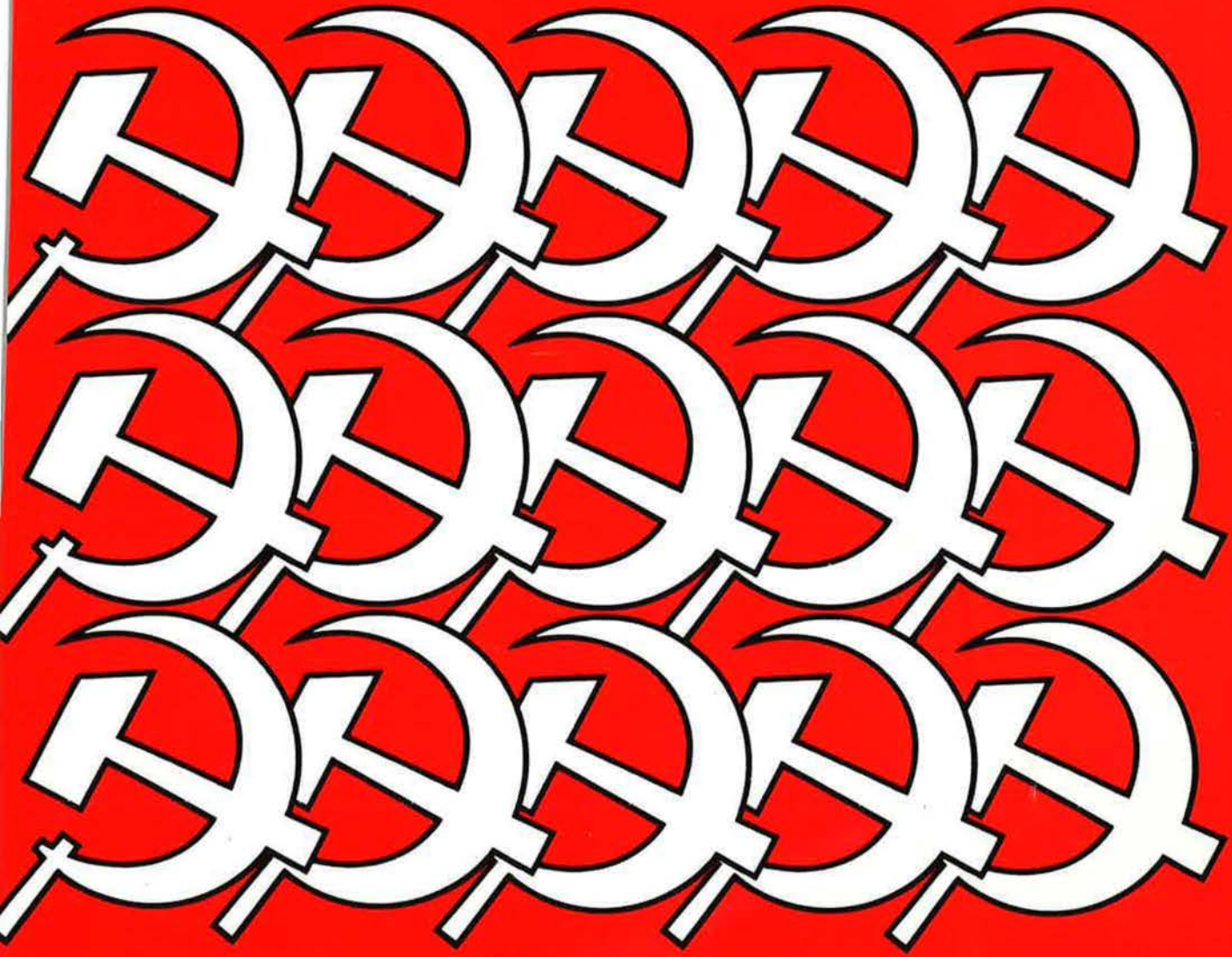
MARCH 1977/$2

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION



СОВЕТСКИЙ АВИАЦИОННО-КОСМИЧЕСКИЙ АЛЬМАНАХ 1977*

*SOVIET AEROSPACE ALMANAC 1977

F-16
FLY-BY-WIRE FLIGHT CONTROL

ACTIVE CONTROL TECHNOLOGY enabled General Dynamics to maximize F-16 performance, maneuverability and handling qualities, making it the most advanced air combat fighter in the world.

The key to successful implementation of Active Control Technology is the fly-by-wire flight control system. Teamed with General Dynamics, the Astronics Division of Lear Siegler, Inc. will provide the fly-by-wire flight control computer and the sidestick force controller.

The first production system of its kind, the F-16 fly-by-wire flight control system, features quad redundant circuitry to assure full-time active control, flight safety and mission completion.

Proud to be a member of the team, Lear Siegler is pleased to work with General Dynamics and European Industry in this vital aerospace program.

LSi®

LEAR SIEGLER, INC.

ASTRONICS DIVISION

3171 SOUTH BUNDY DRIVE • SANTA MONICA, CALIF. 90406 • AREA CODE 213 391 7211

The work platform that reaches up, out, and over... for safer, more efficient service.

is self-propelled Manlift is a work atform designed especially for er, more efficient military aircraft intenance. Every major airline in e world uses Manlift. With its ble, cantilevered platform, it puts n and equipment close to the dest-to-reach spots on an air- ft—even over wheel wells.

ontrolled right from the work form, Manlift units reposition move from place to place kly, saving countless manhours. sor pads around its platform the unit when it touches the raft to prevent damage. Studies prove they save at least 30% in man-hours over stationary stands, ladders, and scaffolds.

And most important, they are safer, helping to eliminate accidents with their stability, mobility, and ability to position men close to their work. They meet OSHA standards, and have failsafe controls.

The Manlift military aircraft service unit has a 31 ft. reach, a lift capacity of 2,000 lbs. These standard units may be procured locally under a Depot Plant Equipment Program, Manlift Model No. SM31-EAST, Federal stock number 1720-00-574-1809.

For details write for brochure on the Manlift Aerial Work Platforms for Military Aircraft: Chamberlain Manufacturing Corporation, 2361 S. Jefferson Davis Highway, Arlington, Virginia 22202, Phone 703/521-5054.

manlift®

Self Propelled Aerial Work Platforms

A product of Chamberlain®

When you need direction, Bendix can steer you right.

It all began when we built the earth inductor compass that Lindbergh used to steer the "Spirit of St. Louis" to Paris. And we've been showing people how to find their way ever since.

Precision measurement and the computation of angles, time, speed—we know these functions from every direction.

Bendix gyro stabilized compasses, air data computers, visual omni-range receivers, instrument landing systems, automatic direction-finders, distance measuring equipment and Doppler radar navigation systems are known and respected by military, commercial and private pilots worldwide.

The Apollo astronauts know Bendix, too. They depended on our inertial measuring unit to provide stabilization and precision guidance data to acquire orbits, and for translunar injection.

Recently, we introduced our new Omega airborne navigation system — a long-range system destined to find widespread use both domestically and overseas.

And we've just introduced to the general aviation market a new automatic radio direction-finder with sensitivity that far exceeds competitive systems.

For the future, we're working on cathode ray tube presentations of navigation data that ultimately will reduce the number of instruments required in the cockpit.

These are all products of Bendix Flight Systems Division, Bendix Guidance Systems and Bendix Avionics Division—three of the many divisions which combine technological expertise through the Bendix Aerospace Electronics Group.

For more information write for our brochure, "Worlds of Creativity." The Bendix Corporation, Aerospace-Electronics Group, Dept. 110-C, 1911 North Fort Myer Drive, Arlington, Virginia 22209.

Bendix

AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

This Month

ABOUT THE COVER

The Editors of AIR FORCE *Magazine are pleased to present the third annual "Soviet Aerospace Almanac," assembled as a year-round reference work on the military forces of the Soviet Union. The special section begins on p. 35 and runs through p. 110.*

Departments

MARCH 1977
VOLUME 60, NUMBER 3

Publisher: James H. Straubel
Assistant Publisher: John F. Loosbrock
Associate Publishers: Charles E. Cruze, Richard M. Skinner

Editor: John F. Loosbrock
Executive Editor: John L. Frisbee
Senior Editors: Claude Witze, Edgar Ulsamer, James H. Taylor
Military Relations Editor: James A. McDonnell, Jr.
Contributing Editors: Ed Gates, Don Steele, John W. R. Taylor ("Jane's Supplement"), Maj. Terry A. Arnold, USAF
Regional Editors: Stefan Geisenheyner, Wiesbaden, Germany; Irving Stone, Los Angeles, Calif.

Managing Editor: Richard M. Skinner
Ass't Managing Editor: William P. Schiltz
Director of Design and Production: Robert T. Shaughness
Art Director: William A. Ford
Special Assistant to the Editor: Nellie M. Law
Editorial Assistants: Nellie M. Law, Pearlie M. Draughn, Grace Lizzio
Administrative Assistant to the Publisher: Ethel J. Vernon
Assistant for Editorial Promotion: Robin Whittle

Advertising Director:
Charles E. Cruze
1750 Pennsylvania Ave., N.W.
Washington, D.C. 20006
Telephone: (202) 452-7330

Advertising Service Manager: Patricia Teevan

Area Sales Managers:
Bayard Nicholas, Stamford, Conn. (203) 357-7781
James G. Kane, Chicago (312) 296-5571
Harold L. Keeler, Los Angeles (213) 879-2447
William Coughlin, San Francisco (415) 546-1234
Yoshi Yamamoto, Tokyo 535-6614

European Sales Representative:
Richard A. Ewin
Overseas Publicity Ltd.
214 Oxford St.
London W1N OEA, England
Telephone: 01-636-8296

AIR FORCE Magazine (including SPACE DIGEST) is published monthly by the Air Force Association, Suite 400, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006. **Phone:** (202) 452-7300. Second-class postage paid at Washington, D.C. **Membership rate:** $10 per year (includes $9 for one-year subscription); $24 for three-year membership (includes $21 for subscription). **Subscription rate:** $10 per year; $5 additional for foreign postage. Single copy $1. Special issues (Soviet Aerospace Almanac, USAF Almanac, Anniversary Issue, and "Military Balance" issue) $2 each. **Change of address** requires four weeks' notice. Please include mailing label. Publisher assumes no responsibility for unsolicited material. Trademark registered by Air Force Association.

BPA Circulation audited by Business Publication Audit








Economical.

There's at least one good reason why 22 commercial airlines are currently operating Boeing 747 wide-bodies with main deck cargo capability.

Performance.

The 747 cost-per-ton mile of operation at 4,000 miles is far less than that of the only other comparable wide-body airplane available. And that's why 68% of all passenger seats offered and 60% of all available cargo space flying the North Atlantic is provided by Boeing 747s.

Also, only Boeing manufactures a pure freighter model, the 747-200F, with a fully mechanized main deck cargo handling system. So, loading and unloading the 125-ton payload through the nose cargo door is an easy 22-minute job for a two-man crew.

The same reasons that make the 747 freighter the best buy for commercial airlines make it an economical choice for the Air Force

In or out of uniform.

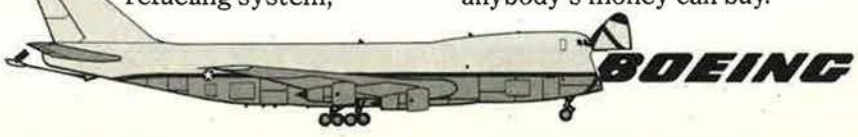
dvanced Tanker/Cargo Aircraft rogram.

It will carry more fuel and more argo, including oversize military quipment, longer distances than ny other military or commercial ansport now in service.

And with practically all the 747's evelopment costs already paid for, taxpayers have already saved several million dollars.

In fact, all the 747-200F needs to become operational as the ATCA is the addition of the aerial refueling system, extra fuel cells and military avionics.

Commercial or military. Either way you look at it, the 747 freighter is the best wide-body aircraft anybody's money can buy.



Airmail

Dangers of Slanted News

Claude Witze's column, "The Wayward Press," is the best thing to happen in the media for a long time. It tells it like it is and alerts the readers to the dangers of not knowing the facts in these days when communication of the truth is so vital.

In the January '77 issue, Mr. Witze alerts us to the one-sided viewpoint on defense by CBS. Interestingly enough, Senator Proxmire has entered the truth-in-the-press battle by inquiring of General Brown as to the truth in the New York *Times* (January 3) article on Maj. Gen. George J. Keegan's comments. Senator Proxmire states he is taking General Keegan's remarks very seriously. By the time this is printed I expect others will, too.

Maybe we are getting somewhere. The American Security Council, in their "Washington Report" of December '76, discusses the CBS issue on reporting of national security news. The American Security Council Education Foundation (ASCEF) has filed a complaint with the FCC charging CBS with "massive and continuing violations of the Fairness Doctrine in reporting national security viewpoints."

The ASCEF has a film called "The Price of Peace and Freedom," which documents the Soviet/USA military relationship. It is an eye-opener and should be seen by every American. The film is available free for showing by television stations. Write or call the American Security Council, Boston, Va. 22713.

Ralph J. Watson
Arlington, Va.

Rescue Teamwork

Your "Aerospace World" column for December carried an item about the October 10 rescue from the Atlantic of balloonist Ed Yost. You may not have known at the time of publication that USAF played a significant role in the rescue.

The Joint Rescue Coordination Center, Ramstein AB, Germany, alerted field units hours before the ditching, when it became apparent Mr. Yost was in serious trouble. An HC-130 aircrew from the 67th ARRS, RAF Woodbridge, UK, located and flew orbits around the balloonist for the final five hours of his flight. They continued to circle with pararescue men ready, maintaining visual and radio contact with Yost and helping guide the German freighter *Elizabeth Bolten* to the ditching site.

In addition to the rescue units involved, Air Force communicators at Croughton Airways RAF Croughton, UK, provided communications in the rescue effort.

You might wish to record in your fine publication proper credit to the professional rescue teamwork of US Air Force units in Europe.

Col. Gerald J. Hickman
Director of Information
Hq. USAFE
APO New York

The 507th Won

AIR FORCE Magazine is an outstanding publication, and we at 507th Tactical Air Control Wing, Shaw AFB, S. C., look forward to each issue. But, as in any journalistic effort, errors in the facts are sometimes inevitable.

Your attention is drawn to page 17 of the January issue. In actuality, the winners of F-4 controller category of the William Tell '76 meet were members of the 507th Tactical Air Control Wing. Capt. Phil Oholendt, 1st Lt. Ray Hathorn, MSgt. Donald Sigurdson, and SSgt. Quentin Konkel, as well as Maj. Ray McCloud and Sgt. Jimmie Watson, comprised the 507th's championship ground control team. These controllers and technicians provided positive radar control of the airspace flown in by F-4 aircraft from the 4th Tactical Fighter Wing. The outstanding teamwork displayed by the 4th TFW pilots and the 507th TAIRCW controllers was the key factor in TAC's victory in the F-4 competition.

Capt. Lawrence M. Jones
Executive Officer
Hq. 507th TAIRCW (TAC)
Shaw AFB, S. C.

The Real General Shotts

I am extremely proud of AI FORCE Magazine and of what does to project the Air Force as a organization, its needs, and the in dustry that supports these require ments.

It has been my pleasure the las two years to serve as military co host of the Annual Air Force Bal held in Beverly Hills, Calif. Unfor tunately, there were no picture taken of my wife and me durin this last ball, October 23, 1976, bu I found on page 79 of the Januar 1977 issue of AIR FORCE Maga

Lt. Gen. Bryan M. Shotts, Commander, Fifteenth Air Force (SAC), and Mrs. Shotts are shown with (at left) AFA National Director Edward A. Stearn, at AFA's Fifth Annual Air Force Ball last October, in Beverly Hills, Calif. General Shotts was one of the military hosts for the Ball. AIR FORCE Magazine regrets the caption error.

zine a picture of a major gener and his wife speaking with CMSg Walter Scott who were identified my wife and me. Not that it mak a lot of difference, but there a probably some who wonder if have a new wife and also if I ha been demoted.

Again, my congratulations on a outstanding magazine. Maybe closer review of the captions of th pictures might preclude instance such as the above.

My best to the AFA and the AI FORCE Magazine for an even mo outstanding year in 1977.

Lt. Gen. Bryan M. Shot
Commander
Fifteenth Air Force
March AFB, Calif.

That First Jet Solo

Reference: "Every Man a Tiger," by Jim Beavers, January '77 issue. Terrific reading. Extremely well written. One of the best humorous articles about flying I have ever read. But, oh, how fortunate Jim was to have had an instructor in the back seat—he just doesn't know!

I first flew the single-seat Lockheed P-80A Shooting Star eight years earlier, in September 1946—just me and God. I had been flying propeller fighters for four years and, even so, it was indeed quite a transition. That first jet takeoff—all by my lonesome—was an experience I shall never forget. "Every Man a Tiger" revived memories going back more than thirty years.

Thank you, Jim Beavers, and AIR FORCE Magazine.

Lt. Col. Bert McDowell, Jr., USAF (Ret.)
McKinney, Tex.

Please convey to Lt. Col. Jim Beavers, USAF (Ret.), an admiring tip of the hardhat for the warm images evoked in a fellow fud who also remembers and is grateful for the opportunity to enjoy superb writing.

Keep honking the return carriage of that Remington upright!

Cmdr. Robert P. Brewer, USN (Ret.)
United States Naval Institute
Annapolis, Md.

27th BG Association Formed

The 27th Bombardment Group (L), USAAC, the only unit in the history of the Air Force to ever fight as infantry, has formed the 27th Bomb Group Association.

Brig. Gen. William Hipps was elected the first Commander. All men from the old 27th who fought in the Philippines on Bataan and Corregidor have been invited to join.

One of the first projects that will be undertaken will be to dedicate a bronze tablet at the "Altar of Valor," which is a war memorial at Mt. Samat on Bataan. This will be done during the "Reunion for Peace Program," which will take place in April 1977.

Plans are now under way for a reunion, to be held in Savannah, Ga., in late September 1977, at which time a plaque will be placed at Savannah Air Force Station, where the 27th was activated and left for the Philippines in 1941.

For further information all ex-27th Bomb men may write me.

Samuel B. Moody
Secretary
102 Bay Berry Rd.
Longwood, Fla. 32750

Nighthawk Squadron

In July 1977, 409 All Weather Fighter Squadron will be presented its Squadron Standard signifying at least twenty-five years of active service with the Royal Canadian Air Force and Canadian Armed Forces. The presentation of a Squadron Standard by the Queen's representative is an important event in a squadron's history, reflecting its past honors and traditions.

In conjunction with this event, the squadron will host a reunion for all ex-members of the "Nighthawks," both aircrew and groundcrew, as well as all honorary members of the squadron.

We are asking any ex-members of the squadron to contact the Squadron Colours Publicity Coordinator at the address below for further information and to help us update our address list.

Capt. J. S. Reith
Sqdn. Colours Publicity Co-ord
409 All Weather (F) Sqdn.
Canadian Forces Base COMOX
Lazo, B. C. VOR 2KO, Canada

Joan Comes Up Swinging

Since you so generously dedicated an entire page in your December '76 issue to my critics, I would like to have an opportunity to answer them.

Lt. Col. Charles G. Voegelin, USAF (Ret.), jokes away my concern of possible discrimination within AFA. Unfortunately, that tactic is often used and continues to be a very successful tool against women. I recall the same tactic used on blacks not long ago, but the jokesters learned to disguise their bigotry. Hopefully, they will *all* retire soon.

SSgt. Robert C. Bishop infers that I joined AFA seeking female companionship. This is another well-used tactic on women who speak out for themselves and other women. Of course, he missed the point entirely. I am concerned about using women's talents and skills (1) in the AFA as fair representation for all women, and (2) on the magazine staff as paid employees.

SSgt. Laurie E. Ross chides me for being a quitter and for not using a title. She then takes the opportunity to extol the virtues and benefits of a military career. I am *not* a quitter, but I *do* have priorities and feel that organizations such as AFA and the Naval Enlisted Reserve Association (with their "Ladies Auxiliary") have a minor impact on women compared to discrimination in employment. Right now I have my hands full fighting discrimination against women at Kelly AFB. As for not using a title, well, I feel quite secure without one, thanks anyway. Sergeant Ross's defense of the military was unnecessary. I have worked for DoD for eighteen years, including military active duty during the Korean War, and I am very proud of my government career. Also, I am currently a Ready Reservist and intend to retire from that at age sixty. I am definitely not antimilitary.

To Amoretta Hoeber, a "dedicated feminist," I appreciate her observations and take note of her differing viewpoint. If she *is* a feminist, she evidently has an entirely different definition of sisterhood than I do.

And finally, to "poor dear" (his condescending words, not mine) Maj. Paul R. Renfro, CAP, AIR FORCE Magazine sent me a complimentary copy of the October issue and I *do* thank Mr. Ed Gates for a fine article.

Joan Gillman
Kelly AFB, Tex.

Not a Raw Nerve in Sight

Come now. Didn't Joan Gillman and 1st Sgt. David R. Malcolm hit some raw nerves?

Why not encourage the membership of women and enlisted persons as well as their presence in executive chambers?

It would be an enlightened procedure to get in tune with the times.

Violet Zambernardi
San Antonio, Tex.

• *AFA has always encouraged the membership of both women and enlisted persons. Over the past few years our enlisted enrollment has tripled. There is no way to tally women members—our roster does not separate the boys from the girls.*—THE EDITORS

Underpaid in Retirement

In your November '76 issue, under "Defense Manpower Issues," an AFA Policy Paper, you recommend

Airmail

recomputation to provide equalization of retired pay.

I retired in 1959 in the grade of major. Today many with less service are drawing more retired pay. My pay is not sufficient to provide for me or to allow me to live in the dignity that one should expect after a lifetime in the service of his country.

May I suggest that you make a greater issue of this recomputation and inform your readers of any congressman who can help, or hinder, such recomputation?

Maj. George W. Owens, USAF (Ret.)
Westminster, Calif.

• *Several bills have been introduced in the 95th Congress, and AFA will monitor progress of these closely, testifying to our position when hearings are held.*—THE EDITORS

Thunderbolt Search

I am trying to gather information for an article on a USAAF P-47 Thunderbolt, serial 42-24964, having letters J11 on the side of the fuselage. It was test-flown on floats and skis from RCAF Station Winnipeg in 1943–44.

I especially want to contact the pilot and engineers who worked on the project.

Norm Ken
42 Curtis Street
Winnipeg, Manitoba
Canada R3B OG2

Warhawk Search

I am attempting to locate a World War II Curtiss P-40 Warhawk, the airplane flown by Lt. Gen. Claire L. Chennault and the Flying Tigers in China. General Chennault graduated from Louisiana State University in Baton Rouge and had close ties with the area.

The citizens of Baton Rouge and the State of Louisiana are extremely proud of the General and establishment of a museum containing his memorabilia and other World War II items is being contemplated. The most appropriate exhibit in the museum would be a World War II Curtiss P-40 Warhawk.

P-40s are collectors' items and are classics; however, the addition of one to this museum is an endeavor I am willing to undertake. The plane does not have to be in flying condition, as it can be rebuilt for this memorial.

If any readers have knowledge of any foreign country, any organization, or individual which may have possession of a P-40, I would be most anxious to contact the party.

W. Henson Moore
Congress of the United States
House of Representatives
Washington, D. C. 20515

"Buzz Buggy" and "Honeybun"

Anyone who has information about or pictures of these two C-47s of the 436th Troop Carrier Group, 9th AF, during the June '44 D-Day landings in France is asked to contact the undersigned: One C-47, from the 81st TC Squadron, was serial no. 2100558, code U5N, nicknamed "Buzz Buggy," and piloted by Lt. Duane Smith. The other, serial no. 2100533, code 7DB, was from the 80th TC Sqdn. and nicknamed "Honeybun III." The writer also seeks information about Col. Charles H. Young, who flew C-47 no. 315159, code D8Z, 94th TC Sqdn., 439th Troop Carrier Group, 9th AF, and a present address for him, if he's still living.

Léon Croulebois
41, Rue Brancion
75015 Paris, France

Stearman Restoration

I am restoring a Stearman. PT-13D, serial no. 75-5326, AAF no. 42-17163. This airplane was delivered February 12, 1944, in Wichita, Kans., and delivered to Eagle Field, Dos Palos, Calif., March 6, 1944. Later on it was transferred to Lancaster AFB, Mather AFB, and then to Hill AFB, in the late forties. A portion of the Air Force number was usually on the fuselage or tail area.

Any information from anyone who flew or maintained this plane or who has pictures of it would be greatly appreciated.

Michael J. Walton
Flight Officer, Western Airlines
11208 St. Andrews Way
Scottsdale, Ariz. 85254

Personnel at Mt. Gambier

I am a senior lecturer in Education at the Geelong State College, involved in an historical study of an area close to the Victorian/South Australian border. My direction of research requires information from members of the US Air Force. The personnel concerned were members of the 35th Pursuit Group and the 46th Air Base Group who were stationed at Mt. Gambier, South Australia, during 1942–43.

Would like to make contact with members of the above groups.

J. A. Henry
Department of Science Education
Geelong State College
Vines Road
North Geelong
Victoria, Australia 3215

Patches and Color Schemes

I am an Assistant Air Traffic Controller serving in the Royal Air Force. My hobby is the study of military aircraft color schemes and squadron insignia. My collection of patches from USAFE squadrons is now almost complete (just three remain outstanding), but I am very short of ADC, SAC, and TAC squadron patches and aircraft decals.

I would appreciate receiving any patches or decals that readers could spare from the above-named commands, from squadrons past and present. Also any color slides showing aircraft in different squadron color schemes, especially now defunct squadrons.

Lastly, I would like to thank the squadrons that have already sent patches and to which I have not yet written my thanks.

Martin W. McClelland
Eastern Radar
Royal Air Force Watton, Thetford
Norfolk, England

Two Men From Tadji Airdrome

The J. K. McCarthy Museum in Goroka would like to contact Lt. C. W. Borders and E. F. Behnkendorf who, it is believed, served with the 110th Tactical Reconnaissance Squadron out of Tadji Airdrome on the north coast of New Guinea during 1944.

We have their aircraft, a P-39 Airacobra, on display at the Museum. It was found at Tadji and air freighted to Goroka by the Royal Australian Air Force. Partial reconstruction and mounting of the aircraft were undertaken by the museum.

We would like to learn something of the operational history of this machine, hence our quest for Messrs. Borders and Behnkendorf. We would be pleased to hear from

any members of the 110th who served at Tadji and would be careful to answer all letters received.

R. J. Giddings
Airacobra Restoration Committee
J. K. McCarthy Museum
P. O. Box 132
Goroka, Papua, New Guinea

Old Acquaintances

I am trying to locate an old WW II buddy. We were in the 461st Bomb Group (H), 764th Bomb Squadron. His name is Paul Moffit, and his home town was Binghamton, N. Y. We were located at a field next to the 451st Bomb Group, whose "Purple Shaft" B-24 was pictured on page 6 of your November issue. We, too, had a "Purple Shaft."

Anyone knowing Paul Moffit's present wherabouts please contact me.

H. William Harrison
6681 N. W. 6th Court
Margate, Fla. 33063

The Major William V. Holohan Squadron of the Arnold Air Society is trying to locate alumni members of our squadron so that we can keep them abreast of events that the squadron intends to hold. Please send us your present address.

Information Officer
Major William V. Holohan Sqdn.
Manhattan College
Manhattan College Parkway
Riverdale, N. Y. 10471

Writers' Corner

Superfortress at War is the title of my next book, a large-format, hard-cover summary of the B-29's combat history. Both World War II and the Korean conflict will be covered.

I would appreciate hearing from former B-29 aircrew and ground crew members with personal comments and stories or anecdotes. Photographs of individual aircraft, nose art, in-flight action, and ground activity, such as arming, will be very welcome. Any material loaned will be carefully treated and returned by first-class certified mail.

David A. Anderton
30 South Murray Ave.
Ridgewood, N. J. 07450

I am a veteran aviation writer who is presently under contract to do a book on the Douglas A-20 and A-26 (later B-26) at war.

I would like to hear from anyone who flew as combat crew members

Airmail

or who supported the combat operations of these aircraft during their operations in World War II, Korea, or Vietnam. Would particularly like to solicit anecdotes, press releases, clippings, and photos of the aircraft during combat operations.

These aircraft enjoyed a long and varied combat career, and I am most anxious to give them the coverage they so richly deserve.

William N. Hess
P. O. Box 61268
Houston, Tex. 77208

I am a writer and historian specializing in German history of the 1918–1945 period. At present research is being conducted for a book on the history of military aviation in Germany.

Without doubt, many readers are ex-servicemen who served in Europe during World War II who have photographs of Luftwaffe aircraft as well as other documents which they took home as souvenirs. Such material could be of the utmost importance in this research, and I would be very grateful for the loan of such material.

Armand van Ishoven,
President
Study Group Aviation History
Antwerp
Lozanastraat 133
2000 Antwerp, Belgium

UNIT REUNIONS

2d Air Division
The 31st annual reunion of the 2d Air Division will be held July 28–31, at the Playboy Club, Lake Geneva, Wis. Information and reservations from

Evelyn Cohen
2555 Welsh Rd., Apt. 404
Philadelphia, Pa. 19114

8th Air Force Historical Society
The 8th AFHS is sponsoring an England tour for members August 23–September 7. First week will include stops in London, the air base areas (Ipswich, Norwich, and Cambridge), a visit to the American Cemetery and the 8th AF Memorial Museum. An optional second-week tour will include York, Edinburgh, the Lake District, and Stratford-upon-Avon. Those who do not wish to take the second-week tour will be on their own until the London departure September 7. Interested persons may write

8th Air Force News
Box 4738
Hollywood, Fla. 33023

17th, 319th, 320th BGs
These three bomb groups will hold reunions in Shreveport, La., June 23–26. The 17th (34th, 37th, 95th, and 432d Sqdns.) was a B-26 outfit serving in the MTO and ETO. The 319th had B-26s and B-25s in the MTO and A-26s in the PTO. The 320th (441st, 442d, 443d, and 444th Sqdns.) flew B-26s in the MTO and ETO. For more information contact

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

27th Fighter Wing
The 27th Fighter Wing will hold a reunion in Austin, Tex., July 29–31. Need addresses of all former members who were with the Wing at Kearney, Neb., and Austin, Tex. Send to

George Kelley
6508 Auburndale
Austin, Tex. 78723

49th Fighter Group
The 30th reunion of the 49th Fighter Group, 7th, 8th, and 9th Squadrons and Headquarters, WW II, will be held at Cherry Hill, N. J., in July. All men ever associated with the 49th FG are cordially invited. Inquiries to

Joseph Cunningham
64 Woodland Rd.
Chatham, N. J. 07928

SR-71/U-2
The 9th Strategic Reconnaissance Wing will host a reunion May 6–8, 1977, at the Downtown Holiday Inn, Reno, Nev., to celebrate the consolidation of the 9th SRW and the 100th SRW. Former members of both wings invited. Contact

Mary Ulmer
9th SRW/CCE
Beale AFB, Calif. 95903
Phone: (916) 634-2692

73d Bomb Wing
The 2d annual reunion of the WW II 73d Bomb Wing, 20th AF, will be held at the Four Seasons Motor Inn, Colorado Springs, Colo., May 26–29. All former members and its supporting units, and members of any Army, Navy, or Marine units who served in the Marianas desiring further information contact

Vern Piotter
1744 E. Woodmen Rd.
Colorado Springs, Colo. 80918
Phone: (303) 598-6400

90th Bomb Group (H)
The "Jolly Rogers" 90th Bomb Group (H), 1942–45, will meet for their 7th annual reunion at San Diego, Calif., July 28–31. Contact

Tom Keyworth
38 Crestlyn Dr. East
York, Pa. 17402

305th Bomb Group
A reunion of the 305th Bomb Group (H), 8th AF, Chelveston, England, will be held in St. Louis, Mo., July 1–3. Please contact

Abe Millar
Box 757
Sanger, Tex. 76266

356th Fighter Group
A reunion of the 356th Fighter Group, 359th, 360th, and 361st Fighter Squadrons, 8th AF, will be held in Washington, D. C., July 29–31, 1977. Address inquiries to

Louis W. Frangella
117 Main St.
Ravena, N. Y. 12143

367th Fighter Group
Reunion number 14 of the 367th Fighter Group, (392d, 393d, and 394th Fighter Sqdns.), 9th AF, will be held in Helena, Mont., July 28–31. All former personnel please contact

J. E. DeFrance
Box 396
Helena, Mont. 59601
or
Troy Bowers
4044 Lakeside Dr.
Odessa, Tex. 79762

385th Bomb Group
The reunion of the 385th Bomb Group, 8th AF, Great Ashfield, England, WW II, will be held April 22–24, at the Aladdin Hotel, Las Vegas, Nev. Please get in touch with

John C. Ford
7204 Easy St.
Camp Springs, Md. 2003
Phone: (301) 449-6382

454th Bomb Sqdn.
The 454th Bomb Sqdn. of the 323 Bomb Group will hold its 2d annual reunion in July 1977, at Dayton, Ohio. Please contact

Ray Vignochi
120 DeLeon St.
Ottawa, Ill. 6135

456th Bomb Group
The 456th Bomb Group and all attached units, 15th AF, WW II, will meet in Dayton, Ohio, July 29–31. Anxious to add new names to our roster. Interested persons please write

Maj. Larry Rijnovan
2013 N. Armistead Ave., #E2
Hampton, Va. 23666

4080th Strat Recon Wing
The 20th anniversary reunion of the 4080th Strategic Reconnaissance Wing will be held at the Del Rio Civic Center, Del Rio, Tex., July 8–10. Need names and addresses of anyone ever in the 4080th.

A. L. "Curley" Evans
110 Greenway Lane
Del Rio, Tex. 78840
Phone: (512) 775-6077

Airpower in the News

By Claude Witze, SENIOR EDITOR

What Are They Up To?

Although the Soviets seek to avoid war, preferring to attain their strategic objectives in other ways, their military doctrine is premised on the notion that war is an instrument of policy and that success in war, even nuclear war, is attainable. Soviet strategic policy and force development continue to be based on this military doctrine, which calls for capabilities to fight, survive, and win a nuclear war.

Washington, D. C., Feb. 7

The way the 1977 debate on national security is shaping up, and it seems headed for early stridency, the issue of Soviet capabilities and Soviet intentions will be dominant. So far as future Soviet views on war are concerned, they perhaps will never be defined any better than in the military goals attributed to Moscow in the above quotation. The words are by our Joint Chiefs of Staff and should represent the best professional military opinion the American people can get.

It is unfortunate that, with the Jimmy Carter Administration barely two and a half weeks old, the discussion seems to be degenerating into an argument about whether Russia can fight, survive, and win a nuclear war right now, or whether it will be able to do so in short order. The point is that Russia has this capability as a goal, as attested peril is here today or tomorrow is by the Chiefs of Staff. Whether the not an issue that should bring dissension among intelligent men.

There have been moves on Capitol Hill to draw out the new Administration on the matter. The issue surfaced before the Senate Armed Services Committee in its hearings on the nomination of Harold Brown to be Secretary of Defense. The date was January 11.

Sen. Henry M. Jackson, now the senior Democrat under Chairman John Stennis, asked Mr. Brown whether he believes the US can rule out the possibility that Russia is seeking strategic superiority. The answer was no, but Mr. Brown added, "The facts admit of several different interpretations," and, "I think that we have to take all of these possible intentions into account in deriving our own military capability."

At an earlier point, Mr. Jackson said the "gut question" is, "What are they [the Russians] up to?"

Mr. Brown hesitated, but only briefly.

"My answer is that we are going to have to live with ambiguity in answering that question," he said. "I think their intentions may vary depending upon what our own actions are and what their own force capabilities turn out to be in the future.

"It is clear that they are continuing to build up their military forces, strategic and conventional, and, as you say, at least one interpretation is that that is to give them more political leverage and more options, and I think that that is not an unreasonable interpretation of what they are doing. Whether [the Russians] would intend to use those options, there is no way for us to know because probably they don't know themselves," Mr. Brown said. "We have to be prepared to respond in a way that does not foreclose diplomatic and peaceful initiatives and at the same time does not leave us open to naked use of military power for political purposes on their part."

Since mid-January, when the lame-duck Ford Administration sent the Fiscal 1978 budget requests to Congress, there has been a deluge of material from the Defense Department reflecting the peril to national security. The Pentagon said at the outset, in seeking obligational authority of $123.1 billion and outlays of $110.1 billion, that the requirement reflects "the scope and momentum of Soviet military programs." It reported that both the size and quality of the Soviet war machine are improving, continuing:

"There has been a steady real growth in the resources applied by the Soviet Union to military activities of all kinds over a sustained period of years; while absolute values are hard to know with precision, given the closed Soviet system of government, it is estimated that their defense spending is at least thirty-five percent greater than that of the US today."

Secretary of Defense Harold Brown: A guarded answer to the "gut question" of Russian intentions.

Finding support for this in the flood of posture statements and other material is easy. The keynote was given by President Ford in his farewell to Congress, a message that emphasized the defense requirement. The President lamented the trends of the past fifteen years, when "our national security needs were steadily shortchanged" while

Airpower in the News

domestic spending "soared." The warning was clear:

"The United States can never tolerate a shift in the strategic balance against us, or even a situation where the American people or our allies believe the balance is shifting against us.

"The United States would risk the most serious political consequences if the world ever came to believe that our adversaries have a decisive margin of superiority.

"To maintain a strategic balance we must look ahead to the 1980s and beyond. The sophistication of modern weapons requires that we make decisions now if we are to ensure our security ten years from now."

This evaluation was supported by testimony of Donald Rumsfeld, the retiring Secretary of Defense, and Gen. George S. Brown, USAF, the Chairman of the Joint Chiefs. None offered a stronger case than Malcolm R. Currie, the Ford Administration's Director of Defense Research and Engineering. He is concerned about the intensity of the technological competition. The Currie analysis:

"The Soviet leadership stresses explicitly the necessity of acquiring and maintaining the initiative in military-technological developments so as to insure that the qualitative level of Soviet weapons becomes unsurpassed and ultimately 'that the USSR triumphs over the US in the crucial struggle for military-technological supremacy.' This belies any direct action-reaction mechanisms which may have existed in the past. It also explains the sheer magnitude of the Soviet effort in basic science and military research and development, which is far larger than our own effort in terms of overall commitment of people and resources."

Dr. Currie also gave the Russians credit for vast improvements in their production capability. He commented on the key area:

"In the strategic area, we have generally underestimated the momentum of Soviet programs and their rate of progress in technical performance (*e.g.*, high-accuracy guidance technology). A Soviet counter-military advantage is clearly coming into existence and, along with it, a war-survival posture that could seek to place the USSR in a stronger position than the United States if war occurred."

The Russians, according to Dr. Currie, are deploying large numbers of new tactical aircraft designed for long-range offensive missions. It is an area in which we must maintain superiority. The US still holds the balance of power at sea, he says, but the Russians are showing progress in attack submarines, cruise missiles, command and control involving satellites, and naval aviation. He is "urgently concerned" about their land warfare systems: "In many cases they are widely deploying technology now for which we will not have roughly comparable counterparts until the early- to mid-1980s." Their new capabilities, the Director said, "aggregate to a revolutionary change in land warfare."

It was in the sphere of space warfare that Dr. Currie made the most frightening evaluation:

"From the US viewpoint, perhaps the most portentous Soviet activity in space is the resumption of their antisatellite development program, after a hiatus of more than four years. The USSR is seizing a new initiative, and creating the prospect of a new dimension of military conflict—war in space. Our lead in space technology is a strong one, but we have deliberately restrained the development of an antisatellite capability. If the Soviet Union chooses to continue along the path they appear to be taking, they will find it a dangerous one. We cannot let them obtain a military advantage in space through antisatellite weapons, because the consequences to the future military balance between the US and the USSR could be no less than catastrophic."

Dr. Currie added that the Soviet Union is capable of achieving breakthroughs in military technology. This is possible in ballistic missile defense, antisubmarine warfare, space support, directed-energy weapons, antisatellite warfare, electronic warfare, the use of computers on the battlefield, or chemical warfare. Moscow has "aggressive and innovative R&D efforts in all these areas."

With these as the defined concerns facing US military decision-makers, the 1977 national-security debate opened with widespread concern. It first surfaced with the selection of Harold Brown as Secretary of Defense and Cyrus R. Vance as Secretary of State. There was some skepticism in these cases, but no serious opposition.

Then came a wave of names from the government in exile. One of the first was that of Theodore C. Sorensen, who was nominated to head the Central Intelligence Agency. This former assistant to President John Kennedy was a witness for the defense in the Daniel Ellsberg-Pentagon Papers case. He withdrew his name following a manifestation of disapproval from most conservatives and some liberals in Congress.

This was followed, almost at once, by the choice of Paul C. Warnke as our arms negotiator and head of the Arms Control and Disarmament Agency. Clifford L. Alexander, Jr., was named Secretary of the Army. Charles L. Schultze became chairman of the Council of Economic Advisers. Clark M. Clifford was given a special mission in Cyprus for the White House.

All of these men served in 1972 on the so-called McGovern Panel on National Security. Mr. Warnke and Mr. Alexander were cochairmen. Mr. Schultze and Mr. Clifford were vice chairmen. The McGovern effort to win the Presidency that year included a pledge to cut military spending to a level of $54.8 billion by Fiscal 1975.

The McGovern program was rejected in 1972. Following this, the 94th Congress took no serious issue with the Ford Administration's request for increased defense spending. Both House and Senate were impressed by evidence of the Soviet buildup. Most important, the 94th agreed with the idea that spending for defense must continue to grow beyond the number of dollars needed to cover inflation.

It is hazardous to predict which issues will be emphasized in the debate about to start at this writing in early February. In general, concern centers around whether the Carter appointees will adhere to the doctrine eloquently promoted by Mr. Warnke and his former associates at the Center for Defense Information, headed by retired Rear Adm. Gene LaRocque. It is that the

Is Motorola Aiming for the Air Force?

YES, from a satellite 22,000 miles from Earth. By acquiring a beacon laser beam in a matter of seconds, "locking on" and tracking it so accurately that a narrow communications laser beam can be used to transmit a continuous wideband high-speed data stream. That's the function Motorola's new digital processing electronics supports in the acquisition and tracking subsystem of the Air Force's space laser communication system. And all this in the small, reliable package you'd expect from a digital system that performs more functions in software rather than hardware.

This is made possible by using space-qualified digital processing electronics developed by Motorola for this Air Force 405B program. Critical elements in this subsystem include a new custom data processor designed to perform all control, computation, and logic manipulations for signal processing in the acquisition and tracking subsystem. The latest LSI techniques reduce package count by a factor of 8:1. This results in valuable savings in weight, power, and size, and contributes to greater reliability and improved cost effectiveness.

As subcontractor to McDonnell Douglas on the project, Motorola is also developing the data handling subsystem. This subsystem provides the Air Force with a fast-talking capability that exceeds one billion bits of information in a single second. That's enough data to fill 68 volumes of the Encyclopedia Britannica.

If you're aiming to solve satellite communications problems . . . fast and accurately . . . please call or write Al Scharf, (602) 949-4335, Motorola Government Electronics Division, P.O. Box 1417, MD 3240, Scottsdale, Arizona 85252.

MOTOROLA

The mind to imagine . . . the skill to do

Now, an airborne memory system you can hold in your hand...

Sure, Sperry's memory disc *is* small. It occupies far less space than comparable memory systems. And we didn't have to sacrifice capability in the design. It still gives you more storage, quicker access and longer media life than any other existing system.

The Sperry memory disc was initially developed for our TERN-100 Navigation System, the only system certified to automatically fly published non-RNAV SID's, STARS, nav chart procedures, missed approaches and holding patterns.

Hughes has selected the Sperry disc for its F-18 radar system, calling for it to meet demanding military specifications for temperature, humidity, vibration, shock and other environmental considerations in addition to its memory performance.

...but don't let its small size fool you.

Other applications? Let your mind run wild. Consider the versatile Sperry disc for storage of tactical or strategic target information . . . for space payload missions . . . or remotely piloted vehicle assignments. Regardless of the mission or vehicle application . . . any time mass storage, an instantaneous read and write capability and non-volatility is required, consider the Sperry disc.

Want to know if the disc could be tailored to *your* special application? Call us, or write to "DISC". We're Sperry Flight Systems of Phoenix, Arizona, a division of Sperry Rand Corporation, making *flying* machines do more so man can do more.

SPERRY
FLIGHT SYSTEMS

Airpower in the News

US should be less cautious about Soviet intentions and should take the initiative by restraining the development and deployment of new weaponry. We have tried this, as Dr. Currie pointed out, in the area of space warfare, where the Russians are exercising new initiatives today. This approach also fails to consider the evaluation of Soviet military doctrine as defined by the Joint Chiefs.

The debate is almost certain to be heated. On one side are several proponents of the McGovern philosophy on defense. On the other are a number of skeptical veterans of former defense wrangles in Congress. If the heat will generate enough light to illuminate the issues, a great purpose will have been served. ■

The Wayward Press

The Power of the Press, it has been observed, is the power to determine what shall be printed, and what shall be left out of the paper. Just as one man's trash is another's treasure, one reporter will ignore what another writes. Or, more commonly, one editor will print a story that is scorned and hung on a spike at another editor's desk.

There was an intriguing example of this in newspaper coverage of a hearing held on the morning of February 1 by the Senate Armed Services Committee. The key witnesses were Gen. David C. Jones, Chief of Staff of the Air Force; Vice Adm. R. L. J. Long, Deputy Chief of Naval Operations for Submarine Warfare, and John B. Walsh, Deputy Director of Defense Research and Engineering for Strategic and Space Systems. The meeting was billed as a presentation on the Pentagon's new request for procurement funds in the strategic nuclear area.

The press table overflowed that morning. A reporter from the Washington *Post* was forced to sit on the floor, and the rest were jammed around an inadequate table, on uncomfortable chairs. There was no complaining. So far as news was concerned, the hearing promised, and delivered, a smorgasbord of goodies. The two uniformed witnesses provided reporters with neatly printed copies of what they were telling the committee, thus easing the burden for note-takers.

These formal messages, about the state of our strategic capability and what it requires in the future, went almost ignored in the newspaper coverage that followed. As frequently is the case, the news was made by the questioning, and this is where the reporters and editors separated trash from treasure, each according to his own lights. We will examine a few of the most evident examples.

Both the Washington *Post* and the Baltimore *Sun*, papers that provide wide coverage of national security affairs, devoted their entire reports to the controversial choice of Paul C. Warnke, a Pentagon official in previous Democratic administrations, to head the US Arms Control and Disarmament Agency. At the moment, the selection was little more than a rumor, but it was to be confirmed the next day by President Carter.

But Sen. Sam Nunn, a Democrat from Georgia, of all places, took issue with the Warnke appointment at the hearing. The *Post* told its readers the "expected nomination . . . is already drawing fire," and that Senator Nunn was demanding an appearance by Mr. Warnke before the Armed Services Committee. The *Sun* was a little more restrained, reporting the development of "stiff opposition" and said this was based "on what are perceived as 'soft' positions of Mr. Warnke" on arms limitations. The Warnke story, complete with what the *Sun* called a "four-page unsigned attack distributed on Capitol Hill," had broken. The resulting coverage was good newspapering that resulted in lively headlines and stern editorial opinions for several days.

But, wait a minute.

If you do not read the *Post*, or the *Sun*, perhaps you read the New York *Times* or a newspaper served by United Press International (UPI). If that is the case, on the morning of February 2, you learned nothing about the Warnke flap. There was nothing about it in your newspaper.

Both the *Times* and UPI were captivated instead by the disclosure at the hearing that, in case of nuclear war, the US intends to knock out seventy percent of all Soviet industry. This went into the record because it was put there by Sen. Thomas J. McIntyre, the New Hampshire Democrat who heads the committee's subcommittee on research and development.

The *Times* acted as if it knew Mr. McIntyre said something significant, but neither the reporter nor his editors knew why. In about twelve inches of type, only two and a half referred to the McIntyre questioning. The lead said General Jones and his fellows "needed billions of dollars worth of new strategic weapons" to carry out their task. It said this is a "deterrent task," to "knock out the bulk of the Soviet Union's industrial and military capacities in a full-scale war."

From here, the *Times* account went on to a cursory account of what General Jones, Admiral Long, and Mr. Walsh had to say about the Triad and why it is essential to our security. Both the B-1 bomber and the Trident system got their paragraphs. There was no mention of Senator Nunn or Paul Warnke. The *Times* reporter identified the chairman of the Armed Services Committee, after listening to him for at least two hours, as John L. McClellan, an Arkansas Democrat. The chairman is John Stennis, a Mississippi Democrat who has been chairman since 1971. The *Times* copy desk was derelict in not correcting such an obvious error.

Higher scores go to the UPI account, which was carried on page one of the Los Angeles *Times* the morning after the hearing. Almost as long as the New York *Times* story, it confined itself to the McIntyre revelation that our strategy "requires a percentage of destruction only in one category—economic recovery." UPI went on to point out the significance of this, a factor ignored by the New York *Times*. It is simply that Soviet citizenry is "not targeted per se." If this is a fact, it discounts the true impact of Soviet civil defense efforts, according to the Senator's reasoning. Witness Walsh, from the Defense Department, insisted that civilian casualties are a factor, despite the targeting decree.

All these things, finer details about targeting, were denied to readers of the New York *Times*, the Washington *Post*, and the Baltimore *Sun*.

There are two items that must be added. The first is that the New York *Times* recovered on the Warnke story one day later, after President Carter gave formal notification of the selection. The newspaper remained scooped on the impending controversy.

The second addendum is that the transcript of the February 1 morning session of the Armed Services Committee, open to the public and covered by the press, was declared classified. The text will be edited by Security Review before it is released, because, according to a reliable source, "of some material introduced to the record by Senator McIntyre."

So far, this is a story missed by all reporters and editors, whose Power of the Press determines what will be printed.

While the quality of our Air Force today is unsurpassed, a future conflict may find it critically outnumbered. Fortunately, already coming into being is what could be . . .

The Key Element—'Multiplying' USAF's Tactical Airpower

By Gen. T. R. Milton, USAF (Ret.)

TO A visitor returning after a long absence, the years appear to have dealt gently with Tidewater Virginia. Admittedly, it is an illusion more easily preserved if he picks his way carefully and sticks to the back roads. It is especially reassuring to see how little change time has worked on Langley Field, or, if you insist on being officially correct, Langley Air Force Base. The changes have been largely unobtrusive, proper treatment for a place now old and historic, as aviation measures time.

Langley has seen much aviation history. It was the home of the short-lived GHQ Air Force, overtaken by events and by a certain amount of intramural bureaucratic warfare. But the GHQ was important because it was the first visible expression of a basic airpower credo: the need for central control.

Langley also was home, at one time or another, to most of the famous names in the Air Force: Andrews, Spaatz, Eaker, LeMay, Kuter, Quesada—the list goes on. It includes, of course, Billy Mitchell, who really put Langley on the map. When Mitchell's Martin bombers left Langley that July day in 1921 for their appointment with the *Ostfriesland*, the whole course of military aviation was changed forever.

The extent of that change can be seen nowhere better than on the same old Langley flight line. The organization in residence is the 1st Pursuit Group, now calling itself the 1st Tactical Fighter Wing but clearly recognizable as the same outfit once commanded by a Maj. Carl Spaatz. The 1st TFW is now equipped with F-15 Eagles, the last word in air combat fighters. What is more, it trains in the air combat mission with an intensity and realism seldom seen at Langley or anywhere else. For that matter, the whole Tactical Air Command trains as if war might begin tomorrow. The TAC Commander, Gen. Bob Dixon, aims to be well along the combat learning curve on any future D-Day.

The thoroughly realistic TAC approach to training is designed to get first-week combat jitters out of the way before, not after, the bell rings. It is the kind of training that would have cut our early losses in Vietnam, where pilots who had been concentrating for years on nuclear deliveries had to make a sudden transition to conventional fighter maneuvers. And while Vietnam seems such a short while ago, combat experience is a perishable commodity. Only thirty percent of the 1st TFW's pilots are Vietnam veterans, and some are fresh out of flying school. The training, then, is essential if TAC forces are not to retrogress. This intensive and realistic training should be immensely reassuring to those of us who worry sometimes about what lies ahead. There is, however, one worry that remains. It has to do with numbers.

World War II remains the only war where there was truly a contest of airpower. Because more recent wars seem to have spawned some suspect theories, it is worth remembering that the invasion of Normandy came only after years of air warfare. If a decorated Army veteran who fought in Europe from D-Day on never saw an enemy airplane, it was not because the Germans didn't believe in airpower. If that same veteran fought in Korea and Vietnam, he has, in all probability, still not seen an enemy airplane. Thus, a certain amount of complacency has come out of thirty years of friendly skies. Somewhere along the way we seem to have forgotten how tough things were in the years between 1940 and 1944. Those years of heavy attrition were made easier by the RAF, who held off the Germans until we were ready. If there is a next time, there will be no one to buy time for us. We will go with what we have.

That brings us back to numbers. In the airpower business, having the best airplane is always a basic consideration, along with having the best people flying and maintaining it. However, there are times when just having the best is not enough. It happens when the other side has too many of the second best. Going back again to World War II, the Germans clearly had the best airplane in the sky with the Me-262, but not enough of them to counter our overwhelming numbers. These days, where a single F-15 costs more than a wing of P-51s, we can no longer think in the profligate terms of World War II. We are now the one who is likely to be outnumbered. Happily, we need not look forward to the Luftwaffe's fate, for there are ways to multiply the existing force, and not with mirrors, either.

The role of the Remotely Piloted Vehicle is unquestionably going to be important. Reconnaissance and interdiction, for instance, are two missions that lend themselves readily to these machines, and thus save the expensive manned airplane force for other things. Then there are the smart bombs, the Precision Guided Munitions, which allow one airplane to do the job of a squadron in terms of target destruction.

There is the Airborne Warning and Control System, the AWACS, that promises to add an entire new dimension to tactical air effectiveness. Again, this, along with our tactical air refueling capability, is a way of multiplying the force by a significant factor.

Finally, there is the multiplier we have already touched on, training the best combat-ready crews and support. This, together with the other multipliers, goes a long way toward equalizing things.

Still, it would be nice to have a few more tactical wings. ■

Right now, Bell & Howell gives you the industry's largest selection of STANDARD instrumentation magnetic tape recorder/reproducers — for wideband direct, FM, and digital high density operation in airborne as well as shipboard, portable and laboratory environments. ☐ Having such a selection will save you time and money. The Space Shuttle program, for example, has chosen the field-proven MARS™ Modular Airborne Recorder for use on the avionics package and booster and the M-14G militarized portable recorder/reproducer for the ground simulator. ☐ Selecting Bell & Howell recorder/reproducers also assures you of the latest available technology. Bell & Howell is the only manufacturer, for example, to offer standard 42 track performance and 80 megabit/second digital high density capability. ☐ Depth of standard products plus technological leadership — only Bell & Howell can give you both.

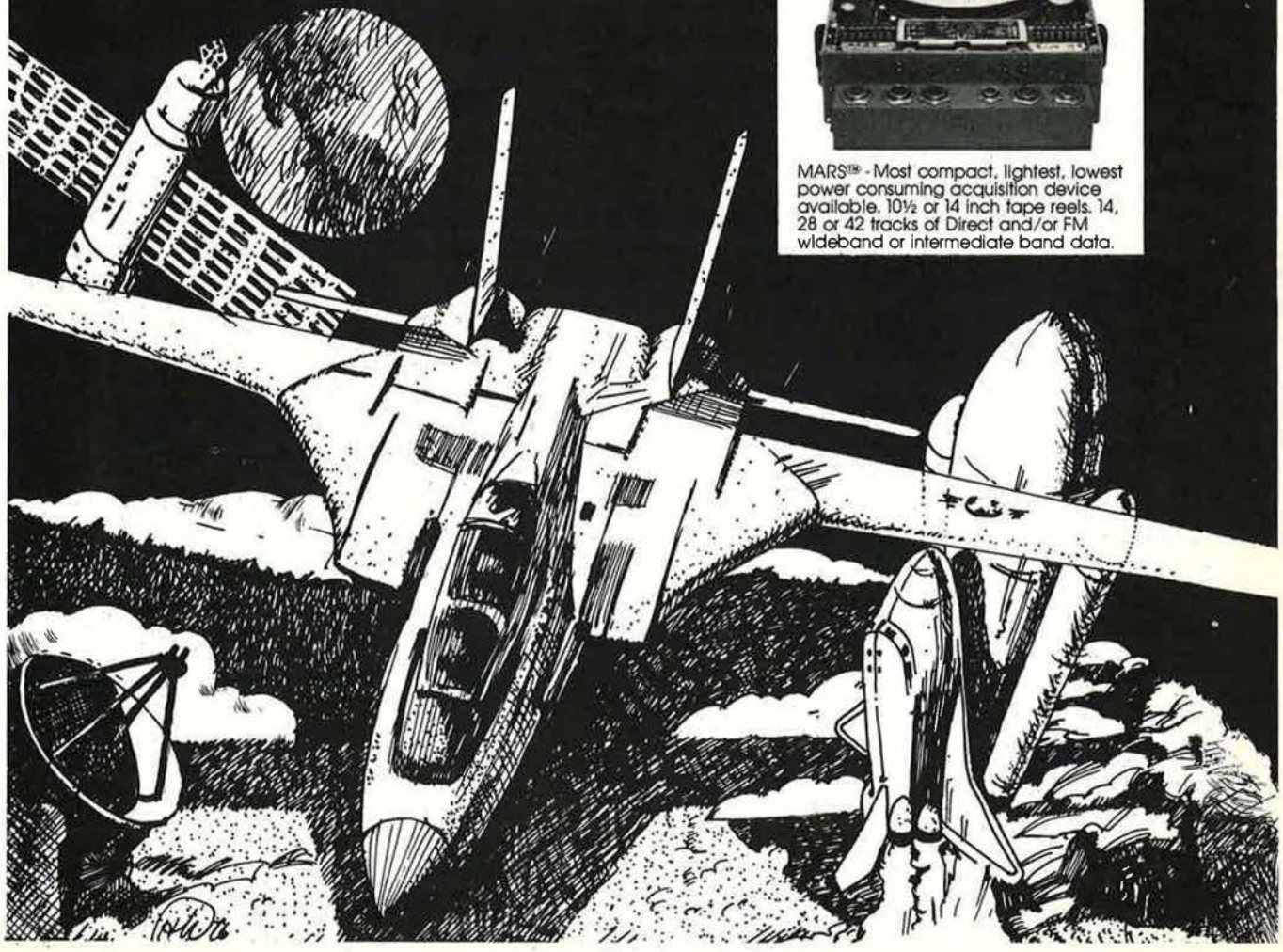
Right now.

BELL & HOWELL
DATATAPE DIVISION

MARS and M-14 are trademarks of Bell & Howell Company. DATATAPE is a registered trademark of Bell & Howell Company.

AIRBORNE DATA TAPE RECORDER/REPRODUCERS

MARS™ - Most compact, lightest, lowest power consuming acquisition device available. 10½ or 14 inch tape reels. 14, 28 or 42 tracks of Direct and/or FM wideband or intermediate band data.



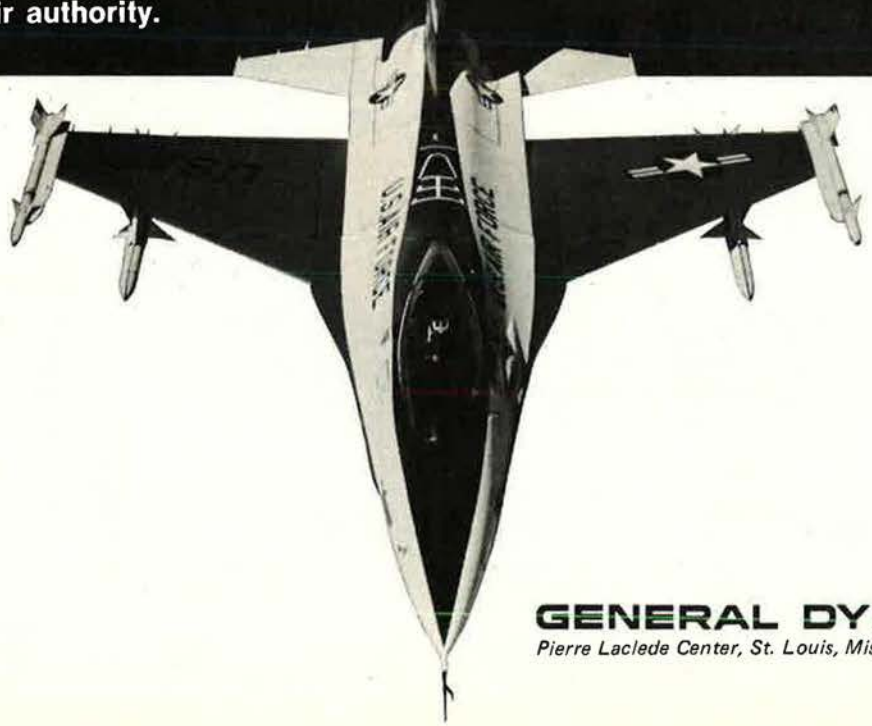
F-16 The Multi-role Fighter

When combat requirements change, so does the Multi-role F-16. It's the flexible fighter specifically designed for both air-to-air and air-to-ground roles.

In the traditional air combat arena, the F-16 is superior to existing threat aircraft. Compared to the operational F-4, the F-16 goes twice as far, turns in half the radius and accelerates twice as fast—yet weighs half as much. Its capability for Sparrow missile delivery gives it added air-to-air authority.

The F-16's all-weather radar acquires both aerial or surface targets. Its ground-mapping feature plus the F-16's head-up display and integrated fire control computer offer the latest in air-to-ground delivery of up to 15,000 pounds in bombs and missiles. What's more, the F-16's life-cycle costs are less than any tactical fighter in the inventory.

Low cost.
Multi-role.
The F-16.



GENERAL DYNAMICS
Pierre Laclede Center, St. Louis, Missouri 63105

Aerospace World News, Views & Comments

By William P. Schlitz, ASSISTANT MANAGING EDITOR

Washington, D. C., Feb. 7

★ The following is quoted from the University of Miami Center for Advanced International Studies' *Soviet World Outlook,* "a monthly report on the view from the Kremlin on issues critical to US interests," edited by Mose L. Harvey and Foy D. Kohler:

> In . . . traditional year-end roundups, Soviet editorials and articles focused on a number of issues which they said would occupy Soviet foreign policy in the forthcoming year. Overall, as emphasized by influential *Pravda* correspondent Yuri Zhukov on January 2:
>
> *"The Soviet Union, in its jubilee year, will wage an extensive peace offensive particularly actively and persistently in accordance with the behests of the great Lenin, to execute the program adopted by the 25th CPSU [Communist Party of the Soviet Union] Congress for the further struggle for peace and international cooperation and the people's freedom and independence. In the eyes of the peoples of the whole world, the land of the Soviets has entered the year when its 60th anniversary will be celebrated as the bulwark of peace and standard bearer of peace."*

Well, from our point of view, the Soviet leadership seems to be pursuing these noble goals from a foundation of solid military muscle and with concepts of freedom, independence, and peace that don't exactly accord with ours. For some alarming aspects of the continuing Soviet buildup, see the contents of this annual Soviet Aerospace Almanac Issue.

★ In mid-January, thousands of US troops and tons of cargo were airlifted into central Alaska from the lower forty-eight and Hawaii to repel an invasion by the mythical country of Mira.

The exercise—Jack Frost 77—was designed by the US Readiness Command to test and evaluate joint task force operations by active and Reserve Forces of all the services under Arctic combat conditions. A key factor was reinforcement and supply procedures over extended air and sea channels.

The field exercises included parachute assaults and troop landings, with tactical air forces providing close air support and simulating air-to-air combat.

Extensive unconventional warfare activity was provided by Army active and Reserve special forces and Navy sea-air-land teams—backed up by the airborne firepower of USAF special forces gunships.

★ The US Army in December took two major steps toward the modernization of its helicopter forces:

- It designated Hughes Helicopter Co. to undertake full-scale development of a new antitank helicopter, a program with a potential of $3.6 billion.
- It selected United Technologies Corp.'s Sikorsky Division over Boeing Vertol Co. for production of the Utility Tactical Transport Aircraft System (UTTAS), which may mean the eventual purchase of as many as 1,107 of the twin-engine helicopters at a total cost of about $3.4 billion. General Electric will build the engines.

Both actions are subject to White House and congressional approval.

Under the planned eight-year production program for UTTAS, the Army is scheduled to receive the first of its new troop-carrying assault helicopters in August.

The UTTAS will be able to transport a squad of eleven fully equipped troops and is designed to withstand severe combat punishment. UTTAS will also be capable of lifting such heavy items as artillery pieces and of toting TOW anti-

Two veteran astronauts, Maj. Gen. Thomas P. Stafford and Dr. David R. Scott, discuss flight-test plans for NASA's Space Shuttle as they welcome the Orbiter stage to Edwards AFB, Calif. The Orbiter was trucked from Rockwell facilities in Palmdale, Calif., to the Mojave Desert test site on January 31.

Aerospace World

In the foreground, the YC-141B—the "stretched" version of USAF's workhorse transport—is currently the subject of a flight-test program (see below.)

tank missiles attached to its underside.

An advanced aircraft, the UTTAS is intended as the replacement for the UH-1 Huey, the Army's assault helicopter that saw extensive action during the Vietnam War. A number of the UH-1s will remain in harness following the arrival of the UTTAS, officials said.

With Austria, Belgium, Canada, the Netherlands, Switzerland, and West Germany expressing interest, the potential for overseas sales of the UTTAS is good, officials declared.

★ A new Navy surface-to-air missile—the Standard Missile-2 Extended Range (SM-2 ER)—successfully completed a recent series of test firings from the guided missile cruiser *Wainwright* at the Atlantic Fleet Weapons Range near Puerto Rico.

According to officials, the missiles found their targets (including supersonic jet drones employing a wide range of electronic countermeasures) at a variety of altitudes and at ranges exceeding fifty miles.

The Navy's new Standard Missile-2 Extended Range SAM has been tested successfully (see above).

The tests, the officials said, prove that the missile can engage maneuvering targets in tactical situations and at twice the range of the operational SM-1. The SM-2 ER has also been deemed compatible with the advanced Terrier weapon system that incorporates a modified firing system, a new weapon direction system, and a "launch on search radar" launching policy.

The Navy sees the missile as beefing up ship protection from airborne threats, thus freeing manned interceptor aircraft for missions at greater distances from the fleet.

The SM-2 ER, which evolved from the SM-1 built by General Dynamics Pomona Division, is the first tactical SAM to be equipped with an inertial reference unit for midcourse guidance control, officials said.

★ And, in mid-January, the Navy's first Trident I SLBM was launched from Cape Canaveral in a test flight that terminated in the South Atlantic near Ascension Island.

Trident has a range of 4,600 miles (7,404 km) or up to 6,000 miles (9,656 km) with reduced payload, compared to 2,800 miles (4,506 km) for Poseidon, the weapon presently serving aboard US missile submarines.

Trident will go into a new class of missile subs currently under development, the first of which—the *Ohio*—is expected to join the operational inventory in 1979. These vessels will carry twenty-four missiles, compared to the Polaris subs' sixteen. Also, beginning in 1978, Trident will replace Polaris in ten submarines already in service.

★ A test-flight program conducted at Marietta, Ga., and Edwards AFB, Calif., is currently under way to prove the feasibility of a "stretched" MAC C-141 jet transport.

The aircraft, designated YC-141B and rolled out at Lockheed-Georgia Co. early in January, has had a little more than twenty-three feet (seven m) added to its fuselage.

Besides increasing the plane's cargo-carrying capability, the modification, according to officials, also provided for aerial refueling, and improves drag characteristics and wing lift distribution.

While no decision has been made regarding stretching other C-141s in MAC's fleet of 271, any such recommendation would be based on test data derived from the ongoing flight-test program.

The prototype YC-141B program including R&D, testing, and administration, is to cost $39.2 million.

★ An electronic gunsight TV camera that produces a video image of great clarity even in meager light and that will provide pilots almost instant replay of missions flown is currently the subject of a test-flight program.

Sponsored by TAC's Air Force Tactical Fighter Weapons Center, the test flights are being conducted aboard an F-4E Phantom of the 57th Fighter Weapons Wing, Nellis AFB, Nev.

The camera is a product of AFSC's Air Force Avionics Lab, and Fairchild Camera and Instrument Corp., and was designed specif

Helping Air Force Utilize Shuttle

WITH TRW SYSTEMS ENGINEERING AND PAYLOAD KNOW-HOW.

Unmatched experience to support DOD Space Transportation System payload integration:

1. Shuttle Orbiter avionics/operations involvement since 1969
2. DOD STS mission/ground operations definition
3. Interim Upper Stage avionics/software support
4. 50 funded Shuttle payload studies since 1969
5. More than 500 space science experiments integrated
6. More than 100 spacecraft built
7. Unique Spacelab support role in Europe.

FOR THE AIR FORCE SPACE AND MISSILE SYSTEMS ORGANIZATION, TRW ALSO PROVIDES: Minuteman weapon systems engineering and technical direction • DSCS II long-haul communications satellites • FLEETSATCOM tactical UHF communications satellites • military satellites.

Call **H. GREENBAUM** (213) 536-1271 for more information.

TRW

DEFENSE AND SPACE SYSTEMS GROUP

One Space Park, Redondo Beach, CA 90278

SCIENCE/SCOPE

A jam-resistant radio terminal that will enable a flying surveillance, command, and control center to exchange secure, real-time information over a single network on a time-ordered basis has been delivered by Hughes to the Boeing Company. The Time Division Multiple Access (TDMA) radio terminal is the first to be built for the US Air Force's E-3A airborne warning and control system aircraft.

Spectrum spreading, frequency hopping, and error correction are among the techniques used for jam-resistance. These radios are the initial equipment in the Joint Tactical Information Distribution System (JTIDS) development, designed to provide a secure means for all four military services to exchange tactical data in real-time form.

An advanced electric storage battery that uses nickel and hydrogen to generate power is in development at Hughes for the Air Force. For future satellite systems, these Ni-H_2 cells offer important advantages of lighter weight and longer life over the standard nickel-cadmium (Ni-Cad) types. Ni-H_2 cells are less than half the weight of Ni-Cad and are expected to have an operational life exceeding ten years in synchronous orbit (22,300-mile altitude) and 30,000 low-earth-orbit charge/discharge cycles. Cells up to 50 amp-hr capacity are being assembled within a 3.5-inch-diameter pressure vessel.

The Army's new XM1 tank will have a day-or-night capability as a result of a new Hughes-built thermal-imaging system. The system, which will become part of the tank's periscope, forms a TV-like picture in total darkness and allows the battle commander to see and identify enemy tanks. Thermal-imaging common modules will be built and incorporated into the system, but electronic multiplexing will be substituted for light-emitting diodes in the display. This will provide greater flexibility, with electronically produced symbology and a computer-controlled moving-target reticle, at lower cost. The system will be delivered in August 1977.

An advanced IR missile seeker, built by Hughes, is undergoing a series of missile flight tests. These tests, conducted under a joint Navy-Air Force AIMVAL (Air Intercept Missile Evaluation) program at Nellis AF Base, Nevada, will determine performance characteristics for the new generation of short-range air-to-air missiles. Ten of the advanced seekers, a second seeker type, and the AIM-9L seeker are being carried on the weapons racks of Navy F-14s and Air Force F-15s. These planes are in air-combat maneuvers against F-5s over an instrumented test range.

An old pro in earth orbit, NASA's Applications Technology Satellite ATS-1, is still in public service ten years after launch, despite an original life objective of three years. The Hughes-built satellite, originally designed for communications experiments, continues to perform mercy missions for the sick or injured in remote parts of Alaska. The satellite transmits emergency calls for help and relays doctors' instructions for treatment. ATS-1 is credited with saving at least seven lives since its launch in 1966.

Aerospace World

SOVIET AIRCRAFT DESIGNER SERGEI V. ILYUSHIN, 82

Early in February, the Soviet News agency *Tass* announced the death of aircraft designer Sergei V. Ilyushin. No cause or date of death was given. Mr. Ilyushin, eighty-two, spent a lifetime in aviation, beginning as a mechanic and going on to design more than fifty types of aircraft, from the "Stormovik" close-support fighter of World War II fame to modern jet transports. During his career, Mr. Ilyushin was cited three times as a Hero of Socialist Labor—the Soviet Union's highest civilian honor. He was awarded the Order of Lenin seven times and in 1967 was made a General Colonel-Engineer. As an aircraft designer, Mr. Ilyushin's latest major creation was the four-jet, 350-passenger Il-86 Airbus, destined to be a mainstay of Aeroflot, the Soviet Union's state airline.

cally to allow pilots quick assessment of such mission data as aerial combat, munitions delivery, and routine aerial training.

★ In 1976, the nation's airlines recorded the lowest accident total in modern aviation history and the fewest fatalities in more than twenty years, according to statistics compiled by the National Transportation Safety Board.

Commercial carriers suffered four fatality-connected accidents during the year, in which a total of forty-five persons were killed. This compares with 1975—also considered to have had an outstanding safety record—which had three fatal accidents with a total of 124 deaths. To put these figures in perspective, about *45,000* people were killed on the nation's highways last year.

The carriers flew nearly 2.5 billion miles in 1976, and transported more than 206,000,000 passengers in the US alone.

If you flew commercially during the year on one of the some 2,200 scheduled airliners, the chance of not landing safely at your destination was a miniscule 00.00002 percent.

★ According to FAA, the number of passengers carried by US scheduled airlines is expected to double by Fiscal Year 1988—to a staggering 428,500,000.

FAA says that the general aviation fleet will increase in that time span from 1976's 168,500 planes to 267,000, with hours flown rising at an even steeper rate—from 35,000,000 in FY '76 to 72,000,000 in FY '88.

For the first time, FAA has projected air cargo growth—from 10.5 billion ton miles in FY '76 to a smashing 25 billion in FY '88 (both domestic and international shipments).

Other areas: Air taxi operations will increase dramatically as the CAB allows larger carriers to abandon unprofitable routes to commuter lines operating smaller aircraft; fuel consumption will just about double.

Remaining steady within the period under study are the number of CONUS-stationed military aircraft, rising only to 20,239 from 20,023.

★ Lockheed-Georgia Co. is busily pursuing worldwide orders for its

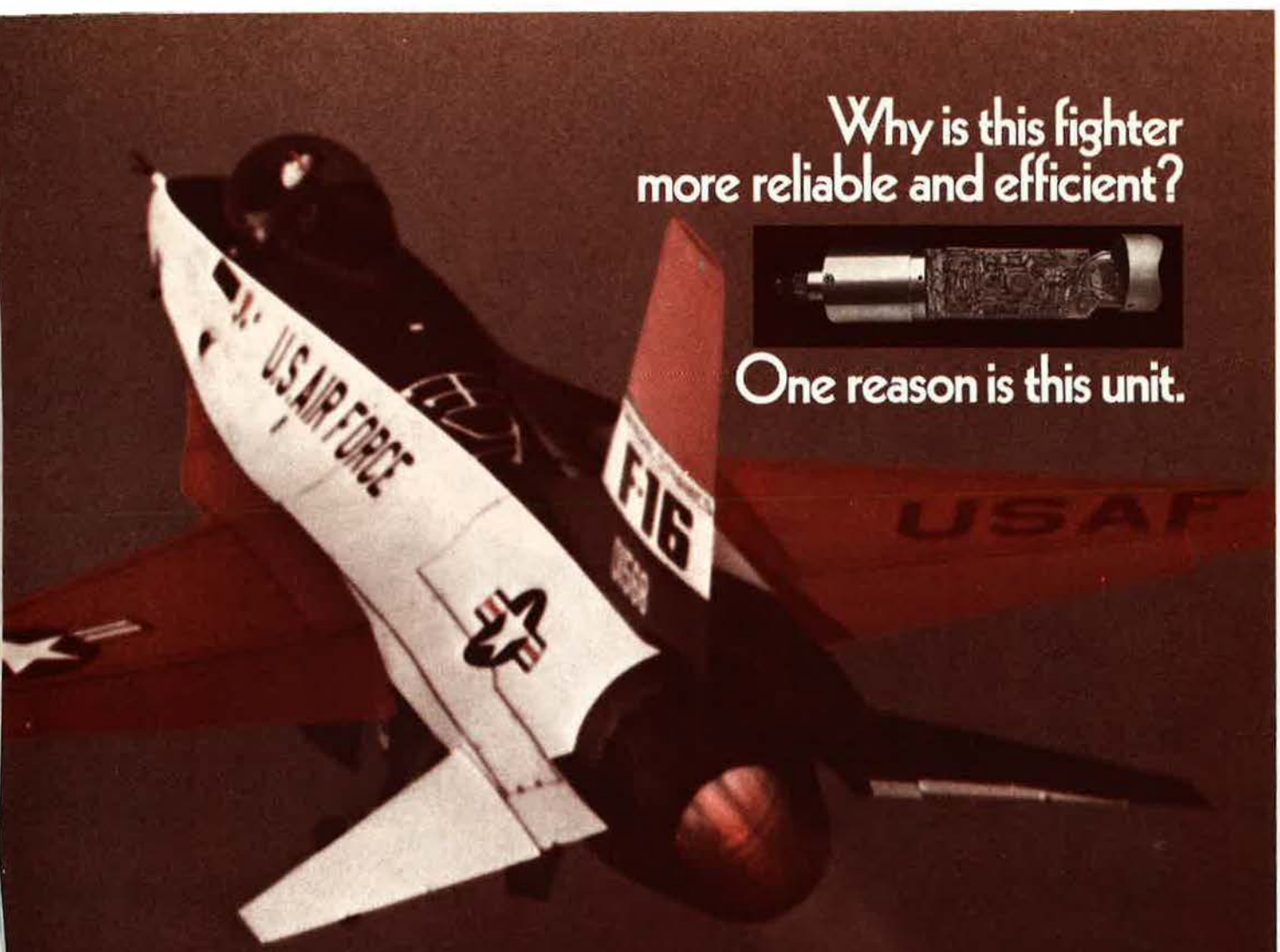
he newest addition to the 89th MAW's inventory is this C-12 used to train Air Force pilots who serve at attaché and MAAG posts round the world. The sleek eight-passenger aircraft is particularly suited for short airfields.

25th year at Lockheed.

They've also added in-flight refueling to the prototype C-141 StarLifter and "stretched" its fuselage to increase that airlifter's productivity. And they're at work on many other advanced phases of airlift.

More than 65,000 years of airlift experience—the 2600 25-year airlift experts at Lockheed-Georgia Company. The Free World's biggest resource when it comes to designing and building airlifters.

Lockheed
Lockheed-Georgia Company



Why is this fighter more reliable and efficient?

One reason is this unit.

The fighter is the USAF F-16. The unit is the Garrett Pressure Transducer.

The pressure transducer is utilized in the F-16's pneumatic sensor assembly to provide key redundant inputs to the automatic flight control systems. It has to be reliable and efficient.

Garrett's pressure transducer is inexpensive and proven. Over 1,000 have been manufactured to date. In addition to the F-16, they are used on the B-1 supersonic strategic bomber, the Air Launch Cruise Missile, the YC-14 AMST jet transport, the F-14 fighter, the JA-37, and in the Space Shuttle's central air data computers.

For more information on Garrett's Pressure Transducer, call us at (213) 323-9500, or write to Sales Manager, Electronic Systems Sales, AiResearch Manufacturing Company of California, 2525 W. 190th Street, Torrance, CA 90509.

GARRETT

The Garrett Corporation
One of The Signal Companies

GARRETT PRESSURE TRANSDUCERS

The reliable answer

the ONE portable VHF/UHF transceiver to meet ALL your ATC needs

Both VHF and UHF in a single portable transceiver without module changes or adjustments. Transceiver also configured for manpack, vehicular, or base station use. ITT's ruggedized 3701 transceiver provides the high performance, capabilities, and features you'd expect only from more expensive, high quality, rack-mounted equipment. Easy to use, too – broadband antenna and circuits make channel selection the only tuning required. Accessories are available that will suit the 3701 to your exact requirements.

Frequency Range: 116 -150 and 225 - 400 MHz
(25 kHz spacing)
4 preselectable channels
Operating Mode: DSB -AM push-to-talk
Power Output: 1 watt or 5 watt selectable
Size: 5 x 11 x 16 in, 16.5 lb w/o battery
Life: 8-hour rechargeable battery (8.5 lb)

Contact us to find out more about the 3701.

AEROSPACE/OPTICAL DIVISION ITT

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

3700 EAST PONTIAC STREET
FORT WAYNE, INDIANA 46803
TELEPHONE (219) 423-9636

There's never been an assembly like this in the history of the aviation industry.

2600 airlift experts mark their
And they're just getting started

They've designed and built the airlifters that for many years have formed the backbone of the airlift capability of the U.S.A. and many other countries.

They've produced the world's most versatile and most used airlifter, the first fanjet airlifter, and the world's biggest airlifter.

They know more about airlift than any other group of people in the world, and they're just getting started.

Now they're putting their unmatched experience to work in designing a short-field version of the C-130 Hercules that will make this remarkable plane even more productive and cost-efficient.

Aerospace World

L-400—a newly designed twin-engine, lightweight derivative of the justifiably famous C-130 Hercules.

The company sees the L-400 "Twin Hercules"—which features the same fuselage structure as its four-engine progenitor—"as the ideal, jet-age replacement for aging aircraft" around the world.

The L-400, according to Lockheed, is designed to carry a 22,500-pound (10,206 kg) payload to a range of 500 miles (805 km). It would operate from runways as short as 3,500 feet (1,067 m).

A production go-ahead for the L-400 depends on an order backlog of at least thirty aircraft, officials said.

The L-400, powered by 4,591 shaft horsepower engines, would offer a number of other economies, say its designers. Operating with a crew of two (vs. four in the C-130), the aircraft would have simplified systems and instrumentation and offer easy maintenance. Having many features in common with the C-130, the L-400 could use that aircraft's ground handling equipment, spares, test equipment, and training.

★ In the case of the Civil Air Patrol, statistics do indeed tell the story.

USAF's volunteer civilian auxiliary participated in 819 search operations in 1976, with CAP members flying a whopping 8,875 sorties involving 17,604 hours in the air. This boils down to an average of two aircraft airborne every hour of every day in 1976.

Cooperating on a USAF project, a USMC helicopter lifts a surplus F-102 from Davis-Monthan AFB to Luke AFB, Ariz., for display.

CAP saved the lives of thirty-four people during the year and otherwise averted tragedy by locating a record 395 search objectives.

Beside search and rescue missions, CAP volunteers also contributed 1,176 man-days of support in disaster relief efforts throughout the nation.

CAP's Mississippi Wing began 1977 in spectacular fashion on January 3. Within minutes of being notified that a private aircraft had probably gone down in freezing rain while inbound to Hawkins Field Jackson, Miss., CAP ground teams had located the aircraft and rescued its pilot and two passengers.

★ Air Force Systems Command has agreed to provide abstracts of new USAF technology to the public through a long-standing program—the Commerce Department's National Technical Information Service (NTIS).

The Air Force abstracts—to number 400 to 800 annually—will be incorporated in NTIS's *Tech Notes*, a new series of one- to two-page summaries about the latest technology that ranges in category from computers to life sciences and that is distributed by subscription to any private citizen.

The *Tech Notes* concept has been tailored specifically to bring the

USAF PROGRAM TO COMPUTERIZE PARTS MANUFACTURING

USAF has undertaken a program that could revolutionize the manufacture of aircraft parts and cut production costs substantially.

While the program—known as Integrated Computer Aided Manufacturing, or ICAM—will focus initially on aircraft parts produced through metalworking processes, it may well be applicable to electronics, composites, and component assembly, officials said. (For a look at ICAM and other production matters of concern to DoD officials and the defense industry, see "USAF's Crusade to Streamline Industrial Production," October '76 issue, p. 62.)

When the Air Force Materials Lab's Manufacturing Technology Division recently signaled prime contractor SofTech, Inc., of Waltham, Mass., to proceed with ICAM, it was announced that a flock of important companies and institutions would act as subcontractors.

They include: General Dynamics, Grumman Aerospace, Hughes Aircraft, Lockheed, MIT, Penn State, Rockwell International, United Technologies, and Vought Corp.

ICAM is visualized as a long-term program reaching well into the 1980s, and goes far beyond plugging computers into work stations. "Rather, ICAM is a system that uses computers to organize every step of manufacturing—from parts design, to physical location of machine tools, to shipping—in the most economical and efficient mode," said AFML's Dennis Wisnosky, ICAM program manager.

"Just as changes occurred on the shop floor when machine tools were automated, we foresee great changes extending even to how parts are designed via the ICAM program. In an ICAM 'facility,' for example, a computer memory would hold all the variables that affect finished parts—size, shape, material cost, performance requirements, etc.," he said.

"The designer would use the computer system to decide the best way of making his product and optimizing all parameters shown. Even costs, therefore, would be known with high confidence beforehand, not after the fact when someone itemizes all the expenses from raw materials to packaging," according to Mr. Wisnosky.

Commented AFSC Commander Gen. William J. Evans: "AFML is beginning the ICAM program with great optimism and not without precedent. The Laboratory is the recognized pioneer in developing numerical control and adaptive control machine tools. While the Air Force invested about $40 million in those programs, savings in the multibillions of dollars have resulted throughout the economy. We hope to achieve far greater savings with ICAM. . . ."

Aerospace World

latest in technology to the attention of US industry and small businesses.

★ DoD has issued Directive 4120.18, which details the "evolutionary" introduction of the metric system within the US military.

The directive provides for the future use of metric units in the design of weapon systems and equipment when possible with "no significant technical or cost penalties." The directive also "discourages" the conversion of existing designs to metric.

In accordance with Public Law 94-168, the directive will keep abreast of US industry's conversion to metric over the coming years.

As the last NATO member to go metric, the US will help foster more effective standardization within the Alliance and facilitate joint production programs.

★ **NEWS NOTES**—The **Defense Supply Agency** has been renamed the **Defense Logistics Agency,** which better reflects the organization's broadened responsibilities, officials said.

NORAD logged a **record 1,117 space objects** in 1976, against the previous high of 929 in 1975.

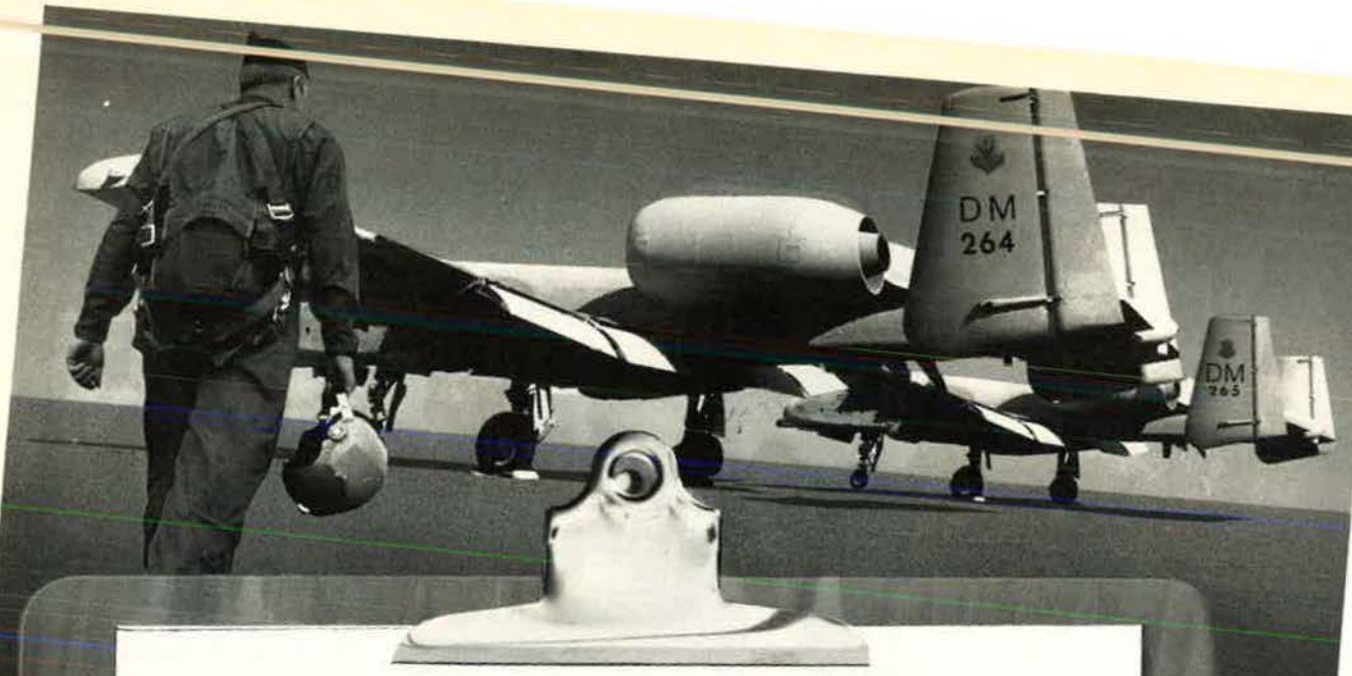
Lt. Col. Edward D. "Dan" Cherry is the new Commander of the Air Force **Thunderbirds** Demonstration Squadron, replacing **Maj. Chris G. Patterakis,** who served as Commander/Leader the past two years.

Died: William D. Pawley, former US Ambassador to Peru and Brazil and entrepreneur who formed several aviation companies and helped organize WW II's famous **Flying Tigers.** He died after a long illness, in Miami Beach, Fla., in January. An AFA Patron, he was eighty years old.

Died: Theodore "Ted" R. Smith, a pioneer in the development of twin-engine business aircraft who helped design WW II's **A-20 attack bomber,** in Santa Monica, Calif., following open heart surgery. He was seventy. ■

The Early Birds, an organization of pilots who flew solo prior to December 17, 1916—the thirteenth anniversary of the Wright brothers' first powered and controlled flight—shown beneath the Wrights' Kitty Hawk Flyer in the National Air and Space Museum during their recent annual reunion. The group includes the world's most eminent balloonist, who has made more than 600 ascents; a pilot who learned to fly at the Wrights' school; the oldest still-active flight instructor; America's No. 1 glider pilot; the ninety-one-year-old designer of the Lockheed planes flown by Wiley Post, Amelia Earhart, and Charles Lindbergh; a flyer of Curtiss Pushers in 1912; pilots of World Wars I and II; a mail pilot of 1916; and, at the center, the lady parachutist who, in 1913, demonstrated to Army officers that a person could jump from an airplane and land safely.

Index to Advertisers



A-10 PILOT REPORTS:

"In order to kill a target, especially something small like a tank, you've got to pick it up with your eyeballs... A HIGH SPEED AIRPLANE JUST ISN'T NECESSARY TO DO THE JOB."

With the A-10 now in the USAF Tactical Air Command, close air support operations achieve a new tactical capability in destroying enemy armor. The A-10 is the only modern attack aircraft developed for the CAS mission.

FAIRCHILD
INDUSTRIES

AIR FORCE
MARCH 1977

Soviet Aerospace Almanac

AFTER the days and hours spent putting together this third edition of our Soviet Aerospace Almanac, it becomes impossible to comprehend how any informed person can be complacent about the threat to US security, world stability, and peace generally that is posed by the waxing military might of the Soviet Union. Informed, in this context, is the operative word, for the cumulative impact of the facts, figures, and estimates in this issue as they pass over our editorial desks is both heavy and dramatic. And worrisome as well.

Herein we have tried, and with some success we immodestly believe, to convey a sense of this impact through a maximum of factual data and a minimum of conjecture. The data, we believe, speak for themselves. No embroidery is necessary. The magnitude, pace, and direction of the Soviet military and technological effort leave no room for comfort in our minds and will not, we trust, in the minds of the growing number of readers who receive, peruse, and retain it for future reference.

The Soviet Aerospace Almanac is well read, we know, not only in US government offices but in Moscow and, indeed, in all the major capitals of the world. We have been told—and we believe it—by a Soviet source (name withheld upon request) that he has learned from us things about his own Air Forces that he had not known. This wry commentary on the compartmentation endemic in a closed society, where the "need to know" does not extend beyond a chosen few, points up the very function this issue of AIR FORCE Magazine is designed to perform.

Informed, as we said above, is the operative word in forming the kind of consensus that leads to wise choices among the defense and foreign-policy alternatives that should be the chief concern of all of us in the months that lie ahead.

This is our major contribution to that national dialogue.

—THE EDITORS

Across the wide spectrum of military power, the Soviet Union is on the move to shift the "correlation of forces" in her favor. It is difficult to determine the reasons behind this seemingly inexorable growth of Soviet military investments and capabilities. It is easy to see the meaning of this relentless growth to the United States:

The USSR's Military Shadow Is Lengthening

BY EDGAR ULSAMER, SENIOR EDITOR

ALTHOUGH wrenched by Moscow's compulsive one-upsmanship and twisted by frequently overblown expectations in the US, détente—now in its fifth year—continues to extend a large but leaky umbrella over the US-Soviet superpower relationship. Admittedly, the analogy is less than perfect. Much of the evidence of Soviet military and geopolitical activities during the past five years, and especially in 1976, makes it tempting to see détente less as an umbrella and more as a smoke screen that serves the USSR at least as effectively as the obsolete Iron Curtain. But misgivings about the course of détente may be outweighed by a pragmatic consideration: Burning the only broad bridge between the world's foremost democratic and foremost totalitarian powers probably is neither in the US national interest nor morally defensible. Maurice Chevalier's *bon mot* that old age is preferable to the alternative applies to détente and its central product—mutual accommodation through arms limitations. There seems to be no other option for avoiding full-scale resumption of the cold war.

Détente, as practiced by the USSR, is rooted in *realpolitik* that in turn is rooted in military power; it signals only a change in methods but not goals of Soviet expansionism. Put another way, détente in the Soviet perception is continuation of the cold war by other means.

It is possible, even inviting, to fault Soviet actions since the advent of détente five years ago on grounds of exploiting to the maximum every loophole the SALT accords contain. But one does so in the face of undeniable Soviet candor concerning Moscow's goals associated with détente, or what they initially termed peaceful coexistence and relaxation of international tensions. The Kremlin never promised that détente meant instant friendship or an accommodation of two intrinsically antagonistic ideologies. To the Soviets it means formalistic concessions that are apt to reduce the risk of nuclear war, to foster more favorable conditions "for peaceful socialist and communist construction," and to hurry along the "inevitability of the victory of communism over capitalism."

Détente, unquestionably, has been good to the rulers of the Soviet Union. As Secretary General Leonid Brezhnev told the last Communist Party Congress, under the aegis of détente "great revolutionary changes" have taken place in the world, such as the fall of Southeast Asia and the attendant humiliation of the United States as well as the Communist victory in Angola and its concomitant, the creation of a strong Red bastion in the African heartland by Moscow's surrogate, Castro's Cuba. He might have mentioned, but did not, the Helsinki Accord that ratified Western acceptance of Soviet hegemony over Eastern Europe.

Better yet, détente and its offspring, SALT, enabled the Soviet Union to thoroughly and systematically modernize its strategic, naval, and general-purpose forces without major countermoves by the US and without provable violation of the arms-limitation accords. Here, too, it may be tempting to cry foul and "Soviet duplicity" because of Soviet triumphs in the "fine-print" aspects of SALT—except that such cries from the nation that invented Yankee horse trading might have a hollow ring.

SALT, the manifestation of détente that most interests readers of AIR FORCE Magazine, has not slowed the steady growth of Soviet military and related technological capabilities, as often stated in these pages. The current brouhaha in Congress and the press over whether the USSR seeks military superiority over the US—or not—is, in practical terms, an exercise in semantics and not fully provable, one way or the other. What is provable, as outgoing Secretary of Defense Donald Rumsfeld pointed out in presenting the FY '78 DoD budget, is that the US is headed toward military inferiority unless last year's trends to shore up US defense efforts are continued in the years ahead.

Steady Growth of Soviet Military Capacity

Statements by US leaders and by the press would seem to indicate that 1976 was a year of intensified Soviet strategic and general-purpose military growth. In reality it was just another year of more of the same. Its only truly distinguishing feature was that the broad findings of the intelligence community were being taken seriously at last by the Congress, the Administration, and the

news media, and were reaching the public. Probably the most profound "net assessment" of where the US and the USSR are headed in relative military capabilities was provided to Congress by outgoing US Arms Control and Disarmament Agency Director Fred C. Ikle, who said the Soviets will do what they can get away with and are constrained only by the military strength of the United States and the national will to use that strength.

The scorecard for the past year offers little encouragement on either of the two counts cited by Mr. Ikle. The latest CIA comparison of US and Soviet defense activities issued in January 1977 finds that "the estimated dollar costs of Soviet [military] activities in 1976 exceed those of the US by about forty percent," if the cost of pensions is not counted. The CIA estimates that last year the USSR invested about twice as much in the procurement of weapons and equipment and the construction of facilities as did the US. Soviet outlays for strategic forces last year were about three and a half times as high as those of this country, the CIA estimate concludes.

The Defense Department's Annual Report (for FY '78) finds that "the Kremlin is behaving as though it is determined to increase Soviet military power whether we show restraint or not; Soviet military programs we observe and measure exceed those necessary for deterrence and the magnitude of the Soviet military effort, impressive by any standard, continues the momentum that it has displayed for more than a decade."

Outgoing Deputy Secretary of Defense Robert Ellsworth told this reporter that, measured in rubles, Soviet military spending over the past few years has grown consistently, averaging about three percent annually; measured in dollars, that growth averages about four percent a year. This "inexorable" and steady increase of Soviet military spending, he said, appears not to emphasize any single military mission or capability. All elements of strategic, general purpose, and naval forces are being strengthened and modernized with equal fervor.

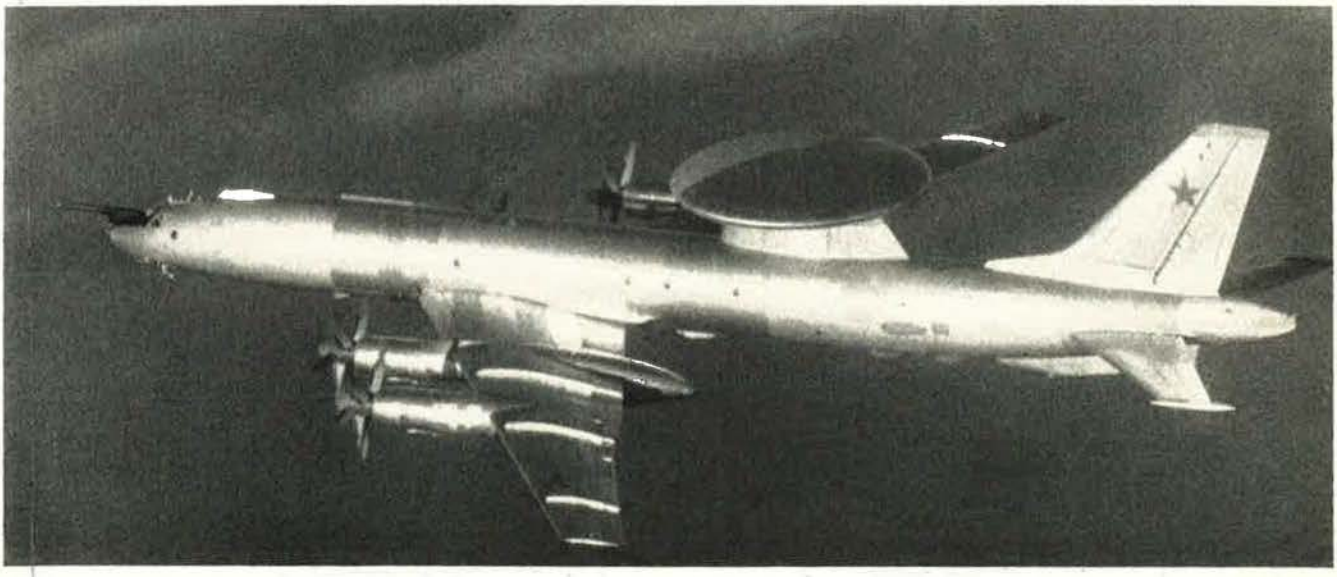
While the Soviet drive toward military modernization is general, its orientation is specific. DoD's Annual Report finds that the bulk of Soviet defense spending and of its increases "have gone to forces which constitute a direct threat to the United States and its European allies. On the average, the costs of the Soviet forces oriented toward China took about eleven percent of the total Russian military budget between 1964 and 1976. During those twelve years, roughly fifteen percent of the growth in the Soviet level of effort, on the average, can be attributed to the buildup in the Far East. The remaining eighty-five percent has been allocated to strategic nuclear forces and the forces deployed opposite NATO."

Strategic Offensive Forces

ICBMs

At the apex of Moscow's growing strategic might stands its ICBM arsenal, numbering more than 1,500 missiles. These systems are being modernized and improved at a furious rate. Missile silos are being hardened to about 3,000 psi, more than twice the hardness of new US Minuteman silos. Cost of the Soviet silo improvement program, if undertaken in the US, would come to about $20 billion, according to USAF analysis.

As of the first of this year, according to DoD, about forty SS-17s, more than fifty SS-18s, and approximately 140 SS-19s had been deployed. Each of these new ICBM systems has greater throw weight and accommodates more higher-yield multiple independently targetable reentry vehicles (MIRVs) than Minuteman III. Their accuracy is roughly 0.3 nautical miles CEP, which is inferior to Minuteman III standards, but at least three times better than the ICBMs they replace. Each of the three new types can be deployed with either very large single warheads or MIRVs. The number of MIRVs carried by the SS-18, the world's largest ICBM with a throw weight of about 15,000 pounds (about seven times that of Minuteman and twice that of USAF's proposed MX), can be between eight and ten. The SS-17 carries four and the SS-19 six MIRVs. Purpose of the extremely high-yield single warheads of the new Soviet ICBMs presumably is assured destruction of such superhardened military targets as NORAD's Cheyenne Moun-



The Moss early warning aircraft, a derivative of the Tu-114 transport, appears to lack an efficient look-down radar system.

tain complex, certain launch control centers, and the Command Post of the US National Command Authorities.

Dr. Malcolm R. Currie, former Director of Defense Research and Engineering, stated in his final report to Congress that in terms of countersilo attack, the new Soviet ICBMs have "a clear lead over our deployed Minuteman III." Assessing the relative standing of the two countries' operational ICBM capabilities, he found that:

- Against soft-point targets, the US has a slight lead in design efficiency;
- Against soft-area targets, the USSR leads;
- Against hard-point targets, there is parity;
- In a countersilo attack, the USSR leads.

A fourth advanced Soviet ICBM, the SS-X-16, continues to be sidelined even though it was first test-flown more than three years ago. Best guess by US analysts is that this system will be deployed in a land-mobile mode and with a single warhead if and when the USSR decides to shift some or all of its ICBMs to mobile launchers. The SS-X-16 has not yet been test-flown with a MIRVed payload, but does use a post-boost vehicle and advanced navigation-guidance avionics requisite to MIRV configuration. Delay of the weapon's operational deployment probably is linked to SALT considerations. Mobile ICBMs are much more difficult to "count" with recce satellites and other technological surveillance means. In the past, US negotiators at SALT objected to the operational deployment of such systems for these reasons. On the other hand, there is widespread recognition that this element of uncertainty, coupled with the high degree of mobile ICBM invulnerability, reduces the risk of the Soviet Union's acquiring a first-strike capability, but only if both superpowers deploy such systems.

One of the potentially most disturbing weapon systems developed by the Soviet Union is the SS-20, a shorter-range version of the SS-X-16. The system straddles the line between weapons within and outside the purview of SALT, and is one of the principal "gray-area" weapon systems that bedevil current arms-limitation negotiations.

DoD's Annual Report says the SS-20, a mobile system carrying three MIRVs, "could be given a range equal to the SALT definition of ICBM range—5,500 km or about 3,000 nautical miles—either by the addition of a third stage or by offloading MIRVs." The new weapon's effect on the strategic balance could be significant. Assigned against targets in the Eurasian landmass, either in Western Europe or Red China, its range, accuracy, and MIRVing vastly boost Soviet theater nuclear capabilities. As a result, tactical strike aircraft of the Warsaw Pact forces currently used to augment the older SS-4s and SS-5s are freed for other missions. There is also evidence that some Soviet ICBMs are targeted against high-value military installations in NATO and China. Pentagon analysts fear that the advent of the SS-20 frees these ICBMs for coverage of targets in the United States.

There is considerable further concern that a large number of mobile SS-20s in being would provide the Soviet Union with a ready-made "loophole" for breaking through the SALT ceilings of 2,400 central launch systems, 1,320 of which may be MIRVed.

The best US bet for countering the SS-20 is development and deployment of a ground-based cruise missile. The Defense Systems Acquisition Review Council (DSARC II), meeting on January 14, assigned the newly conceived ground-launched cruise missile (GLCM) mission to the Air Force. GLCM is envisioned to have a "theater nuclear role and to be adapted from the land-attack Tomahawk that is being developed by the US Navy for launch from submarines and surface ships." GLCM will use mobile launchers.

A disturbing feature of the USSR's most capable ICBM, the SS-18, and of the smaller SS-17 is their sabot "cold-launch" technique: They are launched from a canister installed in the silo. The missile ignites after leaving the silo to prevent damage to the launcher. The result, according to outgoing Air Force Secretary Thomas C. Reed, is that "the silos can be reloaded in a day or so to fire again, if not destroyed by a retaliatory US attack."

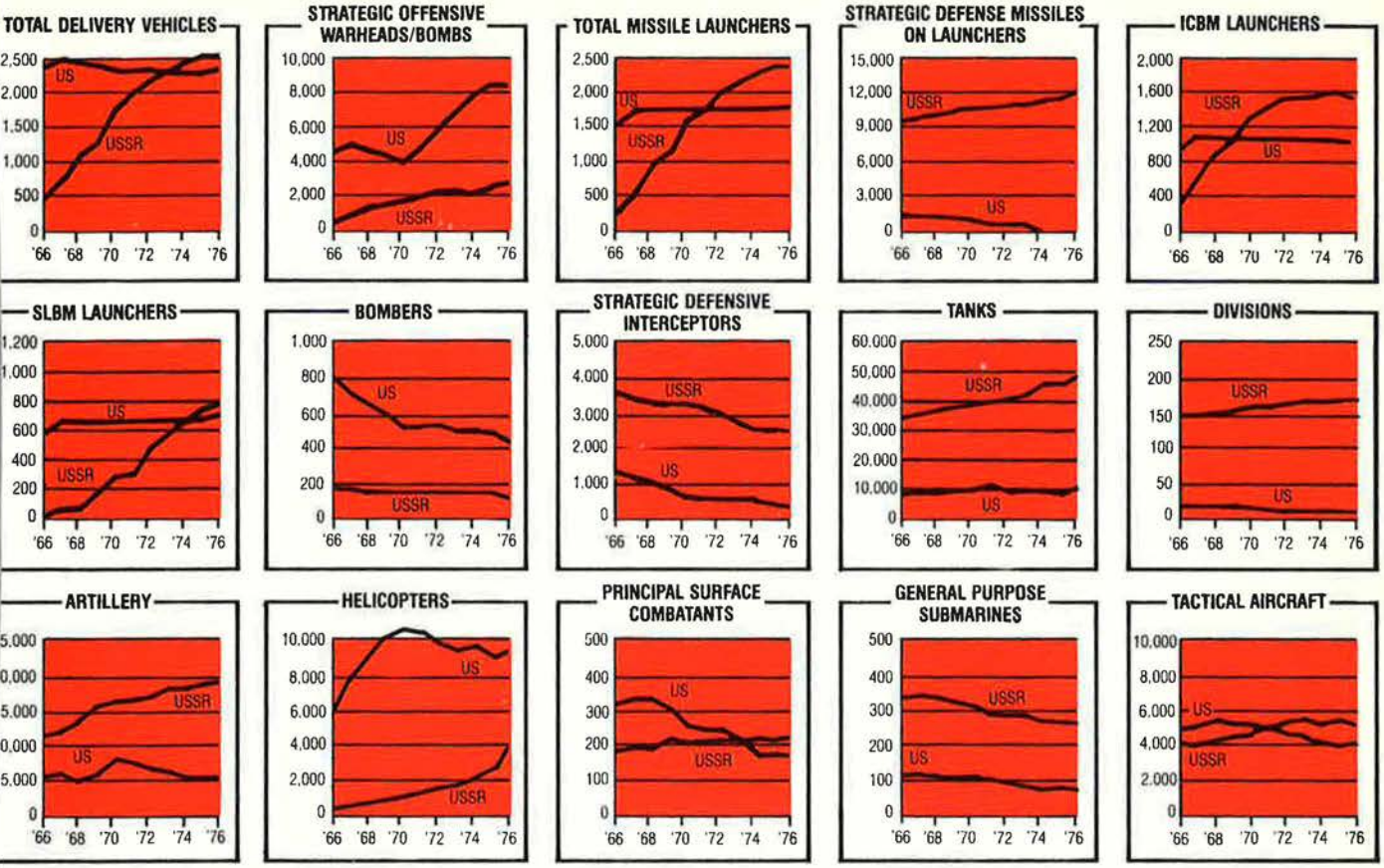
Although it probably will take the Soviets until the early 1980s to replace all their older SS-9, SS-11, and SS-13 ICBMs with the new generation of missiles, yet another, newer wave of Soviet ICBMs is in R&D. The FY '78 Defense Report admits "we do not yet know the specific characteristics of these new missiles. But we anticipate that they will show still further improvements in accuracy and thus in hard-target kill capability. Testing of one or more of these missiles may begin later this year." While the exact number of new ICBM types under development is not known, there are at least four, and at least one of them uses solid propellants. It is reasonable to suggest that these new systems might double Soviet ICBM accuracy to about 0.15 nautical mile CEP, or close to the Minuteman III level.

A noteworthy sidelight concerning the readiness of the Soviet ICBM force is this disclosure by Secretary Reed: "To bring the year [1976] to a close, they fired more than two dozen strategic missiles during the month of December. We fired one Minuteman." Most Soviet ICBM launches are from operational silos. USAF launches are from the Vandenberg AFB test facility, because Congress halted the Air Force's proposed operational test launches.

By the early 1980s, the total throw weight of the Soviet ICBM force will have roughly doubled, from about 6,000,000 pounds at present to between 10,000,000 and 12,000,000 pounds. This figure translates into about 7,000 one- to two-megaton warheads of significantly improved accuracy deliverable by their ICBMs.

By 1982, the Soviets "are going to be able to walk away from us in their ability to attack hard targets," in Secretary Reed's view.

The FY '78 Defense Report is equally blunt: "At exactly what point the combination of throw weight, MIRVs, high yields, and low CEPs will give [the Soviets] a high kill potential against US Minuteman/Titan ICBMs still remains a matter of uncertainty. There can be little doubt, however, that within a decade or less, confidence in the present US fixed ICBM



Graphs selected from the Defense Department's Annual Report and the US Military Posture Statement by Gen. George S. Brown, Chairman of the Joint Chiefs of Staff, show basic trends in US and Soviet military capabilities. The US leads in helicopters, strategic bombers, and strategic nuclear weapons bombs.

forces, as high-confidence, second-strike weapons will be seriously eroded. . . . Before the mid-1980s, the Soviets could possibly have the capability, with a small fraction of their ICBMs, to destroy the bulk of the Minuteman/Titan force. While this in no way would give the Soviets a disarming first-strike, it could create a dangerous asymmetry. Since much of the US capability for controlled, selective responses resides in the Minuteman force, it may be desirable to make the US ICBM force increasingly mobile." At present, more than three-quarters of USAF's ICBMs would survive a Soviet sneak attack; by the mid-1980s, that fraction might be down to "as few as one-fourth," according to Air Force Secretary Reed.

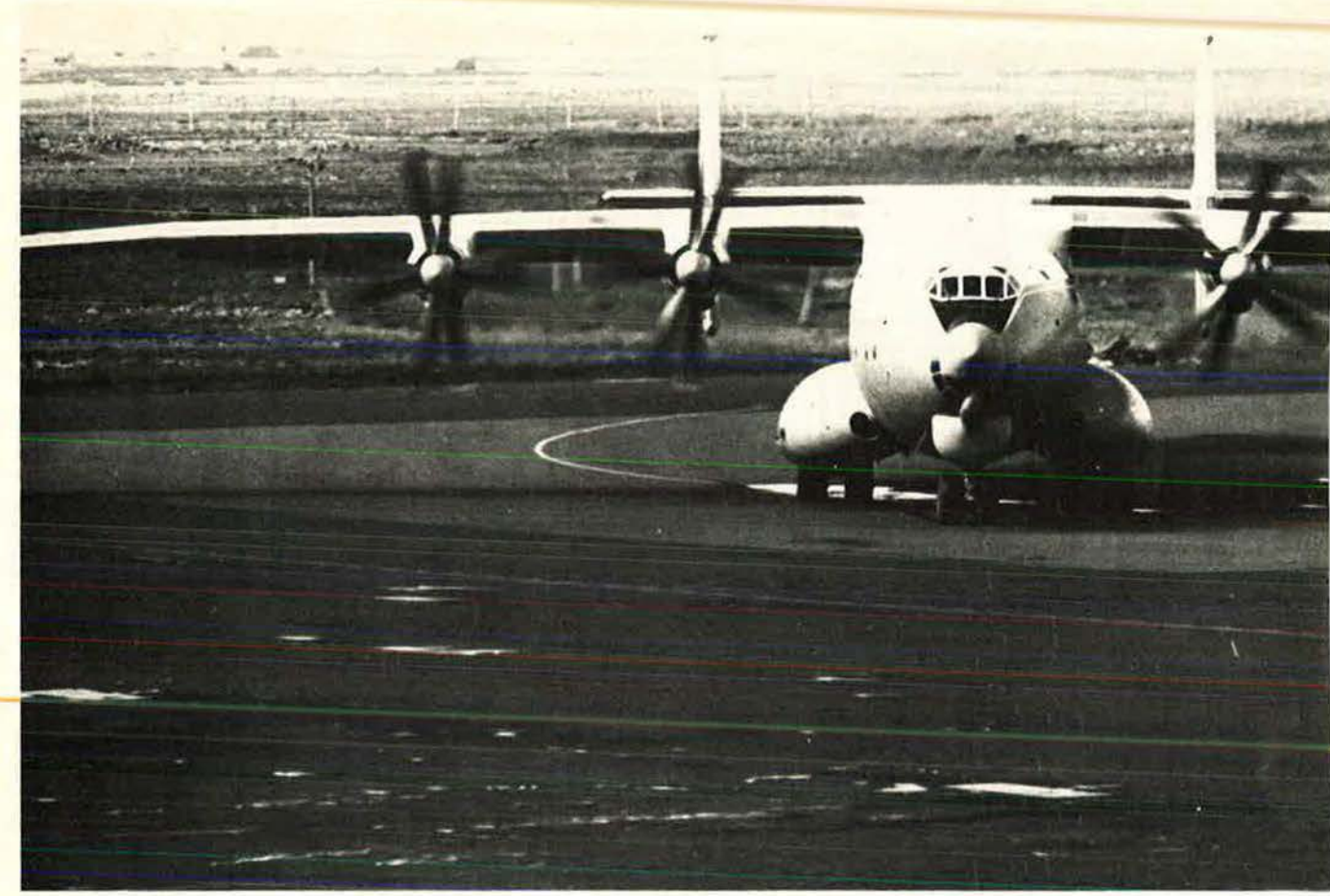
The Defense Report sends an unambiguous message to Moscow on this score, asserting that if the "life of the fixed, hard ICBMs cannot be extended, then stability requires both sides to improve their land-based forces enough so that they are more difficult to target by the other side. The United States should not accept a relationship in which we must bear the heavier costs of alternate basing while the Soviets are allowed the luxury of retaining their fixed ICBMs. Since high accuracy can be built into mobile as well as fixed systems, the Soviet leadership should be aware that if the United States moves toward mobility, the Soviets will have strong incentives to go mobile as well." If this prophecy turns out to be correct and is stressed by the new Administration, the tens of billions of rubles that went into improving the Soviet ICBM force may turn out to be for naught in terms of buying the Kremlin a credible first-strike posture.

SLBMs

One of the most critical elements of the future offensive strategic capabilities of both the US and the Soviet Union is the mix of ICBMs and submarine-launched ballistic missiles. The USSR's emphasis on new ICBMs must not be seen as slighting SLBMs and their nuclear-powered launch platforms, termed SSBNs. To the contrary, the Soviet Union is dismantling some of its older obsolete ICBMs to reach the maximum number of SLBMs permitted under the SALT ceiling. From 1965 to 1976, according to DoD, the Soviets increased the number of operational SLBMs from twenty-nine to about 800 launch tubes and are expected to reach about 880 by the end of FY '78. (The number of ICBMs, about 1,550 at present, is expected to shrink to about 1,450 over the same period.)

Observable Soviet progress in SSBN/SLBM technology has been largely on the side of longer-range ballistic sub-launched missiles, with the submarines, according to DoD, only "becoming slightly quieter," while the missile ranges are becoming significantly longer and the missiles are being MIRVed.

The most advanced SLBM launcher in the Soviet inventory is the *Delta*-class submarine. Some of these



boats are 450 feet long and carry twelve missile tubes; a stretched version, 500 feet long, carries sixteen missile tubes. A completely new design, as large or larger than the US Navy's 560-foot Trident currently in construction, may soon enter the operational inventory. In 1976, the Soviets conducted their first successful flight test of a submarine-launched ballistic missile with a MIRVed payload. The weapon was fired from the Norwegian Sea, and its payload impacted in the Pacific Ocean after covering more than 4,000 nautical miles.

The Soviet Union at present is the world's leader in SLBM performance. Its SS-N-8 ballistic missile, carried by the nineteen *Delta*-class SSBNs, has a range of "at least 4,200 nautical miles," according to the US Defense Department. (The total Soviet inventory consists of sixty ballistic missile-launching submarines now in operation or on the ways. Eventually the Soviet Union can be expected to reach SALT's ceiling of sixty-two boats carrying 950 launchers. The 1972 SALT Interim Agreement limits the US to forty-four submarines and 750 launchers.)

In spite of the USSR's current performance lead in SLBMs, two even newer, more capable SLBMs are undergoing flight test. Development of these systems, which DoD believes will have "substantially improved accuracy, better range capability, and better payload flexibility," probably will be completed this year. As a result, "all or most of the current generation of SLBMs could be replaced by the late 1980s."

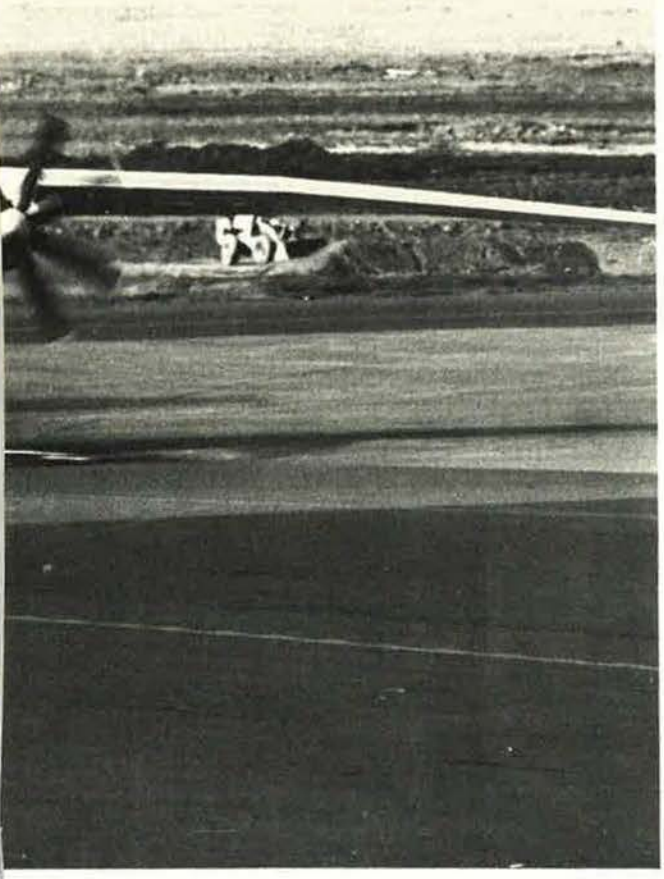
One of the new designs has been designated the SS-NX-17 and is the first Soviet solid-propellant SLBM. Although it uses a post-boost vehicle, it has so far been observed with only a single reentry vehicle. This missile is thought to be a replacement for the SS-N-6 carried by modified *Yankee*-class nuclear-powered submarines.

The other new Soviet SLBM is the SS-NX-18, a follow-on to the 4,200-nm-range SS-N-8 weapon of the *Delta*-class subs. The SS-NX-18, according to DoD analysts, is liquid-propelled, and has been test-fired with two MIRVs. For the time being, the Soviet SLBM force does not appear capable of strikes against hard targets. That may not be true indefinitely, however. The US Navy and agencies of DoD are pursuing the FBM (fleet ballistic missile) Accuracy Program to give SLBMs some "war-fighting," hard-target-kill capability. Similar efforts are going on in the Soviet Union.

Bombers

Soviet Long-Range Aviation includes a heavy bomber force of about 195 Tu-95 Bear and M-4 Bison aircraft. Some of the Bears can carry air-to-surface missiles, and about fifty of the Bisons are used as tankers. In addition, there are about 700 intermediate range bombers, mainly Tu-16 Badgers and supersonic Tu-22 Blinders.

The Soviet Union is also deploying an advanced high-performance bomber, the Backfire. This aircraft has a variable-geometry wing, supersonic design that is about two and one half times the weight of SAC's FB-111 and is about four-fifths as large as the B-1.



Soviet military airlift capabilities are growing steadily. A single An-22 Cock can carry a 170,000-pound payload.

Backfire has the flexibility to perform a variety of missions, including attacks against the US mainland. The aircraft's unrefueled combat radius is about 3,100 nm, and its range is more than 5,500 nm. Unrefueled, Backfire could attack all essential US targets and recover south of this nation's borders. If accompanied by a tanker force, Backfire could cover virtually all US targets and return to Soviet bases. About eighty of these bombers have been produced and assigned about evenly to Long-Range Aviation and Naval Aviation. According to recent CIA testimony, the current production rate is between two and two and a half aircraft per month. Tentative CIA estimates envision a total production run of about 400 Backfire bombers.

Caught up in somewhat contradictory assessments within the US intelligence community in the past, Backfire universally is conceded to have an attack capability against the US. "The CIA is saying the aircraft is primarily built for a peripheral role . . . [against] Western Europe, England, China, and the southern reaches, [but] it has a capability for an intercontinental mission," according to the Agency's Deputy Director for Intelligence. He told Congress that Air Force Intelligence and the Defense Intelligence Agency hold views different from those of the CIA on whether or not the Soviets built Backfire with the intercontinental attack mission clearly in mind. All branches of the intelligence community agree that Backfire is ideally suited for the peripheral and antishipping missions, he testified. According to the CIA, Backfire normally is armed with nuclear bombs or two "large" air-to-surface missiles. A number of variants have been observed recently, suggesting that it is being modified for electronic warfare and other strategic support missions.

This year's Defense Report confirmed AIR FORCE Magazine's disclosure of two years ago that the Soviets are working on a follow-on heavy bomber "with greater range and payload to replace the aging Bears and Bisons."

Cruise Missiles

Although Nazi Germany demonstrated the strategic importance of cruise missiles (then called "buzz bombs") during World War II, the US gave this technology low priority after the advent of the ballistic missile. The lone survivor is the B-52's Mach 2.0 Hound Dog air-to-surface standoff missile with a 600-mile range. The Soviet Union, by contrast, put greater stock in cruise missiles with terminal guidance for naval application. The reason, probably, is geography and the nature of the US target complexes. As the President of Teledyne, Mr. Barry J. Shillito, recently pointed out: "The Russians have considerably more than 300 cruise missiles now deployed in submarines. With these missiles, they can today strike sixty percent of the US population and a large portion of our industry. It is pertinent to remember that the US has no defense in existence to counter the Soviet cruise missile." Mr. Shillito's estimate of 300 operational naval cruise missiles appears to be conservative and disregards weapon systems of this type deployed on the *Kiev* V/STOL carrier and the *Kara* guided missile cruisers. The USSR's inventory of operational cruise missiles, therefore, is in excess of 600.

US cruise missiles need far greater range—between 1,500 and 2,000 nm—if they are to reach the bulk of Soviet prime targets from a standoff position. This applies especially to sea-launched US cruise missiles. The difference in US and Soviet requirements is of major political as well as technological consequence. Soviet SALT negotiators insist on outlawing sea-launched cruise missiles with a range of more than 600 km, primarily because their missiles don't need more range. Secondarily, their guidance technology is adequate to deliver cruise missiles against cities and large industrial complexes over such a relatively short distance. But the Soviets are several years behind the US in self-contained terminal guidance and, therefore, may be deficient in attacking military targets from significantly more distant standoff positions.

The US Navy's Tomahawk cruise missile with terminal guidance and a range of about 2,000 miles could be deployed at sea or on mobile land launchers. According to the Defense Report, "in either mode it would have a high degree of prelaunch survivability and would provide all-weather delivery capability which has excellent collateral damage control characteristics." Its accuracy eventually could be refined so that "many 'strategic' targets could be attacked with conventionally armed cruise missiles," the Report states. The Defense Department ordered the Air Force to begin full-scale engineering development of a stretched, long-range Air-

Launched Cruise Missile (ALCM-B) for internal carriage by the B-52 as well as of a mobile, ground-launched variant of Tomahawk; the Navy was ordered to continue development of Tomahawk.

Outgoing Defense Secretary Rumsfeld's Annual Report cautions that "cruise missiles may be tempting candidates for arms control, but because of their versatility and the verification issues they raise, considerable caution needs to be exercised in how they are treated within the framework of SALT."

Strategic Defensive Forces

In 1972, the US and the Soviet Union ratified as part of SALT I an ABM Treaty that circumscribed deployment of ballistic missile defenses. The accord initially limited each country to 200 interceptor missiles and launchers at two sites, but a protocol in 1974 further lowered the limit to one site and 100 interceptors. The Soviets deployed and have in operation such a system—the Galosh ABM. The system consists of four complexes located on the periphery of Moscow. Each complex consists of sixteen missile launchers and two TRY ADD radar installations, having two large target-acquisition and four smaller interceptor tracking and guidance radars. The interceptor is a multistage missile with a range of several hundred miles and uses a nuclear warhead with a yield of between one and two megatons.

There are indications that the Soviet Union will expand the Galosh system to reach the treaty ceiling of 100 weapons. Soviet ABM test firings continue, and two new designs appear to be under development.

The US, on the other hand, not only abandoned the lead it enjoyed in 1972 by virtue of the Safeguard ABM system and halted all work on the Site Defense Prototype Demonstration Program, but also deactivated the 100 missile complex at Grand Forks, N. D., meant to protect Minuteman ICBM silos. The only remaining element of Safeguard is its Perimeter Acquisition Radar (PAR), which is being turned over to USAF for use as an ICBM warning and raid characterization radar.

As a result of the precipitous tilt in ABM capabilities, there is growing recognition that this country was duped by the Soviet Union.

The new Defense Report underscores the point: "In theorizing about strategic nuclear stability, some analysts have postulated that mutual vulnerability is a condition of stability—in other words, if each side offered its vulnerable population and industry as hostages to the other, neither side would dare to attack. These same analysts saw acceptance by the Soviets of this premise in their signature of the ABM Treaty of 1972. It [is] equally plausible to believe that the Soviets have never really agreed to this assumption, and that they entered the ABM Treaty either because of severe resource constraints or because they feared that, without an agreement, US technology over the near term would give us continuing and even growing advantage in this form of defense." Not surprisingly, the new budget requests funds—some $215 million—for research on advanced ABM technology.

The strategic air defense picture is one-sided. The Soviets have more than 12,000 surface-to-air missiles (SAMs) in their strategic defense inventory vs. none for the US. In addition, the USSR has some 6,000 radar sites and more than 2,600 strategic air defense interceptor aircraft. The number of military personnel assigned to Soviet air defense exceeds 550,000, roughly equal to the total USAF personnel strength.

The key weapon systems of the Soviet air defense forces (PVO) are the SA-5 Gammon SAMs for long-range, high-altitude defense; the SA-3 Goa SAMs optimized for low-altitude point defense; and a large number—in addition to the 12,000 SAMs dedicated to the strategic mission—of tactical SAM systems deployed throughout the Soviet Union and in Eastern Europe to augment the SA-5s and SA-3s.

PVO's all-weather fighters include Yak-28P Firebars, Tu-128 Fiddlers, Su-11 Fishpot-Cs, Su-15 Flagons, Mach 2.5 plus MiG-25A Foxbats, and MiG-23 swing-wing Floggers. A follow-on aircraft to the Foxbat is expected to soon enter the PVO's inventory. Backing up the 2,600 PVO fighters are some 4,500 fighters of Frontal Aviation.

For the time being, PVO has no significant over-land, look-down radar systems comparable to USAF's new E-3A AWACS; the Moss early warning aircraft, a modified civilian Tu-114 airliner, does not appear capable of detecting and tracking low-flying bombers.

A vital, though little understood, element of nuclear strategy are passive defense measures that increase survivability. Dating back to World War II and even before, protection of the national and military leadership, the Party infrastructure, industry, and, to a lesser extent, the population has always been a high-priority concern of the Soviet Union. (*See February '77 issue, p. 53.*) Efforts to increase national survivability have accelerated markedly since about the time of the 1972 ABM Treaty. "They have built dozens of VIP shelters to protect thousands of bureaucrats and Party elite. They have built thousands of hardened military command posts, communications antennas, and associated control facilities—including systems to control the Soviet missile-firing submarines. They have built dozens of underground grain and petroleum storage bunkers. There are hundreds of hardened nuclear weapon storage sites and dozens of nuclear production facilities," according to Secretary Reed.

The FY '78 Defense Report assesses Soviet damage-limiting programs, especially civil defense, in conjunction with a Soviet first strike that "could conceivably eliminate most of the fixed US ICBM force, all of the non-alert bombers [and perhaps some of the alerts], and all of the SLBMs in port. Furthermore, their civil defense capabilities could enable them to protect key leaders, key facilities, and some of the population from a US counterstrike. They would also retain a large residual offensive capability that they could either withhold or use to attack US population and industry. It is at least conceivable that under these conditions, the US second-strike retaliatory forces would have a much lower damage expectancy. Soviet damage expectancy against the United States, by contrast, would remain almost constant." The Defense Report states "the available information suggests a strong Soviet interest in damage limitation."

The Military Posture Statement concludes that the Soviet "shelter program for urban areas appears to be designed for the protection of people deemed essential rather than for the general populace" and adds that the extent and effectiveness of the USSR's civil defense programs "are unknown to our intelligence community at this time."

The pace and scope of Russia's offensive and defensive strategic programs make it abundantly clear, according to the Defense Report, that the Soviets are not "interested in the more abstract and simplistic theories of deterrence but in developing their strategic nuclear posture into a serious war-fighting capability. Mutual assured destruction as a desirable and lasting basis for a stable strategic nuclear relationship between superpowers has never been accepted by the USSR. But Soviet political and military leaders probably regard it as reality that will remain operative at least over the next decade."

General-Purpose Forces

Conventional Balance

The Pentagon's new civilian leaders received on January 24 from the Senate's Armed Services Committee a sobering assessment of NATO, this nation's principal military commitment short of nuclear deterrence. Issued by Sen. Sam Nunn (D-Ga.) in cooperation with Sen. Dewey Bartlett (R-Okla.), the report on "NATO and the New Soviet Threat" says that because of NATO's failure to respond to the buildup and modernization of Warsaw Pact forces "the alliance will become increasingly impotent as a vehicle for the collective security of its members."

The Nunn-Bartlett report questions the central tenet of NATO's defense posture, the wisdom of first-use of theater nuclear weapons if everything else fails. "During the past several years the Soviets have expanded their theater nuclear forces in Europe to the point where they may now credibly deter a NATO first use of tactical nuclear weapons. The bulk of Soviet tactical nuclear weapons are more destructive and longer-ranged than NATO's. They could be used against most large European cities. Moreover, the Soviets have, to a much greater extent than NATO, organized and equipped their conventional forces to continue to operate and fight on a nuclear battlefield. In sharp contrast, the comparative short reach and low yield of most of

MiG-23 Flogger represents the new breed of offensive, long-range tactical fighter capable of delivering nuclear weapons.

NATO's tactical nuclear weapons would restrict their employment primarily to NATO territory, particularly if NATO conventional forces have been driven deep into the rear of Germany. As one knowledgeable German recently remarked, 'During the past eighteen months, NATO has played five war games, and my country has been defended five times and destroyed five times.' "

JCS Chairman Gen. George S. Brown's FY '78 Posture Statement says the USSR has "significant numbers" of nuclear-armed missiles and rockets—tactical, peripheral attack, and ICBMs—for launching an attack on the Eurasian continent that could provide "a significant reinforcement of their offensive operations in Europe." Also, the Soviets have continued "active training in nuclear delivery techniques with the tactical aircraft assigned to Frontal Aviation. The most frequently used aircraft on nuclear delivery training missions are MiG-21 Fishbed-Js, -Ks, and -Ls; Su-7 and Su-17 Fitters; MiG-23 Floggers; and various medium-range bombers. The Su-19/Fencer is expected to be an excellent aircraft for this type of mission," according to General Brown. The MiG-25 Foxbat-B appears capable of nuclear air-to-ground delivery also.

According to the Defense Report, "Out of the 4,400,000 people in their armed forces, the Soviets maintain a general-purpose capability of about 2,100,000 [not counting 450,000 border guards and internal security units of an essentially military character and some 6,800,000 Reservists with active duty during the past five years]. . . . Last year, the number of Soviet divisions was estimated to be 168. Now that total is believed to be over 170. Soviet Frontal Aviation remains at roughly the same size as last year, with about 4,600 tactical fighter and bomber aircraft. Most of the approximately 500 Badger/Blinder medium-range bombers could also be used for conventional operations. . . . Soviet strategic airlift has continued to expand steadily. . . . [They] can currently lift better than fifty percent more cargo to a range of 2,000 nautical miles" than a decade ago.

The Pentagon sees evidence of major adjustments in Soviet general-purpose force doctrine *vis-à-vis* NATO as well as China. In place of an exclusive orientation toward fighting a short war of rapid maneuver (blitzkrieg), the Soviets are developing the capabilities essential for sustained operations. This development pulls the rug out from under NATO's theory that if a Soviet attack could be held for a few days their forces would run out of supplies.

This change in doctrine is reflected also by the evolution of Soviet Frontal Aviation, according to the Defense Report: "Whereas a large number of the tactical aircraft are assigned to units with a primary mission of air defense, most of these, as well as the ground attack fighters and the tactical bombers, are suited and train for offensive operations. Increasingly, the force can deliver bomb tonnages as far west as the United Kingdom. The late-model Fishbeds, and new Fitters, Floggers, and Fencers—with substantially improved range, payload, avionics, and ECM capabilities—are adding to the flexibility, reach, and power of the force. . . . The Soviets give evidence of developing an offensive capability in the air which can complement the growing agility of their ground forces."

Not counting some 3,000 tactical training aircraft and the 2,600 fighters assigned to PVO, the Soviet Union's tactical aircraft inventory—fighter, attack, intermediate-range bomber, and reconnaissance aircraft —numbers slightly more than 5,000 aircraft, according to the Military Posture Statement. In addition, there are "several hundred" armed assault Hind helicopters.

The Soviets, General Brown asserts, are complementing their growing arsenal of modern, multimission tactical aircraft with "improved air-to-air missiles, a [new] family of tactical air-to-surface missiles, and bombs. The improved penetration capabilities of the new aircraft coupled with these weapons will greatly increase the potential effectiveness of each tactical air sortie." As a result, the Posture Statement suggests, the strategic bomber force of Soviet Long-Range Aviation, heretofore expected "to carry the main burden of an attack on Western Europe," can now be augmented by Frontal Aviation, "especially in escort and defense suppression roles."

The Statement stresses the importance of the Backfire bombers assigned to Long-Range and Naval Aviation by improving "the ability of these forces to survive NATO's air defenses, particularly at low altitudes. . . . When viewing the role of the Backfire in an attack on Western Europe, the Soviets are seen to be developing new alternatives in their ability to attack . . . with improved conventional munitions as well as with nuclear weapons."

The job of Soviet Frontal Aviation is aided significantly by massive mobile air defenses, which, according to General Brown, "provide improved low-altitude point and limited low-altitude area protection as well as comprehensive coverage at other operational altitudes. This organic ground force tactical air defense capability . . . will lessen Soviet dependence on aircraft for air defense and free some counterair fighters for other missions."

Land Warfare

It is in the area of land war, Dr. Currie's Report to Congress asserts, "that I am most immediately and urgently concerned. The Soviets have mounted a modernization program of unprecedented magnitude. In many cases they are widely deploying technology *now* for which we will not have roughly comparable counterparts until the early to mid-1980s. . . . Their new capabilities aggregate to a revolutionary change in land warfare."

Dr. Currie cited new attack/assault helicopters, infantry combat vehicles, self-propelled artillery, the new T-72 tank, mobile multiple rocket launchers, and long-standoff, precision-guided antitank weapons as typifying Soviet land warfare modernization. Striking technological progress is coupled to massive deployment. With the exception of helicopters, the Soviet Army weapons inventory and average annual production rates outnumber the US. Soviet artillery production is eight times that of the US, on top of an inventory lead that already is almost four to one.

The USSR's tank inventory of 45,000 is four and a half times that of the US; Soviet armored personnel carriers and fighting vehicles number between 45,000 and 55,000, while the US total is 22,000. In both instances, current production rates favor the Soviet Union, by a ratio of about six to one and three to one, respectively. The Soviet Union clearly leads in both offensive and defensive chemical warfare capabilities.

The Chinese Connection

Of the Red Army's 170-plus divisions, forty are deployed on the Sino-Soviet border. According to US government analysts, between ten and fifteen percent of the USSR's total defense budget goes to maintain military forces and capabilities directed against the People's Republic of China (PRC). The US defense effort and force levels are based on the assumption that the Sino-Soviet rift and the resultant drawdown of Soviet strategic and tactical forces will continue. But this assumption must be reexamined in the context of the political changes brought on by the death of Chairman Mao Tse-tung last year. The Soviet Union, by word and deed, gives evidence of seeking reconciliation and probably is working behind the scenes to turn the current power struggle among Mao's heirs to its advantage. Three distinct possibilities suggest themselves: Continuing confrontation; rapproachement of the Communist giants; political breakup of the PRC leading to factionalism typified by the "warlord" era of China's past.

From the US point of view, the second case clearly would be the "worst case," with Moscow and Peking making common cause militarily. If the third condition were to obtain, China would cease to be a military "threat" to the USSR, and additional Soviet forces could be assigned to the Warsaw Pact to further tilt the balance against NATO.

Outgoing Deputy Defense Secretary Robert Ellsworth, DoD's ranking intelligence executive, told AIR FORCE Magazine that evidence available to the US suggests the present internal turbulence and uncertainties are "far less" severe than during the so-called Cultural Revolution and, therefore, not likely to lead to disintergration of China's central power structure.

On the other hand, he said the new Chinese leadership appears to be "less ideological and more pragmatic" than Mao in terms of considering changes of China's relationship with the Soviet Union. Peking is not likely to seek reconciliation with the USSR unless this "becomes the thing to do" because of doubts about the "steadfastness and reliability of the United States" in the role of a world power and of a counterweight to the USSR.

China, he predicted, will make a critical assessment of the Carter Administration "in this regard very quickly, probably within 180 days." If Peking's reading of US policy causes a rapproachement with Moscow, the consequences to the military position of the US and NATO would be "very significant," Secretary Ellsworth predicted.

General Brown's Posture Statement concedes that the Soviet/Warsaw Pact forces "are the best equipped and prepared forces in the world to employ chemical weapons and to operate under chemical, biological, and radiological (CBR) warfare conditions." The Defense Report finds the Soviets "regard chemical capabilities as an integral part of their offensive war-fighting capability" and would readily employ these weapons if in so doing they could gain "a significant tactical advantage." A large, well-trained, and well-equipped CBR organization is organic to the Warsaw Pact force structure down to the regimental level. "A variety of delivery systems and chemical agents for use against any tactical target in the battle area is available to front commanders," according to General Brown. Increasing numbers of combat and combat-support vehicles with integrated CBR protection systems are appearing throughout the Warsaw Pact forces, according to the Military Posture Statement.

Maritime Threat

"The Soviet maritime threat constitutes a substantial and growing challenge to the United States and its free access to the seas," the FY '78 Defense Report asserts. No longer limited to coastal defense, the Soviet Navy is now a blue-water force that can project Russia's military might effectively and visibly on a global scale. The Soviet Navy has the world's largest and most versatile arsenal of naval guided missiles; 228 major surface combatants (including a new missile ASW carrier and twenty-one missile cruisers); the world's largest attack submarine force of 188 active submarines (thirty-six are nuclear powered); more than 600 patrol boats; and a competent shipbuilding industry with fifteen shipyards involved in production and overhaul.

According to CIA's January 1977 assessment, Soviet investment in general-purpose forces, defined as all ground, tactical air, naval, and mobility (airlift and sealift) forces, exceeded that of the United States by one-third during 1976.

Space and Technology

Space

There is consensus that the US enjoys a broad lead in space technology and the utilization of space for such critical support functions as early warning, command control and communications, pinpoint navigation, data relay, and near real-time target acquisition. But there are two exceptions. One involves the Soviet Union's deployment of nuclear-powered radar satellites used to maintain around-the-clock surveillance of the US Navy's carriers, presumably in hopes of rapidly neutralizing them in case of conflict. No such US satellites exist as yet.

The other Soviet space lead involves weapons. Because of this nation's far greater reliance on space systems, the Soviet push toward broad space warfare capabilities is of major importance.

General Brown reports in the Military Posture Statement that the "Soviet Union has continued to pursue extensive research and development and a renewed testing effort in space warfare as an integral element of

their military doctrine. In . . . space weapon capability, they are ahead and are likely to continue to lead for the next several years."

As military dependence on space grows, the Defense Report asserts, "the loss of key space systems could materially influence the outcome of future conflicts. . . . The resurgence of Soviet antisatellite test activity indicates that the Soviets have undertaken a broad-based program to develop the capability to interfere with the operation of our satellites at all altitudes."

The new budget request allocates more than $120 million to increase the US space defense capability and to "signal our commitment to protect US space-based assets and ensure the US has the capability to operate effectively in a hostile space environment." The importance of survival of early-warning satellites to this nation's fixed-based ICBM force is pervasive, a fact that presumably spurs the USSR's satellite killer (ASAT) program. Four ASAT tests took place last year.

Development of Soviet space war-fighting capabilities is all the more destabilizing because the USSR is less dependent on space-based military systems than is this country. Some important Soviet command control and communications (C^3) systems rely on or are backed up by sophisticated over-the-horizon communications technology involving the high-frequency (HF) bandwidth and thus avoid the intrinsic vulnerability of satellite communications networks. This Soviet approach is not without pitfalls, however. Communications of this type are susceptible to countermeasures. Secretary Ellsworth, therefore, recommends developing US countermeasures that could impair global Soviet naval operations in a major way.

—TASS PHOTO

Some 3,000 tactical trainers are in the inventory of the Soviet Air Forces. Shown here is the Yak-28U Maestro.

Technology

The Soviet leadership is committed to assuring "that the USSR triumphs over the US in the crucial struggle for military-technological supremacy." DDR&E's FY '78 Report states that the Soviets "appear to be sustaining the world's greatest effort in basic and applied science and have coupled that effort to the largest work force in military research and development. . . . We estimate that over the years 1970 to 1976, Soviet R&D scientific and engineering manpower increased from 600,000 to 830,000. . . . We have no direct knowledge of the fraction of the total Soviet R&D work force that is engaged in military work, but I believe that this portion must be greater than half. If this surmise is indeed valid, then the *addition* to the Soviet military R&D work force that has taken place in the 1970s is about equal to our total defense-supported R&D work force, and their total military R&D manpower is now three times ours."

The focus of Soviet military R&D is on the development of technological breakthroughs "which could shift the military balance in their favor," according to the Defense Report. Of particular concern in this regard, according to Dr. Currie, are intensive, high-risk efforts in the areas of:

- Ballistic missile and strategic air defense.
- Antisubmarine warfare.
- Directed energy weapons.
- Antisatellite warfare and the use of space in support of military forces.
- Electronic warfare.
- Long-range radar surveillance.

In his comments on directed energy weapons, Dr. Currie reported: "We know few technical details of the Soviet programs, but the scope and degree of commitment of their interests in these weapons of the future is quite large, as judged by their investments. . . . There was an increase in the size of Soviet facilities that we know to be engaged in high-energy laser R&D [and] there are indicators which point to Soviet interests in particle beam technology which may have advanced weapon applications."

This year's Defense Report culminates in a cautious prophecy of patterns the USSR can be expected to continue in the future.

They include:

"—strengthening its already formidable nuclear and conventional military forces:

"—seeking to expand its influence by manipulating local tensions and conflicts, particularly in the Third World;

"—offering political support and various forms of military assistance to exploit opportunities to divide the Western alliance system;

"—seeking to neutralize Western military advantages in areas in which Soviet and Western policies are in contest;

"—pursuing arms control initiatives that will enhance their security, support their military and political objectives, and stabilize the military balance at levels favorable to the USSR."

Secretary Rumsfeld suggested an antidote that Moscow should heed: "We will not be outmaneuvered; we will not be outlasted; we will not be intimidated."■

In the Soviet view, war is not only thinkable but fightable and winnable. This thought underlies the basics of . . .

Soviet Military Doctrine

BY LEON GOURÉ

IN A PRESS conference on September 27, 1976, then US Secretary of Defense Donald Rumsfeld remarked that "a reasonable person" looking at the Soviet missile buildup and civil-defense program would have to come to the conclusion that the Soviet Union "is clearly striving to not be on the losing side" in the event of a war with the US. Soviet spokesmen put their intentions more positively. They assert that one of the "main directions" in Soviet military development is the "elaboration of a military doctrine expressing the state's official views on the nature of a potential war and the conditions and means of ensuring victory" in any war, including an all-out nuclear conflict. Indeed, according to the former USSR Minister of Defense and Politburo member Marshal of the Soviet Union A. A. Grechko, "The fundamental importance of the military content of Soviet military doctrine consists in ensuring the complete defeat of any aggressor. . . ."

The New World Order

Soviet military doctrine is based on the fundamental premise that the interests and objectives of the two opposing systems—the Communist and the Capitalist—must remain "irreconcilable." By virtue of the "laws of class struggles," they are locked in an unrelenting and unavoidable "savage" rivalry as the new world order, led by the Soviet Union, seeks to replace the old, led by the US.

In line with this "very acute struggle" of the two opposing systems, the Soviet Union considers it a "sacred duty" to support the global revolutionary and national-liberation process and "the just liberation wars against imperialism," while shielding these movements from Western military intervention. Their support has been described by Politburo member M. A. Suslov as "one of the paramount principles of Soviet foreign policy," and is said to be "one of the most important manifestations of the external function" of the Soviet Armed Forces.

Although the détente, which the West is said to have been "forced" to accept as a consequence of the growth of Soviet military might, reduces somewhat the danger that the "inevitable social changes" in favor of communism in the free world will result in a war between the superpowers, it is, nevertheless, expected that the West will resist Communist encroachments. Consequently, the Soviet line is that "the threat of war will remain so long as imperialism exists." Thus, even while taking credit for the successes of the Soviet "peaceful coexistence" policy, Communist Party Secretary L. I. Brezhnev warns that it is realistic to expect that "wars and acute international crises are far from being a matter of the past," and that "it would be extremely dangerous" if the public came to believe that the "threat of war has become illusory." The Soviets insist that modern war, for all its potential destructiveness, remains, nonetheless, an essential instrument by which a state can achieve its class aims. War, therefore, is "thinkable."

Soviet View of Mutual Assured Destruction

In the pursuit of its global objectives and in efforts to shift the "correlation of world forces" in its favor, the Soviet Union takes the position that its security and foreign-policy interests cannot be met by a balance of power or nuclear parity with the US. Such a balance, Soviet spokesmen argue, is not only inherently unstable for political and technological reasons, but, above all, it is intended to paralyze Moscow's ability to support global revolutionary and national-liberation struggles and to "maintain and strengthen reactionary regimes." Furthermore, deterrence based on mutual assured destruction lacks credibility and political utility because "no strategy that is in any way reasonable can set as its objective the crushing of an opponent at the cost of one's own destruction." Thus, the Soviet leadership believes it will be able to pursue its global objectives with minimum risks when the US is "compelled" to reckon with Soviet military might and the "possible consequences of a missile-nuclear war" for US survival.

The logical conclusion the Soviet Union draws from these premises is that it requires not only a highly credible deterrent, but a capability to successfully wage war at any level in the event deterrence fails due to miscalculations or irrational Western responses to Soviet challenges. Rather than distinguish between these two requirements, the Soviet position is that an effective war-fighting, war-survival, and war-winning capability also provides the most credible form of deterrence. It is asserted that the level of Soviet military power

must be such that any potential aggressor realizes in advance "the failure of his political and military aims in the military action" he is contemplating, and, if war breaks out, Soviet capability "to decisively crush any aggressor."

This means, first of all, that the Soviet Union should seek to attain military superiority over its prospective opponents. This superiority is needed not only because Soviet foreign-policy successes are said to be "impossible" without the "continuous strengthening" of Soviet military power, but also because, as Marshal Grechko pointed out, "the greater the combat ability of the armed forces of our country, the more powerfully they are equipped, the better the personnel are trained, the more peace there will be on earth."

In other words, military superiority is the best and most desirable precondition for the attainment of Soviet foreign-policy objectives without war with the West. Consequently, it is claimed that "the military-technological policy of the CPSU [Communist Party of the Soviet Union] is directed toward creating and maintaining superiority of the socialist countries" over the West, and that the ongoing growth of Soviet industry and its qualitative improvements "will allow the Soviet Union to systematically strengthen its defense capability" even further, while "reducing to naught" US attempts to favorably change the "correlation of world forces."

According to the Soviet view, even though the US is now restrained by the awareness of its vulnerability to Soviet nuclear strikes, an unexpected war is still possible. Therefore, the Soviet Armed Forces and the country as a whole must be in a constant state of high combat readiness "to deal a crushing rebuff to any aggressor and to defeat him at any moment." The requirement for waging war at any time serves to justify Soviet concern for quantitative weapons superiority because, the Soviets argue, the experience of World War II proved that failure to deploy enough types of critical weapon systems while waiting for more advanced models can have very adverse consequences at the outbreak of a war.

Victory in Nuclear War

Of particular significance for Soviet military doctrine is the concept of ensuring victory in any war. The Soviets accuse the West of denying the feasibility of victory in a nuclear war, and view it as "profoundly erroneous and harmful." It is tantamount to denying the correlation between politics and war, and that wars are determined by their political aims, irrespective of the weapons employed. Nuclear weapons, they contend, enhance the role of policy because they are an "immeasurably more effective means of struggle" at the disposal of state policies. Thus, the Western views on nuclear wars and the impossibility of victory in them are said to be intended to paralyze the revolutionary process and deny the role of force in it.

More importantly, achieving victory must be a concomitant part of a war-fighting doctrine and capability, and provides the Soviet rationale for more than a mere deterrence posture. Furthermore, as was noted earlier, the Soviet view holds that a no-win deterrence capability

Dr. Leon Gouré is Director of Soviet Studies at the Center for Advanced International Studies of the University of Miami. From 1951 to 1969, he was Senior Staff Member of the Social Science Division of the Rand Corp. During World War II, Dr. Gouré was a special agent in the Counterintelligence Corps. He is the author of many articles and books on Soviet foreign policy and military affairs. His most recent book (see September issue, p. 90) *is* War Survival in Soviet Strategy: USSR Civil Defense.

---

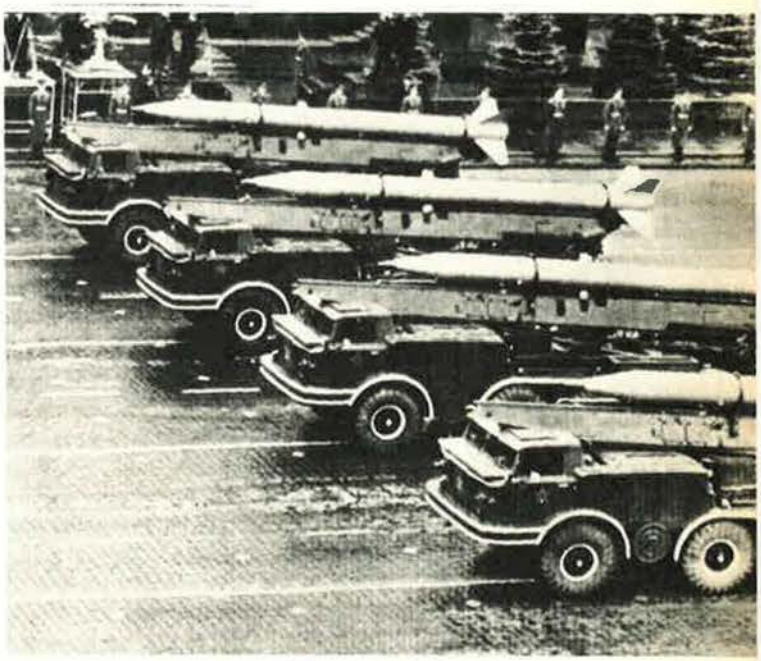
is neither credible nor stable, or politically useful, because, short of a direct attack on its territory, no country can rationally or credibly threaten another with war at the risk of its own assured destruction. The consequence of such a US deterrence doctrine and posture, Soviet spokesmen claim, is that the US is unable to use its "huge military potential" to attain its "military-strategic or political goals, whether regional or global, as this holds out the threat of its own destruction." By contrast, Moscow asserts that its armed forces are and will continue to be "an effective factor promoting the development of progressive social processes" around the world.

Categories of War

Officially, the Soviets recognize two categories of war: local and global. Local wars are waged within a limited territory by a limited number of participants, and with limited forces or means. Such wars may be fought with conventional forces only, or may escalate into nuclear conflicts. Soviet spokesmen warn, however, that resort to theater nuclear weapons greatly increases the likelihood of further escalation into global nuclear conflict, especially if the superpowers are involved. Of course, a major purpose of such Soviet warnings is to deter US intervention in local conflicts and "civil wars between antagonistic classes."

A world war can begin with the use of conventional forces or the escalation of a local war, or it may be initiated by a nuclear surprise attack by one superpower on the other. Soviet military doctrine devotes particular attention to warfare at any level and ascribes to it certain characteristics: It will be a "decisive" collision of the two opposing blocs and have an unlimited character since the war aims of each side will be the "total defeat" of the other. It will be a conflict of two coalitions and will be waged on a global scale. No matter how the war begins, it will be waged with the "main means of armed struggle"—nuclear missiles—although some combat operations may be conducted with conventional weapons. Even though it will be possible at the outset of the war to destroy "important objectives and entire regions of the warring sides by direct strikes with nuclear means," the war, nonetheless, may become protracted, and eventually require the combined efforts of all branches and services of the armed forces to achieve final victory.

Given the scope and destructiveness of such a war, victory will be impossible without the reliable protection of the country and its economy, and the political and psychological preparation of the armed forces and of the entire population so they retain the will to fight and



The Soviet Union continues to systematically strengthen its ocean-going and theater war-making capabilities. Above, a Kashin-class guided missile destroyer. Right, forty-five-mile-range, surface-to-surface Frog-7 missiles that equip most Warsaw Pact nations are paraded through Red Square.

win under the most difficult circumstances. Finally, a future war will impose new demands on troop initiative and command and control because of the dynamic and fluid nature of military operations.

First Strike Paramount

Soviet military doctrine emphasizes the primacy of the offensive and enhanced importance of surprise in any future war. Only an unrelenting offensive, including nuclear strikes, can achieve the complete defeat of the enemy in a short time and the occupation of his vital territories. Nuclear missiles, Marshal Grechko pointed out, are especially suited to a surprise attack, which can place the opponent in a difficult and unequal position, and radically alter the correlation of forces in favor of the attacker.

In the Soviet view—all other factors being equal—surprise, whether strategic or tactical, is the *sine qua non* of military success. Because of the grave consequences of a surprise attack and the Soviet Union's experience with it in World War II, Soviet spokesmen never tire of repeating that it is strategically wrong to allow the enemy to deliver the first strike on one's own territory. The Soviet Union must always be ready to "thwart" such an attack by a preemptive strike of its own. The Soviet Union must always be in full readiness to "foil [the enemy's] criminal intentions at their inception."

In considering the requirements for fighting and winning an all-out nuclear conflict, Soviet leadership has developed a logical and comprehensive doctrine and posture. "Victory" in an intercontinental nuclear war is defined as the survival of the Soviet Union as a nation, with superior military and economic power to ensure a faster rate of recuperation and the ability to impose its will on the US.

In order to satisfy this objective, Soviet military doctrine envisages a strategic package consisting of a superior first-strike counterforce capability and effective active and passive defenses to deal with the retaliatory attacks of the enemy's surviving strategic forces. For this reason, the Air Defense Forces and the USSR Civil Defense are considered to be integral parts of the overall Soviet strategic and war-fighting postures. They are said to be factors of "great strategic significance in assuring the viability of the state," and its ability to achieve ultimate victory. For example, the Soviet view of the relationship between strategic offensive and defensive systems was expressed in 1974 by Colonel General A. T. Altunin, the USSR Chief of Civil Defense

and a Deputy Minister of Defense: "While the Armed Forces take as their objective to prevent the use of destructive means against the rear of the country by the destruction of the attack weapons or the interception of the weapons on their way to their targets, Civil Defense, by carrying out protective measures and the thorough preparation of the population, seeks to achieve the maximum weakening of the destructive effects of modern weapons."

Counterforce a Basic Concept

Counterforce, in Soviet military doctrine, is a basic concept in planning strategic and theater operations. According to Marshal Grechko, the Soviet Strategic Missile Forces "are intended for the destruction of the enemy's means of nuclear attack, his large troop formations and military bases," destroying his defense industry, disorganizing his governmental and military command and control, and paralyzing the operations of his economy and transportation. Strikes by the Strategic Missile Forces will be reinforced by SLBMs from Soviet missile-carrying submarines. At sea, the Soviet Navy will try similarly to preempt enemy strategic attacks by attempting to destroy hostile missile-carrying submarines and aircraft carriers. The Soviet Navy must be prepared, as its Commander in Chief, Fleet Admiral S. G. Gorshkov, and other Soviet naval leaders have emphasized, to "decisively cut off aggression from the sea," and thereby "significantly" weaken the "enemy's nuclear strikes upon the territory of the Soviet Union."

Soviet doctrine also calls for preemptive strikes on enemy nuclear weapons and their means of delivery in the theater, as well as on large troop concentrations and surface fleets in order to facilitate the breaching and overrunning of the enemy's ground defenses. As a rule, nuclear weapons are described as constituting the "main firepower" of the Soviet Ground Forces. It is acknowledged that the success of these various operations will depend in a large measure on timely reconnaissance and surveillance of enemy forces, while denying such information to the opponent, and on an effective capability to conduct electronic warfare.

Soviet military doctrine is less explicit concerning conventional war. Here, too, however, the emphasis is on surprise, rapid concentration of superior forces, and dynamic and relentless offensive operations. Their doctrine stresses night assaults; massed air and artillery strikes to breach the enemy's defenses, allowing exploitation by armored forces; extensive use of air assault and airborne forces in the enemy's rear; and destruction of his airpower, artillery, troop concentrations, airfields, ports, transportation systems, and so on.

Employment of Airpower

Airpower plays an important role in both conventional and nuclear doctrine. Soviet strategic and naval long-range aviation, armed with air-to-surface missiles, will deliver strikes on ground targets in the enemy's country and on his ships at sea and in port. Naval aviation will play a major role in locating and attacking enemy missile-carrying ships and aircraft carriers, interdicting sea lanes, and providing support and protection for antisubmarine warfare operations. In the theater, attention is devoted to "sudden massive air strikes" by Frontal Aviation at the war's beginning to inflict "decisive damage" on the opponent as well as to provide effective support and cover for advancing ground forces. Soviet spokemen also note the growing role of helicopters in air assault operations and as gunships.

In contrast to the US, the Soviets emphasize the role of fighter aircraft in defense against the US bomber and fighter-bomber threat. The Air Defense Forces are said to be constantly developing new means and methods to defeat not only the existing, but the "prospective" enemy air attack capabilities, including cruise missiles. Although restricted by the Antiballistic Missile (ABM) Treaty with the US, the logic of Soviet military doctrine should be expected to promote continuing Soviet interest in an effective ABM capability.

Soviet planners claim to take into account what they describe as this country's greater vulnerability to attack as compared with the USSR. US vulnerability is a result of the concentration of population and industry in a few regions, which is said to make strikes by high-yield nuclear weapons especially effective; the absence of significant US civil-defense measures; and US dependence on overseas sources of strategic materials.

Technological Surprise

While claiming some degree of military superiority over the West, Soviet military leaders recognize that the USSR is now in a qualitative arms competition with the US. They express concern over the rapid obsolescence of their weapon systems and the possibility that the US may attempt to achieve qualitative arms superiority, thereby becoming less deterred by Soviet military power. At the same time, they assert that the Soviet Union is preparing for a "qualitative leap ahead" in weapons development. Frequently discussed are the advantages of "technological surprise" against which "no countermeasure can be created in advance."

Meanwhile, the massive Soviet military R&D program and the improvements in Soviet industrial-technological capabilities are said to create the "necessary prerequisites" for further strengthening Soviet military might. Particular mention is made of improvements in the "technical qualities," flexibility, and accuracy of missiles; strike capabilities of strategic and tactical aviation; and effectiveness of the Air Defense Forces, antisubmarine warfare, and civil defense. Emphasized above all are advances in command control and communication, the integration of combined arms combat capability, and combat readiness.

"Our achievements in all fields of military construction," states the May 1976 issue of the main party-military journal, *Communist of the Armed Forces,* "must be considered merely as a preliminary step in the further upgrading of the combat might of the Armed Forces." The Soviet leadership remains clearly committed to its goal of achieving superior military power and a credible war-fighting capability. ■

DEPARTMENT OF THE INFERIOR...

The MiG-25 Foxbat, flying at three times the speed of sound above 80,000 feet, represents a serious potential threat to the sovereignty of friendly airspace.

There is one proven way to beat it!

The F-14 Tomcat/Phoenix missile combination is the only consistently successful counter to this type adversary.

F-14/Phoenix... First in Air Superiority
(where second-best is last)

GRUMMAN AEROSPACE CORPORATION
BETHPAGE, NEW YORK 11714

The command structure of Soviet Armed Forces knits military and political leadership into a seamless fabric. The differences between US and Soviet military organization at the top level, and the implications of Soviet centralization of authority, need to be understood by US policy-makers.

The Soviet High Command

BY HARRIET FAST SCOTT

LAST year, for the first time in a decade, momentous changes were made in the Soviet high command. These changes will have far-reaching implications for the new US Administration as it prepares for SALT II and Mutual Balanced Force Reduction negotiations and for other defense-related agreements the West may hope to negotiate with the Soviet Union.

On May 7, 1976, Leonid Il'ich Brezhnev, seventy-year-old General Secretary of the Communist Party of the USSR, was promoted to Marshal of the Soviet Union. This was the first promotion to five-star rank since 1968. The announcement referred to Brezhnev as also being Chairman of the Council of Defense. Just ten days earlier, Dmitriy Fedorovich Ustinov, sixty-eight, the Soviet arms production genius of World War II, had been designated Minister of Defense, succeeding the late Marshal A. A. Grechko. Ustinov, newly promoted to General of the Army in April 1976, was again promoted in July to Marshal of the Soviet Union, the same rank as Brezhnev.

Nearly twenty years earlier, in October 1957, Brezhnev and Ustinov had stood side by side in an underground command post as Sputnik-1 was launched. Both had been assigned by the Central Committee of the Communist Party to work on the Soviet missile and space program, using all available means to ensure Soviet success. Their rank of Marshal of the Soviet Union has been well earned.

The promotions of Comrades Brezhnev and Ustinov, combined with references to the Council of Defense—a body heretofore kept secret—have aroused considerable interest in the West about the nature of the Soviet high command. Attention again was focused on this structure on January 8, 1977, when four-star General of the Army V. G. Kulikov, fifty-five, was moved up from his position as Chief of the General Staff to the number two position in the Ministry of Defense—Commander in Chief of the Warsaw Pact Forces—replacing the late Marshal I. I. Yakubovskiy.

The important Chief of the General Staff position was given to General of the Army N. V. Ogarkov, fifty-nine, the extremely successful Soviet negotiator during SALT I. A week later, on January 15, 1977, both Kulikov and Ogarkov became Marshals of the Soviet Union. Kulikov and Ogarkov graduated in the same class, 1959, from the Academy of the General Staff while it was under the wing of Marshal V. D. Sokolovskiy. While they were students, the Academy was involved in what the Soviets now call the "revolution in military affairs," which culminated in the adoption of a new military doctrine in 1960.

Much is written in the United States about deterrent concepts of mutual assured destruction and selected nuclear options, and about arms control, and related subjects. The utility or disutility of these concepts is directly related to probable Soviet reactions, which must be understood and analyzed. That requires detailed knowledge of Soviet decision-making bodies, both in peace and in war. There also must be an understanding of how the military command and control system actually works. Studying the Soviet high command is one key to this understanding.

The Soviet high command today consists primarily of three bodies: The Council of Defense, the Main Military Council, and the General Staff. Attached to them are such other agencies as the Military Industrial Commission and the General Staff's Scientific-Technical Committee. The three main bodies, starting with the Council of Defense, have virtually complete control over the military-economic direction of the Soviet state. They are not constrained by the division of power that exists in the United States. Establishment of these component parts of the high command or of their forerunners took place almost with the October Revolution of 1917. During the Great Patriotic War, as the Soviets call World War II, they proved their worth. How the Soviet high command operates in peacetime, and how it would operate in war is conditioned by more than sixty years of development.

The Council of Defense *(Sovyet oborony)*

The origin of Brezhnev's Council of Defense can be traced to Lenin's Civil War Council of Workers' and Peasants' Defense. Later, when soldiers were put to work in factories and fields during a lull in the fight-

Leonid I. Brezhnev, General Secretary of the Communist Party and Marshal of the Soviet Union, chairs the Council of Defense.

Defense Minister and Marshal of the Soviet Union Ustinov.

Marshal V. G. Kulikov, CINC of Warsaw Pact Forces.

ing, the council took the name Council of Labor and Defense *(Sovyet truda i oborony)* sometimes called STO. After the Civil War, STO remained the highest military-economic planning agency of the government.

In 1932, a Defense Commission was given the task of examining matters that needed to be brought to the attention of STO. The Defense Commission soon became the action agency and STO a rubber stamp. The 1937–38 purges of the military, Soviet participation in the Spanish Civil War and in China, coupled with Hitler's rise to power, necessitated further centralization of power. In 1937, STO was abolished and the Defense Commission made a full-fledged Committee of Defense. Shortly after war broke out, it was transformed into the State Committee of Defense, known as GKO *(Gosudarstvenyy komitet oborony).*

Beginning in February 1973, a series of articles about the work of GKO during the Second World War was published in *Red Star,* the Ministry of Defense's daily newspaper. Seldom does anything appear in the Soviet press without purpose. The series, which ran until May 1975, paved the way for public disclosure of the existence of the Council of Defense, announced the following year.

The Council of Defense examines the preparation of the country, the economy, and the people for war. It ensures that plans are in being for mobilizing industry, transport, and manpower for the possibility of war at various levels of intensity. It has the power to form new or abolish old military districts. The Council examines proposals, makes judgments, and issues decrees that have the effect of law.

In time of war, the peacetime Council of Defense would be transformed into a new GKO, as explained obliquely in Marshal Sokolovskiy's book, *Military Strategy:*

"All leadership of the country and the Armed Forces during wartime will be accomplished by the Central Committee of the Communist Party of the Soviet Union *with the possible organization of a higher agency of leadership* of the country and the Armed Forces. This higher agency of leadership may be given the same powers as the State Committee of Defense (GKO) during the Great Patriotic War." (Emphasis added.)

Probable members of the Council of Defense are L. I. Brezhnev (Chairman), N. V. Podgornyy, A. N. Kosygin, A. P. Kirilenko, M. A. Suslov, and D. F. Ustinov, all Politburo members. Other Party and military heads may be called to attend meetings, depending upon the matters to be discussed. Among them might be General of the Army Yu. V. Andropov, Chairman of the KGB; and General of the Army N. A. Shchelokov, Minister of Internal Affairs (MVD).

In 1938, the Military Industrial Commission was attached to the Committee of Defense, and appears still to be a working agency. Its task is to ensure fulfillment by both defense and nondefense industrial ministries of plans for production and delivery of arms.

The Main Military Council *(Glavnyy voyennyy sovyet)*

Strategic direction and leadership of the Soviet Armed Forces in time of peace is the task of the Main Military Council, which is immediately subordinate to the Council of Defense. It probably is chaired by Minister of Defense Marshal Ustinov. Marshal Brezhnev, as Chairman of the Council of Defense, is assumed to be a member, as are the three "first deputy" Ministers of Defense—Commander in Chief of the Warsaw Pact Forces Marshal Kulikov; Chief of the General Staff Marshal Ogarkov; and General of the Army S. L. Sokolov, whose

Harriet Fast Scott lived in the USSR for four years while her husband, Col. William F. Scott, was US air attaché in Moscow. She has traveled extensively in Russia during the past five years. Mrs. Scott has written several books and many articles on the Soviet Armed Forces and civil defense, lectures frequently on those subjects, and is a Washington-based consultant to several research institutions and Adjunct Professor, University of Miami.

---

exact responsibilities are not known. The Main Military Council membership probably also includes the Chief of the Main Political Administration, commanders in chief of the five services, and the chiefs of the Rear Services and Civil Defense *(see chart, p. 105)*.

In wartime, the Main Military Council would become Headquarters of the Supreme High Command, or Stavka as it was called in World War II. According to both *Military Strategy* and *The Officer's Manual*, Stavka would operate in a future war much as it did in the past. This arrangement permits a degree of centralization of command and control that would be impossible in the West. Since references both to the Main Military Council and to Stavka are extremely rare, it helps to examine their origins and past functions.

A Higher Military Council *(Vysshiy voyennyy sovyet)* was established and chaired by Leon Trotskiy in 1918. As the Civil War increased in intensity, the military councils in the field began to call themselves "revolutionary military councils." By the end of the summer of 1918, the Higher Military Council was replaced by the Revolutionary Military Council of the Republic (*Revvoyensovyet* of the Republic). It was directly subordinate to Lenin's Council of Defense. After the Civil War, the Revvoyensovyet was influential in expanding the Red Army and attempting to achieve superiority over any probable enemy in the decisive weapon systems of the time—aviation, artillery, and tanks.

By 1934, the Revvoyensovyet was duplicating much of the work of the Commission of Defense, and was abolished. The Military Council of the People's Commissariat of Defense was established in its place, but with only an advisory role. In 1938, the Military Council was split into the Main Military Council of the Red Army and the Main Military Council of the Red Navy to match the corresponding division in the Commissariat of Defense.

No plans for a high command had been tested when Hitler attacked. The day after the invasion, the two Main Military Councils were combined into Stavka of the High Command, chaired by Defense Commissar Marshal Timoshenko. Stalin, Molotov, Budennyy, Voroshilov, Zhukov, and Kuznetsov were Stavka members. Stalin soon was designated chairman of the State Committee of Defense (GKO), chairman of Stavka, Commissar of Defense, and, in August 1941, Supreme Commander in Chief of the Armed Forces. Thus, power was completely centralized in the hands of one man. Through Stavka, Stalin ran the war from the Kremlin.

Judging from the few references made to this organization in recent years, a new Stavka would immediately take over the direction of any future war. Its method of command and control would be much different from that found in NATO forces.

In wartime, Stavka would have only six to eight members, probably the Party's General Secretary, one other Politburo Member, the Minister of Defense, the First Deputy Ministers of Defense, and the Chief of the Main Political Administration. There also would be a board of permanent advisers consisting of commanders in chief of the services, other deputy ministers of defense, and chiefs of service branches. As before, the General Staff would be the executive agency for Stavka.

Because the same person might head both bodies, it is difficult to keep separate the responsibilities of Stavka and GKO. GKO, as the higher agency and the wartime equivalent of the Council of Defense, would direct the actions of all government agencies toward winning the war. It would put the economy on a war footing, mobilize the population for the needs of the Armed Forces and industry, and prepare reserves and cadres. GKO would prescribe the military-political tasks that would then be carried out by Stavka, in accordance with the Clausewitz formula adopted by Lenin that "war is the continuation of politics by other (that is, violent) means." GKO would exercise strategic leadership of the Armed Forces through Stavka, which would handle day-to-day military matters. For extremely important decisions, the Politburo, GKO, and Stavka would jointly agree on what was to be done.

The General Staff *(General'nyy shtab)*

There is no equivalent of the Soviet General Staff in the United States Armed Forces. The Soviet staff concept is so radically different from the US Office of the Secretary of Defense and the Joint Chiefs of Staff that its impact on the Soviet Armed Forces is difficult to grasp. Many Western attempts to study the Soviet high command, especially its command and control procedures, have failed to understand the Soviet General Staff structure.

The Soviets rarely reveal anything of consequence about the organization of the General Staff, its personnel, and functions. Only in the last ten years have writings described its activities during World War II. By piecing bits of information together, however, the general nature of its activity can be described in fairly accurate form.

The nearest equivalent of the Soviet General Staff is the pre-World War II German General Staff, with some carry-over from the Imperial Russian General Staff of the early 1900s. Soviet officers who secretly attended courses in Germany in the 1920s were evidently impressed by the German approach to staff work. In 1935, some of these methods were copied when the Staff of the Red Army became the General Staff of the Red Army.

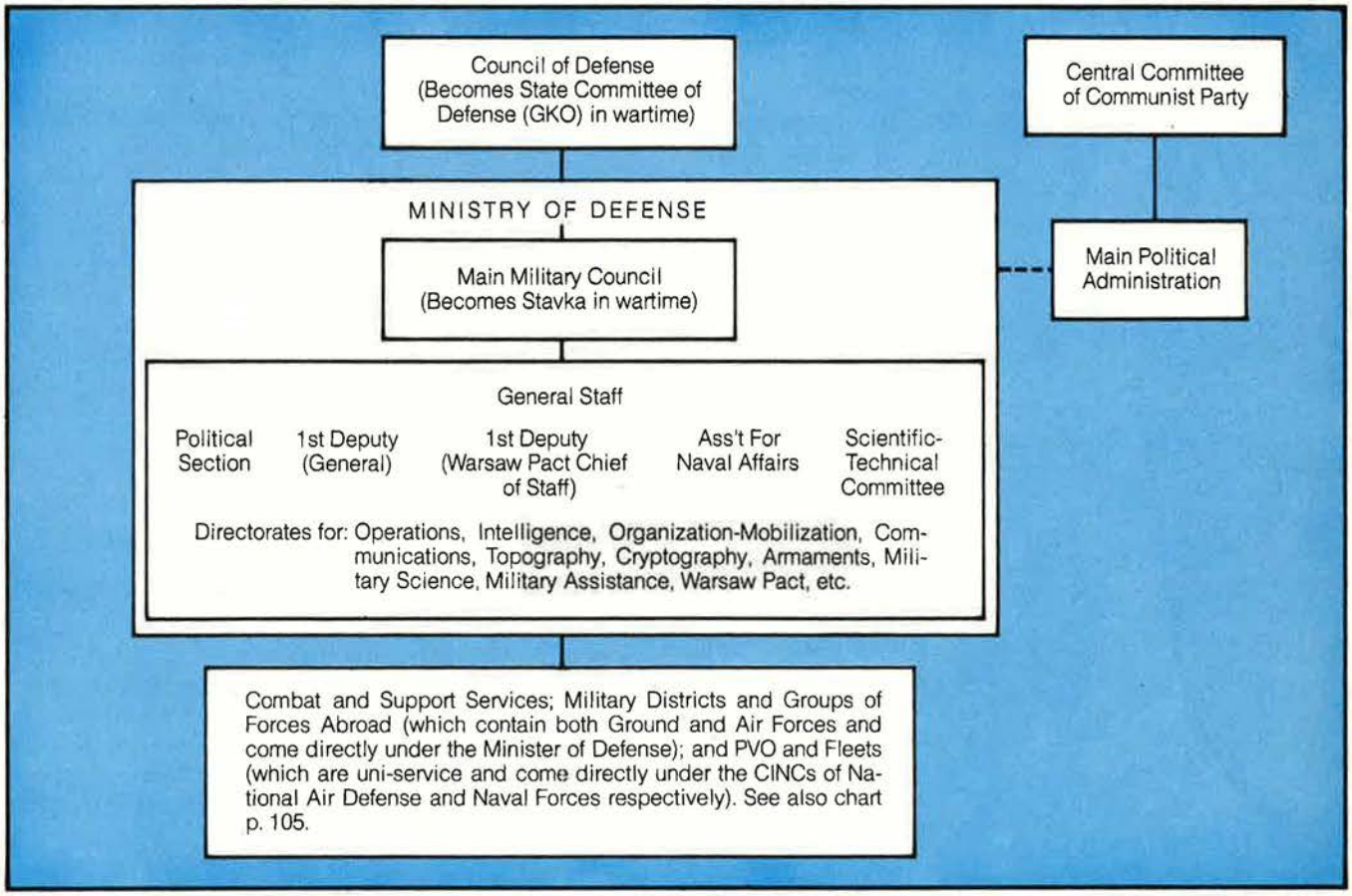
Immediately subordinate to the Main Military Council (which would become Stavka in time of war), the Soviet General Staff is the largest of the three primary bodies of the Soviet high command. It is a major link in the extreme centralization of authority that is gener-

ally characteristic of all activity in the Soviet Union.

Although the General Staff consists of officers from various services and branches, these officers do not represent service interests. The General Staff is not in competition with the staffs of the five Soviet services, attempting to allocate roles and missions among them.

Most positions on the General Staff are filled only by graduates of military academies. Key positions are held by those who have completed the two-year Academy of the General Staff, the highest Soviet professional military school, and, in fact, the General Staff's Academy. A number of senior positions on the staff are filled by men who may serve a decade or two in their assignments.

The Soviets have never revealed the organization of their General Staff any more than they have their actual defense expenditures or the size of their Armed Forces. The following chart, however, is believed to cover the current General Staff functions:



A major task of the General Staff is to ensure "the coordinated actions of the main staffs of the services of the Armed Forces, the staff of the Rear Services, the staff of Civil Defense USSR, the main and central administrations of the Ministry of Defense, the staffs of military districts, groups abroad, air defense districts and fleets." This statement was published in the USSR in December 1976. The General Staff responsibility for Civil Defense USSR includes both military and civilian war-survival functions.

The Soviet General Staff in peacetime has functions that are much broader than those assigned to the US Joint Staff. In addition to those mentioned above, "The General Staff thoroughly analyzes and evaluates military-political conditions which are taking shape, determines the tendencies of development of the means of waging war, the methods of their use, organizes the training of the Armed Forces, and carries out the necessary measures for assuring their high combat readiness to repulse any possible aggression."

Tasks listed above would encompass many of the functions of both the Office of the Secretary of Defense and the Joint Staff, some of the work of the National Security Council, plus a great many of the activities of the Departments of the Army, Navy, and Air Force. Responsibilities of the Soviet General Staff go even further. "An important place in the activity of the General Staff is occupied with the further development of military theory. It directs military scientific work, produces the most important regulations, researches actual problems of Soviet military science, introduces its achievements into the practice of operational and combat training of troops and staffs."

The concept of military theory, as developed in the Soviet General Staff, is almost unknown in the United States Armed Forces. The General Staff is responsible for developing a unified military strategy, which applies to all of the Soviet services. Military strategy is based on military doctrine, which is the "military policy of the Communist Party of the Soviet Union, accepted by the state and the Armed Forces as doctrine." Doctrine provides the guidelines; strategy ensures that the guidelines are implemented. It was natural

that a former Chief of the General Staff, the late Marshal V. D. Sokolovskiy, was charged with producing the book *Military Strategy.* To ensure that day-to-day questions of military theory are understood by all officers, the General Staff publishes its own monthly journal, *Military Thought.*

There is yet another function of the General Staff that demands close study. "For the work of the General Staff, characteristic is the combination of growing centralization of direction, a high degree of readiness necessary for the rapid switchover to fulfilling the functions of wartime. . . . The broad introduction into the work of the General Staff . . . of automatic systems of direction of weapons and troops permits the more operational solution of the complicated tasks of directing the Armed Forces in peace and in war." What will automation mean, and why this attention?

According to Soviet spokesmen, including the late Marshals Malinovskiy and Grechko, the introduction of nuclear weapons brought about a "revolution in military affairs." First was the bomb, then the long-range rocket, and finally the guidance mechanism. Today, the last stage of the revolution in military affairs, sometimes called the cybernetics revolution, continues.

Cybernetics, the science of controlling complex processes and operations in machines, living organisms, and society as a whole, is being used by the General Staff. In theory, cybernetics should make it possible to automate information processing and accounting, staff and command planning. With the help of cybernetics, it is theoretically possible to set up a single automated system able to control all links from individual aircraft, tanks, submarines, launching sites, and combined arms subunits, to the General Staff at the other extreme.

Within recent years, the Soviet military press has published dozens of books and articles on the use of computers in military decision-making. A 1972 book, one of the "Officer's Library" series, entitled *Concept, Algorithm, Decision,* describes the use of computers in military decision-making and control. An introduction to the book was written by General S. M. Shtemenko, the late Chief of Staff of the Warsaw Pact Forces and First Deputy Chief of the General Staff. He noted that "the time has arrived for extensive adoption of automation in the entire chain of command." (A USAF translation of the book has been published by the US Government Printing Office, Washington, D. C. 20402. 296 pages. $2.80.)

The primary author of the book, General Colonel V. V. Druzhinin, is a deputy chief of the General Staff, heading the Armaments Directorate. The massive Soviet effort to import Western computer technology is in part a reflection of the General Staff's drive for "growing centralization of direction."

Marshal Ogarkov, the new Chief of the General Staff, is certain to continue the third phase of the revolution in military affairs. In 1966, when he commanded the Volga Military District, *Red Star* reported that the district hosted a conference at which he was a major speaker on "the growing role of scientific troop control in nuclear war." Now, ten years later, Ogarkov is in the best possible position to implement his ideas.

* * *

The Soviet high command represents one of the most experienced bodies of political-military leadership the world has ever seen. Although recent changes have taken place among the members of Moscow's power elite, none of the faces is new. All have proven themselves over the course of many years in positions of great responsibility.

The Carter Administration in Washington will be confronted by many thorny problems involving relations with the USSR. Success or failure in some may well be determined by how well the Administration understands the Soviet high command and its goals. ■

AIR FORCE Makes It in Moscow

Tho following is an excerpt from an article, "Who Needs the Provocative Hullabaloo?" by Col. V. Petrov, which appeared in the January 21, 1977, issue of *Red Star,* the newspaper of the Soviet Ministry of Defense. It is the most recent of many references to AIR FORCE Magazine and to our contributors appearing in Soviet publications. Colonel Petrov's comments are of particular interest since he singles out for censure two contributors to this issue of the magazine.

"Representatives of American military circles are arbitrarily affirming that the measures of the USSR in the field of civil defense allegedly infringe upon the 'Soviet-American balance of forces,' and propose that Congress allocate . . . additional funds to . . . improve the U.S. Armed Forces. The heads of the war industry corporations and the representatives of the command of various arms are doing their utmost to convince the public of the need to increase expenditure for U.S. civil defense. [The Defense Civil Preparedness Agency's FY '77 budget request for $123 million was cut to $82.5 million—The Editors.] It is . . . recommended to do this with additional appropriations, thereby not accepting a reduction in the military budget for offensive strategic means of warfare.

"Those who profit from U.S. civil defense measures . . . do not shun even pseudoscientific 'studies' by various authors on the state of the defense capacity of the Soviet Union. Until recently, L. Gouré was prominent in that field . . . and he periodically publishes voluminous 'works' on this theme. [See Dr. Gouré's article, p. 47.]

"American readers have long been fed up with his 'scientific' research. . . . Therefore, when it came to the decisive stage in the discussion and the approval of the U.S. military budget for 1977, astronomical in size, the advocates of the arms race and of building up international tension, hoping . . . to get additional appropriations for the requirements of the Pentagon, decided to reinforce the unconvincing arguments of that 'Sovietologist' by the inventions of a certain Harriet Fast Scott. [See Mrs. Scott's accompanying article.] Having lived for a few years in the Soviet Union as the wife of an air attaché, she has now assumed the functions of 'military consultant of the Pentagon' on questions of Soviet civil defense.

"Like L. Gouré, she threads one fabrication after another in relation to USSR civil defense. . . . [Harriet Scott's article, "Civil Defense in the USSR," appeared in the October '75 issue of AIR FORCE, a bit early to affect the FY '77 budget—The Editors.]

"The facts clearly disprove such misinformation, which, it must be added, were seized upon and used by the militaristic propaganda for its own unseemly aims. . . ."

Soviet Aerospace Almanac

Though little noted in the West, Soviet military/political doctrine was broadened drastically in 1974 by "the most significant Soviet pronouncement . . . made thus far in the 1970s." To implement this doctrinal change, the Kremlin is giving increased priority to . . .

The USSR's Growing Global Mobility

BY WILLIAM F. SCOTT

PROJECTING power, whether military or economic, beyond a nation's borders is a political decision. In the Soviet Union, this means a decision by the Communist Party. The requirement that Soviet Armed Forces be able to operate in any part of the globe was stated in February 1974 by the late Marshal A. A. Grechko, then a Member of the Politburo and Minister of Defense. One sentence in that statement significantly changed Soviet military doctrine:

". . . The Soviet Armed Forces are continuing persistently to achieve military mastery and they are maintaining constant readiness to repel *any aggression* no matter from where *and from whom* it comes." (Emphasis added.)

This was a marked departure from the standard expression used to describe the international responsibilities of the Soviet Armed Forces. Previously, the approved statement, made by General Secretary L. I. Brezhnev at the 24th Party Congress in 1971, had been that "the Soviet Armed Forces are prepared to repel *an enemy attack, no matter from where* it comes." (Emphasis added.)

As analysts were puzzling over the significance of Grechko's pronouncement, it was learned in Moscow that all copies of the journal in which the article appeared had been removed from circulation.

Before it could be determined if Grechko, and the censors, had slipped, a second article under his byline appeared in May 1974. This time the doctrinal addition was made somewhat more clear:

> "At the present stage the historic function of the Soviet Armed Forces *is not restricted* merely to their function in defending our Motherland *and the other socialist countries*. In its foreign policy activity the Soviet state actively purposefully opposes the export of counter-revolution and the policy of oppression, *supports the national-liberation struggle,* and *resolutely resists imperialist aggression in whatever distant region of our planet it may appear.*" (Emphasis added.)

This statement is probably the most significant Soviet pronouncement on international affairs made thus far in the 1970s. Inherent in this new policy of resisting "imperialist aggression" on a global scale is the requirement that Soviet Armed Forces be able to operate anywhere in the world.

The doctrinal addition announced by Marshal Grechko was not formulated on the spur of the moment. For well over a decade the requirement had been studied and analyzed. Research institutes under the Soviet Academy of Sciences played a key role in developing this concept, especially after Brezhnev assumed power. Forces capable of projecting military power had been under development for years.

Developing a Concept

Even before the abortive Soviet attempt to put nuclear armed missiles in Cuba, policy papers and studies relative to the political use of military power had been stressed by Soviet research institutes. Much of the work was done by the Institute of World Economy and International Relations (IMEMO), the largest and most prestigious of the social science research institutes under the Academy of Sciences. Marshal V. D. Sokolovskiy had emphasized in 1966 that *military strategy* is a social science, and indicated the need for research institutes to perform better analyses in this field. In 1968, in the third edition of *Military Strategy,* he added that the USSR will render, when necessary, military support to people subject to "imperialist aggression." IMEMO apparently was tasked to find how such support could best be provided.

The Institute's answer was *Military Power and International Relations,* published in 1972. This book helps to explain Soviet past actions and to anticipate future moves. Edited by the military strategist, Col. V. M. Kulish, with contributions by other members of IMEMO's staff, it attracted little attention when it appeared. The book outlines Soviet perceptions of their requirements for new types of military forces:

> "Greater importance is being attached *to Soviet military presence in various regions of the world,* reinforced by an adequate level of *strategic mobility for its armed forces.*
>
> "In connection with *the task of preventing local wars* and also in those cases wherein military sup-

port must be furnished to those nations fighting for their freedom and independence against the forces of international reaction and imperialist interventions, the Soviet Union *may require mobile and well-trained and well-equipped forces. . . .*

"Expanding the scale of Soviet military presence and military assistance *furnished by other socialist states* [is] being viewed today as a very important factor in international relations." (Emphasis added.)

Much of the rationale expressed in *Military Power and International Relations* was the same as that given by Admiral of the Fleet of the Soviet Union S. G. Gorshkov. Throughout the 1970s, Gorshkov's articles have attracted considerable attention in both the East and West. As a Deputy Minister of Defense and a full Member of the Central Committee, his views would have to be supported by the Party-military leadership.

Admiral Gorshkov's book, *The Sea Power of a State,* published in early 1976, more fully explains the implications of Marshal Grechko's 1974 statements. Gorshkov reaffirms Grechko's thesis concerning the expanded role of the Soviet Armed Forces in international affairs. A navy must first be capable of fighting naval actions at sea. In addition:

"Demonstrative actions of the fleet in many cases make it possible to achieve political goals without resorting to armed conflict *by just indicating pressure by their potential might and the threat of beginning military actions. . . .*

"Moreover, the neutral waters of the world oceans permit accomplishing *the transfer and concentration of forces of the fleet without giving the opposing side formal ground for protests or other forms of counteractions.*" (Emphasis added.)

In 1976, *The Sea Power of a State* was nominated for the Frunze prize, awarded annually for the best Soviet writing on military affairs.

The Ideological Justification for Projecting Military Power

Nuclear war, according to Soviet spokesmen, would do great harm to mankind. It can be prevented only if the Soviet Union has strategic nuclear forces so powerful that the "imperialists, and in first place the United States, would not dare unleash such a war." This is a rationale for the continued buildup of Soviet strategic nuclear forces.

"Local, small wars" also must be prevented or suppressed, since such wars "may develop into a universal, nuclear missile war." This is the ideological justification for the development of Soviet military forces capable of projecting military power into areas noncontiguous to Soviet borders.

Taken alone, prevention of both world nuclear war and local war is a laudable aim. However, there is some question of methods and true purpose when Soviet definitions are studied. For example:

"A local war is a small war *unleashed by the ruling circles of imperialist states* for the purpose of *suppressing a national-liberation movement,* enslaving the peoples of small countries or restoring the capitalist system in any socialist country. *A local war usually is waged with limited forces, in a limited area.*" (Emphasis added.)

It is important to note that "local wars" are waged only by the "imperialists," aimed at suppressing "just wars," which may be wars of national liberation, or wars to prevent the overthrow of a Soviet-supported government. The Soviet Union, by its own definition, does not engage in "local wars," since they are "unjust."

Preventing world war, according to Soviet theorists, requires both strategic nuclear forces and theater forces capable of fighting and achieving *victory* either with nuclear or nonnuclear weapons. Preventing or suppressing local wars in order that such wars not escalate into nuclear war requires the ability to project military power and presence.

The Comintern in Modern Form

Soviet interest in expanding its power abroad is not new. In the 1920s and 1930s, the Communist International—known as the Comintern—directed the worldwide Communist movement for the benefit of the Soviet Union. Before World War II, thousands of Soviet "volunteers" participated in the Spanish Civil War. Still other Soviet "volunteers" fought in China, against the Japanese. In 1939, regular Soviet Red Army forces in Outer Mongolia fought the Battle of Khalkhin-Gol against the Japanese Kwantung Army.

In the early 1950s, Soviet military advisers planned, logistically supported, and trained North Koreans for their invasion of South Korea. At the direction of Nikita Khrushchev, elements of the Soviet Armed Forces were sent to Cuba to construct launching platforms for nuclear missiles. Soviet military advisers and Soviet military equipments prepared several of the Arab states for their wars with Israel. There is little likelihood that North Vietnam could have achieved its success in South Vietnam without Soviet military equipment and training detachments. In none of these cases was there a significant direct projection of Soviet power by the Soviet Armed Forces, however.

In the post-World War II period, prior to the mid-1960s, Soviet attempts to project military power were constrained by the strategic nuclear capability of the United States. By 1974, the Soviet Union was a superpower, with strategic nuclear forces superior to those of the United States in throw weight and number of missiles. This has given the Soviet Union, in effect, a nuclear shield behind which her military power and presence can be projected with relatively little risk. As the staff of IMEMO advised in *Military Power and International Relations:*

"The possession of strong strategic superiority was always one of the most important prerequisites for pursuing an active foreign policy, since the very recognition of this superiority by other states often forced them into agreeing to certain and at times considerable concessions, or submitting to the demands of their more powerful rivals."

Soviet projection of military power, except that attempted in isolated instances through volunteer and

proxy forces, had to await the buildup of strategic nuclear forces. It was no accident—an expression frequently used by the Soviets—that the expanded doctrine announced by Grechko in 1974 came *after* the signing of SALT I.

It is not likely that the new element in Soviet military/political doctrine would have been announced openly had the United States retained its previous strategic nuclear lead over the Soviet Union.

Preparing the Population

Psychological preparation of the population for major policy actions is a standard practice of the Soviet leadership. For example, in the 1960s, hundreds of articles and dozens of books were written about the "revolution in military affairs" and the attendant changes in Soviet military doctrine and strategy. "The Soviet military doctrine requires the Soviet Armed Forces, the country, the whole Soviet people be prepared for the eventuality of a nuclear-rocket war." Now, in the 1970s, both the military and the civilian populace are being prepared for the new demands that may be made on them as a result of the Soviet Union's requirement to project military power.

Specific attention now is given to preparing Soviet youth, during their premilitary training, for the international role the Soviet Armed Forces now have assumed. For example, in May 1976, *Soviet Patriot,* the newspaper for Civil Defense and DOSAAF, carried an article directing political instructors to devote two hours to the theme, "The 25th Congress of the CPSU on the World Position and International Activity of the Party." Among other topics, group leaders were directed to show the "strengthening of the collaboration between the Soviet Union and newly liberated countries." Emphasis was given to Soviet support for Angola.

In 1976, Soviet bookstores, from Moscow to Khabarovsk, featured *We Are Internationalists,* a book with an unusually eye-catching cover, showing a man and a woman carrying guns in a tropical setting. The book, however, was an account of Soviet "volunteers" in the Spanish Civil War. A similar book, *On Chinese Soil: Memories of the Soviet Volunteers, 1925–1945,* had been published in 1974.

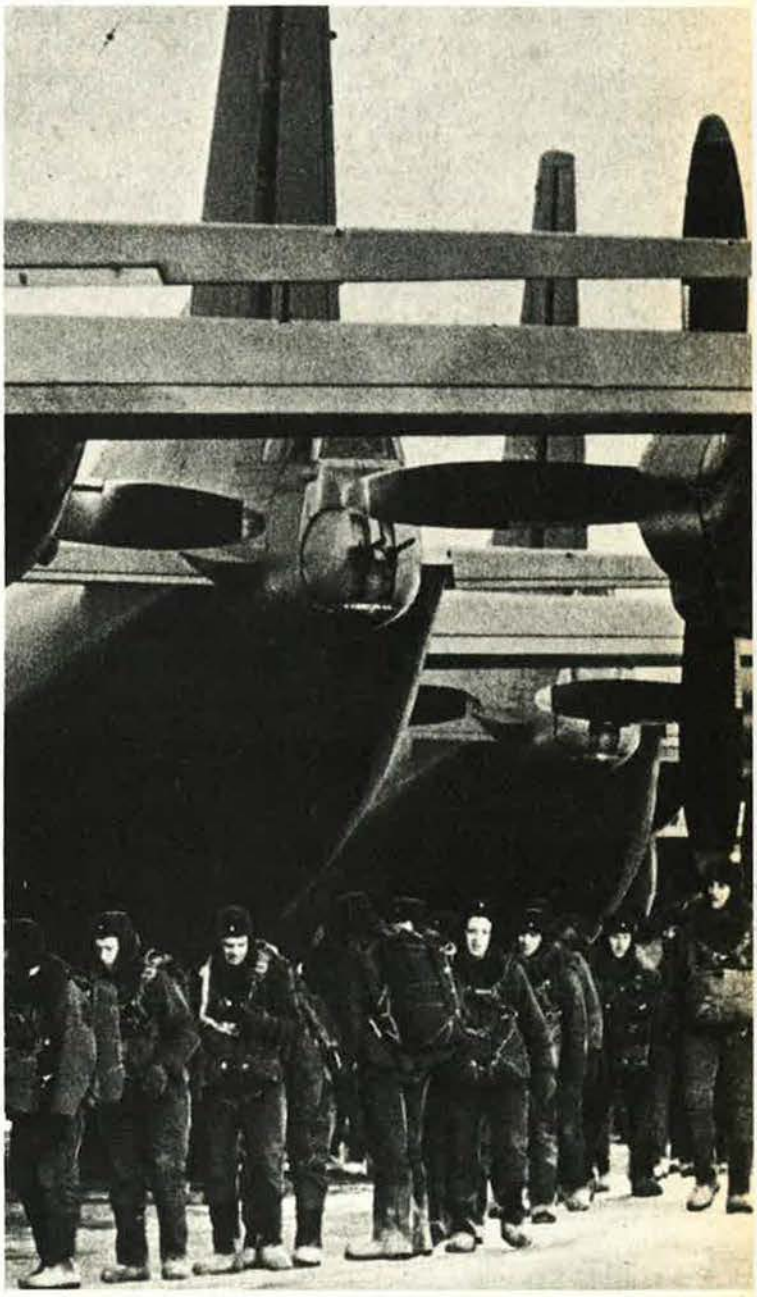
Bases and Military Coalitions

In July 1974, after Marshal Grechko's articles had appeared, a new book, *Military Coalitions and Coalition War,* was sent to the printers. The book was not cleared for publication until October 1975, and was available in bookstores during the time of the 25th Party Congress in 1976. Editor of the book, G. F. Vorontsov, is a General Colonel and a member of the General Staff, who works with military staffs from the Warsaw Pact and Third World countries, making frequent trips abroad. For some reason, the Party-military leaders did not want it known that a senior Soviet officer had written on such a subject; hence, Vorontsov was not so identified in the book.

Attention to military coalitions is not new. Col. V. V. Glazov, a Frunze prize winner in the mid-1960s and now one of IMEMO's defense intellectuals, has written:

> "A new world war will bear clearly defined class character, and will be a decisive armed clash of two opposed social systems. On one side will be the coalition of imperialist countries and, on the other, a coalition of socialist countries."

One purpose of the projection of military power, according to Soviet spokesmen, is to enlarge the "system of socialism" that now embraces fourteen nations. Seven of these, including the Soviet Union, form the Warsaw Pact. Four other nations—North Korea, Cuba, Mongolia, and Vietnam—have close ties with Moscow. However, the twelfth nation, Yugoslavia, is wary of the Soviet Union and concerned with a possible Soviet invasion. Two more nations, Albania and China, currently regard the Soviet Union as having fallen into the heresy of revisionism.



In recent years, the USSR has undertaken a concentrated effort to increase its airlift capability. Here, paratroops board An-12s.

North Korea, Cuba, and Vietnam—three of the four pro-Soviet "socialist" nations outside the Warsaw Pact —provide Moscow with valuable bases. But a wider network of strategically situated bases is needed for refueling and supplying the USSR's military and commercial ships and aircraft. Those bases will serve a combination of political, economic, and military purposes.

The Soviet penetration of strategic regions is furthered by military and economic aid to Third World and emerging nations. Foreign military personnel attend military schools, including the Academy of the General Staff, in the USSR and many foreigners receive flying training at Soviet fields. Soviet training detachments and military advisers are now assigned to a large and increasing number of Third World countries.

It should be borne in mind that the USSR is virtually self-sufficient in strategic materials, while the US and its Western allies range from partial to total dependence on external sources for a variety of strategic minerals, agrarian products, and oil. Control of Western access to raw materials is no doubt a major objective of Soviet strategy and the USSR's perceived need for an ability to project military force.

The Soviet drive for bases in Iraq, Libya, Somalia, the Indian Ocean area, Mozambique, and Angola is clearly associated with Russia's long-standing ambition to control the Mediterranean and its more recent aim of influencing the production and distribution of Middle East oil. Pro-Soviet governments in other African countries could deny such essential strategic materials as chrome ore to the US and the other NATO countries.

In another geographic area, the Soviets, having been repulsed in Chile, are certain to continue their quest for basing arrangements in Peru. Soviet naval units there, combined with access to Cuban bases, would present Washington with a major defense problem.

Naval Forces

There is a general awareness in the United States today about the expansion of Soviet naval power. This is due both to the visible evidence of Soviet ships as they move onto the high seas, and the writings of Admiral Gorshkov. Amphibious vessels, capable of operating at sea for long periods, now are joining the fleet, adding to the capability of mobile forces already in being. These new ships can be supported by the Soviet Union's refueling and supply fleet.

In 1976, when the *Kiev*, a late-model aircraft carrier, steamed into the Mediterranean, she carried new V/STOL aircraft, of a type that previously had been a closely guarded secret. According to Soviet spokesmen, this ship has three roles: support of amphibious landings, antisubmarine warfare, and antisurface fleet engagements. *Red Star*, the official newspaper of the Soviet Ministry of Defense, often features naval infantry performing landing maneuvers. A photograph of a huge air cushion vehicle disgorging its load of tanks and supporting troops has been shown on Soviet television.

In addition to its Naval Fleet (*Voyenno-morksoy flot*), the Soviet Union also has developed seapower in its full sense. The Soviet merchant marine is well integrated with the Navy, and its growth over the past decade has been impressive. Many of its commercial vessels are suitable for transporting troops and military equipment. Of particular interest are the "RORO" (roll-on roll-off) ships, designed so that vehicles can be driven directly onto the ship, and off at destination. Soviet RORO ships do not require sophisticated port facilities, and can use unimproved Third World ports. These ships, entering the Soviet merchant fleet in 1973, will reach significant numbers by 1978. Most of them are being built in the West, using Western technology. They might either support, or substitute for, amphibious ships and landing craft.

William F. Scott is a West Point graduate who retired from the Air Force as a colonel in 1972. He has been an Air University faculty member, an exchange officer with the Department of State, and has held various Air Force assignments, including two tours as US air attaché in Moscow. He holds a doctorate in Soviet studies and now is an Adjunct Professor at Georgetown University and the University of Miami, and a consultant to DoD, General Research Corp., and other research institutions.

Air Forces

The Western press gives considerable attention to the development and deployments of new Soviet combat aircraft, such as the Backfire, Fencer, and Foxbat. Generally overlooked is the growing capability of Soviet airlift, essential for providing strategic mobility—a capability stressed by Soviet analysts as essential for establishing a military presence.

Currently military transport aviation (*Voyenno transportnaya aviatsiya*), often referred to by its Russian language initials as VTA, has approximately the same number of aircraft as in 1966. However, its capability to move cargo to a range of 2,000 nautical miles has increased by fifty percent over the past ten years. It also could airlift two airborne assault divisions to ranges of more than 1,000 miles. Primary aircraft would include between 650 and 750 An-12s (Cub), about fifty An-22s (Cock), and a few Il-18s (Coot).

The An-12 and Il-18 are as old as many of the pilots who fly them. But this situation is changing. The Il-76, a jet transport using the basic design of the USAF C-141, first flew out of Moscow's Central Airfield in 1971. Now entering operational service, this transport can airdrop up to three amphibious airborne assault vehicles at a range of 3,100 miles. This is much more than double the maximum payload and range of the Cub.

Strategic airlift now is of major interest to Soviet planners. In August 1974, only months after Grechko's articles appeared, *Red Star* carried two articles on "Strategic Movement Through the Air." As is often the case when presenting new ideas or equipment in the Soviet press, all of the data were from the "foreign press." But the reader is left well aware that the Soviet Union must have a military air transport system that can move troops "from continent to continent" in a few hours. Specifically, aircraft with the capability of the C-5 are needed.

Exactly one year later, *Red Star* described "Aircraft of the Next Five-Year Plan," featuring the Il-86. This new transport, capable of carrying approximately 350 passengers, first flew in December 1976. It now seems that transport aircraft are given high priority in the current five-year plan. Stepped-up production of the Il-76, plus an additional seventy-five to 100 Il-86s, could provide the Soviet leadership with the global air mobility its doctrine now requires.

Aeroflot

Soviet capability for strategic airlift cannot be measured by VTA alone. Visitors to the Soviet Union often are surprised at the huge numbers of large transport aircraft carrying Aeroflot markings that are parked at the larger commercial airports throughout the USSR. Clearly, the high daily utilization rate that is essential to profitable airline operation is of no importance in the USSR. These aircraft, in effect, are support for VTA. Already, they are playing a role in Soviet projections of military power. In 1976, Cuban troops were airlifted to Angola in Aeroflot's Il-62s. Rotation of military personnel each six months to the Soviet Group of Forces in Germany now is routinely accomplished by Aeroflot, without any disruption of normal passenger schedules.

Aeroflot's worldwide network of air routes, with attendant overflight and refueling rights, are a necessary part of the capability for strategic airlift. In the airlift of Cuban troops to Angola, Aeroflot's Il-62s refueled at Conakry, Guinea. During the Soviet invasion of Czechoslovakia in 1968, Aeroflot personnel in Prague used their own facilities to provide landing instructions to Aeroflot aircraft carrying the first contingent of invading Soviet troops.

It is not difficult for the Soviet General Staff, through VTA, to coordinate strategic airlift with Aeroflot. The airline's top command is made up of Air Forces personnel. Marshal of Aviation B. P. Bugayev, Minister of Civil Aviation, was promoted from General Colonel of Aviation to his present rank in 1974. In 1972, when a group of senior Aeroflot personnel visited the United States to examine our aviation industry and production facilities, General Colonel of Aviation Mishuk, the fifth ranking officer in the Soviet Air Forces and responsible for research and development, was a member of the party.

It is estimated that up to 1,200 Aeroflot aircraft could be diverted for military use. About 300 could be used at any one time without significant disruption of civilian schedules. In the United States, 243 aircraft of the commercial air fleets are committed to the Civil Reserve Air Fleet (CRAF) for support of military operations.

Military Capabilities

Where do the Soviets stand in developing their capability to project military power? In the United States, weapons are first developed and later strategy may be changed or modified. In the Soviet Union, on the other hand, a new doctrine or doctrinal addition may be announced when the political-military hierarchy considers that science and technology have made possible the new weapons to support it. The weapons then are developed further, based on doctrinal requirements.

Little attention was paid to Khrushchev in 1960 when he announced a new military doctrine, based on the primacy of the nuclear weapon. Soviet strategic nuclear forces at the time were clearly inferior to those in the US. It was years before the full extent of Khrushchev's doctrine was reflected in military capabilities.

In 1967, the Soviet doctrine of nuclear primacy was modified. Until then, Soviet theorists asserted that any world war would begin with an all-out nuclear exchange. After NATO officially adopted the policy of flexible response, Soviet doctrine required that "units and subunits must be prepared to fight with or without the use of the nuclear weapon." Without neglecting the buildup in strategic nuclear forces, increased attention was given to theater forces, capable of waging either nuclear or conventional war, or a combination of the two. The extent of the buildup in theater forces was not fully recognized until several years after the doctrinal shift took place.

Some Western observers discount Soviet capability and intent to project military power because of its lack of aircraft carriers. United States experience, stemming from World War II, indicated a need for high-performance aircraft to provide air cover over an assault beachhead. Soviet strategists, however, may approach the problem completely differently. Most analysts in the West now recognize that Soviet military forces and military practices are not mirror-images of those in the United States.

For example, the Soviets may find that merchant ships, and RORO ships in particular, might be the best way to put troops ashore in Third World nations. Airborne forces might be sent to seize a beachhead for incoming surface ships, one of their stated tasks. Material might be prepositioned, with Soviet military personnel sent in under the guise of tourists. Against many Third World nations, V/STOL aircraft and the Hind helicopter, launched from aircraft carriers such as the *Kiev*, could provide whatever close air support is needed, with mobile surface-to-air missiles used for tactical air defense.

In all probability, there will be increasing use of Soviet surrogates, such as the employment of Cubans in Angola. This was indirectly suggested in the second edition of Marshal Grechko's book, *Armed Forces of the Soviet State*. In the first edition, which had been sent to the printers in September 1973, Grechko accused the United States of employing "other hands" to do its fighting. This accusation was dropped in the 1975 edition. The use of "other hands"—trained, equipped, and transported by the Soviets—may become a standard technique for the Soviet projection of military power.

At present, Soviet forces capable of projecting military power may be as inferior to counterpart United States forces as Soviet strategic nuclear forces were inferior to United States strategic nuclear forces in the 1960s. We can expect, however, that the customary Soviet pattern will be repeated. The doctrinal addition will be followed by major increases in military capability, as was the case with respect both to the buildup of strategic nuclear forces and theater forces. ■

The USSR's Frontal Aviation forces are sometimes overlooked in focusing on Soviet strategic power. But dramatic improvements in the past few years pose worrisome problems for NATO . . .

Soviet Tactical Airpower

BY COLIN GRAY

WHILE public attention in the West has tended to focus on the momentum of the Soviet strategic-forces buildup and the emergence of a blue-water naval capability, the no less dramatic improvement in Soviet tactical airpower has thus far failed to attract comparable expressed concern. Very often, the ominous turnabout in Soviet tactical airpower, or Frontal Aviation *(Frontovaya aviatsiya),* achieved since the late 1960s is subsumed in general references to "the growing threat in Europe."

That threat is indeed growing, as the current debate over NATO's possible vulnerability to a surprise attack attests, but by far the most dramatic shift in Warsaw Pact capabilities has lain in the change in orientation of its tactical air component. As recently as three years ago, some supposedly authoritative commentaries on the military posture of the Warsaw Pact took easy comfort from the then-traditional observation that there was a major favorable asymmetry for NATO in the rival, in-theater, air orders of battle. That pleasing thought was followed, typically, by an equally traditional reference to the clear *defensive* attitude of Pact Frontal Aviation. Whether or not there remains a favorable asymmetry in the theater air balance for NATO may be debated (and *not* just in terms of the rival aircraft inventories); what is beyond debate is that Soviet Frontal Aviation is well into the process of transforming itself from a force designed primarily to ensure local air superiority as a protective umbrella over Pact armies and their tactical and deep rear areas into a force capable of posing a truly major offensive threat to NATO ground forces and their infrastructure throughout the European theater.

Although this discussion is focused on the Soviet element in the tactical air dimension in Europe, such an analysis makes no sense if it is divorced totally from consideration of Soviet views of theater war. Soviet theater-war doctrine is nothing if not imbued with the "combined arms" spirit. The changes evident in the posture of Soviet Frontal Aviation speak loudly, if not always with total clarity, to Soviet expectations concerning the course of a war in Europe. The essential backdrop to this article is the realization that the Soviet Union does have a distinctive concept of theater war. Soviet strategic forces appear to be designed (even overdesigned) to serve, in the first and possibly only instance, as a counterdeterrent to the United States escalating a theater conflict to a homeland-to-homeland strategic exchange. The more robust that strategic counterdeterrent, the less inhibited Soviet military planners need be in their conduct of war in Europe.

The Air Order of Battle

The Soviet Air Forces, VVS *(Voyenno-vozdushnyye sily),* have three components: tactical or Frontal Aviation, FA *(Frontovaya aviatsiya);* Long-Range Aviation, DA *(Dal'nyaya aviatsiya);* and Military Transport Aviation, VTA *(Voyenno-transportnaya aviatsiya).* The other major components of Soviet airpower, the air defense forces—PVO *Strany (Voiska protivovozdushnoi oborony strany),* and Naval Aviation, AVMF *(Aviatsiya voyenno-morskogo flota)*—are, respectively, a separate service and an integral part of the Soviet Navy. In principle, the division of responsibilities between these five airpower components is fairly clear, but in practice major problems might arise. PVO *Strany* is charged with the defense of the Soviet homeland and the superior direction of the air defense resources of Warsaw Pact allies. However, Frontal Aviation also has a major air defense mission, and it is not inconceivable that, in the context of a war that had not touched Soviet territory or airspace directly, Frontal Aviation might be provided some assistance from PVO *Strany* and the medium-bomber resources of DA. The point of these remarks, aside from illustrating some plausible consequences of Soviet military organization, is to remind readers that Soviet (and some Pact-allied) Frontal Aviation does *not* comprise the totality of the air threat in and about Europe.

The deployment of Frontal Aviation (FA) matches closely that of the Ground Forces that it is designed to serve—indeed, FA, operationally, is subordinated to the front commander. Like the Ground Forces, FA is deployed by military district within the Soviet Union, and

This paper represents the views of its author. None of the opinions, statements of fact, or conclusions can properly be attributed to the Hudson Institute, its staff, its Members, or its contracting agencies.

by "groups of Soviet forces" in four Warsaw Pact countries. In the event of war, it is envisaged that each Soviet "front" would have its assigned Air Army (VA). A "front" comprises a group of from two to seven armies, each army with three to four divisions.

Before examining what is known concerning the Warsaw Pact air order of battle in 1977, it is useful to outline a "typical" VA. The typical VA, supporting a "front" or a forward military district that might plausibly come to function as an operational "front," would dispose two fighter-bomber divisions and three interceptor divisions, with each division having three regiments of three squadrons each. (A squadron may have from twelve to sixteen aircraft, while the regiment would hold up to fifteen additional aircraft as an operational reserve.) The precise numbers cited below are to be treated with some reservation. They relate to a peacetime (though reasonably war-ready) deployment, they should decline marginally as a consequence of modernization, they change on a week-by-week basis for routine reasons, *and* they could alter quite markedly in a matter of a very few days in response to crisis stimuli.

The deployment of Soviet Frontal Aviation in Europe in 1976–77 is approximately as follows:

Designation (Where Known)	Assigned to	No. of Combat Aircraft
16th VA	Group of Soviet Forces in Germany	1,100
37th VA	Northern Group (Poland)	350
———	Central Group (Czechoslovakia)	100
———	Southern Group (Hungary)	275
13th VA	Leningrad Military District (MD)	200
30th VA	Baltic MD	300
1st VA	Byelorussian MD	300
57th VA	Carpathian MD	350
17th VA	Kiev MD	100
———	Moscow MD	200
15th VA	Odessa MD	250
34th VA	Trans-Caucasus MD	300
	Total:	3,825

Frontal Aviation deployed in the Asian USSR is roughly 1,675 combat aircraft, for a grand total of 5,500. In addition, the Warsaw Pact allies contribute close to 2,300 combat aircraft, of which East Germany has 350; Poland, 750; Czechoslovakia, 500; Hungary, 150; Romania, 300; and Bulgaria, 250.

The Pact air forces of Eastern Europe are very heavily focused on the air defense mission. They are equipped predominantly with elderly MiG-17s and Su-7s and with the more modern MiG-21. The only Pact-allied air force to have been provided "third-generation" attack aircraft is Poland, which is reported to have ten squadrons of the variable-geometry (VG) Su-20 (or Su-17 when deployed with Soviet FA). Therefore, with only minimal exceptions, Pact-allied air forces should properly be viewed more as westward air defense extensions of PVO *Strany,* than as substantial additions to the strike capabilities of FA.

Before discussing the new aircraft types being deployed by FA, three distinctive emerging threats, complementary to the aircraft capabilities of FA, must be cited. First, the Soviet Ground Forces enjoy the services of a dense inventory of all-altitude, surface-to-air missile (SAM) defenses. These defenses, organic to the Ground Forces, release air resources for strike and reconnaissance missions, although, as specified below, they do pose major air battle management problems. Second, for deep strike missions, or for missions in a very hostile environment, FA is backed up not merely by the DA, but also by a force of 600 M/IRBMs (500 SS-4 MRBMs and 100 SS-5 IRBMs)—a force that appears to be on the brink of modernization with the deployment of the mobile and MIRVable SS-X-20 IRBM. NATO does not have a counterpart to this M/IRBM force, which is deployed on Soviet soil. Third, FA has begun to deploy a new assault-transport/gunship helicopter, the Mi-24 Hind *(see photo of the Mi-24 gunship on p. 98).* A large-scale deployment program for this system is under way. It has been reported that seventy-plus Hinds are deployed with the 16th VA in two regiments at Parchim and Stendal in East Germany. Should the Soviet Union decide that the helicopter gunship has a promising future as a close-support (and particularly antiarmor) weapon, FA aircraft resources could be released for other missions.

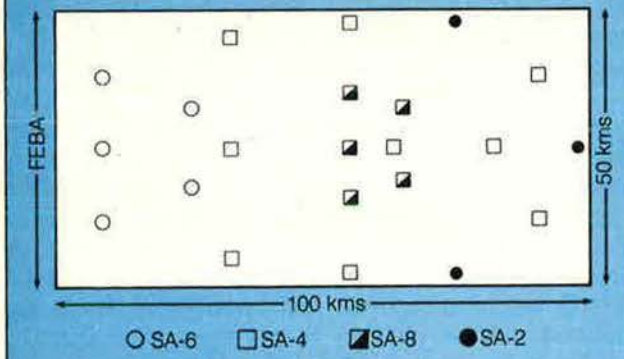
Capability Trends

It would be difficult to exaggerate the change in the air threat (and the threat to NATO air) over the past decade. The Soviet Union has not so much switched the focus of its FA to offensive missions as added new offensive capabilities to an evolving posture that retains a very strong air defense commitment, and shifted a good fraction of the air defense burden from FA to the organic SAM defenses of the Ground Forces. As general points, it is worth noting that the operational aircraft holdings of FA have increased by thirty percent since 1969, and that the overwhelming majority of tactical aircraft types currently in production are optimized for ground attack rather than air-superiority missions.

Soviet air doctrine unequivocally retains its commitment to the early achievement of air superiority, and that commitment seems to be as genuine as it is sensible. But Western observers have to be impressed with the facts of the evolving air order of battle of FA. That evolution, as yet incomplete, is undeniably in the direction of a posture that accords ground attack (and relatively deep penetration for such attack) at least equal priority with local air superiority.

Until the 1970s, the ground-attack aircraft of Soviet FA have been characterized by short range, low payload, and a severe deficiency of electronic countermeasures (ECM). Recent developments have altered the ground attack profile of FA. The new Fencer-A, Flogger-D, and Fitter-C, in that order of importance, give Soviet FA a low-level interdiction capability that previously was missing. The VG Fencer-A, the first postwar Soviet aircraft type to be designed specifically for ground-attack missions, can reach all NATO targets within the European theater. Range-payload tradeoffs are, of course, complex, but by way of elementary example the Fencer-A can carry a payload of 6,000 pounds over an operating radius of 600 miles. In Western terms, the Su-19 Fencer-A may be thought of as a slightly scaled-down version of the F-111. With its terrain-avoidance radar and its laser rangefinder, the Fencer-A, flying in a lo-lo-lo mode, poses a novel

THE AIR DEFENSES OF A SOVIET ARMY (3-4 Divisions)



In addition to the 5 batteries of the SA-6, 9 of the SA-4, 5 of the SA-8, and 3 of the SA-2, a Soviet Army deploys 64 troops of vehicle-mounted quadruple SA-9 launchers, and very large numbers of SA-7, shoulder-fired SAMs. Also, a Soviet Army, typically, deploys 19 AA batteries of ZU-23/2s, 32 AA batteries of ZSU-23/4s, 6 AA batteries of ZSU-57/2s, and 23 AA batteries of S-60s.

Type	Comments
SA-2	Slant range, 27 miles; ceiling 90,000 ft; mobile
SA-4	Slant range, 43 miles; ceiling 80,000 ft; mobile
SA-6	Low-altitude; mobile; ceiling 40,000 ft; used for 1st time in October 1973 War
SA-7	Low-altitude against slow-moving targets; slant range 2.5 miles; ceiling 10,000 ft
SA-8	Vehicle-mounted; low-altitude; range possibly 7.5 miles
SA-9	Upgraded SA-7; vehicle mounted
ZU-23/2	Towed, 23-mm twin cannon; max. firing rate 2,000 RPM; range, 3,900 ft
ZSU-23/4	Vehicle-mounted, 23-mm quadruple cannon; max. firing rate, 4,000 RPM; range 8,200 ft
ZSU-57/2	AA tank, 57-mm twin cannon; max. combined firing rate 240 RPM; range 13,100 ft
S-60	Towed, 57-mm gun; max firing rate, 120 RPM; range 13,100 ft

threat to NATO. Between 200 and 250 Fencer-As are now in service with FA in Europe.

Some 1,200 to 1,300 MiG-23S (Flogger-B) and B (Flogger-D) now are deployed with FA. These systems, with Fencer-A, will form the backbone of FA over the next decade. Flogger-B, the air-superiority version, is armed with a 23-mm twin-barrel GSh-23 cannon and four infrared and radar-homing AA-7 Apex and AA-8 Aphid air-to-air missiles. Flogger-D, the ground-attack version, has a six-barrel 23-mm rotary cannon, a laser designator, and terrain-avoidance radar. Flying in the exacting lo-lo-lo mode, Flogger-D would have a plausible operating radius of 250 miles. The Su-17/20 Fitter-C, a VG development of the Fitter-A, attests both to the Soviet interest in the ground-attack role and to dissatisfaction with the performance of the now-obsolescent Fitter-A. Fitter-C is a far more versatile aircraft than was its A model predecessor, above all in its takeoff and landing requirements. The Su-17/20, unlike the Su-7, can operate from emergency short fields for crisis and wartime dispersal.

Although Western sources tend to disagree on many details concerning Soviet FA, there is a marked and important consensus on the following conclusions: a major modernization program is under way with its primary focus on the improvement of ground-attack capabilities; traditional air-superiority missions have not been abandoned to the SAM system of the Ground Forces, impressive though those are. The Flogger-B is optimized for air defense tasks, while the Su-17/20 (Fitter-C) would appear to have air defense as an important secondary mission.

In addition, the days of clear NATO ECM (and ECCM) superiority are now definitely past. Soviet FA is capable, in large numbers, of flying *really* lo-lo-lo profiles so that ECM and ECCM is scarcely relevant; of enjoying ECM escort; and of deploying effective ECM onboard strike aircraft. Furthermore, Soviet FA aircraft are housed on the ground in very hard shelters, and FA has the use of close to ninety major airfields in East Germany, Poland, and Czechoslovakia (and many more emergency dispersal fields).

Soviet FA has a small deployment of MiG-25 Foxbat-Bs (perhaps twenty aircraft) at Brieg in Silesia. This system, and the "A" interceptor version, have been the subjects of much ill-informed comment. Lt. Viktor Belenko's defection in 1976 with a Foxbat-A of PVO *Strany* settled most of the disputes over the technical characteristics of this system, and also raised questions of much wider importance. Above all, perhaps, Belenko was emphatic as to the total dependence of the pilot of a Foxbat-A upon positive ground control. If, reflecting the limitations of onboard radar and operating "style," it should prove to be a fairly general characteristic of Soviet air intercept operations that pilots are not permitted to proceed in the absence of real-time instruction, a major potential Achilles' heel in the effectiveness of FA (and PVO *Strany*) has been revealed and invites exploitation.

Overall, Soviet FA is evolving in a direction and at a pace that should give pause to those American commentators who have been in the habit of using the theater air balance as a major argument to excuse manifest deficiencies in NATO's ground forces.

Ground-Based Air Defenses and Frontal Aviation

In the past decade there has been a major Soviet drive to provide all-altitude *organic* air defenses for the Ground Forces, which will provide continuous cover even for fast-moving armored forces. NATO's tactical air certainly has the capability to penetrate those defenses, but such a claim could mislead the unwary. Reasonably cohesive ground-based air defenses (in a fluid battle situation any air defense system is going to suffer some loss of cohesion, no matter how mobile it is supposed to be) on a scale and with the quality of those integral to the Group of Soviet Forces in Germany (GSFG), must impose heavy "virtual attrition" upon an enemy. Even if few kills are achieved by such a system, SAM-suppression sorties and ECM equipment represent sorties not flown against Soviet armor and loss of payload to that end. The principal mission of the Soviet mobile SAM and automatic cannon systems is not to shoot down aircraft. Rather it is to prevent NATO's tactical

"If you ever think Pratt & Whitney's new Government Products Division isn't going all out for you, I'd like to hear about it."

"My number is (305) 844-4111."
Edmund V. Marshall
President
Government Products Division
Pratt & Whitney Aircraft Group

"We're making some of the most successful engines in the history of military aviation. But we're going to do even better."

Edmund V. Marshall

"The history of performance and reliability of our J52 engine used in the Grumman A-6, and McDonnell Douglas A-4, dates back to 1959. As the most active engine in the Navy inventory, it logs more flight hours each month than any other Navy powerplant. It has the highest maximum operating time rating of any Navy engine – up to 1,900 hours. Although this is an excellent MOT, we're working toward raising it to 2,000."

Joe R. Phillips
Vice President

"Our new F401 engine, designed for the Grumman F-14, uses the same advanced technology as our F100 engine, but delivers 20% more thrust. It's already 80% through its development cycle, and has undergone flight evaluation in an F-14. We're refining the F401's design and are testing the modified configuration. Results are 9% better than promised, and we can provide an operational engine to the Navy within 22 months."

Richard H. Anschutz
Vice President
Advanced Systems and Programs

"Our F100 engines in the McDonnell Douglas F-15 passed the toughest qualification test of any engine ever, including sustained operation at Mach 2.3 at 42,000 feet for 30 hours. Our accelerated operational mission testing program is running four years ahead of the current Air Force Fleet, and the correlation to date is excellent. This continuing test program will help us detect potential problems early and prevent them from becoming operating problems later."

Jack F. McDermott
Vice President – Product Integrity

"Our F100 engine has been outstanding since the day it entered service. Its thrust-to-weight ratio is the best in the world. And it's playing a major role in the continued success of the General Dynamics F-16. Even though the F100's maintenance to flight hour ratio already is better than many engines at the same level of maturity, we're working to improve it approximately 50% by early 1981."

Leonard L. DeSantis
Vice President – F100 Program

"Our commitment to developing new technologies is stronger than ever."

Edmund V. Marshall

The advances in metallurgy and design that have proved so significant in the success of the F100 engine are simply part of an ongoing series. In fact, the history of aircraft engine technology is virtually the history of Pratt & Whitney Aircraft. From the original Wasp engine through a variety of piston, turbojet, turboprop, turbofan, augmented turbofan and rocket engines, our development work in new technologies has made major contributions.

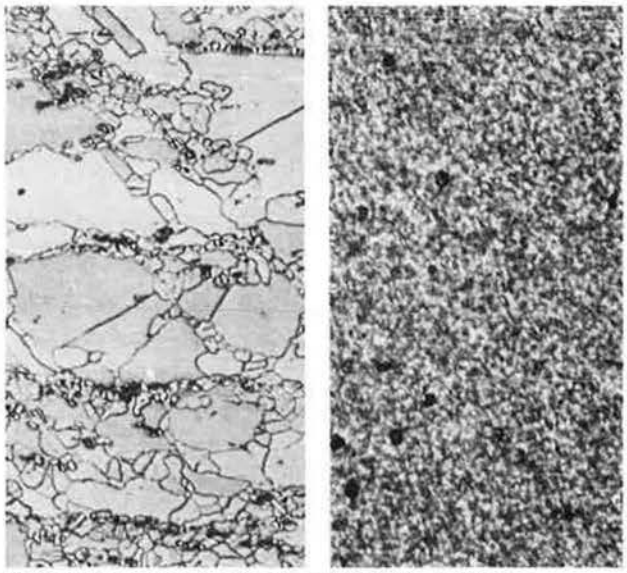
New technologies mean better engines.
Today, we are working in large and small propulsion systems, in new processes and new materials. For example, our Gatorizing™ process greatly simplifies the forging of difficult alloys into parts previously available only as castings. Gatorizing delivers high-quality parts with significant savings in equipment, material and labor.

With our Gator-Gard™ coating process, we can apply tungsten carbide, the toughest coating material on the market today, with greater uniformity than any conventional process. Because Gator-Gard coatings are more uniform, they are stronger. With coating densities of over 99%, they resist extreme temperatures, wear and oxidation better than any conventional coating application.

New technologies mean new processes.
A new piece of equipment with enormous potential is our Hot Isostatic Press (HIP). The largest production unit of its type in the world, this press converts powdered superalloy metals into ultra-strong, solid shapes. HIP promises to dramatically reduce the amount of raw material and machining that now accounts for a major portion of the cost of finished engine parts.

Another project with great promise is our new automated casting facility in Middletown, Connecticut. Based upon our directional solidification process, it is designed to produce stronger, more uniform turbine blades than can be produced with today's technology at a lower overall cost.

The aircraft engines of the future will be built upon new processes and techniques such as these. Through a continued emphasis on developing new technologies we will be able to build jet engines with even higher power-to-weight ratios, greater fuel efficiency and longer service lives.



The microstructures of conventionally forged parts (left) are frequently not uniform. The microstructures of Gatorized™ forged parts (right) have uniform metallurgical structures and mechanical properties.

PRATT & WHITNEY AIRCRAFT GROUP
Government Products Division
West Palm Beach, Florida 33402

UNITED TECHNOLOGIES®

Colin S. Gray was awarded a doctorate in International Politics by Oxford University in 1970. He has taught in both British and Canadian Universities and was a Ford Fellow at the Department of War Studies, University of London, in 1973–74. Prior to joining the Hudson Institute, Croton-on-Hudson, N. Y., in 1976, Dr. Gray was a member of the staff of The International Institute for Strategic Studies in London. He has written extensively on strategy, defense policy, and arms control for European and US journals. His book, The Soviet-American Arms Race, *is reviewed in this month's "Airman's Bookshelf," p. 119. Dr. Gray has been a frequent contributor to AIR FORCE Magazine.*

---

air from intervening decisively against the armored offensive in the critical opening days of a war. In short, the mission is to keep the damage imposed by NATO's tactical air down to a level that does not arrest the momentum of the attack.

The benefits to the Soviet forces of their dense SAM and tube antiaircraft artillery deployments are as obvious as are the costs. The benefits include the release of some Frontal Aviation for strike missions, and some reduction in the anticipated scale of the NATO tactical air threat. (FA need not be tied closely, as a general rule, to providing protective cover for the Ground Forces.) The costs include the diversion of Ground Forces resources to defensive as opposed to offensive shock-power roles, and the creation of major problems in air battle management. Despite careful planning of friendly air traffic control, and despite reliable IFF equipment, virtually every NATO exercise—not to mention the graphic evidence provided in the Middle East in October 1973—shows that each side is going to lose a number of aircraft to its own ground-based air defenses. (Some recent NATO exercises have shown a higher kill rate against friendly aircraft than even the Syrians managed to achieve against the Israelis in 1973!) The more hostile the air defense environment, the greater the number of friendly aircraft that will be destroyed.

Theoretical solutions to this problem are not hard to devise, but they may fare ill in the confusion of a major war in Europe, with Soviet mobile ground-based air defenses deployed irregularly and fairly deep in NATO territory. A drastic though effective Soviet solution would be to adopt a "switch on/switch off" procedure for the SAMs and mobile cannons, with the ground-based air defense systems—at different times—being instructed to assume that everything in the air is either friendly or hostile. Such a procedure might rest upon an exaggerated assessment of the fault-proneness of IFF equipment and routines, and might overestimate Soviet unwillingness to accept aircraft losses to friendly action. But whatever the chosen Soviet solution or solutions, it is probably correct to claim that in many instances FA will be posed as many, if not more, problems by the impressive organic air defenses of the Soviet Ground Forces as by NATO air defenses. Soviet air doctrine attempts to minimize these problems by prescribing that interceptors operate only above 10,000 feet.

Notwithstanding the apparent fact that the Soviet military has opted for an air defense organic to the Ground Forces that might be capable of self-sufficiency *vis-à-vis* NATO's tactical air, FA does maintain *(and modernize)* a major force of manned interceptors. Confident NATO analysts should bear in mind that late models of the MiG-21 performed very creditably over North Vietnam (at least by comparison with the kill-ratios achieved by American pilots in "MiG Alley" over North Korea), that the VG MiG-23S (Flogger-B) would be a very formidable opponent, and that some of the resources of PVO *Strany* might be invoked on very short notice for combat duty in the European theater. American critics of SAC's manned bomber force would do well to recognize that the greater the manned bomber/standoff missile threat to the Soviet homeland, the less likely would it be that PVO *Strany* would release aircraft in aid of FA in Europe.

The Yak-28 is being phased out as an attack aircraft, but a modified version is used as an ECM escort.

The accompanying diagram and table (*see p. 64*) indicate the character and density of the organic air defenses of the Soviet Ground Forces.

Theater War

The marked improvement in the FA ground attack capability matches the discernible trend in Soviet doctrine for theater war. It is probable that Soviet military planners are not wedded to a single idea with respect to war in Europe—"one-variant war," as Nikita Khrushchev's rigid nuclear orientation was disparagingly termed by some Soviet military professionals. Whatever the circumstances of the outbreak of war, and whatever the scope of Soviet ambitions, the refurbished FA promises to be an asset of increasing value. The complementary and essential triplet of missions—reconnaissance, interception, and strike—will need to be accomplished in a European war at any level, and of any character.

Soviet theater-war doctrine is evolving, under the pressure of new theater and strategic capabilities, but this evolution should provide little comfort for Western governments. On the one hand, it is true both that the Soviet Union has purchased the military option of being able to wage a sustained nonnuclear campaign in Europe and that there are some signs *that could be* indicative of a willingness to wage a very restrained theater-nuclear war. Above all else, perhaps, the appearance of nuclear-capable artillery could mark a fairly dramatic change in the Soviet view of the proper role of nuclear fire support.

On the other hand, across-the-board modernization and augmentation of theater-war capabilities could sensibly be viewed in the West as evidence of Soviet determination to be able to do better what they had already planned to do. Also, and this is a point that merits widespread attention and debate, Soviet "style" in theater war should, to an important degree, reflect Soviet perceptions of the likelihood of an American *strategic* nuclear response to a NATO-European disaster. In the context of conflict in Europe, Soviet strategic forces should be seen, in the first instance, as a *counter-deterrent.* The kind of ordnance carried by FA, its depth of penetration, and the character of its targets, will depend in significant part on the credibility of American strategic nuclear intervention. Many factors should serve to restrain the theater-nuclear fire plan of the Soviet Union, but current trends in the strategic balance make it unlikely that the prospects of American strategic nuclear action will be one of them.

Although it is not possible to be certain just how the Soviet Union would prosecute a war in Europe, the following points are suggested by the diverse evidence available: a preplanned attack would be launched without prior reinforcement, so as to maximize surprise; the attack would be designed to unfold very rapidly; the Soviet objective would be *victory* in the theater; the Soviet decision on when, or whether, to introduce nuclear weapons would depend on NATO actions, the progress of the offensive, and the Soviet understanding of the war's political character. With regard to nuclear weapons, the Soviet Union: has developed a concept of theater (nuclear) war; does not share Western ideas of

The mobile SA-4 SAM is characterized by a long slant range of forty-five miles and effectiveness to 80,000 feet.

escalation; sees nuclear weapons as being complementary to the primary territory-acquiring/holding function of Ground Forces; and believes, by way of contrast to NATO, that the character of a war should determine the choice of weapons and the manner of their use, rather than vice versa (the Western academic strategic heresy).

It is entirely possible, though far from certain, that the Soviet Armed Forces would execute their theater-nuclear fire plan as an immediate precursor to the Ground Forces' offensive. In this case it is more likely

SOVIET FRONTAL AVIATION AT A GLANCE

Type	Primary Role	Comments
Su-7B Fitter-A	Close air support	First deployed 1959.
Su-17 Fitter-C	Close air support/interdiction	First deployed 1974; partially successful VG development of Su-7B (export version—Su-20).
Su-19 Fencer-A	Interdiction	First deployed 1974; First Soviet aircraft since 1945 designed specifically for ground attack (VG; terrain-avoiding radar; laser designator; operating radius of 500–600 miles).
MiG-17F Fresco-C	Close air support	Phasing out.
MiG-21 PFMA Fishbed-J	Air superiority/close air support	Multirole; combat radius with minimum payload, 125 miles.
MiG-21 SMT Fishbed-K	Air superiority/close air support	As Fishbed-J, with ECM capability.
MiG-23S Flogger-B	Air superiority	First deployed 1973; at least 500 in service with FA; first Soviet VG aircraft in service.
MiG-23B Flogger-D	Close air support/interdiction	First deployed with FA in 1976; laser designator; significant ECM; and combat radius of 250 miles.
MiG-25 Foxbat-B	Reconnaissance	Vulnerable, in the future, only to the F-14 and the F-15.
Yak-28 Brewer	Close air support/interdiction	Phasing out.
Yak-28 Brewer-E	ECM escort	First deployed in 1970; first Soviet aircraft (re) designed for ECM escort duties.
An-12 Cub-C	ECM and ELINT	A development of the An-12 transport.

than not that most high-value NATO fixed targets would be struck by Scud-B and Scaleboard short-range ballistic missiles, and by M/IRBMs. The principal initial roles for FA would be preattack reconnaissance, the attack upon mobile targets (and particularly nuclear-capable weapon systems), and forward interception of NATO manned aircraft that escaped the first (missile) blow.

In the event of a Soviet decision to attempt a nonnuclear invasion—probably in the hope that a nonnuclear phase would last long enough to enable the first and second echelons of attacking armor to complete preattack assembly and breakthrough operations without nuclear attention by NATO—FA would have, plausibly, as its primary missions paralyzing NATO's C^3 and reducing NATO's means of nuclear delivery. Given the very capable organic air defenses of the Soviet Ground Forces, and the fact that those forces are still extremely artillery-heavy, the immediate necessity for FA to beat back NATO tactical air and provide close ground support should not be overwhelming.

More likely, if a good measure of tactical surprise were achieved by the Warsaw Pact offensive, Soviet FA—aside from its task of blunting the potential NATO theater-nuclear response—would be most usefully applied to isolating NATO's forward-deployed formations. A high-intensity conventional interdiction campaign against the tactical and deep rears of NATO forces could both deny (or help deny) reinforcing NATO units' access to the battlefield and, perhaps above all, help deny forward NATO forces an orderly fighting withdrawal. Fencer-As, Fitter-Cs, Flogger-Ds, and perhaps Backfire-Bs could—flying lo-lo-lo profiles—isolate the battle area and create chaos in the NATO command/communication structure. In a nonnuclear environment, it would only be the penetrating aircraft of FA that could accomplish this in a very short time-span.

It is probably true to claim that tactical airpower cannot compensate fully for gross deficiencies in the holding capacity of Ground Forces. However, Soviet military planners have to assume, prudently, that NATO's tactical air might just be capable of making the difference between victory and defeat in the first days of a war. In other words, a commitment to a fairly expansive notion of air superiority is probably dictated by analytical considerations as well as by tradition. However, as noted earlier, *the* task for FA is to facilitate the operations of the Ground Forces. It could well be sufficient for FA to be active in the counterair role early in the war, in order to reduce the NATO sortie rate and the effectiveness of the sorties that were completed. In a nonnuclear context, FA, in combination with ground-based mobile (and fixed) air defenses, could not totally paralyze NATO's tactical aviation. But, the new ground-attack capability should help markedly to reduce the NATO sortie rate—and hence the weight of firepower that NATO could bring to bear promptly upon Soviet armor and transport/communication choke-points.

FA can properly be appraised only against the background of Soviet combined-arms doctrine for the conduct of theater war, and in the context of Soviet perceptions of the theater implications of trends in the strategic balance. Just as the improvements in Soviet Frontal Aviation are an integral part of the momentum of Soviet military modernization, so the appropriate NATO response must encompass all aspects of military posture. ■

Soviet Aerospace Almanac

The Soviets take space activity seriously, especially its military applications as reflected in . . .

Soviet Space Activities in 1976

BY CHARLES S. SHELDON II

LAST YEAR, the Soviet Aerospace Almanac issue included a general review of the Soviet space program with emphasis on its military features. Since then the Senate Committee on Aeronautical and Space Sciences has published one of the most detailed reviews of the Soviet space program yet made public, a two-volume study prepared by the Congressional Research Service. This study was reviewed by Edgar Ulsamer in the December '76 issue of AIR FORCE, again with emphasis on military implications. It might now seem difficult to so quickly add much new information. Nonetheless, the momentum of the Soviet space program is such that some further discussion of its apparent scope, direction, and innovations is worthwhile.

Scope

The Soviet space program continues to develop on a broad front of regular operations and new developments, including both civil and military applications, with the military overwhelmingly dominant. Still, the civilian application is larger than the corresponding effort in the United States. The program combines unmanned and manned flight activities in both the civilian and military sectors.

An accompanying table summarizes the number of flights for 1976 and cumulatively for the entire 1957–76 period, showing figures for each major program category. The figures are for numbers of functional payloads, somewhat in excess of the number of launches, because some launches carry multiple payloads. There were ninety-nine launches in 1976, surpassing the previous record of eighty-nine in 1975. This trend, compared with the United States, is shown in the table on p. 74. The latter shows the persistent US lag in launches, which now has been with us for a full decade. In 1976, the ratio was nearly four to one in the Soviet favor. One may construe mitigating circumstances that apply to so striking a comparison, but so great a difference persisting over time and carrying so heavy a military flavor cannot but raise concerns.

The first of the tables, which gives mission categories, conveys the general sense of distribution of interests and efforts, but should be elaborated on briefly. In the military area the most important effort is in low-orbit flights that are recovered after approximately two weeks. These logically would be photographic missions, perhaps also with other sensors. Although it might seem hard to distinguish between military and civil use of the even more numerous communications satellites, indirect evidence suggests a greater variety and number of such satellites for military purposes than for civil uses.

Beyond these two categories, dominant in numbers and subdivided into many variants to meet particular needs, the numbers in a particular class of military flight are more modest. But they spread into such categories as navigation, geodesy, electronic ferreting, ocean surveillance, early warning, weather reporting, and other minor military applications that could include some kind of environmental monitoring, radar calibration, or other electronic ferreting not so readily definable. Examples of specialized subclasses among the photographic missions include such things as area search with medium-resolution cameras, maneuverable satellites presumably able to do high-resolution work and used almost certainly for order of battle intelligence (evidenced by their placement over crisis areas from time to time), ice patrol, and multispectral camera work.

Among the communications subcategories may be payloads designed to give continuous coverage over all of Eurasia at geostationary orbit; general-purpose satellites in twelve-hour inclined orbits in such numbers as to provide reliable communications at all latitudes, worldwide, or at least from equatorial regions to the North Pole; lower flying satellites in large numbers that can be used either for tactical real-time communications in any land theater or ocean, or for worldwide relay in a store-dump mode; and still another even lower orbit in smaller numbers for some kind of store-dump secure communications, perhaps for clandestine services, where time is less important than certainty.

These many unmanned military flights are coordinated with use of space stations of which several have been dominantly military, as indicated by the use of different telemetry formats and frequencies, the use of all-military crews, and flights at lower altitude. This is contrasted with the externally similar civilian space station program that includes a civilian crew member and flies at higher altitude, and whose communications are more easily followed. Both types of stations perform similar supplemental missions related to space medicine, space manufacturing, and earth resources work.

The prime mission of a station can be made military or civilian by exchanging before launch a large instrument section that slips into a recess resembling a giant ice-cream cone and is able to take solar and astronomical instrumentation, or the folded optics of a high-resolution camera system. The space stations, although designed for multiple visits by cosmonaut crews, can operate in automatic mode and return film capsules to earth while continuing their orbital missions. They can also be resupplied by automated ferries that travel from earth to the station and dock without cosmonauts being present.

In addition to these dominantly military missions, the Soviet program includes civilian communications work at geostationary orbit, and in twelve-hour orbits inclined to the equator for good Northern Hemisphere coverage. They also have weather reporting satellites and the beginnings of earth resources work, both manned and unmanned. Civilian efforts also include continuing programs to investigate particles, radiation, and magnetism in all regions ranging from near-earth space to the outer radiation belts, to the moon, and in the zone around the sun between Venus and Mars. These have been the principal ones that involve most of the countries of the Soviet political bloc, plus some additional payloads from France, Sweden, and India. Soviet civilian space work is still directed toward exploration of the moon and planets, the latter generally ambitious but ranging from highly successful to ones fraught with failures.

Resumption of the Interceptor Program

From the second half of the 1960s through 1971, the Soviet Union gave clear evidence that it was developing an ability to approach noncooperative satellites, presumably to inspect, and if need be, to destroy them. Although an apparent target was put up in 1972, no interceptor was launched against it, in contrast to the single or multiple attacks made on past targets. But in 1976, after this long lapse, the program was resumed. In February, Kosmos-803 was sent up from the Plesetsk launch site, using a C-1 launch vehicle in roughly a 600-km circular orbit. Four days later a large, maneuverable interceptor, Kosmos-804, went up from Tyuratam on an F-1-m launcher to attempt an interception. Again, in April, a similar interceptor, Kosmos-814, was flown against Kosmos-803.

In July, another target, Kosmos-839, was launched from Plesetsk, this time in an eccentric orbit ranging between 1,000- and 2,000-km altitude. Twelve days later, Kosmos-843 was launched against it from Tyuratam. Apparently, it was not successful in reaching the target and seems to have plunged into the ocean within hours of launch.

In December, Kosmos-880 had the earmarks of a target at about 600 km circular. Kosmos-885 was put into a similar orbit but at about 500-km circular. Then Kosmos-886 was put into the kind of eccentric orbit used by most of the interceptors up to 1971, which enabled it to make a fast flyby of Kosmos-880 to explode in a destruction test. At this writing, the role of Kosmos-885 remains unclear.

There is circumstantial evidence that the interceptor program has expanded to encompass more than one operating mode. Some do a near co-orbit of the target for a somewhat lingering look and shortly thereafter are destroyed by plunging into the ocean. Others assume an eccentric orbit with their perigees at the location of the target and, after making a swift pass, are exploded. This raises the question of whether one type emphasizes inspection from a lingering co-orbit, and the other destruction after a swift flyby. Since the inspection technology would seem the more difficult, time to develop better sensors might be part of the explanation for the pause in flights after 1971. Until that year, only one mission attempted a co-orbit followed by an ocean plunge. In 1976, all but one mission were of the co-orbit type.

Elaboration of Ocean Surveillance

For several years, the Soviet program has included elements that seemed to be related to ocean surveillance. Congressional testimony and published analyses settled upon an interpretation suggesting that the heavy F-1-m launch vehicle from Tyuratam was also being used to put a 4,500-kg class payload into a circular low orbit of about 250-km altitude. As performance improved, stay times in such low orbit were longer. At mission conclusion the payload would be broken into three major segments with two allowed to decay while one portion was boosted to about 1,000-km circular, where it would endure for centuries. The interpretation in the United States was that the low-flying payload conducted all-weather search with a spaceborne active radar and, at mission conclusion, a nuclear power system was moved

DISTRIBUTION OF SOVIET SPACE PAYLOADS BY PUTATIVE PROGRAM 1957–1976

(As of Dec. 31, 1976)

Possible Mission	*1976*	*(1957–1976) Cumulative*
Military Recoverable Observation	34	362
Communications	38	220
Earth Orbital Science	7	118
Minor Military Mission (which could include some environmental monitoring, radar calibration, or electronic ferreting)	7	101
Navigation and Geodesy	8	54
Electronic Ferreting	7	49
Weather Reporting	3	41
Earth Orbital, Man- or Biology-Related	3	37
Unmanned Lunar Related	2	34
Earth Orbital, Manned	4	33
Venus Related	0	23
Fractional Orbital Bombardment	0	18
Mars Related	0	16
Ocean Surveillance	4	16
Targets for Inspection	3	12
Inspector/Destructor	5	12
Lunar, Man- or Biology-Related	0	8
Early Warning	1	8
Engineering Test	0	6
Orbiting Launch Platform	14	149
TOTAL	140	1,317

to high orbit where it could gradually lose radioactivity before eventual decay in the atmosphere.

This ingenious but pat explanation began to fall apart as the sole interpretation of such activities. For one thing, some such flights, instead of coming in pairs, were single flights placed immediately in about 450-km altitude circular orbits and not moved again. This suggested a different power source and different sensor system, perhaps related to ferreting. Then to further confound the analysts, amateur observers in Europe discovered changes in the radio frequencies coming from some of the satellites of the ocean series. More of them moved fairly early to the 1,000-km so-called disposal orbit, and occasional signals were heard from the piece of what should have been nuclear powerplant debris at this final orbit. These several variations suggest the ocean surveillance program is still evolving and may have several different categories within its overall framework, which will take more time for us to understand completely.

Longer Life Reconnaissance

Over the years, the time that Soviet military observation photographic missions stay in orbit has increased. The most typical are now from twelve to fourteen days, except in times of crisis when missions may be called back in less than half that time for detailed analysis of high-resolution films.

The appearance of still another variant in this highest priority Soviet program was disclosed in 1976, and it is too early to understand it. A new series of flights began in 1975 and has continued into 1976. These flights from Plesetsk are at an inclination to the equator of sixty-seven degrees, unique in the photographic program. Most have been exploded in orbit, often a sign of special Soviet sensitivity to nearly intact landings of payloads outside Soviet territory. One of these flights was successfully recovered after twenty days in orbit. But if the flights represent merely an extension of orbital stay time, why the explosions? And why the choice of a different inclination? There is no immediate explanation.

The principal move toward longer life reconnaissance is, of course, the use of space stations of almost 19,000 kg, probably three times the weight of the regular unmanned military observation flights whose ancestry goes all the way back to the original Vostok manned flights that may even have been test beds for the military program. While the recoverable Kosmos flights stay up twelve, fourteen, or as many as twenty days, the Salyut stations can stay up for years, although needing resupply and doing more useful work with cosmonauts on board.

HISTORICAL TABLE OF SUCCESSFUL LAUNCHES TO EARTH ORBIT OR ESCAPE

(As of Dec. 31, 1976)

Year	United States	Soviet Union
1957	0	2
1958	5	1
1959	10	3
1960	16	3
1961	29	6
1962	52	20
1963	38	17
1964	57	30
1965	63	48
1966	73	44
1967	57	66
1968	45	74
1969	40	70
1970	29	81
1971	31	83
1972	31	74
1973	23	86
1974	22	81
1975	28	89
1976	26	99
TOTALS	*675	977

*US launches include four by Italy for the United States

Expansion of Synchronous Capability

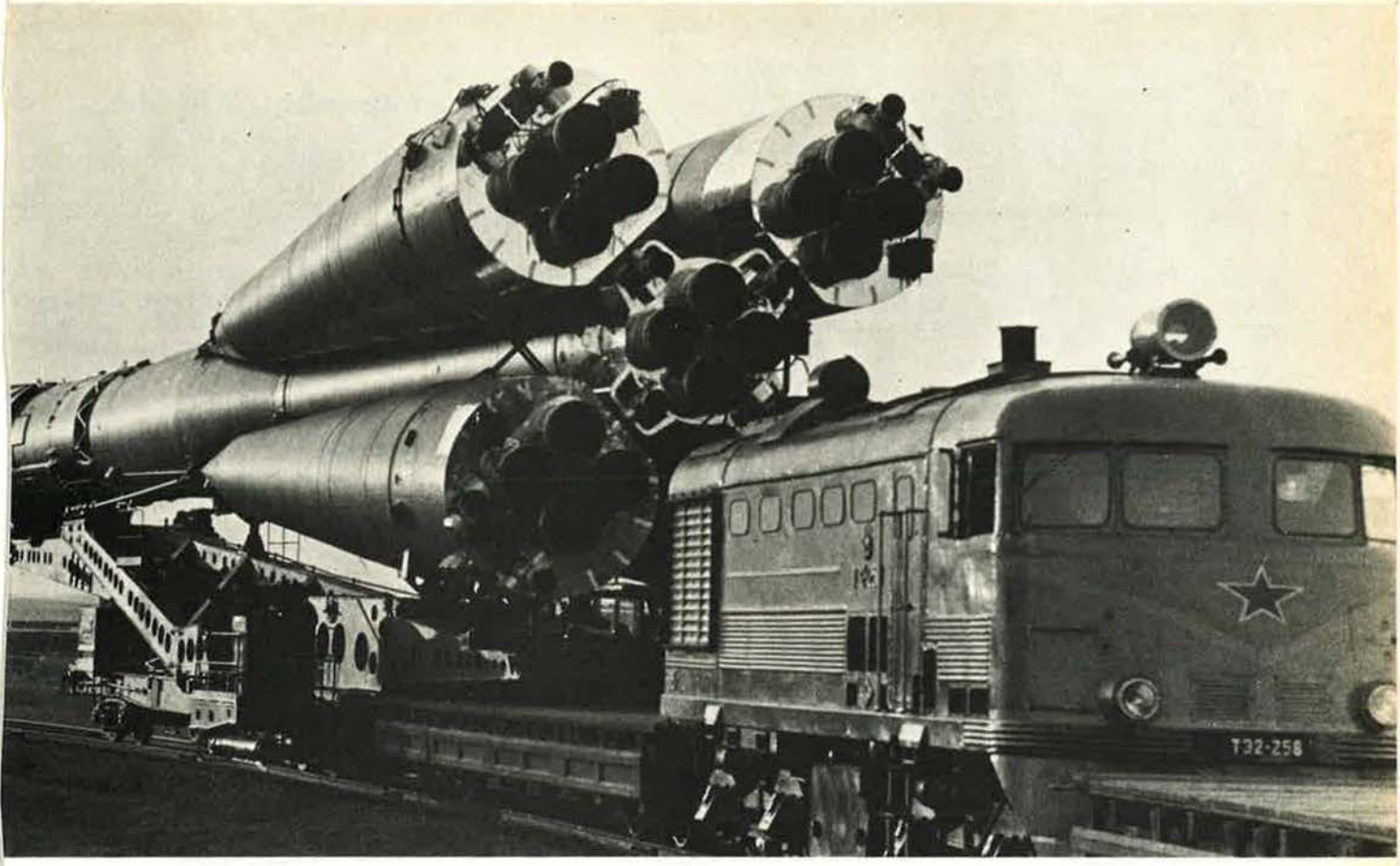
The Soviet Union has lagged far behind the United States in placing satellites in geostationary orbits, partly explained by more northerly launch sites and in part by less-developed launch capabilities. But this is beginning to change. There is public notice of intent to establish a total global system of Statsionar satellites, according to data filed with the International Telecommunications Union. As part of this system, the first location has been filled, and now replaced by satellites named Raduga. A television distribution satellite called Ekran was also placed in geostationary orbit in 1976. Just as twelve-hour inclined eccentric orbits are used both for Molniya communications and for Kosmos early-warning missions, these types have also appeared in geostationary orbit, but not yet in a comprehensive system.

Expansion of Military Molniya Flights

The original Molniya-1 series of communications flights were first placed in planes 120 degrees, and later ninety degrees, apart. These satellites were the first to provide a general-purpose domestic distribution system for television, telephone, and data links, but were superseded by the Molniya-2 and then the Molniya-3 series. One gains the impression that Molniya-2 is the mainstay of the domestic "civilian" system, and that Molniya-3 probably has a primary mission of supporting the "hot line" to the United States. Yet, strangely, the earlier Molniya-1 system thrives as never before, and most of the 1976 launches expanded as well as replaced elements in this earlier system. Now the separation of orbital planes is only forty-five degrees. This strongly suggests a recognized need to provide both greater capacity and redundancy, almost certainly in support of military uses.

A Regular Pattern in Lesser Series

With his Kettering Group, Geoffrey Perry, the English analyst, does more unclassified observation work on Soviet satellites than anyone else. During 1976, he found that virtually no Soviet military flights were put up on any basis where the orbital planes seemed random. The apogees, perigees, inclinations, and periods have almost always fallen into repetitive patterns. Now Perry has established that virtually all flights establish plane relationships that are forty-five, sixty, ninety, or 120 degrees



Being transported on special railway equipment is a Soyuz launcher, the central element of the Soviet Union's space program, both military and civil. With the February launch of two cosmonauts, manned flights continued into 1977.

apart depending on the category. This has given him a good ability to predict the plane in which particular types of new flights will fall, or when a new flight that has just occurred represents a replacement of an earlier flight. Toward the end of 1976, he found that the single payload store-dump communications satellites are not randomly placed but made up a system with 120-degree plane separation.

Expansion of Navigation Satellites

Navigation satellites have a primary role of supporting submarine navigation, but, as in the United States, they are beginning to be used more widely by other Soviet ships. They operate in the same general mode and close to the same frequencies as US navigation satellites, the frequencies of 150 MHz and 400 MHz being internationally agreed upon for this purpose. Perry and Christopher Wood in the United Kingdom have established that a third generation of navigation satellites has filled out a pattern with a sixty-degree separation, different from the planes used by the second-generation system. A lesser number of flights that often (though not always) differ in orbital altitude do not fit these planes and may be somewhat more specialized geodetic missions than the operational navigation flights.

Improvement of Weather Satellites

Although in 1975 there was one weather satellite called Meteor-2, instead of the regular Meteor designation, there are clear signs from the Soviet government that the Meteor system is being upgraded, and the new label may come into general use shortly. Last year, advanced sensors were added to some of the Meteor (1) series. Multispectral sensors not only give more weather data, but are a step toward an earth resources capability such as the United States has in the LandSat payloads. Further, during 1976, the Soviet weather satellites have moved more generally toward an APT (automatic picture transmission) capability.

Earth Resources Work

As suggested, the Meteor weather satellites are beginning to move in the direction of earth resources interpretation, at least in gross measures, which may show such things as tectonic features and moisture levels in soil. The more detailed work has come both from the Salyut space stations and from the flight last year of Soyuz-22. That flight, unrelated to visiting a Salyut space station, came shortly after Soviet cosmonauts told the press there would be no more independent flights! It carried attached to its work compartment a special six-band multispectral camera system developed by Zeiss in East Germany. The flight was at a higher inclination to cover a much larger part of the Soviet Union and the

Dr. Charles S. Sheldon II is Chief of the Science Policy Research Division, Congressional Research Service, the Library of Congress. He has prepared or directed comprehensive studies of the Soviet space program for the Senate Committee on Aeronautical and Space Sciences. The views presented in this article are his own and not necessarily those of the institution he serves.

German Democratic Republic, in the developing earth resources analysis techniques. Last November, Kosmos-867 was launched at Plesetsk and, in general, its earmarks and telemetry were akin to the military photographic recoverable program, according to Perry. However, the satellite was maneuvered upward to a somewhat higher orbit than is used for regular military programs of that type. An unmanned earth resources experiment may have been conducted, but it is too early to draw conclusions from available public information.

Joint Manned Flights

Perhaps as an offset to United States plans to carry foreign nationals in the reusable Space Shuttle, the Soviet Union announced a cooperative manned program that will carry Soviet bloc cosmonauts as well as Soviet citizens. Late in 1976, the first cosmonauts from the German Democratic Republic, Czechoslovakia, and Poland went into training at the Yuriy Gagarin Training Center near Moscow.

New Imponderables

We have already suggested several instances in which new Soviet space developments cannot be interpreted with complete assurance because they are so recent. Usually with the passage of time, and some repetition, the task of the analyst becomes easier.

Perhaps the most mystifying developments of 1976 were the twin flights of Kosmos-881 and -882. Placed in orbit by a single launch vehicle from Tyuratam at an inclination of 51.6 degrees, they were recalled just short of one orbit. Although one newspaper account tied them to the space interceptor program, there are other equally good interpretations, but none is satisfying and totally consistent. The flights could be man-related. They could even be somehow related to the FOBS (fractional orbit bombardment system) flights that ended in 1971. Interpretation depends on clues to launch vehicles and radio frequencies, which have not yet been made public.

Reusable Soviet Space Shuttle

We have not advanced in understanding the status of a possible Soviet reusable shuttle. Logic points to its being extremely helpful in so large a program, and for several years Soviet spokesmen have pointed to such a development as the only logical way to go. Further, there have been stories in trade publications, some derived from an East German magazine, that purport to give details about a wholly reusable shuttle vehicle. But the accuracy of these accounts is dubious. Until the Soviet government changes its policy, and becomes more outgoing or until long-range flights begin, it is unlikely there will be any reliable public information on this question.

Long-Term Operations With Men

Troubles have beset the delivery of cosmonauts to Salyut space stations. Most often the mechanical and guidance tasks of rendezvous and docking have been causes of failure. At other times there were questions as to whether life in the stations was comfortable, or whether the crews adapted well. In Salyut-5, the crew complained about an unpleasant odor whose source they could not find. The mission was terminated after forty-nine days.

While a crew in the civilian station, Salyut-4, was able to stay up for sixty-three days, no Soviet crew has stayed for as long as the eighty-four-day record set by an American Skylab crew. Soyuz-20, an automated unmanned resupply and biological experiment ship, joined Salyut-4 and stayed for ninety days before returning to earth. Almost certainly a ninety-day stay is a near-term goal for manned flights. As of this writing, it remains to be seen whether another crew will visit the Salyut-5 military station. Meanwhile, the civilian Salyut-4 station, launched in 1974 and now in automatic mode, was still in orbit as 1977 began.

Potential for Action With Interceptors

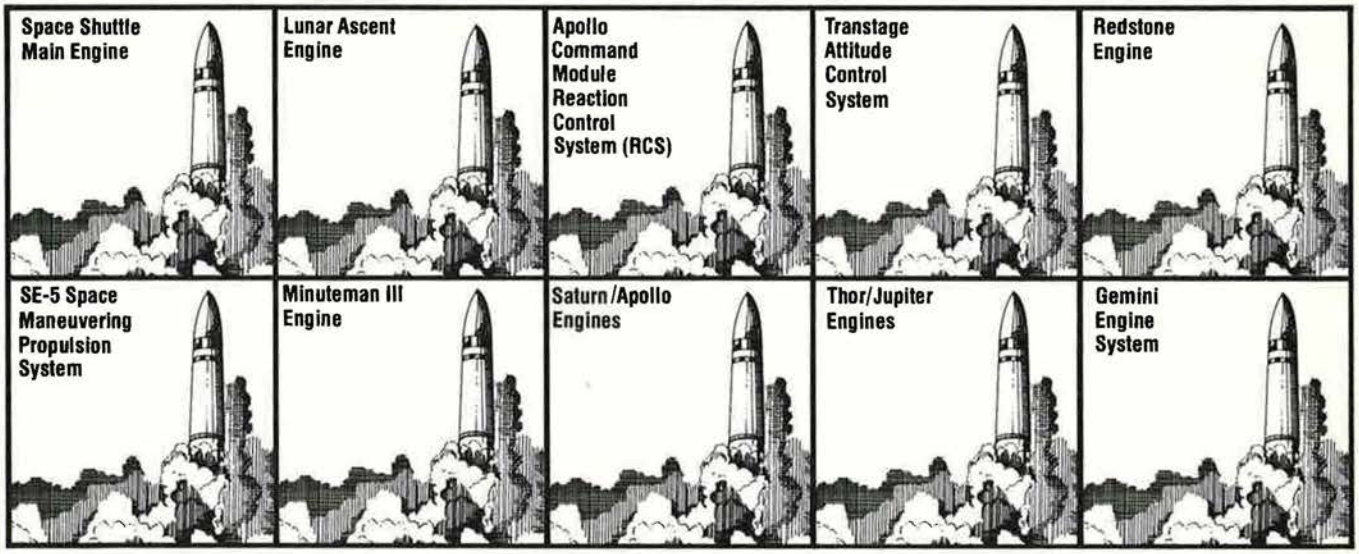
Some of the greatest concern has surrounded the reappearance in 1976 of the Soviet interceptor program. So long as the practice is confined to Soviet targets, and weapons of mass destruction are not used, there seems to be no treaty violation. But the potential for trouble is very evident. *Newsweek* magazine ran a lengthy story on military uses of space that suggested there has already been interference with US payloads either by laser beams from the earth or by satellites. Although both possibilities are significant, it is not clear that such events actually have happened. A year ago, the laser events reported in the press were denied by the US Department of Defense. Understandably, the US is interested in hardening military payloads and in making them more difficult to find. This interest has been expressed in congressional testimony and in the press.

Should it be proved that US satellites were interfered with, there would seem to be a violation of the SALT I understandings that national technical means of verification are not to be interfered with. Any large-scale attempt to blind a military space power or obstruct its communications and navigation would suggest a dangerous escalation of military moves, and present command authorities a totally new strategic situation of the utmost gravity. The perils for both sides would be so great that such a likelihood is small. Yet, the military planner must prepare for the unpleasant, and capabilities may enter into calculations of credible deterrence.

During the past year, there has been further evidence of the seriousness with which the Soviet Union regards space activity, especially in the military sphere. New questions have been raised regarding Soviet capabilities and intentions—questions that will require study and interpretation. ■

AIR FORCE MX PBPS

IF IT'S HEADED FOR SPACE, ROCKETDYNE CAN BUILD A POST BOOST PROPULSION SYSTEM TO OPERATE THERE.



We've done it time after time, after time... From its earliest days, Rocketdyne has been a pioneer in rocket propulsion. Today, we're the leading developer and producer of reliable liquid propulsion systems.

You probably know us best for powering such history-making vehicles as Redstone, Jupiter, Atlas, Navaho, Thor, Gemini, Saturn/Apollo and Lance. We are also developing the Space Shuttle Main Engine.

A nice side benefit to all this work is the reputation we've established as being a highly reliable systems supplier—developing and then delivering low-cost, high-technology systems that can be produced in quantity, on schedule, with minimal risk.

We've delivered the Main Engine for the Minuteman III Post Boost Propulsion System. And now we're ready to go to work on the next big job: to develop and deliver the Post Boost Propulsion System for the U.S. Air Force MX Program. We have the experience, the technology and the resources to do the job right. Right now.

Rocketdyne Div., Rockwell International, 6633 Canoga Avenue, Canoga Park, CA 91304.

Rockwell International

Soviet Aerospace Almanac

Size, composition, and status of the Soviet Armed Forces are state secrets. Their military structure is so different from ours that comparisons are difficult. But there are ways to measure . . .

Soviet Military Manpower

BY DAVID A. SMITH

ANYONE interested in the names, numbers, and ranks of officers in the United States armed forces need only consult the Officers Register for each of the services, published by the Government Printing Office. Data on US military strength are published in great detail, for example, in the Military Manpower Requirements Report, submitted to Congress annually.

In the USSR, virtually all data on the size, composition, status of training, and other factors regarding Soviet armed forces are a state secret. Exceptions are rare. In 1940, Stalin did publish a promotion list of generals and admirals. This was only two years after the purges, which had killed off three of the five marshals and the majority of colonels and above. He may have wanted to let the people know that some officers were still alive. In 1960, Khrushchev published a similar list, identifying approximately 300 general officers. His probable motive was to publicize the promotion of younger officers. Today, the Soviet press periodically identifies some individual officers and those promoted to the four- and five-star ranks.

During the past year, there has been considerable discussion in NATO about Soviet military manpower—the size of the Soviet armed forces, what to count, what not to count, and how the strength and quality of Soviet and US, NATO and Warsaw Pact, military manpower compare. The analysis is far from complete. Much more work must be done to confidently assess the effect of manpower dissimilarities on comparative combat capabilities.

On the surface, the problem may seem to revolve around Soviet security. It is ironic to note in that context that for three years Warsaw Pact troop data used for discussions in the Mutual and Balanced Force Reduction (MBFR) talks were furnished by the Western side, not by the Soviets. The Soviets have not yet provided data on their armed forces. But, apart from this, the Soviet military structure is so different from our own that comparisons are exceedingly difficult—even when Soviet figures are available. Some progress is being made, however.

What We Know

Numbers

In 1975, analysts reassessed the strength of Soviet military manpower. Generally accepted estimates were increased by approximately 700,000, not because it was believed that the Soviet forces had suddenly increased by that amount, but because the lagging Western analysis had until that time failed to fully assess many Soviet military functions. Most agreed that this significant increase involved command and support. The new evaluation indicated that the total size of the Soviet armed forces was approximately 4,800,000, including 400,000 in the Internal Security Troops and Border Troops. Internal Security Troops are under the Ministry of Internal Affairs (MVD), and the Border Troops and some other categories are under the State Committee for Security (KGB). The latter two organizations are considered part of the armed forces by Soviet law, but are not under the Ministry of Defense (MOD).

An estimate of Soviet military manpower derived from open sources is:

Strategic Rocket Forces	375,000
Ground Forces	1,825,000
Air Defense Forces (PVO)	550,000
Air Forces	490,000
Navy	370,000
Ministry of Defense, Headquarters Staff, various types of support troops	800,000
Total	4,410,000
Border Troops and Internal Security Troops	400,000
Total	4,810,000

(Some observers believe that effective Soviet forces should be reduced by from 800,000 to 1,200,000 to compensate for lower productivity in the Soviet armed forces and for nonmilitary functions performed by some kinds of Soviet troops, *i.e.*, Construction Troops.)

We can only generalize on the basis of these statistics, but we do know that almost all Soviet enlisted people serve for two years. Border Troops and Navy people

aboard ship serve for three. When an individual is called into military service, he might be sent to any one of the five Soviet Ministry of Defense combat services or to a special category, such as Building and Construction Troops, Civil Defense Troops, or perhaps to the Border or Internal Security Troops.

Detailed unclassified comparisons of US and Soviet military manpower are not possible because of security restrictions and limited knowledge of many aspects of the Soviet program. A few points can be made, however:

- The two systems are dissimilar in many ways, reflecting the basic differences between free enterprise and Communist systems. For example, the Soviets use military forces for such tasks as railroad repair, crop harvesting, and construction. They apparently have proportionately fewer civilians in their defense establishment, and many more military directly involved in operating R&D and production facilities.
- The Soviet reserve system does not directly relate to ours. Most of their reserves are in categories that more nearly approximate our unpaid reservists.
- Much or all of the Soviet Border and Internal Security forces are not available for use outside the Soviet Union. The large size of these forces reflects the feeling of insecurity that characterizes the Soviets. Some military units inside the Soviet Union and, as events over the last twenty years have shown, some in Eastern Europe probably are also for control of the local civilian population.
- A rough adjusted comparison on the US side includes:

Active military	2,100,000
Coast Guard	36,000
Estimate of DoD superiority over MOD in number of civilian employees	300,000
	2,436,000

Numbering about 550,000, the Soviet Union's Air Defense Forces alone are nearly equivalent in strength to the entire US Air Force.

The uncertainty suggested above is the essence of the problem of making a rational comparison between US and Soviet military manpower and capabilities. Additionally, any assessment of overall capabilities would have to include both Warsaw Pact and NATO manpower, which favors NATO.

Trends

It should be noted that the trends in numbers of Soviet military personnel over the last decade have continued to increase, even allowing for the recent reassessment:

	1965	1970	1975
Initial US estimate, including Border and Internal Security Troops	3,500,000	3,800,000	4,100,000
Reassessment			+700,000

A further word concerning Soviet military manpower trends is in order. The death, destruction, starvation, separation of families, and general deprivation associated with World War II caused the Soviet birth rate

then, and in the immediate postwar period, to be extremely low. Even at the end of the war, starvation was widespread. As a result, the number of nineteen- to twenty-two-year-olds in the early 1960s was extremely low. In fact, it was only about half what it had been in the late 1950s. The impact of the low World War II birthrate was still evident in 1965.

By 1967, the number of men reaching military age equaled that of the mid-1950s. That year, a new Uni-

Soviet troops stationed along the Chinese border could be rapidly redeployed to the Warsaw Pact area and should be considered in a comparison of US/USSR manpower.

versal Military Obligation law lowered the period of compulsory military service as previously indicated. It appears that, since then, only a small percentage of Soviet youth has been excused from military service. Demographic studies indicate that the growth of the Soviet population may now be peaking, or even turning slightly downward. Therefore, if the present percentage of youths reaching military service age continues to be called up, we might expect the total Soviet military manpower to level off, or even start decreasing in the early 1980s. The level of active military manpower could then be raised only by increasing the period of service, decreasing deferments, or by increasing the number of professional officers, warrant officers, and extended-service enlisted personnel.

There are some who hold that not all Soviet personnel in uniform should be counted, since many perform support functions for which there are no counterparts in our own armed forces or that are performed by US civilians. Others feel that all Soviets in uniform receive considerable premilitary training in the civil school system or through the huge "DOSAAF" paramilitary organization. Also, according to our current understanding, all troops receive up to six weeks of additional training in military skills after induction regardless of what duties they will later perform.

David A. Smith is Special Assistant to the Deputy Assistant Secretary of Defense (Programs and Resources). He is a graduate of the US Naval Academy and holds an advanced degree from Rensselaer Polytechnic Institute. While on active duty, he served as an Air Force technical intelligence officer and as an inertial guidance engineer. Prior to assuming his present position, Mr. Smith was a manpower analyst in several OSD agencies.

Soviet troops who appear to have no counterparts in the United States require careful analysis. At first glance, it might seem that "political officers," of whom there are thousands, should not be counted as part of the military establishment. However, most political officers are selected for Party responsibilities because they are the best officers in their units.

Construction troops, in peacetime, may dig missile silos or build hardened command posts, during which they would receive only minimal military training. Many Railroad Troops are now shown in Soviet military journals and newspapers working on the "BAM" railroad, which will provide a second route to the Pacific Coast, north of Lake Baikal. In wartime, these troops would be opening and maintaining supply routes and perhaps directly supporting the assault forces. These are somewhat similar to the US Seabees of World War II.

Border Troops and Internal Security Troops, sometimes referred to as militarized security forces, are among Soviet forces for which the US has no direct counterpart. They have sometimes been compared to the World War II German Waffen SS. Tourists entering or leaving the Soviet Union may note the green lapels and piping of the Border Troops who check their passports. Less visible are the many other Border Troops stationed along the 60,000-km border. They are armed with tanks, self-propelled guns, armored personnel carriers, helicopters, armed maritime cutters, and other modern equipment. More than once, Border Troops have been used as the first shock troops in international border clashes. Interestingly, the skirmishes with the Chinese, including the 1969 Battle of Damansky Island, were fought by the Soviet Border Troops of the KGB—not by Ground Forces troops under the Ministry of Defense. Both the Border Troops and Internal Security Troops maintain their own military schools for training officers.

Deployments

A considerable number of MOD troops are stationed along the Sino-Soviet border to the rear of the Border Troops. Other troops stationed in Eastern Europe appear to have duties akin to garrison or security functions. Some analysts think that such troops are "tied down" and should not be considered in any comparisons of the strength of Soviet and United States military manpower. However, the Soviets could rapidly redeploy elements of the forces stationed along the Chinese border Aeroflot alone, without modifying its civil air schedule now rotates Soviet troops to and from East Germany a a matter of course. Soviet military air transport, aug mented by Aeroflot, has the capability of redeployin troops to any theater.

Reserves

The 1967 Soviet Universal Military Obligation law specifies that after initial active military service all persons will be "discharged into the reserve." The same law also generally extended the length of each individual's reserve obligation. The following applies to enlisted personnel and warrant officers:

Class I (through 34 years)	Class II (35–44 years)	Class III (45–49 years)
4–6 call-ups of 3 months each	1–2 call-ups of 2 months each	1 call-up of 1 month

The Soviets do not have a system of organized reserves such as ours, although each Soviet reservist has a mobilization assignment. Judging from comments in the Soviet press, it is believed that many of those discharged into the reserves fail to conform to this call-up refresher training schedule. With the normal two-year enlistment (except for the Navy categories previously noted), somewhere between 1,200,000 and 1,500,000 are discharged into the reserves each year. Regardless of whether refresher call-ups are met according to regulations, a large number of trained men—or men who have had active service within a five-year period—are readily available. Because Soviet training is narrow and specialized, a large percentage of these reservists would probably retain a high enough level of expertise in their specialties to meet the demands of their recall assignments.

Mobilization Capability

Within the Ministry of Defense, the Soviets maintain a military commissariat system that has many functions. These officials induct, process, and separate all military personnel, coordinate local premilitary training, and maintain personnel records and a registry of all equipment (particularly vehicles) that might have military use. Military commissariats are located throughout the USSR. Most of the fifteen Soviet republics have a general major responsible for commissariat functions. The 150 *oblasts* and equivalent administrative areas normally have colonel-grade military commissars, although some of the more heavily populated areas have general officers. Most of the approximately 3,000 regions, the next lower administrative level, have military commissars ranging from major through colonel, with lieutenant colonels most prevalent. Some large cities also have their own commissars. Moscow and Leningrad, for example, have general officers. (As many as forty-five general officers have been identified at various times by the Soviet press as being involved within the commissariat system.)

What We Don't Know

In the United States, understanding of Soviet strategic weapons systems, conventional hardware, and order of battle has had priority. We have a good idea about the size and firepower of Soviet divisions, the composition of air units, and the capabilities of their aircraft.

There are other areas in which our knowledge and understanding are less complete. For example, what is the quality of Soviet military training, performance in the field, leadership? How reliable are Soviet troops? These questions are as relevant to an assessment of the military balance as are data on active-duty and reserve strength and the manpower pool.

Several types of Soviet forces are known as "elite" troops—the Strategic Rocket Forces, the Border Troops, and some units in the Group of Forces in Germany. Other Soviet elements are thought to be marginal. For example, those manning air defenses in European Russia and many troops stationed in Siberia. Furthermore, forty-year-old reserve truck drivers may perform well in certain circumstances, such as the Czechoslovakian invasion of 1968, but what about forty-year-old reservists in heavy combat? Does narrowly specialized Soviet training assure longer retention of military skills or could this narrowness reduce flexibility and initiative to the point of being counterproductive?

How long might a Soviet Air Army fight a sustained engagement against NATO forces? Staying power depends on spare parts, fuel, maintenance—a huge logistical effort that requires people with a wide range of training and skills. A great deal more study and analysis of Soviet support capabilities needs to be done before reliable comparisons can be made of Soviet and US abilities to sustain combat in a protracted conflict.

How does mobilization under the Soviet military commissariat system compare with the mobilization potential of our Reserve Forces and standby selective service? How do Soviet and US scientists and engineers engaged in military R&D compare in numbers and quality? How rapidly could Aeroflot (managed even in peacetime by active-duty Air Force generals and headed by a Soviet Marshal of Aviation) be mobilized for military duties? How efficiently could it operate at sustained high utilization rates?

We know a great deal about Soviet hardware and about some combat elements. We also have general data relevant to the Soviet armed forces as a whole. But lacking specific, detailed information on the entire Soviet military structure—especially in the areas of command, training, and support—an accurate assessment of the impact of manpower asymmetries on the US/Soviet balance is doubtful. Are we overestimating or underestimating the USSR's capability for sustained combat?

For the long-term, trend data must be generated. Point-in-time comparisons of manpower and dollars/rubles are interesting, but of limited value unless we also know the trends in these data. Recently, both Soviet manpower and rubles allocated to defense have been increasing. Better understanding and higher confidence in assessing these trends are needed. How good are the numbers? How significant are the trends?

In the final analysis, we are trying to perceive the capabilities of the Soviet military forces and the intentions of the Soviet leadership. To do this with reasonable confidence, a more complete understanding of Soviet military manpower is essential. ■

Soviet Aerospace Almanac

Today's Soviet conscript is healthier, better educated than his father was in World War II. He's well equipped, with a high level of combat readiness . . .

The Soviet G. I.

BY COL. FREDERICK C. TURNER, USA

HOW TALL are the Russians?

My knowledge is based largely on five and a half years of daily eyeball-to-eyeball contact with (as the Soviets categorize them) soldiers, sergeants, warrant officers, officers, and generals of the Soviet Tactical Forces. This included two tours of duty, one in the 1960s and one in the 1970s, when I served with the Group of Soviet Forces in Germany.

Literally, the Soviet Russians average about 5′ 6″ in height, which meant that I was usually looking down on them. Beyond that generalization, the Soviet Russians I know range from crude peasant dwarfs to impressive, well-educated, and dedicated seven-footers.

Let's first look at the Russians to appraise the strengths and weaknesses of the man behind the Soviet weapon. The Soviet conscript, who represents about eighty percent of the Soviet Armed Forces, is first of all a healthy, reasonably well-educated youth of eighteen or nineteen who harbors few illusions regarding what life has to offer him in the way of material comforts. He accepts two years of service without really expecting any alternatives. Thus, he has the making of an obedient soldier who will carry out the orders he is given, with little complaining or deviation. He is not happy. But happiness is not a Russian trait, and the Soviet soldiers, particularly in the Group of Forces outside the USSR, are living proof of Dostoyevski's maxim that misery is just as important in life as is happiness.

One of my first questions, on joining the Soviets in 1963, was why no Soviets below officer rank could be seen wearing glasses. The first answer came from a Soviet colonel, who informed me that the Soviets were not genetically weak like the degenerate Western capitalists, and that their vision, both real and political, was unimpaired. I discarded this out of hand as a sequel to the Hitler "master race" line and decided it must be that many of the Russians were walking around unable to see their hands in front of their faces.

Shortly thereafter, on a trip to the Soviet Union for the Glorious October Socialist Revolution Parade (November 7), I found an answer. Indeed, considerable numbers of Soviet soldiers wear glasses, but they seem to be concentrated in the apparently endless number of engineer construction and other service units in the Soviet Union. The Soviet tactical forces, and in particular the Groups of Forces outside the USSR, are furnished conscripts who need no visual correction. In the US, this would present a problem. But thus far in the USSR, perhaps because of the rural peasant heritage, a much smaller percentage of the population than in the US has to wear glasses.

Just as visual acuity presents no significant limitation to the Soviet Armed Forces, likewise the design of tanks to carry crewmen of 5′ 6″ or less is really no problem. I once asked a Soviet general if it were not a problem having to screen out those over 5′ 6″ from tank crew duty. He replied with apparent honesty that there were not that many Soviets over 5′ 6″ and that if one were over 5′ 6″, he would probably be needed for something else—such as a unit basketball team. Although he said this partly in jest, it does reflect the fact that six-foot-tall Russians are not numerous, and among the minorities in the Soviet Union (Georgians, Tadzhiks, Kazaks, etc.) they are even harder to find. The typical Russian conscript is short and thin, although the Soviet officer blossoms in girth about the time he reaches field grade—one would assume because of genetic background and eating habits rather than as a result of promotion.

Educationally, the Russian *is* growing taller. Most of the conscripts have completed high school, a ten-year school system starting at age seven and ending at age seventeen. In any case, the Soviet conscript of today is a far cry in educational stature from his father of World War II, or the "Great Patriotic War," as the Soviets call it.

In 1967, the Soviets cut the conscription term for the Army from three to two years. On one occasion I had an opportunity to speak with Army General Viktor Kulikov, who at that time was the Commander in Chief of the Group of Soviet Forces in Germany to which I was accredited and who now is a Marshal of the Soviet Union and Commander of the Warsaw Pact Forces, the second highest post within the Soviet military. I asked him about the effect on training of the cut in service time. After first discharging some ideological baggage, he said—probably correctly from what I have since observed—that in the past, the educational level had not been high enough and it had been necessary to spend about one year out of the three educating the conscripts so that they could be effectively trained to use their equipment. There is probably more truth here than meets the eye, and this is one area in which the Soviet Russian *is* getting taller by the year.

In World War II, the soldier conscript was the product of a rural environment with a peasant background, a true son of the land. He was almost without peer as a defensive soldier, and was an excellent night fighter, being used to the dark and the land. He was also a

tenacious defender whose mastery of camouflage and digging into the ground made him extremely difficult to dig out—once he had a will to stay.

The Soviet conscript in the 1970s is not the conscript of World War II and, in many ways, not a chip off the old block. Temperamentally, the Russian, like the bear with whom we often associate his country, is still deliberate and plodding, lacking spirit but not curiosity. He comes not from a rural collective and a peasant background as often as he does from an urban environment and a worker's family. The peasant is being replaced by the worker and the tenacious defender is, in turn, being replaced by the mechanized warrior, who is much better educated than the Soviet conscript of thirty-five, twenty, or even ten years ago. The ability as a night fighter and dug-in ground defender has declined, and it is probably not a coincidence that Soviet tactics have moved away from defense and night attacks.

However, the net result of the change has probably made him grow in stature and capability. He is much better educated by the urban schools. Trucks being the lifeblood of the Soviet economy, he is acquainted with driving and maintaining vehicles. He is taught that the best defense is a good offense—an offense based largely on tanks, other vehicles, missiles, and sophisticated technology that he is now much better able to handle. In any case, the 5′ 6″ conscript in 1977 is being inculcated with an offensive mission and armed with offensive equipment.

The Soviet soldier, whether conscript or general, is a member of a collective from birth to death—the great socialist experiment in togetherness. The individual Soviet soldier found on the road at night, perhaps standing guard as a traffic regulator to guide the vehicle column in a certain direction, is a lonely, cold, frightened kid of eighteen or nineteen.

In East Germany, he finds himself in a foreign land, an enemy land. In general, Germans are still hated and feared, although Soviet propaganda does try to distinguish, without much success, between the East (good) Germans and the West (reactionary, revanchist) Germans. The soldier cannot speak the language, or even recognize the letters of the alphabet. Since maps are classified material that only officers are allowed to handle, in most cases the soldier has no idea where he is or of any master plan for movement. Even if he got to a phone, he wouldn't know where to call or even how to use the German phone system. Essentially, he is "of short stature" when placed on his own. Initiative is not favorably regarded. There might be a thin line between initiative and questioning the party line, or the movement or operational directive that must be carried out at the time, place, and manner as specified and without deviation.

A junior officer and a sergeant (rear) instruct conscripts.

Col. Frederick C. Turner is a graduate of The Citadel and holds a master's degree from Middlebury College. An armor officer, Colonel Turner served for five and a half years as a member and as Chief of the US Military Liaison Mission to the Commander in Chief, Group of Soviet Forces in Germany. He is a graduate of the US Army Institute of Advanced Russian Studies, the Command and General Staff College, and the Army War College, where he now serves as Director of Foreign Capabilities Studies. This article is based on a presentation Colonel Turner made last fall to the annual meeting of the Association of the United States Army (AUSA).

The product of a collective and with the experience of the ultimate in togetherness, the Soviet youth learns early in life to engage brain before engaging mouth, or to be prepared to pay the consequences. He learns that decision-making and initiative come with positions of responsibility and power. He learns to keep his mouth shut and his opinions to himself, other than what he can parrot back. This training makes it possible for all thirty tanks in a Soviet tank battalion to use a single radio net. Only officers are authorized to use the radio, and normally only the battalion and company commanders will talk, except in an emergency. This is adherence to a system in which everything comes down from the top. This is the same society in which only a few of the gas masks for civilian defense have talking diaphragms in the mouthpieces. It is accepted that those with power and responsibility will do the talking, and those not in the vanguard of the proletariat are to listen and carry out instructions.

From my vantage point, the strength of the Russians that, figuratively, makes them seven feet tall is due largely to their equipment and their combat readiness, even more so than their number, which is also impressive. The Russians subscribe to that old adage of Confederate Gen. Nathan Bedford Forrest, "git thar fustest with the mostest." The Soviet troops are well trained in the technical use of their equipment, particularly the crews assigned to heavier weapons, communications, bridging, etc., but most of all in movement. First priority is given to movement and proficiency, particularly with crew-served weapons, and second priority to tactical employment.

In sum, I am concerned that the Russians, largely through technological sophistication, are getting taller, and the US really has no choice but to match or pace their growth in certain key areas and see that they do not outlap us in others. We can never match their rapid mobilization and recall capabilities. We cannot afford to be manpower-intensive to the extent of matching them man for man—nor do we need to if our troops are well trained, well armed, and obviously ready and willing to fight. However, on weapon systems R&D, on adequate and accurate strategic systems, and on high-quality, modern, general-purpose equipment, we must also stand tall—at least as tall as the Russians. ■

Soviet Aerospace Almanac

Converting the defense expenditures of one superpower to the currency of the other presents serious methodological problems and can lead to faulty conclusions. More accurate guides for policy formulation are the implications of . . .

Trends in Soviet Military Spending

BY WILLIAM T. LEE

Which of the two superpowers spends the most for defense?

For a variety of reasons, superpowers buy many kinds and quantities of weapons and other goods and services that are not directly comparable. One way to make these differences comparable is to translate them all into a common denominator. In our case, this is the money expended to equip and run the respective military establishments of the US and the USSR.

Using money as the standard common denominator, however, immediately poses other questions. In the coin of which realm? Shall we compare in dollars or in rubles, or both? And how will the choice of currencies affect the comparisons?

It has been pointed out that if we were to buy and operate the Soviet weapons inventory at US prices, to put as many men into uniform and compensate them at US pay scales for volunteer forces, and conduct comparable R&D programs, we would then have to spend many more dollars on defense than now. Such claims have engendered critical comment on how meaningful it is to make a comparison in dollars. Some critics argue that using dollars makes the Soviet military appear larger than it really is. If rubles were used instead, the US would appear to be making the larger investment.

Most agree, however, that the rate of growth of Soviet military expenditures over the past fifteen years has been less than the rate of growth of the Soviet economy as a whole. At the modest long-term growth rate of three percent per annum most often mentioned, Soviet defense spending may have grown faster than US expenditures in constant dollars. Nevertheless, if one accepts three percent per annum as the growth rate for Soviet defense outlays, defense has fallen in Soviet national priorities because the overall rate of economic growth, although declining, has averaged more than five percent per annum in the same fifteen-year period.

This article has four objectives. First, to provide an explanation of the problems involved in trying to compare superpower military establishments in the coin of either realm. Second, to argue that more will be learned by comparing the trends and composition of military expenditures in the coin of each superpower than by trying to translate both into dollars or rubles. Third, to compare the priority given to defense expenditures in the US and the USSR. Fourth, to compare the composition of defense expenditures in both superpowers.

Why Compare US and Soviet Defense Expenditures?

Expenditures for military establishments are one basic dimension of any comparison of superpower defenses. First, how a nation spends its money tells us something about its policy objectives. When accurately measured, changes in defense expenditures are good indicators of a nation's objectives.

Second, over a period of time, trends in expenditures tell us something about trends in a nation's priorities. In the US, debate over our priorities in recent years has centered on how the US budget is divided among defense, social, and welfare programs, improving the environment, public transportation, and so on.

Similarly, we allocate our gross national product among the three basic "end uses" of consumption, investment, and defense. Trends in our national budget and in apportioning our GNP tell us a great deal about our national priorities.

The same is true of the Soviet budget and national income. The latter differs from GNP by the exclusion of most personnel services, but Soviet GNP can be roughly approximated from published Soviet data. In analyzing trends in Soviet national priorities among consumption, investment, and defense, it does not matter much whether one uses Soviet national income or estimates of Soviet GNP as long as the data are reasonably reliable and consistent.

It is often argued that defense expenditures are a heavy burden on the US economy even when their share of GNP is down to five or six percent compared to about ten percent a decade ago. But what is the burden of defense on the Soviet economy? As we shall see, it is more than twice the US burden in terms of its share of GNP. But this is a crude measure. The real measure in both superpowers is the "opportunity cost." That is, what the US and USSR give up in investment or con-

sumption, or in some combination of the two, to support a given level of defense expenditures. Unfortunately, we do not have good estimates of the Soviet opportunity cost. The analytical tools, or at least some of them, apparently exist, but they have yet to be used.

Trends in national priorities and even crude measures of the burden provide insight into the political utility a nation ascribes to military power. If defense priority is low and the burden light, the political utility ascribed to defense is likely to be low, unless some exceedingly fortuitous political and economic conditions make military power unusually cheap. But, under the best of conditions, powerful defense establishments are never free. If a country's defense establishment is expanding at a rising share of GNP (or national income), it seems reasonable that the national decision-makers must ascribe considerable political utility to military power.

Measuring the magnitude and trend of defense expenditures, therefore, is one of the dimensions needed to analyze a country's objectives, national priorities, defense burden, and perceived political utility of military power. Comparable measures are required for international comparisons. Let us first examine a few of the salient methodological problems.

Some Methodological Issues

It is not uncommon to hear that the Soviets are "spending" this or that many billions of dollars for defense. Whether US expenditures are discussed in the same way in Moscow is unknown. Keep in mind, however, that domestic expenditures are made only in domestic currencies both in Washington and in Moscow. Rubles can be converted to dollars, and vice versa, but the data are fraught with many uncertainties and the results should be used cautiously. For policy analysis, we should confine the discussion to expenditures in the domestic currencies of both countries.

Ideally, comparisons of US and USSR defense expenditures, and their major components, would be measured in rubles and dollars four ways:

- USSR defense spending in rubles;
- US defense spending in dollars;
- USSR defense outlays converted to dollars; or
- US defense spending converted to rubles.

In practice we have only the first three measures. Data required to price US procurement and RDT&E in rubles are lacking. The CIA has attempted to compare "defense" expenditures of both superpowers in rubles and has found Soviet expenditures to be from ten to about thirty percent higher. But no details of data or methods used have been released. CIA testimony before Senator Proxmire's Subcommittee on Priorities and Economy in Government indicates that these are very preliminary calculations. Nevertheless, they have important implications. But let's discuss the methodological problems further before returning to this point.

When we convert goods and services produced by one superpower into the monetary values of the other, we seek the cost of replicating one country's basket of goods in the other country. For example, we replicate the cost of a Soviet missile when produced by the particular combination of capital, labor, and management engaged in producing missiles in the US. Thus, we attempt to translate Soviet outputs into comparable US outputs in dollars. Conceptually, we may do this either by pricing out the Soviet missile directly in dollars, or by applying an appropriate ruble/dollar conversion ratio if we know the ruble price.

When we seek the comparable value of USSR output in US prices, we are adjusting for the differences in the level of productivity in the two countries. The Soviet basket of goods valued at US prices reflects US productivity. However, using US prices introduces a basic ambiguity. Those prices represent the cost of producing US goods. If the US actually produced Soviet (or some other) goods instead, US prices would be different from the goods the US actually produced. Technologically less sophisticated goods generally cost less, and small buys usually have higher unit costs than do large buys. The same argument applies to valuing a US basket of goods in Soviet prices if we were in Moscow.

Given that the estimate of US dollar costs to replicate the Soviet defense establishment exceeds what we are spending on defense, the conventional wisdom is that costing the US establishment in rubles would yield a larger number than the Soviets are spending on defense. This is the so-called index number effect. The relative costs depend on whose prices you use.

But the military establishments of the US and the USSR represent a special case that confounds the conventional wisdom in one sense and confirms it in another. To better understand this, let's take a somewhat oversimplified version for starters. Assume that both the US and the USSR purchase only ten defense goods and services. These are identical on both sides, but each side purchases different quantities. Five of the ten are purchased in larger quantities by the US and the other five by the USSR. Because prices tend to correlate negatively with quantities, the conventional wisdom holds. Which country is the bigger defense spender depends on whether you are in Moscow or Washington.

The actual situation is a bit different. The USSR is buying more of all ten goods, or at least nine of the ten. Under these circumstances it doesn't make any difference where you are. The USSR is the bigger spender regardless of whether you price in dollars or in rubles.

Now for the paradox. The USSR buys more of most everything. But "everything" here really means *only* those things that are within the state-of-the-art in both countries. The US buys high technology weapons that the USSR does not buy because such advanced weapons often are still in the laboratory stage in the USSR.

To illustrate, what would it have cost the US to have produced a Minuteman III missile in 1960, in 1965, and in 1970? In 1960, one Minuteman III missile could not have been produced for all the GNP of planet earth. By 1965, the GNP of the US *might* have purchased one overweight Minuteman III. Yet by 1970 the US was able to start volume production of Minuteman III missiles at several million dollars per copy.

Now consider assigning ruble prices to US weaponry that is not within the Soviet state-of-the-art. Assign all the rubles there are and there still won't be enough. But stick around a few years and the Soviets will probably be turning out much larger quantities than the US.

Finally, we know that the USSR has about twice as many men in uniform as does the US, but comparing military manpower costs presents its own difficulties. Among them is the disparity between the pittance paid to Soviet conscripts and US volunteer pay; whether to value manpower at Soviet or US pay scales, in dollars or rubles; uncertainty as to which establishment uses more civilian employees; differences in tax structures and consumption patterns; and opportunity cost.

Perhaps the least bad solution here would be to show defense costs in the two countries with military manpower valued at going pay scales and at opportunity cost, as best that may be approximated. The consequences for total defense expenditures (in dollars or in rubles) would be explicit, and the US critics would have to find something else to complain about.

Another alternative would be to drop, or at least deemphasize, the whole business of trying to say how much it would cost the US to purchase the Soviet defense establishment in dollars, and vice versa. If people would concentrate on how much each superpower is spending in its own currency then we could legitimately talk about expenditures instead of simulated costs, to say nothing of the problems peculiar to converting one currency to another. Plenty of realistic and meaningful problems would remain, such as:

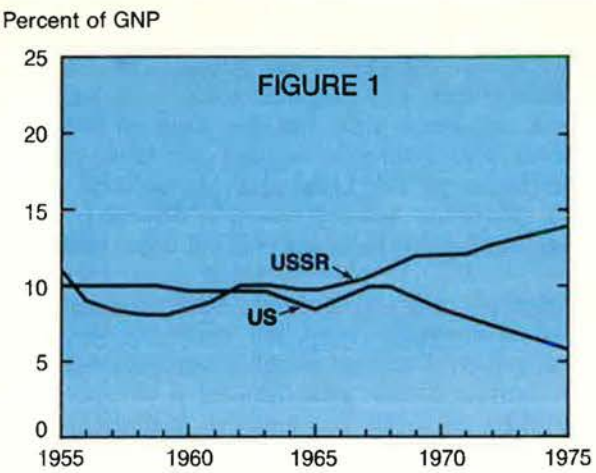
- How much do the Soviets spend in any given year?
- What is the trend in Soviet expenditures over time?
- What share of their budget, national income, and GNP do, and will, the Soviets devote to defense?
- How do the Soviets apportion their defense expenditures among personnel costs, operations and maintenance, procurement, and RDT&E?
- How do Soviet trends in national priorities and expenditure compare with US trends and proportions?

To answer these questions we need to know how much the Soviets are spending in rubles.

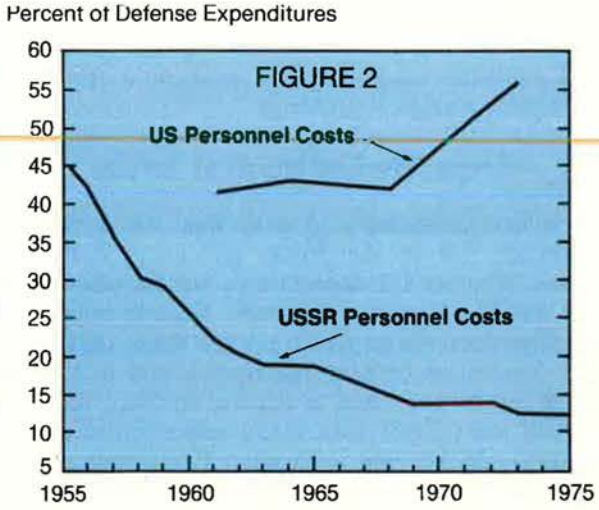
Comparative Trends in Defense Expenditures

The military establishments of the two superpowers are similar in some respects but strikingly different in others. One of the most evident differences is in nuclear doctrines and strategies, which have been almost complete opposites since the mid-1960s. Perhaps not coincidentally, the priority each superpower has given to defense also has grown increasingly disparate since about the same time. Concurrently, the structure of defense expenditures in the two superpowers has become strikingly dissimilar, as shown in Figures 1 through 3.

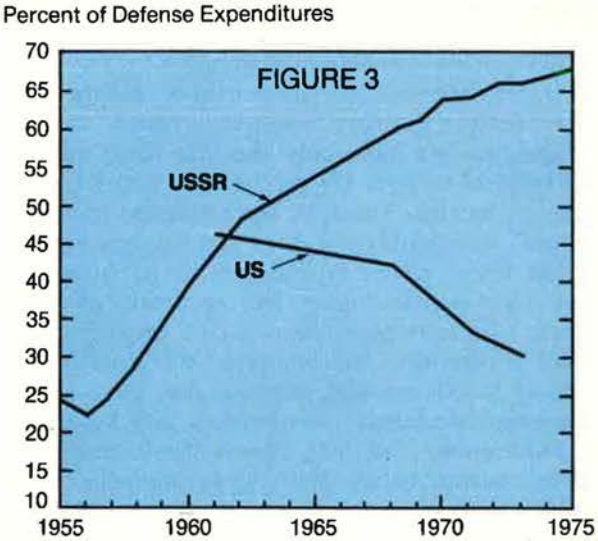
In 1955, the USSR allocated about eleven percent of its GNP to defense (including space). The share declined to about eight percent in 1958 and then began to rise with the adoption of Khrushchev's Seven-Year Plan (1959–65). Currently, Soviet outlays for defense and space have reached fourteen to fifteen percent of USSR GNP and apparently will rise to about seventeen or eighteen percent in 1980 if the current Five-Year Plan proceeds as scheduled. These shares represent direct costs of maintaining the forces and (probably) most military assistance. They do not include pensions, most premilitary training and civil defense costs, na-



Trend In Share of GNP Devoted to Defense in the US and USSR



US and USSR Shares of Defense Expenditures Devoted to Personnel Costs



US and USSR Shares of Defense Expenditures to Procurement and RDT&E

William T. Lee is a leading authority on Soviet defense economics. Following more than a decade as a CIA specialist in Soviet affairs, he was a member of the Stanford Research Institute from 1964 to 1972. He now is a consultant to several government agencies and to Systems Planning Corp. Mr. Lee is the author of Soviet Defense Expenditures 1955–1975: An Unconventional Approach, *and has contributed articles on Soviet military affairs to a number of US publications.*

tional strategic stockpiles, and other indirect economic effects such as dispersion of USSR industry or other means of reducing vulnerability.

In terms of Soviet national income, which excludes many services counted in GNP, the trend has been the same. The shares have been a bit higher because of the differences in the two measures. The Chinese evidently have acquired some data on Soviet defense expenditures as a share of national income. According to the Chinese, the share was 13.1 percent in 1960, 17.1 percent in 1970, and about twenty percent in 1975. These Chinese data are quite consistent with the estimated trends as presented above.

During 1955–68, US national priorities were similar to those of the USSR. About ten percent of US GNP was spent for defense during 1955–63. The declining trend in 1964–65 was arrested until 1969 by the Vietnam War. Subsequently, defense has declined steadily in US national priorities from about ten percent to five or six percent of GNP. From about one-half of the US federal budget in 1960, defense declined to less than thirty percent in Fiscal 1976. Since the late 1960s, the trend of defense in US and USSR national priorities has been as asymmetrical as their national military strategies.

Even more diverse trends are evident in the structures of defense expenditures as shown in Figures 2 and 3. In 1955, roughly forty-five percent of Soviet defense outlays went for manpower, while in Fiscal 1961 manpower accounted for about forty-two percent of the US defense budget. But the cost of a volunteer force has driven the US manpower share to nearly sixty percent (including retirement costs). Conversely, the USSR spends less than fifteen percent (excluding pensions) on manpower.

In the US, procurement and military R&D have declined from about fifty percent of defense expenditures in 1961 to about thirty percent currently. In the USSR, procurement, R&D, and all space programs accounted for about thirty percent of Soviet outlays in 1955 and about fifty percent in 1965. Currently, procurement, military R&D, and all space programs account for as much as two-thirds of total Soviet outlays for defense and space.

Ideally, we should also compare trends by branch of service and by major mission. Aside from institutional differences posed by such USSR branches as Strategic Rocket Troops and National Air Defense, which have no direct counterpart in the US, the methods used to estimate these trends in Soviet defense and space expenditures do not provide estimates by branch of service or military mission. These estimates can be provided by the direct costing approach. Direct costing estimates recently have been revised upward by a factor of two, but still underestimate the rate of growth in Soviet defense outlays by factors of two to three, primarily because this method does not capture the full cost of technological innovation. Moreover, even space-age intelligence collection systems cannot identify all inputs to operating and maintaining the Soviet military establishment. Until these defects are corrected, direct costing estimates of Soviet defense expenditures by branch or mission may not be accepted as plausible.

It has also been argued that most of the increase in Soviet defense expenditures over the past fifteen years has been due to the buildup in Soviet forces facing China. If the conventional wisdom that about a three percent annual growth rate in total Soviet defense expenditures since 1960 were correct, this argument might have some credence. The cost of expanding and modernizing Soviet ground and air forces facing China has not been trivial, although it alone probably would not have accounted for even a three percent annual growth rate. After all, only about one-quarter of Soviet ground forces are stationed on the China border. The proportion of Soviet tactical air forces stationed there may be similar, and presumably some Soviet strategic missiles are targeted on China. Nevertheless, all such Soviet forces devoted to the Chinese threat will not begin to account for the eight to ten percent annual growth in Soviet defense expenditures observed since 1958. Rather, the principal cause, under both the Khrushchev and Brezhnev-Kosygin regimes, has been the cost of forces deployed against NATO and the US.

Implications

All these numbers and percentages have political and policy implications. First, it is evident that changes in Soviet political leadership have had little effect upon trends in Soviet defense expenditures. The most rapid growth rates were in 1958–63 under Khrushchev and in 1966–70 under Brezhnev-Kosygin. Secondly, it is difficult to see how such a long-term trend could have been maintained without a fairly broad consensus within the ruling elite that all these rubles for defense were worth it. Third, the rise in Soviet defense expenditures, both relatively and absolutely, over the past two decades reflects the economic cost of the growth in Soviet military capabilities. This is also evident from the number and capabilities of the new Soviet weapons.

Fourth, the Soviets evidently are serious about their long-standing goal, first publicly stated in 1961 and often reiterated, of "quantitative and qualitative superiority" over the US and its allies. The Soviets still have quite a way to go on the qualitative aspect, but they have made a good deal of progress in the last twenty years and they are still trying hard. Fifth, the Soviets have a lot to gain from trade, credits, favorable prices for grain, and, most importantly, technology transfer.

Without question, the Soviets do not use everything they get very efficiently. Nevertheless, it is difficult to see how they could keep up the drive for "quantitative and qualitative superiority" over the US and its allies were it not for the economic benefits of what we call "détente," or what the Soviets call "peaceful coexistence." This, in their view, has been forced upon the US by the growth in Soviet military and economic power. ■

Gallery of Soviet Aerospace Weapons

Again this year, the Gallery has been prepared exclusively for AIR FORCE Magazine by John W. R. Taylor, the British authority on aerospace systems. Completely revised, it contains much new information on Soviet planes and missiles. Some specifications are necessarily estimated or approximate. British spelling and usage have been retained throughout.

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

Bombers and Maritime

—TASS PHOTO

Beriev M-12 (NATO 'Mail')

Beriev M-12 (NATO 'Mail')

About 100 of these twin-turboprop maritime patrol amphibians were built for shore-based service with the Soviet Naval Air Force. Deployment to operational air bases of the Northern and Black Sea Fleets began at least ten years ago, and a few M-12s were reported to be flying over the Mediterranean from Egypt before the departure of Soviet forces from that country. Equipment for over-water search includes radar in a nose 'thimble' and a MAD (magnetic anomaly detection) tail-sting. The fact that M-12s hold all 20 records for turboprop amphibians currently recognised by the FAI, as well as all 14 records for turboprop seaplanes, emphasises both the efficiency and uniqueness of their design.

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

Dimensions: span 97 ft 6 in, length 102 ft 0 in, height 22 ft 11½ in.

Weight: gross 65,035 lb.

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

Accommodation: crew of five.

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

Ilyushin Il-38 (NATO 'May')

Soviet counterpart to the US Navy's P-3 Orion, this shore-based anti-submarine/maritime patrol aircraft was evolved from the familiar Il-18 turboprop airliner. Fewer than 60 are thought to be operational at present with naval units covering Atlantic and Mediterranean waters; but production continues, with India as the first export customer for

three. Compared with the basic airliner, the Il-38 has a lengthened fuselage containing few windows, an internal weapon-bay, MAD tail-sting, and a large radome under the forward fuselage. The wing had to be moved forward to cater for the effect of internal equipment and stores on the CG position. No defensive armament is fitted.

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.

Myasishchev M-4 (NATO 'Bison')

Twenty-three years have elapsed since this Soviet counterpart of the USAF's B-52 Stratofortress took part in its first flypast over Moscow, on May Day 1954. About 35 still serve nominally as bombers with Dalnaya Aviatsiya, the long-range air force; more significant are the 50 M-4s that have been converted into tankers for in-flight refuelling of the other bombers of this force, including supersonic 'Backfires'. Even the maritime reconnaissance versions may switch to tanker duties now that 'Backfires' are operational also with the Naval Air Force. The three major variants of the M-4 have the following NATO reporting names:

Bison-A. Basic strategic bomber, with single nuclear weapon in internal bomb-bay and armament of ten 23 mm guns. Now deployed primarily as tanker with internal hose-reel unit.

Bison-B. Maritime reconnaissance version, first reported in 1964. 'Solid' nose radome instead of glazed nose of 'Bison-A', with large superimposed refuelling probe. Underfuselage blister fairings over electronic equipment. Forward portion of centre bomb-bay doors bulged. Upper and lower aft turrets deleted, reducing armament to six guns.

Bison-C. Generally similar configuration to 'Bison-B', but with large search radar faired into lengthened nose, aft of centrally-mounted refuelling probe.

(Data for 'Bison-A' follow.)

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

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

Weight: gross 350,000 lb.

Performance: max speed 560 mph at 36,000 ft, service ceiling 45,000 ft, range 7,000 miles at 520 mph with 10,000 lb of bombs.

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

Tupolev Tu-16 (NATO 'Badger')

As long ago as July 1955, a formation of 54 Tu-16s took part in an Aviation Day flypast over Moscow; yet nearly half of the 2,000 thought to have been built are still operational, in the following six variants:

Badger-A. First Soviet strategic jet bomber. Crew of seven. Glazed nose, with small undernose radome. Armed with seven 23 mm guns. Nearly 500 equip medium bomber squadrons of Dalnaya Aviatsiya, a few as tankers for wingtip-to-wingtip flight refuelling. Nine supplied to Iraq. About 60 built in China since 1968.

Badger-C. Anti-shipping version, first shown in 1961 Aviation Day flypast, with 'Kipper' winged missile carried under fuselage. Wide nose radome, in place of glazing and nose gun of 'Badger-A'. Total of about 150 'Badger-Cs, Ds, Es, and Fs' believed active with Soviet Naval Air Force.

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'). About 275 serve with anti-shipping squadrons of the Soviet Naval Air Force; others are included in the 25 'Badgers' supplied to Egypt as replacements for aircraft lost in the Yom Kippur War of October 1973. *(Data for 'Badger-A' follow.)*

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

Dimensions: span 110 ft 0 in, length 120 ft 0 in, height 35 ft 6 in.

Weight: gross 150,000 lb.

Performance: max speed 587 mph at 35,000 ft, service ceiling 42,650 ft, range 3,975 miles at 480 mph with 6,600 lb of bombs.

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')

First operational Soviet supersonic bomber, the Tu-22 was intended to spearhead the strategic attack force, carrying a 37 ft long air-to-surface missile (NATO 'Kitchen') semi-submerged in its weapons-bay. Western observers at the 1961 Aviation Day display in Moscow, where the aircraft was first shown in public, overestimated its performance and potential. In fact, the Tu-22 proved incapable of fulfilling a strategic role. Production was limited to around 250 aircraft, of which about 65 were transferred to the Naval Air Force for maritime reconnaissance and to help protect the sea approaches to the Soviet Union, from bases in the Southern Ukraine and Estonia. In addition to the main versions listed below, a missile-armed long-range interceptor variant has been reported, as a replacement for the Tu-28P.

Blinder-A. Basic reconnaissance bomber, with fuselage weapons-bay for free-fall bombs. About 12 sent to Libya.

Blinder-B. Similar to 'Blinder-A' but able to carry air-to-surface missile (NATO 'Kitchen') semi-recessed in underfuselage. Larger radar and partially-retractable flight refuelling probe on nose.

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 17 ft 0 in.

Weight: gross 185,000 lb.

Performance: max speed Mach 1.4 at 40,000 ft, service ceiling 60,000 ft, range 1,400 miles.

Accommodation: three crew, in tandem.

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

Tupolev Tu-95 (NATO 'Bear')

This unique turboprop-powered aircraft proved so superior to the four-jet Myasishchev M-4 that it became the primary long-range strategic bomber of the Dalnaya Aviatsiya for two decades, until the advent of 'Backfire'. All six major versions identified by NATO reporting names continue in service, as follows:

Bear-A. Basic long-range strategic bomber, first flown in the late Summer of 1954. Chin radome. Internal stowage for two nuclear or a variety of conventional free-fall weapons. Defensive armament of six 23 mm guns.

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. About 110 'Bear-As' and 'Bs' remain in Air Force service. Other '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 more advanced 'Kitchen' air-to-surface missiles.

Ilyushin Il-38 (NATO 'May')

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

—US NAVY PHOTO

Tupolev Tu-16 (NATO 'Badger-F') with intercepting US Navy F-4 Phantom II

—TASS PHOTO

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

—US NAVY PHOTO

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

Bear-C. Maritime patrol version, first observed near NATO ships in 1964. Differs from 'Bear-B' in having a streamlined blister fairing on each side of its rear fuselage.

Bear-D. Identified during harassment of US Coast Guard icebreakers in the Soviet Arctic in 1967, this was the first version fitted with X-band radar in large blister fairing under centre fuselage, for reconnaissance and important anti-shipping missile role. Tasks include pinpointing of targets for missile launch crews on board ships and aircraft which are themselves too distant to ensure precise missile aiming and guidance. Glazed nose like 'Bear-A', with undernose radome and superimposed refuelling probe. Rear fuselage blisters as on 'Bear-C'. Added fairings at tips of tailplane. I-band tail-warning radar in enlarged fairing at base of rudder. About 50 serve with Soviet Naval Air Force.

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

Bear-F. Much-refined maritime version, identified in 1973. Smaller X-band radar fairing, further forward than that of 'Bear-D'. Large blister fairings absent from rear fuselage. Lengthened fuselage forward of wings, with shallow undernose radome on some aircraft only. Enlarged fairings aft of inboard engine nacelles to improve aerodynamics. Armament reduced to two guns, in tail mounting. Two stores bays in rear fuselage, one replacing ventral gun turret. Bulged nosewheel doors, over larger or low-pressure tyres. About 15 operational in early 1977. *(Data for 'Bear-A' follow.)*

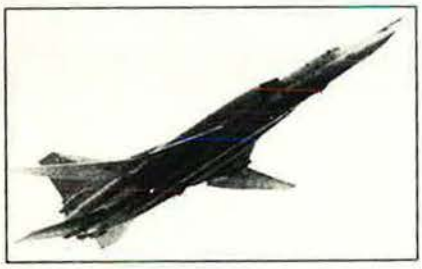
Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp.

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

Weight: gross 340,000 lb.

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

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



Tupolev variable-geometry bomber (NATO 'Backfire-B')

Tupolev variable-geometry bomber (NATO 'Backfire')

This elegant twin-jet bomber is currently the subject of considerable controversy. Anxious to exclude it from SALT limitations, the Soviet Union insists that it is a short-range, purely tactical aircraft. Former US Defense Secretary Donald H. Rumsfeld stated last year: "Even without aerial refuelling or staging from bases in the Arctic, 'Backfire' bombers could cover virtually all of the US on one-way missions, with recovery in third countries. Using Arctic staging and refuelling, they could achieve a similar target coverage and still return to their staging bases in the Soviet Union". Air Force Secretary Thomas Reed repeated the warning last July, and the RAF's former Chief of Air Staff added that: "Russian fast, wide-ranging, and high-performance aircraft like 'Backfire', armed with standoff missiles, may soon become an even greater danger to allied shipping than the relatively slow-moving Russian submarines".

Development of 'Backfire' is believed to have been started when the shortcomings of the Tu-22 became apparent. A prototype of the initial version was observed on the ground near the production factory at Kazan, in Central Asia, in July 1970. Up to twelve pre-production models were tested subsequently, and one early 'Backfire' remained airborne for a further ten hours after an in-flight refuelling. Two versions have been identified by non-classified NATO reporting names:

Backfire-A. Initial version, with large landing gear fairing pods on wing trailing-edges. Production limited to sufficient aircraft for a single Dalnaya Aviatsiya squadron.

Backfire-B. Extensively redesigned operational version, overcoming range deficiency of 'Backfire-A'. Increased span. Landing gear pods eliminated except for shallow underwing fairings which do not protrude beyond trailing-edge. Entire fixed portion of wings believed to form integral fuel tankage; outer panels have thin section and flex considerably in flight. Engine air intakes are fitted with splitter plates and embody complex internal variable geometry. By early 1977, about 30 'Backfire-Bs' were thought to equip a single Dalnaya Aviatsiya squadron, with a similar number in Naval Air Force service, operating as far south as the Azores from Northern Russia. Production continuing at rate reported as fifteen per year. *(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.

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

Weight: gross 270,000 lb.

Performance: max speed Mach 2.25 to 2.5 at high altitude, supersonic at low altitude, max unrefuelled combat radius 3,570 miles.

Armament: may have single gun in radar-directed tail mounting. Nominal weapon load 17,500 lb. Pylon under fixed portion of wing for 'Kitchen' or new missile known in the West as AS-6. Soviet development of decoy missiles has been reported. 'Backfire' can also carry the full range of Soviet free-fall weapons.

MiG-17 (NATO 'Fresco')

MiG-21PF (NATO 'Fishbed-D') of the Polish Air Force

Fighters

MiG-17 (NATO 'Fresco')

No aircraft demonstrates better than the MiG-17 the Soviet reluctance to retire an aeroplane, however old, while it can still be put to good use. Its development from the pioneer Soviet sweptwing MiG-15 was initiated more than a quarter of a century ago, in an unsuccessful effort to achieve supersonic performance in level flight. A thinner wing section was used; sweep was increased to 47° inboard and 43° outboard; the rear fuselage was lengthened; and a more powerful engine was fitted. Production began in 1953 and many thousands were built, of which an estimated 550 MiG-17F (NATO 'Fresco-C') single-seat day fighter-bombers continue to serve with Frontovaya Aviatsiya tactical support units stationed in less-critical areas. MiG-17PF ('Fresco-D') limited all-weather interceptors have been withdrawn from first-line squadrons of the PVO-Strany air defence force, together with MiG-19s; but versions of both the MiG-17 and -19 are deployed widely with the air forces of Russia's allies and friends in Eastern Europe, the Middle East, Africa, and Asia, as well as in China. *(Data for MiG-17F follow.)*

Power Plant: one Klimov VK-1A turbojet engine, based on the Rolls-Royce Nene; 6,990 lb st with afterburning.

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

Weight: gross 14,750 lb.

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

Accommodation: pilot only.

Armament: three 23 mm NR-23 guns. Four eight-rocket pods or two 550 lb bombs.

MiG-21 (NATO 'Fishbed')

Most widely-used fighter in the world, the MiG-21 has been manufactured in Czechoslovakia, India, and China (as the F-8), as well as in the Soviet Union. It is standard equipment in more than twenty air forces, and is listed by *Jane's* in twenty-one different forms, all of them smaller and lighter in weight than either of the US types built for the LWF (lightweight fighter) programme. This reflects the fact that Colonel-General Artem Mikoyan designed the MiG-21 on the basis of jet-to-jet combat experience during the Korean War, with the emphasis on good

transonic and supersonic handling, high rate of climb, small size, and medium power. The resulting E-5 prototype of 1955 fulfilled these requirements, but the initial production model (NATO 'Fishbed-A') proved woefully short on range, search capability, and punch; subsequent development has concentrated mainly on overcoming these deficiencies within the limitations of a small airframe. Major versions serving with the Soviet tactical air forces, totalling perhaps 1,500 aircraft, 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 new series, with R1L search/track radar 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 with reported lock-on range of under 8 miles and ineffective below 3,000 ft because of ground clutter. Max permissible speed at low altitude 683 mph.

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

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

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

MiG-21bis ('Fishbed-L'). Latest-generation multi-role air combat fighter/ground attack version, with Tumansky R-25 turbojet, rated at 16,535 lb st with afterburning. Updated electronics and generally improved construction standards. Fully operational. *(Data for MiG-21MF follow.)*

Power Plant: one Tumansky R-13-300 turbojet engine; 14,550 lb st with afterburning.
Dimensions: span 23 ft 5½ in, length 51 ft 8½ in, height 14 ft 9 in.
Weight: gross 20,725 lb.
Performance: max speed Mach 2.1 above 36,000 ft, Mach 1.06 at low altitude, service ceiling 59,050 ft, range 683 miles on internal fuel, 1,118 miles with three external tanks.
Accommodation: pilot only.
Armament: one twin-barrel 23 mm GSh-23 gun, with 200 rounds. Typical underwing loads for interceptor role include two K-13A ('Atoll') and two 'Advanced Atoll' air-to-air missiles; two K-13As and two UV-16-57 (sixteen 57 mm) rocket pods; two drop tanks and two missiles. Typical ground attack loads are four UV-16-57 rocket packs; two 1,100 lb and two 550 lb bombs; or four S-24 240 mm missiles.

MiG-23 (NATO 'Flogger-A, B, C, and E')

The production versions of the MiG-23 represent almost a total redesign by comparison with the prototype, which was demonstrated during the 1967 Aviation Day display at Domodedovo. The airframe now offers great flexibility in terms of power plant, equipment, and role, leading to two distinct families of fighters: the air combat fighter variants are covered by the MiG-23 designation; the interdictors are believed to be designated MiG-27 and are described separately. Deliveries of all versions to the Soviet tactical air forces are reported to exceed 750; two fighter regiments of MiG-23s and -27s have been stationed in East Germany since 1973/74. Export versions, with a lower equipment standard, operate with the Egyptian, Iraqi, Libyan, and Syrian Air Forces. Variants of the MiG-23 identified to date are as follows:

MiG-23 ('Flogger-A'). Prototype.

MiG-23S ('Flogger-B'). Single-seat air combat fighter for Soviet AF. Compared with prototype all tail surfaces except ventral fin have been moved rearward, increasing gap between wing and tailplane; size of dorsal fin has been increased; fixed inboard wing leading-edges have been introduced. Equipment includes radar (NATO 'High Lark') in nose, ECM in fairings forward of starboard underwing pylon and above rudder, undernose laser rangefinder and Doppler.

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

MiG-23S ('Flogger-E'). Export version of 'Flogger-B', equipped to lower standard. Smaller radar in shorter nose radome.

On all versions, wing sweep is variable manually, in flight or on the ground, from approximately 19° to approximately 72°. Full-span single-slotted trailing-edge flaps are each in three sections, permitting continued actuation of outboard sections when wings are fully swept. Upper-surface spoilers/lift dumpers operate differentially in conjunction with horizontal tail surfaces, and collectively after touchdown. Extended-chord leading-edge flap on outboard two-thirds of each main (variable-geometry) wing panel. Horizontal tail surfaces operate differentially and collectively for aileron and elevator functions respectively. Conventional rudder. *(Data for Soviet AF MiG-23S follow.)*

Power Plant: one unidentified turbojet engine; thrust estimated at 20,500 lb with afterburning. Variable-geometry air intakes and variable nozzle. Provision for external fuel tank on centreline pylon.
Dimensions: span 46 ft 9 in spread, 26 ft 9½ in swept, length 55 ft 1½ in.
Weight: gross 28,000–33,050 lb.
Performance: max speed Mach 2.3 at height, Mach 1.1 at sea level, service ceiling 59,000 ft, combat radius 600 miles.
Accommodation: pilot only.
Armament: one twin-barrel 23 mm GSh-23 gun in belly pack. One pylon under centre-fuselage, one under each engine air intake duct, and one under each fixed inboard wing panel, for air-to-air missiles (NATO 'Apex' and 'Aphid') or various other stores.

MiG-25 (NATO 'Foxbat')

Following the defection of Lt Viktor Belenko to Japan in a MiG-25 interceptor, on September 6 last year, much more is known in the West about the structure and equipment of what is confirmed as the world's fastest weapon-carrying aircraft. It is constructed mainly of steel, with titanium only in places subject to extreme heating, such as the wing leading-edges. The ejection seat is similar to that of the MiG-21. The radar is the most powerful fitted to any interceptor, but uses vacuum tubes rather than modern circuitry, with emphasis on anti-jamming capability rather than range. ECM standards are high, and US technicians admit that much can be learned from the MiG's structural fuel tanks and system of ground-controlled interception. Lt Belenko's MiG, built three years earlier, did not have 'look-down, shoot-down' radar capability to any advanced degree.

—FLUG REVUE PHOTO

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

—FLUG REVUE PHOTO

MiG-25R (NATO 'Foxbat-B')

Under the alternative Soviet designation E-266, a prototype set a speed record of 1,441.5 mph around a 1,000 km closed circuit, carrying a two-ton payload, as long ago as April 1965. Many subsequent records include a still-current speed of 1,852.62 mph around a 500 km circuit, and the absolute height record of 118,898 ft. Four versions can be described:

MiG-25 ('Foxbat-A'). Basic interceptor, with large radar (NATO 'Fox Fire') in nose, and armed with four air-to-air missiles on underwing pylons. Slightly reduced wing sweep towards tips. Wingtip fairings appear to house missile guidance equipment.

MiG-25R ('Foxbat-B'). Reconnaissance version, with five camera windows and various flush dielectric panels aft of very small dielectric nosecap. SLAR (side looking airborne radar) on some, if not all, aircraft. Span about 2 ft less than that of 'Foxbat-A'. Wing leading-edge sweep constant. Max speed of this version is about Mach 3.2.

MiG-25U ('Foxbat-C'). Trainer, of which first photographs became available in late 1975. New nose, containing separate cockpit with individual canopy, forward of standard cockpit and at a lower level. No radar or reconnaissance sensors in nose. The aircraft designated E-133 in which Svetlana Savitskaya set a women's world speed record of 1,667.412 mph on June 2, 1975, is believed to have been a MiG-25U.

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 sec, subject to confirmation. This aircraft is assumed to have an uprated power plant, enabling a future production version to carry six underwing missiles. *(Data for 'Foxbat-A' follow.)*

Power Plant: two Tumansky R-266 turbojet engines; each 24,250 lb st with afterburning. Internal fuel capacity approx 30,865 lb. Electrically-controlled variable ramps in intakes.

Dimensions: span 45 ft 9 in, length 73 ft 2 in, height 18 ft 4¼ in, wing area 603 sq ft.

Weights: basic operating 44,100 lb, gross 77,150 lb.

Performance: never-exceed combat speed Mach 2.8, service ceiling 80,000 ft, normal combat radius 700 miles.

—FLUG REVUE PHOTO

MIG-27 (NATO 'Flogger-D')

Sukhoi Su-9s (NATO 'Fishpot-B')

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

MiG-27 (NATO 'Flogger-D and -F')

The single-seat ground attack aircraft known to NATO as 'Flogger-D' has many airframe features in common with the MiG-23, but differs in important respects and is believed to have the official designation MiG-27. Two versions have been identified by NATO reporting names, as follows:

Flogger-D. Basic Soviet AF version. New forward fuselage compared with MiG-23. Nose is sharply tapered in side elevation, with small sloping window over a laser rangefinder and marked target seeker. Additional armour on flat sides of cockpit. Uprated engine. Fixed air intakes, consistent with primary requirement of high subsonic speed at low altitude. Different gun. Provision for ferry tank under each outer wing, which must be kept in forward position when this is fitted. ECM antenna above port glove pylon. Larger, low-pressure tyres.

Flogger-F. Export counterpart of 'Flogger-D', equipped to lower standard. Believed to retain variable-geometry intakes and GSh-23 twin-barrel gun of MiG-23. *(Data for 'Flogger-D' follow.)*

Power Plant: one unidentified turbojet engine; thrust estimated at 24,250 lb with afterburning. Internal fuel capacity 1,420 gallons.

Dimensions: As for MiG-23.

Weights: max weapon load 4,200 lb, gross 39,130 lb.

Performance: max ferry range (3 external tanks) 1,550 miles.

Accommodation: pilot only.

Armament: one six-barrel 23 mm Gatling-type gun; five pylons for unidentified external stores, known to include tactical nuclear weapons and, probably, AS-7 (NATO 'Kerry') air-to-surface missiles.

Sukhoi Su-9 (NATO 'Fishpot-B')

More than 25% of the PVO-*Strany*'s force of 2,650 interceptors are 'Fishpots'. It can be assumed that Su-11s predominate, but some Su-9s remain operational eighteen years after the type entered service.

Power Plant: one Lyulka AL-7F turbojet engine; 19,840 lb st with afterburning. Provision for two external fuel tanks side by side under fuselage.

Dimensions: span 27 ft 8 in, length 55 ft 0 in.

Armament: no guns; four 'Alkali' air-to-air missiles under wings.

Sukhoi Su-11 (NATO 'Fishpot-C')

As its NATO reporting name implies, the Su-11 is an uprated version of the Su-9. First displayed at Domodedovo in 1967, it has a lengthened nose of less tapered form, with an enlarged centrebody, and two slim duct fairings along the top of the fuselage, as on the Su-7B. Its armament is also much improved, and an uprated version of the AL-7F turbojet is installed.

Power Plant: one Lyulka AL-7F-1 turbojet engine; 22,046 lb st with afterburning.

Dimensions: span 27 ft 8 in, length 56 ft 0 in.

Weight: gross 30,000 lb.

Performance: max speed Mach 1.8 at 36,000 ft, ceiling 55,700 ft.

Accommodation: pilot only.

Armament: no guns; two air-to-air missiles (NATO 'Anab') under wings, one radar-homing, one infra-red homing.

Sukhoi Su-15 (NATO 'Flagon')

One year ago, about 50% of the PVO-*Strany* domestic air defence units were equipped with Su-15s, MiG-25s, Tu-28Ps, and Yak-28Ps. Since then, replacement of older types on a one for one basis has continued, and these four designs now total about 1,550 of an estimated 2,650 home-based interceptors. Most of the newcomers are 'Flagons' and 'Foxbats' of progressively increased capability, although former US Defense Secretary Rumsfeld has assured Congress that there is not yet any reason to believe that the Soviet Union has succeeded in perfecting a look-down, shoot-down system for any of its fighters. Allied to the known shortcomings of the Soviet Tu-126 'AWACS' this limits the capability of the air defences against fast, low-flying intruders protected by ECM. Nonetheless, the Su-15 represents a major advance by comparison with the Su-11, although the wings, tail surfaces, and cockpit area of the two types look almost identical. Main differences are 'Flagon's' two side-by-side engines and large ogival nose radome, which necessitated the side intake boxes with splitter plates. At least 700 are believed to be operational, all in the Soviet Union, and five variants may be identified by NATO reporting names:

Flagon-A. Basic single-seater, of which a prototype and nine pre-production models participated in the Aviation Day display at Domodedovo in 1967. Constant wing sweep of approx 53°.

Flagon-B. Experimental STOL version with wings of compound sweep, and three vertically-mounted lift-jet engines in centre fuselage. Demonstrated at Domodedovo, 1967. For R & D only.

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

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

Flagon-E. Major production version, operational since 1973. Wings as for 'Flagon-D'. More powerful engines; increased speed and range. Uprated electronics. *(Data for 'Flagon-A' follow.)*

Power Plant: two unidentified afterburning turbojets.

Dimensions: span 30 ft 0 in, length 68 ft 0 in.

Weight: gross 35,275 lb.

Performance: max speed Mach 2.5 above 36,000 ft, combat radius 450 miles.

Accommodation: pilot only.

Armament: no guns; two missiles (NATO 'Anab') under wings, one radar homing, one infra-red homing. Two further pylons for weapons or fuel tanks under centre fuselage.

Tupolev Tu-28P (NATO 'Fiddler')

Although the Tu-28P is regarded as one of the four new PVO-*Strany* interceptors, it has been operational since 1966. To meet specification requirements in terms of long range, heavy weapon load, and radar performance, Tupolev designed the largest fighter ever put into squadron service. When it was first seen, at Tushino in 1961, it carried two missiles, each 18 ft long, had a large blister fairing under its fuselage, and was fitted with two ventral fins. Production 'Fiddlers' dispensed with the fairing and ventral fins, but appeared at Domodedovo in 1967 with armament increased to four missiles. Unconfirmed reports suggest that the long-range interception role has been taken over from the Tu-28P by an interceptor version of the Tu-22; production appears to have been comparatively small.

Power Plant: two unidentified afterburning turbojet engines; each estimated at 27,000 lb st. Half-cone shock-body in each air intake.
Dimensions: span 65 ft 0 in, length 85 ft 0 in.
Weight: gross 100,000 lb.
Performance: max speed Mach 1.75 at 36,000 ft, ceiling 65,620 ft, range 3,100 miles.
Accommodation: crew of two in tandem.
Armament: four air-to-air missiles (NATO 'Ash') under wings, two radar homing, two infra-red homing.

Yakovlev Yak-28P (NATO 'Firebar')

Even by highly economical Soviet standards, the Yak-28 has proved a remarkably versatile aeroplane. The same basic airframe has been 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. The Yak-28P transonic all-weather interceptor variant emphasises how easy it is to misinterpret aspects of Soviet design. The long pointed fairings forward of the balancer wheel housings have no sinister significance, being simply lead-filled for aerodynamic reasons. Similarly, the much longer dielectric nosecone fitted retrospectively to some aircraft does not indicate any increase in radar capability or aircraft performance, but simply a change of material and shape.

Power Plant: two turbojet engines, believed to be related to the Tumansky R-11 fitted in the MiG-21; 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 radar homing heads.

Yakovlev Yak-28P (NATO 'Firebar')

Attack Aircraft

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

The prototype of this single-seat ground attack fighter was first seen in company with the prototype of the Su-9 interceptor at the 1956 Aviation Day display. Study of the two designs revealed that their airframes were almost identical, except for the use of swept and delta wings respectively. They also had the same Lyulka engine, with a fuel consumption so high that the Su-7 is reported to have an endurance of only eight minutes with full afterburning. Despite this, production has been on a large scale. Formations of up to 21 aircraft were already operational in time to participate in the 1961 Aviation Day flypast. About 400 Su-7s still serve with Soviet tactical air forces; others have gone to Cuba, Czechoslovakia, Egypt, East Germany, Hungary, India, Iraq, Poland, Syria, and North Vietnam. Standard versions are the Su-7B and BM, the latter with a low-pressure nosewheel tyre, necessitating bulged doors to enclose it when retracted.

Power Plant: one Lyulka AL-7F-1 turbojet engine; 22,046 lb st with afterburning. Internal fuel capacity 7,000 lb. Provision for two external tanks under belly, combined capacity 2,100 lb. Two JATO rockets can be fitted under rear fuselage to shorten take-off run.
Dimensions: span 29 ft 3½ in, length 57 ft 0 in, height 15 ft 0 in.
Weights: empty 19,000 lb, gross 29,750 lb.
Performance: max speed Mach 1.6 at 36,000 ft, or 530 mph at sea level without afterburning, service ceiling 49,700 ft, combat radius 200–300 miles.
Accommodation: pilot only.
Armament: two 30 mm NR-30 guns in wing roots, each with 70 rounds; underwing pylons for two 1,650 lb and two 1,100 lb bombs, or rocket pods. External weapon load reduced to 2,200 lb when two underbelly fuel tanks are carried.

Sukhoi Su-17 and Su-20 (NATO 'Fitter-C')

The Su-17 and Su-20 are, respectively, home and export versions of the same variable-geometry adaptation of the Su-7, differing in both power plant and equipment standards. Prototype for both was an experimental aircraft shown at Domodedovo in 1967 and allocated the NATO reporting name 'Fitter-B'. Only some 13 ft of each wing was pivoted, outboard of a very large fence, the remainder of the airframe being virtually identical with that of the Su-7. An attachment for an external store was built into each wing fence, but there seemed no reason to expect 'Fitter-B' to form the basis of a production aircraft, in view of the modest improvement in overall performance offered by such minimal modification. Discovery of at least one or two squadrons of generally-similar aircraft in service with the Soviet tactical air forces in 1972 came as a surprise, suggesting that even a small improvement in range and endurance by comparison with the Su-7 was considered worthwhile. Large numbers are now deployed by Soviet tactical air forces, including the ground attack regiment based at Finsterwalde in East Germany. Operators of the export version include the Polish AF; Peru is to have 36, referred to in some reports as Su-22s. Differences between the two versions (both known to NATO as 'Fitter-C') are as follows:

Su-17. Soviet AF model, with Lyulka AL-21F-3 turbojet, rated at 25,000 lb st with afterburning and offering better specific fuel consumption than AL-7F-1. Equipment said to include SRD-5M (NATO 'High Fix') centrebody radar, ASP-5ND fire control system, and Sirena 3 radar homing and warning system.

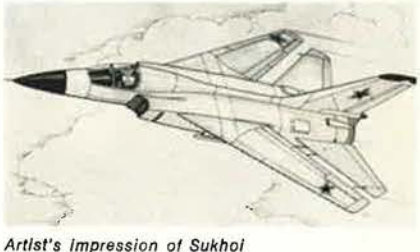
Su-20. Export model. Variations in rear fuselage contours by comparison with Su-17 suggest that Su-7's AL-7F-1 afterburning turbojet may be retained. *(Data for Su-17 follow.)*
Power Plant: see under model description. Provision for large drop-tank under each wing fence.
Dimensions: span 45 ft 11¼ in spread, 34 ft 9½ in swept, length 61 ft 6¼ in, height 15 ft 7 in, wing area 431.6 sq ft spread, 400.4 sq ft swept.
Weights: empty 22,046 lb, take-off clean 30,865 lb, gross 41,887 lb.
Performance: max speed Mach 2.17 at height, Mach 1.05 at sea level, ceiling 59,050 ft, combat radius with 4,409 lb external stores 224–391 miles according to profile.
Accommodation: pilot only.
Armament: two 30 mm NR-30 guns in wing roots; eight pylons under fuselage and wings for up to 11,023 lb of bombs, rocket pods, and guided missiles, including the air-to-surface AS-7 (NATO 'Kerry').

Sukhoi Su-19 (NATO 'Fencer')

No photographs of the Su-19 have yet appeared in print, although the aircraft has been in squadron service since early 1975, with some examples based in East Germany for operational evaluation. The accompanying artist's impression is believed to be fairly

—TASS PHOTO

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



Sukhoi Su-20 (NATO 'Fitter-C') of the Polish Air Force

Artist's Impression of Sukhoi Su-19 (NATO 'Fencer')

representative, although the nose shape may be more like that of the MiG-27 (see page 92). Except for the side-by-side seating for a crew of two, and the use of variable-geometry wings, the airframe has much in common with that of the Su-15 ('Flagon'), reflecting the Soviet propensity for progressive development of a proven design. Admiral Thomas H. Moorer, former Chairman of the US Joint Chiefs of Staff, described the Su-19 as the "first modern Soviet fighter to be developed specifically as a fighter-bomber for the ground attack mission". The following data should be regarded as provisional:

Power Plant: possibly two Lyulka AL-21F turbojets, as fitted in Su-17.
Dimensions: span 56 ft 3 in spread, 31 ft 3 in swept, length 69 ft 10 in.
Weight: gross 68,000 lb.
Performance: max speed above Mach 2 at height, combat radius (lo-lo-lo) over 200 miles.
Armament: one 23 mm GSh-23 twin-barrel gun in belly; six pylons under fuselage and wing-root gloves for more than 10,000 lb of guided and unguided air-to-surface weapons.

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

A small number of two-seat tactical attack Yak-28s remain in service with Soviet units in secondary areas. Most have been switched to support roles, as described under the *Reconnaissance, ECM, and Early Warning Aircraft* heading.

Yakovlev Yak-36 (NATO 'Forger')

When the new Soviet Navy carrier/cruiser *Kiev* entered the Mediterranean for the first time last July, Western air and naval forces had their long-awaited opportunity to take a close look at the Soviet Union's first operational fixed-wing VTOL combat aircraft. About ten or twelve of these aircraft appeared to be on board, probably with a development squadron, and including a single example of the rather crude-looking two-seat training version. NATO reporting names given to the two models are:

Forger-A. Basic single-seater, presumably for attack and reconnaissance duties. All available details given in *Jane's* Supplement in December AIR FORCE Magazine.

Forger-B. Two-seat trainer. Second cockpit forward of normal cockpit, with blister canopy at lower level. Rear fuselage lengthened to compensate for longer nose. No ranging radar or weapon pylons. Overall length about 58 ft 0 in.

As expected, this aircraft (referred to as Yak-36 by Defense Department) utilises both vectored thrust and direct jet-lift for VTOL. The single large turbojet exhausts through a pair of rotating nozzles aft of the wing roots. Two lift-jets are mounted in tandem aft of the cockpit, inclined at an angle so that their thrust is exerted 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 efflux es can be envisaged as forming a V under the fuselage. Only vertical take-offs were observed during operations from the *Kiev*. It is difficult to conceive how STOL take-off could be effected with such a power plant arrangement, which also seems to rule out the possibility of thrust vectoring in forward flight, which has proved such an advantage on the Harriers of the US Marine Corps. Puffer-jets at the wingtips and tail help to give the Yak-36 commendable stability during take-off and landing.

Power Plant: one unidentified turbojet, without afterburner; thrust estimated at 17,000 lb. Two lift-jets; each estimated at 5,600 lb st.
Dimensions: span 23 ft 0 in, length 49 ft 3 in.
Weight: gross 22,050 lb.
Performance: max speed Mach 1.3 at height.
Accommodation: pilot only.
Armament: four pylons under inner wings for stores, including gun pods and rocket packs.

—ROYAL NAVY PHOTO

Yakovlev Yak-36 (NATO 'Forger')

Antonov An-12 (NATO 'Cub-C')

Tupolev Tu-126 (NATO 'Moss')

Reconnaissance, ECM, And Early Warning Aircraft

Antonov An-12 (NATO 'Cub-C')

An accompanying photograph shows, in Egyptian Air Force markings, a variant of the An-12 transport equipped for ECM duties, and known to NATO as 'Cub-C'. It has an ogival 'solid' fuselage tailcone, housing electronic equipment, instead of the usual gun position. The glazed nose and undernose radome of the transport versions are retained. Additional electronic pods are faired into the forward fuselage and ventral surfaces. Both the Soviet Air Force and Navy operate this aircraft.

MiG-21 (NATO 'Fishbed-H')

Two versions of this supersonic single-seat fighter are equipped 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.

MiG-25 (NATO 'Foxbat-B')

(See page 92.)

Tupolev Tu-126 (NATO 'Moss')

The Tu-126 is the PVO-*Strany*'s counterpart to the USAF's Boeing E-3A AWACS (Airborne Warning And Control System). Ten or twelve are operational, with airframe and power plant developed from those of the Tu-114 turboprop airliner rather than from the smaller-fuselage Tu-95 bomber. The 36 ft diameter rotating radar "saucer" above the fuselage is 6 ft larger than that of the E-3A; however, at its present stage of development, the Tu-126 is believed by US defence experts to have only limited effectiveness over water and to be ineffective over land.

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

Yakovlev Yak-28 (NATO 'Brewer')

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 the most important Yak-28s now operational are probably the following two versions:

Brewer-D. Reconnaissance aircraft, carrying cameras instead of weapons in its internal bomb-bay.

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.

Transports

Antonov An-12 (NATO 'Cub')

After many years of excellent service as a troop and freight transport, and in para-troop-dropping roles, the An-12 appears to be giving way to the turbofan Il-76 as the mainstay of the Soviet military air transport force (A-VDV). At its peak, it equipped about half of the A-VDV fleet of 1,700 fixed-wing aircraft, providing airlift capacity for two full army divisions, totalling 14,000 men and their equipment, over a radius of 750 miles. Layout is conventional for a freighter, with access to the hold via a ramp-door which forms the bottom of the upswept rear fuselage when closed. This ramp-door is made in two longitudinal halves, which can be hinged upward inside the cabin to permit direct loading from trucks on the ground, or air-dropping of supplies and equipment. A full load of 100 paratroops can be despatched via this exit in under one minute. The 'Cub-C' ELINT version is 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.
Weights: empty 61,730 lb, gross 121,475 lb.
Performance: max speed 482 mph, service ceiling 33,500 ft, range 2,236 miles with max payload.
Accommodation: crew of six; freight, vehicles, or 100 parachute troops. Built-in freight handling gantry with capacity of 5,070 lb.
Armament: two 23 mm NR-23 guns in manned tail turret.

Antonov An-14 (NATO 'Clod')

This easy-to-fly light transport has been observed in the insignia of the Soviet, Bulgarian, East German, and Guinea Air Forces. Access to the cabin is via rear clamshell doors. All-weather operation is said to be practicable, with full-payload take-off and landing runs of 328 ft and 230 ft respectively, on concrete.

Power Plant: two Ivchenko AI-14RF piston engines; each 300 hp.
Dimensions: span 72 ft 2 in, length 37 ft 6½ in, height 15 ft 2½ in.
Weights: empty 4,409 lb, gross 7,935 lb.
Performance: max speed 138 mph at 3,280 ft, service ceiling 17,060 ft, range 404 miles with max payload.
Accommodation: pilot and one passenger on flight deck; six or seven passengers, or 1,590 lb of freight, in main cabin.
Armament: none.

Antonov An-22 (NATO 'Cock')

The prototype of this huge turboprop freighter flew for the first time on February 27, 1965. By mid-1967 a total of six An-22s were under test, including the first production model. Two were on loan to Aeroflot, for experimental freight services. Three participated in the Aviation Day display at Domodedovo in July, demonstrating their military potential by disembarking batteries of 'Frog-3' rockets and SA-4 ('Ganef') surface-to-air missiles on tracked launchers. Production continued until 1974, and estimates of the number delivered to the A-VDV vary from 30 to 50. During officially-confirmed record attempts, one An-22 lifted a 100-tonne payload to 25,748 ft after a take-off run of only 3,500 ft.

Power Plant: four Kuznetsov NK-12MA turboprop engines; each 15,000 shp.
Dimensions: span 211 ft 4 in, length 190 ft 0 in, height 41 ft 1½ in.
Weights: empty 251,325 lb, gross 551,160 lb.
Performance: max speed 460 mph, range 6,800 miles with 99,200 lb payload.
Accommodation: crew of five or six; 28–29 passengers in cabin forward of main freight hold. Four travelling gantries and two winches to speed freight handling.
Armament: none.

Antonov An-24 (NATO 'Coke')

This twin-turboprop transport is in its fourteenth year of service as Aeroflot's standard short-range airliner. The Soviet AF also operates An-24s, as do more than a dozen other airlines and fourteen air forces throughout the world, usually in small numbers. The **An-24T** freighter differs from the basic passenger-carrying **An-24V** in having a belly freight door at the rear, instead of the port-side passenger door, and two ventral fins instead of one. The belly door can be opened in flight for air-dropping payload or parachutists. The **An-24RV** and **An-24RT** versions differ in having a 1,985 lb st RU 19-300 auxiliary turbojet in the rear of the starboard engine nacelle, for turboprop starting and to provide additional power for take-off, climb, and cruising flight, as required. *(Data for An-24V follow.)*

Power Plant: two Ivchenko AI-24A turboprop engines; each 2,550 ehp.
Dimensions: span 95 ft 9½ in, length 77 ft 2½ in, height 27 ft 3½ in.
Weights: empty 29,320 lb, gross 46,300 lb.
Performance: normal cruising speed 280 mph at 19,700 ft, service ceiling 27,560 ft, range 341 miles with max payload, 1,490 miles with max fuel.
Accommodation: crew of three to five; seats for 44–52 passengers in main cabin. (An-24T can carry 30 paratroops, 38 combat-equipped troops, or 24 litters instead of freight.)
Armament: none.

Antonov An-26 (NATO 'Curl')

Eight years after its first appearance at the Paris Air Show, this much improved freight version of the An-24 is beginning to be seen in service with air forces in countries such as Poland, Bangladesh, and Yugoslavia. It is basically an An-24T with more powerful engines and a completely redesigned rear fuselage. The latter embodies a large loading ramp, which forms the underside of the rear fuselage when retracted, and can be slid forward under the rear of the cabin to facilitate direct loading on to the floor of the hold, or when the cargo is to be air-dropped. Conversion of the standard freighter to carry troops or litters takes 20 to 30 minutes in the field. Optional equipment includes an OPB-1R sight for pinpoint dropping of freight. Max payload is 12,125 lb.

Power Plant: two Ivchenko AI-24T turboprop engines; each 2,820 ehp. One 1,985 lb st RU 19-300 auxiliary turbojet in starboard nacelle *(see An-24 entry)*.
Dimensions: span 95 ft 9½ in, length 78 ft 1 in, height 28 ft 1½ in.
Weights: empty 33,113 lb, gross 52,911 lb.
Performance: cruising speed 264–270 mph at 19,675 ft, service ceiling 26,575 ft, range 559 miles with normal 9,920 lb payload, 1,398 miles with 4,687 lb.
Accommodation: crew of five, plus station for load supervisor or despatcher. Electrically-powered mobile hoist, capacity 3,300 lb, and conveyor to facilitate loading and air-dropping. Provision for carrying 40 paratroops or 24 litters.
Armament: none.

Ilyushin Il-18 (NATO 'Coot')

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

Power Plant: four Ivchenko AI-20M turboprop engines; each 4,250 ehp.
Dimensions: span 122 ft 8½ in, length 117 ft 9 in, height 33 ft 4 in.
Weights: empty 76,350 lb, gross 134,925 lb.
Performance: max cruising speed 419 mph,

—TASS PHOTO

Antonov An-22 (NATO 'Cock')

Antonov An-26 (NATO 'Cub')

Ilyushin Il-18 (NATO 'Coot') of the Polish Air Force, at Brussels

—TASS PHOTO

Dished fairing on tailcone of this Il-76 (NATO 'Candid') suggests it was used as testbed for military flight refuelling version or for rear gun turret

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')

This thoroughly modern four-turbofan heavy freighter seems likely to become the mainstay of the Soviet military air transport service. Development has been rapid. The prototype was exhibited at the Paris Air Show only two months after its first flight on March 25, 1971. It was described as an aircraft for commercial operation in Siberia, the north of the Soviet Union, and the Far East, where conditions are often difficult, with short, unprepared airstrips. Its basic task of transporting 40 tonnes of freight for a distance of 3,100 miles (5,000 km) in under six hours made it also a clear candidate for the military role of An-12 replacement. Nobody could have been surprised, therefore, when an official film released in 1975 showed Il-76s already in squadron service with the A-VDV, with an added rear gun turret. More significant is that an in-flight refuelling version has been evaluated as a tanker for the 'Backfire' bomber force, and is expected to supersede the Myasishchev M-4 in this role.

Design features include rear loading ramp-doors, a T-tail, full-span leading edge slots, and double-slotted flaps for good field performance, a navigator's station in the glazed nose, with ground-mapping radar in a large undernose fairing, and a unique and complex landing gear. The nose unit is fitted with two pairs of wheels, side by side. Each main unit comprises four pairs of wheels in two rows, and retracts in such a way that the wheels remain vertical but at 90° to the direction of flight. Four long fairings are required, to enclose the wheels and actuating gear on each side. The entire accommodation is pressurised. Advanced mechanical handling systems are fitted for containerised and other freight. Equipment for all-weather operation includes a computer for automatic flight control and automatic landing approach.

A series of 24 official records set by the Il-76 in July 1975 include a payload of more than 70 tonnes (154,590 lb) lifted to a height of 38,960 ft, and a speed of 532.923 mph around a 1,000 km circuit with the same load.
Power Plant: four Soloviev D-30KP turbofan engines; each 26,455 lb st.
Dimensions: span 165 ft 8 in, length 152 ft 10½ in, height 48 ft 5 in.
Weight: gross 346,125 lb.
Performance: normal cruising speed 528 mph at 42,650 ft, nominal range 3,100 miles with maximum payload of 88,185 lb.
Accommodation: crew of three to five.
Armament: gun turret in tail.

Czech-designed and -built Aero L-39

MIG-15 UTI (NATO 'Midget') of Polish Air Force

—FLUG REVUE PHOTO

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

Trainers

Aero L-29 Delfin (NATO 'Maya')

It has long been the practice of Warsaw Pact nations to standardise aircraft of all categories throughout their air forces. Thus, the L-29 two-seat jet basic and advanced trainer, designed and manufactured in Czechoslovakia, is standard equipment in all of these nations except Poland, which prefers its own TS-11 Iskra. More than 3,000 L-29s were built between 1963 and 1974, and continue to fly with more than a dozen air forces.
Power Plant: one M 701c 500 turbojet engine; 1,960 lb st.
Dimensions: span 33 ft 9 in, length 35 ft 5½ in, height 10 ft 3 in.
Weights: empty 5,027 lb, gross 7,804 lb.
Performance: max speed 407 mph at 16,400 ft, service ceiling 36,100 ft, range 555 miles with external tanks.
Accommodation: crew of two, in tandem.
Armament: provision for two bombs of up to 220 lb, eight air-to-ground rockets, or two 7.62 mm machine-gun pods under wings.

Aero L-39

First flown on November 4, 1968, the L-39 was developed by an all-Czechoslovakian team as a successor to the L-29 Delfin. Five flying prototypes were built. Testing of these led to design changes such as lengthening of the engine air intake trunks. By the time the ten pre-production L-39s began to join the test programme, it had been decided to order the type as the next standard basic and advanced trainer for all Warsaw Pact nations except Poland, which continues to satisfy its own requirements. Service acceptance trials, in Czechoslovakia and the Soviet Union, took place in 1973. By the Spring of the following year, L-39s had begun to enter service with the Air Forces of both of these nations.
Power Plant: one Ivchenko AI-25 turbofan engine; 3,792 lb st.
Dimensions: span 31 ft 0½ in, length 40 ft 5 in, height 15 ft 5½ in.
Weights: empty 7,341 lb, gross 10,141 lb.
Performance: max speed 466 mph at 16,400 ft, service ceiling 37,075 ft, range 565 miles with tip-tanks empty.
Accommodation: crew of two, in tandem.
Armament: provision for underwing bombs, rockets, and air-to-air missiles.

MiG-15UTI (NATO 'Midget')

After completing their basic and initial advanced training on the L-29 or L-39, pupil pilots of the Soviet Air Force graduate to this tandem two-seat version of the once-renowned MiG-15 jet fighter. The airframe differs from that of the original single-seater mainly in having an aft cockpit for an instructor in place of some fuselage fuel tankage. Armament is also reduced to a single gun on most of the trainers, which continue in service with more than twenty air forces. Next stage of training after the MiG-15UTI is normally on one of the two-seat adaptations of current operational aircraft described after this entry.
Power Plant: one Klimov VK-1 turbojet engine; 5,952 lb st.
Dimensions: span 33 ft 0⅞ in, length 32 ft 11¼ in, height 12 ft 1⅝ in.
Weights: empty 8,818 lb, gross (clean) 10,692 lb.
Performance: max speed 631 mph at sea level, range 590 miles (clean) or 885 miles (with two underwing tanks) at 32,800 ft.
Accommodation: crew of two, in tandem.
Armament: normally one 23 mm NS-23 gun or one 12.7 mm UBK-E machine-gun under port side of nose.

MiG-21U (NATO 'Mongol')

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

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

(See page 91.)

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

(See page 92.)

Sukhoi Su-7U (NATO 'Moujik')

The Soviet, Indian, and Egyptian Air Forces use this tandem two-seat adaptation of the Su-7B as an operational trainer for their ground attack pilots. Changes are mini

mal. The aft cockpit is installed with a slightly-raised canopy, from which a prominent dorsal spine extends back to the base of the tail-fin.

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

Tupolev Tu-22U (NATO 'Blinder-D')
(See page 89.)

Yakovlev Yak-28U (NATO 'Maestro')
Although the operational Yak-28P ('Firebar') is a tandem two-seater, it was not possible to adapt the existing rear cockpit in order to produce a dual-control training version. Instead, the Yakovlev bureau had to design a completely new front fuselage for the Yak-28U. This has two individual single-seat cockpits in tandem, each with its own blister canopy. The front canopy is sideways hinged, to starboard. The higher rear canopy is rearward-sliding. A very large conical probe projects forward of the nose-cone.

Yakovlev Yak-36 trainer (NATO 'Forger-B')
(See page 94.)

Helicopters

Kamov Ka-25 (NATO 'Hormone')
The Ka-25 ASW helicopters which accompanied Yak-36 VTOL combat aircraft during the first cruise of the carrier *Kiev*, last Summer, were disappointingly familiar in all visible respects. Yet there are known to be several variants in service, some with a much larger undernose radome, some without an underfuselage weapon bay, and some reportedly equipped for transport and other duties. Only two versions may be identified by NATO reporting names:

Hormone-A. Basic ASW version, with large undernose search radar, and racks for small stores on each side of the fuselage. Other equipment varies from one aircraft to another. Some have an underfuselage weapon bay. A few have a streamlined blister fairing built into the base of the central tail-fin; others have a fairing of flower-pot shape, with a transparent top, above the central point of the 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; an electro-optical sensor and a towed magnetic anomaly detector are also carried. ASW Ka-25s, equipped for all-weather operations, fly from cruisers of the *Kara* and *Kresta* classes, the carrier/cruiser *Kiev*, and from the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 18 aircraft. They have largely replaced piston-engined Mi-4s in the Soviet Navy's ship and shore based force of around 250 helicopters. Those on ships are said to have the capability of assisting with mid-course guidance of surface-to-surface cruise missiles fired from the vessels.

Hormone-B. Special electronics variant. No details.

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

Mil (WSK-Swidnik) Mi-2 (NATO 'Hoplite')
About 2,000 helicopters designed by the Mil bureau support the operations of the Soviet tactical air forces. Virtually all of them are turbine-powered, and the only one not built in the USSR is the small Mi-2, of which manufacture was transferred to the WSK-Swidnik in Poland in 1964. Many hundreds have been delivered for military and commercial service, with the air forces of Bulgaria, Hungary, Poland, Romania, and the Soviet Union among known operators. There are two versions of the aircraft, as follows:

Mi-2. Basic model, as described below.

Mi-2M. Enlarged, modified, and more powerful version, designed at WSK-Swidnik and first flown on July 1, 1974. Production began in Spring 1975. Two 450 shp GTD-350P engines. Room for ninth passenger in main cabin.

Power Plant: two Isotov GTD-350 turboshaft engines; each 400 shp.
Dimensions: rotor diameter 47 ft 6¾ in, length of fuselage 39 ft 2 in, height 12 ft 3½ in.
Weights: basic operating 5,213 lb, gross 8,157 lb.
Performance: max speed 130 mph at 1,640 ft, service ceiling 13,125 ft, range 360 miles with max fuel, 105 miles with max payload.
Accommodation: pilot on flight deck; eight passengers, 1,543 lb of freight, or four litters and medical attendant in cabin.
Armament: provision for air-to-surface rocket pod 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. First demonstration of the Mi-6 in its role as a conventional military freighter was given at Tushino in 1961. Two groups of three landed at the airport, after which one helicopter in each group unloaded two field artillery rockets while the others delivered support equipment. At least 500 production Mi-6s are believed to be in commercial and military service, the latter with the air forces of the Soviet Union, Bulgaria, Egypt, Iraq, Syria, and North Vietnam.

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

Mil Mi-8 (NATO 'Hip')
Well over a thousand Mi-8s have been built, mainly for military use. Largest operator by far is the Soviet AF, which utilises the helicopter as an assault transport, heavily armed with rockets and supported by the formidable Mi-24. At least sixteen other air forces also operate Mi-8s.

Power Plant: two Isotov TV2-117A turboshaft engines; each 1,500 shp.
Dimensions: rotor diameter 69 ft 10¼ in, length of fuselage 60 ft 0¾ in, height 18 ft 6½ in.
Weights: empty 16,007 lb, gross 26,455 lb.
Performance: max speed 161 mph at 3,280 ft, service ceiling 14,760 ft, range 264 miles as passenger transport.


—US NAVY PHOTO

Kamov Ka-25 (NATO 'Hormone') flying near a US Navy oiler


—TASS PHOTO

Troops load aboard a Mil Mi-6 (NATO 'Hook')


—TASS PHOTO

Mil Mi-8 (NATO 'Hip')

Accommodation: crew of two or three; up to 32 passengers, 8,820 lb of freight, or 12 litters and attendant.
Armament: provision for up to eight external stores, including pods each containing up to sixteen 57 mm rockets, on cabin-side outriggers.

Mil Mi-10 (NATO 'Harke')

This specialised flying crane embodies the power plant, rotor system, transmission, gearboxes, and most equipment of the Mi-6. The depth of the fuselage is reduced considerably, and the tailboom is deepened so that the flattened undersurface extends unbroken to the tail. The Mi-10 also lacks the wings of the standard Mi-6. Payloads can be carried by sling or cable, clasped under the belly, or on interchangeable wheeled platforms slung between the legs of the wide-track, stalky landing gear. Further freight, or up to 28 passengers on tip-up seats, can be accommodated in the main cabin.
Dimensions: rotor diameter 114 ft 10 in, length of fuselage 107 ft 9¾ in, height 32 ft 2 in.
Weights: empty 60,185 lb, gross 96,340 lb, max payload including platform 33,070 lb.
Performance: max speed 124 mph, service ceiling 9,850 ft, range 155 miles with 26,455 lb platform payload.

Mil Mi-12 (NATO 'Homer')

There has been little news of this heavy-lift helicopter for several years. Existence of the prototype was revealed as long ago as March 1969, after it set four payload-to-height records. On August 6 of the same year, the original records were far exceeded by an Mi-12 which lifted 88,636 lb to 7,398 ft. Photographs and eventual study of the aircraft at the Paris Air Show confirmed that, to ease development, the designers had utilised two power plant/rotor packages almost identical with those of the Mi-6, mounted at the tips of fixed wings. A requirement was that the cabin should accommodate missiles and other payloads compatible with those carried by the An-22 fixed-wing transport. Although this produced the largest helicopter ever flown, the Mi-12 is claimed to present no problems to pilots accustomed to flying other types of helicopter, and to have an extremely low level of vibration. Loading is via rear clamshell doors. A travelling crane on the cabin roof has a max capacity of 22,000 lb.
Power Plant: four Soloviev D-25VF turboshaft engines; each 6,500 shp.
Dimensions: rotor diameter (each) 114 ft 10 in, length of fuselage 121 ft 4½ in, height 41 ft 0 in.
Weights: gross 231,500 lb, normal payload 66,000 lb (STOL), or 55,000 lb (VTOL).
Performance: max speed 161 mph, service ceiling 11,500 ft, range 310 miles with 78,000 lb payload.
Accommodation: crew of four on flight deck; navigator and radio operator in tandem on upper deck; about 50 folding seats along cabin walls for work crews or troops accompanying freight.

Mil Mi-24 (NATO 'Hind-A')

First photo of gunship version of Mil Mi-24 (NATO 'Hind-D'), showing four-barrel Gatling-type machine-gun in turret under nose

Mil Mi-24 (NATO 'Hind')

A new dimension was added to the mobility and hitting power of Warsaw Pact forces in Eastern Europe in early 1974, when it became known that at least two units, of approximately squadron strength, in East Germany had been equipped with Mi-24 assault helicopters. In much the same class as the US Army's UTTAS prototypes, then under construction, each Mi-24 was calculated to carry eight combat-equipped troops, as well as heavy armament that would be used to keep down the heads of any enemy in the drop zone. Design features new to Soviet rotorcraft included a fully retractable landing gear.

As this Gallery was being completed, first photographs were received of an even more formidable variant of the same basic design, reconfigured for optimum capability as an all-weather gunship. Four versions of the Mi-24 can, therefore, be identified by NATO reporting names, as follows:

Hind-A. Armed assault transport, with large enclosed flight deck for crew of four. The auxiliary wings of this version have considerable anhedral and each carry three weapon stations for heavy armament, supplemented by 12.7 mm machine-gun in nose. Anti-torque rotor on starboard side of offset tail pylon. Initial production Mi-24s were of this type.

Hind-B. Similar to 'Hind-A' except that auxiliary wings have neither anhedral nor dihedral, and carry only the two inboard weapon stations on each side. This version is believed to have preceded 'Hind-A' and was not built in large numbers.

Hind-C. Replaced 'Hind-A', to which it is generally similar except for having tail rotor transferred to port side.

Hind-D. Development of 'Hind-C', with front fuselage completely redesigned to enhance gunship capability. Tandem stations for weapon operator (in nose) and pilot now have individual canopies, with rear seat raised to give pilot an unobstructed forward view. Unidentified probe fitted forward of top starboard corner of bulletproof windscreen at extreme nose. Under nose is a four-barrel Gatling-type machine-gun in a turret with a wide range of movement in azimuth and elevation. Undernose pack for sensors, including probably a forward-looking infra-red scanner and low-light-level TV. Wing armament retained. Many small antennae and blisters. Nosewheels further aft, and semi-exposed when retracted.

Soviet women pilots have set seven helicopter records in an aircraft identified as a Mil A-10, with two 1,500 shp Isotov TV2-117A turboshafts, as fitted in the Mi-8. They include a speed of 212.105 mph over a 15/25 km course, and climb to 6,000 m (19,685 ft) in 7 min 43 sec, representing performance capability that might be expected from an aircraft in the class of the Mi-24. *(Data for 'Hind-A' follow.)*
Power Plant: two unidentified turboshaft engines, expected to give the same power as the engines of the Mi-8 but dimensionally smaller.
Dimensions: rotor diameter 55 ft 9 in, length of fuselage 55 ft 9 in, height 14 ft 0 in.
Accommodation: crew of four; eight combat equipped troops.
Armament: one 12.7 mm machine-gun in nose; mountings for four anti-tank missiles (probably 'Swatters') and four other stores, including rocket pods (each thirty-two 57 mm rockets), under stub-wings.

Strategic Missiles

SS-4 (NATO 'Sandal')

First deployed in 1959, this is the medium-range ballistic missile (MRBM) that precipitated the Cuba crisis three years later. Its development, via the earlier SS-3 ('Shyster') drew heavily on wartime German V-2 technology. About 500 are thought to remain operational, some near the western borders of the Soviet Union but many east of the Urals, targeted on China. The age of the weapon system is indicated by the fact that about 12 tractors with special trailers, and 20 men, are needed to transport, erect, and fire the SS-4. Replacement by the SS-X-20 is likely to begin this year, unless this class of weapon is introduced into a new SALT agreement.
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) o high-explosive.
Dimensions: length 77 ft 0 in, diameter 5 7 in.
Launch weight: 60,000 lb.
Performance: max speed Mach 6.7, ma range 1,100 miles.

SS-5 (NATO 'Skean')

About 100 of these intermediate-range missiles supplement SS-4s in the 600-strong Soviet IRBM/MRBM force. All are thought to be in the western USSR, some in silos. The SS-5 represented a further development of the SS-3/SS-4 concept, with control by vanes acting on the motor exhaust rather than by external fins.

Power Plant: single-stage liquid-propellant engine with four chambers.
Guidance: inertial.
Warhead: nuclear (1 megaton).
Dimensions: length 80 ft 0 in, diameter 8 ft 6 in.
Performance: max range 2,175 miles.

SS-7 (NATO 'Saddler')

The SALT I agreement listed a total of 209 older SS-7 and SS-8 ICBMs that were expected to be replaced eventually by submarine-launched ballistic missiles. Dismantling of the launch sites was under way in mid-1976 and no more than 90 SS-7s now remain. Each is a two-stage liquid-propellant missile, about 107 ft long, and able to deliver a 5 megaton warhead over a range of 6,800 miles with a CEP (circular error probability) of under 2 km (1¼ miles).

SS-8 (NATO 'Sasin')

This two-stage liquid-propellant ICBM was first displayed in a Moscow military parade in November 1964, suggesting that it may have been regarded as a backup to the SS-7, which was never revealed in public. Only 83 ft long, its warhead, range, and accuracy were in the same order as those of the SS-7, with which it is now being withdrawn from service.

SS-9 (NATO 'Scarp')

This mighty three-stage liquid-propellant missile was the heavyweight of the Soviet ICBM force at the time the SALT I agreement was signed, in May 1972. There were then 288 operational SS-9s, with 25 new silos under construction in SS-9 complexes. It was assumed that all 313 launchers would eventually carry new SS-18 missiles, and by December 1976 the number of SS-9s in service had already been reduced to 210. They were produced in five versions, identified by the US Department of Defense as follows:

SS-9 Mod 1. First displayed in Moscow on November 7, 1967. Operational deployment thought to have started in 1965. Only a relatively small number still emplaced, each with a single re-entry vehicle of slightly smaller yield than that of the Mod 2. These versions were, in 1975, the only operational Soviet ICBMs considered to possess the combination of yield and accuracy needed to attack successfully hard targets like America's Minuteman missile silos.

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

SS-9 Mod 3. Under test until 1971 both in a depressed trajectory mode and as a Fractional Orbital Bombardment System (FOBS). Latter technique provides unlimited range and the ability to attack from any direction, by putting the re-entry vehicle into an orbit from which it could be directed down on to any preselected target. Advantages in terms of potential reduced warning time for the defences are offset by some reduction in accuracy. There is no evidence that this version is operational.

SS-9 Mod 4. Test vehicle for Soviet multiple independently-targeted re-entry vehicles (MIRVs). Early tests were terminated in November 1970. A new series started in January 1973, with each missile carrying three re-entry vehicles of much different design, equipped with parachutes to ensure recovery. Despite an improvement in targeting flexibility, this version was not deployed, perhaps because of the imminent availability of the SS-18.

SS-9 Mod 5. This is said to be the launch vehicle for the Soviet Union's satellite-killing payloads. Tests from Tyuratam against satellites launched from Plesetsk have suggested that an operational launch of the SS-9 Mod 5 could be made within 90 minutes of receiving an order to intercept. *(Data for SS-9 Mod 2 follow.)*

Power Plant: three-stage liquid-propellant.
Guidance: inertial, offering CEP of better than 1.5 km (0.9 mile).
Warhead: nuclear (25 megatons).
Dimensions: length 113 ft 6 in, diameter 10 ft 0 in.
Performance: range 7,500 miles.

SS-11 (NATO 'Sego')

A total of 970 of these 'light' ICBMs were deployed in May 1972, with 66 new silos under construction. All 1,036 launchers were expected to carry SS-17 and/or SS-19 missiles in due course. No photograph of an SS-11 has ever been identified. It is believed to be about 3 ft shorter than the SS-13, and to resemble the much larger SS-8 in external shape, with no space between its liquid-propellant stages. There are three versions:

SS-11 Mod 1. Operational since 1966. Single re-entry vehicle, stated by US Department of Defense to be of slightly higher yield than that of the comparable American Minuteman, but considerably less accurate. Of 970 originally deployed, about 50 have been replaced by SS-11 Mod 3 and others by SS-17s. As Mod 1 has been tested over both intercontinental and reduced ranges, the displaced missiles may be adapted for an IRBM role, unrestricted by SALT I.

SS-11 Mod 2. Similar to Mod 1, but fitted with penetration aids. Included in Mod 1 totals.

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 are already emplaced. Range is about 6,200 miles.

SS-13 (NATO 'Savage')

In the Minuteman category, the SS-13 is the only solid-propellant ICBM in the Soviet inventory at the present time, and only 60 are deployed. The top two stages are, however, used by themselves in the SS-14 IRBM. It is anticipated that the SS-13 will be replaced by the SS-16.

Power Plant: three-stage solid-propellant.
Guidance: inertial, offering CEP of 2 km (1¼ miles).
Warhead: nuclear (1 megaton).
Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).
Performance: range 5,000 miles.

SS-14 (NATO 'Scamp/Scapegoat')

The 'Scapegoat' intermediate-range ballistic missile carried by this mobile weapon system appears to comprise the top two stages of the SS-13, giving it an overall length of about 35 ft. The NATO reporting name 'Scamp' refers to the complete weapon system, based on the JS III heavy tank chassis. The missile, inside its hinged container, is raised to a vertical position for launch by hydraulic jacks at the rear of the vehicle. The container is then moved away from the missile and its launch platform before firing. Range of this IRBM is estmated at 2,500 miles. Areas of deployment are reported to include the Chinese frontier near Buir Nor, in Outer Mongolia.

SS-15 (NATO 'Scrooge')

This mobile ballistic missile system employs the same basic JS III transport/erector/launch vehicle as the SS-14, with a different missile. Nothing is known of the latter, except that it is fired from its launch-tube, which is raised to a vertical position for firing. The launch-tube is about 62 ft long, with a diameter of 6 ft 6 in, suggesting that the missile might have a range of up to 3,500 miles.

SS-X-16

Only solid-propellant missile among the four new Soviet ICBMs, the SS-X-16 is viewed as a replacement for the SS-13. It is described as being about the same size as the latter, with greater range and payload capability. So far, it has been tested with only a single re-entry vehicle, but is intended to employ a post-boost vehicle (PBV, known in the US as a bus-type dispensing system)

—TASS PHOTO

SS-5 (NATO 'Skean')

SS-9 (NATO 'Scarp')

SS-13 (NATO 'Savage')

SS-14 (NATO 'Scamp/Scapegoat')

for MIRVs. The US Department of Defense has suggested that the SS-X-16 is under development for potential deployment in both silo-based and land-based mobile forms, and its two upper stages are used in the SS-X-20 mobile weapon system. Range of the SS-X-16 is estimated at more than 5,000 miles.

SS-17

Developed, like the SS-19, as a replacement for the SS-11, this two-stage liquid-propellant ICBM has been under test since the second half of 1974. Described as a city destroyer, it has been emplaced so far in about 30 modified SS-11 silos, from which it is intended to be cold-launched. Although it has been tested with a single large re-entry vehicle, as well as four MIRVs, the latter are standard on production missiles. The MIRVs are known to be shaped for high-speed atmospheric re-entry, to ensure greater accuracy, and may also achieve capability against hard targets by the early 1980s.
Warhead: nuclear (four MIRVs of 1 megaton each).
Dimensions: length 75 ft 0 in, max diameter 8 ft 6 in.
Performance: range 6,200 miles with CEP of around 500 m (0.3 mile).

SS-18

According to former US Secretary of Defense Donald Rumsfeld, this extremely formidable two-stage liquid-propellant ICBM is already deployed, with at least 40 emplaced by September 1976. Each has about 30% more throw weight than the SS-9 it replaces, and a degree of accuracy comparable with that of the SS-17. In consequence, a force of about 300 SS-18s (permitted under SALT I) could pose a serious threat to the American Minuteman force in their silos, even after the silos have been upgraded. Being cold-launched, the SS-18 does not require such a large-diameter silo as the SS-9, enabling existing silos to be considerably reinforced against nuclear attack. Three versions have been identified:

SS-18 Mod 1. Initial operational type, with single 25 megaton warhead.

SS-18 Mod 2. Tested with up to eight relatively large (1–2 megaton) MIRVs dispensed by a post-boost vehicle (PBV) similar to that employed on the US Minuteman III and Poseidon missiles. Not yet deployed, but regarded as potentially the most effective anti-Minuteman ICBM.

SS-18 Mod 3. Longer-range version, with single re-entry vehicle lighter and more accurate than that of Mod 1. Not yet deployed.
Dimensions: length 118 ft 0 in, max diameter 10 ft 0 in.
Performance: range 6,500 miles.

SS-19

This SS-11 replacement has been under test since early 1974, proving so successful that more than 100 SS-19s have already been deployed. Each carries a MIRVed payload of six re-entry vehicles, twice as many as Minuteman III carries and described as being twice as large. Although shaped for high-speed atmospheric re-entry, to improve accuracy, these warheads are not expected to offer reasonable hard target kill capability until the 1980s. However, by the time all current ICBMs have been replaced with the SS-16/19 series, the Soviet Union may well deploy around 7,000 one-megaton to two-megaton warheads in their ICBM force alone. The hot-launched SS-19 is thought to have a range of more than 6,300 miles and to be longer than the SS-11 and SS-17, requiring more extensive modification to any existing silos in which it is emplaced.

AS-3 (NATO 'Kangaroo') dropping from a Tu-95 'Bear-B'

SS-X-20

This IRBM has much in common with the SS-14 in that it is a mobile system using as its missile the two upper stages of the SS-X-16. Firing trials from the Kamchatka Peninsula are reported to have gone well, and the US Department of Defense has suggested that the Soviet Union may consider the SS-X-20 as deserving greater priority than the SS-X-16. Like the latter, it is probably configured initially to carry a single large re-entry vehicle, with a PBV already available for three MRVs as an alternative. Its range with either of these warheads should be in the order of 3,500 miles. A third alternative might be a lightweight nuclear warhead of 50 kilotons yield, which would give the missile a range of around 4,600 miles. Bearing in mind that this mobile 'IRBM' would be outside the SALT I limitations, it would offer the Soviet Union an extremely potent increase in capability over ranges associated normally with ICBMs.

AS-3 (NATO 'Kangaroo')

Resembling a sweptwing jet fighter in size and configuration, this air-to-surface missile was displayed for the first time under its Tu-95 carrier aircraft on Soviet Aviation Day, 1961. Little has been seen of it since that time, except for a launch sequence in an officially released Soviet film, from which the accompanying 'still' has recently become available.
Dimensions: span 30 ft 0 in, length 48 ft 11 in.
Performance: max speed Mach 2, 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 swing-wing 'Backfire', the AS-4 is the most advanced air-to-surface missile yet displayed publicly in the Soviet Union. It was first seen on a single Tu-22 ('Blinder-B') in 1961. Most of the 22 Tu-22s which participated in the 1967 Aviation Day display at Domodedovo carried an AS-4, semi-submerged in the fuselage, and production by 1976 was stated by the UK Defence Minister to be around 1,000. The missile has an aeroplane configuration, with stubby delta wings and cruciform tail surfaces. Propulsion is believed to be by liquid-propellant rocket motor; a nuclear warhead can be assumed.
Dimension: length 37 ft 0 in.
Performance: range 185 miles at low altitude.

AS-6

Even more advanced than 'Kitchen', the AS-6 is another of the air-to-surface weapons that can be carried by the Tupolev variable geometry supersonic bomber known to NATO as 'Backfire-B'. Propulsion is said to be by liquid-propellant rocket motor, with inertial mid-course guidance and active radar terminal homing, giving an exceptional degree of accuracy. Unofficial reports have suggested that the AS-6 can be fitted with interchangeable 1,000 lb nuclear or high-explosive warheads. Range is said to be more than 135 miles at low altitude.

Airborne Tactical and Defence Missiles

Helicopter missile (NATO 'Swatter')

No photograph has yet shown the type of anti-tank missile carried on the four wingtip launchers of the 'Hind-A' version of the Mil Mi-24 assault helicopter. However, the weapon carriers appear to have no provision for wire guidance, and 'Swatter' is the only one of three standard Soviet anti-tank missiles known to operate without wires. It is steered in flight via elevons on the trailing edges of its rear-mounted cruciform wings. Its blunt nose suggests the likelihood of a terminal homing system, with control by means of the small foreplanes.

Other Soviet helicopters capable of carry

ing missiles in this category include the 'Hind-D' attack version of the Mi-24 and the Ka-25 ASW helicopter.
Dimensions: span 2 ft 2 in, length 3 ft 8 in.

AS-2 (NATO 'Kipper')
This is another of the aeroplane-configuration air-to-surface missiles displayed under carrier aircraft at the 1961 Aviation Day display, but hardly mentioned since that time. Described by the commentator at Tushino as an anti-shipping weapon, the AS-2 is similar in configuration to the larger and more refined US Hound Dog, with swept wings and underslung turbojet engine. Radar is carried in the nose of the Tu-16 launch aircraft.
Dimensions: span 16 ft 0 in, length 31 ft 0 in.
Performance: max speed Mach 1.2, range 130 miles.

AS-5 (NATO 'Kelt')
According to the UK Minister of Defence, well over 1,000 AS-5s had been delivered by the Spring of 1976. About 25 were used operationally during the October 1973 war between Israel and the Arab states, when Tu-16s from Egypt launched them against Israeli targets. Only five eluded the air and ground defences, to hit a supply depot and two radar sites in Sinai.
The AS-5 has a similar aeroplane-type configuration to that of the turbojet-powered AS-1 ('Kennel') which it superseded. The switch to rocket propulsion eliminated the need for a ram air intake, and permitted the use of a larger radar inside the hemispherical nose fairing.
Dimensions: span 15 ft 0 in, length 31 ft 0 in.
Performance: range 100 miles.

AS-7 (NATO 'Kerry')
Nothing is known about this tactical air-to-surface guided missile, except that it is carried by Su-17, Su-20, and MiG-27 close support aircraft. It is believed to be the first of a new family of such weapons under current development in the Soviet Union.

AA-1 (NATO 'Alkali')
First Soviet air-to-air missile to become operational, 'Alkali' equipped the older generation of PVO-*Strany* interceptors, such as the Su-9 and all-weather versions of the MiG-19, and can be expected to disappear from service soon. It has a solid-propellant rocket motor and semi-active radar guidance system.
Dimensions: length 6 ft 2 in, body diameter 7 in, wing span 1 ft 10¾ in.
Performance: range 3.7 to 5 miles.

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. A solid-propellant rocket motor is fitted.
Dimensions: length 9 ft 2 in, body diameter 4.72 in, fin span 1 ft 8¾ in.
Performance: range 3 to 4 miles.

'Advanced Atoll'
The latest multi-role versions of the MiG-21 (NATO 'Fishbed-J, K, and L') can carry a radar homing version of 'Atoll' on the outer stores pylon under each wing, in addition to a standard infra-red homing 'Atoll' on the inboard pylon. The radar version is known at present as 'Advanced Atoll'.

AA-3 (NATO 'Anab')
The UK Ministry of Defence estimates production of this solid-propellant air-to-air missile as being "in the thousands". It was first observed as armament of the Yak-28P all-weather fighters which took part in the 1961 Aviation Day display at Tushino. Subsequently, it became standard on the Sukhoi Su-11 and Su-15 interceptors. Each aircraft normally carries one 'Anab' with a 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 standard armament for the Tu-28P interceptors of PVO-*Strany*. The version with infra-red homing head is normally carried on the inboard pylon under each wing, with a semi-active radar homing version on each outboard pylon.
Dimensions: length 18 ft 0 in (IR) or 17 ft 0 in (SAR).
Performance: range 18.5 miles.

AA-6 (NATO 'Acrid')
This is the air-to-air missile that was identified during 1975 as standard armament of the 'Foxbat-A' interceptor version of the MiG-25. Its configuration is similar to that of 'Anab' but it is considerably larger. Photographs suggest that the version of 'Acrid' with an infra-red homing head is normally carried on each inboard underwing pylon, with a radar-homing version on each outer pylon. The wingtip fairings on the fighter, different in shape from those of 'Foxbat-B', are thought to house continuous-wave target illuminating equipment for the radar-homing missiles.
Dimension: length 20 ft 0 in (radar version).
Performance: range at least 23 miles.

AA-7 (NATO 'Apex')
This long-range air-to-air missile is one of the two types known to be carried as standard armament by the MiG-23. No details are available, except that 'Apex' has a solid-propellant rocket motor. It is likely to exist in both infra-red and radar-homing versions. The following data should be regarded as provisional:
Dimensions: length 14 ft 1¼ in, body diameter 9.4 in, wing span 3 ft 5½ in.
Performance: range 17 miles.

AA-8 (NATO 'Aphid')
Second type of missile carried by the MiG-23, 'Aphid' is a close-range solid-propellant weapon. The following data should be regarded as provisional:
Dimension: length 6 ft 10½ in.
Performance: range 5 miles.


—TASS PHOTO
AA-1 (NATO 'Alkali')


AA-2 (NATO 'Atoll') on Indian AF MiG-21 (note GP-9 gun pack)


AA-5 (NATO 'Ash') on Tu-28P


AA-6 (NATO 'Acrid') on MiG-25

Surface-to-Air Missiles

SA-1 (NATO 'Guild')
This missile was first displayed in a Moscow military parade on November 7, 1960. Although subsequently reported to be deployed as a standard anti-aircraft weapon, it took no further part in the regular Moscow parades until 1968, when it appeared on May Day. The SA-1 is not thought to have been supplied to any country outside the USSR, and its phase-out there has probably started.
Dimensions: length 39 ft 0 in, body diameter 2 ft 3½ in.
Performance: range 20 miles.

SA-2 (NATO 'Guideline')
Unlike the SA-1, this missile has been supplied to most of the Soviet Union's allies and friends, and is a standard anti-aircraft weapon in about 30 countries. It has been used extensively in combat in North Vietnam and the Middle East, and has been improved through several versions as a result of experience gained. One variant, first exhibited in Moscow in November 1967, has an enlarged, white-painted warhead without the usual small canard surfaces. It was claimed to be far more effective than ear-


—TASS PHOTO
SA-2 (NATO 'Guideline')

—KEX FEATURES PHOTO

SA-3 (NATO 'Goa')

—TASS PHOTO

SA-4 (NATO 'Ganef')

SA-6 (NATO 'Gainful')

SA-7 (NATO 'Grail')

—NOVOSTI PHOTO

SA-8 (NATO 'Gecko')

—NOVOSTI PHOTO

SA-9 (NATO 'Gaskin')

lier versions, and may have a nuclear warhead. At least 3,500 SA-2 launchers are thought to remain operational in the Soviet Union, although the number declines annually. Data for the standard export version:

Power Plant: liquid-propellant sustainer, burning nitric acid and hydrocarbon propellants; solid-propellant booster.
Guidance: automatic radio command, with radar tracking of target.
Warhead: normally high-explosive, weight 288 lb.
Dimensions: length 34 ft 9 in, body diameter 1 ft 8 in, wing span 5 ft 7 in.
Launching weight: 5,000 lb.
Performance: max speed Mach 3.5, slant range 25 miles; effective ceiling 60,000 ft.

SA-3 (NATO 'Goa')

Soviet counterpart of the American Hawk, the SA-3 is deployed in increasing numbers by the Soviet Union, by other Warsaw Pact nations, and in the Middle East and North Vietnam as a mobile low-altitude system to complement the medium/high-altitude SA-2. As the SA-N-1, it is also the most widely-used surface-to-air missile in the Soviet Navy, fired from a roll-stabilised twin-round launcher.

Power Plant: two-stage solid-propellant.
Guidance: radio command, with radar terminal homing.
Warhead: high-explosive.
Dimensions: length 22 ft 0 in, body diameter 1 ft 6 in, wing span 4 ft 0 in.
Performance: slant range 18.5 miles, effective ceiling 40,000 ft.

SA-4 (NATO 'Ganef')

Ramjet propulsion gives this anti-aircraft missile a very long range. Its usefulness is further enhanced by its mobility, as it is carried on a twin-round tracked launch vehicle which is itself air-transportable in the An-22 military freighter. The SA-4 was first displayed publicly in 1964, and is now a standard Soviet weapon.

Power Plant: ramjet sustainer; four wrap-around solid-propellant boosters.
Guidance: radio command.
Warhead: high-explosive.
Dimensions: length 28 ft 10½ in, body diameter 2 ft 8 in, wing span 7 ft 6 in.
Launching weight: 3,975 lb.
Performance: slant range 43 miles, effective ceiling 80,000 ft.

SA-5 (NATO 'Gammon')

There is reckoned to be a total of 12,000 missiles on 10,000 surface-to-air missile launchers operational at 1,650 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. When first displayed publicly in Moscow, in 1963, it was said to have anti-missile capability. This must be limited, even if the warhead section separates after second-stage burnout and is able to use an inbuilt rocket motor during the final stages of interception.

Power Plant: two-stage solid-propellant, possibly with terminal propulsion for warhead.
Guidance: radar homing.
Dimensions: length 54 ft 0 in, body diameter 2 ft 10 in, wing span 12 ft 0 in.
Performance: slant range 155 miles, effective ceiling 95,000 ft.

SA-6 (NATO 'Gainful')

This mobile low-altitude weapon system took an unexpectedly heavy toll of Israeli aircraft during the October 1973 war. Its unique integral rocket/ramjet propulsion system is a decade in advance of comparable Western technology, and the US-supplied ECM equipment which enabled Israeli aircraft to survive 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.

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 37 miles, effective ceiling 59,000 ft.

SA-7 (NATO 'Grail')

This Soviet counterpart of the US shoulder-fired, heat-seeking Redeye first proved its effectiveness in Vietnam against slower, low-flying aircraft and helicopters. It repeated the process during the 1973 Arab-Israeli war, despite countermeasures, including the use of decoy flares, and deflecting upward the exhaust of helicopters. In addition to its use by infantry, the SA-7 is carried by vehicles in batteries of four, six, and eight, for both offensive and defensive employment, with radar aiming.

Power Plant: solid-propellant boost/sustainer.
Guidance: infra-red homing.
Warhead: high-explosive, weight 5.5 lb.
Dimensions: length 4 ft 5 in, body diameter 2.75 in.
Performance: max speed Mach 1.5, slant range 5.5 to 6 miles, effective ceiling 5,000 ft.

SA-8 (NATO 'Gecko')

First displayed publicly during the parade through Moscow's Red Square on November 7, 1975, this short-range, all-weather surface-to-air weapon system has much in common with the European Roland. Missile configuration is conventional, with canard foreplane control surfaces and fixed tail-fins. Fire control equipment and quadruple launcher are mounted on a rotating turret, carried by a new three-axle six-wheel vehicle that appears to be amphibious. 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 estimated range of 12–15 miles. The SA-8 is believed to be at the service evaluation stage, but may use the same missile as the well-established but enigmatic naval SA-N-4 system. Each vehicle is believed to carry a total of 12 missiles.

Power Plant: probably solid-propellant.
Guidance: command guidance by proportional navigation.
Warhead: high-explosive, about 90–110 lb weight.
Dimensions: length 10 ft 6 in, body diameter 8.25 in.
Performance: range up to 7.5 miles.

SA-9 (NATO 'Gaskin')

This weapon system comprises a BRDM amphibious vehicle, carrying two pairs of box launchers for missiles described as uprated SA-7 'Grails'. The launchers rest flat on the rear of the vehicle when not required to be ready for launch. Range of the missile is approximately 5 miles.

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/cruiser *Kiev*, helicopter cruisers *Moskva* and *Leningrad*, and *Kara* and *Kresta II* cruisers, carry a new and more effective missile than the SA-N-1 ('Goa'). Known as the SA-N-3, this could be similar to the SA-6.

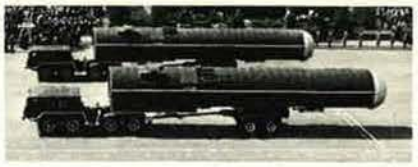
SA-N-4

Little is known about this naval close-range surface-to-air weapon system, although at least 33 SA-N-4 installations are known to be operational on six classes of ships of the Soviet Navy. The retractable twin-round 'pop-up' launcher is housed inside a bin on deck. It has been suggested that the missiles might be similar to those used in the land-based mobile SA-8 system.

NATO 'Galosh'

The SALT I agreement permitted each na-

tion a total of 100 ABMs (anti-ballistic missiles) on launchers for defence of the national capital and 100 more for defence of an ICBM launch area. ABM deployment was further reduced to one site for each country at the Moscow Summit meeting of late June and early July 1974. The Soviet 'Galosh' ABM system deployed around Moscow consists at present of 64 operational launchers and associated radars. There is no indication that the other 36 launchers are to be added to the system, although Soviet ABM R & D continues at a high priority, with two completely new systems reported. Missiles purported to be 'Galosh' have been paraded through Moscow, inside containers with one open end, on frequent occasions since 1964. No details of the missile could be discerned, except that the first stage has four combustion chambers.



'Galosh' ABM

Launch Vehicles

Cosmos launchers

Two categories of launch vehicles appear to be used for Cosmos and Intercosmos satellites, and other Soviet spacecraft. One category is based on the structures and power plants of standard missiles, such as the SS-4 ('Sandal'), SS-5 ('Skean'), and SS-9 ('Scarp'), with additional upper stages as required. The other combines the basic core vehicle developed originally for the Vostok manned spacecraft with a variety of upper stages. Examples are as follows:

SS-4 + Cosmos stage (US designation B-1). Launched from Plesetsk and Kapustin Yar. First stage powered by 158,800 lb st RD-214 four-chamber liquid-propellant rocket engine, burning nitric acid and kerosene. Second stage powered by RD-119 single-chamber engine, burning liquid oxygen and dimethylhydrazine, and giving 24,250 lb st in vacuum. Typical launch, on June 26, 1974, orbited Cosmos-662, a 900 lb ellipsoid, 6 ft long with a diameter of 4 ft, intended for scientific research.

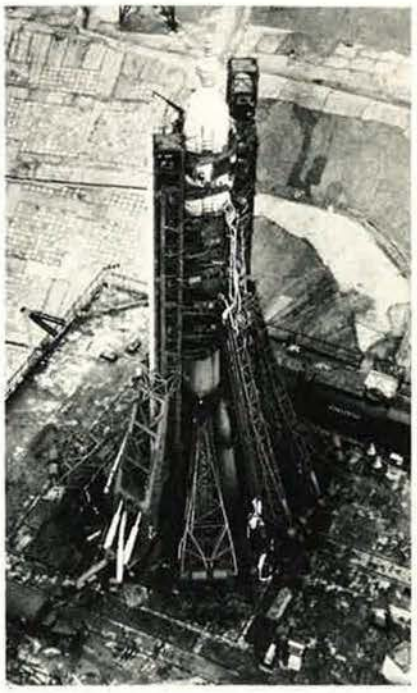
SS-5 + Restart stage (US designation C-1). Launched from Plesetsk, with payloads weighing up to 3,300 lb. A typical application for the SS-5 was to orbit Cosmos-655 and -661 satellites. Shaped as cylinders, 6 ft long and 3 ft in diameter, with paddle-type solar panels, these are thought to have had navigation and/or electronic intelligence missions.

SS-9 + FOBS stage. Frequent launches of this vehicle are expected to contribute to continued development of Fractional Orbital Bombardment System techniques and/or to ocean surveillance missions. Satellites like Cosmos-651 and -654 normally remain in low parking orbit for two months, then split and move into a 104-min orbit.

Vostok core + Venus stage. This standard launch vehicle has many applications. It is used with an escape stage to orbit the 2,750 lb uprated Molniya-2 communications satellites. Typical military payloads were Cosmos-639, a manoeuvrable reconnaissance satellite intended probably to study the breakup of Arctic pack ice; and Cosmos-658, a reconnaissance satellite in the form of a four-ton sphere-cylinder, 16½ ft long, which remained in orbit for 12 days.

Soyuz launcher

This vehicle is an uprated version of that used to orbit Yuri Gagarin's Vostok-1 spacecraft on April 12, 1961, with some 36 ft of additional upper staging and structures. During launch it is surmounted by an escape tower with three rows of rocket nozzles. It is not possible to identify the current engines, or give their individual ratings. However, official Soviet reports have stated that the vehicle has a total thrust of around 60 million horsepower, which is three times the power quoted for the original Vostok launcher. The basic configuration has not changed. Thus, the first stage consists of a central core, powered by an engine with four primary nozzles and four verniers. This is surrounded by four wrap-around boosters, each with four primary nozzles and two verniers, so that 32 rocket chambers are fired simultaneously during lift-off. Weight of the current Soyuz spacecraft is about 14,500 lb.



Launch vehicle for Soyuz-10, April 1971

RPVs and Target Drones

Little has been published about the operation of RPVs and target drones by the Soviet armed forces. However, Soviet films shown to invited audiences have depicted two types of target drone in use for training surface-to-air missile crews and the pilots of interceptor fighter aircraft:

Lavochkin La-17

This small radio-controlled target has a slim cylindrical fuselage, with unswept wings of constant chord mid-set on the fuselage at about mid-length. The conventional tail surfaces are also unswept and of constant chord, with the tailplane mounted partway up the fin to avoid the exhaust from two jettisonable solid-propellant booster rockets which are fitted under the wings for take-off. The La-17, which was developed in the early 1950s, has an all-metal airframe. Cruise propulsion is provided by a turbojet engine mounted in a pod under the fuselage. It has been suggested that this may be a modified version of the 1,985 lb st RU-19-300 engine which is used as an APU in the Antonov An-24/26/30 series of aircraft. Equipment is reported to include a parachute recovery system and a Luneberg lens radar reflector. The following data should be regarded as provisional:

Dimensions: span 22 ft 9½ in, length 23 ft 3½ in, body diameter 1 ft 7¾ in, height 8 ft 3½ in.
Weights: empty 2,645 lb, gross 3,968 lb.
Performance: max speed Mach 0.85 at high altitude, Mach 0.7 at low altitude, ceiling 45,925 ft, endurance 1 hour.

Yakovlev Yak-25RD (?)

Shown as a target for an SA-2 ('Guideline') surface-to-air missile in a film made in the late 1960s, this Soviet target aircraft appeared to be almost identical with published impressions of the Yakovlev high-altitude reconnaissance aircraft known to NATO as 'Mandrake'. This suggests that the 'Mandrakes' may have been adapted into high-flying pilotless targets when retired from active service in their original role.

'Mandrake' was a development of the Yak-25, with an existing fuselage married to a new straight wing of extended span. This made possible the high-altitude performance needed for 'U-2 type' missions, with a minimum of new design effort. The fuselage was believed to be generally similar to that of the Yak-25R/26, with a single-seat cockpit and a new 'solid' nose to house reconnaissance equipment. The zero-track main landing gear of the Yak-25 was retained, with single nosewheel and twin-wheel rear unit under the centre-fuselage, requiring the provision of housings for the outrigger wheels on the tips of the new wings. The engines are believed to have been Tumansky R-9 turbojets, each rated at 8,818 lb st with afterburning. Photographs of a generally similar aircraft, referred to as the Yak-25RD, have appeared in the Eastern European press.

Dimensions: span 70 ft 6 in, length 51 ft 4¾ in.

The USSR's Armed Forces—particularly its aerospace forces—are organized differently from those of the US. Both combat and principal support services are headed by officers who also are Deputy Ministers of Defense.

Organization of Soviet Aerospace Forces

ONE should divest himself of the temptation to slice Soviet armed forces into land-sea-air segments. Soviet forces are organized in five separate services: Strategic Rocket Forces, Ground Forces, Troops of National Air Defense (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 services do not include Troops of Civil Defense, Border Guards (KGB), Troops of the Ministry of Internal Affairs (MVD), rear service logistical support, construction troops, or other support organizations. A further precaution: The Soviets sometimes refer to all their services as the "Soviet Army," even including their Navy.

The Ministry of Defense and the **General Staff** provide centralized command over all military services. Immediately subordinate to the Minister of Defense, who is roughly comparable in authority to both the US Secretary of Defense and the Chairman of the JCS, comes the Chief of the Warsaw Pact Forces, followed by the Chief of the General Staff, who heads a staff similar to that of prewar Germany. *(See accompanying charts.)*

The Strategic Rocket Forces, established in 1959, operate all land-based ballistic missiles with ranges greater than 1,000 km. While the SRF is extensively publicized by the Soviet news media, little is known about it 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 '76 issue of* AIR FORCE *Magazine)* credits the Strategic Rocket Forces with 375,000 military personnel. Strength figures for the services that follow are from *The Military Balance 1976/77.*

The Ground Forces, numerically the largest of the five services, are divided into four major branches: Motorized-rifle, tanks, rockets and artillery, and troop air defense. (The last must not be confused with Troops of National Air Defense.) Airborne forces, while closely allied with the Ground Forces, are a special branch directly subordinate to the High Command. Ground Forces air defense equipment includes mobile surface-to-air missiles and antiaircraft artillery. Tanks, armored personnel carriers, self-propelled artillery, and personal equipment all are designed for a CBR environment. The Soviet Ground Forces are well equipped for combat either with or without nuclear, chemical, and biological weapons. Ground Forces personnel number about 1,825,000.

The Troops of National Air Defense (PVO *Strany*) was separated from the Ground Forces in 1948. Its three major components are antiaircraft defense, antimissile defense (PRO), and antispace defense (PKO). Its fighter-interceptors, SAMs (for example, the SA-3 and SA-5), combined with its huge radar network, exceed NORAD's capabilities several times over. PVO has some 550,000 troops.

While the **Soviet Air Forces,** with approximately 450,000 personnel, does not include ICBMs or air defense aircraft and missiles, it does include the three major components of Frontal Aviation, Long-Range Aviation, and Military Transport Aviation.

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

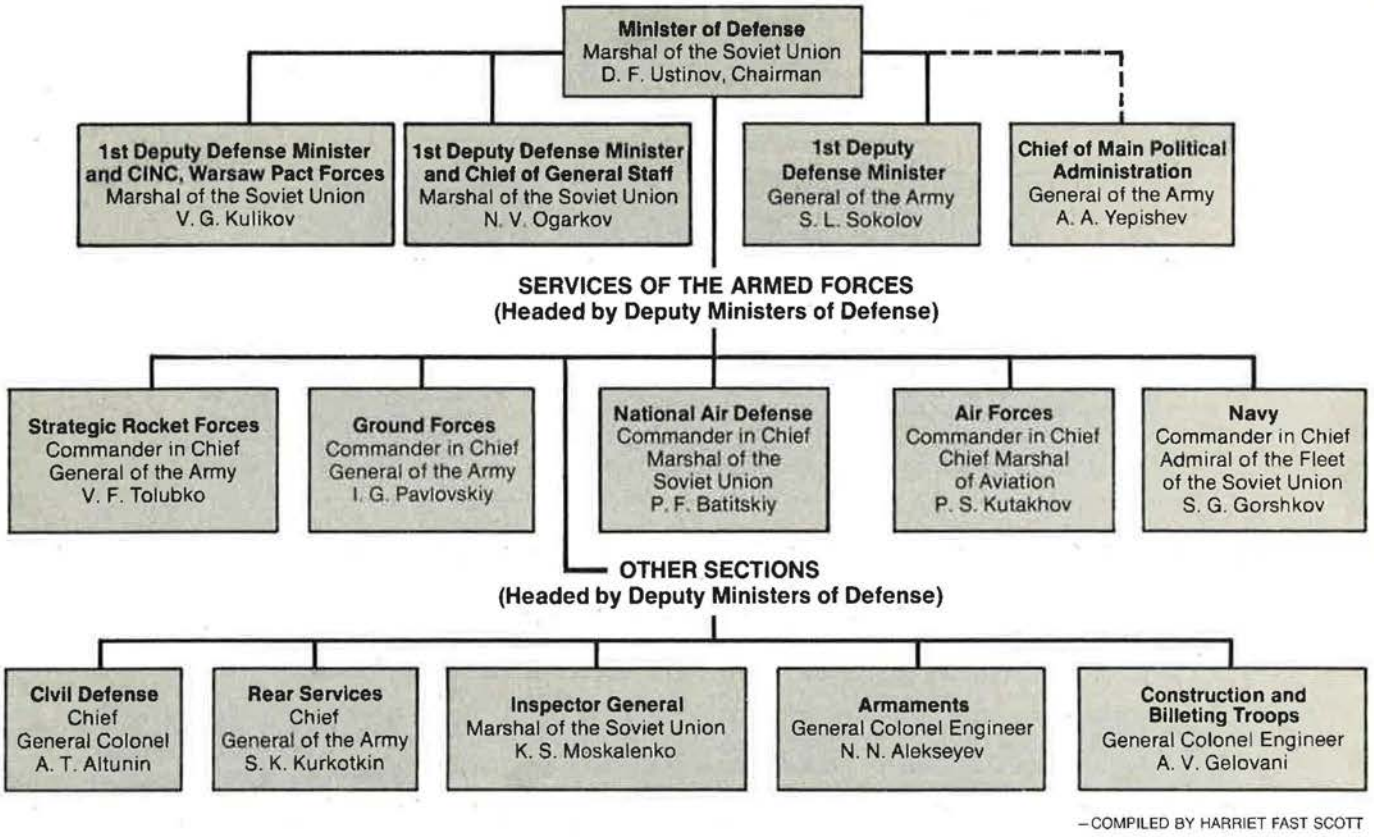
Long-Range Aviation has both long-range (Bear, Bison, and Backfire) and medium-range (Badger and Blinder) bombers. Backfire and Blinder are supersonic, but the bulk of the bomber force is still subsonic. Capable of air-to-air refueling by LRA's small tanker force, the bombers can carry either nuclear 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 both fixed-wing airlift and helicopters, although some helicopters are also assigned to the Navy. The transport aircraft of the Soviet airline, Aeroflot, must also be included in this component, essentially as a full-time reserve.

The Soviet Navy is now a maritime superpower. With the first aircraft carrier, the *Kiev,* having put to sea (they are expected to produce more of these), Soviet Naval Aviation has a mix of helicopters and fixed-wing V/STOL aircraft. Naval Aviation also has strike and reconnaissance fighters, a limited transport force, bombers, and surveillance aircraft. Navy personnel strength is about 450,000, including 50,000 in Naval Aviation.

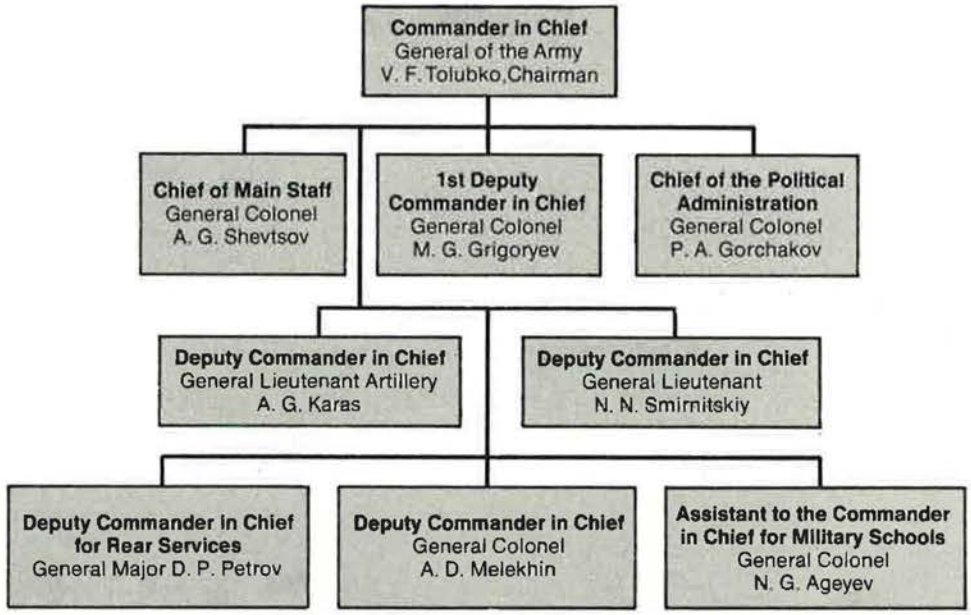
The accompanying charts, prepared by Harriet Fast Scott, and current as of February 1, 1977, depict the membership of the top military organization. It is noteworthy that the new Minister of Defense, Dmitriy Ustinov, although he holds the rank of Marshal of the Soviet Union, is the first essentially civilian Defense Minister since 1925, when Leon Trotskiy was removed.

MEMBERS OF THE MAIN MILITARY COUNCIL OF THE MINISTRY OF DEFENSE



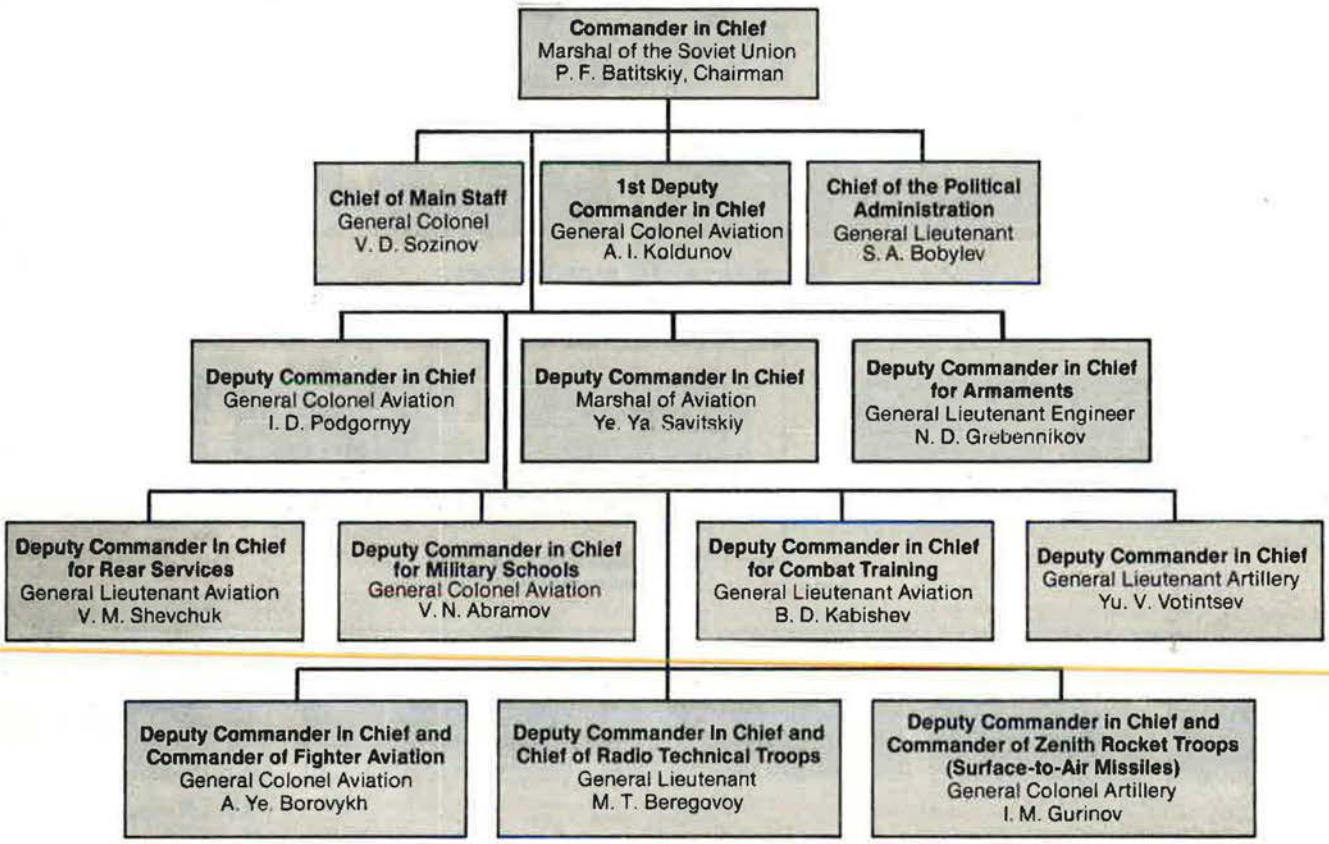
—COMPILED BY HARRIET FAST SCOTT

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



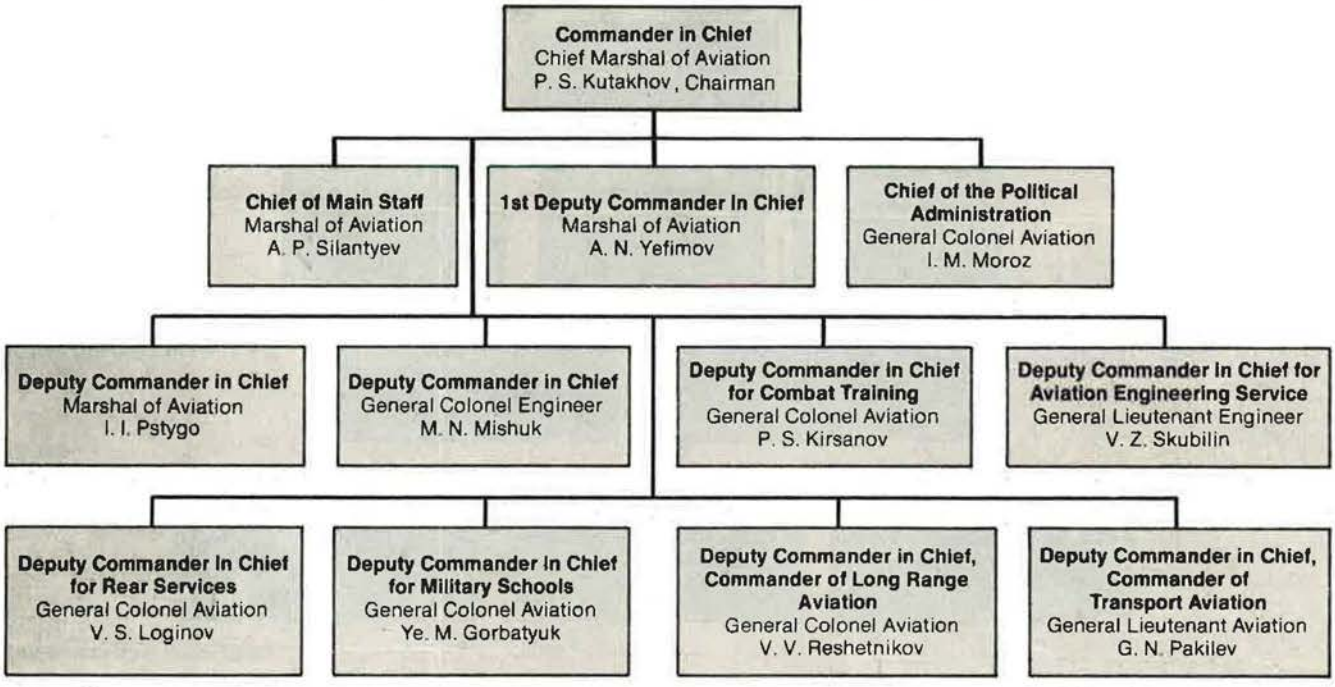
—COMPILED BY HARRIET FAST SCOTT

MEMBERS OF THE MILITARY COUNCIL OF COMMAND AND STAFF OF NATIONAL AEROSPACE DEFENSE FORCES



—COMPILED BY HARRIET FAST SCOTT

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



—COMPILED BY HARRIET FAST SCOTT

Although major subordinate aviation units bear army designations, they are generally comparable to the USAF structure below major command level.

Organization of Subordinate Aviation Units

THE organization of Soviet aviation units below a level that might be considered comparable to USAF major commands—*i.e.,* National Air Defense (ADCOM), Long-Range Aviation (SAC), Frontal Aviation (TAC), Transport Aviation (MAC)—bears some similarities to the USAF organization patterns but is not an exact parallel. The principal organizational units are described below.

The Air Army *(Vozdushnaya armiya)* (VA) is the largest operational formation of Frontal (tactical) and Long-Range (strategic) Aviation. A VA consists of aviation divisions (sometimes, when reinforced, of corps) and detached units plus support and servicing units. It is commanded by a general colonel of aviation.

During the last war, there were seventeen Air Armies of Frontal Aviation and one Air Army of Long-Range Aviation. Frontal Aviation Air Armies were part of the fronts and subordinate to the front troop commander, but operationally they were also under the Commander in Chief of the Soviet Air Forces. By the end of the war, VAs generally had about 1,500 aircraft and in some operations 2,500 to 3,000 when reinforced with aviation corps and divisions belonging to the reserves of the High Command. Very important fronts sometimes had two VAs.

The next highest aviation unit is the Aviation Corps *(Aviatsionnyy korpus)* (AK). In time of war, the AK performs tactical or strategic tasks independently or as part of an Air Army, in cooperation with other services. An AK, commanded by a general lieutenant of aviation, consists of command and control, and several aviation divisions with one or more types of aircraft. It may also have such support units as reconnaissance, communications, ECM, etc. An AK usually consists of two to three aviation divisions and, depending on the type of aircraft, 200 to 300 bombers or 250 to 375 fighters or ground-attack airplanes.

The Aviation Division *(Aviatsionnaya diviziya)* (AD) is the basic tactical unit. An AD consists of command and control, several aviation regiments either of one kind or mixed, and support units. It is commanded by a general major of aviation or a colonel, but in Long-Range Aviation the commander may be one rank higher. The AD may operate independently or as part of an aviation corps. ADs generally are made up of three aviation regiments with ninety-eight aircraft in a bomber AD or 124 in a fighter AD.

The Aviation Regiment *(Aviatsionnyy polk)* (AP) is commanded by a colonel or, in Long-Range Aviation, sometimes by a general major. In National Air Defense (PVO *Strany*), APs are part of an air defense division. In the Air Forces, an AP is composed of thirty-two bombers or forty fighters or ground attack aircraft, usually of one type, organized into three squadrons.

The Aviation Squadron *(Aviatsionnaya eskadril'ya)* (AE) is commanded by a major (a colonel/lieutenant colonel in Long-Range Aviation), and operates alone or with other kinds of aircraft or other armed services. It has several elements of one type of aircraft or helicopter. An AE has from ten to, in some instances, as many as twenty-four aircraft.

The Aviation Flight *(Aviatsionnoye zveno)* (AZ) is the primary tactical and fire subunit assigned a tactical role. Normally led by a captain, the AZ can be part of an aviation squadron or independent. Depending on the type of aircraft, an AZ has three or four airplanes. Fighter-bombers and fighters operate in pairs.

Aviation Detachments *(Aviatsionnyy otryad)* now exist only in the heavy bomber element of Long-Range Aviation and in Naval Aviation, and are commanded by a lieutenant colonel or a major. In the Air Forces, aviation detachments were replaced by aviation squadrons.

The logistical system of aviation support units in the Soviet Armed Forces is called the Aviation Rear Services. In 1945, Aviation Technical Divisions *(Aviatsionno-tekhnicheskaya diviziya)* (ATD) were created to support aviation corps. The ATDs were made up of Aviation Technical Regiments *(Aviatsionno-tekhnicheskiy polk)* (ATP), which were attached to aviation divisions. ATPs in turn were made up of Aviation Technical Battalions *(Aviatsionno-tekhnicheskiy batal'yon)* (ATB), which serviced aviation regiments.

The Aviation Technical Unit *(Aviatsionno-tekhnicheskaya chast')* is the basic support unit of the Air Forces, Naval Aviation, and Air Defense Aviation. It provides material, airdrome-technical, and medical support to aviation units on air bases. The unit has an aviation-technical base, a battalion or company of airdrome technical support, and an office for the commandant of the Aviation Garrison. An aviation technical unit is not part of an aviation unit. During the time it is supporting an aviation unit, however, it is operationally subordinate to the commander of that unit. —H.F.S.

INDUSTRIAL ASSOCIATES OF THE AIR FORCE ASSOCIATION

"Partners in Aerospace Power"

Listed below are the Industrial Associates of the Air Force Association. Through this affiliation, these companies support the objectives of AFA as they relate to the responsible use of aerospace technology for the betterment of society, and the maintenance of adequate aerospace power as a requisite of national security and international amity.

Aerojet ElectroSystems Co.
Aerojet-General Corp.
Aeronca, Inc.
Aerospace Corp.
AIL, Div. of Cutler-Hammer
Allegheny Ludlum Industries, Inc.
American Telephone & Telegraph Co.
AT&T Long Lines Department
Applied Technology, Div. of Itek Corp.
AVCO Corp.
Battelle Memorial Institute
BDM Corp., The
Beech Aircraft Corp.
Bell Aerospace Textron
Bell Helicopter Textron
Bell & Howell Co.
Bendix Corp.
Benham-Blair & Affiliates, Inc.
Boeing Co.
Brunswick Corp., Defense Div.
Brush Wellman, Inc.
Burroughs Corp.
CAI, Div. of Bourns, Inc.
Canadian Marconi Co.
Cessna Aircraft Co.
Chamberlain Manufacturing Corp.
Chromalloy American Corp.
Cincinnati Electronics Corp.
Collins Division, Rockwell Int'l
Colt Industries, Inc.
Computer Sciences Corp.
Connecticut International Corp.
Conrac Corp.
Control Data Corp.
Day & Zimmermann, Inc.
Dayton T. Brown, Inc.
Decca Navigation Systems, Inc.
Dynalectron Corp.
E-A Industrial Corp.
Eastman Kodak Co.
ECI Div., E-Systems, Inc.
E. I. Du Pont de Nemours & Co.
Emerson Electric Co.
Engine & Equipment Products Co.
E-Systems, Inc.
Ex-Cell-O Corp.—Aerospace
Fairchild Industries, Inc.
Federal Electric Corp., ITT
Firestone Tire & Rubber Co.
Ford Aerospace & Communications Corp.
GAF Corp.
Garrett Corp.
General Dynamics Corp.
General Dynamics, Electronics Div.
General Dynamics, Fort Worth Div.
General Electric Co.
GE Aircraft Engine Group
General Motors Corp.
GMC, Delco Electronics Div.
GMC, Detroit Diesel Allison Div.
GMC, Harrison Radiator Div.
General Time Corp.
Goodyear Aerospace Corp.
Gould Inc., Government Systems Group
Grimes Manufacturing Co.
Grumman Corp.
GTE Sylvania, Inc.
Harris Corp.
Hayes International Corp.
Hazeltine Corp.
Hi-Shear Corp.
Hoffman Electronics Corp.
Honeywell, Inc.
Howell Instruments, Inc.
Hudson Tool & Die Co., Inc.
Hughes Aircraft Co.
Hughes Helicopters
Hydraulic Research Textron
IBM Corp.
International Harvester Co.
Interstate Electronics Corp.
Israel Aircraft Industries, Ltd.
ITT Aerospace, Electronics, Components & Energy Group
ITT Defense Communications Group
Kelsey-Hayes Co.
Lear Siegler, Inc.
Leigh Instruments, Ltd.
Lewis Engineering Co., The
Libbey-Owens-Ford Co.
Litton Industries, Inc.
Litton Industries Guidance & Control Systems Div.
Lockheed Aircraft Corp.
Lockheed Aircraft Service Co.
Lockheed California Co.
Lockheed Electronics Co.
Lockheed Georgia Co.
Lockheed Missiles & Space Co.
Logicon, Inc.
Loral Corp.
Magnavox Government & Industrial Electronics Co.
Martin Marietta Aerospace
Martin Marietta, Denver Div.
Martin Marietta, Orlando Div.
McDonnell Douglas Corp.
Menasco Manufacturing Co.
MITRE Corp.
Moog, Inc.
Northrop Corp.
OEA, Inc.
O. Miller Associates
Pan American World Airways, Inc.
PRC Information Sciences Co.
Products Research & Chemical Corp.
Rand Corp.
Raytheon Co.
RCA
Redifon Flight Simulation Ltd.
Rockwell International
Rockwell Int'l, Electronics Operations
Rockwell Int'l, North American Aerospace Operations
Rosemount Inc.
Sanders Associates, Inc.
Singer Co.
Space Corp.
Sperry Rand Corp.
Sundstrand Corp.
Sverdrup & Parcel & Associates, Inc.
System Development Corp.
Teledyne, Inc.
Teledyne Brown Engineering
Teledyne CAE Div.
Teledyne Ryan Aeronautical Div.
Texas Instruments Inc.
Thiokol Corp.
Tracor, Inc.
TRW Systems, Inc.
Union Carbide Corp.
United Technologies Corp.
UTC, Chemical Systems Div.
UTC, Hamilton Standard Div.
UTC, Norden Div.
UTC, Pratt & Whitney Aircraft Div.
UTC, Research Center
UTC, Sikorsky Aircraft Div.
Vought Corp.
Western Gear Corp.
Western Union Telegraph Co., Government Systems Div.
Westinghouse Electric Corp.
World Airways, Inc.
Wyman-Gordon Co.
Xonics, Inc.

Soviet Armed Forces Facts and Figures

The "Facts and Figures" on these pages should help readers evaluate the relative capabilities of US and Soviet aerospace forces, and recent trends in defense funding on both sides. The tables on manpower and forces were prepared by the staff of AIR FORCE Magazine from data found in the most authoritative open sources.

ESTIMATED SOVIET EXPENDITURES FOR BASELINE FORCES COMPARED TO US

(TOA IN BILLIONS US $)

	US	USSR in FY '77 $		
Fiscal Year	Current $	FY '77 $	Low Estimate	Middle Estimate	High Estimate
1964	46.4	110.4	92	97	102
1965	47.6	105.8	94	99	104
1966	47.9	102.7	98	103	108
1967	52.7	108.2	102	107	112
1968	53.7	106.5	107	112	117
1969	55.6	104.3	109	114	119
1970	58.5	100.7	114	119	124
1971	60.2	97.2	115	120	125
1972	58.0	93.3	115	120	125
1973	59.6	95.8	117	122	127
1974	76.1	94.9	118	123	128
1975	81.1	92.3	126	131	136
1976	87.9	94.2	137	142	147
1977	100.8	100.8			
1978	*112.9	*106.2			

Expenditures for baseline forces do not include military retirement, military assistance, civil defense, and some more peripheral items. The figures in the above table indicate that in FY '76, the USSR outspent the US for baseline forces by from forty-five to fifty-six percent. In constant dollars, US expenditures for baseline forces in FY '77 were nearly nine percent less than in FY '64 (the last pre-Vietnam budget), while Soviet expenditures have increased by nearly fifty percent between FY '64 and FY '76.

The total US defense budget, which includes those items that are excluded in baseline forces, was six percent of GNP in FY '75; 5.7 percent in FY '76; and is estimated to be 5.4 percent in FY '77. On a comparison basis, Soviet defense expenditures are estimated to be at least fifteen percent of the USSR's GNP.

* Estimated

PERSONNEL STRENGTH OF SOVIET ARMED FORCES

WW II	11,375,000	1970	4,470,000
1964	3,775,000	1971	4,540,000
1965	4,270,000	1972	4,600,000
1966	4,290,000	1973	4,660,000
1967	4,350,000	1974	4,720,000
1968	4,380,000	1975	4,740,000
1969	4,440,000	1976	4,760,000

The above figures include Soviet Border Guards (KGB) and Internal Security Forces (MVD).

In 1976, an estimated 1,375,000 Soviet military personnel were assigned to aerospace forces as follows:

Strategic Rocket Forces	375,000
National Air Defense (PVO)	550,000
Air Forces	450,000

During the same year, USAF military strength was approximately 571,000. For a comparison of Soviet and US aerospace forces, some 2,000 US Army personnel assigned to air defense tasks must be added to the USAF military personnel strength, giving a grand total of 573,000.

US military personnel assigned in 1976 to aerospace tasks, on a functional basis, compared to their counterpart Soviet aerospace forces of the same year are approximately as follows:

	USSR	US
Long-range missile forces	375,000	9,300[a]
Aerospace defense	550,000	29,000[b]
Other air force tasks	450,000	534,700
TOTALS	1,375,000	573,000

[a] Includes only Strategic Air Command military personnel assigned to missile launch crews and missile maintenance, since many personnel in support functions serve both SAC missile and bomber forces. The total number of military personnel assigned to SAC in 1976 was approximately 124,000.

[b] Includes 27,000 military personnel assigned to the USAF Aerospace Defense Command and 2,000 military personnel of Army air defense activities.

PRINCIPAL US AND SOVIET AEROSPACE SYSTEMS

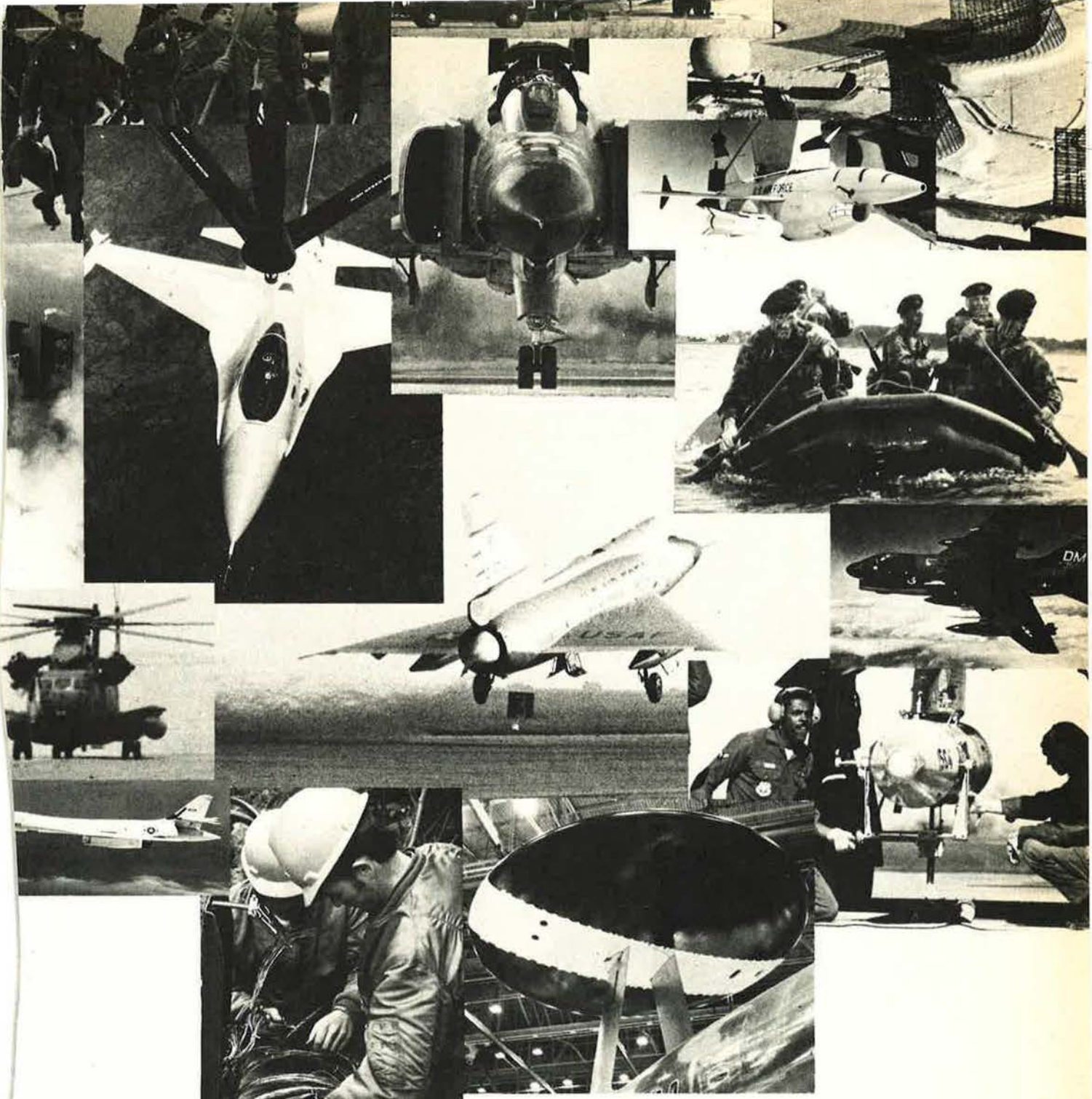
The information in this table was extracted from *The Military Balance 1976/77*, compiled by The International Institute for Strategic Studies, London, and reprinted in the December '76 issue of AIR FORCE Magazine. Figures are those available to the Institute on July 1, 1976, in some instances are approximations, and will not in all cases agree with figures elsewhere in this issue.

	US		USSR	
CATEGORY	TYPE	NUMBER	TYPE	NUMBER
Strategic Bomber	B-52D/F/G/H; FB-111	453	Tu-95, Mya-4, Backfire	165
Tactical Bomber		0	Tu-16, Tu-22; Il-28, Backfire (includes Naval Aviation)	1,260
Other Tactical Combat Aircraft	USAF USN/USMC (Includes A-4, A-6, A-7, A-8, A-10; F/RF-4; F-8, F-14, F-15, F-105, F-111; E-2B; EA-6B; EB-57; S-2)	4,500 1,586	MiG-17, MiG-21, MiG-23, MiG-25; Su-7, Su-17, Su-19; Yak-28, Yak-36; An-12	4,325
Manned Interceptors	F-106 (USAF and ANG); and F-4 and F-101B of ANG	331	MiG-17, MiG-19, MiG-25; Su-11, Su-15; Yak-25P; Tu-28P	2,650
Transports	C-130, C-141, C-5	890	Il-14, Il-18, Il-76; An-8, An-12, An-22, An-24/26	1,700
ICBMs	Titan (54); Minuteman II (450); Minuteman III (550)	1,054	SS-7 (140); SS-8 (19); SS-9 (252); SS-11 (900); SS-13 (60); SS-17 (20); SS-18 (36); SS-19 (100)	1,527
SLBMs	Polaris (160); Poseidon (496)	656	SS-N-8 (220); SS-N-6 (544); SS-N-5 (54); SS-N-4 (27). Under SALT, the -4s and 33 of the -5s are not considered "strategic."	845
M/IRBMs		0	SS-4 (500); SS-5 (100)	600
Strategic Defense Missiles	ABM Strategically deployed surface-to-air missiles.	0 0	Galosh SA-1, SA-2, SA-3, SA-4, SA-5, SA-6	64 10,000

COMPARATIVE MILITARY RANKS—US AND USSR

UNITED STATES		SOVIET UNION	
(none)	(none)	Generalissimus of the Soviet Union*	
General of the Army	Admiral of the Fleet	Marshal of the Soviet Union	Admiral of the Fleet of the Soviet Union
(none)	(none)	Chief Marshal of Aviation, Armored Forces, Artillery	
General	Admiral	General of the Army, Marshal of Aviation, Marshal of Armored Forces, Artillery, Engineers, Signals, etc.	Admiral of the Fleet
Lieutenant General	Vice Admiral	General Colonel, General Colonel Aviation, General Colonel Armor, Artillery, Engineers, Justice, General Colonel-Engineer, etc.	Admiral, Engineer Admiral
Major General	Rear Admiral (Upper Half)	General Lieutenant, General Lieutenant Aviation, Armored Forces, Artillery, Engineers, General Lieutenant-Engineer, etc.	Vice Admiral, Engineer-Vice Admiral
Brigadier General	Rear Admiral (Lower Half)	General Major, General Major Aviation, General Major Armored Forces, Artillery, Engineers, Signals, Supply, Technical Troops, General Major-Engineer, etc.	Rear Admiral, Engineer-Rear Admiral
Colonel	Captain	Colonel (Polkovnik)	Captain 1st Rank
Lieutenant Colonel	Commander	Lieutenant Colonel (Podpolkovnik)	Captain 2d Rank
Major	Lieutenant Commander	Major	Captain 3d Rank
Captain	Lieutenant	Captain	Captain-Lieutenant
1st Lieutenant	Lieutenant (Jr. Grade)	Senior Lieutenant	Senior Lieutenant
2d Lieutenant	Ensign	Lieutenant	Lieutenant
(none)	(none)	Junior Lieutenant	Junior Lieutenant

* Stalin is the only man who has held this rank. Awarded June 1945.



oming in May . . .

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

The 27th Annual Air Force Almanac Issue featuring:

- ★ Exclusive articles by the Secretary and Chief of Staff, US Air Force
- ★ Reports from each Command, including important statistical data
- ★ Gallery of Weapon Systems prepared by the staff of "Jane's All the World's Aircraft"
- ★ Compilation of important US Air Force statistics and data
- ★ Guide to Air Force Bases

You can be part of this important, authoritative issue with your advertising. Readership will be high throughout the year, as this issue serves as a desk-top reference for leaders in the Air Force, government and the aerospace industry.

Advertising reservations close March 25, copy by April 6

The Bulletin Board

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

The Budget's People Plans

A 6.5 percent pay raise next October, new PCS curbs, family separation payments for lower grades, a better shake for trailerites, and pay cuts for Academy cadets and federal employees who are also Reservists are among the "people" highlights of USAF's FY '78 budget.

Though advanced by the outgoing Ford Administration, many of these personnel programs are expected to receive the blessings of the new Administration and Congress. The proposals appear to contain more pluses than minuses for the services.

To make quarters allowances more realistic, Defense again plans to pack twenty-five percent of next fall's basic pay raises into BAQ payments. People in family quarters will surrender more money, but those living off base will enjoy more tax-free income.

In addition to the 6.5 percent raise next October, for both military and civilians, the budget projects the following subsequent increases: October 1, 1978—6.25 percent; October 1, 1979—6.00 percent; October 1, 1980—5.75 percent; and October 1, 1981—5.25 percent.

This month, military retirees are getting a 4.8 percent CPI boost. The budget also projects the following CPI raises: September 1977—2.7 percent; March 1978—2.6 percent; September 1978—2.7 percent; March 1979—2.4 percent; and September 1979—2.5 percent.

Defense's decision to allow only one PCS following technical training, during a person's initial three years of service, drew protests from USAF. If the rule sticks, it will erode the Air Force's overseas rotation base, officials told AIR FORCE Magazine. It was not immediately clear whether the Pentagon's new leadership, under Secretary Harold Brown, would go along with the plan. But it is consistent with his earlier statements about reducing moves to save money.

Air Force leaders feel they have already severely cut PCS moves over the past two years. At press time, they were again pressing overseas members to voluntarily extend their tours. The average on-station time is now thirty months, according to officials. Furthermore, they note that through its many move curbs USAF has cut its PCS expenditures to $499 million in FY '78, down from $567 million two years ago.

The budget provides $30 million to extend family separation payments to lower-ranking married enlisteds throughout DoD, and $8 million more in larger trailer allowance payments. As reported here last month, full commissary funding is provided.

Two other Defense proposals Congress rejected last year were reinstated. These are pay cuts for academy cadets and federal employees who also serve in the Reserves. The latter's Reserve pay when they're training would be cut but there would be no loss in take home pay, which is the general practice in the private sector. Academy students would receive full academic expenses and $125 a month.

The budget also provides for initial cost increases under the Defense Officer Personnel Management Act (DOPMA) and Retirement Modernization Act (RMA). RMA savings would begin in the early 1980s, Defense says, in continuing to push this piece of legislation. Congress rejected both DOPMA and RMA last year, but could approve them this year or next.

Also funded, by $7 million, is an AFA-backed provision for cost-of-living raises for survivors under the old Retired Servicemen's Family Protection Plan. In the Veterans Administration's budget, Congress was asked to eliminate VA home-loan guarantees for people who enter service after September 30, 1977, and also to halt new enrollments in

TSgt. Donald R. Overley, a USAF recruiter in the Valdosta, Ga., area and Wolfman Jack, well-known disc jockey and television personality, check out some of the Wolfman's records during his recent visit to Valdosta. Jack narrates Air Force spot announcements used by recruiters and makes personal appearances with Sergeant Overley when he visits.

First woman weapons director for the 25th NORAD Region, McChord AFB, Wash., is Lt. Christine Cole, here taking a light gun action on a SAGE console. She is a recent AFROTC graduate of Miami University, Oxford, Ohio, and is working on her master's at Pacific Lutheran University, Tacoma, Wash.

GI Bill flight training after that date.

Some $65 million savings in the FY '78 military personnel account would come from the proposal to pack a quarter of the next pay raise into BAQ. The plan to slash people moves would save $110 million, Defense officials claim.

Total proposed military personnel outlays for FY '78 are put at $27.7 billion, plus $9.1 billion in retired pay. These estimates compare with $26.2 billion and $8.1 billion for the present fiscal year. The percentage of the budget going for personnel programs would decline to fifty-five percent, because of the much larger increases proposed in other sections of the new budget.

Unions, Benefits Cuts Hit

"I am unequivocally opposed to the unionization of the military, . . . but that] is not enough. We must also address the fundamental causes that would make union membership attractive with the military." JCS Chairman Gen. George S. Brown made this statement in late January testimony on the FY '78 military procurement authorization bill. In denouncing erosion of military benefits, he told the Senate Armed Services Committee that "as a minimum . . . there should be a one-year moratorium on changes to the compensation and benefits system." This would give Defense and Congress time to work out satisfactory changes that all service people could understand, the nation's top military officer said.

Committee Chairman John Stennis (D-Miss.), meanwhile, announced that he would hold early hearings on the flock of bills already introduced to outlaw military unions. The full Congress will approve such a ban, he predicted. Stennis, along with AFA and other associations, has strongly opposed the unionization idea. Secretary of Defense Harold Brown, at his confirmation hearings, indicated opposition to military unions, and Stennis asked him to provide a report as to whether unions should be allowed.

Earlier, following reports that union employees were organizing Air Force members at McGuire AFB, N. J., AFA President George Douglas fired off letters to the White House and the Pentagon. He enclosed copies of AFA's position paper on the subject and asked then President Ford and Defense Secretary Rumsfeld to affirm that "total control of the military is vested in the Commander in Chief and the civilian departmental heads under him." No such affirmation was forthcoming.

Star, O-6, High GS Cuts Near

Senior military and civilian positions in the services are being cut by more than 3,000 in what the Defense Department calls an effort "to achieve as lean a top management structure as possible." The reductions, to be completed by September 1978, will also save money.

During the same period, the Air Force is scheduled to increase its military population from 571,000 (end-FY '77 estimate) to 572,000. However, within that total, the airman force is slated to increase by 2,316 and officer strength will drop by 1,316, to 94,923. This modest decline does not carry RIF implications, officials said.

Air Force's share of the senior-level reductions: thirteen generals, ending with 367; 202 colonels, winding up with 4,435; nine GS-16s through 18s, and other equivalent civilians, for an end-strength of 190; and 489 GS-13s through 15s, reducing them to 12,503.

Everything About CHAMPUS

CHAMPUS, the military's complex health program for families and retirees using civilian facilities, has been a major fixture on the benefits scene for the past decade. But it's been beset with problems. Confusion and misunderstanding have reigned over eligibility rules, cost-share requirements, the program for the handicapped, how to appeal rejected claims, etc.

All that is not surprising. There

AFA President George Douglas, a major general in the Air Force Reserve, was recently made an honorary NCO by the Timberwolf Chapter of the Non-Commissioned Officers Association, Colorado Springs, Colo. SMSgt. Chuck Zimkas of Hq. ADCOM made the presentation. General Douglas, a former M-Day assignee to Hq. ADCOM, is now mobilization assignee to the Deputy Chief of Staff Personnel, Hq. USAF.

The Bulletin Board

has never existed a single document that covered CHAMPUS in any depth.

Now relief is on the way. The Defense Department has finally published its long-awaited, all-inclusive regulation on CHAMPUS. The document is lengthy but well organized, intelligently indexed, and reasonably easy to follow. There is little gobbledygook and few fiendish cross-references so popular in government publications. Helpful notes and examples spell out answers to every conceivable question.

Dr. Robert N. Smith, Assistant Secretary of Defense (Health Affairs), says the new document, DoD Regulation 6010.8-R, tells CHAMPUS users in "precise terms what they can expect from the program—it makes the program more predictable." It tells people promptly whether CHAMPUS will share the cost of any procedure. The brand-new formal appeals section is also an important plus for beneficiaries wanting to protest adverse decisions on benefits.

The new regulation was to have been published in the Federal Register early in February. Interested parties may comment and changes considered appropriate are to appear in the first revision. Some 35,000 copies of the new reg were slated to have been distributed to the services, "down to the lower echelons," starting in late February.

Each service family should try to snag itself a copy. The complete CHAMPUS program should then come into clearer focus.

Many AFers in Inaugural Activities

More than 1,500 USAF members participated in the festivities surrounding the inauguration of the new Commander in Chief. Prominent in the inaugural parade were the Air Force Band, active-duty marching units from Bolling and Andrews AFBs, an Air National Guard squadron, an Air Force Reserve squadron, and a ninety-member cadet group from the Air Force Academy. A Civil Air Patrol bagpipe group from Massachusetts performed along the route prior to the parade.

The 112 members of the USAF Honor Guard did escort and other duties. Hundreds more played support roles, including about sixty-five officer volunteers who served as social aides at the inaugural parties and as VIP escorts. The Armed Forces Inaugural Committee, the same group that puts together the Armed Forces Day program every May, started working on the project last September.

Conduct Standards Tightened

The Department of Defense has tightened standards of conduct for

Ed Gates . . . Speaking of People

VEA—DoD Faces a Tough Selling Job

Congress recently threw the services a big surprise—some call it a curve—in the form of a "contributory" education program for future members of the armed forces.

Known as the Post-Vietnam Era Veterans' Education Assistance Act (VEA), it in effect replaces the GI Bills that have been around for most of the past thirty-four years. The new project, actually a five-year test conducted jointly by the Defense Department and the Veterans Administration, has been scored for being but a shadow of the program it replaces.

To participate in VEA, an eligible person must give up part of his pay, which goes into a fund he may use two or three years later to defray college expenses.

VEA is optional, so the big question is whether young men and women entering service during the next few years will buy it. Most important, of course, is how the new program will affect recruiting and retention.

VEA is a section of the same law that ends current GI Bill eligibility ten years after discharge, or December 31, 1989, whichever is earlier. It and the two previous GI Bills have propelled millions of veterans into college classes and degree programs. Millions more have taken vocational, farm, on-the-job, and flight training.

But with the nation at peace, budgetary pressures mounting, and charges of abuses of government-subsidized education, moves to remove the subsidy completely have recently intensified. The services, however, have been happy with the way the GI Bill attracted good people. Military members like it because it is often more lucrative than the services' tuition aid program, which pays up to seventy-five percent of tuition costs.

The previous Administration, nonetheless, asked Congr to phase out GI benefits for present and past veterans bar it entirely for new service personnel. The lawmakers September appeared ready to go along, but in a surp move they approved the VEA, or the "Hartke Substitu (after former Sen. Vance Hartke (D-Ind.), who engineered passage).

VEA applies to persons who entered service after Dec ber 31, 1976. Air Force recruits are being briefed on the program during their third week of basic training, and sign up then or later. New officers are being briefed at t first base. People electing to participate will allot $50 to a month for up to thirty-six months. The government guard the money and, on release from active duty, Uncle S will match the fund two to one. This means a member co wind up with a maximum of $8,100 for college expenses.

For example, a person contributing $75 for the full thirty-months will ante up $2,700. The government will add $5,4 Example two: a new member decides to contribute $60 month but after twenty-four months elects to stop. He wind up with $4,320 for his college—his $1,440 plus Uncl $2,880.

The new law also authorizes the Defense Department give unspecified additional amounts to any participant to h promote the all-volunteer force by attracting top-quality cruits. But Defense officials told AIR FORCE Magazine t there are no current plans to use this authority. If recruiti really gets tough, it may be laid on in some cases. "It's faucet to turn on when required," says USAF Col. Robert Zimmer, a Defense official in charge of implementing VEA plan.

military and civilians. The biggest change affects the financial interest statements all generals and many less senior officers involved in contracting decisions must file with the government by October 31 each year. The new statements pry deeper into real-estate interests, commodities, industrial affiliations, etc.

Throngs Want Clean Exit Papers

When the new Commander in Chief brushed aside the pleas of AFA and other patriotic groups and pardoned Vietnam-era draft dodgers, he touched off a tremendous howl for similar treatment from the hundreds of thousands of former servicemen who are holding cloudy discharges—general, undesirable, bad conduct, and dishonorable.

Pentagon statistics show that since 1950 the services have handed out more than 750,000 general discharges, plus 507,000 undesirables, 114,000 BCDs, and 27,000 dishonorables. For the Vietnam era (August 1964–March 1973) the respective all-service figures (predominantly Army, Navy, and Marine Corps) are approximately 245,000, 150,000, 28,000, and 1,600. And the holders have many supporters, so the pressures are building up for clean discharges all down the line. President Carter told the Defense Department to study the matter.

Newly appointed junior officer adviser 1st Lt. Glen L. Brady confers with his boss, NORAD/ADCOM Commander Gen. Daniel "Chappie" James, Jr., on his recent assignment to the post. His job is to keep the commander posted on matters involving young officers in the command.

The Department, meanwhile, has stopped issuing dishonorable discharges. Instead, it's giving a new certificate, Form 794, "Discharge under other than Honorable Conditions," which has been used for of-

Payments from the fund will be made monthly to each par-ipant. To be eligible, he or she must have contributed for least twelve consecutive months, completed one tour of ty or six years' service (whichever is less), receive an norable discharge, and enroll in VA-approved educational training courses. All this, of course, won't occur for some e because eligibility only started to accrue this past nuary 1.

Obviously, VEA benefits are less attractive than the GI Bill efits persons who donned a uniform before 1977 enjoy. latter receive more and contribute nothing. Congress also sted GI Bill monthly payments in the VEA measure by it percent and extended maximum entitlement from thirty- to forty-five months.

his raised pay for a single person to $292 monthly, while e with one dependent now receive $347. A person with dependents receives $396, which, for the full forty-five nths, comes to $17,820. Quite a difference from the $5,400 ximum the government will provide VEA participants.

'entagon authorities, meanwhile, are certain the wide dif-ence in the payoff will ignite a heavy demand for more ion assistance. While in-service people are permitted to either tuition aid or the GI Bill, the services have been shing the latter route because VA, not Defense Department, ds are involved. And for veterans not hoarding their GI gibility for post-service use, it has been a better deal.

But, with the exceptions cited below, the new people won't ve the GI Bill. So, in the opinion of Pentagon planners, ey will rush to tuition aid." Unfortunately, tuition aid funds rently are limited. Air Force, for instance, has only a dest $12.5 million in the FY '77 budget.

But in a few years, when hundreds of thousands become gible for VEA, Air Force will need a "substantial increase" meet the demand, an Air Staff official said. He and his sociates are already mapping their strategy for securing the ost.

The drawing power of the GI Bill was forcibly brought me to officialdom in late December. Recruiting offices und the country reported a surge of enlistments under "delayed enlistment program" right up to the final day of the year. By signing before the first of the year, they qualified for full GI benefits, even though their actual service didn't begin until 1977. It was a last-minute scramble by thousands of youths to gain the coveted GI benefits in lieu of the less attractive contributory scheme.

So large is USAF's delayed enlistment pool now that most new airmen entering basic training the first few months of this year are in the delayed enlistment category.

ROTC seniors and previously deferred ROTC graduates coming on active duty this year are also "safe." They'll receive the full GI Bill treatment. Not so this year's service academy graduates, who are limited to the VEA. "We know there will be unhappiness over this at the academies, but that's the way the law reads," Colonel Zimmer said.

The new law also requires institutions that enroll veterans receiving VEA benefits to (1) enforce academic standards; (2) report any changes in a vet's academic status within one month; (3) restrict federal-grant recipients enrolled in every course to eighty-five percent of the total; and (4) bar veterans from enrolling in educational programs that are fewer than two years old. All this, of course, is designed to curb abuses.

With GI Bill benefits long a US institution, will future service people buy the less-attractive contributory plan?

"Not at first," one informed source speculated. "The $50 to $75 monthly deduction is too big a bite into a small pay check. Maybe later, after they win a couple of stripes and earn more . . . but by then they'll have things like cars in mind." The general consensus among knowledgeable observers: "It's going to be a tough selling job."

Air Force and Defense officials, however, are taking a positive attitude. "Let's face it, the old GI Bill is dead. The new plan is much better than nothing, which is what we had expected. So the VEA is a plus and we're going to promote it vigorously," Colonel Zimmer said.

Toward the end of the five-year test, the President may recommend changes, continuation, or elimination of the unique peacetime educational project. Congress, of course, at any time could tamper with it. One thing seems certain: VEA will stir up considerable comment and controversy during the next few years. ■

The Bulletin Board

ficers since 1954. Ex-Air Force members wishing to swap can do so by contacting the CBPO at any USAF base.

Earlier, AFA President George Douglas wired then President-elect Carter expressing AFA's deep concern about the pending action. He reiterated the Association's resolution opposing the pardons for draft evaders and favoring a case-by-case examination. "You have it in your power," Douglas told Carter, "to insure that the sacrifice [of the 45,000 Vietnam war dead] is not degraded."

AFA has since restated its opposition to the pardon, while recognizing the President's authority to take such action, and the fact that the pardon is now a *fait accompli*.

CCAF Going Defense-Wide?

"The next consideration is whether to set up a Community College of the Armed Forces," a Defense Department official told AIR FORCE Magazine following the government's recent decision to let the Community College of the Air Force grant associate degrees.

Chief of Staff Gen. David C. Jones called the degree authority "a landmark decision," marking the first time that a military agency can "grant degrees to members of the enlisted force." The nearly 50,000 airmen currently registered with CCAF are combining off-duty course credits with technical training in their quest for the new two-year degree. The first are scheduled to be conferred next month.

CCAF opened in 1972. Before the new authority, the more than 161,000 participants received transcripts and certificates. The next logical move, many authorities feel, is extension of the program to the other services. Defense is working on it.

NCOs Are Contracting Officers

Air Force noncoms are playing greater roles in the procurement career field, particularly overseas where seventy of the 278 EM procurement specialists are actually contracting officers. On their own they commit huge sums of government money.

CMSgt. Herman Nock, of Hq. USAF, who monitors the Air Force-wide NCO procurement assignment program, reports that in the Pacific area alone last year NCO contracting officers committed more than $505 million in 220,000 purchase order, contract, and related actions. In Europe they spent more than $145 million.

Air Force-wide, there are about 1,400 enlisted procurement specialists. Half of those in the states have limited authority to commit US government funds.

Retirees in Iran Concerned

Commissary privileges are denied US military retirees in most countries. But in Iran, where the Pentagon says the US retired military population has jumped from 300 to more than 1,400 in the past two years, they can spend $75 a month ($150 per family) in the stores. Still, retirees in Iran fear this limited privilege may be withdrawn. Any such move is up to the local US military commander.

Another point of concern in Iran is use of the APO system. Last September they lost APO package mail service except for small parcels weighing less than one pound. Had this step not been taken, "other

CAPT. (DR.) FIONA CLEMENTS: FLIGHT SURGEON

Capt. (Dr.) Fiona Clements.

Last fall, a new flight surgeon reported to Norton AFB's 53d Military Airlift Squadron.

A simple, normal transfer? Not quite.

Mass consternation swept the troops when they learned that henceforth their flight physicals would be performed by a doctor whose blouse was buttoned backwards. A woman!

This is history now, and Capt. (Dr.) Fiona Clements is thoroughly accepted by the crews, and, particularly, their families. They have full confidence in her and her businesslike, no-nonsense ways.

Dr. Clements has a lot going for her: she's the lone female USAF flight surgeon on active duty, and she's half of the only husband-wife flight surgeon team in the military service.

Fiona Marshall was born in Sudbury, England, and still retains her British accent. Although still a British subject, she expects to get her final US citizenship papers shortly.

She met Dennis Clements while in her third year at London's St. Bartholomew Medical School. He was there on an elective from Rochester University's Medical Establishment.

Fiona and Dennis were married and returned to Rochester, where Dennis received his MD and went on to Duke University for internship and residency.

Fiona was accepted in Duke's Medical School because of her outstanding academic record at St. Bartholomew, and, in time, got her MD, too.

Both put in for Air Force duty, were accepted, commissioned, and assigned to the School of Aviation Medicine at Brooks AFB, Tex. Following certification as rated flight surgeons, they were assigned to Norton's 63d Military Airlift Wing.

Both are pilots—each with several hundred flying hours—and they own a Beech Bonanza. This, according to Dr. Fiona, helps when she's out in the stream from Norton to Kadena or Australia—particularly when she crawls up into the crew compartment of a C-141 and the pilots find she knows what the instruments mean and that she's not just along for the ride.

—Maj. Gen. Perry Griffith, USAF (Ret.)

retiree privileges could have been jeopardized," the Defense Department said.

Senate Veterans' Unit Retained

The Senate has accepted the advice of AFA, other veterans groups, and numerous lawmakers by retaining the Veterans' Affairs Committee. Abolishing the Veterans' unit and shifting its functions to a new "human resources" committee was part of a broad plan to streamline the Senate committee system. But a modified proposal saving veterans and a few other groups was adopted by the Rules Committee and later by the full Senate.

AFA President George Douglas had urged the lawmakers to keep Veterans' Affairs a separate group. He wrote to Sen. Howard Cannon (D-Nev.), the Rules Committee chairman, that "the Association firmly believes the scope and complexity of veterans' unique problems would not adequately be served by merger with other, non-related groups."

VA Contacting Disabled Vets

The Veterans Administration is sending letters to the 320,000 veterans with service-connected disabilities rated at fifty through seventy-nine percent on the agency's compensation rolls, explaining that they are now eligible for outpatient treatment for any medical condition. Prior to a legal change late last year, such treatment for any condition was limited to those rated eighty percent disabled or higher. All service-connected veterans, of course, have received treatment for the particular ailments that brought about their disabilities.

Short Bursts

Rumbles continue on the **officer effectiveness report** (OER) front *(see "Speaking of People," November '76 issue),* as Air Force revealed statistics on the recent temporary majors list. They show that 1,018 of the 1,074 line primary zone contenders who had received top-box OERs under the new controlled system were chosen for promotion. That's ninety-five percent. Conversely, only 257 of the 1,456 contenders with third-box ratings were chosen. Only eighteen percent. Question: Is a third box competitive? Not much, say most people.

AFA's **Aerospace Education Foundation** was named winner of American Society for Training And Development's National Chapter **"Community Service Award."** AFA Executive Director James Straubel accepted the plaque and citation at a late January luncheon.

Three USAF bases will participate in a one-year feasibility test of the Environmental Protection Agency's guidelines on **returnable beverage containers.** This requires a five-cent deposit on all carbonated beverages sold on the bases. Idea is to evaluate the economic impact of the charges on beverages sold in exchanges, commissaries, clubs, and package stores. The guinea pigs are at Laughlin AFB, Tex.; Malmstrom AFB, Mont.; and Patrick AFB, Fla.

Bonuses for Vietnam veterans expired in five states last year, leaving only ten and one territory that will still accept applications. They are Connecticut, Illinois, Iowa, Louisiana, Massachusetts, Michigan, New Hampshire, North Dakota, Ohio, Vermont, and Guam. Full details are available from the respective statehouses and veterans affairs agencies.

The American Ex-Prisoners of War, Inc., has compiled four packets of information that will help former POWs gain the benefits to which they are entitled. The packets cover VA claim information, dental treatment, compensation benefits, data on diseases suffered by POWs, after-effects of imprisonment, and more—all beamed directly at the ex-POWs. For further information contact American Ex-Prisoners of War, Inc., 2620 N. Dundee St., Tampa, Fla. 33609.

Senior Staff Changes

RETIREMENTS: B/G William P. **Comstock;** B/G Mervin M. **Taylor.**

CHANGES: Col. (B/G selectee) John B. Marks, Jr., from Cmdr., Foreign Technology Div., AFSC, Wright-Patterson AFB, Ohio, to Dir. for Intel., J-2, PACOM, Hq. Camp H. M. Smith, Hawaii . . . **Col. (B/G selectee) Robert F. McCarthy,** from Cmdr., Tac. Comm. Area, AFCS, Langley AFB, Va., to Dir., Comm./Data Processing, PACOM, Camp H. M. Smith, Hawaii . . . **B/G (M/G selectee) Bobby W. Presley,** from Asst. Compt. of the AF, Hq. USAF, Washington, D. C., to Dep. Cmdr., Army-AF Exchange Svc., Dallas, Tex., replacing B/G George L. Schulstad . . . **B/G George L. Schulstad,** from Dep. Cmdr., Army-AF Exchange Svc., Dallas, Tex., to V/C, Odgen ALC, AFLC, Hill AFB, Utah . . . **B/G (M/G selectee) James W. Stansberry,** from Dep. to Dep. Asst. Sec. of Def. (Proc.), OASD (I&L), Washington, D. C., to DCS/Procurement & Manufacturing, Hq. AFSC, Andrews AFB, Md. ■

ARE YOU CONFUSED?

Confused over the numerous proposals to overhaul the military retirement/compensation system? You needn't be. AFA has a supply of newly published, easy-to-read charts that explain them. They are yours for the asking. They explain how the five principal proposals would change retirement eligibility, pensions, etc., and how three of them would also tamper with regular pay. Each sponsor's rationale is included.

In addition to the current system, the charts examine the Interagency Committee report of 1971; the Pentagon's Retirement Modernization Act; the 1976 Defense Manpower Commission report; the partially released findings of the third Quadrennial Review of Military Compensation; and the Aspin plan, brainchild of Rep. Les Aspin (D-Wis.), which contains the most drastic changes.

Official concern over rising retirement costs remains high, so one of these plans, or more likely portions from more than one, could become law this year or next. It behooves interested parties to study the proposals and make their feelings known.

To get your free copy of these charts, which are a joint effort of AFA and several other associations, just drop a card or letter to:

James McDonnell, Military Relations Editor
AIR FORCE Magazine
1750 Pennsylvania Ave., N. W.
Washington, D. C. 20006

Give your name and mailing address and ask for the free charts. Remember that stocks are limited, so we encourage you to be prompt.

This Is AFA

The Air Force Association is an independent, nonprofit, airpower organization with no personal, political, or commercial axes to grind; established January 26, 1946; incorporated February 4, 1946.

OBJECTIVES

The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principle of freedom and equal rights to all mankind.

PRESIDENT
George M. Douglas
Denver, Colo.

BOARD CHAIRMAN
Gerald V. Hasler
Endwell, N. Y.

SECRETARY
Jack C. Price
Clearfield, Utah

TREASURER
Jack B. Gross
Hershey, Pa.

NATIONAL DIRECTORS

John R. Alison
Arlington, Va.

Joseph E. Assaf
Hyde Park, Mass.

William R. Berkeley
Redlands, Calif.

John G. Brosky
Pittsburgh, Pa.

Daniel F. Callahan
Nashville, Tenn.

Stanley L. Campbell
San Antonio, Tex.

Robert L. Carr
Pittsburgh, Pa.

Earl D. Clark, Jr.
Kansas City, Kan.

Edward P. Curtis
Rochester, N.Y.

James H. Doolittle
Los Angeles, Calif.

Herbert O. Fisher
Kinnelon, N.J.

Joe Foss
Scottsdale, Ariz.

James P. Grazioso
West New York, N.J.

John H. Haire
Huntsville, Ala.

George D. Hardy
Hyattsville, Md.

Martin H. Harris
Winter Park, Fla.

Roy A. Haug
Colorado Springs, Colo.

John P. Henebry
Chicago, Ill.

Joseph L. Hodges
South Boston, Va.

Robert S. Johnson
Woodbury, N.Y.

Sam E. Keith, Jr.
Fort Worth, Tex.

Arthur F. Kelly
Los Angeles, Calif.

George C. Kenney
Bay Harbor Islands, Fla.

Thomas G. Lanphier, Jr.
La Jolla, Calif.

Jess Larson
Washington, D.C.

Robert S. Lawson
Los Angeles, Calif.

Curtis E. LeMay
Newport Beach, Calif.

Carl J. Long
Pittsburgh, Pa.

Howard T. Markey
Washington, D.C.

Nathan H. Mazer
Roy, Utah

J. P. McConnell
Washington, D.C.

J. B. Montgomery
Newport Beach, Calif.

Edward T. Nedder
Hyde Park, Mass.

J. Gilbert Nettleton, Jr.
Washington, D.C.

Martin M. Ostrow
Beverly Hills, Calif.

Julian B. Rosenthal
Atlanta, Ga.

John D. Ryan
San Antonio, Tex.

Peter J. Schenk
Vienna, Va.

Joe L. Shosid
Fort Worth, Tex.

C. R. Smith
Washington, D.C.

William W. Spruance
Marathon, Fla.

Thos. F. Stack
San Mateo, Calif.

Edward A. Stearn
San Bernardino, Calif.

Hugh W. Stewart
Tucson, Ariz.

Arthur C. Storz
Omaha, Neb.

Harold C. Stuart
Tulsa, Okla.

Zack Taylor
Lompoc, Calif.

James M. Trail
Boise, Idaho

Nathan F. Twining
Hilton Head Island, S.C.

A. A. West
Newport News, Va.

Herbert M. West, Jr.
Tallahassee, Fla.

Philip E. Adams
(ex officio)
National Commander
Arnold Air Society
Ruston, La.

Rev. Msgr.
Rosario L. U. Montcalm
(ex officio)
National Chaplain
Holyoke, Mass.

Capt. Alan L. Strzemieczny
(ex officio)
Chairman, JOAC
Offutt AFB, Neb.

CMSgt. Alton G. Hudson
(ex officio)
Chairman,
Enlisted Council
Tyndall AFB, Fla.

VICE PRESIDENTS

Information regarding AFA activity within a particular state may be obtained from the Vice President of the Region in which the state is located.

Toulmin H. Brown
6931 E. Ridge Dr.
Shreveport, La. 71106
(318) 865-0293
South Central Region
Tennessee, Arkansas, Louisiana, Mississippi, Alabama

Dan Callahan
134 Hospital Dr.
Warner Robins, Ga. 31093
(912) 923-4288
Southeast Region
North Carolina, South Carolina, Georgia, Florida, Puerto Rico

William P. Chandler
1025 W. San Miguel Cir.
Tucson, Ariz. 85704
(602) 327-5995
Far West Region
California, Nevada, Arizona, Hawaii

Hoadley Dean
Box 8210
Rapid City, S.D. 57701
(605) 348-1660
North Central Region
Minnesota, North Dakota, South Dakota

R. L. Devoucoux
270 McKinley Rd.
Portsmouth, N.H. 03801
(603) 669-7500
New England Region
Maine, New Hampshire, Massachusetts, Vermont, Connecticut, Rhode Island

Richard Emrich
6416 Noble Dr.
McLean, Va. 22101
(202) 426-8256
Central East Region
Maryland, Delaware, District of Columbia, Virginia, West Virginia, Kentucky

James C. Hall
11678 E. Florida Ave.
Aurora, Colo. 80012
(303) 755-3563
Rocky Mountain Region
Colorado, Wyoming, Utah

Vic R. Kregel
P. O. Box 5907
Dallas, Tex. 75222
(214) 266-2242
Southwest Region
Oklahoma, Texas, New Mexico

William C. Rapp
1 M & T Plaza, Rm. 1603
Buffalo, N.Y. 14203
(716) 842-7140
Northeast Region
New York, New Jersey, Pennsylvania

Lyle O. Remde
4911 S. 25th St.
Omaha, Neb. 68107
(402) 731-4747
Midwest Region
Nebraska, Iowa, Missouri, Kansas

Sherman W. Wilkins
4545 132d Ave., SE
Bellevue, Wash. 98006
(206) 342-0619
Northwest Region
Montana, Idaho, Washington, Oregon, Alaska

Jack Withers
P. O. Box 3036,
Overlook Br.
Dayton, Ohio 45431
(513) 426-2405
Great Lakes Region
Michigan, Wisconsin, Illinois, Ohio, Indian

Airman's Bookshelf

The Exercise of Power and Politics

Khrushchev—The Years In Power, by Roy and Zhores Medvedev, Columbia University Press, New York, N. Y., 1976. 198 pages. $10.95.

It is remarkable that more than a decade of Brezhnev's rule passed before Soviet authors could claim to have written an analysis of Khrushchev's reforms and policies. This is the claim made by the Medvedev brothers in this book. Of course, even now, with Khrushchev out of power for a dozen years and deceased for five of them, such an analysis of the exercise of political power in the USSR can still only appear in the West. Indeed, one of the authors, Zhores Medvedev, is no longer a Soviet citizen and is living in London.

Those in the West seeking insights into the workings of Soviet politics have already heard much of the story straight from the horse's mouth. Khrushchev's memoirs appeared in two volumes in 1971 and 1974. However, Roy and Zhores Medvedev point out that the memoirs dealt little with internal Soviet matters and contained no critical analysis of the political and economic errors that led to his downfall. It is these gaps the authors ought to fill.

The Medvedevs' approach is pragmatic and dispassionate. They lack the vast conceptual sweep, incredible detail, and artistic flair of a Solzhenitsyn. The book, in fact, would hardly qualify as "dissident literature," except in a country where total control of history and policy, the book is an extremely readable, brief history that will leave him with an appreciation of many of the problems with which the current regime must still cope.

Soviet agricultural problems and policies are used by the authors to form a unifying theme, or kind of intermittent "case study," that is woven through the book. Khrushchev's penchant for experimentation and, as described by those who toppled him, "hare-brained schemes" is well revealed. There is a remarkable chapter that describes the virtual bankruptcy of an entire agricultural district, caused by a combination of Khrushchev's unrealistic demands and the desires of political underlings seeking to appear as if those demands were being met.

Although the book does not pretend to deal extensively with subjects other than Khrushchev's agricultural policies, it does include brief, informative glimpses into other policy areas. Gyrations in Soviet policy toward religious and national groups, and toward literature and the arts, are related to the changing power relationships at the summit of Soviet society. There is much useful and interesting detail on the mechanics of Khrushchev's rise and fall and, in the process of presenting these fascinating Byzantine maneuvers, we are shown the critical importance of personal allegiance and institutional power in Soviet politics.

Khrushchev is shown to be a man of good intentions, even of considerable courage, but a man whose energy exceeded his ability to handle complicated technical and sociopolitical realities. A "victim of his own exuberance," he failed and lost the widespread popularity he once enjoyed. How he failed, and the penalties for his failures, are important lessons for future Soviet leaders. This little book presents to the Western reader these practical lessons in the exercise of power politics in the USSR.

—Reviewed by Cmdr. Steve F. Kime, USN, a member of the faculty at the National War College.

Strategic Philosophies—The Coming Decade

The Soviet-American Arms Race, by Colin S. Gray. Lexington Books, D. C. Heath & Co., Lexington, Mass., 1976. 196 pages. $15.50.

Although this book is directed primarily to the arms-control community, all of us concerned with the Strategic Arms Limitation Talks (SALT) and, more immediately, with a prescription for the new Administration, will find it timely, relevant, and provocative.

The book derives its title from the major focus of Dr. Gray's analysis: the alleged arms race that underlies much arms-control thinking and is at the heart of our SALT problems. The notions he challenges are (1) that an arms race is abnormal, can only lead to war, and, therefore, is bad; and (2) that the converse of an arms race is arms control, which is viscerally perceived as good.

He examines the nature of the arms race from the perspective of contributing pressures and independent variables, the inherent US and Soviet asymmetries, and the various conceptual models that may underlie arms-race thinking. After reading Dr. Gray's analysis, one is impressed with the need to be a bit more careful about referring to the current condition as an arms race, or in using the action-reaction hypothesis as a basis for advocating arms control.

The arms-race concept has serious problems, not the least of which is the absence of a race. In financial terms, the US is, at best, walking when compared with the Soviet Union. Dr. Gray identifies the only real competition as that within the bureaucracy, between the services and the various agencies. This analysis, if fair, is disturbing. What Dr. Gray presents is a national security course governed more as a result of *intra*state politics and bureaucratics than *inter*state defense considerations, although the threat is prominent for "tactical" reasons.

As if this were not bad enough, the problem is, in effect, squared because we impute the same sad state of affairs to the Soviet national apparatus. Part of the problem is the secrecy that surrounds the Soviet system. We have to assume a Soviet model, and what is more natural than to assume their system is as bad off as ours? However, as Dr. Gray points out, there is in fact an enormous wealth of informa-

Airman's Bookshelf

tion on Soviet national security plans, objectives, and strategy; but we fail to read, understand, and accept it—perhaps because it destroys most of our arms-control notions and models.

The current SALT situation is serious insofar as the Soviet logic is clearly different from Western logic. There is a strong probability that the Soviets are not interested in halting the arms race, when it is *approached as an end in itself.* Their doctrinal views are different from ours, and no amount of doctrinal enlightenment will "educate" them. Military competition and détente diplomacy are not opposed concepts in Soviet logic. Recognizing that competition with the Soviet Union is unavoidable is the *sine qua non* for understanding the nuclear race.

The author believes that an "arms race" may be neither abnormal nor bad in itself, does not necessarily lead to conflict, and may indeed be a sign that the patient is quite healthy. He suggests "that investigators of arms-race phenomena are studying the regular warp and woof of international politics, rather than some atypical condition."

It is this normal defense behavior that needs to be addressed, not halting the arms race as an end objective of arms-control negotiations. Arms control must begin with the proposition of serving defense, not vice versa.

The author argues that it is Imperative to begin deliberations before we enter into an era of strategic imbalance that could take many years to correct. While the political consequences of an imbalance cannot be calculated, Dr. Gray cautions that the risk of continuing on the current course is one of learning the political meaning of strategic superiority during an international crisis in the 1980s.

The first priority is a determination of what constitutes an adequate strategic posture. Dr. Gray contends that we have lost sight of this in the arms-control race and that "SALT II does not address *the* critical question for the 1980s, namely what should be done about the impending vulnerability of silo-housed ICBMs? SALT II permits such a high level of MIRV launchers that the qualitative arms race is bound to be accelerated over the next decade."

Dr. Gray concludes by examining a variety of strategic philosophies that might serve Western defense needs over the coming decade and the role and benefit of the technology menu that is available to support the various options. All matters considered, the author concludes that the greater danger is not that the United States will be too active, but the reverse. The path to equitable arms-control agreement and to an eventual deceleration of the arms race now lies, paradoxically, in the direction of more energetic arms-race behavior. The United States must now accept the need for earnest pursuit of a genuine equivalence in strategic capabilities.

—Reviewed by Dr. Joseph D. Douglass, Jr., System Planning Corp., Arlington, Va.

The New Year of JAWA

Jane's All The World's Aircraft 1976–1977, edited by John W. R. Taylor. Franklin Watts, Inc., 730 Fifth Ave., New York, N. Y. (US distributor), 1976. 860 pages, large format. $72.50.

No one can dispute John W. R. Taylor's unique and continuing contributions in his highly detailed, systematic accounting of aerospace products and his projections of how these may shape the future. His is *the* authoritative reference on the world's aerospace products and their applications.

Actually, since 1909, *Jane's* (then, *All The World's Air-Ships)* has been annually describing those man-made things that rise above the surface of the earth. (J. W. R. Taylor brought his outstanding talents to the book as editor in 1959.) But, ironically, for the first time this edition includes a subsection on hot-air balloons—the first practical aircraft of all.

This edition has more changes than previously. It has twenty-four more pages of main text than did last year's. And the entire book has been completely reset. Taylor's encyclopedic treatise covers the aerospace products of thirty-seven countries. (Brazil now claims to be the eighth largest aircraft manufacturer in the world.) Well detailed are descriptions of military, civil, and homebuilt aircraft; lighter-than-air; remotely piloted vehicles; target vehicles; spaceflight and research rockets; and aero engines.

Jane's contains more than one and a half million words and 1,500 photographs. It records brief development histories, descriptions of major systems and subsystems, and performance criteria. An example worthy of note is that of the F-16, an article that runs to some 5,000 words.

Last year's section on hang gliders has been at leas temporarily dispensed with because of accidents. How ever, when new regulations are implemented, this sec tion will be reintroduced.

In his Foreword, which assesses the state of th world's aerospace affairs, Mr. Taylor says it is impo tant that the US build the B-1 bomber and develop replacement for the F-106. The Shuttle Orbiter *Ente prise,* he says, may well represent more than just th start of a new era of space research. With sol boosters and onboard liquid-propellent rocket engin to put it into orbital speed, the *Enterprise* may be th prototype for transport aircraft built for the critic period after hydrocarbon fuels will have essentiall disappeared.

Under an exclusive Western Hemisphere arrange ment, AIR FORCE Magazine publishes "Jane's Supple ment" on alternate months, to provide our reader with a continuing cross section of aerospace develop ments, as prepared by John Taylor and his small bu exceptionally competent staff.

Readers of this magazine are also aware that eac January issue includes John Taylor's annual revie of aerospace developments. AIR FORCE Magazin is proud of its long and congenial working relatior ship with Mr. Taylor and his staff. His definitive an analytical approach to aerospace products and prol lems has been rewarding to us, to our readers, ar to industry. No one whose occupation relates to aer space endeavors can afford not to have access to th most definitive of all such publications.

—Reviewed by Jim Taylor, Senior Edito

New Books in Brief

Anyone Can Fly, by Jules Bergman. An updated, simplified guide to private flying by a noted network TV science commentator. More than 200 photos and diagrams, plus a gallery of US private and business planes, and a comprehensive glossary of flight terms. Index. Doubleday & Co., New York, N. Y., 1977. 255 pages. $9.95.

Arming the Luftwaffe, by Edward L. Homze. Here is an inside view of Germany's aerial rearmament between world wars, based on records of the Reich Air Ministry's Technical Office that directed production programs, contracts, and R&D. Homze concludes that despite their rhetoric, the Nazis had difficulty planning and executing their aerial rearmament program. Photos, notes, selected bibliography. Univ. of Nebraska Press, Lincoln, Neb., 1977. 296 pages. $14.95.

The Blitzkrieg Story, by Charles Messenger. Defining "Blitzkrieg" as it was coined in the thirties—quick victory through air and ground forces that dislocate an enemy—the author analyzes the technique between the wars, its use in WW II, postwar use by the Israelis, and possible future uses. Photos, bibliography, index. Charles Scribner's Sons, New York, N. Y., 1977. 256 pages. $10.

The Bomber in World War II, by Alfred Price. The author examines bomber aircraft and tactics during World War II. Previously unpublished facts about six famous bombers and explanations of wartime bomber tactics are included. Photos, line drawings, selected bibliography. MacDonald and Jane's, Ltd., Paulton House, 8 Shepherdess Walk, London N1 7LN, 1976. 150 pages. $8.

The Cruise Missile: Bargaining Chip or Defense Bargain? by Robert Pfaltzgraff, Jr., and Jacquelyn Davis. The authors examine applications of US cruise missiles suggesting within the context of US and NATO defense doctrines, strategic and battlefield options for air-launched and sea-launched cruise missiles. They conclude that cruise missiles should be considered a bargain, not a bargaining chip. Institute for Foreign Policy Analysis, Inc., Cambridge, Mass., 1977. 53 pages. $3.

The Directory of Defense Electronic Products and Services, by Bermont Books. The third annual edition of this directory contains about seventy percent new material above that of last year. It is a concise source of current information on offerings of the US electronic industry. Technical performance information is presented clearly and succinctly. It is complete with a glossary of terms and an index to buyers. Bermont Books, Suite 1108, 815 15th St., N. W., Washington, D. C. 20005, 1977. 185 pages. $20.

Fighter Pilots of World War II, by Robert Jackson. The author has selected from hundreds who fought with distinction fourteen WW II fighter pilots whose individual characteristics set them apart. St. Martin's Press, New York, N. Y., 1976. 176 pages. $8.95.

The High Frontier—Human Colonies in Space, by Gerard K. O'Neill. Professor O'Neill originated the space concept in 1969. This book tells who will work in space and how they will get there. In fewer than 200 years there could be more people living in space than on earth, the author maintains. Photos, references, index. William Morrow & Co., Inc., New York, N. Y., 1977. 288 pages. $8.95.

Night Fighters: A Development and Combat History, by Bill Gunston. Beginning with night-flying pioneers during World War I, the book describes the development of airborne radar in various countries before, during, and after World War II, and discusses such special aircraft as the Beaufighter, Mosquito, Black Widow, Me-110, Ju-88, and Me.262, weapons like Schrage Musik and, more recently, radar- and infrared-guided missiles and night-fighter tactics. The author describes the problems of tracking aerial targets by radar, and the greater problem of guiding a fighter into the right patch of sky to make an interception. Photos, drawings, appendix, glossary. Charles Scribner's Sons, New York, N. Y., 1976. 192 pages. $8.95.

The Water Jump, by David Beaty. In this story of airmen conquering the North Atlantic, the author relates not only the drama of man against the elements, but the increasingly vehement struggle of man against man, the race to be first, the race to beat the ships, and the race to be fastest. Photos, index, bibliography. Harper & Row, New York, N. Y., 1977. 304 pages. $10.

—Reviewed by Robin Whittle

AFA News

By Don Steele, AFA AFFAIRS EDITOR

Unit of the Month

THE SILVER AND GOLD CHAPTER, COLORADO . . . cited for effective support of the Air Force and AFA's mission, most recently exemplified in its annual project to provide food and clothing for needy Air Force families in the metropolitan Denver area.

In 1972, AFA's Silver and Gold Chapter initiated a project to assist needy Air Force families in the metropolitan Denver area at Christmas. The 1976 project provided shoes, clothing, and food for 150 needy families, involving some 500 individuals, and toys for about 200 children. Shown at the presentation of the donations from the Retired Pay Division of the Air Force Accounting and Finance Center (AFAFC) are, from left, Col. Thomas Richards, Air Reserve Personnel Center Commander; Sherry Brown, President, Employees Recreation Association; Maj. Gen. Lucius Theus, AFAFC Commander; Chapter Vice President John Driver; and Donna Gillham and Chris Godfrey, AFAFC employees. In recognition of this outstanding program, AFA President George M. Douglas names the Silver and Gold Chapter as AFA's "Unit of the Month" for March.

More than 211 leaders of the Department of Defense, aerospace industry, and AFA attended the Nation's Capital Chapter's holiday reception at the Marriott Twin Bridges Hotel in Arlington, Va. In the photo above left, AFA Board Chairman Gerald V. Hasler, right, presents AFA's 1976 Hoyt S. Vandenberg Award for outstanding leadership in Aerospace Education to the Hon. David P. Taylor, Assistant Secretary of Defense for Manpower and Reserve Affairs. In the photo at right above, the Aerospace Education Foundation's Secretary, George D. Hardy, right, presents a Jimmy Doolittle Fellow plaque to Mr. Ordway P. Burden, a limited partner in the William A. M. Burden Co. The photo at left shows Chapter Treasurer George L. J. Dalferes describing an apparently amusing incident to Air Force Chief of Staff Gen. David C. Jones, center, and Chapter President James M. McGarry, Jr., right.

—PHOTOS BY STEVE ADAMS

chapter and state photo gallery

During the observance of Air Force Week in Fresno, Calif., AFA's Fresno Chapter arranged to have Air Force personnel speak at various civic and service club meetings, and on radio and TV; cosponsored a luncheon with the Fresno Chamber's Military Affairs Committee; and sponsored its annual Air Force Honors Night Banquet and Awards Ceremony. Among the luncheon guests were, from left, California State AFA President Dwight Ewing; Lt. Col. Robert Stuart, Fresno State University Professor of Aerospace Studies; and Lt Col. Thomas G. Storey, Deputy Commander, 557th Flying Training Squadron, Air Force Academy, and a former POW in Vietnam, who was the guest speaker at the banquet.

—PHOTO COURTESY OF 144TH FIW CAANG

Brig. Gen. Walter C. Leonardo, center, Chief of Staff, California Air National Guard, was named the Fresno Chapter's "Man of the Year" at its 12th Annual Air Force Honors Night Banquet and Awards Ceremony, the highlight of Fresno's observance of Air Force Week. Program participants included S. Samuel Boghosian, left, Honors Night Chairman; and William P. Chandler, right, Vice President for AFA's Far West Region, who was the master of ceremonies. Distinguished guests included Congressman John F. Krebs (D-Calif.); State Assemblyman Ernest Mobley; Fresno Mayor Pro-Tem Elvin C. Bell; Col. James Kilpatrick, 144th FIW Commander; and Gene Kuhn, the Fresno Bee military editor.

Brig. Gen. Louis C. Buckman, Deputy Director for Readiness Initiatives, Office of the DCS/Plans and Operations, Hq. USAF, was guest speaker at the Suffolk County Chapter's annual dinner in The Airport Inn at Islip-MacArthur Airport, N. Y. Head-table guests included, from left, Maj. William J. Ballee, New York Office of Information; Chapter President Vincent F. O'Connor; General Buckman; and New York State AFA President Kenneth C. Thayer. During the evening, the chapter recruited its 200th member, Mr. C. A. "Chuck" Sewell, Chief Test Pilot, Grumman Aerospace Corp.

Some 400 AFA members and guests, including leaders of the Strategic Air Command, AFA, and the community, attended the Ak-Sar-Ben Chapter's annual Arthur C. Storz, Sr., Awards Luncheon honoring the 1976 recipients of the Chapter's Arthur C. Storz, Sr., Awards to the Outstanding Airman, Junior Officer, and Civilian at Offutt AFB, Neb. Shown here are the award recipients and two of the program participants. They are, from left, Gen. Russell E. Dougherty, SAC's Commander in Chief and the luncheon speaker; Mr. Wendell G. Jones (civilian recipient); Sgt. Carl J. Quijas (Airman recipient); Lt. Gen. James H. Doolittle, USAF (Ret.), one of AFA's founders and its first National President, who presented the three chapter awards; Capt. Robert P. Smith (Junior Officer recipient), who also is a member of AFA's Junior Officer Advisory Council Executive Committee; and Mr. Howard Silber of the Omaha World-Herald, who received an AFA Citation of Honor from AFA National President George M. Douglas for his efforts in furthering public understanding of national defense issues.

AFA News

Col. James L. Gardner, Jr., center, 438th MAW Commander, and CMSgt. Frank J. LaGreca, right, Senior Enlisted Advisor for the wing, accept an oversized copy of a check for $1,000 from William J. Demas, President of AFA's Thomas B. McGuire Chapter. The check represented the Chapter's donation to the Air Force Enlisted Men's Widows Home at Fort Walton Beach, Fla. Following the presentation, McGuire NCOs honored Demas by presenting him a set of stripes and naming him an honorary Air Force master sergeant in appreciation of his many contributions and services to McGuire AFB and the Air Force.

—USAF PHOTO BY SSGT. ERIC C[illegible]

INTERESTED IN JOINING A LOCAL CHAPTER?

For information on AFA Chapters in your area, write:
Assistant Executive Director/Field Operations
Air Force Association
1750 Pennsylvania Ave., N. W.
Washington, D. C. 20006

The Arnold Air Society's Area I Squadrons recently held their Area Conclave in Tucson, Ariz. Shown during a break in the working sessions are, from left in the foreground, Col. Russell C. Roberts, PAS at Arizona State University; Angel Flight National Commander Mindy Martin, University of Evansville, Ind.; Cadet Ron Thomas and Horace Hickam AAS Squadron Commander Susan Lim, University of Hawaii; and Col. W. L. Busboom, Commandant, AFROTC Western Region. Thanks to a $500 donation from AFA's Hawaii Chapter, and the assistance of the Hickam AFB Officers Wives' Club, the delegation from Hawaii was able to attend the conclave.

—SHREVEPORT TIMES PHOTO BY KEN ACLIN

During a recent meeting of AFA's Ark-La-Tex Belle Chapter, La., Toulmin H. Brown, left, Vice President for AFA's South Central Region, presented an AFA Membership Award to representatives of the all-female chapter. Bessie Hazel, center, Louisiana State AFA Secretary, is the immediate Past President of the Chapter, and Mrs. Irvin B. Mann, right, is the current Chapter President.

Dr. R. J. Rummel, a Political Science Professor at the University of Hawaii, was the guest speaker at a pre-Christmas luncheon sponsored by the Hawa Chapter at the Hilton Hawaiian Village in Waikiki. Dr. Rummel, the author of a new book titled Peace Endangered: The Reality of Détente, spoke on th requirements for the B-1 bomber. Shown with Dr. Rummel are Chapter President Jim Dowling, left, and Maj. Gen. Charles C. Pattillo, right, Vice Commander in Chief, Pacific Air Forces.

chapter and state photo gallery

The Andrews Area Chapter's recent dinner observing AFA's 30th Anniversary was held in the Andrews AFB, Md., NCO Club with Mr. Barry ZeVan, a former Air Force weatherman and now the weatherman on Washington's TV Channel 7, as the guest speaker. Guests included, from left, CMSgt. Robert Harrison, Senior Enlisted Advisor, AFSC; Col. Frank J. Tomlinson, Vice Commander, 76th Airlift Division (MAC); Chapter President Tony Anthony; Mr. ZeVan; CMSgt. Robert Dunnwedy, Senior Enlisted Advisor, and Col. L. Peterson, Vice Commander, 1st Air Base Wing (MAC), Andrews AFB, Md.

The Lubbock Chapter, Tex., in cooperation with the Lubbock Chamber of Commerce, donated the trophies for the second annual Reese AFB Christmas Basketball Classic. Shown during presentation of the trophies to tournament officials are, from left, Chapter President Doug Boren; Joel Apel, member of the Lubbock Chamber's Armed Services Committee; Capt. Stanley Symons, 64th Air Base Group, Squadron Commander; MSgt. Jimmy Creekmore, NCOIC of base gym; Hal Gree, Chief, Morale, Welfare, and Recreation Division; and Maj. George Wilson, tournament project officer.

"Go Out and Recruit Another Member"

In his address to AFA's 30th Anniversary National Convention, at the luncheon in his honor on September 22, Secretary of the Air Force Thomas C. Reed had some good advice for AFA members. His advice is especially appropriate at this time, in view of the annual AFA membership campaign, which begins April 1. Secretary Reed said:

If ever there was a need for the Air Force Association, it's now. At the AFA Convention in 1947, our first Chief of Staff, General Spaatz, said that the Air Force would look to AFA "as a major link with the people of the United States, through which it will be possible to insure that the roots of airpower are firmly established and maintained."

No one could say it better. We still look to AFA as that major, vital link. Go out and recruit another member. NOW. He or she doesn't have to be a former blue-suiter, or be in the aerospace business, or live near an air base. All that's required is a serious concern for our future.

Go home and recruit that key local leader who can help maintain our civilian roots. The next generation is counting on you.

—USAF PHOTO

Scott Berkeley Chapter President Bill Bowden, left, was at the flight line to greet Air Force Secretary Thomas C. Reed, right, when he arrived at Seymour Johnson AFB, N. C., recently for an orientation flight in a 68th Bombardment Wing B-52 bomber.

AFA News

During the Silver Wings Fraternity's 18th Anniversary Awards Dinner, recently held in Harrisburg, Pa., to honor Leroy W. Clark for his contributions to the development of aviation in central Pennsylvania, Mr. Clark was cited by the Air Force Association, the Silver Wings Fraternity, and AFA's Olmsted Chapter. Shown with Mr. Clark, right, and his three awards, are AFA National Treasurer Jack B. Gross, left, and Russ Brinkley, center, National President, Silver Wings Fraternity.

Maj. Gen. Billy J. Ellis, right, Deputy Inspector General, Hq. USAF, and guest speaker at the Austin Chapter's Bicentennial Meeting at the Bergstrom AFB Officers' Club, chats with the AFROTC Cadet recipients of the Chapter's Bicentennial Awards for Outstanding Performance. They are, from left, Cadet Cols. William Perkins, University of Texas, Patrick S. Nolen, Southwest Texas State University, and Gerald Krenck, Texas A&M.

Sculptor Tasso Pitsiri, left, accepts payment from Steve True, President of AFA's Enid Chapter, Okla., for the bronze statue shown in the center of the photo right. A joint project of the Chapter and the Vance AFB Bicentennial Committee, the statue depicts a Revolutionary War Minuteman and a modern-day Air Force pilot, and is scheduled to be placed in the proposed Vance AFB Bicentennial Park.

—USAF PHOTO BY CAPT. STEVEN KLEID

COMING EVENTS . . .

Fourteenth National Air Force Salute, New York Hilton Hotel, New York City, March 26 . . . **Angel Flight/Arnold Air Society National Conclave,** Marriott Hotel, New Orleans, La., April 9–12 . . . **Alaska State AFA Convention,** Anchorage, April 15–16 . . . **Massachusetts State AFA Convention,** Chicopee, April 16–17 . . . **Connecticut State AFA Convention,** New Haven, May 7 . . . **New Jersey State AFA Convention,** Golden Eagle Inn, Cape May, May 20–22 . . . **California State AFA Convention,** Newport Beach, May 20–22.

Missouri State AFA Convention, St. Louis, May 21 . . . **New Hampshire State AFA Convention,** Portsmouth, May 21 . . . **AFA Golf Tournament,** The Broadmoor, Colorado Springs, Colo., May 27 . . . **AFA Board of Directors and Nominating Committee Meetings,** The Broadmoor, Colorado Springs, Colo., May 28 . . . **AFA's Annual Dinner honoring the Outstanding Squadron at the Air Force Academy,** The Broadmoor, Colorado Springs, Colo., May 28 . . . **Colorado State AFA Convention,** Denver, June 3–5.

Pennsylvania State AFA Convention, Allentown, June 3–5 . . . **Ninth Annual Bob Hope AFA Charity Golf Tournament,** March and Norton AFBs, Calif., June 4–5 . . . **Alabama State AFA Convention,** Airport Holiday Inn, Mobile, June 9–11 . . . **Washington State AFA Convention,** Davenport Hotel, Spokane, June 17–19 . . . **New York State AFA Convention,** Dutch Inn, Long Island, July 15–17 . . . **Texas State AFA Convention,** St. Anthony Hotel, San Antonio, July 30–31 . . . Academy of Model Aeronautics' 1977 **National Model Airplane Championships,** March AFB, Calif. (AFA's Riverside County Chapter is a cosponsor), August 7–14.

AFA's 31st Annual National Convention, Sheraton-Park Hotel, Washington, D. C., September 18–21 . . . **AFA's Aerospace Development Briefings and Displays,** Sheraton-Park Hotel, Washington, D. C., September 20–22 . . . **Sixth Annual Air Force Ball,** Beverly Hills, Calif., October 28. ■

photo gallery

AFA President George M. Douglas, left, guest speaker at the Texas State AFA's winter quarter Executive Committee Meeting in Dallas, presents an AFA Membership Award for 1976 to Beverly Jacobsen, center, the Texas State AFA's Membership Chairman, and Texas State AFA President E. F. "Sandy" Faust, right. David Blankenship, Oklahoma State AFA President, is seated in the foreground.

When this photo appeared on p. 79 of the January '77 issue, we erroneously identified the couple on the right as Lt. Gen. Bryan M. Shotts, Commander, 15th AF, SAC, and Mrs. Shotts. In fact, they are Maj. Gen. Thomas A. Aldrich, Commander, 22d AF, MAC, and Mrs. Aldrich, shown here at the Air Force Ball visiting with CMSgt. Walter Scott, 60th MAW, Travis AFB, Calif., and Mrs. Scott. A photo of General and Mrs. Shotts, also taken at the Air Force Ball, may be found on p. 8 of this issue. Our sincere apologies to both General Shotts and General Aldrich for the misidentification in the January issue.

NOW! Thousands of $$$ More Protection

AIR FORCE ASSOCIATION

Bigger Benefits in Personal and Family Coverage . . . Same Low Cost
These Figures Tell the Story!

Choose either the Standard or High-Option Plan

The AFA Standard Plan

Insured's Age	New Benefit	Old Benefit	Extra Accidental Death Benefit*	Monthly Cost Individual Plan
20-24	$75,000	$66,000	$12,500	$10.00
25-29	70,000	60,000	12,500	10.00
30-34	65,000	50,000	12,500	10.00
35-39	50,000	40,000	12,500	10.00
40-44	35,000	25,000	12,500	10.00
45-49	20,000	15,000	12,500	10.00
50-54	12,500	10,000	12,500	10.00
55-59	10,000	10,000	12,500	10.00
60-64	7,500	7,500	12,500	10.00
65-69	4,000	4,000	12,500	10.00
70-75	2,500	2,500	12,500	10.00

The AFA High-Option Plan

20-24	$112,500	$100,000	$12,500	$15.00
25-29	105,000	90,000	12,500	15.00
30-34	97,500	75,000	12,500	15.00
35-39	75,000	60,000	12,500	15.00
40-44	52,500	37,500	12,500	15.00
45-49	30,000	22,500	12,500	15.00
50-54	18,750	15,000	12,500	15.00
55-59	15,000	15,000	12,500	15.00
60-64	11,250	11,250	12,500	15.00
65-69	6,000	6,000	12,500	15.00
70-75	3,750	3,750	12,500	15.00

Optional Family Coverage
(May be added either to the Standard or High-Option Plans)

Insured's Age	Spouse Benefit New	Spouse Benefit Old	Benefit, Each Child**	Monthly Cost Family Coverage
20-24	$10,000	$6,000	$2,000	$2.50
25-29	10,000	6,000	2,000	2.50
30-34	10,000	6,000	2,000	2.50
35-39	10,000	6,000	2,000	2.50
40-44	7,500	5,250	2,000	2.50
45-49	5,000	4,050	2,000	2.50
50-54	4,000	3,000	2,000	2.50
55-59	3,000	3,000	2,000	2.50
60-64	2,500	2,250	2,000	2.50
65-69	1,500	1,200	2,000	2.50
70-75	750	750	2,000	2.50

*In the event of an accidental death occuring within 13 weeks of the accident, the AFA plan pays a lump sum benefit of $12,500 **in addition** to your plan's regular coverage benefit, except as noted under AVIATION DEATH BENEFIT, below.

**Each child has $2,000 of coverage between the ages of six months and 21 years. Children under six months are provided with $250 protection once they are 15 days old and discharged from the hospital.

AVIATION DEATH BENEFIT: A total sum of $15,000 under the Standard Plan or $22,500 under the High-Option Plan is paid for death which is caused by an aviation accident **in which the insured is serving as pilot or crew member of the aircraft involved.** Under this condition, the Aviation Death Benefit is paid in lieu of all other benefits of this coverage.

AFA'S DOUBLE PROTECTOR—now with substantial benefit increases—gives you a choice of two great plans, both with optional family coverage. Choose either one for strong dependable protection, and get these advantages:

FAMILY PLAN. Protect your whole family (no matter how many) for only $2.50 per month. Insure newborn children as they become eligible just by notifying AFA. No additional cost.

Wide Eligibility. If you're on active duty with the U. S. Armed Forces (regardless of rank, a member of the Ready Reserve or National Guard (under age 60), A Service Academy or college or university ROTC cadet, you're eligible to apply for this coverage. (Because of certain limitations on group insurance coverage, Reserve or Guard personnel who reside in Ohio, Texas, Florida and New Jersey are not eligible for this plan, but may request special applications from AFA for individual policies which provide similar coverage.

No War Clause, hazardous duty restriction or geographical limitation.

Full Choice of Settlement Options, including trusts, are available by mutual agreement between the insured and the Underwriter, United of Omaha.

Disability Waiver of Premium, if you become totally disabled for at least nine months, prior to age 60.

Keep Your Coverage at Group Rates to Age 75, if you wish, even if you leave the military service.

Guaranteed Conversion Provision. At age 75 (or at any time on termination of membership) the amount of insurance shown for your age group at the time of conversion may be converted to a permanent plan of insurance, **regardless of your health at that time.**

Reduction of Cost by Dividends. Net cost of insurance to AFA insured persons has been reduced by payment of dividends in 10 of the last 13 years. However, dividends naturally cannot be guaranteed.

Convenient Premium Payment Plans. Premium payments may be made by monthly government allotment, or direct to AFA in quarterly, semi-annual or annual installments.

EFFECTIVE DATE OF YOUR COVERAGE. All certificates are dated and take effect on the last day of the month in which your application for coverage is approved. AFA Military Group Life Insurance is written in conformity with the insurance regulations of the State of Minnesota. The insurance will be provided under the group insurance policy issued by United of Omaha to the First National Bank of Minnesota as trustee of the Air Force Association Group Insurance Trust.

EXCEPTIONS. There are a few logical exceptions to this coverage. They are:

Group Life Insurance: Benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until your coverage has been in force for 12 months.

The Accidental Death Benefit and Aviation Death Benefit shall not be effective if death results: (1) From injuries intentionally self-inflicted while sane or insane, or (2) From injuries sustained while committing a felony, or (3) Either directly or indirectly from bodily or mental infirmity, poisoning or asphyxiation from carbon monoxide, or (4) During any period a member's coverage is being continued under the waiver of premium provision, or (5) From an aviation accident, either military or civilian, in which the insured was acting as pilot or crew member of the aircraft involved, except as provided under AVIATION DEATH BENEFIT.

PLEASE RETAIN THIS MEDICAL INFORMATION BUREAU PRENOTIFICATION FOR YOUR RECORDS

Information regarding your insurability will be treated as confidential. United Benefit Life Insurance Company may, however, make a brief report thereon to the Medical Information Bureau, a nonprofit membership organization of life insurance companies, which operates an information exchange on behalf of its members. If you apply to another Bureau member company for life or health insurance coverage, or a claim for benefits is submitted to such a company, the Bureau, upon request, will supply such company with the information in its file.

Upon receipt of a request from you, the Bureau will arrange disclosure of any information it may have in your file. (Medical information will be disclosed only to your attending physician.) If you question the accuracy of information in the Bureau's file, you may contact the Bureau and seek a correction in accordance with the procedures set forth in the federal Fair Credit Reporting Act. The address of the Bureau's information office is P.O. Box 105, Essex Station, Boston, Mass. 02112, Phone (617) 426-3660.

United Benefit Life Insurance Company may also release information in its file to other life insurance companies to whom you may apply for life or health insurance, or to whom a claim for benefits may be submitted.

Increase in Premium

ILITARY GROUP LIFE INSURANCE

APPLICATION FOR AFA MILITARY GROUP LIFE INSURANCE

United of Omaha

Group Policy GLG-2625
United Benefit Life Insurance Company
Home Office Omaha, Nebraska

Full name of member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of birth Mo. Day Yr.	Height Weight	Social Security Number

Please indicate category of eligibility and branch of service.

- ☐ Extended Active Duty
- ☐ Ready Reserve or National Guard
- ☐ Air Force
- ☐ Other _____ (Branch of service)
- ☐ Air Force Academy
- ☐ _____ Academy
- ☐ ROTC Cadet _____ Name of college or university

Name and relationship of primary beneficiary

Name and relationship of contingent beneficiary

This insurance is available only to AFA members

- ☐ I enclose $10 for annual AFA membership dues (includes subscription ($9) to AIR FORCE Magazine).
- ☐ I am an AFA member.

Please indicate below the Mode of Payment and the Plan you elect.

HIGH OPTION PLAN			STANDARD PLAN	
Members Only	Members and Dependents	Mode of Payment	Members Only	Members and Dependents
☐ $ 15.00	☐ $ 17.50	**Monthly** government allotment. I enclose 2 months' premium to cover the period necessary for my allotment to be established.	☐ $ 10.00	☐ $ 12.50
☐ $ 45.00	☐ $ 52.50	**Quarterly.** I enclose amount checked.	☐ $ 30.00	☐ $ 37.50
☐ $ 90.00	☐ $105.00	**Semiannually.** I enclose amount checked.	☐ $ 60.00	☐ $ 75.00
☐ $180.00	☐ $210.00	**Annually.** I enclose amount checked.	☐ $120.00	☐ $150.00

Names of Dependents To Be Insured	Relationship to Member	Dates of Birth Mo. Day Yr.	Height Weight

Have your or any dependents for whom you are requesting insurance ever had or received advice or treatment for: kidney disease, cancer, diabetes, respiratory disease, epilepsy, arteriosclerosis, high blood pressure, heart disease or disorder, stroke, venereal disease or tuberculosis? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance been confined to any hospital, sanitarium, asylum or similar institution in the past 5 years? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance received medical attention or surgical advice or treatment in the past 5 years or are now under treatment or using medications for any disease or disorder? Yes ☐ No ☐

IF YOU ANSWERED "YES" TO ANY OF THE ABOVE QUESTIONS, EXPLAIN FULLY including date, name, degree of recovery and name and address of doctor. (Use additional sheet of paper if necessary.)

I apply to United Benefit Life Insurance Company for insurance under the group plan issued to the First National Bank of Minneapolis as Trustee of the Air Force Association Group Insurance Trust. Information in this application, a copy of which shall be attached to and made a part of my certificate when issued, is given to obtain the plan requested and is true and complete to the best of my knowledge and belief. I agree that no insurance will be effective until a certificate has been issued and the initial premium paid.

I hereby authorize any licensed physician, medical practitioner, hospital, clinic or other medical or medically related facility, insurance company, the Medical Information Bureau or other organization, institution or person, that has any records or knowledge of me or my health, to give to the United Benefit Life Insurance Company any such information. A photographic copy of this authorization shall be as valid as the original. I hereby acknowledge that I have a copy of the Medical Information Bureau's prenotification information.

Date _____, 19 ___ _____
Member's Signature

3/77
Form 3676GL App

Application must be accompanied by check or money order. Send remittance to: Insurance Division, AFA, 1750 Pennsylvania Avenue, NW, Washington, D.C. 20006

Bob Stevens'

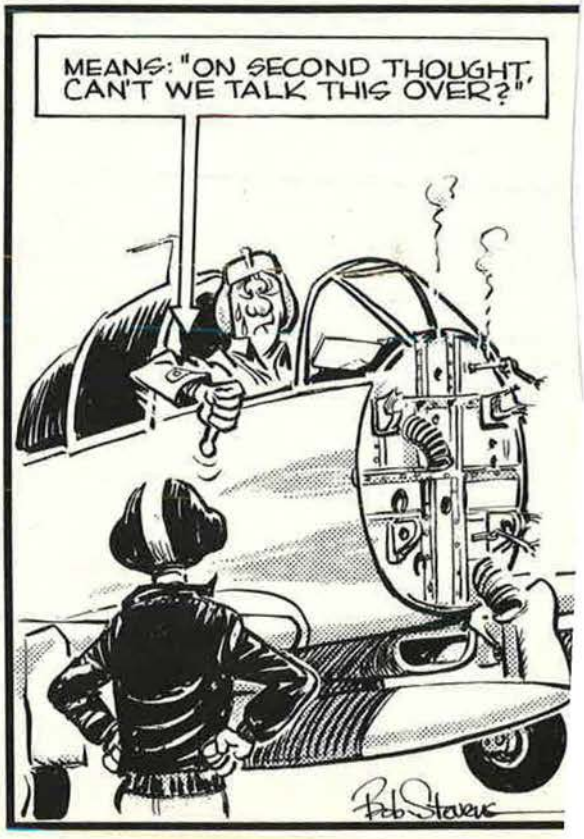
"There I was..."

WE'VE HAD AN EXCHANGE PILOT PROGRAM WITH OUR "SISTER" SERVICES FOR MANY YEARS. THIS STORY INVOLVES A BLUE-SUITER OPERATING SWABBIE MACHINERY (THERE WAS ALSO AN AF VERSION OF THIS BIRD) OFF THE COAST OF 'NAM.

AN AD-5 SKYRAIDER (AKA THE "SPAD") IS ON A CARRIER'S CATAPULT READY TO LAUNCH WITH A TRUCK LOAD OF STORES.

A BROKEN CATAPULT YOKE - JUST A MINOR MALFUNCTION - LEAVES THE SPAD IN PLACE BUT CATCHES THE WOUND-UP PROP...

... and FLINGS THE R-3350 A COUPLE OF MILES OUT TO SEA.



Who makes mini-RPV's that do everything in a big way?

Everybody knows the concept behind remotely-piloted vehicles: To avoid the loss of pilots and multi-million dollar aircraft.

But the trick is to make an RPV that can do the job consistently.

E-Systems has done it. And with a *mini*-RPV, no less. They don't look very fancy, but they fly very effectively. And our guidance systems are the next best thing to a pilot.

These RPV's have proven themselves with a high mission success rate. And they have a lot of flexibility with reconnaissance, jamming, deception, targeting or destructive punch.

And best of all, they're expendable.

For the systems answer to your problems, write: E-Systems, Inc., P.O. Box 6030, Dallas, Texas 75222.

E-Systems is the answer.

E-SYSTEMS

What can outfox a Foxbat? An Eagle with Sparrows.

F-15. The world-record-setting time-to-climb fighter that brings true all-weather air superiority into the inventory.

Combining advanced IFF with long-range look-down, shoot-down radar and improved AIM-7F Sparrow missiles, the F-15 can identify and attack hostile aircraft far beyond visual range. Tests have demonstrated the lethal accuracy of the F-15/Sparrow combination against high Mach targets at extremely high altitudes.

For close-range attacks, the F-15 combines high-G maneuverability with AIM-9 Sidewinders and an M-61 20mm Gatling gun.

The F-15. The air superiority fighter that lives up to its name.

F-15 Eagle

McDONNELL DOUGLAS