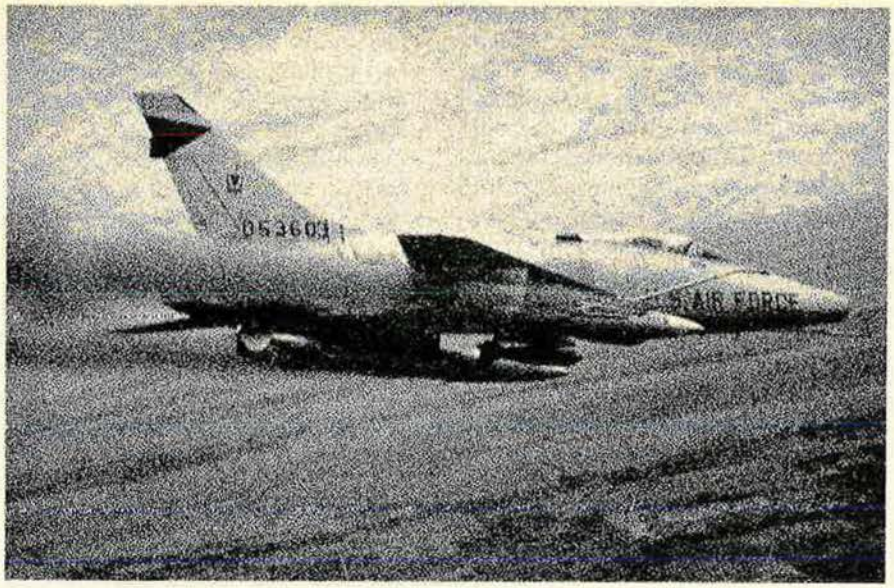
Gen. T. R. Milton's by-line is familiar to regular readers of this magazine through his monthly "Viewpoint" column and insightful feature articles on aspects of airpower. He commanded bomber units in Europe during World War II, and held a series of high-level command and staff positions after the war. Prior to his retirement from the Air Force in 1974, he was US Representative to the NATO Military Committee. This article is adapted from the fourth Eaker Lecture on National Defense Policy given by General Milton at the Air Force Academy in April 1982.



Early in the war, a USAF F-100 Super Sabre of the 481st Tactical Fighter Squadron fires two clusters of 2.75-inch rockets at a target in the Mekong Delta. (USAF photo)

use of US ground troops in offensive operations against the insurgents in South Vietnam. This was the beginning of our search-and-destroy strategy, our escalating troop commitment with a consequent increase in casualties and, hence, the mobilization of the antiwar effort. It was also the beginning of the last and most unhappy phase of the Vietnam conflict.

John McCone, then Director of the Central Intelligence Agency, was alone among the Washington hierarchy in his misgivings about this curious decision, one which unreservedly sent American men into ground battle while keeping a tight rein on our air forces. McCone, in a very private memorandum to Secretaries Rusk and Robert McNamara, objected to the limitations on air strikes. "With the passage of each day and week," he said, "we can expect increasing pressure to stop the bombing. This will come from various elements of the American public, from the press, the United Nations, and world opinion. . . . I think the North Vietnamese are counting on this."

Limited Effectiveness

McCone went on to say we were "starting on a track which involves ground operations which in all probability will have limited effectiveness against guerrillas." He urged, in this memo, increased use of air strikes against essential targets. In short, he advised taking the wraps off our airpower. If we were unwilling to do that, McCone said, we should not take the actions that would put our ground forces into combat. John McCone had it right, one of the few who did.

Despite this farsighted advice, we began the ground war in South Vietnam. For a long time it was Secretary of Defense McNamara's war, with body counts, captured rifles, and other detritus from the daily fighting fed into the Secretary's marvelous computer system. Thanks to that system, he was on top of every detail, and he worked long hours to stay on top. But this mass of information, the increasingly Byzantine command structure, the elaborate command posts at every level, and the blizzard of messages flying back and forth across the Pacific only served to obscure the basic and most important single fact about the Vietnam struggle: We had no strategy while the other side did. Laos and Vietnam were out of bounds for our side; the enemy, whose boundaries encompassed all of Indochina, could withdraw there whenever he was hard pressed. Targets in North Vietnam above the 20th Parallel were in forbidden territory, so the enemy, knowing this, could mass his surface-to-air missiles and antiaircraft artillery around the targets he knew we were going to hit.

Years later, President Nixon, out of frustration with Hanoi's tactics in the Paris negotiations, turned the B-52s loose on North Vietnam, the so-called Christmas bombings of December 1972. As Henry Kissinger has related it, Hanoi had become greedy.

The bombing began on December 18 and continued for eleven days, along with the mining of Haiphong harbor. Our press was outraged, and our relations in NATO were severely strained, notwithstanding the fact that the bombing was very accurate, sparing both civilian targets and civilians themselves far better than had been the case in World War II.

I was in NATO at the time and had to receive formal protests from several of my colleagues in the Military Committee. A particularly forceful complaint was read to me on behalf of his government by the Danish general who then asked if he could sit down. He undid his uniform jacket, accepted a cup of coffee, and apologized for what he had been required to do.

This Danish officer, an old friend, had been a German prisoner in World War II. Because he had been caught in the underground, he was not given military POW status but was, instead, doing forced labor in Hamburg when we and the British bombed that city. He said that according to Hanoi's own account of the B-52 raids, our Christmas bombing was a marvelously precise affair, the damage in no way comparable to the damage he had seen in Hamburg. He could not understand why we didn't make a better case for what we were doing.

We all know the results of those eleven days. Their antiaircraft missiles expended, their supply lines cut, the North Vietnamese came back to the peace table, and an agreement was quickly reached. We also have the word of Sir Robert Thompson, the celebrated counterinsurgency expert, that we had the war won that December and could have ended it on almost any terms we wished.

Already Far Too Late

It was, however, too late for us—years too late. The Christmas bombings of 1972 should have taken place in 1965, before we had filled the Hanoi Hilton with aviators shot down while carrying out the absurd strategy of giving signals, before the

ground war in South Vietnam had become our ground war with its never-ending search for an enemy to destroy, before this country had torn itself apart.

Our objectives in Vietnam were valid ones—perhaps, as President Reagan has said, even noble ones. True, the domino theory, which postulated the fall of Southeast Asia to communism if we didn't take a stand in Vietnam, has been only partially confirmed. Nevertheless, Indonesia reversed its slide toward communism during our long Vietnam commitment. The Philippines and Thailand remain outside the Communist orbit. Had we been indifferent to Southeast Asia in 1961, those three countries, along with Malaya, might have gone a different route. Even the fall of South Vietnam itself, after our pullout, was made inevitable when Congress cut off the military pipeline to the South Vietnamese we had left behind.

This final and vengeful act is inexplicable except in the context of the time. More than anything else, the denial of military supplies to our South Vietnamese ally was a product of Watergate, itself perhaps the most overblown affair in American history. Whatever the motivation behind this congressional action, the effect on South Vietnam's forces was predictable and calamitous. The Vietnamization process had worked surprisingly well as our troops were withdrawn, and the South Vietnamese forces, by the end of 1973, were beginning to make a credible showing. True, their retreat from the Laos incursion was a disorderly affair, a fact the entire American public knew from our ubiquitous press cameras. In fairness to the South Vietnamese, it is worth remembering there were no television cameras at Kasserine Pass or in the first days of the Korean War.

Anyway, we sold our allies down the river. People who had been trained by us, and who had been fighting for a decade trusting in our support, were suddenly facing a North Vietnamese invasion without ammunition, fuel, or spare parts. As it turned out, the North Vietnamese had a more reliable supplier.

We have seen the justification for our Vietnam involvement in the hundreds of thousands of boat people who have fled Vietnam, risking death and, at the very best, a bleak future, rather than facing life under the Hanoi regime. It is a strange and sad result for a conflict we could have won without hundreds of thousands of troops or a nation torn and divided. Maybe it would not have stayed won, but it need not have turned out the way it did. Those humiliating last days in Saigon, ending with the helicopter evacuations from our embassy roof, are a poor way for us to remember a war that was fought for a good end, and with great gallantry, by so many. For the Air Force Academy's own Lance Sijan, for example, whose heroism stretches the imagination, and for the aviators imprisoned in Hanoi, tortured and isolated, there is nothing in our history to equal their bravery.

We can conclude our reflections on this melancholy era with a few brief observations, the validity of which is for you to judge. It appears certain we will see a continuing, even rising, number of Communist-sponsored, and Moscow-supported, insurgencies in the world. Some are going to be very close to home, and we will have an occasional military role to play in defeating these insurgencies, if, that is, we are serious about remaining a world power.

We should, however, restrict that role to things we know how to do. Bashing around in a strange land with major formations of ground troops is not one of those things. Expert ground soldier advice with small cadres of professional soldiers is. So is the provision of air and naval support when the situation calls for that kind of effort, for these are things we know how to do better than anyone.

Dictates Accepted With Docility

Finally, I can't help wondering, in retrospect, why we in the military accepted the vacillating and arrogant dictates of our civilian masters with such docility. The wasted opportunities, loss of aircrews over meaningless targets, and arbitrary and senseless rules of engagement were all constantly on the minds of senior military men. Yet, no one turned in his suit in protest.

Maybe, and this is the view of many, that kind of protest—even by very senior people—would have caused no more than a ripple. The fact remains that something is definitely wrong in the way our military makes itself heard.

It is fashionable, and largely correct, to blame most of our Vietnam errors on Robert McNamara and his fellow bureaucrats. Nevertheless, the military must take some of it on as well. There was the pernicious business of interservice rivalry, for instance, which sometimes almost confused the issue of the enemy's identity. Vietnam was, after all, the only war we had, each service had some things to prove, and never mind the overall objective.

A far more important failing, however, was the inability of the military to present to the President and the Congress a clear and persuasive war-winning plan. The Joint Chiefs, CINCPAC, and all the senior uniformed hierarchy were overshadowed by politically appointed civilians to an extent that went beyond the philosophical intent of civilian control. Instead of that control, Vietnam began an era of civilian domination.

The problem, it seems to me, lies in our system. The Department of Defense has become a bureaucratic monstrosity, and the services, in self-defense, have followed suit. There is no lack of intelligence in uniform; on the contrary, it is at a very high level, as anyone who deals with individual military people can testify. Unhappily, our system filters out the wisdom in the interest of some kind of final consensus. The Joint Chiefs' organization, by its very nature, is incapable of reaching a decision discomfiting to any one service. Hence, the least common denominator is sought. The civilian authorities, on being presented with such waffled advice, are reinforced in their contempt for the military mind.

Whatever the solution—and one has to be found to get unfiltered military advice out where it can be heard—the fact remains that we cannot fight any more wars the way we fought the one in Vietnam. We have concocted in our Defense Department, Joint Chiefs of Staff, congressional, and White House relationships a formula for disaster—one where no one is in charge, and no one is to blame. ■

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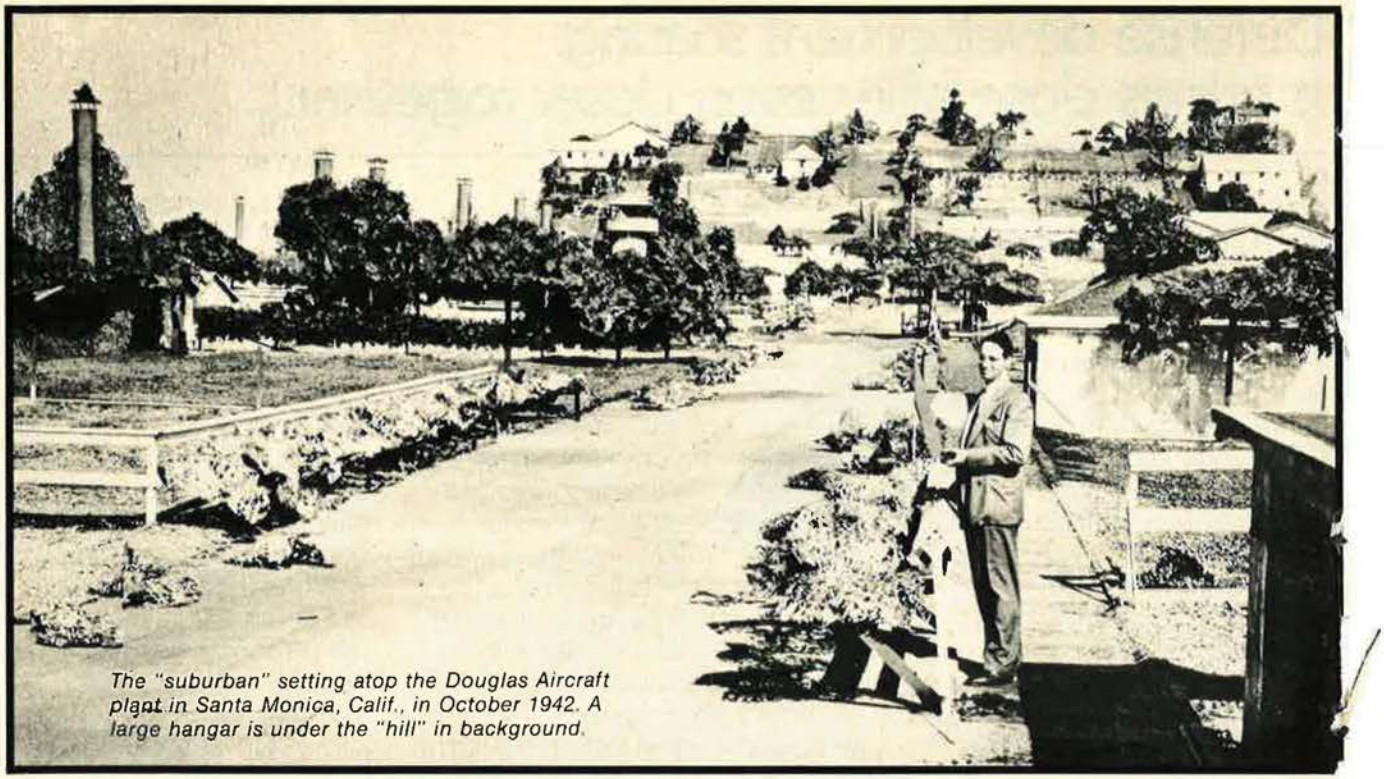


The "suburban" setting atop the Douglas Aircraft plant in Santa Monica, Calif., in October 1942. A large hangar is under the "hill" in background.

Hiding the Aircraft Factories

It has been called "the greatest strategic camouflage, concealment, and deception effort ever undertaken." A photo-interpretation expert tells why it is fortunate that its effectiveness was never put to the test.

BY DINO A. BRUGIONI

MAJOR elements of the US Pacific Fleet lay sunk or battered at Pearl Harbor and, supposedly, the whereabouts of the attacking Japanese Imperial Fleet was unknown. The threat of an invasion or heavy air attack on US West Coast facilities in early 1942 was regarded as very real and set in motion a frenzied clamor, bordering on paranoia, for urgent defensive measures.

Perhaps the most memorable undertaking was the camouflage, concealment, and deception instituted by the Army Corps of Engineers to protect the aircraft plants in California and in the State of Washington. Several years ago, I found aerial photos taken in 1942 and 1943 to monitor Corps progress at the Douglas Aircraft plant in Santa Monica and the Lockheed Aircraft plant in Burbank. In subjecting these photos, along with others supplied by the two companies, to a detailed interpretation, I discovered that there were glaring deficiencies in what has been labeled "the greatest strategic camouflage, concealment, and deception effort ever undertaken."

The camouflage effort was not designed to withstand close scrutiny by skilled photo-interpreters, but was meant to cause pilots momentary difficulty in finding their targets. The intent was also to hide such landmarks as runways and parking lots and to conceal high aircraft hangars and assembly buildings, with their attendant large shadows. Both the Douglas and Lockheed plants were located adjacent to residential areas, and the scheme was designed primarily to blend the facilities into the surrounding landscape.

The Army had experts in combat camouflage, but the art of strategic concealment had been sadly neglected. As a result, few officers were capable of planning deception on this unprecedented scale. A strategic deception is vastly different from a tactical scheme in that it is static, done on a large scale, difficult to construct, and must last for months or years. The tactical scheme, on the other hand, is designed to be movable, easy to erect, and able to last for hours—sometimes minutes—to keep up with the changing tide of battle.

Outside Experts Sought

Few people knew what the military situation would be in the future, and the scheme for the aircraft plants was based on the premise that all that was needed was to create a single lie successfully. The Army sought help from outside experts. The specialists they chose were, for the most part, artists and architects or the art directors, set designers, and craftsmen from the major motion picture studios. The Army quickly capitalized on their know-how from creating make-believe sets on studio lots.

A scheme of this magnitude would normally require months of planning and site preparation. This, however, was an emergency, and the Army allocated $50 million for what was described as "the passive pro-

tection program for defense plants engaged in essential production."

The Army also created a priority allocation system for scarce materials. The Douglas plant alone, for example, would require more than 400 ninety-foot telephone poles, 1,120,000 feet of steel cable, 4,500,000 square feet of chicken wire, miles of canvas, tons of fiberglass, thousands of gallons of paint, and substantial quantities of burlap and lumber. All this had to be produced quickly. It is amazing that activity to implement the scheme was already under way in early 1942.

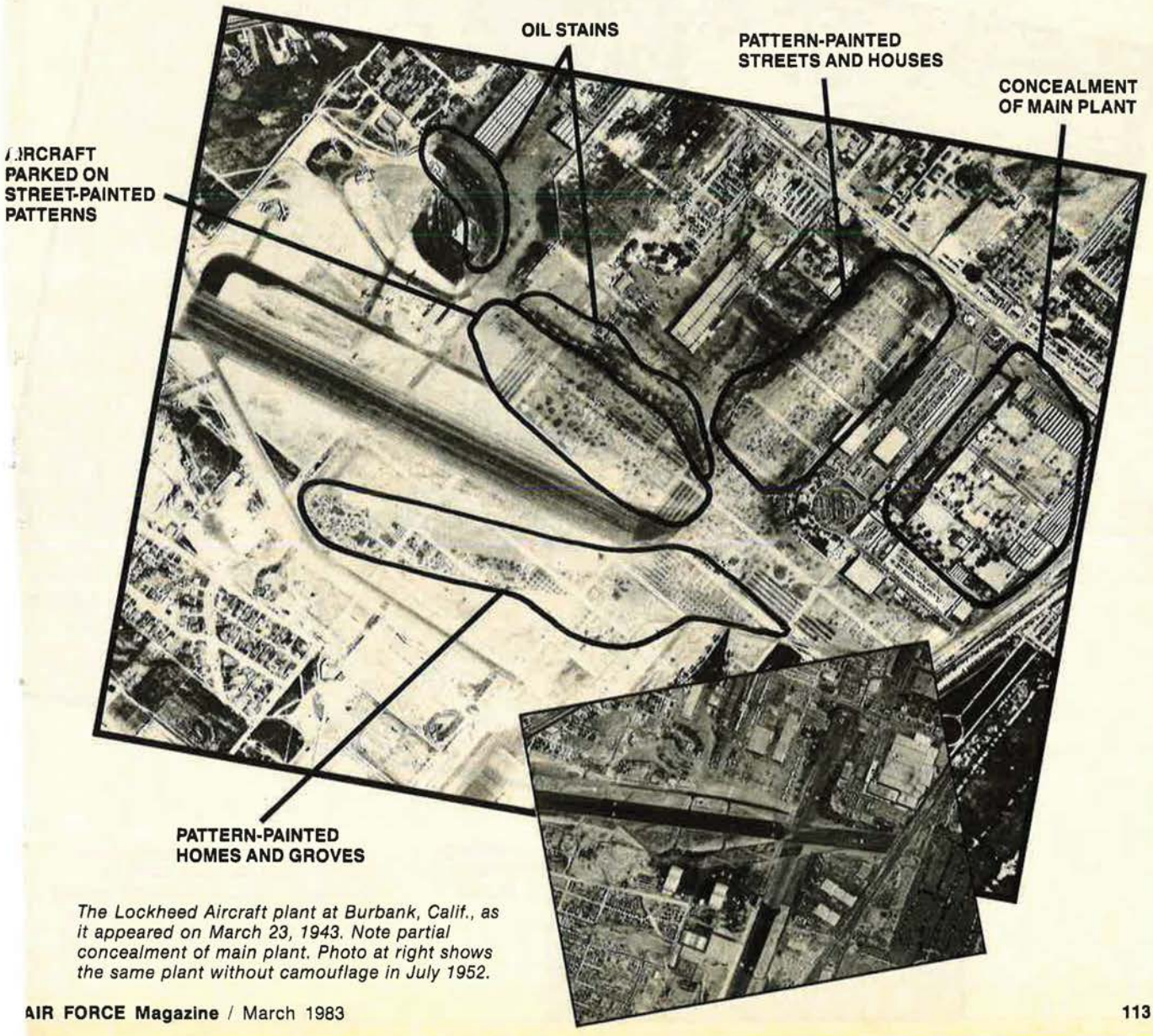
The first task was to paint and blend the runways in colors, tones, and patterns to match the neighboring areas. In an aerial photo of the Lockheed plant taken in the spring of 1942, the runway is being painted and the work areas of individual painters are clearly visible.

The next phase was to "pattern paint" streets, houses, trees, gardens, orchards, playgrounds, tennis courts, baseball diamonds, etc., on the runways and paved surfaces around the production buildings to conform with the surrounding areas. To make these "patterns" realistic on flat surfaces is to achieve the greatest possible exaggeration between the areas supposedly in full sunshine and those in shadows. The contrast must appear realistic from high altitudes. At low altitudes, however, the contrast is often so great as to make the patterns appear ludicrous.

Quick Detection by Experts

The false patterns of houses, streets, orchards, gardens, and the like, with their attendant shadows, would be quickly unmasked by modern skilled photo-interpreters. When a shadow is painted, its length and orientation are only plausible for a few minutes each day. The photo-interpreter would immediately compare any suspicious shadows with real ones, and the false patterns would be quickly detected. Photo-interpreters also subject photos to stereo interpretation and would quickly determine that the painted patterns had no height.

The construction plan for the concealment phase was relatively simple. Tall telephone poles were implanted at regular intervals and cables were strung from pole to pole, interlaced, and anchored. Chicken wire was strung over the cables, which supported either canvas or a net scrim. The scrim was made of fiberglass slivers felted into continuous strands, which were then sandwiched between two layers of chicken wire.



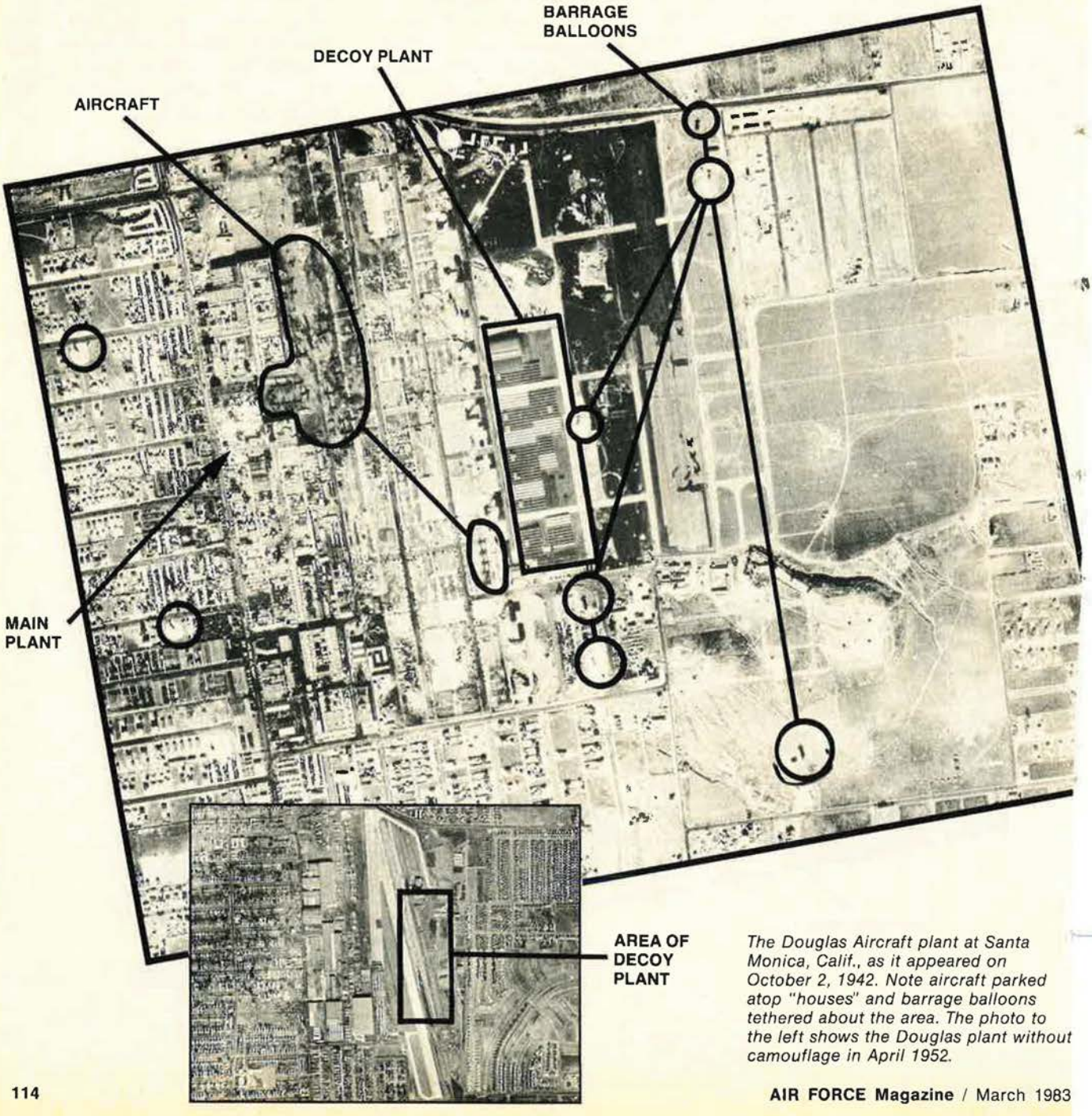
The Lockheed Aircraft plant at Burbank, Calif., as it appeared on March 23, 1943. Note partial concealment of main plant. Photo at right shows the same plant without camouflage in July 1952.

There was a decided advantage in using the net scrim. It was lightweight and allowed air to circulate and rain to fall through. The disadvantage was that it would often tear in high winds. The canvas or net scrim was painted to blend in with the surrounding areas. The scheme would not be complete without the appearance of "real articles." Therefore, dummy houses, garages, trees, shrubbery, fences, gardens, etc. were built on top of the canvas or scrim. To add to the realism, laundry was hung from "lines" behind the houses and dummy cars were moved about on the various "streets."

To provide access for maintenance, wooden walkways with railings were constructed on the roofs of the aircraft plants, and were designed to give the appearance from above of being sidewalks and fences.

Many technical difficulties had to be overcome, not the least of which was the problem of making sure that the concealment effort did not result in fire hazards to the plant and surrounding area. The paint, netting, and canvas also had to withstand weather and exposure.

While these massive projects generally did meet concealment criteria, very little deception was achieved. Every successful deception scheme must convey a false but plausible picture to the enemy and deflect the attack from the real target onto a dummy, but similar-looking, target. This deception should create momentary confusion in the bomber pilot's mind when he does not see the buildings and runways at the precise location he was briefed on. Next, he should spot a dummy target that he can rationalize is the real one. He would probably blame his confusion on faulty intelligence, or figure that he was slightly off in navigation. In the perfect deception, the pilot drops his bombs on the dummy target.



The Douglas Aircraft plant at Santa Monica, Calif., as it appeared on October 2, 1942. Note aircraft parked atop "houses" and barrage balloons tethered about the area. The photo to the left shows the Douglas plant without camouflage in April 1952.

But no dummy plant was constructed near the Lockheed plant. In the event of a Japanese attack the hope apparently was to divert the attack to an alternate target, not another aircraft plant. The danger in such an attack was that, had the pilots released their bombs late in confusion or in panic, they would have struck densely populated areas.

A dummy aircraft plant and a dummy airfield were constructed at the Douglas plant, but they were much too close to the real ones—only 1,500 feet away. With the bombing accuracies achieved in World War II, had the dummy plant been attacked, the real one would also have sustained damage.

Personnel and priority supplies were transported by air to both plants during World War II, unfortunately in silver-colored C-47 transports. These large aircraft stand out prominently in the aerial photos. There were always C-47s parked in front of the Lockheed Air Terminal. Neither camouflage netting nor canvas covers were employed to break up the color or shape of the C-47s at either the Lockheed or Douglas plants.

Wingtip to Wingtip

In any good camouflage scheme, military equipment is concealed or dispersed in such a fashion as not to attract the enemy's attention. The parking of aircraft wingtip to wingtip along runways and hardstands was considered a cardinal sin in wartime, as we had learned from the Japanese attack on Hickam Field. Yet, at both the Lockheed and Douglas plants, aircraft were parked routinely in that manner.

Although elaborate measures were taken to make the plant appear as part of the urban scene, and while all the parking lots were covered to conceal the workers' automobiles, there was no apparent concern about concealing the airplanes produced by the plant. In the May 1942 photo of the Lockheed plant there are forty Hudsons and eighty P-38 Lightnings, many parked in rows. In the March 23, 1943, photo, there were eighty-seven P-38 fighters and fifty-four Hudson/Ventura bombers, many also parked in rows—hardly what one would expect to see in an "urban scene."

The main Lockheed plant at Burbank as it appeared in late 1943 or early 1944. Note aircraft and incoming supplies parked haphazardly amid and atop "houses."

In the 1930s, it was the practice to paint compass directions or names of airports on hangars or terminal buildings in large white letters. In the 1942 photos of the Lockheed plant, the words "Lockheed Air Terminal" were visible in large letters on the roof of the terminal building. The words were not painted over until 1943. The runway numbers, giving the magnetic orientation, were painted over in 1942.

Faulty Deception

Substantial effort was expended to paint urban scenes on the runways and parking aprons, but those concerned with parking the aircraft appeared oblivious to the scheme. Aircraft were rolled out of the production buildings and parked randomly on the top of "orange groves," "houses," "gardens," etc., again violating the whole scheme of the camouflage.

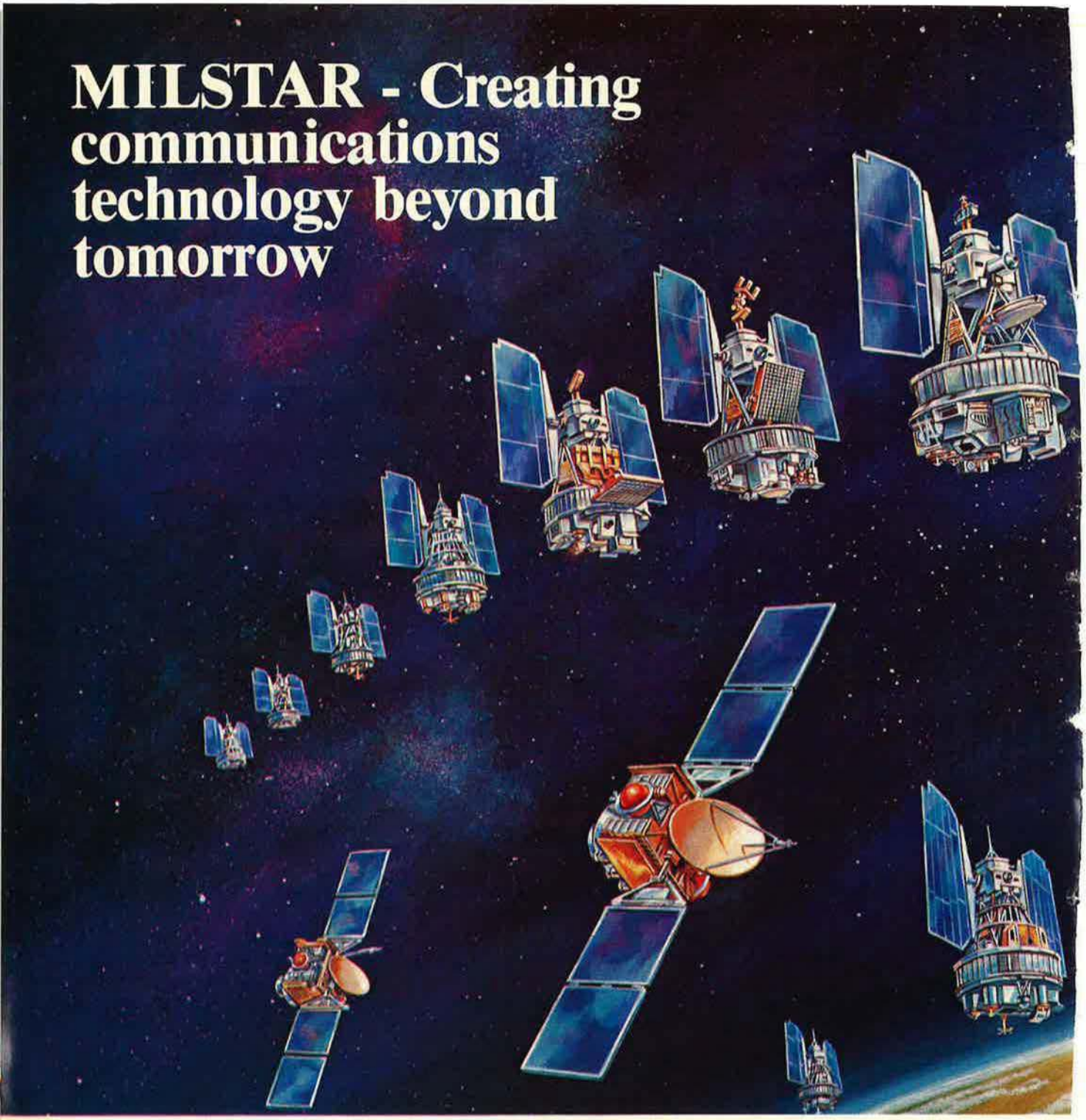
Japanese intelligence would have been aware of the exact location of these important plants and would undoubtedly have planned bombing runs using easily recognizable landmarks. The deception scheme, however, appears to have been based on the presumption that the Japanese would be operating on pre-camouflaging information and would not know that the plants had been concealed. This is hard to rationalize since both plants were situated along major roads and rail lines, and could easily have been viewed by human agents. The camouflaging of the plants was a common topic of wartime conversation among Californians, and it is doubtful that it was a secret to the Japanese.

Although the plants were concealed, highly visible landmarks near the plants were not concealed or disguised. The Valhalla Memorial Park bordering the Lockheed plant has a number of highly visible circles, rectangles, and ellipses that would have provided excellent landmarks for enemy pilots. There were also a number of large drive-in motion picture theaters near the plants that were not disguised or concealed. The Douglas plant, in addition to being close to excellent coastal landmarks, was bordered by a large and easily recognized golf course.

From late 1942 until the end of the war, the Japanese never again constituted a real threat to the West Coast. However, the camouflage, concealment, and deception effort continued at strategic West Coast installations until late 1944, and the camouflage and concealment materials were not removed from the plants until after the war. ■

Until his retirement, Dino A. Brugioni was a senior official and a reconnaissance and photo-interpretation expert for the Central Intelligence Agency. He flew sixty-six bombing missions and a number of reconnaissance missions during World War II, and was awarded the Purple Heart and the Air Medal with eight oak leaf clusters. He holds bachelor's and master's degrees in foreign affairs from George Washington University. Mr. Brugioni's most recent article for this magazine, "Precision Bombing Pays Off," appeared in the June '82 issue.

MILSTAR - Creating communications technology beyond tomorrow



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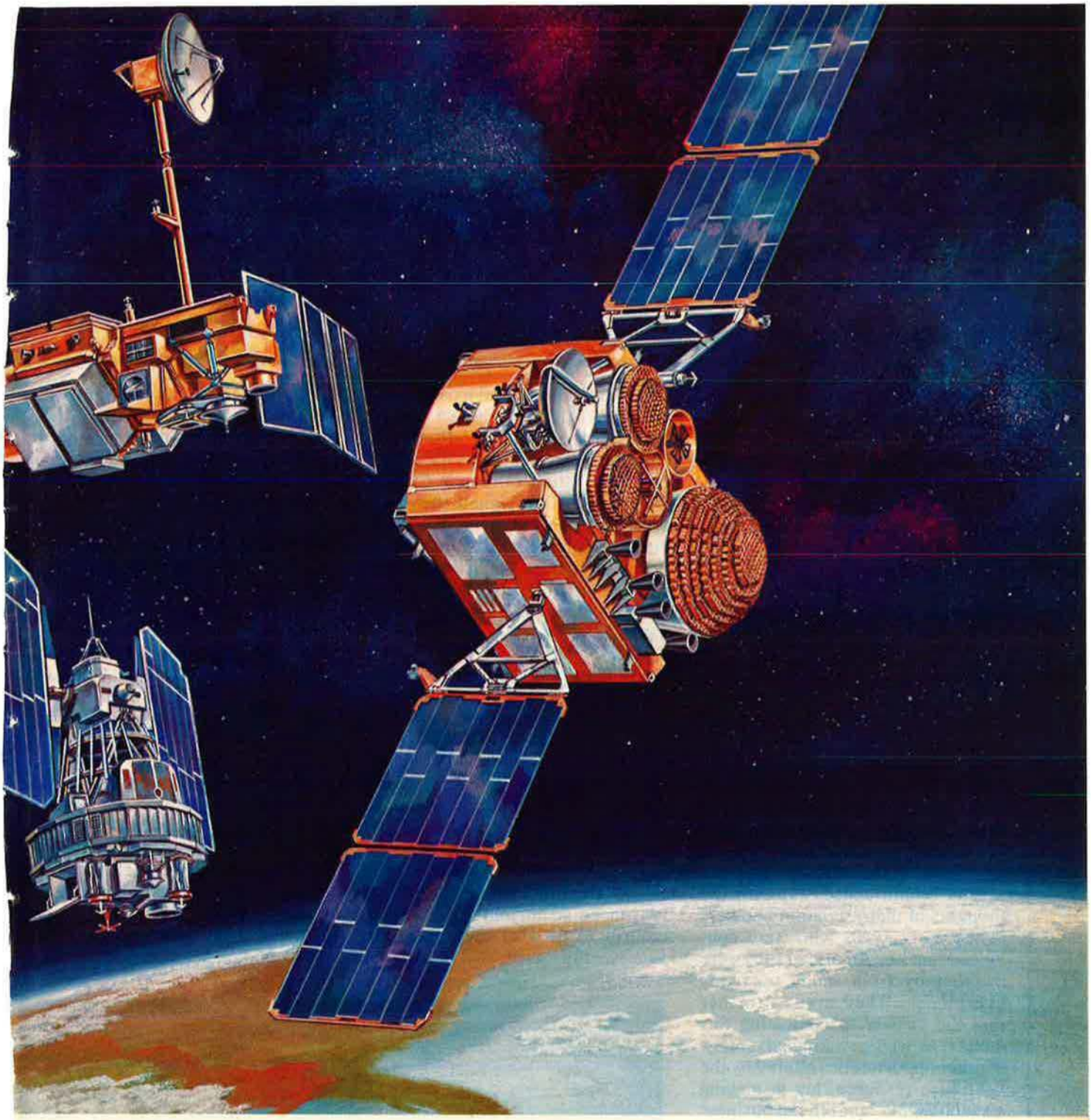

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CIVIL AIR PATROL: Yesterday, Today, and in 2003

BY JAMES A. McDONNELL, JR., MILITARY RELATIONS EDITOR

At the Civil Air Patrol's most recent annual national convention in Chicago, AFA, a long-time supporter of CAP, was represented, and took the opportunity to have AIR FORCE Magazine interview several key CAP officials to bring AFA members this report.

"EARLE Johnson, who later became National Commander of the Civil Air Patrol, took his small plane and some marked bricks and went out one night and flew over the industrial area of his city and dropped the bricks on the roofs of some war plants. He went back the next day to talk to the companies and impress upon them that the bricks—which they didn't even believe were on their roofs—could have been bombs."

This reminiscence sums up the thoughts of many aviation boosters in the early 1940s who were convinced that key American sites were in jeopardy from saboteurs flying lightplanes. They argued further that the answer to combating this danger, as well as taking advantage of other opportunities offered by the lightplane resource, lay in making all such flights "for official business only," under the auspices of the newly created Civil Air Patrol. The "brick-bombing" demonstration solidified this case.

The reminiscer is CAP Brig. Gen. Cecil Whelen, who was there at the beginning of the Civil Air Patrol (CAP), which he noted to AIR FORCE Magazine ". . . is a long time back to remember." Indeed, CAP came into formal existence on December 1, 1941, when former New York Mayor Fiorello H. La Guardia, then serving as the Director of the nation's Office of Civilian Defense (OCD), signed the order creating CAP and giving it various duties involving defense of the nation. And that *is* a "long time back." But like anything else, a lot of other activity preceded the "official" date.

Early Days

In fact, from about 1938 on, concerned civilian pilots and other aviation enthusiasts were convinced that, if war should come, the nation's 25,000 light aircraft and 128,000 certified pilots could be uniquely useful. Many of these people, of course, joined the RAF or RCAF or later the American armed forces. But those who, for whatever reason, could not join still wanted to contribute to what they perceived as a worthy cause.

One of these people, Gill Robb Wilson—later to become AFA's ninth President—can probably be credited with starting the first civilian air "patrol" when he convinced the governor of New Jersey, in 1938, to establish the New Jersey Civil Air Defense Services.

Wilson's plan, backed by Gen. H. H. "Hap" Arnold, then Chief of the Air Corps, set forth tasks suitable for small planes, such as patrolling coastlines and keeping an eye from the air on such vital installations as dams, defense plants, etc. Other states formed similar groups.

During World War II the civilian, volunteer CAP flew 24,000,000 miles of coastal patrols, spotted submarines—sinking or damaging at least two—towed targets, aided ships in distress, and generally made themselves useful as only someone with wings and a high-altitude perspective can. General Whelen, who later became CAP's third National Commander (Chair-

CAP aircrews use general aviation aircraft to support emergency services program.

CAP cadets rescue "victim" during emergency services training.

man of the Board), remembers those days of the coastal patrols well. "We had to get in the air before daylight because the subs generally surfaced during the night to recharge their batteries," he recalls. "The Army supported us in housing, we helped guard the Navy's ships, and we worked with the Coast Guard. The main thing we were out there for was not just to sink subs but to let the ships—especially the oil tankers—know that someone was looking out for them."

During this period, CAP also began a program to introduce teenagers and potential aviation cadets to airplanes and flying, as well as a program to put courses on aviation into the public schools.

Rather than see it disbanded at the end of World War II, Civil Air Patrol's founders and supporters, convinced of its future usefulness in peacetime, prevailed on Congress to pass legislation incorporating it in its present form. On July 1, 1946, public law made CAP a nonprofit, benevolent organization dedicated to humanitarian activities. In May 1948, Congress designated it as a civilian auxiliary of the US Air Force, and today it is still the only USAF auxiliary.

"We want to do more for the Air Force because we are their auxiliary. That's our prime mission."

In the years since that time, Civil Air Patrol has flown no wartime coastal patrol missions, no border patrol missions, no wartime courier airlift—none of these—but the relationship between the Air Force and its auxiliary has strengthened. Today, the Air Force and CAP contribute much to each other.

With its force of some 65,000 volunteers, roughly 25,000 cadets and 40,000 senior members, CAP furnishes—to the Air Force and thus to the nation—voluntary, benevolent, and noncombatant service. In return, the Air Force gives to CAP technical information and advice for its leaders and certain services and facilities, such as excess Department of Defense aircraft, spare parts, communications equipment, airlift for summer encampments and aerospace education workshops, and so on.

In addition, the Air Force provides a staff of civilians and military personnel to help CAP operate its national headquarters at Maxwell AFB, Ala., home of Air University. This staff serves in an advisory capacity. In addition, this headquarters provides Air Force liaison personnel at all of CAP's fifty-two wings (state-level units) and eight national regions.

The Air Force also provides some aircraft maintenance reimbursement for Civil Air Patrol, helps CAP conduct week-long encampments at military bases introducing CAP cadets to Air Force life, provides staff members to help conduct CAP training sessions, provides office

CAP cadets receive realistic training at the survival school at the Air Force Academy.

space where available, and assists in other ways.

Three Missions

CAP has three principal missions—emergency services, including communications; aerospace education; and a cadet program. The emergency services is probably the best-known, embracing as it does search and rescue (SAR), local disaster relief, and other humanitarian efforts. For example, a recent agreement between CAP and the American Red Cross calls upon CAP to be available for airlift of human blood or medication.

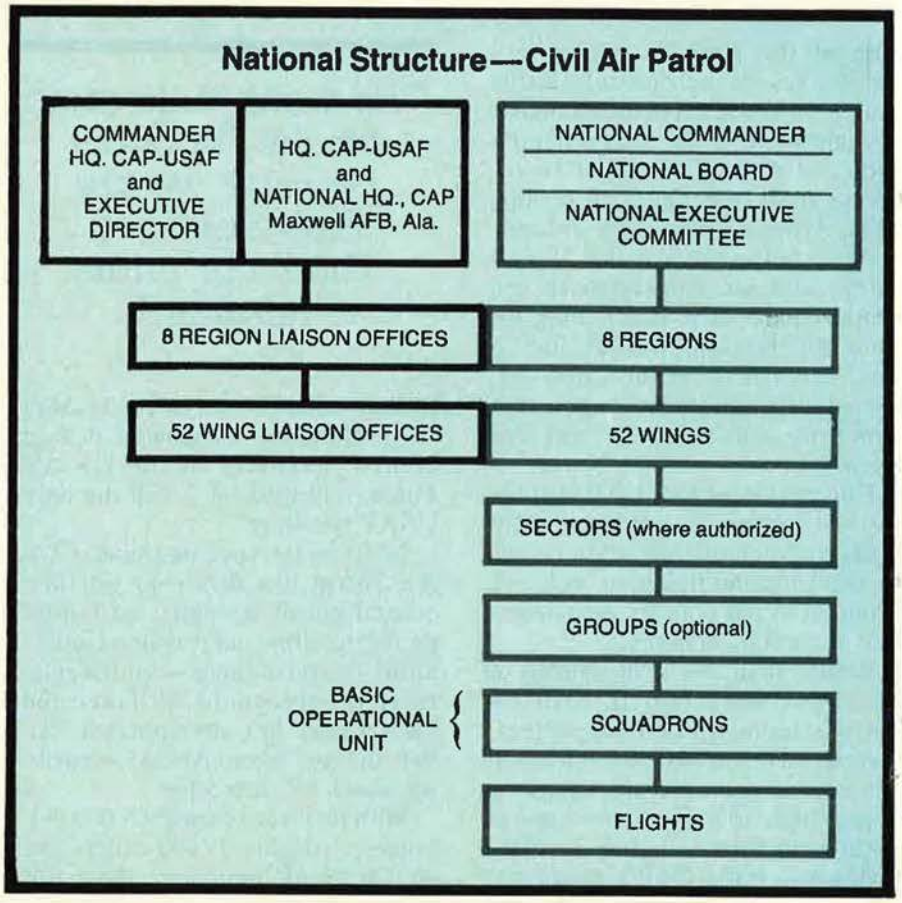
CAP Brig. Gen. Howard Brookfield, serving his first term as CAP Commander, feels that this type of activity truly exemplifies the CAP volunteer. "The thing about this," he says, "is that our folks do this because, I guess, it's their kind of patriotism. It shows a concern for their fellow human beings, and I'd say that it is this kind of humanitarian effort that has kept me interested in CAP over the years."

In the all-important search and rescue effort, CAP works closely with the Air Force Rescue Coordination Center at Scott AFB, Ill. CAP has chalked up three out of every four hours flown on SAR missions, and this includes searches within the forty-eight contiguous states, Alaska, Hawaii, and Puerto Rico. In the past five years, CAP crews have flown more than 90,000 hours and participated in almost 5,000 SAR missions, and have saved the lives of some 400 people.

Just in the past reporting year alone, eighty-seven lives were saved and 782 search objectives located—quite a record.

Also, the "search objectives" just don't cover downed aircraft, although the fact that CAP does this is of great comfort to flyers. "Search objectives" during the last reporting year, for example, included an elderly woman who had wandered away from her Ohio nursing home—a CAP aircraft spotted her, sunburned and dehydrated, and called in sheriff's cars to pick her up. Four boaters in Alaska, stranded without food for three days, were located by CAP spotters and were picked up by an Air Force helicopter. Two young men in New Mexico became lost in the wilderness while on a snowshoe hike. One died and the other would have had not CAP found him. And so it goes.

A second important mission—that of aerospace education—helps to inform the public about air and space. This is done by means of CAP-sponsored workshops for teachers and by research, writing, and publication of a vast variety of aerospace-related material for the classroom. Curriculum planning assistance for teachers is also available. More than 600 schools and colleges are involved in some way with this mission. Additionally, "internal" training of CAP's own senior and cadet members is carried out



under the aerospace education umbrella.

Speaking of cadets leads us to CAP's third mission—its cadet program. This program provides young people between the ages of thirteen and twenty-one the opportunity to develop leadership skills in an aerospace-oriented environment. Under the guidance of adult CAP leaders, and with the advice and assistance of USAF liaison personnel, cadets progress at their own pace through a structured program of aerospace education that embodies leadership and physical fitness training.

What this program is all about—and what it means to someone who is in it—is perhaps best summed up by Daniel J. Marszalek of Westmont, Ill. Each year, the Air Force Association honors one CAP cadet as Cadet of the Year. The current selectee is Cadet Marszalek. This twenty-year-old college student says, "I've learned a lot of leadership techniques—had opportunities I wouldn't have been able to get elsewhere in dealing with people. Conferences and summer encampments have given me a first-class opportunity to try out my skills as a leader. You can't get that at very many other places that I know of, especially at my age."

Even though—another misconception—there is no obligation for cadets to enter the Air Force, Cadet Marszalek feels that the Air Force liaison people do a good job of making cadets aware of the Air Force. "There are," he says, "not only the active service opportunities, but the Reserve and Guard seem pretty attractive to me." CAP Headquarters notes that a recent survey found some 25,000 active-duty blue-suiters with CAP experience and seven percent of the Air Force Academy student body as former CAP cadets. That's a good investment in itself.

Organization

Perhaps the most difficult thing for someone outside of CAP to grasp is its organization. Its "wiring diagram" *(see chart)* is conditioned in large measure by its dual status as an official USAF auxiliary and also as a volunteer organization. It is important to keep in mind that CAP is a civilian corporation made up of volunteers who pay dues for the privilege of serving CAP, the Air Force, and their country. CAP members wear an adaptation of the Air Force uniform, and have "CAP rank" based on Air Force grade titles, but are still civilians.

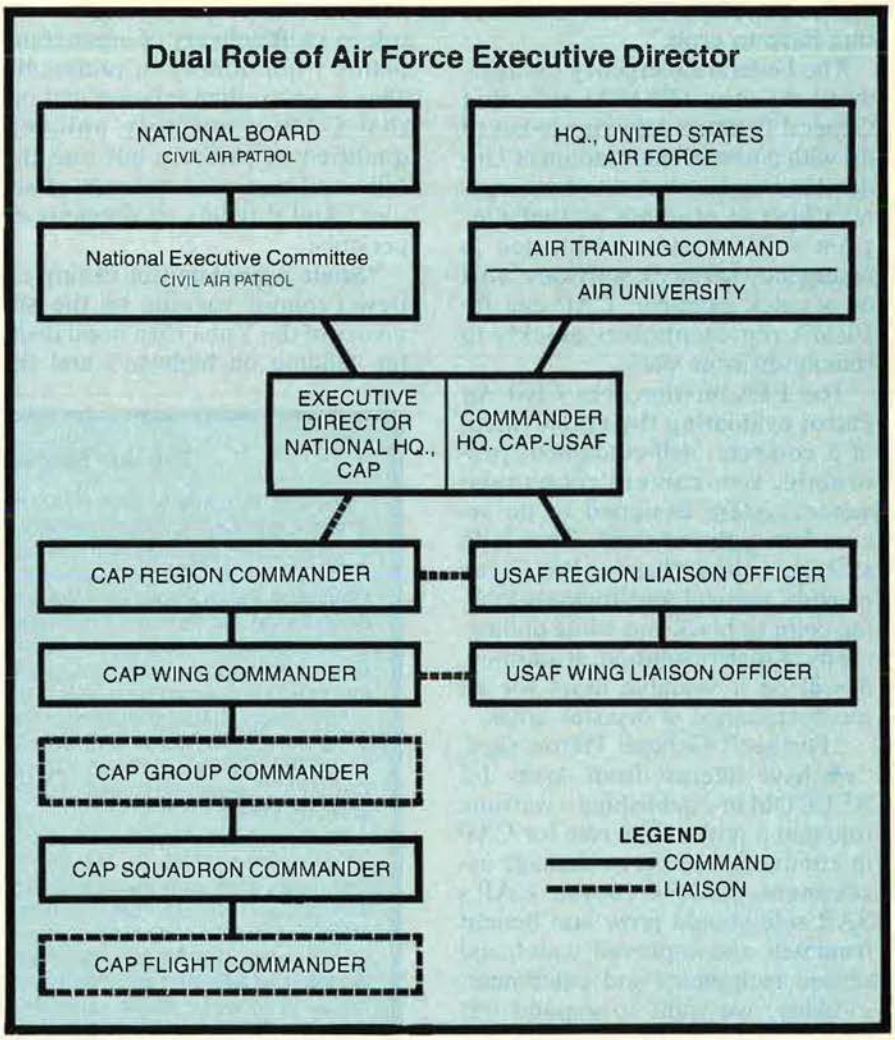
CAP consists of eight geographic regions. Within these regions, each state and the District of Columbia and Puerto Rico is classified as a wing.

The highest governing body of the CAP is its National Board, chaired by a member of the Civil Air Patrol Corporation whose title is National Commander. The current National Commander—elected by the board—is Californian CAP Brig. Gen. Howard W. Brookfield. The organization has only one person who holds the CAP rank of brigadier general, and that person is the Commander. Also on this National Board is an active-duty Air Force officer, usually a brigadier general, who is the CAP Executive Director. The current incumbent is Brig. Gen. David L. Patton. The CAP elected Commander and the active-duty Air Force Executive Director work closely together to guide CAP.

All other members of the National Board hold various CAP grades and include the eight CAP region commanders and the fifty-two CAP wing commanders.

The CAP Executive Director conducts the day-to-day activities of the corporation and is also the military commander—not of CAP—but of the headquarters and field liaison staff of USAF people and civilians (a force, down through CAP wing level, of just under 300 people). Likewise, the Executive Director is responsible to Air University for those purely US Air Force actions *(see chart below)*.

CAP is also a rather potent Air Force in its own right. It controls some 7,000 planes—about 600



owned by the CAP corporation and more than 6,000 member-owned aircraft.

A Look Ahead

Now, where is CAP going in the next twenty years?

The best answers come from its leaders—the CAP National Commander, General Brookfield, and the Executive Director or Commander, Hq. CAP-USAF, General Patton. AIR FORCE Magazine asked them to project CAP ahead to the year 2003, and both agreed that, while they possessed no fortune-telling cards, it appears that certain trends now beginning accurately foreshadow the future.

For example, General Patton is proud of certain new initiatives. CAP is, he says, "growing both in size of membership as well as number of activities. We're taking on more and new relationships with such organizations as FEMA, EPA, and so on. These are new initiatives that have to grow."

The Federal Emergency Management Agency (FEMA) role that General Patton is referring to has to do with a new Memorandum of Understanding between the two organizations to promote mutual program support and coordination in emergency services activities. Just as a quick example, CAP can fly FEMA representatives quickly to remote disaster sites.

The EPA mission sees Civil Air Patrol evaluating the employment of a compact, self-contained, panoramic, two-camera reconnaissance system designed to be secured to light aircraft. This EPA system, called "Enviro-Pod," can provide vertical and forward-looking color or black and white photography of high resolution. If adopted, it will be a valuable asset for air reconnaissance of disaster areas.

"Further," General Patton says, "we have interest from Army J-5 REDCOM in establishing a wartime role and a post-attack role for CAP in continental airborne damage assessment. And, of course, CAP's SAR role should grow and benefit from new and improved search and rescue techniques and equipment.

"Also, we want to expand our ability to serve the different Air Force commands. For example, right now, in the Pease AFB and Plattsburgh areas, we fly FB-111 small parts between these bases for SAC. And, for both TAC and SAC, we put their pilots on board general aviation aircraft and fly low-level, low-speed routes to look for obstructions that aren't charted. We want to do more for the Air Force because we are their auxiliary. That's our prime mission."

General Brookfield concurs in this. Also, he is very conscious of CAP's responsibility—and opportunity—as an Air Force-related presence in those parts of the country where active-duty blue suits are scarce. He sees the continuing strengthening of CAP as an excellent way to heighten the nation's consciousness of the Air Force and the military role.

Over and above this, he looks to the expansion of some of CAP's new missions in the future. For example, he says, "A new program gives us a role in swift delivery of organ transplants from donors to recipients. This is an exciting mission and one that CAP is not only uniquely qualified to perform but one that fully embraces the concept of service. And it builds on previous experience.

"Some years ago, for example, I flew typhoid vaccine to the survivors of the Yuba City flood disaster, landing on highways and that type of thing. This new role is similar but a building upon that—so I see, even though I can't predict exactly how at this time, a further building in this area. Also, the merging of our resources with the Scout Explorer Program should give a boost to both organizations, and this is so natural that it can only get better."

General Brookfield also sees CAP moving toward a diversification of its missions that will allow it to assist other government agencies. "Keeping in mind our prime role as the official auxiliary of the Air Force," he says, "and always putting that mission first, I see us expanding our assistance to other federal agencies, consistent with our charter and public law."

General Whelen, who was there when it all began and thus has a unique perspective, put it this way: "Whatever comes," he said, "it's going to be tied in with flying. That's how we started and that's our strength. The FEMA role, the flying of the kidney and heart transplants, it's all flying. Back forty years ago I didn't necessarily see all the things we're doing today—I probably couldn't look ahead to 2003 now and tell what we'll be doing then—but I know it's going to be helping the Air Force, and it's going to have something to do with flying."

And that's a pretty good capsule description of Civil Air Patrol. ■

The Air Force Association and CAP

General Brookfield, CAP National Commander and a long-time AFA member, stressed that CAP is most grateful to AFA for support over the years. This includes chapter, state, and national level assistance.

And certainly AFA does provide a variety of support to CAP. AFA's Defense Manpower Policy Paper *(see November '82* AIR FORCE *Magazine),* adopted by the delegates at the National Convention, sets forth a national program for CAP that AFA supports, on Capitol Hill and elsewhere. AFA leaders carry this message to speaking platforms across the country. AFA's National Award for the CAP Cadet of the Year is a coveted prize and a unique recognition.

Also, many chapters and states give awards, feature CAP activities as part of their program, and furnish funds and/or leadership to CAP units. This past year, the New Jersey State AFA chartered a chapter in Old Bridge, N. J., called the New Jersey Wing CAP/AFA Chapter, composed of CAP members. Indeed, there are close ties between AFA and CAP.

To expand and strengthen these ties, AFA President David L. Blankenship, acting on a recommendation by last year's Executive Committee, has appointed an AFA/CAP Task Force, with the mission to recommend new and innovative ways in which AFA can aid CAP. Members as of this writing include: Daniel F. Callahan as Chairman; former CAP National Commander Johnny Boyd; Col. Win E. De Poorter, Vice Commander, CAP-USAF; AFA Presidential Advisor on CAP, Ken Rowe; Dorothy Welker; and AFA staff member Jim McDonnell. AFA President David L. Blankenship will serve in an *ex officio* capacity.

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By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

Blue-Suiters Among "Ten Best"

The US Jaycees' list of "Ten Outstanding Young Men of America" for 1983 includes two Air Force officers, Maj. Frank Klotz and Capt. Felix Sanchez. This is only the second time in the forty-five years that the US Jaycees have been naming the annual "ten best" that two members of the same military service have made the list—and again it was the Air Force, back in 1981.

The ten individuals named for 1983 *(see photos)* are an eclectic group, representing such varied fields as journalism, sports, business, and government service. Selectees, who must be between eighteen and thirty-six, are chosen for career accomplishments and humanitarian efforts.

Major Klotz, a USAFA graduate who holds both a master's degree and a doctorate from Oxford University, is the coauthor of the Air Force's 1977 Long-Range Capabilities Objectives Document. He has taught at the Air Force Academy, served as a research associate with the Los Alamos Scientific Laboratory, and held several Pentagon positions. Currently he is a White House Fellow, working as a special assistant to Deputy Secretary of State Kenneth W. Dam.

Captain Sanchez, also a USAFA graduate, received his master's degree in aerospace engineering from the Georgia Institute of Technology. He has served in a variety of aeronautical engineering assignments, including a tour as director of flight-test engineering for the GLCM test program. His recommendations pared some $640,000 from test program costs. He is now an instructor of aeronautics at USAFA.

The other selectees are Roland Arriola, first Hispanic mayor of Waco, Tex.; Matt Blair, defensive captain of the NFL's Minnesota Vikings; Lex Frieden, a quadriplegic who is a leading authority on independent living by disabled people; Luke Hingson, Executive Director of the Brother's Brother Foundation, a resource group for developing countries; Myron Lowery, anchorman for WMC-TV in Memphis, Tenn.; Roger Michaud, President and founder of American Stablis, Inc., an energy-saving devices multinational corporation; Sen. Don Nickles of Oklahoma, the youngest member of the Senate; and Tom Watson, pro golfer just named PGA 1982 Player of the Year.

Roland Arriola

Matt Blair

Lex Frieden

Luke Hingson

Maj. Frank Klotz

Myron Lowery

Roger Michaud

Sen. Don Nickles

Capt. Felix Sanchez

Tom Watson

End of the Goldwater Connection

The "Big Switch" has been thrown *(see photo above)* to terminate operation of the Military Affiliate Radio System (MARS) station at the Phoenix, Ariz., home of Sen. Barry Goldwater.

Senator Goldwater is assisted by Maj. Gen. Robert F. McCarthy, Commander of Air Force Communications Command, in throwing the switch to end operation of the Senator's MARS station. See item.

The facility, in operation since the 1960s, brought many heartwarming experiences to Vietnam-era service people and their families. The Senator, who has been involved in amateur radio activities—as well as in the MARS program—for many years, set up a "phone patch" relay point for SEA/US traffic.

Secretary of the Air Force Verne Orr, himself an amateur radio operator, sent a message to the Senator via the MARS channels citing the service provided by the station. "Operated exclusively by your dedicated volunteers, and at considerable expense to you, AFC6BG has provided the DoD and the nation, in times of emergency, a service unparalleled in military communications. We all owe you and your people a tremendous debt of gratitude that can never be adequately repaid," stated a portion of the Secretary's message.

Maj. Gen. Robert F. McCarthy, Commander of Air Force Communications Command, presented plaques of appreciation to Senator Goldwater, station manager Tom Moore, and about a

dozen volunteers who helped to operate the station. The decision to shut down was sparked by a combination of declining mission activity and the anticipated cost of modernizing the station's aging equipment. Most of the morale-boosting contacts previously handled by the station can now be made over regular telephone voice circuits during non-duty hours.

Military Families in the Spotlight

Pointing up the Air Force's commitment to family programs, the first ever presentation of the Air Force Meritorious Morale, Welfare, and Recreation Award to an individual in the child-care field went recently to Mrs. Lois Williams, who directs the Peterson AFB, Colo., Child-Care Center. The Peterson facility is recognized as one that has moved beyond good custodial care to implementation of developmental programs for the military children using the Center.

Further, the first Air Force Family Advocacy Program Manager has been appointed. Maj. Frank Vader, on the Surgeon General's staff at Brooks AFB, Tex., will be the focal point for information on all programs in the Air Force concerning family advocacy. These programs, among other things, concern problems of family violence.

Family concerns have a high priority in the Air Force today, as highlighted in a recent Air Force study, which showed an increasing number of single-member parents, a rise in spouse employment, and an increase in childless marriages.

The study found that an Air Force man married to a civilian wife is the most usual arrangement, with seventy-nine percent of the male officers and fifty-five percent of the enlisted men fitting this pattern. Fourteen percent of the female enlisted force and fifteen percent of female officers are married to civilian men. The majority of these marriages are childless. Continuing a trend, 7.6 percent of the force is "married to each other" or, in other words, are both Air Force members. This is up thirty percent from three years ago. Like the Air Force woman/civilian man marriages, the blue-suit couples are, in the majority of cases, also childless.

Since the late 1970s, the study found a fifty percent increase in the number of single parents. It also showed that nearly half of the single parents are divorced men with custody of their children. Overall, single parents are raising almost 10,000 children, and about forty percent of these children are under six years of age.

Sixty percent of Stateside Air Force wives are employed. Of those not employed, the survey found that four out of five have definite plans to go to work outside the home.

All of the foregoing adds special urgency to the Air Force's plans to open Family Support Centers at all 124 major installations by 1988. The thirteenth such facility just opened at Plattsburgh AFB, N. Y. Sixteen more are planned for 1983. These centers provide a variety of services to Air Force people and families.

Outstanding Base Exchanges Sought

"Outstanding customer service—that's what we're looking for."

So said Maj. Gen. Richard D. Murray, Army and Air Force Exchange Service (AAFES) Commander, as he kicked off a new competition called the Best Exchange Award. "Customer service will be the primary consideration when selecting the best exchanges," he told his managers recently at a meeting at the Dallas, Tex., Exchange Headquarters.

Area General Managers will nominate their best exchange on the basis of courteous and helpful customer service, availability of merchandise, cleanliness of the exchange, checkout-line length, and attractive and effective merchandising.

After endorsement by the installation commander where the nominated exchange is located, AAFES regional chiefs will select a "best" and a runner-up exchange from each of the five AAFES regions and two overseas systems. The seven representatives from the winning exchanges will gather at an event later this summer to receive their awards. Each will receive a plaque for display in his exchange. Additionally, signs and special employee name tags will be authorized for the winning exchanges. The seven runner-up exchanges, though not represented at the event, will also receive plaques.

The importance of exchange profits to the services' morale and recreational activities was pointed up by a recent announcement by AAFES that the past ten years has seen more than $750 million in contributions go to Army and Air Force MWR activities from exchange profits. General Murray notes that "when a customer buys merchandise or patronizes an AAFES movie theater or a food or service outlet, this not only ensures the customer quality at reasonable prices but helps support his or her own morale and recreational facilities."

Thus, the customer is the key, and the new award will honor those exchanges that best serve the customer.

Rx: Imagination

Strange as it may seem, a clinical psychologist at the Charleston, S. C., Veterans Administration Medical Center is treating migraine headaches with imagination—the patient's own imagination, that is.

Dr. John Roitzsch is proving that a patient's imagination is as effective as medication or surgery in coming to grips with crippling migraine headache pain. He has introduced bio-

Reflecting the Air Force's growing emphasis on quality recruiting, Herb Spies, an Eglin AFB, Fla., mathematician, discusses Eglin's computer facilities during "College Computer Career Day." The tour of the complex is a recruiting effort by Eglin to interest area high school students in a career in military-oriented computer science. (USAF photo by Sgt. Charles H. Newkirk)

feedback—a self-control and relaxation technique—to patients in his study. In tallying the results, he reports that the average number of headaches decreased from 103.2 per year to 10.2; the duration reduced from 129.4 hours to 12.9; and the average severity (measured on a subjective scale of one to five where one is no pain and five is intense, incapacitating pain) dropped from 4.75 to 2.63.

What does he do to achieve these results? Dr. Roitzsch, who is also a faculty member of the Medical University of South Carolina, explains that biofeedback is simply a method of letting the patient know what his body is doing so he can respond to it and control it. Changes in blood flow patterns through the temporal arteries cause migraines by constriction and dilation of the arteries. Patients are encouraged to control this blood flow through biofeedback techniques.

The process involves placing a sensor on the patient's head over the temporal artery. The sensor measures skin temperature, which is an indicator of blood flow. The sensor con-

nects to a computer that buzzes to alert the patient when pain-producing arterial contraction occurs. The patient's job is to keep the buzzer from sounding by controlling the blood flow. The therapist increases the patient's control by gradually reducing the flow change allowed by the computer before buzzing.

Each patient used the control technique that works for him. The common denominator is imagination. The patient may find that thinking of a calm water scene on a sunny spring day will relax a constricted artery. One may imagine floating through her own blood vessels; another might envision an ever-narrowing river. Dr. Roitzsch admits that "we don't know how it works, but we see results. The artery diameter can be changed at will and headache averted."

This study followed a relatively few people. Others may expand on these promising findings.

THE BULLETIN BOARD

Aero Clubs: More Than Fun

Most military members are well aware of the potential of base aero clubs for recreational flying. In this capacity, aero clubs are a prime morale builder, and membership ranges across the grade spectrum and includes retirees and family members.

Perhaps not so well known is the clubs' "mission connection." The Air Force is trying to get the word out on this, too.

Certainly the mission connection to recruitment and retention can be easily gauged. Most people who come into the Air Force are at least somewhat attracted to airplanes, and the opportunity for flight by those who don't do it for a living is motivating.

But Headquarters also points out that aero club plane usage is saving many commands important dollars in TDY costs. "Aero club planes," says the Headquarters planners, "are a proven, low-cost travel mode that should be considered, if available." Charts are available that show the average saving for TDY trips, and the point is made that big savings can be realized for two or more travelers, regardless of the trip length.

Other aero club mission connections noted include Space Shuttle support by the Vandenberg AFB, Calif., club during a recent Shuttle landing, numerous parts supply runs between Altus and Kelly AFBs, and Alaska site support.

Marathon Reservist

Anyone citing benefits of Air Force

SENIOR STAFF CHANGES

PROMOTIONS: To be **Major General:** Ralph H. **Jacobson;** Joseph L. **Shosid** (Air Force Reserve); James L. **Tucker,** Jr. (Air Force Reserve); Harold J. M. **Williams.**

To be **Brigadier General:** Clyde F. **Autio** (Air Force Reserve).

RETIREMENTS: M/G Christopher S. **Adams,** Jr.; M/G John E. **Kulpa,** Jr.; M/G Mele **Vojvodich,** Jr.

CHANGES: B/G Thomas P. Ball, Jr., from Surgeon, Hq. AFMPC, Randolph AFB, Tex., to Dir. of Medical Inspections, Hq. AFISC, Norton AFB, Calif., replacing B/G Gerald W. Parker . . . **B/G (M/G selectee) Schuyler Bissell,** from Dep. Ass't C/S, Intel., Hq. USAF, Washington, D. C., to Dep. Dir., Defense Intelligence Agency, Washington, D. C. . . . **M/G John T. Buck,** from Dep. for AWACS & Dep. for Tac. Systems, ESD, AFSC, Hanscom AFB, Mass., to Vice Cmdr., ASD, AFSC, Wright-Patterson AFB, Ohio, replacing M/G Richard K. Saxer.

M/G Joseph H. Connolly, from Dir. of Contracting & Manufacturing Policy, DCS/RD&A, Hq. USAF, Washington, D. C., to Dep. Dir. (Acquisition Mgmt.), Defense Logistics Agency, Cameron Station, Va. . . . **B/G James C. Dever, Jr.,** from Cmdr., Contract Mgmt. Div., AFSC, Kirtland AFB, N. M., to DCS/Contracting & Manufacturing, Hq. AFSC, Andrews AFB, Md., replacing B/G Bernard L. Weiss . . . **B/G John J. Doran, Jr.,** from Cmdr., 7th AD, SAC, Ramstein AB, Germany, to DCS/Log., Hq. SAC, Offutt AFB, Neb., replacing B/G (M/G selectee) Harold J. M. Williams.

B/G Robert D. Eaglet, from Ass't DCS/Plans & Prgms., Hq. AFSC, Andrews AFB, Md., to DCS/Plans & Prgms., Hq. AFSC, Andrews AFB, Md., replacing B/G Donald J. Stukel . . . **Col. (B/G selectee) Anthony J. Farrington, Jr.,** from Cmdr., 47th FTW, ATC, Laughlin AFB, Tex., to Vice Cmdr., San Antonio ALC, AFLC, Kelly AFB, Tex., replacing B/G Charles P. Skipton . . . **Col. (B/G selectee) Edsel R. Field,** from Cmdr., 317th TAW, MAC, Pope AFB, N. C., to Dep. Cmdr., Joint Special Ops. Command, OJCS, Fort Bragg, N. C., replacing B/G David W. Forgan.

M/G Monroe W. Hatch, Jr., from DCS/Plans, Hq. SAC, Offutt AFB, Neb., to C/S, Hq. SAC, Offutt AFB, Neb., replacing retired M/G Christopher S. Adams, Jr. . . . **B/G (M/G selectee) Ralph H. Jacobson,** from Vice Dir. of Special Projects, OSAF, Los Angeles, Calif., to Dir. of Special Projects, OSAF, & Dep. Cmdr., Space Div. for Space Ops., SD, AFSC, Los Angeles, Calif., replacing retiring M/G John E. Kulpa, Jr. . . . **B/G Wayne O. Jefferson, Jr.,** from Director, Command & Control, Hq. SAC, Offutt AFB, Neb., to Ass't DCS/Ops., Hq. SAC, Offutt AFB, Neb., replacing B/G Wayne W. Lambert.

B/G Wayne W. Lambert, from Ass't DCS/Ops., Hq. SAC, Offutt AFB, Neb., to Cmdr., 7th AD, SAC, Ramstein AB, Germany, replacing B/G John J. Doran, Jr. . . . **B/G Paul H. Martin,** from Chief, Tac. Systems, Research & Engineering, Nat'l Security Agency, Fort Meade, Md., to Dep. Ass't C/S, Intel., Hq. USAF, Washington, D. C., replacing B/G (M/G selectee) Schuyler Bissell . . . **Col. (B/G selectee) Charles A. May, Jr.,** from Dir. of Training, DCS/Ops., Hq. SAC, Offutt AFB, Neb., to Dir., Command & Control, Hq. SAC, Offutt AFB, Neb., replacing B/G Wayne O. Jefferson, Jr.

B/G Gerald W. Parker, from Dir. of Medical Inspections, Hq. AFISC, Norton AFB, Calif., to Cmdr., Hq. AFMSC, & Dep. Surgeon General for Ops. & Dir. of Professional Services, Brooks AFB, Tex., replacing retired B/G Donald B. Wagner . . . **Col. (B/G selectee) Billy J. Rhoten,** from Cmdr., 12th FTW, Hq. ATC, Randolph AFB, Tex., to Command Dir., NORAD Combat Ops., J-31, NORAD/SPACECOM, Cheyenne Mountain Complex, Colo. . . . **M/G Richard K. Saxer,** from Vice Cmdr., ASD, AFSC, Wright-Patterson AFB, Ohio, to Dep. Dir. (Ops. & Admin.), Defense Nuclear Agency, Washington, D. C.

B/G Donald J. Stukel, from DCS/Plans & Prgms., Hq. AFSC, Andrews AFB, Md., to Cmdr., Contract Mgmt. Div., AFSC, Kirtland AFB, N. M., replacing B/G James C. Dever, Jr. . . . **Col. (B/G selectee) David S. Watrous,** from Cmdr., Foreign Tech. Div., AFSC, Wright-Patterson AFB, Ohio, to Chief, Tac. Systems, Research & Engineering, National Security Agency, Fort Meade, Md., replacing B/G Paul H. Martin . . . **B/G Bernard L. Weiss,** from DCS/Contracting & Manufacturing, Hq. AFSC, Andrews AFB, Md., to Dir. of Contracting & Manufacturing Policy, DCS/RD&A, Hq. USAF, Washington, D. C., replacing M/G Joseph H. Connolly.

B/G (M/G selectee) Harold J. M. Williams, from DCS/Log., Hq. SAC, Offutt AFB, Neb., to DCS/Plans, Hq. SAC, Offutt AFB, Neb., replacing M/G Monroe W. Hatch, Jr. . . . **Col. (B/G selectee) Larry D. Wright,** from Cmdr., 438th MAW, MAC, McGuire AFB, N. J., to Dep. Dir., Log. Plans & Prgms., DCS/L&E, Hq. USAF, Washington, D. C., replacing B/G (M/G selectee) William P. Bowden . . . **B/G (Dr.) C. Thomas Yarington, Jr.,** from Mobilization Ass't to Command Surgeon, Hq. AFSC, Andrews AFB, Md., to Mobilization Ass't to Dep. Surgeon General, Hq. USAF, Washington, D. C.

SMSgt. Robert Nelson, wearing the shirt that shows he ran the Greek Marathon, pounds the pavement in his red 301st TFW cap. See item. (Photo by Maj. Ernie Stepp, USAF)

Reserve service can usually cover a broad range of incentives. One uncommon advantage is stated by SMSgt. Robert Nelson, who, as a full-time technician, is a munitions maintenance section supervisor with the 301st Tactical Fighter Wing at Carswell AFB, Tex.

"The Air Force Reserve gave me the opportunity to participate in the Greek Marathon," said Sergeant Nelson. "It's a dream of most every runner to participate in the Greek Marathon, but few get the opportunity."

Sergeant Nelson, who began running several years ago, got his chance when the 301st deployed to Turkey to participate in a NATO exercise. Since the exercise tapered off about the time the Marathon began, he was given permission to go to Greece if he could get there on his own and back in time to catch a returning C-141 to Carswell.

With the aid of a space-available flight from Turkey to Athens, Sergeant Nelson made it to the town of Marathon, participated in the run, and made it back. It was the experience of a lifetime, he noted, to run the same route as that done in 490 B. C.—after which that runner dropped dead.

The route today has an extra loop in it so that it measures the exact 26.2 miles of sanctioned marathons. More than 1,000 runners competed in the 1982 event, twelve of them Americans—and one wearing the red baseball cap of the 301st *(see photo).* Sergeant Nelson told AIR FORCE Magazine that when townspeople saw his cap they would "put forth a special cheer for the American."

The Sergeant, whose wife, Pat, is also a runner, brought home a medal from his Greek odyssey. Next stop—the Boston Marathon.

Short Bursts

The **annual dividend distribution for GI life insurance** policies will see USGLI (World War I) holders getting an average of $257; NSLI (World War II) insureds will receive an average of $122; and the newer VSLI policy holders will get around $26 to $123, depending on the plan. All payouts will differ according to age, length of time the policy has been in force, and plan carried. No application is necessary—dividends will be received in the policy anniversary month.

An agreement between DoD and the US Postal Service will extend to **military commanders** the Post Office's authority **to inspect and open overseas mail.** The agreement does not allow indiscriminate opening of personal mail and does not create new federal powers—it merely transfers existing authority to military officials, thereby improving the effectiveness of the war on drugs.

The **VA is one of the largest employers of disabled veterans** in federal government. Approximately sixty-six percent of its male employees are vets, and eighteen percent are Vietnam vets.

A University of Michigan survey of **high school seniors** finds that "many" would **swap paid education for military service.** This is a turnaround from a survey done five years ago.

GAO is touting an idea not likely to find much acceptance among the services. It recommends that **DoD drop entry medical fitness standards for "quality applicants"** and also provide corrective treatment to recruits who currently would be disqualified because of readily correctable medical conditions and physical defects, such as abdominal hernia and weight problems.

Selectees for the Air Force's **Physician Assistant** training program must now **qualify for award of a baccalaureate** degree upon graduation from the two-year program. Reason is that the Air Force is sticking to its insistence that PAs be commissioned, even if other services do not. Thus, the bachelor's degree is necessary. This means selectees for training must have at least sixty college hours going in, with History, American Government, and English Composition credits among them. ■

Ordeal by Flak and Fighter

Though severely wounded, Sergeant Vosler steadfastly stood to his post aboard the mortally crippled B-17 bomber.

BY WILLIAM P. SCHLITZ
SENIOR EDITOR

THE Eighth Air Force continued its sustained assault on Bremen, Germany, on December 20, 1943. On that day, twenty-year-old SSgt. Forrest L. Vosler was serving as a radio operator and aerial gunner aboard *Jersey Bounce Jr.*, a B-17 Flying Fortress of the 303d Bomb Group's 358th Bomb Squadron.

Sergeant Vosler had been in England since October, and was on only his fourth combat mission.

Coming off the target, *Jersey Bounce Jr.* was heavily damaged by antiaircraft fire and drifted out of formation to become of immediate interest to predatory enemy fighters.

In the attacks that followed, a 20-mm cannon shell exploded in the radio compartment, wounding Sergeant Vosler in the legs and thighs. The radio was damaged and rendered inoperative. At about the same time, the tail gunner was seriously wounded by a direct hit on the tail of the plane, and his guns were put out of commission.

Vosler, realizing the need to protect the vulnerable tail of the bomber, began a steady stream of fire to take up the slack. As enemy fighters continued to swarm about the crippled bomber, a determined Sergeant Vosler fought back.

A short time later, another shell exploded in the plane, hitting the Sergeant in the chest and face. Refusing first aid, and with metal fragments in his eyes blurring his vision, he kept firing his guns.

Jersey Bounce Jr. survived the ordeal over the North Sea until off Cromer, England. It was there that the pilot announced his decision to ditch the limping bomber. Though blinded, Sergeant Vosler managed to repair the aircraft's battle-damaged radio entirely by touch. With the set now operating, Vosler sent out distress calls in between periods of unconsciousness.

The plane slammed into the water. Sergeant Vosler groped his way, without assistance, onto a wing. There he held the severely wounded tail gunner from slipping under until the other crew members could help them both into a dinghy.

They were subsequently taken aboard a Norwegian coaster. A short time later a fast motor patrol boat directed to the vessel by air/sea rescue took the two wounded men to England.

"I don't know what happened to the others," Mr. Vosler said in a recent interview. "I was confined to hospitals in England until my return to the United States in March 1944."

On his return to the US, Sergeant Vosler was presented the Medal of Honor for his bravery by President Roosevelt at a White House ceremony. Vosler is one of only three Eighth Air Force enlisted men to receive the nation's highest award during World War II.

Sergeant Vosler continued to receive treatment at various hospitals until he was discharged from service in October 1944, with the rank of technical sergeant (his promotion came through two weeks after he was wounded).

Employed by a radio station while earning a college degree, in 1946 Mr. Vosler became one of the charter members of the fledgling Air Force Association's board of national directors.

Today, he lives in Baldwinsville, N. Y. ■

In early 1946 President Harry S. Truman welcomed to the White House six officers of the newly formed Air Force Association, among them Medal of Honor winner Forrest L. Vosler. The distinguished company, from left: AFA's first President, Jimmy Doolittle; Willis Fitch; Forrest Vosler; the President; second AFA President Tom Lanphier, Jr.; Meryll Frost; and Jimmy Stewart.

AFA Intercom

Academy Falcons Excel In Many Ways During "A Season of Firsts"

As the new year dawned, a telegram went winging over the wires from AFA National Headquarters in Washington, D. C., to Maj. Gen. Robert E. Kelley, Superintendent of the Air Force Academy. It said, "Please copy to Coach Ken Hatfield and the Falcons: Congratulations from the entire 180,000-member Air Force Association on your superb season. Your decisive victory in the Hall of Fame Bowl was a fitting climax to 'a season of firsts.' We salute you."

The occasion that sparked this wire was the dramatic come-from-behind performance of the USAFA Falcon footballers in beating the Commodores of Vanderbilt University in the Hall of Fame Bowl in Birmingham, Ala., on the day of New Year's Eve. But what the wire referred to as a "season of firsts" was truly a stretch of time at the beginning of the 1982–83 academic year that will long be remembered.

This was the season that the Falcons beat both Navy and Army to win for the first time the coveted Commander in Chief's Trophy, symbolic of service academy football supremacy. And it will be remembered as the first time the Falcons beat Notre Dame, whipping the Irish 30–17 before a home crowd exceeding 47,700 fans and securing the Hall of Fame Bowl bid in the process. And, of course, capping it all off was the bowl victory, perhaps best summed up by the losing team's coach.

"Air Force went at it hard," George MacIntyre said following the Commodores' 36–28 defeat at the hands of the Air Force. "I guess I'm glad our military institutions play really hard. That's

TOP RIGHT: Before the 1982 Hall of Fame Bowl football game between Air Force and Vanderbilt, SSgt. Robert Stone of the Academy's Wings of Blue parachute team arrives in Legion Field, Birmingham, Ala., with the Stars and Stripes. ABOVE: Air Force Academy fullback John Kershner bulls his way ahead for tough yardage against Vanderbilt. Kershner led all Falcon rushers with thirty-two carries for 132 yards and one touchdown. The 36–28 final score gave the Falcons their first bowl victory in four attempts. RIGHT: Victorious Falcon head coach Ken Hatfield and his star quarterback, Marty Louthan, head for the locker room after their Hall of Fame Bowl victory. (USAF photos by C1C Mark Abbott)

ELECTRONICS AND THE AIR FORCE

A National Symposium of the Air Force Association
Hilton at Colonial, Wakefield, Mass. (near Hanscom AFB on Route 95/128)
April 28–29, 1983

An authoritative overview of the importance of electronics to the Air Force with special emphasis on the opportunities and problems in the evolution of command control communications and intelligence (C^3I) and electronic warfare for coalition warfare in concert with allied forces. Participants will include senior officials and advisors from the White House, allied countries, the Defense Department, and the Air Force. The Symposium will be held in conjunction with the Air Force Systems Command. Recognizing that command control communications and intelligence systems are essential to the implementation of allied strategy, control of forces, and optimum use of weapons in modern warfare, the program will focus on the fact that coalition warfare requires coalition C^3I. Presentations will examine how and where we can link the command and control systems of all the services and those of our allies, thereby making them increasingly interoperable and effective.

SPEAKERS INCLUDE:

Gen. Robert T. Marsh
Commander, Air Force Systems Command

Lt. Gen. Robert T. Herres
Director for C^3 Systems/OJCS

Maj. Gen. Doyle E. Larson
Commander, Electronic Security Command

Maj. Gen. John B. Marks
Air Force Assistant Vice Chief of Staff, Intelligence

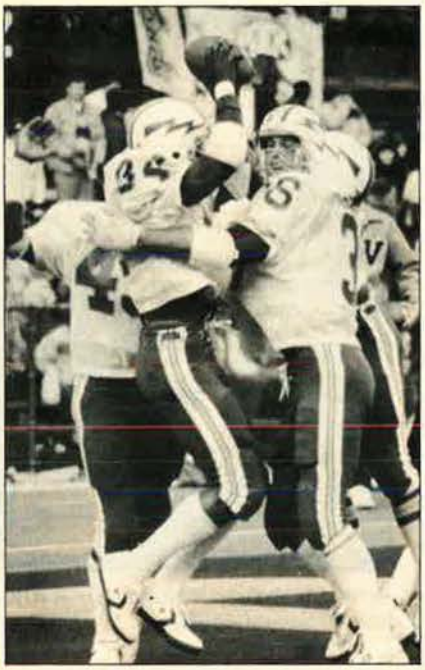
Lt. Gen. Thomas H. McMullen
Commander, AFSC's Aeronautical Systems Division

Maj. Gen. Gerald L. Prather
Director, Command and Control, and Telecommunications, Office of DCS/Plans and Operations

Dr. Victor H. Reis
Assistant Director, National Security and Space, White House Office of Science and Technology Policy

Lt. Gen. James W. Stansberry
Commander, AFSC's Electronic Systems Division

Registration fee for all Symposium events is $195. This fee includes all presentation sessions, coffee breaks, continental breakfast, lunch, and a dinner with a major speaker. For information and registration, call Jim McDonnell or Dottie Flanagan at (202) 637-3300, Air Force Association, Suite 400, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006.



Falcon cornerback Don Smith comes up with one of three Air Force interceptions to help stop the passing attack of Vanderbilt quarterback Whit Taylor during the Hall of Fame Bowl. (USAF photo by C1C Mark Abbott)

nice. It makes me sleep a little better at night."

"They're an amazing and wonderful bunch of kids," Falcon Coach Ken Hatfield said of his team. "They've come back to win the big ones all year, and they did it again against awfully long odds."

Indeed, the Falcons had some very dramatic turnarounds—against Navy in the final seconds, beating the Midshipmen 24–21; against Brigham Young in Provo, Utah, where the Falcons stole the thunder from the perennial Western Athletic Conference champion Cougars with a ninety-nine-yard drive in the last ninety seconds and a two-point conversion with six seconds remaining that resulted in a 39–38 Falcon win; and in Birmingham, where Air Force scored nineteen points in the fourth quarter to negate an awesome aerial attack by the Commodores.

While members of the Air Force squad are training at the Academy to become Air Force leaders, it was their ground troops who secured them the Hall of Fame Bowl victory and seven other wins this season. Employing a flexible wishbone (or "flexbone") attack led by quarterback Marty Louthan, the Falcons gained record yardage and points as they gobbled up great chunks

An Open Letter to President Reagan

When the Administration singled out military people and federal civilians for a proposed pay "freeze" in January, Air Force Chief of Staff Gen. Charles A. Gabriel was among the first to speak out publicly against it (see "In Focus . . ." p. 20). David Blankenship, AFA President, wrote to General Gabriel, applauding him for his courage, and at the same time sent the following letter to President Reagan.

Dear Mr. President:

Speaking for the 180,000 members of the Air Force Association, I ask you to order a closer review of the Administration's consideration to eliminate the cost-of-living allowance for military and civil service personnel. We are surprised that a major portion of the proposed reductions in the FY 1984 DoD budget came from the "salaries of people" and readiness training of our forces.

Last year, during congressional hearings on the 1983 defense budget, military and civilian personnel were told by DoD that because of the necessity to build up equipment for our armed forces, hardware must take priority over cost-of-living increases. At the same time, they were assured that these cost-of-living increases would be in the next year's (1984) budget. As a result, there was little or no outcry.

At our National Convention in September 1982, our delegates considered the DoD pay issue as a top priority and adopted a policy paper that stressed the importance of this subject. This National policy paper states:

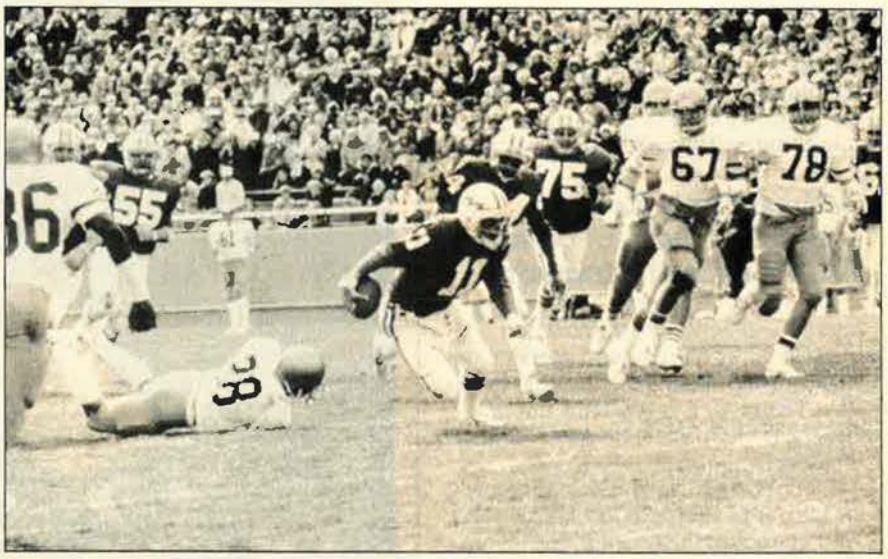
> . . . we are doing well now, but an upturn in the economy . . . or pay caps, could return us to the brink of the retention disaster we experienced in the late 1970s. . . . [W]e must be alert about the future. In many ways what the Air Force faces today is chillingly reminiscent of 1975, when the services were unknowingly on the brink of the worst manpower crisis since the advent of the All-Volunteer Force.

We have shared your pride in the recent successes of the All-Volunteer Force; successes reflecting directly the extent to which our defense personnel have supported your Administration's policies.

This proposed pay cut appears to be selectively targeted and heavily weighted toward DoD, and the far-reaching, adverse implications of selecting our defense personnel for such pay cuts cause us to appeal to you to order a closer review of this action.

Mr. President, we urge you to continue your strong support of the security interests of our nation "on alert" throughout the world.

Respectfully,
David L. Blankenship



Air Force quarterback Marty Louthan cuts upfield against Navy during last October's meeting at Falcon Stadium. The Falcons went on to beat the Midshipmen by a score of 24–21. The Falcons also downed Army by a score of 27–9 to capture the Commander in Chief's Trophy. (USAF photo)

AFA's Curtis E. LeMay Chapter recently held its annual brunch in Newport, Calif. Guest speaker at the event was PACAF Commander in Chief Lt. Gen. Arnold W. Braswell, who presented an AFA Award for Distinguished Service to outgoing Chapter President Ray S. Villareal. Those present included (from left): Carrol Buford, Vice President of South California State AFA; Ray Villareal; General Braswell; and Marc H. Coody, President of the LeMay Chapter.

Retired Maj. Gen. Richard Carr is AFA's new National Chaplain.

of turf in game after game. At season's end, they ranked fourth in the nation in rushing offense and had gained a total of 4,666 yards, surpassing the old Academy mark of 4,660 yards set in 1970. Fullback John Kershner alone rushed for more than 1,000 yards.

All-American senior guard Dave Schreck, named to the Associated Press All-America third team, also won a $1,500 postgraduate scholarship from the National Foundation and Hall of Fame and was selected to play in the Hula Bowl college all-star game played this past January.

Their 8–5 season gave the Falcons their best record since 1970. "The players will never forget this season," Coach Hatfield told one reporter in Birmingham. "It will carry over, because the players of the future at the Academy can always think about this season and this game and know they can do it, too."

Father Hank Retires, Reverend Carr Becomes AFA National Chaplain

AFA National Chaplain Rev. Henry J. Meade—affectionately known as "Father Hank"—has resigned as National Chaplain for health reasons. AFA President David L. Blankenship accepted Reverend Meade's resignation "with reluctance."

The new AFA National Chaplain will be Maj. Gen. Richard Carr, USAF (Ret.), who accepted President Blankenship's invitation to fill the National Chaplain post for the remainder of this AFA year. Chaplain Carr is the immediate past Air Force Chief of Chaplains.

Chaplain Carr is a graduate of the Fuller Theological Seminary in Pasadena, Calif., and was ordained as a minister of the United Church of Christ in 1954. He saw service as a B-24 radio operator/gunner during World War II, and reentered active-duty Air Force service in 1955. He was named Chief of Chaplains in August 1978.

Chaplain Carr, a California native, now lives with his wife Jeanne in Springfield, Va. AIR FORCE Magazine joins all AFAers in wishing Chaplain Carr a hearty "Welcome aboard!"

Travis Chapter Presents Twenty-two State and National AFA Awards

California State AFA's Robert F. Travis Chapter is no slouch when it comes to honoring those who support AFA and

The super recruiters: California State AFA President Scott Norwood, left, presents 1st Lt. Mary McQueen an AFA Life Membership and Maj. Mike Singer an AFA desk pen set for their superb AFA membership recruitment efforts. See item.

the Air Force. They proved as much last year when they recognized twenty-two civilians and military people at an awards banquet held in Vacaville, Calif.

Chapter President Robert Hazeleaf explained at the banquet that the awards were being presented on behalf of California State AFA as well as AFA National Headquarters. California State AFA President Scott Norwood, along with Maj. Gen. Donald Bennett, Commander of MAC's Twenty-second Air Force at Travis AFB, and Col. Robert Sample, Commander of the 60th Military Airlift Wing at Travis, assisted in presenting the awards.

Awards presented included California State AFA's Meritorious Service Awards and the National Medals of Merit. Several Air Force officers also received Scott Associate Awards for their ongoing AFA membership support.

1st Lt. Mary McQueen and Maj. Mike Singer received California State AFA Membership Achievement Awards *(see photo)*. Major Singer, chapter membership chairman, was responsible for bringing in 560 new AFA members during the 1982 membership year—the most new members for any chapter membership chairman in California, and fourth highest total throughout the Association. Lieutenant McQueen singlehandedly recruited 146 new AFA-ers—more than any other membership worker in the state.

Special recognition was also extended Vacaville *Reporter* publisher Richard Rico at the banquet for his strong support of AFA and the Air Force.

Unit Reunions

AAS/AnF Conclave
The Arnold Air Society/Angel Flight National Conclave will be held April 1–4, 1983, at the Peabody Hotel in Memphis, Tenn. All alumni are invited. **Contact:** Memphis State University, AFROTC Det. 785, Memphis, Tenn. 38125. Phone: (901) 454-2681/2682. AUTOVON: 966-9638.

11th Service Sqdn.
The Headquarters, 11th, and 482d Service Squadrons and the 8th Service Group will hold a reunion on May 13–15, 1983, in Lancaster, Pa. **Contact:** John J. "Jack" Heckler, 76 E. Harbor Dr., Teaticket, Mass. 02536. Phone: (617) 540-1303.

30th Bomb Group Ass'n
Members of the 30th Bomb Group, Seventh Air Force, will hold a reunion on October 7–8, 1983, at the Shangri-La in Afton, Okla. **Contact:** John S. Allison, 30th Bomb Group Association, 19 Lowndes, Charleston, S. C. 29401.

75th Troop Carrier Sqdn.
Members of the 75th Troop Carrier Squadron, 435th Troop Carrier Group, will hold a reunion on May 13–14, 1983, in Houston, Tex. **Contact:** Robert C. Richards, 139 Kiser Dr., Tipp City, Ohio 45371. Phone: (513) 667-3827.

82d Troop Carrier Sqdn.
The 82d Troop Carrier Squadron of the 436th Troop Carrier Group will hold its third annual reunion on April 30–May 1, 1983, in San Francisco, Calif. **Contact:** Peter F. English, 659 Claremont Dr., Vacaville, Calif. 95688. Phone: (1-707) 447-0729.

420th Air Refueling Sqdn.
The first reunion of the 420th Air Refueling Squadron will be held on March 19–20, 1983, in Alexandria, La. **Contact:** Jess E. Gibbs, 5411 Downing St., Alexandria, La. 71301. Phone: (318) 442-5556.

490th Bomb Group Ass'n
Members of the 490th Bomb Group will hold a reunion on May 12–15, 1983. **Contact:** George Pickard, 30430 Red Maple Lane, Southfield, Mich. 48076.

510th Fighter Sqdn.
The 510th Fighter Squadron, Ninth Air Force, will hold its second reunion on April 29–May 1, 1983, at the Ramada Inn in Sun City, Ariz. **Contact:** Bill Shaeffer, 2318 Monteagle St., Colorado Springs, Colo. 80909.

2d Air Division Ass'n
Veterans who served in Hq. 2d Air Division during World War II and who are not members of the 2d Air Division Association at this time should please contact me at the address below for some important information.

James H. Reeves
2d Air Division Ass'n
P. O. Box 98
Moultrie, Ga. 31768

UPT Class 65-XF
Class reunion plans for graduates and instructors from UPT Class 65-XF, Del Rio, Tex., are now being developed.

Please contact the address below for information.

Lt. Col. James L. Taylor, USAF
130 Creekside Trail
Fayetteville, Ga. 30214
Phone: (404) 763-7243 or 797-5481

Class 42-A
I am trying to contact members of the Class of 42-A (January 9, 1942), Brooks Field, Tex., for a proposed reunion.

This Is AFA

The Air Force Association is an independent, nonprofit, aerospace organization serving no personal, political, or commercial interests; established January 26, 1946; incorporated February 4, 1946.

OBJECTIVES: The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principle of freedom and equal rights for all mankind.

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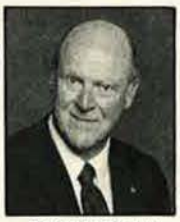

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Seaford, Va. 23696
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Rapid City, S. D. 57701
(605) 343-0729
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National Commander
Arnold Air Society
Los Angeles, Calif.

AFA Intercom

AFA's Pope Chapter had a real surprise in store for the football fans of Pope AFB, N. C., last year. The Chapter treated fifty airmen from the base to the Duke-Wake Forest game at Durham, N. C.

Please contact the address below for more information.

Col. Jarrett B. Roan, USAF (Ret.)
12063 Arms Way
San Antonio, Tex. 78233

313th Troop Carrier Group

Would anyone who served with the 313th Troop Carrier Group at RAF Folkingham in England during World War II please contact me at the address below?

Col. Bruce F. Kolofske, USAF
Commander
313th Tactical Airlift Group
APO New York 09127

330th Bomb Group

The 330th Bomb Group, which flew B-29s from Guam in 1945, plans to hold a reunion in late 1983.

Those interested in attending should contact the address below.

Jack B. Schade
3976 Parkview Dr.
Salt Lake City, Utah 84117

509th Composite Group

We are searching for members to attend a reunion of the 509th to be held on August 9–12, 1984.

Please mail inquiries to the address below.

Charles Levy
509th Composite Group (VH)
P. O. Box 24606
Philadelphia, Pa. 19111
Phone: (215) 342-3887

Coming Events

April 8–9, **South Dakota State Convention,** Sioux Falls . . . April 22–24, **Northeast Regional Meeting,** Corning, N. Y. . . . April 30, **South Carolina State Convention,** Columbia . . . June 3–4, **Arkansas State Convention,** Little Rock . . . June 3–4, **Ohio State Convention,** Newark . . . June 11, **Illinois State Convention,** Scott AFB . . . June 17–19, **Texas State Convention,** Bryan/College Station . . . July 15–17, **Pennsylvania State Convention,** Philadelphia . . . July 22–24, **Georgia State Convention,** Athens . . . July 29–31, **Florida State Convention,** Orlando . . . August 11–13, **California State Convention,** Sunnyvale . . . August 12–14, **New York State Convention,** Rome . . . August 18–20, **Utah State Convention,** Ogden . . . September 11–15, **AFA National Convention and Aerospace Development Briefings and Displays,** Washington, D. C.

Bob Stevens'

"There I was..."

IN THE SOFT-HELMET ERA, ALL FIGHTER GROUPS USED AIRCRAFT MANEUVERS PLUS HEAD and HAND SIGNALS TO COMMUNICATE WHILE MAINTAINING RADIO SILENCE. VARIATIONS OF THIS SYSTEM ARE IN USE TODAY. HOWEVER, ANY TIME "BODY ENGLISH" IS USED YOU'LL RUN ACROSS SOMEONE WHO DOESN'T SPEAK ENGLISH... and THAT'S THE BASIS OF THIS MINI-SERIES.

COMMUNICATING WITHOUT TALKING, PT I.

LESSON 1. - AIRCRAFT SIGNALS

"CLOSE IT UP"

"OPEN IT UP- SPREAD OUT"

"ECHELON RIGHT"

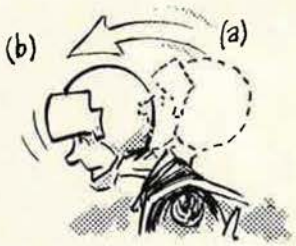
(ALT. WING FOR LEFT, NATCH)

"PREPARE TO LAND"

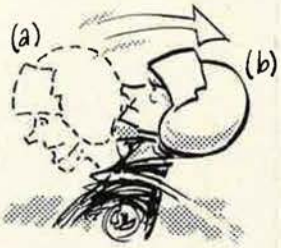
(NOT *TOO* VIOLENT OR YOU'LL LOSE THE WHOLE OUTFIT)

LESSON 2. - HEAD and HAND SIGNALS

"RELEASE BRAKES" (TAKEOFF ROLL)



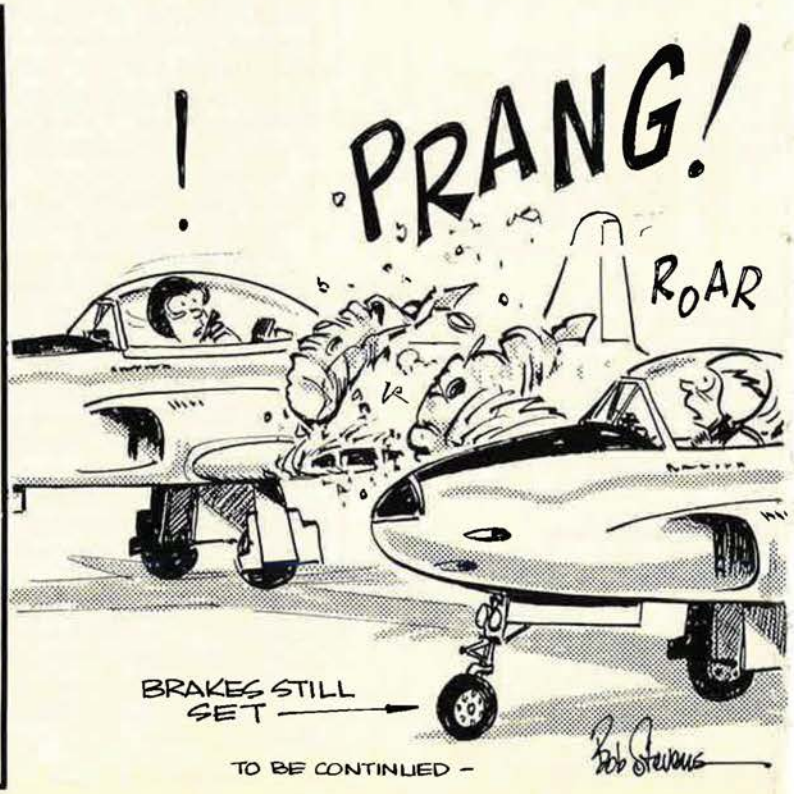
"REDUCE POWER" (IN FLIGHT)



"MY RADIO'S OUT"

"OPEN SPEED BRAKES" (JETS)

REMEMBER "RELEASE BRAKES" SHOWN ABOVE? PICTURE 2 F-80s LINED UP (WITHOUT WINGTIP CLEARANCE) FOR TAKEOFF - THE LEADER SNEEZES...



TO BE CONTINUED -

Bob Stevens

A training system that flies wing-to-wing with the F/A-18...

because Sperry knows how to listen.

Communicating with the onboard avionics of the highly computerized F/A-18 Hornet required data rates which overpowered conventional input/output systems.

That was until Sperry developed the first operational flight trainer able to match the sophistication of this "fly-by-wire" tactical aircraft. Our solution was a unique systems architecture—a new programming approach capable of greater speed and capacity, and of relieving the host computer of many input/output processing tasks.

Realism—coupled with instructional and growth flexibility—is the key element in training effectiveness. Computer-generated imagery displays panoramas ranging from carrier decks to airfields. A computer-linked G-suit/G-seat and a buffet system reproduce the physical dynamics and physiological cues of the full supersonic and subsonic flight environments.

We listened to the needs of fleet instructor pilots when we designed the instructor station. So even for new instructors, our system is easy to operate and offers flexibility in structuring and evaluating the training exercise. And the system is designed to keep pace with changing training requirements and aircraft developments. As aircraft features and objectives change, the simulation programs can be upgraded accordingly.

For more information on what we're doing—and can do—in the broad field of simulation and training, talk to us...we listen.

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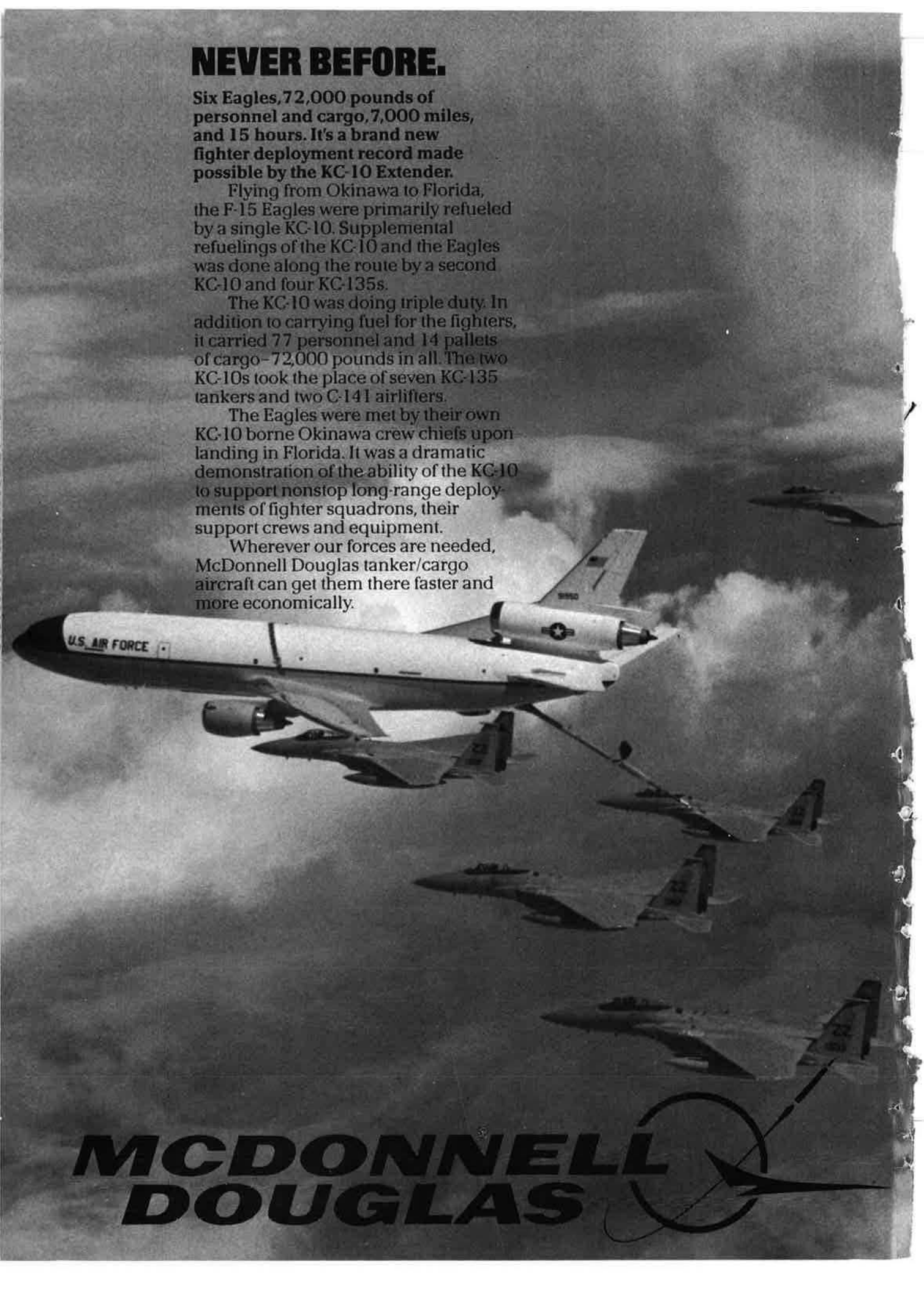

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Six Eagles, 72,000 pounds of personnel and cargo, 7,000 miles, and 15 hours. It's a brand new fighter deployment record made possible by the KC-10 Extender.

Flying from Okinawa to Florida, the F-15 Eagles were primarily refueled by a single KC-10. Supplemental refuelings of the KC-10 and the Eagles was done along the route by a second KC-10 and four KC-135s.

The KC-10 was doing triple duty. In addition to carrying fuel for the fighters, it carried 77 personnel and 14 pallets of cargo–72,000 pounds in all. The two KC-10s took the place of seven KC-135 tankers and two C-141 airlifters.

The Eagles were met by their own KC-10 borne Okinawa crew chiefs upon landing in Florida. It was a dramatic demonstration of the ability of the KC-10 to support nonstop long-range deployments of fighter squadrons, their support crews and equipment.

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