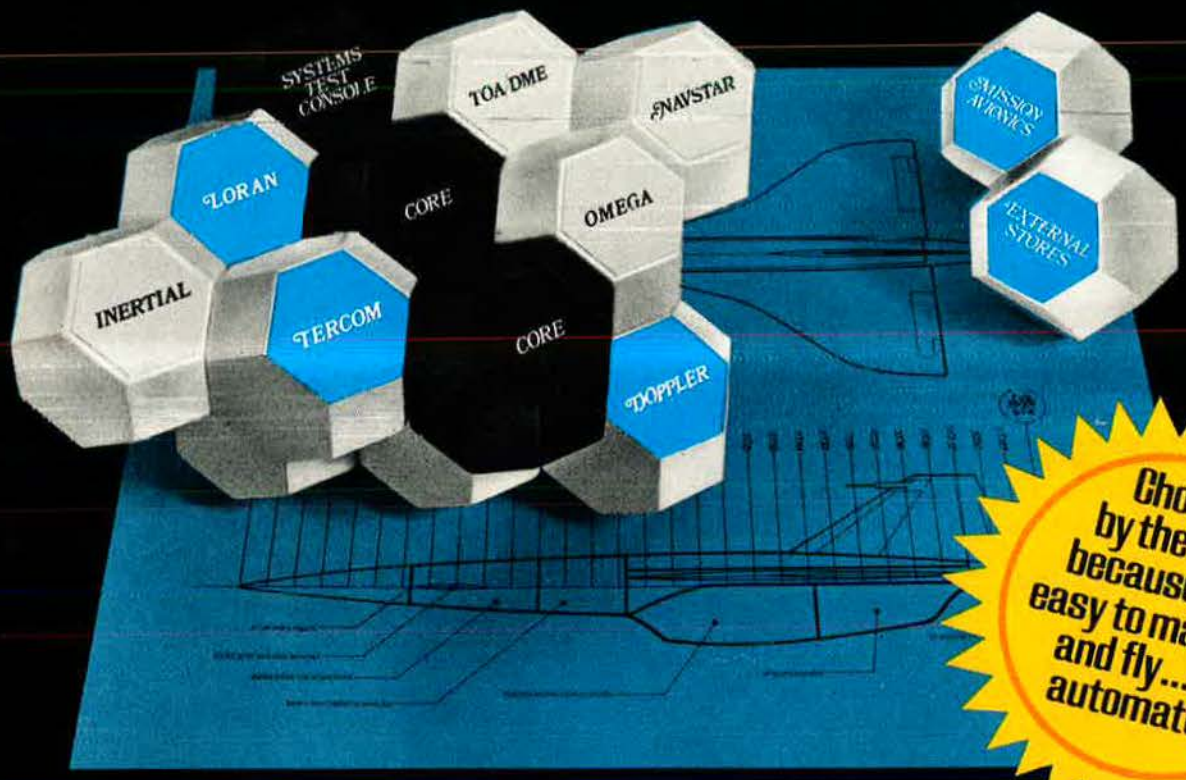
MARCH 1976/$2

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

СОВЕТСКИЙ АВИАЦИОННО-КОСМИЧЕСКИЙ АЛЬМАНАХ 1976*

*SOVIET AEROSPACE ALMANAC 1976



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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 second annual "Soviet Aerospace Almanac," designed as a compact, year-round reference work on aerospace forces of the USSR. The special section begins on p. 37 and runs through the "Facts and Figures" material on pp. 108–111.*

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YOU

WHO'S KEEPING THINGS MOVING IN ADVANCED TECHNOLOGY?

We've had a lot of practice getting from one point to another. With the Space Shuttle's leading edge. The Tomahawk cruise missile. The Corsair tactical fighter. Airtrans people mover. And more.

All hard-working solutions to tough problems.

But one of the things we've learned over the years is never to be content with our past success. Because we keep some fast moving company.

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GHT

AN EDITORIAL

BETTING ON A BARE-BONES BUDGET

By John F. Loosbrock
EDITOR

IN preparing this March issue of AIR FORCE Magazine at the time the United States national defense budget is being articulated, explained, and defended, one cannot help being struck by a series of policy contradictions that are as frightening in their implications as they are puzzling to the observer. The more so because the anomalies are, in our view, so obvious that they cannot be ignored. And yet they are ignored, bypassed, and circumvented.

Start with the threat that must underlie any rational analysis of a defense budget. This year's "posture statements," made annually on Capitol Hill, are, individually and collectively, the most forceful and persuasive statements of the Soviet threat we have seen. Secretary of Defense Donald H. Rumsfeld, Chairman of the Joint Chiefs Gen. George S. Brown, Director of Defense Research and Engineering Dr. Malcolm R. Currie, Secretary of the Air Force Thomas C. Reed, and Air Force Chief of Staff Gen. David C. Jones, each speaking from his own vantage point, have without exception painted a dark and ominous picture of the pace and extent of the Soviet military effort. The key evidence on which they base these views is included in our second annual Soviet Aerospace Almanac, beginning on p. 37.

Against this has been set a defense budget, which while the biggest in dollars (but not in purchasing power) of any in US history, is described, and with good reason, as a bare-bones effort that cannot be trimmed without unacceptable risks. Certainly it represents a level of effort and investment that, by almost any measure except possibly that of technical excellence, is far below that of the Soviet Union. Inflation and the soaring costs of personnel leave a precariously small residue for buying hardware and operating and maintaining the forces. Adding to the financial pressures is the fact that an unusually large number of weapon systems, desperately needed for modernization, are scheduled to come into the inventory over a short period of time, so that the procurement dollar must be stretched over a wide range of programs.

One is tempted to say at this point, "So what else is new?" Budgetary shortfalls have been a fact of Pentagon life for almost as long as the Pentagon has been there. But let's assume for the moment that the FY '77 budget is barely adequate. It's the only budget we have, and the likelihood of its being bumped upward on its journey through the legislative process is so slim as not to merit consideration.

This austere budget, large as it is, draws its rationale from two assumptions that may or may not prove vali

The first assumption is that a truly mutually attracti SALT agreement can be worked out. If SALT collapse a substantial supplemental request is clearly called for.

But here one of the anomalies referred to above ente the picture. In an election year, an impression of pro ress is the Administration's most important product. A a result, the pressure rises on our SALT negotiators come to an agreement, not necessarily based on a pari of advantages with the Soviet Union but upon a pr spective erosion of US military capabilities, if that is th only way agreement can be reached.

The second assumption is that the Sino-Soviet r will continue, causing a significant fraction of Sovi military forces to be tied up along the Soviet-Chines border. Should the Soviets and the Chinese agree t agree once again, the US military posture achievab through the newly proposed budget quickly become inadequate.

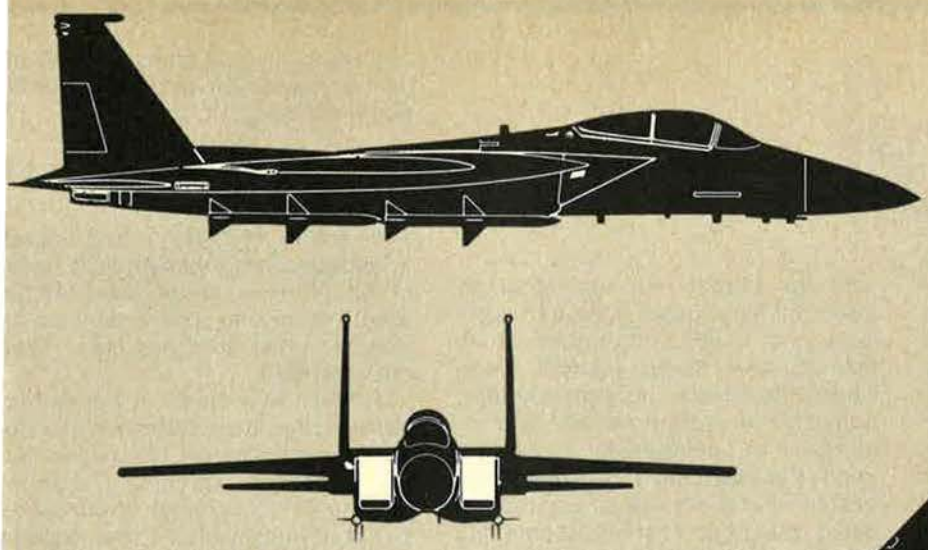
All this is bad enough, but at this point a kind o reverse synergism comes into play. So long as th Chinese see the Soviet pursuit of détente with the U through SALT as a threat to them, they are not likely t move toward the Soviets. But should SALT break down or be negotiated in a way clearly advantageous to th Soviets, thus threatening the continuation of détente then the Chinese will be likely to climb back into bed with their fellow Communists. Who can forget the Hitler Stalin pact of 1939 and its overnight impact on powe relationships?

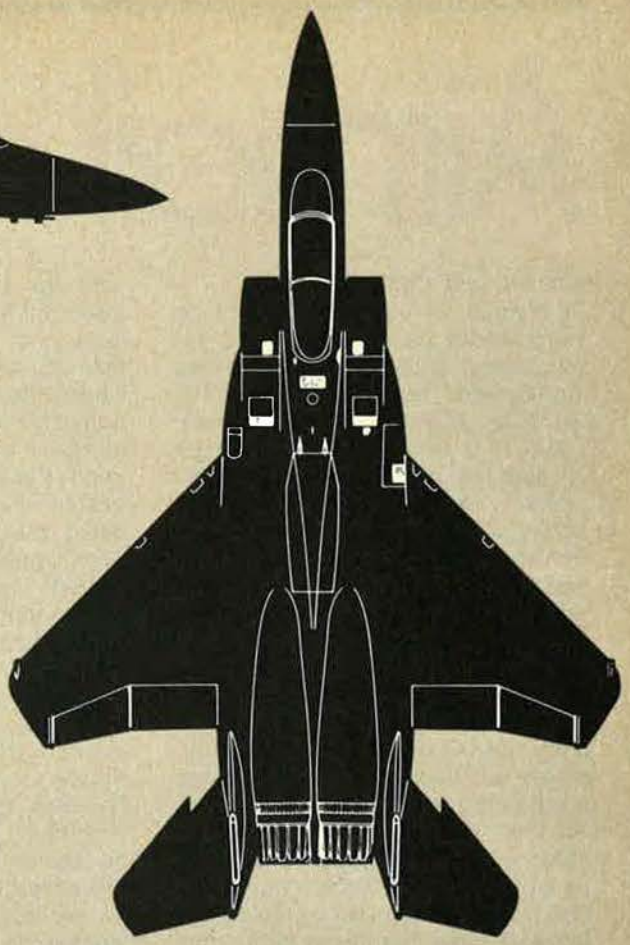
So, there is the clear danger that in attempting t operate as marginally as it is, the US may face th collapse of both assumptions on which the bare-bone budget approach hinges.

And all this is even more likely to happen should th Administration suffer defeat on any major programs i the FY '77 budget. The stakes are extremely high, highe than at any time in the past three decades and perhap in the nation's history. There is little or no hedge facto in the budgetary betting. We wish there were, and les reliance on the imponderables of Soviet and Chines behavior.

The problem, it seems to us, is that the United State so often acts like it is already a second-rate power, an the step from that to thinking like a second-rate powe is short and quick.

We simply refuse to believe that this is the way th American people want to go, if the alternatives are mad clear to them.





What makes this aircraft so hard to identify?

It is probably easy for you to identify this aircraft as the McDonnell Douglas F-15 Air Superiority Fighter.

But, under combat circumstances, it would be very difficult for enemy forces to identify, or even find, the F-15.

That's because Northrop's Internal Countermeasures Set (ICS) provides automatic jamming of enemy radar signals as part of the F-15's Tactical Electronic Warfare System. The ICS, designated AN/ALQ-135, enhances survivability and mission success in a hostile environment.

An important feature of the Northrop ICS is that it is carried internally so as not to affect the F-15's performance or maneuverability.

Northrop's F-15 ICS provides maximum protection because it is the most advanced Electronic Countermeasures (ECM) system yet developed for a tactical aircraft. It operates automatically, permitting the pilot to concentrate on his mission, even within the densest radar environments.

Production of the F-15 ICS has begun at Northrop's Defense Systems Department, Rolling Meadows, Illinois. Since 1952 this department of Northrop (formerly the Hallicrafters Co.) has designed and manufactured more than 10,000 jamming transmitters, including the radar-jamming ECM systems that have helped protect the B-52 bomber for nearly two decades.

With this background and experience, we can say with confidence that production of the new F-15 ICS will be carried out with Northrop's customary efficiency—on time, on cost, and with the promised performance, or better.

Northrop Corporation, 1800 Century Park East, Los Angeles, California 90067, U.S.A.

NORTHROP

Airmail

Not a Legal Contract

Gentlemen: It is very difficult to know where best to begin the response to "SALT I Aftermath: Have the Soviets Been Cheating?" by Dr. Gray (November 1975 issue). There is a temptation to begin by dismantling the very shaky underpinning of most of his technical points, but this would direct attention to conclusions which are in the first place erroneous, secondly meaningless, but most dangerously, would lead the readers to accept an underlying assumption which is false and delusive.

The most important thing is to point out the erroneous assumption which will then by and large settle all the other points. The notion that SALT I is a contract, with terms enforceable in a court, is a grave misconception. Anyone who holds this false notion is going to be bogged down in endless arguments whose conclusions will be meaningless because "violations" of a nonbinding agreement have no legal significance. SALT I is *not* a contract and cannot be enforced in a court.

Attacking the technical ability or naïveté of the negotiators because they did not produce a technically watertight text is a cheap shot because they were *not negotiating a contract.* . . .

The author and readers should reflect on the treaties of the last fifty or sixty years whose goals were to limit the formation or utilization of major military forces, including Versailles '19, Washington '21-'22, German/Polish Nonaggression Pact '34, Munich '38, and German/Soviet Nonaggression Pact of '39. It should be obvious that whenever the leaders of a nation perceived that it was in their interest to create or utilize major military forces, *it was done* regardless of outstanding treaties, pacts, etc.

The possible usefulness of a diplomatic treaty of this nature is to achieve an *element of timing* in either internal, *i.e.,* domestic, or international affairs. It *will not* prevent the creation or utilization of major military forces. One can conjecture as to what the objectives of the US and Soviet leaders were when SALT I was agreed, whether domestic or international, and a number of candidates come to mind. For example, it has been suggested that both sides wanted to avoid the high cost of a national ABM system deployment based on current technology because the performance predictions were less than satisfactory against the known threat.

Now we can look at the American unilateral statements. Dr. Gray states, "They do not have the force of law . . ." which is unarguable because neither does SALT. . . . It remains that SALT rests entirely on spirit or intention and not on the power of a court. Then it is useful to know when the "spirit" is weakening. Earlier treaties were quite brittle in that all articles were agreed upon and, therefore, a violation precipitated a direct confrontation. It seems that the unilateral statements should serve to provide advanced indications of when the underlying intentions are dissipating.

However, the most important points to keep in mind are that SALT I, and, in fact, any such agreement to limit the creation or utilization of major military forces, is *not* a contract, is *not* enforceable in a court, and does *not* prevent the leaders of the countries involved from acting contrary to its terms when they perceive it to be in their best interest.

We, therefore, need to:

1. Be *prepared* for the time when the treaty is violated or abrogated;
2. Continue to work toward *verifiable* reductions in the inventory of mass-destruction megatonnage and means of delivery;
3. But, *avoid* conditions in future treaties that would constrain us from best providing for our own security and well-being.

Ben Werle
Woodland Hills, Calif.

The author replies: I find myself in substantial agreement with much of Mr. Werle's letter. Most of his effort seems to be expended in assaults upon positions that I have not defended.

To cut to the heart of the matter, both parties bound themselves not to do certain things for a specified period (interim agreement) and indefinitely (ABM treaty). If one party performs acts which it has agreed not to perform (by reasonable interpretation of the *texts* of the treaty agreement) then that is a violation —period. Mr. Werle appears to be hung up on the question of whether or not SALT I comprises a contract—understood legally. This is a monumental irrelevance. Unfortunately, performance or alleged nonperformance under an arms control regime cannot be submitted for judgment by a court, nor can treaty terms (or penalties for noncompliance) be enforced save by state action.

My expression, "do not have the force of law" (with reference to the American unilateral statements), was probably unfortunate, in retrospect, in that it invites the pedantic to misunderstand my meaning. As Mr. Werle must surely appreciate, I was stating merely that the unilateral statements lack *whatever* legal, quasi-legal, pseudolegal (politics in a legal guise), or frankly political authority is enjoyed by the provisions that were mutually agreed.

I could not agree more that interstate negotiation is not a very fruitful path for the attempt to limit the creation or utilization of major military forces. But, as I think I have demonstrated, the Nixon Administration did, foolishly, believe that it had achieved a major constraint on the growth of the counterforce threat inherent in Soviet ICBM deployment. While agreeing with many of Mr. Werle's judgments (even some of those intended to devastate my arguments!), I must confess to some confusion as he leaps from legalistic pedantry of an obvious kind to the heights of obscurity, *i.e.,* we are told that SALT *et al.* is useful "to achieve an *ele-*

We suggest that readers keep their letters to a maximum of 500 words. The Editors reserve the right to excerpt or condense as required in the interests of space or good taste. Names will be withheld on request, but unsigned letters are not acceptable.

nent of timing. . . . He may know what he means, but the rest of us are less fortunately situated.

Colin S. Gray

Broadside Blast

Gentlemen: I have been a member of the Air Force Association since 1965. This year, 1976, however, must be my last year to belong.

You have become entirely too one-sided. You have supported every proposed military acquisition and every military pay raise. This is an irresponsible approach. Oh yes, pretty soon you have a magnificent military by your methods but, also, pretty soon you have financially and spiritually destroyed the very society you are professing to protect.

Two years ago I wrote you concerning the attitude of the USAF's first Vietnam jet ace, Capt. Steve Ritchie. He had made the statement that if flight pay were not paid to pilots in nonflying jobs, he would consider resigning. My opinion was that he should resign if his priorities were such that flight pay were more important than serving his country. You did not publish my opinion. I can only suppose you viewed it as a threat to your pious views. And I have to suppose the same for this letter.

One other item. The one very bright star for national defense, the Reserves and National Guard, receive all too little mention in your magazine. These men consistently do the job of national defense as well or better than the men on active duty and they do it for one heck of a lot less money. That is a bargain that deserves a lot of credit.

I will miss you, but my hope is that I can help to balance you out. Good luck to you and good luck to me, and I hope we meet somewhere in the middle for, God willing, gentlemen, that is the only way we will all survive.

Lauran Paine, Jr.
Ashland, Ore.

AECP Scholarships

Gentlemen: The future of the Air Education and Commissioning Program (AECP) is still very much in doubt. This program has been a major up-from-the-ranks route for the last seventeen years and a major source of career motivation. No AECP have entered school since October 1974; the House Appropriations Committee blocked further entries as an economy measure. An attempt to reinstate the program for FY '76 was partially successful in that the Congress will now permit resumption of the program when the Air Force no longer RIFs officers or defers the entry of AFROTC graduates.

However, when and if the program is resumed, an AECP student would have to provide for his own tuition and fees. According to the *Air Force Times* (December 31, 1975, p. 6), the individual could use his GI Bill, obtain grants, or pay these expenses out-of-pocket. Additionally, veterans and service organizations would be encouraged to offer tuition scholarships to qualified airmen seeking entry into the AECP.

This is a most unusual opportunity! If Air Force members believe strongly in the up-from-the-ranks concept, we should now demonstrate our convictions through voluntary action via the veterans and service organizations by establishing scholarship programs for AECP. Put very bluntly, it's put up or shut up time.

If organizations such as the Air Force Association are to retain their credibility as representatives of service members, they must act quickly to prove they can back up words with actions. In the past, AIR FORCE Magazine has supported the AECP. . . . [I would like to see] the AFA Board endorse the scholarship concept and move to legally establish an AECP scholarship fund.

Eventually, such funds may be most feasible through individual AFA chapters or through state-level action. One can easily visualize an Alamo Chapter Scholarship in police science at San Marcos, a Wright Memorial Chapter Scholarship in business at Ohio State, an Indiana State AECP Scholarship in aero engineering at Purdue, etc. . . .

Since the next fiscal year Congress will consider does not begin until October 1, 1976, AECP scholars could probably not enter school until January 1977, or later that year. With average two-year programs and three months of OTS, this would mean initial commissioning in May or December 1979. In order to meet even this schedule, things must begin to move fairly quickly. Scholarship funds must be established, Congress convinced, quotas worked out, regulations revised, applications gathered, selections made, and reassignments ordered. With so much to be done, scholarship funds need to be established in the next three to six months, if we are to see AECP scholars commissioned in mid or late 1979.

Officers have been permitted to accept appropriate scholarships for a number of years (Rhodes, Fulbright, Olmstead, Mershon, etc.), and it is quite natural to extend the concept to the support of enlisted commissioning programs. This new development has the substantial benefit of permitting all military personnel, acting together through organizations such as AFA, to help those well-motivated, career-minded young enlisted people who aspire to commissioned status. But quick action on the part of the AFA and its chapters is required if this challenge is to be met and AECP scholarships established so as to communicate proper support of the idea to Congress before it acts on the FY '77 program requests.

Maj. Jimmy L. Mitchell
West Lafayette, Ind.

Mustang/Lightning Research

Gentlemen: I would like to hear from anyone who was connected in any way with the North American F-82 "Twin Mustang" and the Lockheed P-38M "Night Lightning." The purpose of this research is twofold: to build up a detailed history of both aircraft and to build a current address directory of all those who were associated with both programs.

Warren Thompson
7201 Stamford Cove
Germantown, Tenn. 38138

Wild Ride With a 75

Gentlemen: The letter in "Airmail" for January didn't tell the whole story on the B-25 with the 75-mm. It also had fourteen (count 'em) forward-firing .50s in two pods on either side of the fuselage.

I did not run into the Air Corps version, but made several gun runs in the Marine Corps version. If a memory track of thirty-odd years serves, it was designated the PBJ. It was intended to be a bunker buster. When everything was going, it was a shudderingly wild ride,

Airmail

with the run starting at about 2,000 feet and slamming seven 75 rounds plus the .50s into the target area. When the 75 fired it seemed, if not literally true, that the old girl just stood still in the sky for a couple of seconds.

Recalling this, it occurred to me at this late date that in the usual B-25, the "way out" was through a drop hatch behind the cockpit. With the 75 I don't recall any such hatch. And it was no airplane to go out of the top of which! Thirty years later ain't no time to figure that one out!

William G. Key
Washington, D. C.

ANG Museum

Gentlemen: An Air Museum is being established at Otis AFB, Mass., by the Massachusetts Air National Guard for the display of memorabilia used by the 101st Observation Squadron prior to World War II and by the present units of the Massachusetts Air National Guard.

For further information and donation of items please write

SSgt. Warren Freda
102d Consolidated Maintenance Sqdn.
Otis AFB, Mass. 02542

UNIT REUNIONS

Arnold Air Society

All past Arnold Air Society National Commanders are invited to attend the 1976 AAS National Conclave. It will be held April 12–18 at the Penn-Sheraton Hotel in Philadelphia, Pa. For information and reservations contact

Larry Freiberger
Chairman Protocol Committee
AAS 1976 National Conclave
AFROTC Det. 495
Stevens Institute of Technology
Hoboken, N. J. 07030

Disabled Officers Association

The National Convention of the Disabled Officers Association will be held June 24–26 at the Benjamin Franklin Hotel, Philadelphia, Pa. For additional information write

Maj. Walter J. Reilly
Disabled Officers Assn.
1612 K St., N. W.
Washington, D. C. 20006

Flying Cadet Class

June 1932 graduates of Kelly Field are holding a reunion May 26–28, 1976, at the Menger Hotel, San Antonio, Tex. For details write

Col. Jasper N. Bell, USAF (Ret.)
2709 Mountainview Dr.
Waco, Tex. 76710

Michigan ANG

The Michigan Air National Guard is planning a reunion June 18–20, at Selfridge ANG Base, Mt. Clemens, Mich., to celebrate the 50th anniversary of the founding of Michigan's AG and the 25th anniversary of the recall to federal service of the state's 127th Tac Fighter Wing. Those who have not been contacted or know of others who have not been notified, please contact

Col. Robert A. Stone
Det. 1/LGS Contacts
Selfridge ANG Base
Mt. Clemens, Mich. 48045

Stalag Luft III Revisited

At the request of Dave Pollack, at last year's reunion, Maj. Gen. Delmar T. Spivey, USAF (Ret.), has arranged two 2-week tours, departing Seattle/Los Angeles May 16, and Chicago/New York May 17. First get-together will be in Poland for a visit to Zegan (Segan). One group will then visit Russia and Denmark, the other Germany and Denmark. Cut-off date for acceptance is March 21, so send reservations as soon as possible to

Wanda Rudzinski, Pres.
Dana Travel Agency Inc.
91 Third Ave.
Mineola, L. I., N. Y. 11501
Phone: (516) 747-4884

Thunderbolt Pilots

Members of the P-47 Thunderbolt Pilots Association will hold their annual reunion in San Juan, Puerto Rico, April 30–May 2. Please contact

John W. Keeler
Keeler Newspapers
302 State St.
Wyalusing, Pa. 18853
Phone: (717) 746-1217

27th Fighter-Bomber Group

There will be a reunion of the 27th Fighter-Bomber Group and its predecessor, the 27th Bomb Group, both of WW II, at the Imperial House, Dayton, Ohio, June 4–6, 1976. Contact

Lowell A. Smith
4449 Charlotte Ann Dr.
Louisville, Ky. 40216

49th Fighter Group

The 49th Fighter Group reunion will be held in Dayton, Ohio, in July. Would like to have all members and former members attend. This group has gone under the names of Pursuit, Fighter, Fighter Bomber, and maybe others. Further information from

James Roy Garrett
Reunion Secretary
1282 Hartley St.
Macon, Ga. 31206

70th Service Squadron

The 70th Service Squadron A/C, WW II, will hold its second reunion July 14-17, 1976, at the Ole Coach Motor Inn 4205 South Bryant Blvd., San Angelo Tex. 76901. For full details, contact

Clark Titus
12001 Oakwood Dr
Austin, Tex. 7875
Phone: (1/512) 836-0291

75th Air Depot Wing

The 75th Air Depot Wing Association is planning a tour to Korea. This 8-day tour is specially prepared for Korean service veterans at reduced rates. All vets and their families are eligible. Group will depart from Los Angeles on June 4. Interested persons should write

Vern Wriedt, Pres.
75th Air Depot Wing Assn
2121 Cedar St.
Davenport, Iowa 52804

100th Bomb Group

The 100th Bomb Group (H) and attached units, stationed in England during WW II, will hold a reunion July 1–4 at the Antlers Plaza Hotel, Colorado Springs, Colo. Please contact

Gene Goodbread
2116 Carlton Terrace
Colorado Springs, Colo. 8090
Phone: (303) 636-2235

121st & 167th Liaison Sqdns.

The 121st and 167th Liaison Squadrons will hold a joint reunion at the Hyatt Regency Hotel, Dearborn, Mich., June 18–20. Please contact

William G. Rieger
3945 Parkview
Monroe, Mich. 48161

305th Bomb Group

Former members of the 305th Bomb Group and attached units, 8th AF, WW II, plan a reunion in Colorado Springs, Colo., June 18–20. For additional details write

305th Bomb Group Reunion
c/o Reunion Services
Box 1304
Hallandale, Fla. 33009

319th Bomb Group

The 319th Bomb Group will meet in July '76 at Tampa, Fla., in conjunction with the 57th Bomb Wing. Men of 17th and 320th Bomb Groups welcome. Contact

Harold E. Oyster
662 Deering Dr.
Akron, Ohio 4

871st Signal Corps

The 871st Signal Corps, 32d Air Group, 20th AF, based at Harmo on Guam during WW II, is plan reunion in the spring of 1976. Fo members of the 871st please contact

John R. Sewell
6033 N. W. 54th St.
Warr Acres, Okla. 7312
Phone: (405) 787-1646

SCIENCE/SCOPE

A jet-fighter turret that "sees" in the dark with laser and FLIR (forward-looking infrared) sensors has been developed by Hughes. Called TRAM (target recognition and attack multi-sensor), it is the only system that integrates FLIR, a laser designator-ranger, and a laser receiver in a precision-stabilized turret. Operating in conjunction with the aircraft's radar, TRAM will give the U.S. Navy's A-6E Intruder a full day-night, all-weather capability for navigation, target location, and attack with any of the weapons aboard. Hughes has delivered a TRAM system to Grumman Aerospace Corp. for flight test and evaluation.

The first scanning optical microscope that will inspect large-scale integrated circuits while they are being operated has been developed by Hughes. It has demonstrated its ability to detect, localize, and identify flaws in complex devices. Unlike other scanning microscopes, which scan only one logic state at a time, the Hughes microscope will effectively superimpose many logic states at one time to "characterize" or inspect the microcircuit. The completely non-destructive instrument scans with a modulated laser and was specifically designed under sponsorship of NASA's Marshall Space Flight Center to meet the high throughput requirements of manufacturers of high reliability microcircuits.

A cryogenic refrigerator that has achieved minus 439°F. -- only 20.6° short of absolute zero -- has been developed for the U.S. Air Force Flight Dynamics Laboratory by Hughes. The three-stage Vuilleumier-type cooler has the highest refrigerative capacity of any yet built. Operating at slow speed and low pressure, Vuilleumier coolers provide high reliability and a maintenance-free life.

A new communications satellite for the Department of Defense is in the preliminary design phase at Hughes, one of two contractors selected by the U.S. Air Force Space and Missile Systems Organization for the year-long program. Each contractor will demonstrate performance of critical components through brassboard and breadboard testing. One contractor will be selected for the 42-month Phase II program to design, build, and test three developmental flight model satellites. Ten production satellites are contemplated for Phase III, the first to be launched in fiscal 1981.

Spain has ordered an air defense shipboard radar system for her helicopter carrier, Dedalo. The three-dimensional scanning solid-state radar has a dual function of air search and weapons support, providing simultaneous information on an aircraft target's altitude, range, and bearing. Originally developed for the U.S. Navy by Hughes, the AN/SPS-52B system is the latest model in the Hughes family of three-dimensional radars aboard over 70 ships of the U.S. and the free world.

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Airpower in the News

By Claude Witze, SENIOR EDITOR

Here We Go Again

Washington, D. C., Feb. 2

USAF's Chief of Staff, Gen. David C. Jones, made what is probably the most perceptive observation of the season last week.

It is the season when our desk is groaning with books, reports, speeches, testimony, and tabulations on the state of the union and the state of our finances, topped by the Pentagon's annual evaluation of our military posture.

In all of this wordage from the legislative and executive branches, which feed it to each other, it was easy for the General's words to be overlooked. Here is what he said:

"The direction and momentum of Soviet [defense] spending are far out of proportion to any rational perception of threat or equilibrium. *Not since Germany's rearmament in the 1930s has the world witnessed such a single-minded emphasis on military expansion by a major power.*" (Italics added.)

General Jones is fifty-four years old and the first man to head USAF who did not experience combat in World War II. While he never fought the Nazis, he has not forgotten them.

It was the direction and momentum of Soviet spending that led President Ford to offer a proposed budget for Fiscal 1977 that finally calls for an end to seven years of shrinking defense purchasing power. For the first time he seeks outlays of more than $100 billion. Total obligational authority for the Pentagon is set at $112.7 billion. This figure is $14.4 billion more than Congress is providing for Fiscal 1976, but only about half of the increase is real. The other half is the price of inflation. Of the Total Obligational Authority (TOA), $32 billion is allocated to the Air Force, up from $28.6 billion in Fiscal 1976. For procurement of aircraft, USAF seeks nearly $6.4 billion, compared with a little less than $4 billion the previous year.

Most of the headlines, of course, have gone to President Ford's total budget request of $394.2 billion for the entire federal government, and the $43 billion deficit. Keeping it that low took effort, and to do it the White House recommended cuts and consolidations in the social programs that have been prospering through the past decade. This spells trouble for his defense proposals.

It is an election year and federal programs in the areas of education, health, social services, child nutrition, and even aid to the unemployed have built up their own constituencies. The recipients and the bureaucracies that serve them will fight to hold their place in the line, backed by members of Congress who fathered the original legislation. A cut in outlays that will give them $18 billion instead of last year's $21 billion was assailed at once as an attack on the poor and the elderly.

On January 21, the day the budget went to the Hill, the newspapers did not have space to cover the debate in the House of Representatives. If they had, the headlines would have gone to Rep. George H. Mahon, respected chairman of the Appropriations Committee, who immediately predicted the social service curtailments will not be adopted. As for the increases in defense spending, "Congress is unlikely to concur fully." The chairman pointed out, as suggested above, that Congress has been rearranging priorities in recent years, increasing the money available for social programs and forcing a steady decline in the outlay fo defense. He does not believe it wil reverse itself to a substantia degree. This, while admitting "th impetus given to the growth o domestic programs has to som extent been achieved through cut in the defense budget. This ha become the traditional tradeoff.' Mr. Mahon was not critical of tha approach.

Well, if the President has his way the tradeoff ends here. He say the requirement for new weapon is pressing. The total Defense De partment procurement request is fo $29.3 billion. This compares witl $21.4 billion in Fiscal 1976 and $17.4 billion allowed in Fiscal 1975. Lin items of major interest are:

- There is $1.5 billion for USAF' B-1 bomber, two-thirds of it t launch procurement from Rockwe International, with a go-ahead fo three aircraft.
- More than $600 million is in cluded to buy 100 Fairchild A-1 attack aircraft. Previous order totaled seventy-three.
- For the McDonnell Dougla F-15 tactical fighter, USAF plans t continue production at the estab lished rate. This means another 10 aircraft, at a cost of about $1.5 billion.
- The new General Dynamics F-16 Air Combat Fighter is listed fo $620 million, more than half o which would inaugurate production with an order for sixteen aircraft.
- Anticipating a production deci sion in 1978, the budget seeks $45.2 million for early work on an Ad vanced Tanker Cargo Aircraft (ATCA). This will be a modified commercial wide-body plane.
- Continued production is sought for the Airborne Warning and Con trol System (AWACS) with a request for $584.3 million, most of which is for purchase of six aircraft. Last year's order was limited to four, after extensive debate in Congress. Boeing and Pratt & Whitney are the contractors.
- Funding for the Boeing Minute man III ICBM is limited to $471.6 million because of a decision to close the line. The money is for modernization, spares, and further RDT&E.
- Major Navy project is the Tri dent submarine system. General Dynamics, builder of the first boat is expected to produce the second for which $1.3 billion is sought. The

lavy includes in this $244 million or "cost growth," plus construction funds and RDT&E.

• An almost equal amount is requested by the Navy to purchase three nuclear attack submarines (SSN 688). The main mission is to protect other submarines, such as the Trident.

• The Navy also would continue production of the Grumman F-14A Tomcat fighter with an order for thirty-six, the same as last year, at a cost of $708.2 million.

• Another substantial Navy request is for $242 million to continue production at the twelve-a-year rate of the Lockheed P-3C Orion patrol plane.

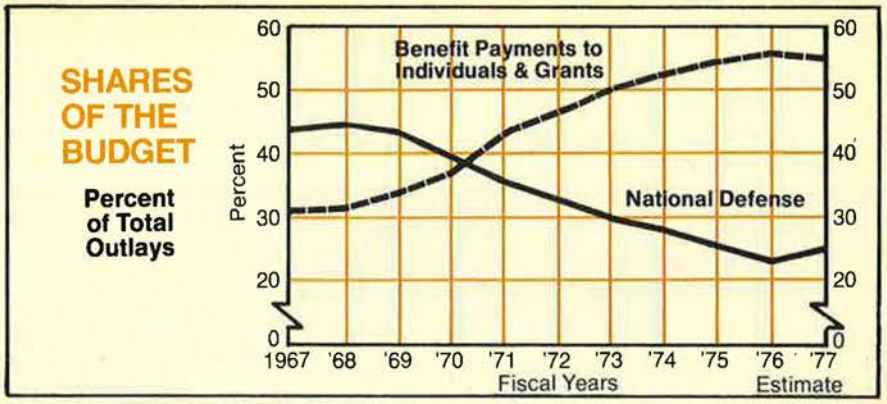
• The Army's major aircraft project is the Utility Tactical Transport Aircraft System (UTTAS). General Electric is the contractor, with Boeing Vertol and Sikorsky working on airframe possibilities. Funding is sought for fifteen aircraft. With RDT&E, the price is $213 million.

• Biggest single Army proposal is to continue high output by the Chrysler Corp. of the M60A1 tank. More than $500 million is sought to buy 927 tanks, up from 814 in Fiscal 1976 and 248 in the three-month transition period of next July, August, and September.

Proposed funding for research and development is fixed at $10.9 billion, of which the Air Force will get nearly $4 billion. This includes $85 million for a new generation of ICBMs and $79.2 million to pursue the air-launched cruise missile concept.

Broken down by functions, the new defense budget gives wide preference to the requirements for general-purpose forces, $40.2 billion, compared to $9.4 billion for strategic forces. There is heavy emphasis on tanks, armored personnel carriers, and helicopters. These are needed to complete the equipping of three new Army divisions, upgrade two light infantry divisions, and rebuild stockpiles. The materiel on hand has been seriously depleted by the heavy demand imposed by Israel in its 1973 war, which badly dented our reserves in Europe and at home.

The strategic funding is keyed closely to the success, or failure, of the SALT negotiations. As the headlines tell us, the outlook is not good and the options for expansion



must be provided in Fiscal 1977. Hence the funding for the Trident and the B-1. Both programs will come under attack in Congress.

On the subject of manpower alone, the Pentagon demonstrated the effect of escalating costs. Payroll costs have increased from $22 billion to $50 billion since before Vietnam. The manpower level has gone down, from 2,860,000 to 2,140,000. About 26,000 more civilian employees will be eliminated in Fiscal 1977, along with 1,000 uniformed personnel. This tells only part of the story, because there was a slash of nearly 100,000 each year of 1973, 1974, and 1975 while payroll costs went up.

Defense Secretary Donald H. Rumsfeld, in his posture presentation on Capitol Hill, warned Congress it faces difficult choices this year and in the future. The growth of Pentagon manpower costs must be slowed, he said, if funds are to remain for hardware and operations. The Secretary said the federal wage system should be reformed, by Congress, to keep defense blue-collar workers from earning more than their equals outside government. Also, he anticipates action to reduce total compensation for many in uniform. He mentioned proficiency pay, reenlistment bonuses, terminal leave payments, paid graduate education, commissary subsidies, CHAMPUS coverage, parachute pay, and flight pay as areas under scrutiny. He anticipates that by Fiscal 1980 adjustments in these areas will save about $4.7 billion a year.

Aside from the reference to the Nazi rearmament effort of the 1930s by General Jones, there were equally alarming words from Gen. George S. Brown, Chairman of the Joint Chiefs of Staff. He expressed deep concern before the House Armed Services Committee over the Soviet challenge that grows in spite of talk about détente. The Chairman fears Russia's new strength will permit "an increasingly confident Soviet Union to take advantage rapidly and decisively of political and military opportunities." He said the United States has reduced the size of its military force, limited procurement, deferred maintenance, canceled exercises, and reduced supply levels in the past few years. The stresses are building, and:

"In time, they will reinforce one another and will be the basis for the deterioration of a credible military capability. The process is insidious. Our forces may be perceived by others to be inadequate or inadequately ready before we ourselves reach such perceptions. That would be very dangerous."

The General was talking to the right audience. Within hours of his warning, the House added its approval to that of the Senate to end covert arms aid to two factions in Angola's civil war. The vote was 323 to 99, a tally that reflected the temper of the times and of Congress more than it did anything else. There is no evidence in the *Congressional Record,* which we monitor closely, of any consideration being given to the strategic position that Angola might fill in future military operations. If a general or admiral was questioned or quoted, we missed it. Evil will triumph, as good men stand idle.

On top of this, we have been witnessing a mad performance in Washington over the role of intelligence operations, not only by the CIA, but in the Defense Department as well. Both in Congress and the press, the know-nothings are ram-

pant. The damage they are doing may be irreparable to our intelligence capability.

There is a prolonged battle ahead on the issues raised by the proposed Fiscal 1977 budget. There is little, if any, optimism that the Ford program will survive. The new Budget Committees of the House and Senate have had their trial run and are digesting oats for a new race. The early noises from their first deliberations do not augur well fo the White House, particularly a the presidential campaign looms.

It is a situation that Hitler did no face in the 1930s and Brezhnev does not face today. ■

The Wayward Press

Herewith, a modest proposal. It is that newspapermen, like doctors and lawyers, should be subject to lawsuits for malpractice when professional negligence can be demonstrated. There are libel laws now, but they require that the prosecution prove *intent* on the part of a writer to damage the reputation or legitimate interests of a person or organization. Newsmen already claim professional status. Sigma Delta Chi, which used to be a newspaperman's fraternity, now calls itself The Society of Professional Journalists. That is close to the labels used by the American Bar Association and the American Medical Association, with an added touch of éclat. As nouveau-pros, these notetakers have put the word professional, capitalized, in a place where it can be used on a business card or letterhead.

If they are professionals, it is hard to understand why newspapermen should not be subject to the perils of professionalism. The problem faced by physicians and surgeons is known all across America. In Los Angeles it has become so desperate that the men in white, faced by extortionate malpractice insurance fees, are providing only basic medical care. Emergencies are taken care of, with professional skill, but, aside from that, there is what workers in overalls call a slowdown. In other parts of the country our medics have taken less action, but they are no less disturbed by the trend.

Then, there are the lawyers. There has been a dramatic upsurge in malpractice suits faced by the legal profession. Like the doctors, and unlike the professional newspapermen, they fear what the press calls "a new wave of consumer attacks on professional competence." That, in itself, is sloppy reporting. The attacks are against professional incompetence. Fred Grabowsky, a counsel to the District of Columbia Bar Association, was quoted recently on the trends in professional malpractice actions. Said he: "Once the doctors have been picked clean, the lawyers will be hauled in. People won't let any professionals get away with mistakes."

Our proposal is that newspapermen be next on the list. And, as fellow-professionals, the other media must be included. It seems reasonable that back in 1971, when CBS put on a TV show called "The Selling of the Pentagon," it demonstrated professional negligence. The network took tape recordings of interviews, clipped them apart and repasted them, distorting the message. In retrospect it would seem that Daniel Z. Henkin, then Assistant Secretary of Defense for Public Affairs, and Col. John A. MacNeil of the US Marine Corps, were victims of professional malpractice. Mr. Henkin, as a government official, took his lumps with dignity. Colonel MacNeil filed suit under the inadequate laws of libel. What he needed was a case for malpractice of a profession.

Later in 1971, the Washington *Post*, attempting to discredit Fairchild Industries of Germantown, Md., printed a phony composite picture, put together by its art department. The purpose was to cast aspersions on the real motivations of the company in an effort to enlist young people's interest in modern technology. The picture was not libelous, but it could be construed as journalistic malpractice.

Jack Anderson, the Pulitzer Prize-winning "investigative" reporter, is an old offender in the malpractice arena. Probably his most famous violation was his charge, on the eve of the last presidential election, that Sen. Thomas Eagleton had a police record. Anderson claimed to have "located photostats of half a dozen arrests for drunken and reckless driving." He never produced the photostats.

In the summer of 1974, the Washington *Post* gave page-one play to a false story, charging that costly gear had been dumped in a pond at Charleston AFB, S. C. The story was not true, but no action for professional malpractice was possible at the time. About a year later, the *Post* went again with a yarn out of Hong Kong charging that American bombers had conducted heavy raids in Vietnam on the day of the Saigon evacuation. The story was not true. In this case, the *Post* waited about eight weeks and then regretted having published the story. It was a little like the surgeon who was sorry he cut off a leg when he was hired to remove an appendix.

It is not necessary to labor the point, but there is a recent example that must go in the record. On January 5, on page one, the New York *Times* took a cheap shot at the military services with a headline that proclaimed: "Millions in Taxes Lost by States on Military Pay." The story said "in a large number of cases" military personnel fail to pay state income taxes. There was no comment about delinquencies among newspapermen, or editors. But the article did say men in the armed forces, "particularly" officers, avoid state income taxes by maintaining legal residence in states that have no income tax or that exempt military pay. Then:

"All five members of the Joint Chiefs of Staff, for example, according to the Defense Department, maintain legal residence in states that do not tax military pay, although they do not live in those states."

The next day, to its slim credit, the *Times* carried a correction, admitting that Gen. David C. Jones, USAF Chief of Staff, is a legal resident of North Dakota, which is where he entered the military service from his family home, and that he pays an income tax there. The *Times* reporter, John W. Finney, now says he knew this, but, "I must have misread my notes."

The *Times* still has not told its readers that Adm. James L. Holloway, Chief of Naval Operations, entered the Naval Academy from his family home in Dallas, Tex., and obeys the income tax laws of that state. Nor has the *Times* told its readers that Gen. Fred C. Weyand is a native of California and that the Army's Chief of Staff entered the service after ROTC training at the University of California. Nor, of course, that he obeys the income tax law of the state of his origin. California does not tax military pay.

The point of the *Times* article of January 5 was made most clear in an editorial in the New York *Post* of January 6. In a further example of professional malpractice, the *Post* accused the chiefs of staff of "occupying comfortable, well-camouflaged loopholes." It accused the Pentagon chiefs of "calculated tax avoidance" and of deliberately establishing legal residence in states without income taxes.

The charge is false, and the *Times* should have known it was false when it led the *Post* into its reckless accusation. If it takes legal action to stamp out this kind of negligence, let the laws be amended, where necessary, to put newspapermen in a class with physicians and lawyers. We have never been convinced that newspapering is a profession. But if it is, the practitioners should be willing to submit to professional disciplines. Perhaps the place to start is in the newspaper family itself, where the exercise of due diligence to avoid error too frequently is neglected.

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Aerospace World News, Views & Comments

By William P. Schlitz, Assistant Managing Editor

Washington, D. C., Feb. 4

★ In terms of sheer numbers, the USSR in 1975 again outclassed the US in successful space launches. In fact, the Soviets set a record, launching eighty-nine missions, compared to the previous mark of eighty-six in 1973.

For its part, the US achieved twenty-eight space launches for the year, only one of which—the joint Apollo/Soyuz rendezvous and docking mission—was manned.

During 1975, the Soviets experienced at least two failures in space launches, the most significant being April's Soyuz mission that saw two cosmonauts brought down safely following an abort during attempted orbit. The second was said to have been that of a Swedish scientific payload aboard a failed Soviet launch vehicle.

The US, too, had a pair of launch mishaps: an Intelsat F-4 and the Dual Air Density experiment both failed to achieve orbit.

The Soviet space program had a number of highlights during the year, aside from the cooperative manned mission with the US: The unmanned landing of scientific packages on Venus produced the first photographs ever of that planet's surface. Another milestone was the linkup of unmanned Soyuz-20 with orbiting space station Salyut-4, to demonstrate, as the Soviets claim, the capability of unmanned resupply of orbiting space vehicles or the dispatch of rescue missions to them. An additional feat in 1975 was the flight of Soyuz-18, resulting in the sixty-three-day docking mission with Salyut-4.

(According to just-released Defense Department information, the Soviet Union uses at least six types of communications satellites, primarily for military/strategic support: Molniya I, II, and III, which are in twelve-hour elliptical orbits; Molniya I-S, which is in a twenty-four-hour synchronous orbit; and single payload and multiple payload systems that are at relatively low altitudes.)

For a detailed appraisal of the Soviet space program by a leading US expert, see p. 82. A word on some notable US space endeavors follows.

★ While well behind the USSR in the number of space launches in 1975, NASA was far from idle, engaging in a host of activities ranging from environmental studies to advances in communications.

Last year's most ambitious undertaking was the launch of two Viking spacecraft toward Mars, a project that eventually will provide a better understanding of the Red Planet and, hence, our own.

While advances may have

AFA leaders with President Ford at a recent White House meeting on national defense matters. From left, Presidential Assistant William J. Baroody, Jr.; AFA Executive Director James H. Straubel; the President; and AFA National President George M. Douglas.

Aerospace World

DoD Secretary Donald H. Rumsfeld, far left, with new DoD officials. From left, Deputy Defense Secretary Robert Ellsworth; USAF Secretary Thomas C. Reed; Asst. DoD Secretary (Public Affairs) William I. Greener, Jr., an AFA member; DoD General Counsel Richard Wiley; and Special Assistant M. Alan Woods.

seemed at a minimum, the space agency in 1975 got well into the preliminaries on a number of important future programs:

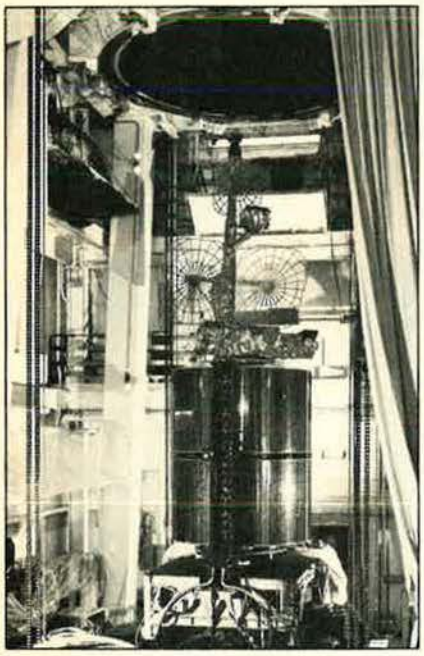
• Development of the Space Shuttle, a basic component of the future Space Transportation System, is well along and peak activity is expected soon.

• NASA completed the Manned Orbital System study that indicates the feasibility of orbiting four-to-six-man space stations using present technology that would need a minimum of modification. The station would be of modular design, with the modules transported to earth orbit by Shuttle. Thus assembled, the station would allow uninterrupted work in life-science studies on humans, plants, and animals, and such other enterprises as the manufacture in commercial quantities of large perfect crystals—a job that can be done only in space (other space-only work is under consideration, as well).

• In the effort to explore nearby planets, preparations continue for the 1977 launch of Mariner-type craft to Jupiter and Saturn, and the 1978 dispatch of two additional vehicles to Venus for the most detailed look at that cloud-shrouded planet yet.

• Closer to home, in January '75 NASA orbited Landsat-2, to provide practical utility in everything from surveying mineral deposits to monitoring atmospheric and global pollution.

• Among many other projects, NASA is continuing the development of efficient new jet engines and nonfossil fuels to power them.



Prior to launch (see adjacent item) is the second in a series of six Intelsat IV-A satellites designed to beef up worldwide telecommunications through the year 1979.

★ NASA got off to a flying start in 1976 with the January launch of the second in a series of six Intelsat IV-A communications satellites.

Put into synchronous equatorial orbit over the Atlantic, the satellite will act as backup for a previous craft launched last September and designed to handle telecommunications traffic in the area through 1979.

Other increased-capacity IV-As, built by Hughes Aircraft Co., are scheduled to beef up service in the Pacific and Indian Ocean regions.

Ninety-one nations make use of the Intelsat global system, which currently includes two Intelsat IV satellites over the Pacific, two over the Indian Ocean, and three over the Atlantic.

It is estimated that more than 70,000,000 overseas calls from the US were completed last year, a volume that may triple by 1980.

Intelsat IV-A provides 6,250 two-way voice circuits (compared to 4,000 for the IVs now in operation) plus color TV channels.

Also in January, NASA launched Helios-B, a spacecraft that, ninety-three days after launch, will come closer to the sun than any previous man-made object. In elliptical orbit around it, the craft will approach the sun every 186 days thereafter.

★ Until recently, the Soviets were believed to be well ahead in a long-term effort to utilize nuclear fusion in reactors as an eventual—and possibly unlimited—source of electricity or other forms of energy.

Their T-10 "tokamak"—an experimental device that makes possible the highly complex conditions needed for sustained fusion—began operation at the Kurchatov Institute in Moscow in 1975.

Now, however, the largest tokamak (Russian for toroidal magnetic chamber) in the US has gone operational at the Princeton Plasma Physics Laboratory in New Jersey.

According to the Energy Research and Development Administration, the Princeton Large Torus (PLT) is a doughnut-shaped device that employs strong magnetic fields to confine "plasma" (matter transformed into a state of ionized gas) under conditions similar to those of projected fusion reactors.

At a gunnery range at Nellis AFB, Nev., an A-10 close support aircraft, above left, destroys a Soviet T-62 main battle tank, above right, during tests of the aircraft's 30-mm Gatling gun system. To assure realistic combat conditions, the tank was configured with fuel and weapons ammunition.

The object is to achieve fusion by magnetic means, which requires a tricky combination of high temperatures, dense plasmas, and long confinement times "to cause nuclei to join, or fuse, and thereupon release large quantities of energy." PLT will permit definitive studies of the laws of plasma physics, a preliminary step toward development of fusion reactors.

ERDA's fusion program calls for the completion of the next stage, a tokamak test reactor in 1981, followed by a demonstration powerplant in the 1990s.

A possible source of such unlimited power—and in the future perhaps even transportable—would have a pervasive military potential.

★ The Air Force's hot new F-15 Eagle is entering the inventory of TAC's 1st Tactical Fighter Wing, Langley AFB, Va.

Since first flight in July 1972, more than fifty of the air-superiority fighters have been delivered to the Air Force and have more than lived up to advanced claims of performance excellence.

In air combat maneuvering tests in the skies over Europe and the US, the F-15 was pitted against seven types of US fighter and attack aircraft especially modified to improve dogfight capability and act as simulated threat aircraft. According to officials, the Eagles "won" 176 out of 178 such encounters, for a whopping win-loss ratio of eighty-eight to one.

In NATO exercises during 1975, the F-15 demonstrated its ability to work with AWACS aircraft. In a convincing display of its beyond-visual-range capabilities, the Eagle was able to detect and defeat F-111 and F-4 simulated attackers that were "flying individually and in groups at high and low altitudes and shielded by adverse weather conditions," officials said.

The Eagle has thus far scored high in safety, as well. In more than 7,000 sorties at this writing, the F-15 has had only one major accident (no casualties).

The 1st TFW at Langley should be up to full F-15 strength by year's end and thereafter F-15 deliveries are scheduled for USAFE.

There is talk that, because of severe cuts in its defense budget and other problems, Britain might opt for the F-15 instead of the multirole combat aircraft (MRCA), jointly developed by the UK, West Germany, and Italy. (Britain alone had planned an air-superiority fighter version.)

The suggestion is that Great Britain, West Germany, and Italy might be able to build the F-15, or

USREDCOM CINC Gen. John J. Hennessey congratulates Allan R. Scholin as the latter's wife, Mary Virginia, looks on. Retiring after thirty-five years' cumulative federal service, Colonel Scholin, AFRES (Ret.), a former Associate Editor of AIR FORCE Magazine, was presented the Civilian Meritorious Service Medal, the first ever awarded by USREDCOM or its predecessor, US Strike Command. Scholin served seven years with the Command as a writer and researcher.

The JT9D has swallowed a six-foot stepladder and kept on running. Plus a vulture, Canadian geese, seagulls, a flock of starlings and a block of ice.

The JT9D. 42 airlines, over 300 aircraft delivered or on order; over 14,000,000 engine flight hours.

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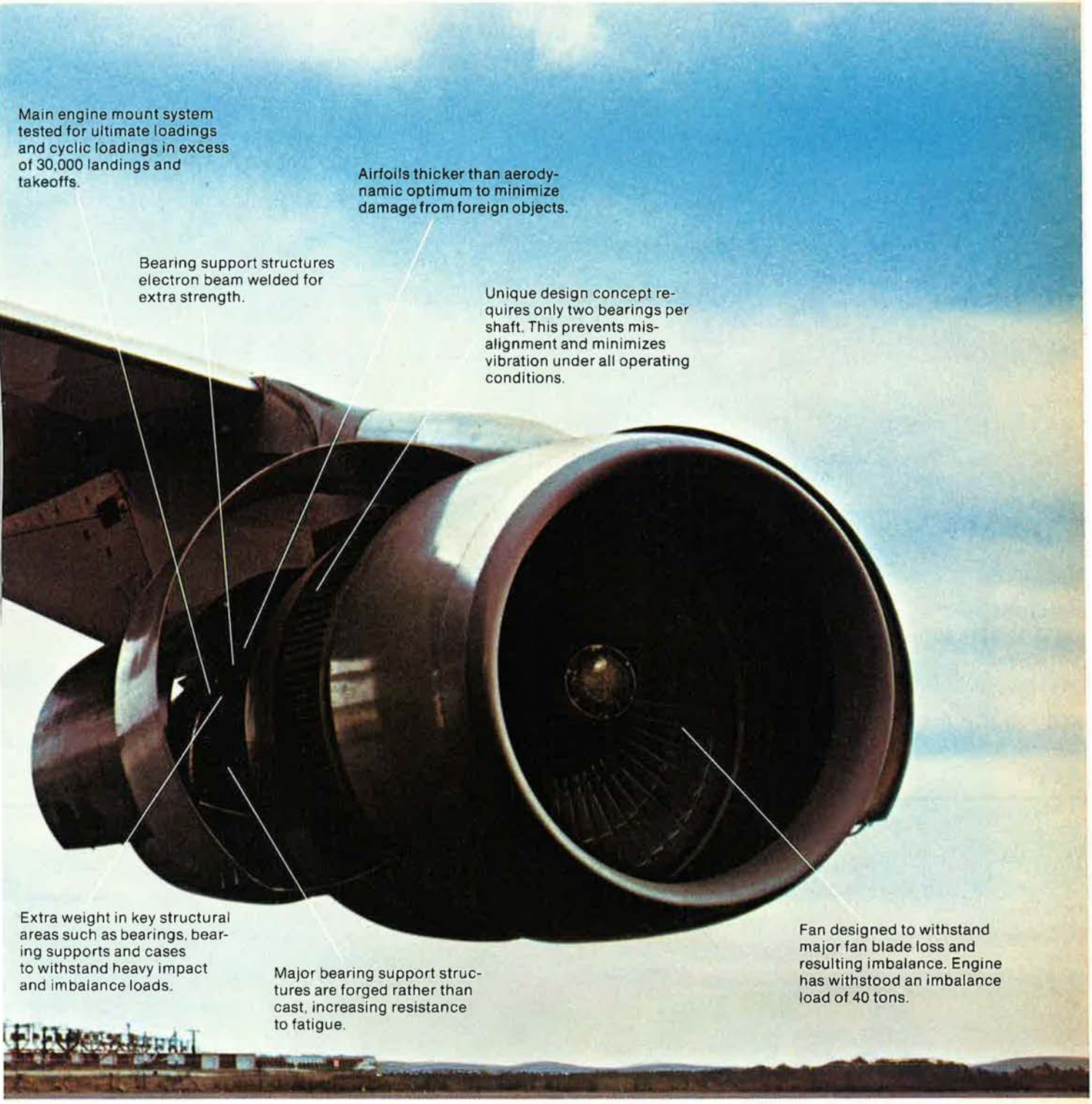

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major components, in Europe, under an agreement similar to that arrived at by Belgium, Denmark, the Netherlands, and Norway to equip their air forces with General Dynamics F-16 Air Combat Fighters.

★ In an F-15 equipment matter, one of the recent Eagles to join the inventory has a unique speedbrake built of graphite/epoxy composite materials, a lighter-weight, less-expensive substitute for the standard aluminum speedbrake.

According to the Air Materials Lab, which developed it, the new component "represents the first production application of graphite/epoxy material in fabrication of a large aircraft component."

★ Air Force Systems Command's Aeronautical Systems Division, Wright-Patterson AFB, Ohio, has undertaken a series of internal realignments to improve its management of R&D and acquisition. The offices involved are responsible for most of the hottest items under development for USAF's weapons inventory.

The Deputies for Remotely Piloted Vehicles (RPVs) and Air-Launched Strategic Missiles (ALSM) have already been merged into a single organization. Headed by Col. Ward W. Hemenway, former Deputy for RPVs, the new Deputy for RPV/ALSM will oversee development and acquisition of RPVs, the Air-Launched Cruise Missile (ALCM), and the Short-Range Attack Missile (SRAM).

Realigned, too, have been the Deputy for Reconnaissance/Strike/Electronic Warfare, and the Deputies for Systems, and Subsystems into two organizations—Deputy for Systems and Deputy for Aeronautical Equipment.

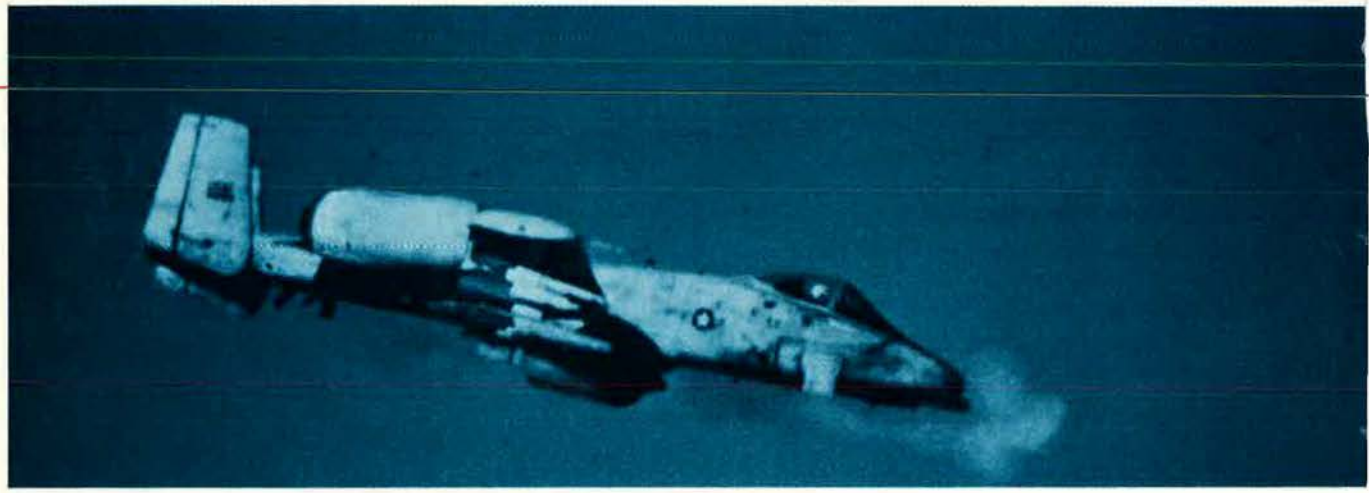
Systems, remaining under Brig. Gen. B. K. Partin, includes the Attack/Fighter Systems Program Office (SPO), Maverick SPO, Simulator SPO, EF-111A SPO, F-5 SPO, Specialized Systems SPO, and the Precision Locator Strike System Program Office. Attack/Fighter SPO looks after the F-4, F-111, AU-23, A-7, T/A-37, T-41, T-43 aircraft, and helicopters.

Aeronautical Equipment, directed by former Reconnaissance/Strike/Electronics Warfare chief Brig. Gen. G. K. Patterson, will include those SPOs as well as Life Support, Avionics and Aircraft Accessories, Support Equipment, Propulsion, and the Directorate of Avionics Standardization and Systems Architecture.

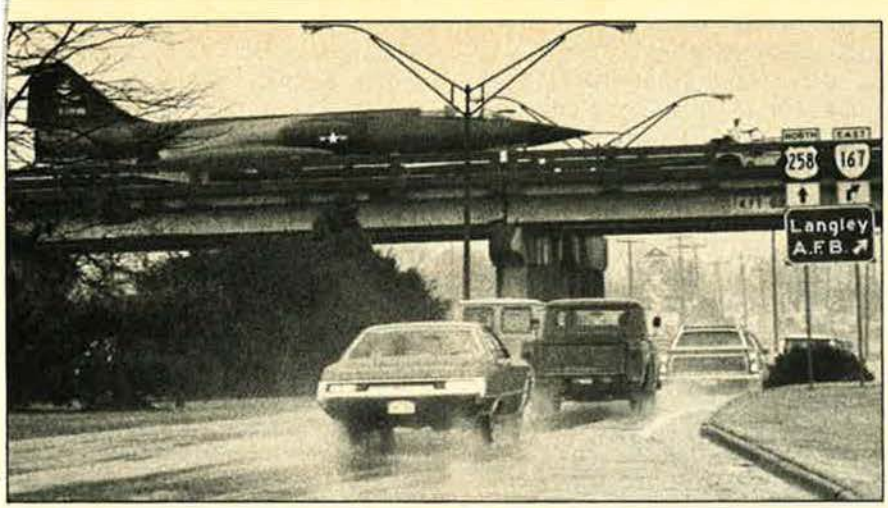
To provide more efficient use of ASD engineers, its Deputy for Engineering will realign from five to three Directorates: Avionics, Flight Systems, and Equipment Engineering.

★ Supersonic air travel was inaugurated in late January with the first passenger flights of the Anglo-French-developed Concorde SST.

The 5,000-plus-mile flight of Air



A-10: PROVEN TANK KILLER!



Not a few motorists were startled recently by this Lockheed F-104 Starfighter, on its way to a Bicentennial display site at Langley AFB, Va. The aircraft is late of the Puerto Rico Air National Guard.

France's Concorde from Paris to Rio de Janeiro took about seven hours (with a fuel stop at Dakar), or five hours faster than subsonic aircraft make the trip.

The British Airways SST flew from London to Bahrain on the Persian Gulf—a distance of 3,500 miles—in a little over three hours, trimming flight time by about two and a half hours.

Each aircraft carried twelve crewmembers and 100 passengers.

The Concorde, in development fourteen years, is now flown by just the two airlines, although both Iran and China have expressed interest. No US carrier has ordered the aircraft.

A controversial decision was made in February by Transportation Secretary William Coleman to allow limited flights into the US on a trial basis of sixteen months—two flights daily into Dulles International near Washington and four daily into New York's Kennedy (in the latter case, local approval is doubtful, and lawsuits blocking the venture have already been filed). There is widespread belief that the Concorde has no economic future if denied the lucrative US market.

For its part, the USSR is conducting Tu-144 SST flights—mail and freight only—between Moscow and Alma Ata (1,900 miles) until "some unresolved questions" apparently about performance and passenger operations have been answered. These flights began in late 1975.

★ Set for first flight this spring, USAF's second prototype B-1 strategic bomber was rolled out at Palmdale, Calif., in mid-January.

In USAF tests, the A-10 scored first pass kills against armored targets—including Warsaw Pact T-62 main battle tanks. USAF pilots, firing one and two-second bursts at varied dive angles and slant ranges, demonstrated 4-mil CEP strafing accuracy with the A-10's high velocity 30mm GAU-8 cannon. Armor piercing and high explosive incendiary rounds penetrated T-62 armor causing secondary explosions of internal ammunition and fuel stores. The T-62s were totally destroyed. With this devastating firepower, the A-10 and its 30mm cannon provide a never-before-achieved aircraft capability against the threat of armored attack.

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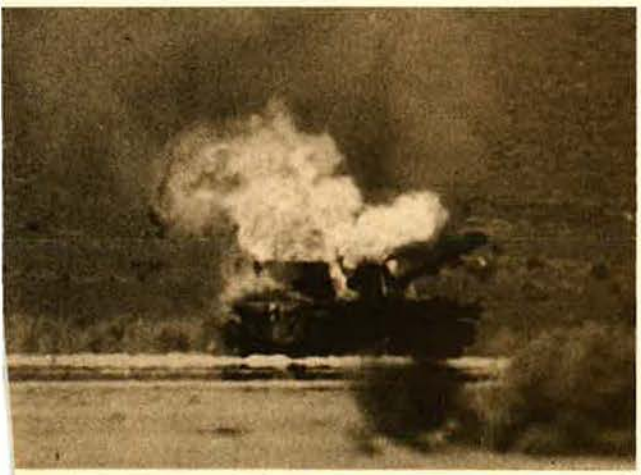

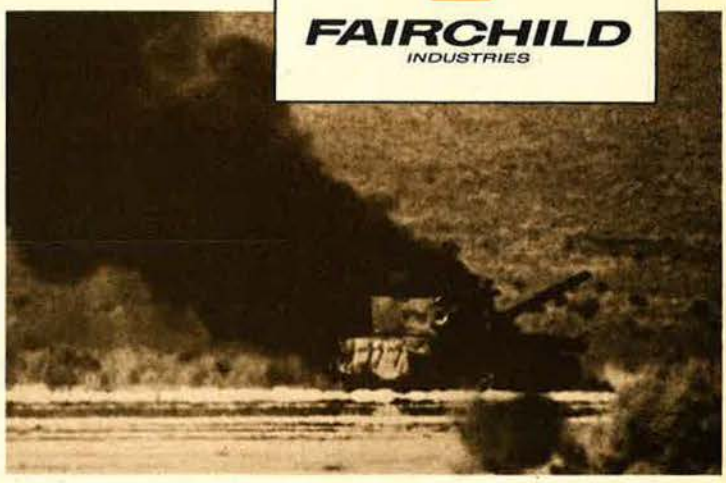

Aerospace World

US Army's Aquila remotely piloted vehicle undergoes final check prior to first flight. Built by Lockheed Missiles and Space Co., Aquila is designed to fly reconnaissance and target acquisition missions. It can carry both still and TV cameras and laser designator and is launched via pneumatic rail.

The aircraft, built by Rockwell International, is one of four planned prototypes and the first to be equipped with a complete offensive avionics subsystem, including an offensive operator's station in the rear cockpit. The test-flight program calls for evaluation of the offensive avionics subsystem and aircraft compatibility, "particularly as it relates to navigation performance, low-level penetration, and weapons delivery," USAF said. Boeing is the avionics interface contractor.

A third B-1 is currently undergoing system installation and is expected to begin structural flight testing by early fall.

The fourth B-1, which is to include such design refinements as advanced-technology ejection seats and lighter and less-complex engine nacelles, will flight-test the aircraft's defensive avionics beginning early in 1979.

Since rollout and its first flight in December 1974, B-1 No. 1 has chalked up well over 100 flight hours, during which it achieved speed of 1.6 Mach (about 1,070 mph) and altitude of 50,000 feet. It has also demonstrated its low-level penetration capability and compatibility with the KC-135 tanker.

If a production go-ahead is given (word on a decision is expected in November), B-1s could enter the inventory by mid-1979 with operational capability by late 1981.

★ The Air Force has authorized the test of yet another engine aboard the prototype YC-15 Advanced Medium Short Takeoff and Landing Transport built by McDonnell Douglas.

The engine is the 18,000-pound-thrust Pratt & Whitney JT8D-209, to be flight-tested on the YC-15 early in 1977. (Previously, USAF gave a go-ahead for test of the CFM-56 high-bypass turbofan jointly developed by GE's Aircraft Engine Group and SNECMA of France. *See January '76 issue, p. 18.)*

According to officials, the -209 will offer improved fuel consumption, reduced noise, and higher thrust.

The two prototype YC-15s, normally powered by P&W JT8D-17 fanjets, are currently undergoing extensive flight-testing at Edwards AFB, Calif. The other contender in the AMST competition, Boeing, has two prototype YC-14s abuilding and scheduled for completion this year.

Retrofit and test of both the -209 and the CFM-56 "will be accom-

Index to Advertisers

plished within the original" contract funding, officials said.

★ The Ava Flight Academy, in cooperation with American Airlines and Baylor University, has launched a unique program designed to produce pilot-managers for domestic and foreign airlines and general aviation. Unlike most new airline pilots heretofore, they won't have military backgrounds.

Behind the project, called "Total Man in the Cockpit," is a conviction by Academy and American officials that the demands of modern aviation have increased the need for pilots who are managers as well as flyers. The officials also insist that a serious shortage of qualified pilots from the military services is in the offing.

Accordingly, qualified high school graduates will take three years of resident academic study at Baylor, Waco, Tex., followed by one year of intensive flight training at Ava, located at American's spacious, ultramodern Flight Academy near Dallas. The Baylor phase features liberal arts plus courses in science, management, and psychology.

Completion of the full program will bring a Bachelor of Science in Aviation degree plus commercial, instrument, and multiengine ratings. The first fifty students, including several from European and Mideast countries, are expected to enroll at Baylor in June 1976. Many will be sponsored by governments or organizations, according to Ava President John H. Gibson, a former USAF brigadier general.

Ava also will grant an Associate Degree in Aviation in cooperation with Texas State Technical Institute. Training courses at TSTI and flight training at Ava will occur simultaneously. The actual flight training is conducted at Ava facilities at former James Connally AFB in Waco.

American Airlines pilots and the crews of many other airlines take refresher or transition training at the Flight Academy. Newly hired aircrew, who generally come from the military, take a twelve-week course covering classroom instruction, simulator, and actual flying training. The Flight Academy relies heavily on simulators that "fly" millions of miles each year. In its simulator "fleet" are two DC-10s, four 707s, four 727s, one 747, and a Cessna Citation.

Probably the last of its kind in existence, this Douglas O-46A of the 1930s era has joined the growing collection of the Air Force Museum, Wright-Patterson AFB, Ohio. It was restored by students of Purdue's Aviation Technology Department.

★ **NEWS NOTES—C. R. Smith,** an AFA Life Member and former AFA President and Board Chairman whose sixty-five-year career in aviation culminated with his retirement from American Airlines in 1974, has been chosen for the **1976 Hall of Fame of Business Leadership.** Administered by Junior Achievement, a group devoted to teaching young people about American business and industry, the HFBL's nominees this year were selected by *Fortune's* Board of Editors.

NASA's **Flight Research Center,** Edwards AFB, Calif., has been renamed in honor of **Hugh L. Dryden,** the aeronautical research pioneer who was the space agency's first Deputy Administrator.

ATC Commander **Lt. Gen. John W. Roberts** has been awarded the **1975 Eugene M. Zuckert Management Award** for his "superb contribution to the Air Force personnel resource management."

The **318th Fighter Interceptor Squadron,** McChord AFB, Wash., has won the **1975 Hughes Trophy** for excellence in air defense operations.

Dr. Thomas K. Latimer has been designated **Principal Deputy Assistant Secretary** in the Office of Assistant Secretary of Defense (Intelligence). Since 1974, he has served as Special Assistant to the Secretary and Deputy Secretary of Defense.

Retiring: USA Lt. Gen. James F. Hollingsworth, following more than thirty-four years of active service. As the commander of the Third Regional Assistance Command MACV during the North Vietnamese/Viet Cong Easter offensive in 1972, General Hollingsworth directed the **successful defense of An Loc,** during which the effective use of B-52s was the deciding factor.

Died: L. J. Sverdrup, General USAR (Ret.), long-time AFAer, in Missouri of a heart attack. He was seventy-seven. ■

A key feature of the B-1's GE F101 engine is the ability to inspect it while "on the wing," thus cutting maintenance costs and aircraft down time.

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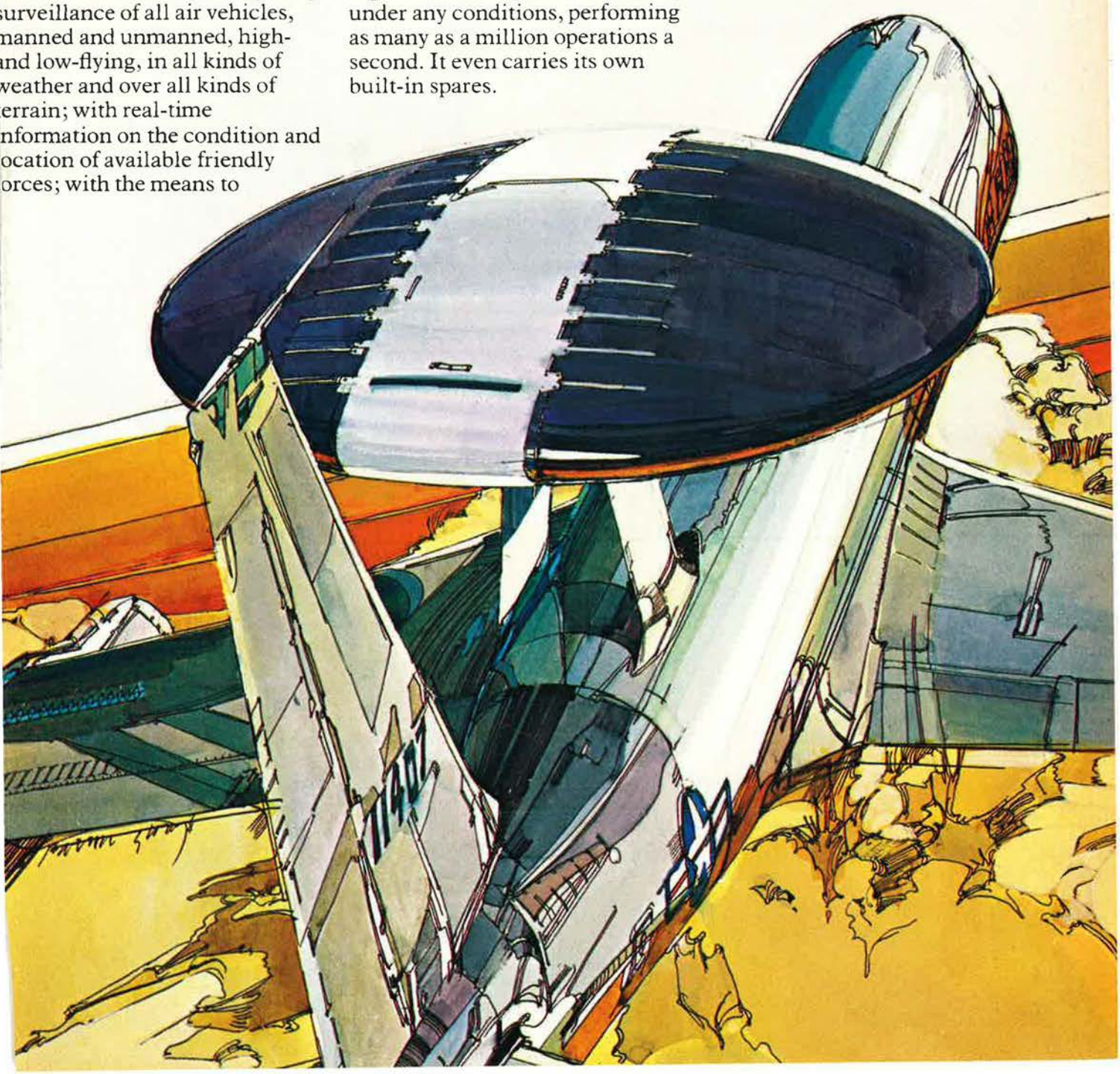

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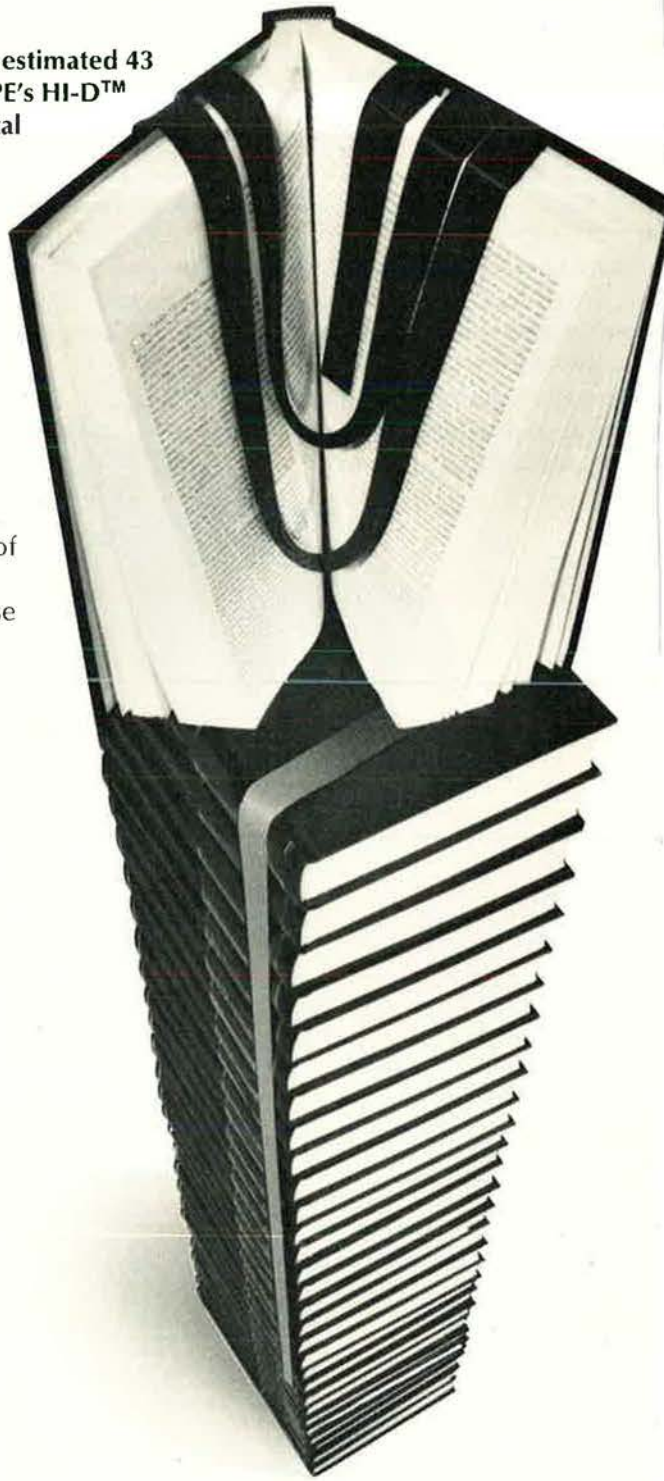

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"No more Vietnams" has become a mindless cliché, repeated *ad nauseam* by people of apparent good will but little understanding of today's world or of US national interests. An encouragement to potential aggressors, that slogan capsulizes the . . .

PERILS OF THE VIETNAM SYNDROME

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

The other day, a man on the radio interrupted his market report to give his opinion on Angola. "No way," he said, in that curious modern dialect that employs English words in an aboriginal syntax, "No way do we need Angola, after Vietnam." The man on the radio was echoing what a great many politicians are saying these days. No more Vietnams.

If that is what they mean, literally, then they are on solid ground. No one in even approximately his right mind wants any more Vietnams, with all that name conjures up: the massive overcommitment of troops, the confused strategy in which the giving of signals to the enemy took the place of trying to defeat him. No one wants that, but Vietnam cannot be used as an excuse for dodging all the future challenges that are going to come our way.

There is a rising suspicion among our remaining friends in this world that the United States has lost its way. The power is still there, but the will, and even worse, the mind, seem to be gone. The image is increasingly that of a bewildered giant bent on self-destruction in payment for his imagined sins. If, as the American Civil War politician Thaddeus Stevens said, the Congress is not just the representative of the people, it *is* the people, then we are truly on an uncharted course. Admittedly, he made that judgment in the early nineteenth century, and there have been a few changes in the intervening years.

Nonetheless, there is clearly a great deal of support for those elected officials who insist on foreign policy and intelligence being carried out in Macy's window. We can only hope that, sooner or later, we will shake off the vapors and face up to our increasingly dangerous world. When that time comes, it will also be the time for a few elemental decisions on the future posture of our national defense. Put broadly, what must we have for basic survival in the nuclear age, what do we consider our responsibilities, and what should we provide to meet those responsibilities?

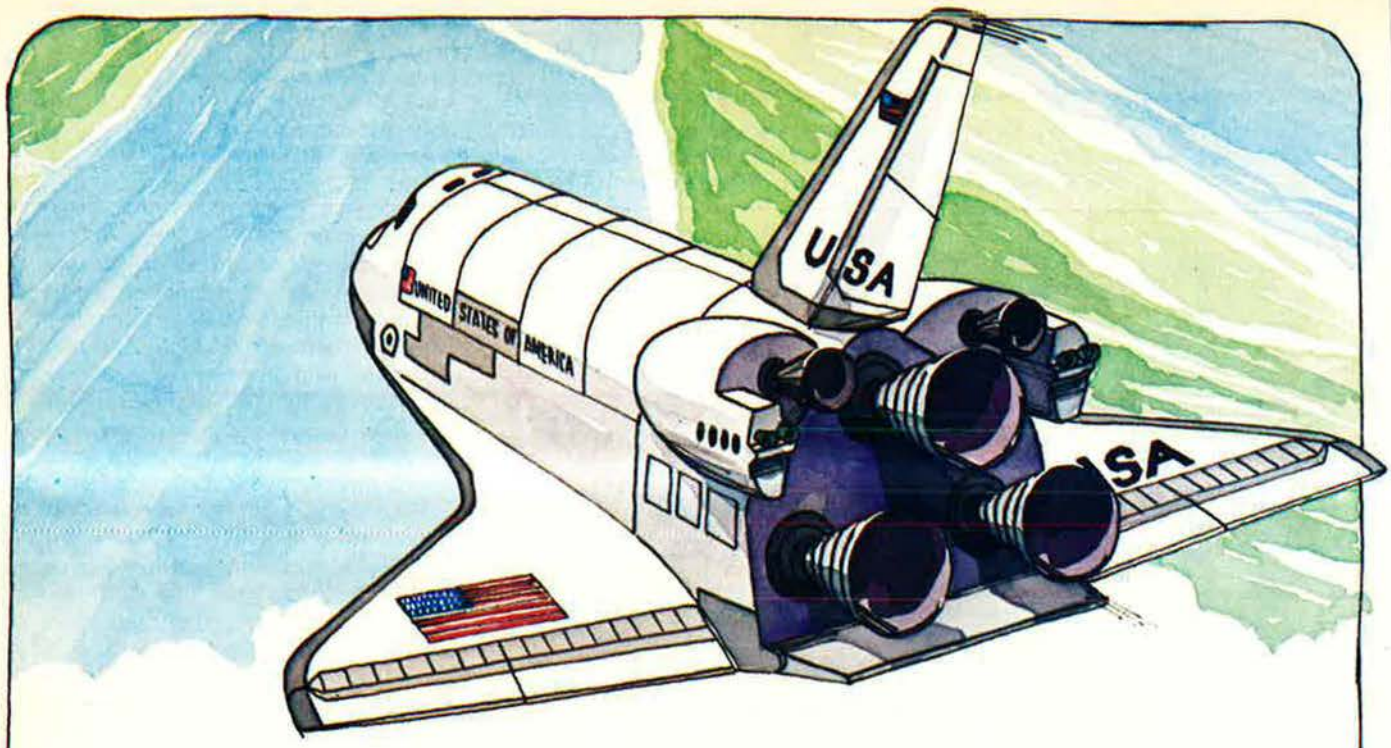
In the matter of basic survival, we are already at a crossroads. Paul Nitze, a man who has never been classed as a hawk, left the SALT delegation in disillusion. In an article in the January issue of *Foreign Affairs,* he states his belief that "under the terms of the SALT agreements, the Soviet Union will continue to pursue a nuclear superiority . . . designed to produce a theoretical war-winning capability." Having achieved this capability, Mr. Nitze then speculates what the Soviets will do with it: nuclear confrontation or as a support for expansion by other means.

In our present addled state, Nitze is not telling us what we want to hear, any more than is Schlesinger, or Solzhenitsyn, or President Ford, for that matter. The debate these days does not get into the complicated, and macabre, subjects of what we may have to pay to guarantee survival, or what the cost may be if we do not. As a nation that coasted along for a good many years in the comfortable security of nuclear superiority, it is ironic that we cannot see ourselves in the role of nuclear underdog, and all that implies. We created NATO with nuclear superiority. The whole policy of containment was founded on it. We fought in Korea knowing, if things came to that point, we had an enormous edge. And now we face, with apparent equanimity, the loss of that edge. The current defense budget, for instance, has some writing on the wall for the land-based missile systems.

Even now, with our own nuclear capability still a credible standoff, we have begun to make Nitze's other prophecy come true: that of Soviet expansion through other means of pressure. Here, the Vietnam syndrome seems to have done its work. No more Vietnams is the sure-fire slogan these days, and it is going to be used whenever anything like Angola crops up. Since it seems clear that things like Angola are going to continue to crop up, the question arises as to what we are going to do about it. The answer to the question has everything to do with the future shape of our nonstrategic forces. If the answer is "Nothing—it's none of our business," then we should begin a hard look at our current defense establishment, for its role, in an ever-shrinking world, will more and more become one of continental defense. The Vietnam syndrome, aside from being mindless, is an encouragement to Soviet military adventures, and thus it is also very dangerous, just as Munich turned out to be very dangerous.

Presumably we are still committed to a defense of NATO Europe. No one, so far at least, has seriously contested that obligation. But if we are going to confine ourselves to meeting the Soviet challenge only on that ground, then we are wasting resources, and people's time. The game will be over in Europe without contest if Africa, the Persian Gulf, and the oil trade routes come under the clear domination of the USSR. If that day comes, the future of Europe will lie in accommodation, not resistance. The ultimate prize will fall to the Soviets, like a ripe plum, without even a token fight.

This new era of Soviet expansion, all the while maintaining a long shadow in Europe, is the most sophisticated approach yet made toward achievement of a USSR goal—European domination. ■



We work with NASA on STOL, but we're big on the shuttle, too.

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Working in conjunction with general purpose computers, MDM units will convert data from spacecraft systems into a format useable by the computer. They will also make computer signals useable by other subsystems.

Sperry MDMs can play an important role in future space shuttle payload applications.

In another related program, we have designed a shuttle payload pointing system capable of aiming a variety of space measurement devices within one arcsecond.

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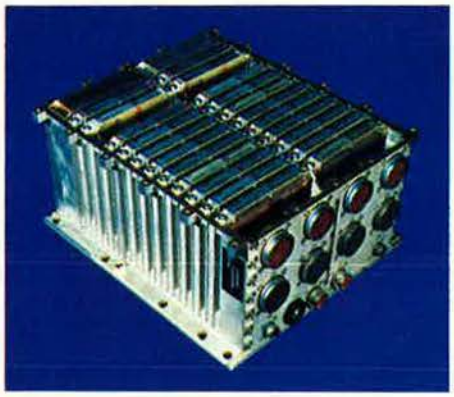

Multiplexer-demultiplexer unit.

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AIR FORCE
MARCH 1976

Affordability + Performance: USAF's R&D Goal

In exploring and developing technological options that are the basis for USAF's future weapon systems and capabilities, the Air Force Systems Command is concentrating on a new criterion—cost of ownership—while retaining traditional emphasis on performance and staying on the cutting edge of technology.

BY EDGAR ULSAMER
SENIOR EDITOR

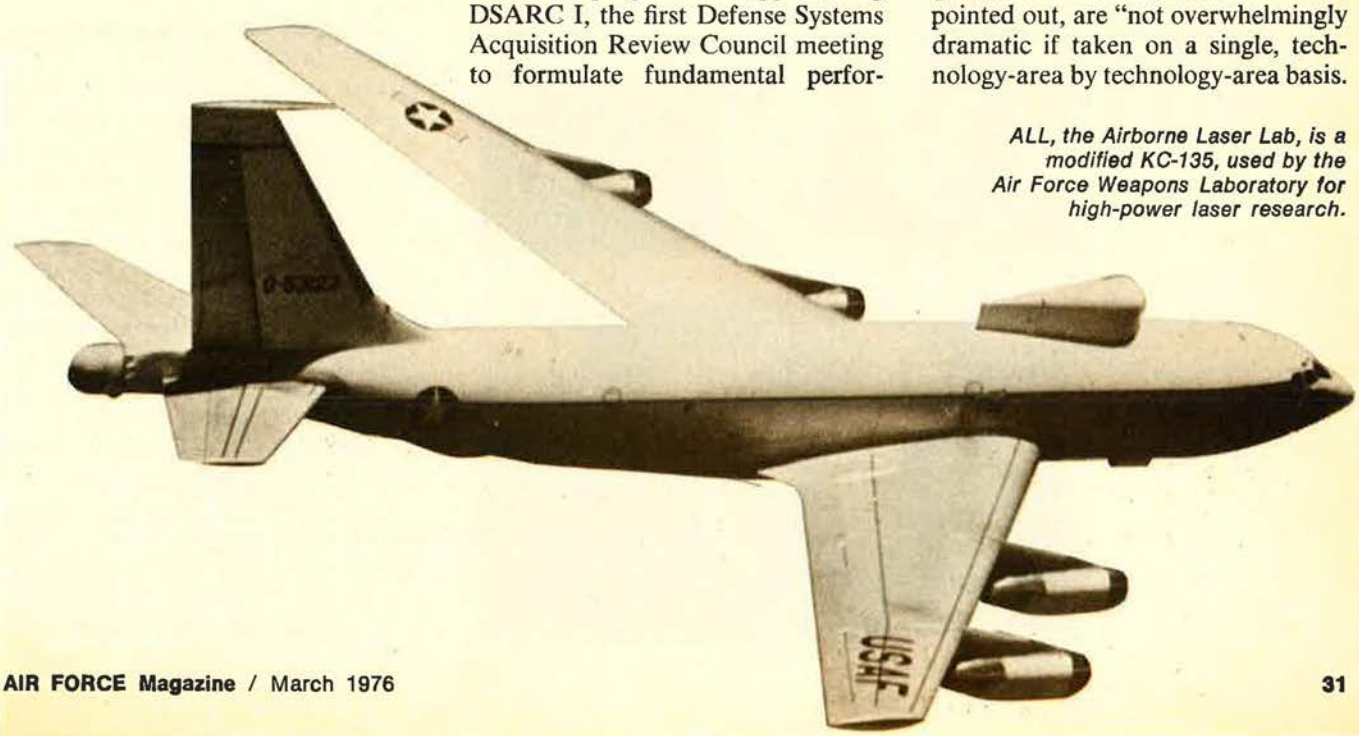
THE Air Force's operational capabilities in the 1980s and beyond are being molded by the exploratory technological work now getting under way. Selecting the technological options to be pursued through new initiatives thus becomes one of the most crucial decisions in formulating the Air Force's annual budget requests.

The initiatives planned by the Air Force for FY '77, Gen. William J. Evans, Commander of the Air Force Systems Command, told AIR FORCE Magazine, meet a fundamental criterion that differs somewhat from the emphases of the past: "We seek to stay on the cutting edge of technology but with emphasis on the pervasive need to cut costs. A principal feature we seek is reduction in the cost of manufacturing, acquiring, operating, and maintaining weapon systems."

Archtypical of this new emphasis is the MX advanced ICBM program, rated by some DoD officials as the Department's single most important initiative for FY '77. At this writing, the MX program is approaching DSARC I, the first Defense Systems Acquisition Review Council meeting to formulate fundamental performance and schedule features. MX is now, and will remain through the next development phase, in the process of concept validation. General Evans explained that the program is not scheduled to develop a full prototype during the currently proposed cycle but will be confined to "brass boarding," that is, hardware demonstration of subsystems in such critical areas as vehicle construction, guidance, propulsion, and encapsulation.

No commitment is being made to a specific basing mode beyond fixed silos, with a capability for some future form of alternate basing. The Air Force, General Evans pointed out, believes that "silo basing is viable and will continue to be for the foreseeable future. We do want to provide an R&D basis in the event that we desire an alternative basing mode in addition to silos." The specific form of alternate basing affects missile-guidance requirements as do the objectives of national policy with regard to military target kill capability.

The performance gains from new generation missiles, General Evans pointed out, are "not overwhelmingly dramatic if taken on a single, technology-area by technology-area basis.

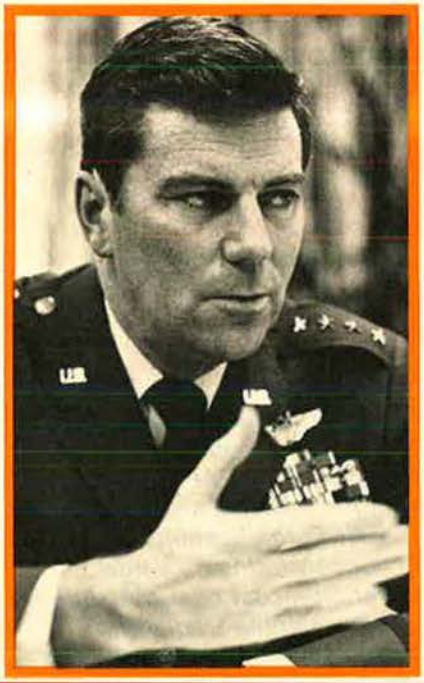


ALL, the Airborne Laser Lab, is a modified KC-135, used by the Air Force Weapons Laboratory for high-power laser research.

In the aggregate, however, the advances over today's systems take on revolutionary proportions."

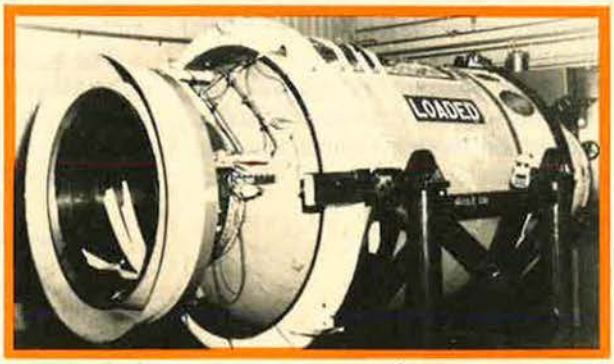
For instance, the dynamics of collapsible and expandable rocket-exhaust nozzles, combined with accuracy gains well within the present state of the art, "represent a decisive improvement over the current generation of ICBMs," according to the AFSC Commander. Recent tests of expandable rocket-engine exhaust cones at AFSC's Arnold Engineering and Development Center in Tennessee demonstrated a capability to boost either range or payload of Minuteman III ICBMs by about 7.5 percent. In these tests, four pneumatic actuators were used to deploy an enlarged cone a few seconds after ignition, extending the nozzle length by nearly sixteen inches and enlarging the nozzle area ratio from twenty-four to forty-three, thus increasing the effectiveness of the available thrust.

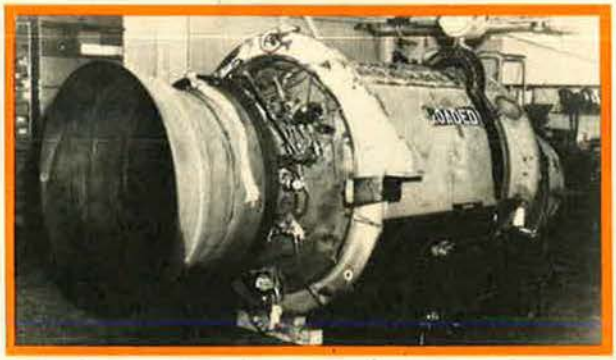
Boeing engineers are putting the finishing touches on the first Air-Launched Cruise Missile (ALCM). Following stringent flight tests this spring, USAF will rule on ALCM's fate.



AFSC Commander General Evans treats LCC as a paramount design criterion.

Minuteman III's proposed new upper stage retractable exhaust nozzle is shown in closed (right) and opened (below) positions.





Collapsible or expandable nozzles can be retrofitted into such existing systems as Minuteman III and Agena or incorporated into an MX missile where even greater performance gains can be derived from an optimized missile and rocket-motor system designed around the expandable nozzle concept. This is accomplished by shortening the interstage length required for the motor nozzles and using the space thus saved for an increased propellant load. The exit-cone development program was conducted by the Aerojet Solid Rocket Co. of Sacramento, Calif.

The Air Force's funding request for the MX program in FY '77 is $84 million, about double the investment in FY '75 or FY '76, but in "no way should this be interpreted to

mean that we want to abandon the existing silo-based ICBMs or that we have completed all the technological homework needed for the orderly development of such a vast and crucial R&D program," according to General Evans.

Attack Assessment

An essential and continuing initiative that directly affects US strategic capabilities are DoD and Air Force programs to improve that part of the national Early Warning System known as "attack assessment." The latter term embodies unambiguous near-real-time information about impending attacks by ICBMs, SLBMs, and bombers, precise and detailed enough to establish the aggressor's intentions and to permit immediate formulation of US counteraction by the National Command Authorities (NCA).

Unambiguous attack assessment, General Evans pointed out, requires improved software capabilities of the command and control systems to permit integration of information from such different sensors as radar systems and infrared detection systems. Current systems, General Evans said, incorporate "good capabilities" in detecting enemy ballistic missile launches but do not provide all the information that may be desirable. Improvements are being made or actively investigated.

An important step forward in attack assessment of SLBMs is the development of two Pave Paws phased-array radar systems, able to track SLBMs in both the boost and ballistic phases to provide precise impact information.

Present and future early warning systems do double duty in the sense that in case of a US retaliatory (second) strike against an attacker, they can provide precise information about detonating US warheads, General Evans said.

An important initiative in the strategic field to be carried forward from the current year is the Air-Launched Cruise Missile (ALCM), a headline-generating issue of the current round of SALT because of differing perceptions of what was and what was not agreed to at the Vladivostok summit meeting. (The US envisioned counting only air-launched missiles with a fully ballistic trajectory and a range of more than 600 nm against the ceiling of 2,400 central launch systems, whereas the USSR disclosed in subsequent negotiations that it meant to include *all* air-to-surface missiles with a range of more than 600 km.)

Stressing that the B-1's viability does not depend on ALCM, General Evans said that the cruise missile's ability to dilute enemy defenses "makes it a very helpful support system for the B-52 and FB-111." The fourteen-foot-long missile is compatible with the internal and external launch systems developed for the Short-Range Attack Missile (SRAM) now deployed on B-52 and FB-111 aircraft. The first ALCM flight test missile is scheduled for launch from a B-52 over the White Sands Missile Range in New Mexico early in 1976. A series of ALCMs will be test-flown this year before the Air Force decides whether or not to begin full-scale engineering.

A step beyond SRAM and ALCM technology is ASALM, another technological initiative the Air Force is carrying forward into FY '77.

ASALM, the Advanced Strategic Air-Launched Missile, is an integral rocket-ramjet that capitalizes on the advantages of both solid-fuel rocket and liquid-fuel ramjet technologies: ASALM is boosted to supersonic speed by its solid-fuel rocket motor and then converts to ramjet operation, thus extending both its range and performance. ASALM is not only a potential complement to or replacement for SRAM in the 1980s but, according to General Evans, "a more versatile system than either SRAM or ALCM that could be used also as a supersonic air-to-air weapon." In FY '77, ASALM will remain in concept formulation augmented by advanced-technology development.

The Air Force sees no requirement for a new technological initiative to support the eventual acquisition of a new air defense interceptor, General Evans told AIR FORCE Magazine: "There is enough intrinsic capability in existing new fighters for conversion into such a weapon system. We demonstrated the effectiveness of a new external fuel tank when we flew an F-15 to the last Paris Air Show using a so-called slipper tank, a means of conformal [low-drag] carriage that can extend the range of the F-15 sufficiently to perform bomber intercept."

Improved Avionics

An important FY '77 initiative is development of low-cost, high-reliability avionics for large aircraft, especially strategic bombers, according to the AFSC Commander. Although conceived as a technology program not tailored to specific weapon systems, this initiative stems from the recognition that almost all offensive and some defensive avionics now available were developed for the B-52 force in the late 1950s and early 1960s. The B-1 uses off-the-shelf offensive avionics hardware developed for and used in a variety of US military aircraft. The military target kill capability of SRAM can be improved by providing more accurate guidance initialization (information about the aircraft's position at the time of launch) than the B-52's inertial guidance system can furnish. The avionics initiative, as contemplated by the Air Force, could make the two weapon systems fully compatible, according to General Evans.

A third USAF initiative in the strategic area involves several developments to boost the survivability and reliability of space systems and space communications. Special emphasis here will be directed at increasing the jam resistance of the Air Force's communications systems, "to and from satellites, including the exploitation of laser communications technologies that provide us with vast increases in the rate of our data transmissions," General Evans said.

Low-Cost Radar Missile

Recent strides in radar technology, General Evans pointed out, "make it possible for us to build better, more economical radar-guided missiles, even though our current system, the AIM-7F, is still excellent." The Air Force wants to create the potential for a high-low mix in air-to-air missiles by complementing the high-cost AIM-7F with a less-costly weapon.

AFSC is already working on a lightweight radar missile development project involving an advanced-technology, low-cost radar seeker. Specific performance features of the new missile are not yet firm but

"certainly it will have medium range and we will stress low ownership costs." This program is not directed toward any specific aircraft.

Another technology to be pursued in the coming fiscal year is radar systems that can be used for all-weather tactical strikes against mobile targets. The challenge, General Evans said, "is to come up with technology that permits us to find and strike mobile targets under all-weather conditions *at an affordable price.*"

The Airborne Laser Lab

Among the technology efforts in progress within the Defense Department is the high-energy laser program. All three services conduct R&D programs under close coordination by DDR&E and DARPA. The Air Force's principal high-energy laser program is ALL, the Airborne Laser Lab, operated by the Aeronautical Systems Division out of Kirtland AFB, N. M., in support of the Air Force Weapons Laboratory (AFWL). AFWL, as the Air Force's principal agent in high-energy laser R&D, performs the design, fabrication, and operation functions of the R&D equipment in the ALL. ALL, General Evans explained, can handle some of the highest power lasers developed to date. ALL, a modified KC-135, is used as a research tool from which laser propagation experiments are conducted.

A program objective is to test variations in the laser beams' intensity that result from effects of distance and time. For this purpose, instruments have been developed that receive, measure, and record information about the laser beam transmitted by ALL. The program objective, General Evans said, is "to determine the potential use of lasers for a variety of Air Force applications."

The Advanced Fighter Technology Integrator (AFTI) Program

An important combination of technologies heading for hardware demonstration is the Advanced Fighter Technology Integrator (AFTI) program, complemented by the National Aeronautics and Space Administration's HiMAT (Highly Maneuverable Aircraft Technology) program. The initial phases are aimed at enhancing subsonic and transonic maneuver, tracking, and kill capabilities of future fighter aircraft in both air-to-air and air-to-surface operations, including a range of individual technologies that have synergistic effects. In the field of aerodynamics, these include variable incidence wings, jet flaps, vectored thrust, and super circulation. In the area of advanced control techniques, AFTI seeks to harness the potential of relaxed static margins, direct side force control, direct lift control, drag modulation, fuselage aiming, integrated fire/flight control, and gust alleviation. The third range of technologies relates to high acceleration cockpits, and includes high G seats and advanced displays and controls. Finally, AFTI explores the potential of advanced composites and metallic structures in aircraft fabrication.

Contracts were awarded to McDonnell Douglas, Fairchild Industries, and Rockwell International to pinpoint the most productive approaches, to select a configuration for the demonstrator development and flight test, and to formulate a specific development and test program. The basic designs are not meant for direct transition into operational vehicles but serve solely to demonstrate benefits, feasibilities, and cost.

The Air Force, General Evans told AIR FORCE Magazine, is evaluating three initial AFTI configurations through simulation and analysis that include potential payoffs in the air-to-surface area. A decision is anticipated by 1978 whether or not to enter into a fabrication phase. On a longer term, the program has several interests. One is "invisible airplane" technology for better survivability through reductions in infrared, radar, and visual detectability. Another interest is supercruise technology to break through the present barrier of fuel economics separating subsonic from supersonic flight and to improve the reaction time, survivability, and endurance of future combat aircraft. A third area is integrated flight control and propulsion —the so-called thrust vectoring— that combined with other aerodynamic advances can lead to a truly "pointable aircraft."

Among the key questions is whether manned aircraft testbeds are better suited for the AFTI technology demonstrations or whether NASA's HiMAT approach using RPVs is more cost-effective. The F-16 is a candidate for an AFTI testbed, but a completely new airframe "is also under consideration," according to General Evans. Another choice, he explained, "is to take the NASA HiMAT approach of doing the high-risk technology demonstration work with a subscale RPV."

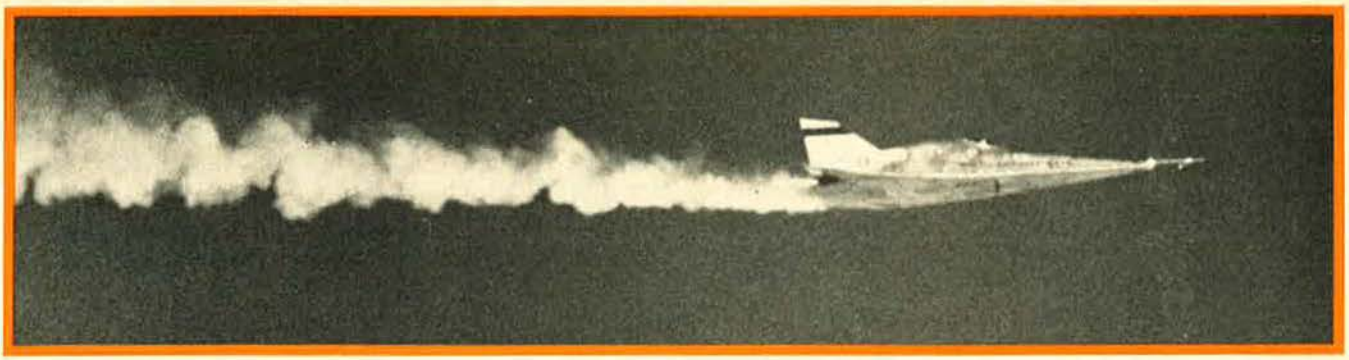
A joint USAF/NASA Hypersonic

WILL MINUTEMAN PRODUCTION END THIS SUMMER?

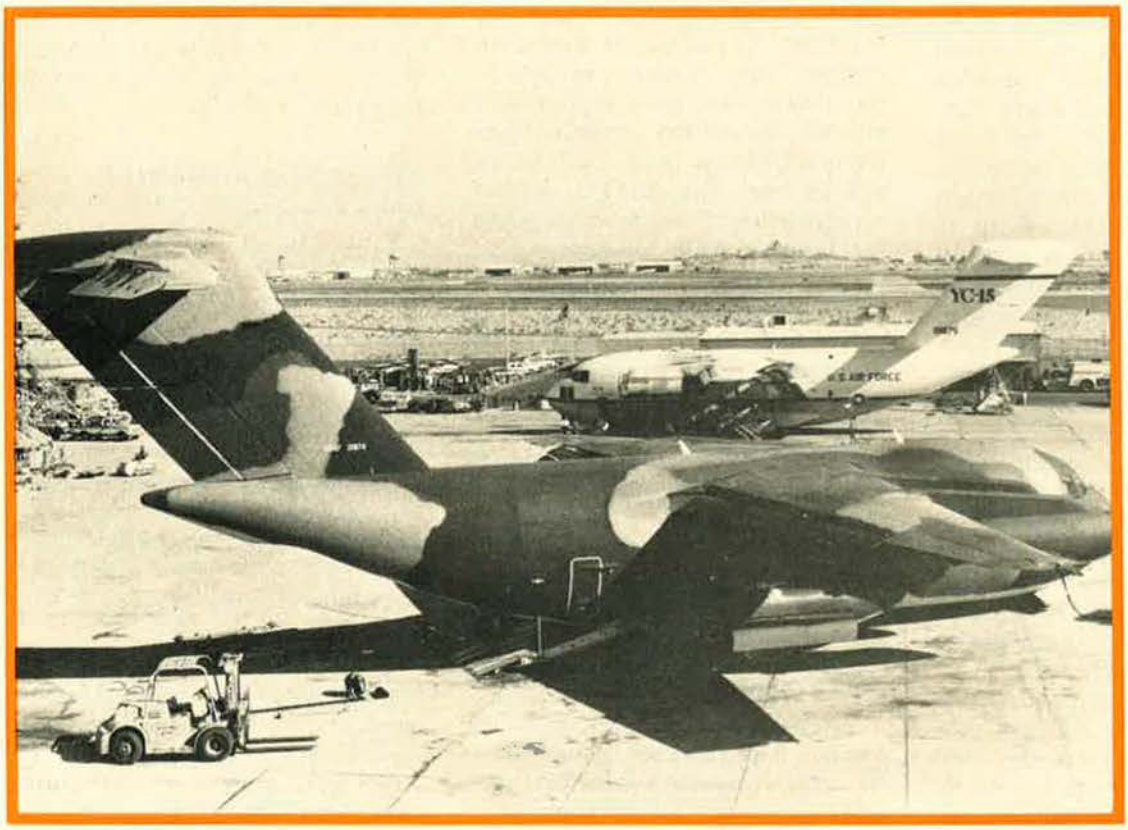
Assistant Secretary of Defense (Comptroller) Terence E. McClary confirmed recently that the FY '77 Defense budget request contains no funds for production of either the Minuteman III ICBM or the advanced technology, high-yield Mk 12A reentry vehicle. As a result, Minuteman production is scheduled to end this summer, and the associated contractor team will disband.

But at the same time, the DoD Comptroller disclosed that, "at the White House level," consideration was being given the possibility of keeping the production line—or at least production of such critical components as the ICBM's guidance system—"warm." If there is a decision to keep Minuteman III production at the minimum rate of five missiles per month, it would require reprogramming about $322 million of USAF's FY '77 funds, he said. This figure could go down somewhat if only parts of the system are kept in production. At this writing, retention of component production only appears more likely than full production. The Air Force has a reserve of spare Minuteman IIIs for test and other purposes, in addition to the 550 systems deployed in silos. The number of spare ICBMs acquired in FY '76 is fifty, according to Secretary McClary.

The next US ballistic missile to enter production is the Navy's Trident SLBM, scheduled to enter the inventory in FY '79.



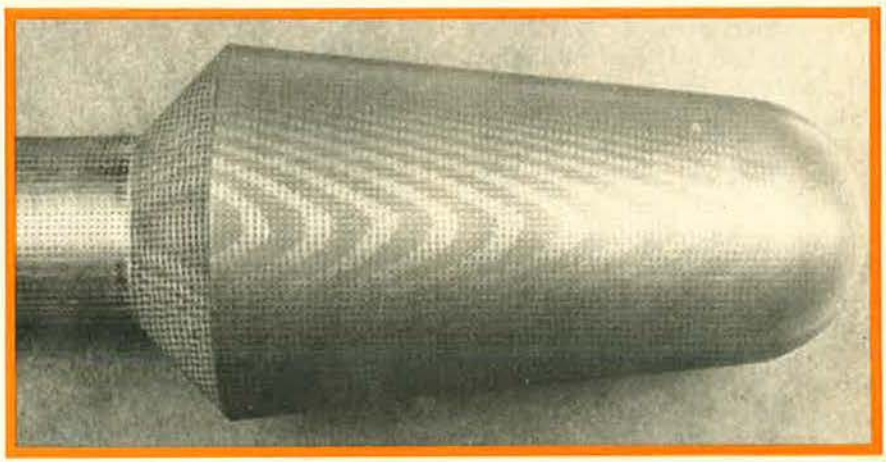
A follow-on to the X-24B research vehicle (above), the X-24C, is under joint USAF/NASA consideration and would involve design and test of an air-launched hypersonic vehicle.



The Advanced Medium STOL (AMST) prototype program is an important USAF initiative in the tactical airlift arena. YC-15, background, competes against YC-14.

Research Aircraft Program using an X-24C high-speed research aircraft is under consideration. Now in a planning stage, this program is a Mach three to Mach six follow-on to the X-15 research aircraft of the 1960s and X-24B research program of the 1970s. The X-24C is envisaged as a rocket-boosted delta planform lifting body designed for air launch by a B-52 aircraft. Research objectives include flight-testing a blended wing-body vehicle integrated with advanced propulsion systems that may include ramjet, scramjet, and rocket propulsion. The program also is to test advanced structures; various forms of cooling; and liquid hydrogen tankage.

Joint USAF/NASA investigation



Advanced reentry vehicles descend on targets at high speed and steep reentry angles to minimize dispersion, leading to increased kinetic heating. Carbon composites are a promising candidate for high-speed RV designs.

of high-performance aircraft technology also could pay off in the strategic area if attrition or other reasons necessitate replacing the SR-71, according to General Evans. "If we were to decide on a new aircraft, it probably would be a product of the X-24C hypersonic investigation," General Evans said.

Other Design Initiatives

Other initiatives in the field of advanced aircraft design include the joint USAF/NASA TACT II follow-on to the "Transonic Aircraft Technology I" program employing supercritical wing designs. TACT I, by contrast, concentrates on "mission adaptive" wing designs, meaning mechanized wings that adapt their shape and aspect ratio to optimized subsonic, transonic, and supersonic flight. For tactical aircraft this could lead to range increases of up to twenty-five percent at low altitude, up to twenty-percent reduction in thrust required for supersonic high altitude flight, and maneuverability increases of between twenty and forty percent. Payoffs for strategic aircraft could be range increases of up to twenty percent—or a corresponding reduction in fuel consumption—and up to thirty percent increases in cruise altitude. Future tactical and strategic aircraft employing mission-adaptive wings are expected to reduce acquisition cost and maintenance hours, and improve reliability.

The Air Force's Advanced Design Composite Aircraft (ADCA) program involving boron/epoxy and graphite/epoxy laminates also promises impressive results. Military aircraft designs using these advanced materials may point the way to future generations of economical, durable, high-performance combat aircraft.

The Air Force is not now engaged in any advanced technology programs in aircraft propulsion for a specific application but work is under way on advanced performance and reduced-cost concepts for the next generation of engines, according to General Evans. The Air Force Aero-Propulsion Laboratory at Wright-Patterson AFB, Ohio, is working on advanced engine components in conjunction with such major engine manufacturers as GE, Pratt & Whitney, Detroit Diesel/Allison, and Teledyne CAE involving high through-flow compressors, new fan designs, and extremely high-temperature turbine sections.

ASTF

Systems Command's Arnold Engineering Development Center at Tullahoma, Tenn., is directing the design of the Aero-Propulsion Systems Test Facility (ASTF). The $437 million facility will be designed to test full-scale turbojet and turbofan aircraft engines and related equipment under conditions simulating the engines' actual altitude and speed during flight. It will utilize two twenty-eight-foot diameter test cells, one for engines of future subsonic aircraft and the other for advanced supersonic engines. Such testing will include those larger and more sophisticated aircraft propulsion systems programmed for use in the next decade and beyond. The ASTF is one of several test facilities being proposed for inclusion in a long-range plan for the National Aeronautical Facilities Program (NAFP).

New fuels for aircraft are of great long-term concern to the Air Force because "we have to prepare for the day when fossil-based fuels won't be available in the required quantities. Developing new sources for fuels is the job of ERDA (Energy Research and Development Administration). It is our job to find ways to effectively use whatever new fuels ERDA may come up with. We have already used fuels produced from oil shale in a T-39," according to General Evans.

ERDA experts believe that solid, metallic hydrogen fuel technology is the most promising candidate for replacing present aircraft fuels. Solid hydrogen overcomes the drawbacks of liquid hydrogen, which requires special cooling and is of low density, but probably will require many years of development before it can become economically viable.

USAF continues "low-level, cautious" monitoring of a nuclear propulsion system for aircraft, concentrating mainly on "containment" of the reactor in case of accident. The Air Force is not prepared to tackle development of a complete system "as yet," General Evans said.

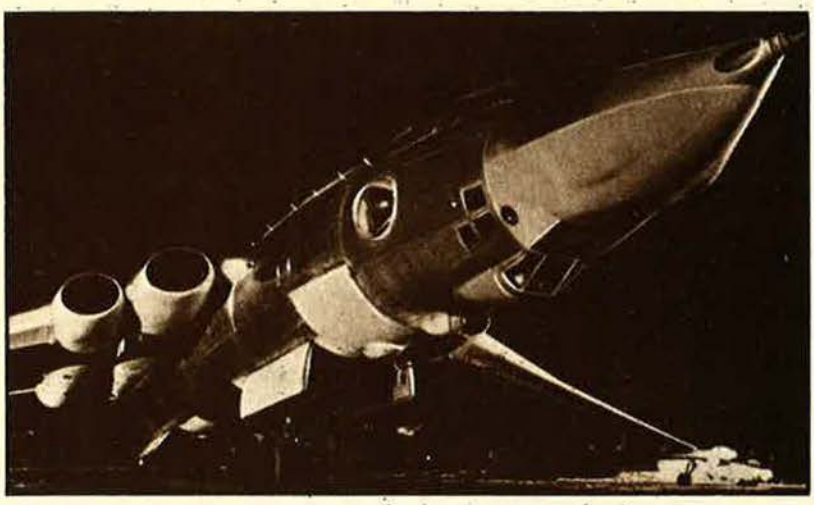
An important program to get under way this year is modification of the C-5 Galaxy wing. In December 1975, the Air Force awarded a $28,454,000 contract to Lockheed Georgia Co., covering the first phase of a wing-modification design. Assessments of C-5 wing deficiencies between 1970 and 1973 concluded that all other aircraft components could meet the 30,000-flight-hour goal. The average C-5 wing currently has a projected safety limit of 8,000 hours, based upon 1973 average usage of the aircraft. First-phase objective of the four-phase modification program that could run for ten years is development of a kit that will extend aircraft life to 30,000 flying hours. The Air Force found that awarding Phase One to Lockheed on a sole-source basis is more economical than competitive bidding, but follow-on phases involving fabrication and installation of the modification kit may be competitive, General Evans said.

AFSC's Foreign Military Sales Programs

Last year, the Command handled Foreign Military Sales contracts valued at about $4.8 billion, a figure that will go up to about $7 billion this year, according to General Evans. (The importance of FMS to the nation and the Air Force was discussed in last month's editorial.) AFSC has FMS contracts with fifty-three countries and two NATO organizations, accounting for about fifteen percent of all the Command's acquisition funding, General Evans said.

General Evans is focusing major attention on cost-effective management. A key requirement, he said, is to "encourage industry toward more efficient manufacturing technology through competitive incentives. We must find better ways to coax contractors to update their tooling. President Ford has urged in his State of the Union message that changes be enacted in federal tax laws that will speed up plant expansion and the purchase of new equipment. I agree with this recommendation. This probably means that we will have to give the contractors tax breaks, allow them to amortize their investment over a shorter period of time, and so on. The problem is that we can't give a contractor assurance that if he tools up for one weapon system contract he will get continuing contracts over a long enough period to amortize his investment. But if we can come up with the right incentives, we help the contractor as well as the government." ■

SOVIET AEROSPACE ALMANAC



The 1976 edition of AIR FORCE Magazine's Soviet Aerospace Almanac presents an expanded range of analysis, interpretation, and reporting covering the growth, organization, doctrine, capabilities, and future trends of Soviet aerospace forces, and the military profession in the USSR. The Gallery of Soviet Aerospace Weapons is a unique, compact, and authoritative reference document.

We believe the information contained in this Almanac will be of value to readers, both military and civilian, in assessing the state of the military balance between the US and USSR, and in considering defense and foreign policy alternatives that will be widely debated in the months ahead.

—The Editors

Soviet Aerospace Almanac

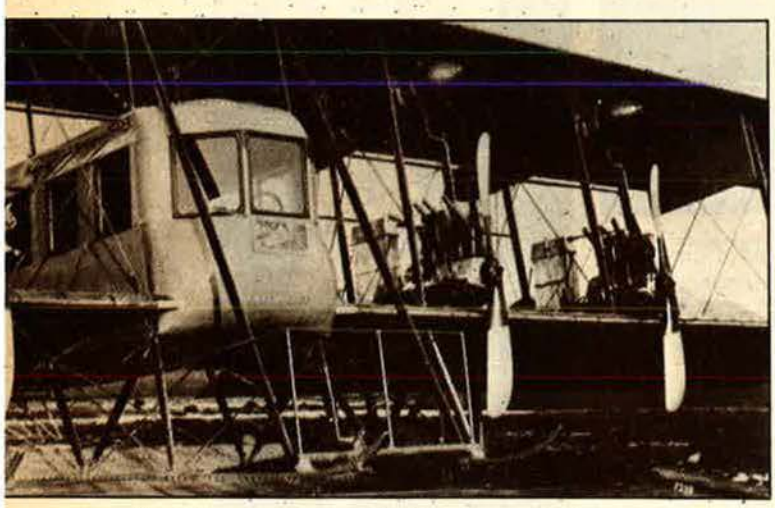
The author, a former US Air Attaché in Moscow, examines the evolution of Russian aerospace forces and doctrine from inception in Czarist times to the current Soviet bid for air and space supremacy.

SOVIET AEROSPACE FORCES: CONTINUITY AND CONTRAST

BY COL. WILLIAM F. SCOTT, USAF (RET.)

IN February 1917, Imperial Russia had 1,039 aircraft, of which 590 were in active combat service. Among these was the world's first four-engine bomber, the Ilya Muromets, which had been in action for almost three years. With an endurance of five hours, this aircraft could carry a bomb load of approximately 3,500 pounds and had a speed of more than 100 kilometers an hour. Its designer was Igor Sikorsky, later to become a leading figure in the US aircraft industry.

(In April of the same year, on the eve of the United States's entry into World War I, the Aviation Section of the US Army's Signal Corps consisted of thirty-five pilots and fifty-three training aircraft. The Navy and Marine Corps were more air-minded. Their combined forces had forty-eight officer-pilots and fifty-three aircraft, one airship, and three balloons.) Almost sixty years later, in 1976, the Soviet rulers continue the same air emphasis begun by Imperial Russia. Only the United States represents a serious challenge to the Kremlin in military aerospace forces. Despite a civil war, famines in which hundreds of thousands perished, a series of internal purges that took millions of lives, a world war in which 20,000,000 people were killed, and with a present GNP much less than half that of the United States, current trends indicate that the Soviet aerospace forces soon may be the most powerful in the world. The evolution of these forces in slightly more than half a century represents one of the most dynamic developments in military history.



Ilya Muromets, the world's first four-engine bomber, was developed in Russia by Igor Sikorsky prior to World War I. It had a span of 113 feet, was sixty-seven feet long, powered by Argus engines, and weighed 9,500 pounds.

The Early Soviet Years

On November 10, 1917, only three days after Lenin seized power, the Bureau of Commissars of Aviation and Aeronautics was formed. The Workers and Peasants Red Army (RKKA) officially was established the following year. It consisted of ground, air, and naval units.

To provide a basis for the new air force, the Central Aerodynamics Institute (TsAGI) was established by Professor N. Ye. Zhukovskiy in 1918. One of his assistants was young Andrei Tupolev, whose supersonic transport, the Tu-144, went into commercial service last December, establishing another mark in aviation history.

Although the TsAGI and other new schools were a start, the new Soviet state needed outside help to develop an air force and an aviation industry. Early Soviet attempts to produce aircraft met with little success. Peter the Great had looked to the West for assistance in building his armed forces, and the new Soviet rulers did the same. Help came from the recently defeated Germany.

Under the Treaty of Versailles, Germany was forbidden to build military aircraft. The "London Ultimatum" of 1921 extended this prohibition to civil aviation. The Soviets needed designs, equipment, and engineers. The Germans, on the other hand, wanted a safe place to construct plants, establish an aviation industry, train pilots, and, in general, circumvent the Versailles Treaty. Arrangements for military cooperation between the two nations were formalized in 1922.

Professor Junkers, head of the German aviation firm that bore his name, constructed a plant at Fili on the banks of the Moscow River, within a few miles of

today's United States Embassy. The Lipetsk Flying School, near Voronezh, was specifically designated to train German pilots. These pilots, along with German airmen who had combat experience in the recent war, acted as instructors in the new Red Air Force.

Cooperation between the Soviets and Germans in military training and education was perhaps of even greater importance than training pilots or constructing aircraft plants. In the 1920s, about 100 carefully selected Soviet officers studied each year in German war colleges. German officers, in turn, received field training in the Soviet Union.

The Soviet-German collaboration ceased soon after 1933, when Hitler came to power. During its existence, it was of major assistance to the young Soviet Air Force, and to Soviet aviation in general.

Throughout the years of cooperation with Germany, senior officers in the Red Air Force made an exhaustive study of foreign air strategy and tactics. For example, *Tactics of Bombardment Aviation,* written in 1920 for the US Army Air Service bombardment school at Ellington Field, Tex., was translated into Russian in 1926 and used as a textbook.

The Soviets also made original contributions in the use of airpower. In 1929, parachute detachments were formed and integrated into the Red Air Force. During the 1935 Kiev military district maneuvers, 1,200 soldiers made a mass parachute jump—the largest ever attempted in any nation up to that time.

Marshal Tukhachevsky, one of the most influential Soviet officers in the 1930s, was a strong supporter of independent air operations, while at the same time attempting to build up tactical aviation, armor, and artillery forces. General V. V. Khripin, Red Air Force Chief of Staff and a leading air theorist, gave strong encouragement to the development of a long-range bomber force.

In the 1920s and '30s, Andrei Tupolev continued the tradition of bomber aircraft development, begun in 1913 with Sikorsky's design of the Ilya Muromets. Tupolev's four-engine TB-3, which could carry a bomb load of approximately two tons, was in production by the mid-1930s. By the end of 1936, the bomber component was the primary arm of the Red Air Forces, and production of the TB-3 soon reached an annual rate of 200. (In contrast, in 1939, when Hitler's forces attacked Poland, the four-engine bomber force of the United States Army Air Corps consisted of thirteen experimental B-17s.)

Preeminence of the Soviet bomber forces was short-lived. Even before World War II, almost all of the Soviet air leaders of the mid-1930s, including commanders as well as air academy instructors, would be dead or in concentration camps. For those concerned with Soviet aerospace forces today, the reasons are instructive.

Between 1936–39, both Hitler and Stalin tested concepts and military equipment in Spain. At the beginning of the Spanish Civil War the aircraft flown by Soviet "volunteers" were equivalent to or better than the aircraft flown by the Germans. This situation changed in 1937, when the Germans sent to Spain the Me-109, one of the most advanced fighters of its time. Tupolev's bombers were too slow to cope with the German fighters, and bombing efforts generally were unsuccessful, due in large measure to bad navigation, inadequate instruments, and equipment failures.

Soviet air leaders were still studying the not-yet-ended Spanish War when the entire structure of the Soviet Armed Forces started coming apart. In 1937, Stalin's purges reached the Soviet military.

The Purges: 1937–38

"From May 1937 to September 1938, almost half of the commanders of regiments, almost all the commanders of brigades and divisions, all the commanders of corps and commanders of the troops of the military districts, members of the military councils and chiefs of the political directorates of the districts, the majority of the political officers of the corps, divisions, and brigades, about a third of the political commissars of the regiments, many of the instructors of the higher and secondary military educational institutions suffered repressions." This description is from the Soviet six-volume *History of the Great Patriotic War: 1941–45,* written in 1964 during Khrushchev's de-Stalinization period.

The Polikarpov I-16 saw service in Soviet Air Forces from 1935 to 1943. At the start of World War II, it was the most heavily armed fighter in the world. This Type-24 was credited with a top speed of 326 mph.

The vast majority of those who "suffered repressions" were shot outright or died in concentration camps. Three of the five Marshals of the Soviet Union were shot, including Marshal Tukhachevsky, the strong supporter of aviation. Among the many senior Air Force officers

The author, Col. William F. Scott, USAF (Ret.), is a West Point graduate who served as a bomber pilot during World War II. He has been a faculty member of Air University, an exchange officer with the Department of State, and has served in various intelligence assignments. He has twice been US Air Attaché in Moscow, a position from which he retired in 1972. Colonel Scott holds a doctorate in Soviet studies, and now is a consultant on Soviet military affairs.

killed were Gen. Ya. I. Alksnis, Commander in Chief, and Gen. V. V. Khripin, Chief of Staff and a proponent of long-range aviation. Most of the leading air strategists, such as A. N. Lapchinskiy, A. C. Algazin, and A. K. Mednis, also were executed. Even the aircraft industry was purged. Tupolev was arrested, but later was brought back to his own design bureau and permitted to work. The head of TsAGI narrowly missed arrest. A leading aircraft designer was shot because one of his aircraft crashed.

Results of this blood-letting were immediate. The Red Air Forces were in a state of confusion. Surviving senior officers waited to see where Stalin would turn next. Those officers who had favored a long-range air force had been hit the hardest. Ironically, the four-engine bombers served a useful purpose for Stalin; they were dispatched to bring a number of the accused to Moscow for trial.

Prelude to World War II

As the Red Air Forces were withdrawing from Spain, they became engaged in the Far East. Soviet "volunteers," some just returned from Spain like future Air Force Commander P. V. Rychagov, appeared in the skies over China, fighting the Japanese. In the spring of 1939, Japanese forces penetrated to the Khalkha River in Outer Mongolia. By July, approximately 500 Soviet aircraft, commanded by another veteran of the Spanish War, Ya. I. Smushkevich, were engaged in this area. Fighting intensified, and on August 23, 1939, when the Battle of Khalkhin Gol was at its height and the outcome still uncertain, Stalin signed a nonaggression pact with Hitler. Two weeks after the pact was signed, Hitler attacked Poland. World War II had begun.

General Lieutenant of Aviation Smushkevich, hero of Khalkhin Gol, who under the alias "General Douglas" also had achieved fame in Spain as a fighter pilot, took command of the uneasy Red Air Forces in 1939, two of his predecessors having been shot in 1937 and 1938. A fighter pilot himself, he gave top priority to building up the fighter strength of the Red Air Force. Stalin himself took a personal interest in the speed and armament of fighter aircraft. Specific attention was given to developing equipment and tactics for close air support.

Efforts at producing new fighter aircraft were successful and, by May 1940, the I-26 (Yak-1), armed with a 20-mm cannon and two machine guns, was in production. As the modernization and reequipping of the Red Air Forces were in progress, but far from complete, Hitler launched "Operation Barbarossa," the invasion of Russia.

The "Great Patriotic War": 1941–45

On June 29, 1941, within a week of Hitler's attack, STAVKA (General Headquarters of the Supreme High Command) redesignated the Chief of the Administration of the Red Air Forces as Commander of the Air Forces of the Red Army and a Deputy Commissar of Defense. At the same time, the civil air fleet was made into an operational arm of the Red Air Forces, directly subordinate to the High Command.

Soviet air units were parceled out among the commanders of the various armies and fronts at the time war broke out. This arrangement was the result of experience in the Spanish and Finnish Wars, during which it was thought that each ground unit should have its own direct support aircraft.

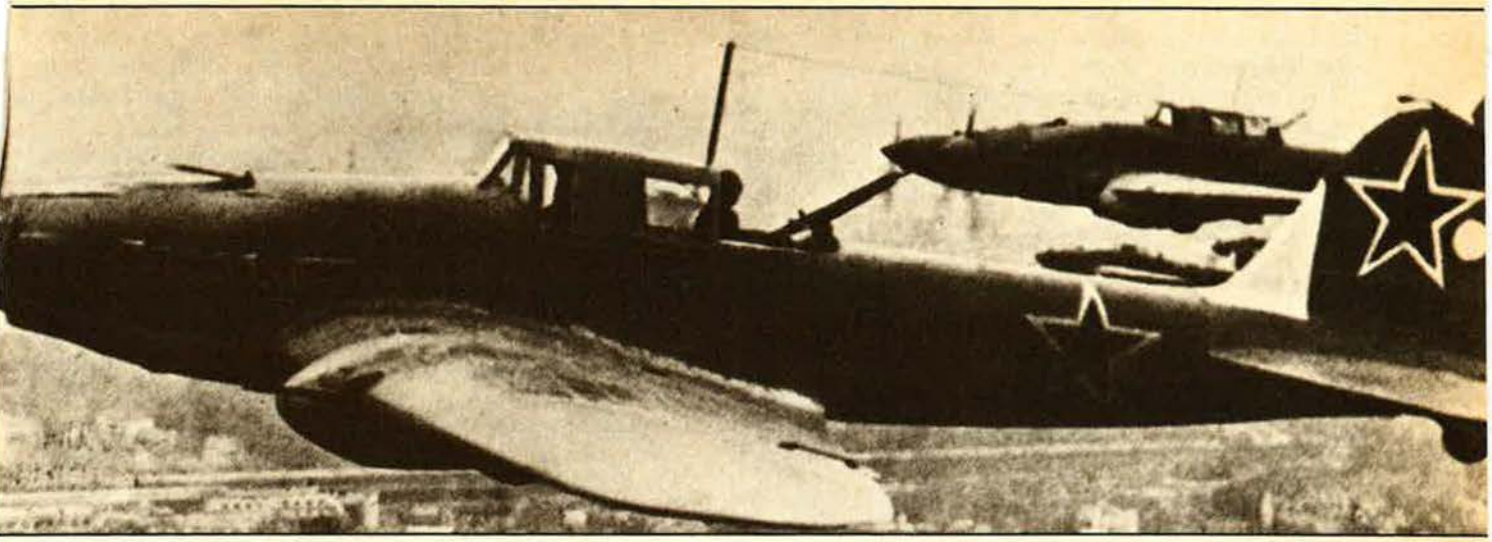
After Soviet air units thrown against the Germans were destroyed piecemeal, STAVKA learned a lesson that the United States did not recognize until the North African campaign in 1942: Air forces in a theater must be under one centralized control. As a result, seventeen "air armies" were formed, which could support specific fronts, or could be consolidated, as directed by STAVKA.

Shortly after the war started, two former chiefs of the Red Air Forces, Generals Loktionov and Rychagov, were shot, along with a number of other senior Air Force officers. General Smushkevich, hero of the Spanish War, met the same fate in early 1942. General Zhigarev, commander of the Air Forces at the time of Hitler's attack, maintained his position until the spring of 1942, when he was sent to the Far East. He was lucky. In all, five of Zhigarev's predecessors had been shot on Stalin's orders.

Gen. A. A. Novikov took command of the Red Air Forces in April 1942 and retained it throughout the remainder of the war. His primary task was to act as STAVKA's senior air representative. In this capacity, he was responsible for the coordination of air armies assigned to the various fronts. Centralized control was effected over the Soviet Air Forces by STAVKA, which appeared to have been as effective as the centralized control exercised over the USAAF or RAF during World War II.

In the first few days of the German attack, the Red Air Forces may have lost as many as 5,000 aircraft, many of which were destroyed on the ground. The Red Air Forces' first major stand was at Moscow in November 1941, after STAVKA had stripped other fronts of aircraft in order to provide sufficient strength to win local air superiority. Eighteen months later, at Kursk, in July 1943, the Red Air Forces won perhaps their greatest victory of the entire war, when they gained general air superiority which, except in a few local instances, was retained until Hitler's final defeat.

At the end of World War II, the Red Air Forces emerged as a highly professional force that successfully had withstood the Luftwaffe and carried the war from Moscow to Berlin. Aircraft provided by the United States and Great Britain had given substantial help. After the massive repressions of senior officers, both in 1937–38 and again after the war started, the group of capable air leaders who had escaped the purges—



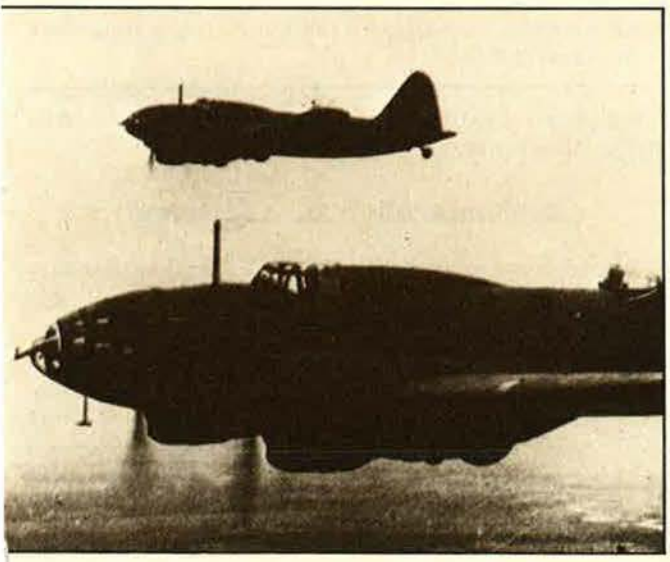
Perhaps best remembered by US airmen of World War II is the Il-2 Stormovik, a heavily armed and armored ground attack plane. It had two 20-mm cannons and two 7.6-mm machine guns in the wings and carried rockets and bombs.

Vershinin, Sudets, Brayko, Rudenko, and others—managed to guide the Soviet Air Forces in the postwar years.

Red Air Forces commanders had excelled in ground support operations, and where the Soviet leadership was concerned, one lesson was paramount: "The experience of the war demonstrated with full conviction that defeating the enemy on the ground is possible only after having won mastery in the air."

The Immediate Postwar Period: 1945–53

With the defeat of Germany and Japan, Soviet ground forces stood unsurpassed on the Eurasian land mass. But in the air, the USAAF and the RAF had almost unquestioned superiority. These forces, combined with US possession of the atomic bomb, were the primary brakes on further Soviet expansion in Europe and the Middle East.



The USSR did not develop strategic bombing during World War II. Among their medium bombers was the Il-4, which was used primarily to support the Red Army.

Stalin and his marshals soon began to claim that their arms alone had defeated Hitler, with only inconsequential help from the United States and Britain. Because of this claim, Soviet spokesmen, and even later historians, could not admit that the bombing of Germany and Japan shortened the war, or that strategic airpower, which they did not possess during the war, had any merit.

Subsequent actions by Stalin, however, indicate that he fully recognized the impact of the Anglo-American air offensive against Germany. "It is no accident," as the Soviets frequently say, that the Soviet leadership undertook three priority tasks: first was the development of nuclear weapons; second, development of jet fighters; and third, development of a long-range bomber force. These tasks took precedence over feeding tens of thousands of Soviet citizens, who were starving in the postwar period, and over the rebuilding of vast areas devastated by Hitler's forces.

To hasten development of jet aircraft and missiles, tens of thousands of German scientists, engineers, and technicians were rounded up and transported to the Soviet Union, beginning in 1945 and continuing for the next several years. The "German connection" of the 1920s was revived in a somewhat different form.

Among the most successful of the jet aircraft designed in the immediate postwar years was the MiG-15, whose sweptwings were based on the same German design as the F-86. Initial requirements for a bomber were met by making an exact copy of the B-29, a few of which had made emergency landings in the Soviet Far East during World War II. Designated the Tu-4, it was referred to by Tupolev, its "designer," as a "locally built Boeing product."

To what degree the initial Soviet nuclear bombs were the product of their own scientists and to what degree they too were dependent upon outside aid still is not known. What is important is that in 1949, years ahead of most Western estimates, the Soviets exploded their first nuclear weapon. And, in 1953, again years ahead of estimates, they exploded what they refer to today as

the world's first hydrogen bomb. An earlier explosion in the United States, only a few months previously, had been a hydrogen "device" placed on the ground.

Two organizational changes affected the Soviet Air Forces during this period. The airborne troops, a branch of the Soviet Air Forces since their initial development in the 1930s, were made a separate service, directly subordinate to the General Staff. (Subsequently, they became a "mini" service.) The second change was of greater significance. In 1948, air defense was reconstituted as the Troops of National Air Defense (PVO-Strany, hereafter referred to as National Aerospace Defense Forces) and formed as a separate service, coequal with the Ground Forces, Air Forces, and Navy.

These Yak-9 fighters were photographed at a Soviet base used by USAAF bombers during the shuttle-bombing campaign.

Transition to Nuclear Weapons and Missiles: 1954–59

From 1954–59, the Soviet Armed Forces experienced rapid change, striving to overcome and surpass the superiority of the West in aircraft and nuclear-tipped missiles. At this time, the Soviet Union took a commanding lead in the development of missiles and in space exploration, areas the United States had neglected in the immediate postwar years.

Emphasis was first placed on the development and production of new bombers, with significant results. The Tu-16 Badger, with only two engines but comparable to the B-47 in many respects, was placed in operational service in 1954. Within a short time it was joined by the four-engine Mya-4 Bison.

By 1955, Soviet industry had the plant capacity to produce between twenty-five and thirty Bisons a month, making it potentially possible for the Soviet heavy bomber force to match that of the United States. However, production never reached more than half of plant capacity. One reason was given later by Colonel Bondarenko of the Lenin Military-Political Academy: A "bold scientific strategy" was adopted by the Central Committee, which specified that no attempt would be made to match the United States in heavy bombers. Instead, they would "concentrate efforts" on ballistic missiles. By this means, the Soviet Union could "overtake the USA, which in that period had concentrated its efforts on the development of intercontinental bombers as the sole [in their opinion at the time] means of delivering nuclear charges."

This not only was a period of change in weapons and weapon systems, as Colonel Bondarenko indicated; it was also an era of revolution in Soviet military concepts. Within months after Stalin's death in 1953, *Military Thought,* the classified journal of the Soviet General Staff, called for a discussion of the impact of nuclear weapons upon warfare. This debate resulted in a series of seminars conducted in 1957–59 under the auspices of the General Staff. Based on these findings, the Party leadership made a doctrinal decision that nuclear-armed rocket weapons would be the decisive factor in any future war. Leading marshals and generals were directed to prepare studies describing how the nuclear rocket weapon would impact upon their particular branch or service. These papers, known as the "Special Collection," were passed to the West by Col. Oleg Penkovskiy, who was arrested in the USSR in 1962.

By the late 1950s, according to Soviet theoreticians, the introduction of nuclear weapons and missiles had brought about a "revolution in military affairs," the greatest change in arms and warfare since the introduction of gunpowder centuries earlier. From this time on, Soviet spokesmen asserted, the military power of a state would be measured "by the quantity and quality of its nuclear weapons and the means of their delivery." The basic tasks of aviation became the delivery of nuclear weapons and the annihilation of enemy atomic weapon-carrying aircraft both on the ground and in the air.

The Strategic Rocket Forces were formed as a separate service in December 1959. This organization, combined with the earlier formation of National Aerospace Defense Forces, created a military structure much different from anything found in the West. As a result, the Soviet equivalents of the USAF would include the Soviet Air Forces, Strategic Rocket Forces, the manned aircraft and part of the radar troops of National Aerospace Defense, as well as a portion of the bomber fleet of the Soviet Navy.

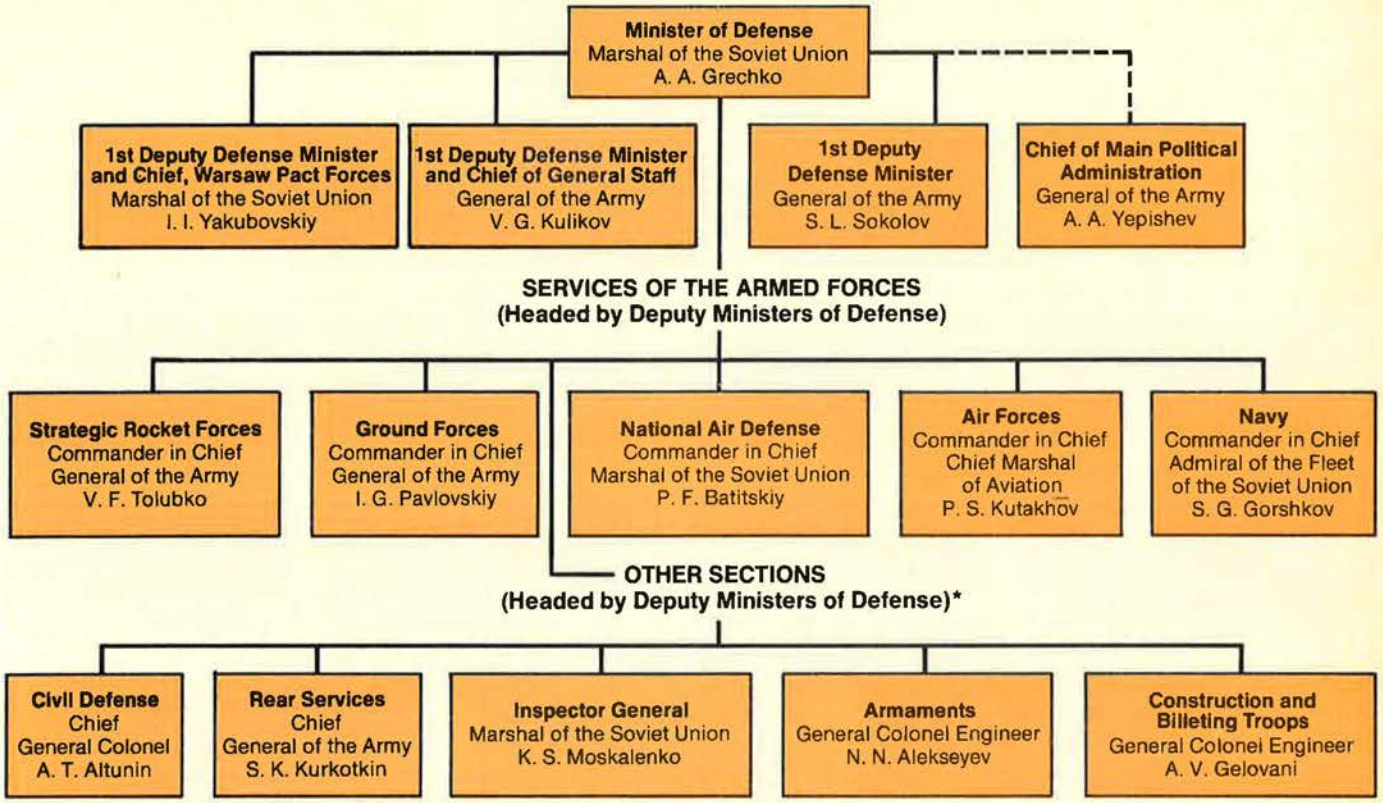
In the 1960s and early 1970s, Soviet spokesmen revealed the doctrine, strategy, and tactics for the utilization of this massive military force.

Implementation of a Concept

It was Nikita Khrushchev who announced, on January 14, 1960, that a new military doctrine had been formulated, based on the primacy of the nuclear-rocket weapon. In the following years, Soviet military spokesmen explained the new military doctrine in detail. Marshal Malinovskiy's early dictum, that in any future *world* war "nuclear weapons will be the principal means of destruction, and missiles will be the principal means of delivering weapons on target," has been reaffirmed in the 1970s.

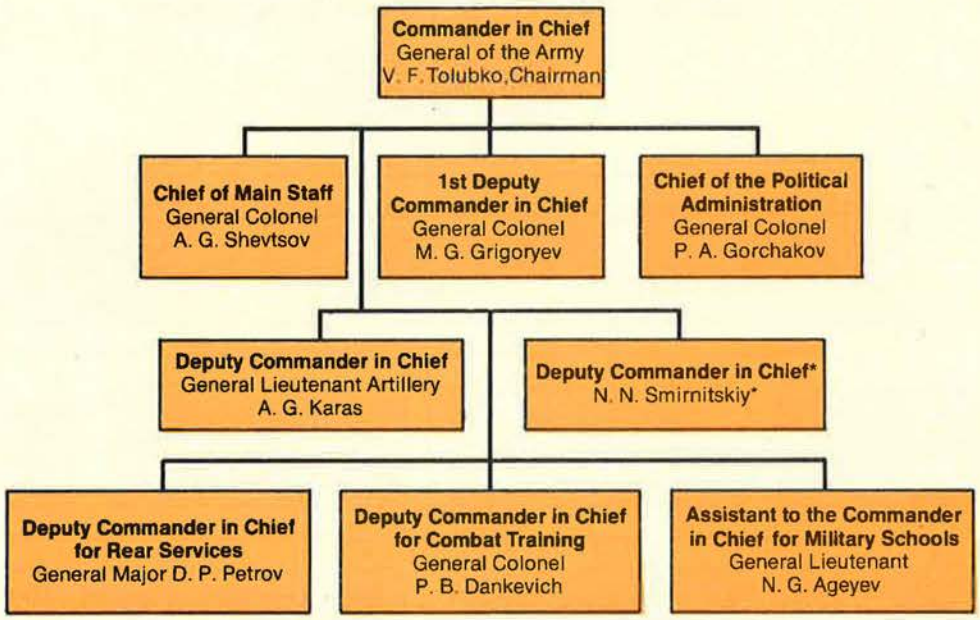
The essence of the new military doctrine is that "the Armed Forces, the country, and the whole Soviet people must be prepared for the eventuality of a nuclear rocket

MINISTRY OF DEFENSE



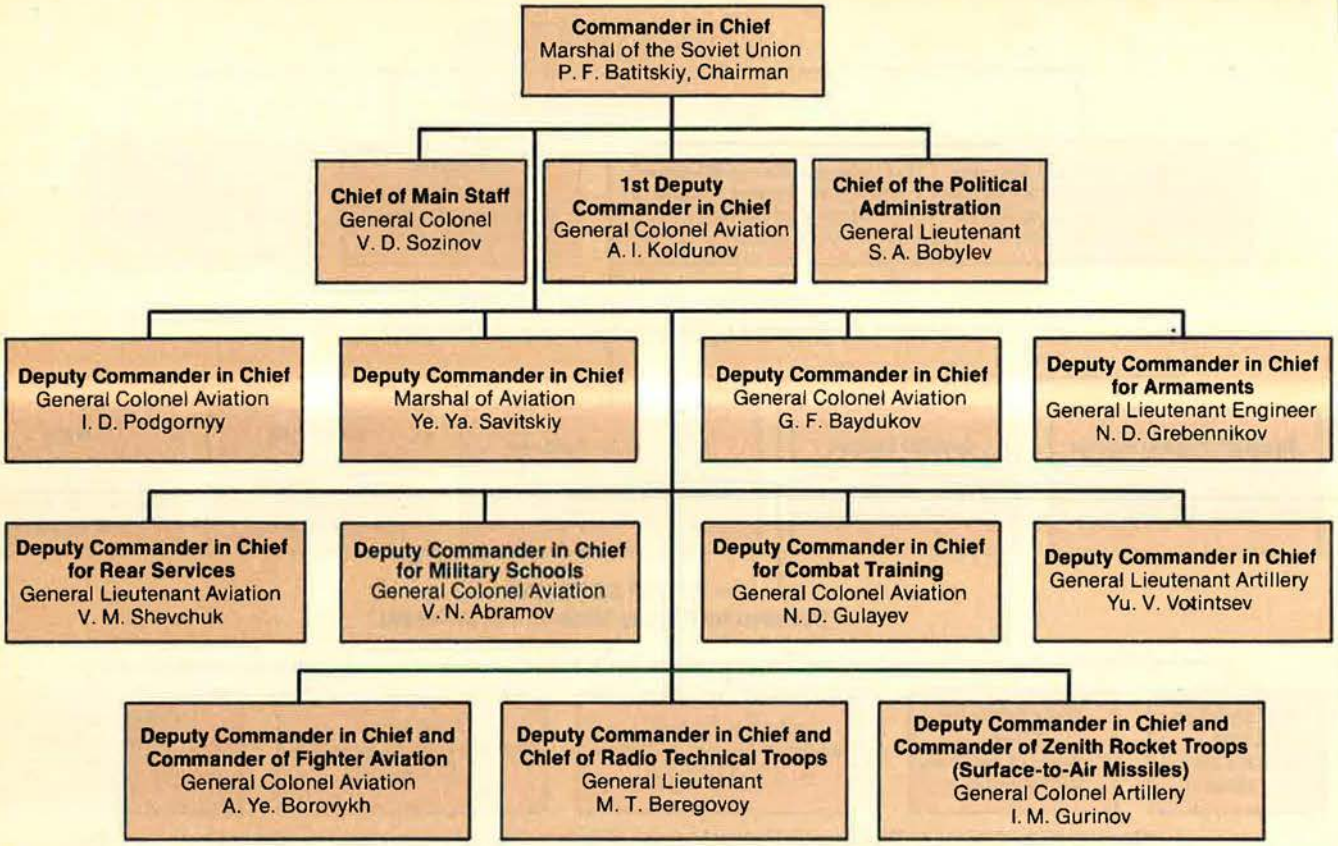
*General of the Army N. V. Ogarkov is a Deputy Minister of Defense, whose responsibilities have not been identified.

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

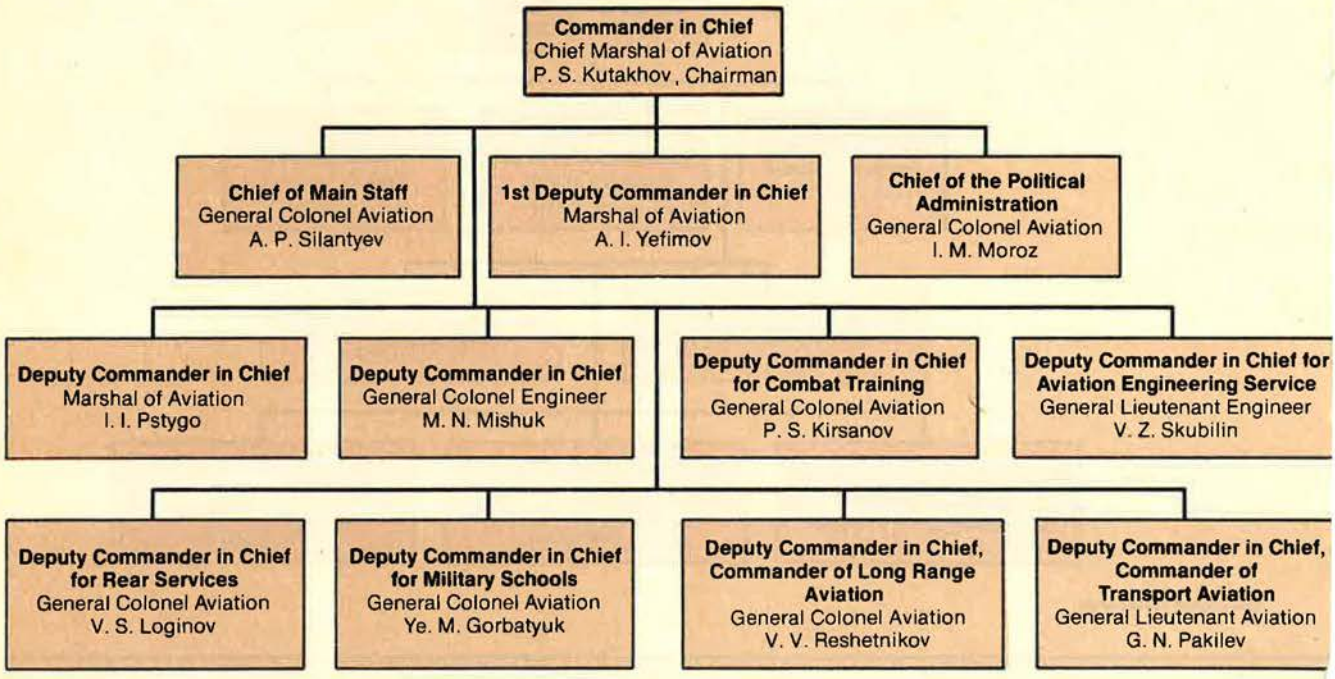


*Not definitely established

MEMBERS OF THE MILITARY COUNCIL OF COMMAND AND STAFF OF NATIONAL AEROSPACE DEFENSE FORCES



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



war." Throughout the 1960s and into the 1970s, as described below, the Soviet Aerospace Forces have been restructured and developed to meet the demands of this doctrine.

• *Strategic Rocket Forces*

From its inception in December 1959, the Strategic Rocket Forces have been considered the primary service, and its Commander in Chief takes precedence over the other service chiefs. The Party's leadership, whether it be Khrushchev or Brezhnev, has given top priority to the continued development and production of ballistic missiles and to improvements in their launch sites.

In the mid-1960s, it was assumed by the United States Secretary of Defense that the Soviet Union had settled for a position of strategic nuclear inferiority. However, the Soviet Union simply had placed initial emphasis on MRBMs and IRBMs, which placed Europe in hostage, and then proceeded with a long-range plan for producing missiles on a systematic basis, with new models appearing in regular sequence. Major attention currently is given to mobile solid-fuel missiles, whose development, production, and launch areas can be concealed from the "national technical means of verification."

Soviet missile programs probably have been affected very little, if at all, by the 1972 SALT I Treaty and subsequent SALT activities. Soviet SALT delegations simply have maintained a position to which US negotiators finally agreed. Had SALT never existed, Soviet missile programs probably would be exactly as they now are.

• *National Aerospace Defense Forces*

In the 1950s, jet interceptors and surface-to-air missiles of the Soviet National Aerospace Defense Forces (PVO) were developed and deployed at a rate far in advance of US estimates. Research and development also was in progress to construct antimissile and antispace defenses.

By the early 1960s, PVO spokesmen were declaring that their surface-to-air missiles could destroy enemy aircraft "with the first shot." Subsequently, the primary defensive missile of PVO, the SA-2, was deployed in Vietnam. It proved to be an excellent system, but it could not stop a well-coordinated air attack on ground targets.

At the same time, the Soviets were making great claims for their ABM system. It was asserted that the National Aerospace Defense Forces included the new components of PRO *(protivo raketnaya oborona* or antimissile defense) and PKO (*protivo kosmicheskaya oborona* or antispace defense).

Successful testing of the US MIRV caused a major dislocation in Soviet plans. Their ABM defenses, both in being and planned, would be useless against this new warhead. In contrast, the US ABM system, Safeguard, would have been effective against Soviet missiles for the next several years. The situation then could have become critical, as Marshal Sokolovskiy had discussed in the 1968 edition of *Military Strategy:*

> . . . the side which first creates an antimissile [antispace] defense, will have a most important strategic advantage which would allow the threatening of war or its unleashing without danger from the enemy's retaliatory strikes.

The danger was averted through negotiations. As the United States was about to fund Safeguard, the Kremlin agreed to enter into talks on possible strategic arms limitations. The SALT I agreement of May 1972 included provisions to restrict ABM sites. Further deployment of Safeguard was stopped and subsequently limited to one site (now inactive), while the Soviet Union was given time to work on advanced ABM systems.

Failure of the Soviet ABM appears to have increased the importance attached to civil defense. In 1961, prior to Khrushchev's missile adventure in Cuba, control of civil defense was transferred from the MVD (Ministry of Internal Affairs) to the Ministry of Defense. Civil defense is an adjunct of the Aerospace Defense Forces, and civil defense in its entirety, as Marshal A. A. Grechko has emphasized, is "a matter of strategic significance."

Decline in the number of aircraft in the USAF's Strategic Air Command has not decreased the importance attached to the Soviet National Aerospace Defense Forces. Such interceptor aircraft as the MiG-25 Foxbat continue to be developed and deployed, as well as new generations of SAMs.

It was announced in April 1969 that Marshal P. F. Batitskiy, Commander in Chief of the Soviet National Aerospace Defense Forces, also was Commander of the Troops of Aerospace Defense of the Warsaw Pact countries. This signified a marked improvement in the Soviet early warning antiaircraft capability.

• *The Soviet Air Forces*

Successes of the Soviet ballistic missile program did not signal the major decline, once forecast, of the Soviet Air Forces. As a Ministry of Defense spokesman stated in the mid-1960s:

> No matter how great the capabilities of ballistic rockets and pilotless aircraft, only the presence of a man on board the flying apparatus can guarantee the fulfillment of any tasks assigned to combat means in the near earth space.

In the mid-1970s, the Soviet Air Forces consist of three major components: Frontal Aviation, Long-Range Aviation, and Military Transport Aviation. This organizational structure cannot be mirror-imaged against that of the USAF. There also are basic differences in concepts for the accomplishment of missions.

Long-Range Aviation *(dalnaya aviatsiya)* now is composed of "supersonic rocket-carrying aircraft" armed with either nuclear or conventional warheads. According to Soviet doctrine, the primary targets of this force will be "strategic objectives deep in the enemy rear," that will include "first of all" the opponent's nuclear forces and then his military-economic potential, government system, military control, and armed forces. Air-to-air refueling provides aircraft of long-range aviation with an intercontinental range.

While the USAF B-1 bomber is still far removed from operational service, the Soviet approximate equivalent, the Backfire, now is a proven aircraft in bomber units. In view of the Soviet practice in scheduling the output

of new aircraft in a regular sequence, it can be assumed that the Backfire's successor already has flown, or soon will do so.

STAVKA, through its executive agency, the General Staff, probably would direct operations of Long-Range Aviation in the event of a general war. Strategic nuclear forces, consisting of the Strategic Rocket Forces, Long-Range Aviation, and nuclear-armed submarines, would be programmed as a unit by STAVKA's designated agency.

Frontal Aviation *(frontovaya aviatsiya)* is assigned to the military districts and groups of forces abroad. Its major tasks are achieving and maintaining air superiority and cooperating with the Ground Forces. These tasks have become extremely complex and are different from those undertaken in previous wars.

Frontal Aviation must be prepared both for conventional and nuclear war. Prior to 1967, Soviet military doctrine had asserted that any war between two major powers, or military blocs, each possessing nuclear weapons, would begin with nuclear strikes. In that year, when NATO officially adopted the concept of "flexible response," Soviet military doctrine was modified to include the possibility that a conflict between nuclear powers might start with the initial use of conventional weapons. Doctrine was amended to include the statement: "Units and subunits must be prepared to fight with or without the use of the nuclear weapon." This, however, was only a modification to basic doctrine and did not signify a major change.

In the early 1970s, Frontal Aviation began to receive the aircraft that it so badly needed—the MiG-23 Flogger, somewhat similar to the US F-4 Phantom in bomb-carrying capability and range and, later, the Su-19 Fencer, comparable in some respects to the US F-111. These two versatile aircraft could operate effectively in either a nuclear or nonnuclear environment and could carry penetration aids together with a sizable bomb load, including "smart bombs." Furthermore, the Fencer could be launched from a Soviet base against NATO targets.

Military Transport Aviation *(voyenno-transportnaya aviatsiya)* includes both transport aircraft and helicopters. Although weak in some respects, this is a very significant and growing force. As events in the 1973 Mideast war indicated, the Soviet Armed Forces still do not have a global air transport capability approaching that of the USAF. In view of the announced Soviet interest in establishing a "military presence" in certain parts of the world, it is safe to predict that wide-body aircraft are included as a priority item in the USSR's new Five-Year Plan.

All Soviet civilian transports in Aeroflot, the Soviet national air carrier, may be regarded simply as a reserve of the Ministry of Defense. At the beginning of World War II, such aircraft were incorporated into the Red Air Forces. An indication of the military significance of Aeroflot is that its aircraft have the same pricing structure as do military equipments.

The helicopter strength of Soviet Military Transport Aviation appears to be increasing rapidly, both in transport and combat versions. Soviet interest in helicopters is based, at least in part, on the fact that they would have high utility in either a nuclear or conventional military environment. If airfields are contaminated by nuclear bursts, helicopters would be able to seek out noncontaminated areas to land troops for the purpose of eliminating remaining resistance. Also, in a conventional war, helicopters might become a primary weapon system for use against tanks.

Eastern European Air Forces—An Adjunct

In the event of a Warsaw Pact/NATO conflict, the air forces of East Germany, Poland, Czechoslovakia, Hungary, Romania, and Bulgaria would be completely under the control of the Soviet High Command. As previously noted, the air defense forces of these nations, which represent a very high percentage of their total air strength, already are directed by Moscow. STAVKA representatives would program ground support strikes in much the same manner as for Soviet aircraft.

Total strength of the Eastern European air forces is about 125,000 personnel and 1,700 combat aircraft, of which more than 1,000 are MiG-21s. The Polish Air Force, with approximately 60,000 personnel and 800 aircraft, is by far the largest. Next is Czechoslovakia, with about 45,000 personnel and 450 combat aircraft. *(See "The Military Balance," December '75 issue.)*

How well would the Eastern European pilots fight? Individually, the ability of these pilots, like pilots elsewhere, is based on experience, morale, leadership, and equipment. But would they carry out Moscow's orders? Much would depend on how the war started, by whom, the kind of war, on whose territory combat took place, and which side would most likely win.

Nations of Western Europe, such as Britain, France, and Sweden, produce some of the world's finest aircraft. The countries of Eastern Europe, however, depend entirely on the Soviet Union for aircraft and related equipments. The Kremlin keeps its satellite nations, and especially their air forces, completely under its thumb.

Future Prospects

In the mid-1970s, Soviet aerospace forces are in a process of rapid evolution, caused by new technologies and additional requirements. Major changes can be expected within the next decade.

There is little doubt that the Soviets are making immense efforts to develop an ABM defense. This might be provided by some new technology, such as a laser weapon working in conjunction with satellites. But even if an ABM system is developed, the Kremlin still will have other worries. Cruise missiles could present almost as many problems as MIRVed warheads.

Technological improvements will continue to be made in the weapons of the Strategic Rocket Forces. Major efforts probably will be to develop more effective mobile launchers, which could not be detected by "national technical means of verification." Cruise missiles should be in the research and development stage at present and will enter the inventory as a complement to ballistic missiles.

The greatest change will be in the Soviet Air Forces. New aircraft and engines will continue in a programmed sequence, and there will be replacements for existing

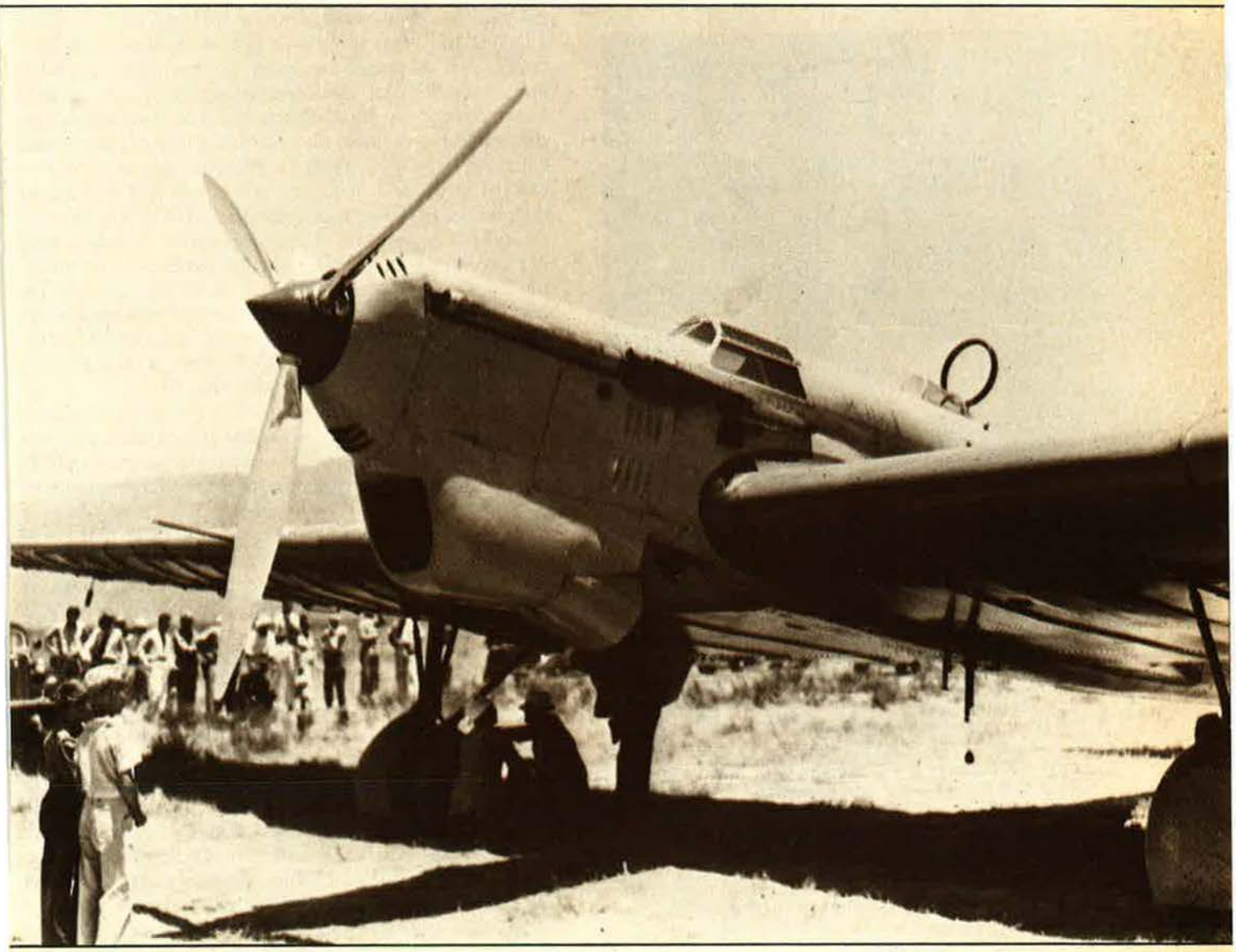
fighters and bombers. The near-earth manned satellite program, taking advantage of the vast amount of technology freely given by the United States, now probably has priority second only to the development of an ABM system.

With the strategic nuclear umbrella now provided by the Soviet *troika*—the Strategic Rocket Forces, Long-Range Aviation, and submarine-launched ballistic missiles—the Kremlin will use its air and naval forces to project a Soviet military presence in areas away from the Eurasian land mass. It is expected that emphasis will be given to wide-body aircraft and V/STOL fighters that can operate from relatively inexpensive aircraft carriers.

A number of unresolved problems, some of which surfaced in the 1973 Mideast war, face the Soviet air leadership. With the advent of sophisticated ground-to-air missiles, what will be the capability of Frontal Aviation to give close air support to ground units? What efforts should be expended on development and production of "smart bombs"? Do the one-sided air victories in that war reflect on pilot training, especially tactical training?

In the final analysis, as the Soviets so often write, the effectiveness of a military force is dependent upon its leadership. It is in this area that the Soviet aerospace forces—especially the Soviet Air Forces—may be the most vulnerable. The great Soviet strategists who created their air forces in the 1920s and 1930s died in Stalin's purges. World War II produced a number of outstanding tactical commanders. The postwar Soviet aerospace leaders appear technically competent, but lacking in concepts of both strategic and tactical applications. They have been given vast quantities of sophisticated hardware by the Soviet defense industry. But, thus far, they have failed—the Strategic Rocket Forces, National Aerospace Defense Forces, and Air Forces—to produce strategists and tacticians even approaching the capabilities of Chief Marshal of Tank Troops P. A. Rotmistrov or Admiral of the Fleet of the Soviet Union S. G. Gorshkov. This failure may represent the greatest weakness in the entire Soviet military structure. ■

In July 1937, this ANT-25, a product of the Tupolev design group, set an international distance record by flying nonstop from Moscow over the North Pole to San Jacinto, Calif., a distance of nearly 6,300 miles.



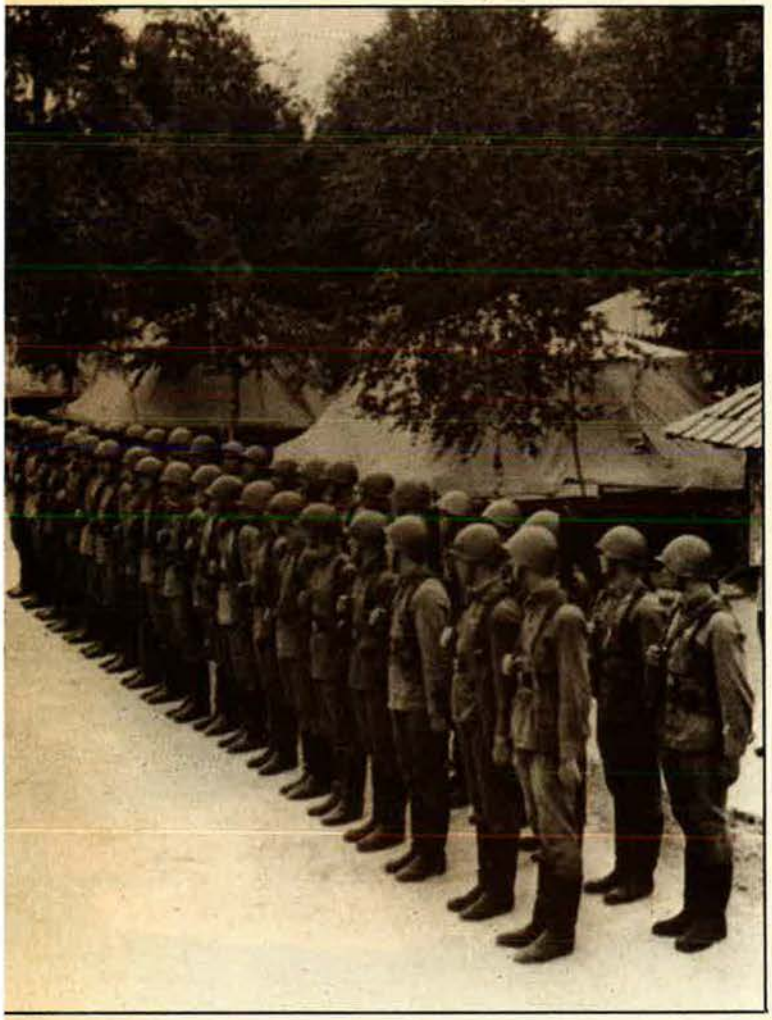
Soviet Aerospace Almanac

The true cost to the USSR of its drive for military superiority can be estimated only by assessing the impact of military programs on all institutions of Soviet society. To a degree that we can scarcely imagine, the entire Soviet system is conditioned by. . .

MILITARY ECONOMICS IN THE USSR

BY WILLIAM T. LEE

TO BE A superpower is to maintain a large military establishment equipped with enough nuclear weapons to deter the other superpower and, incidentally, annihilate any one or any combination of lesser powers. To be a superpower is to head one or more alliances of lesser powers, to provide military and economic aid to penurious lesser powers while peddling large quantities of sophisticated weaponry to affluent lesser powers. To be a superpower also is to attempt to determine the political and economic fate of the nations emerging from the Western colonial system that was erected in the four centuries prior to World War I and demolished in the three decades after World War II.



Most of the USSR's 4,500,000 men and women in uniform are paid a pittance, but the true cost to Soviet society of its military manpower cannot be measured in rubles.

To be a superpower is very expensive. A year or two of peacetime superpower status probably costs as much, just in direct defense spending, as all the participants spent in World War I. Several years of superpower defense spending probably would equal the respective outlays of each superpower in World War II. But that's a bargain if the alternative is World War III.

Currently the US is spending a lot on national security in absolute terms, more than $90 billion annually, but not so much proportionately—about six percent of GNP. The USSR also is spending a lot on national security in absolute terms—in the neighborhood of sixty-five to seventy-five billion rubles—and a great deal more proportionately—about fifteen percent of the Soviet GNP. The US publishes its defense expenditures and complains a lot. The USSR hides about seventy percent of what it spends while, publicly at least, complaining not at all. For example, the officially announced Soviet defense budget for 1975 (17.4 billion rubles) does not include procurement, RDT&E, or retired pay. Those expenditures, and others that are less significant, are buried in various "nonmilitary" budget accounts. The 17.4 billion rubles cover primarily those expenditures that, in the US defense budget, would be listed as pay, maintenance, operations, and military construction.

The objective of this article is to discuss the economic impact of the Soviet defense establishment on Soviet society. The discussion is not confined to the litany of standard quantitative measurements, important as these

are, but extends to those areas where measurement is very rough or impossible for lack of data.

Economic Organization

To be a superpower takes a lot of organization. At the top of the Soviet bureaucratic heap is the Politburo, whose executive instrument for organizing economic support of the Soviet military establishment is the Military Industrial Commission (Russian initials VPK). Despite many words committed to paper on the subject, we know very little about the actual decision-making process in the USSR. But we do know that once the decision is made to develop and/or to produce a weapon system, the VPK is in charge. Most of the new weapons are developed and produced by about ten industrial ministries. Each ministry combines a network of RDT&E organizations that design and fabricate the prototypes for test and evaluation by State commissions, and series production factories that produce the weapon systems that are approved by the State commissions. The RDT&E organizations number in the hundreds; the series production factories, in the thousands.

In addition to these ten or so core ministries, the VPK receives much support from other ministries and organizations that are primarily responsible for civilian programs. For most basic research support, the VPK turns to the institutes and laboratories of the USSR Academy of Sciences. For additional applied research support, and for the development of such items as military trucks, the VPK turns to the State Committee for Science and Technology, whose purview is all civilian RDT&E programs. Similarly, much military material—from trucks to ammunition to uniforms—is produced outside the core ministries.

At the same time, the core military industrial ministries produce many civilian products. Soviet leaders have put the civilian-product share of these ministries' output at forty percent or more. There is no reason to doubt such statements. After all, the Ministry of the Aircraft Industry must produce Aeroflot's transports and the Ministry of the Electronics Industry must produce TV sets for the populace, and so on. To be sure, military products enjoy top priority, at least most of the time, but there are *not* two economies, civilian and military, each so specialized that it cannot turn out the other's products.

Gross Expenditure Measurements

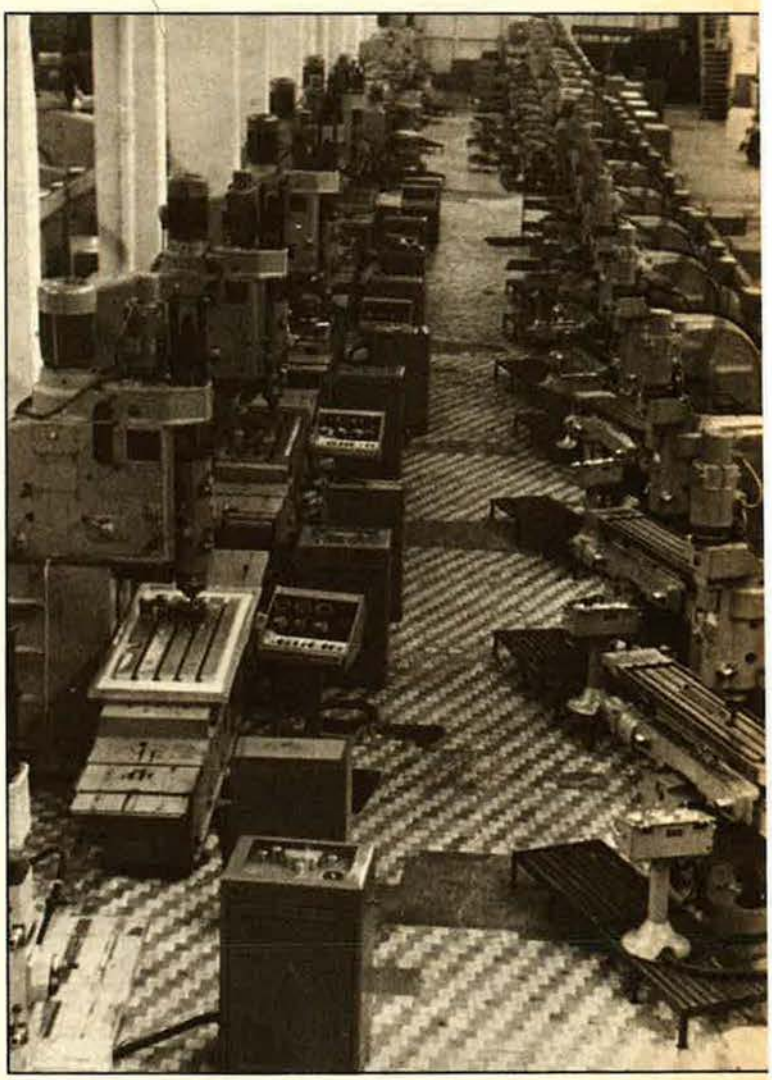
Since reaching a post-Korean War low of eight percent of GNP, USSR defense outlays have risen steadily to at least 12.5 percent of GNP in 1970 and about fifteen percent currently. Annual outlays reached about 50 billion rubles in 1970 and about 70 billion (±5 billion) in 1975. The current tenth Five-Year Plan (1976–80) appears to call for ninety to 100 billion rubles, maybe considerably more, by 1980. In a few years, the Soviets may be spending as many rubles for national security as the US spends dollars.

Because Soviet conscripts receive only a few rubles a month, manpower accounts for less than fifteen percent of current Soviet defense expenditures, even when food, clothing, quarters, etc., furnished to conscripts are added. Procurement, RDT&E, and space currently account for about seventy percent of total Soviet national security outlays.

The rate of growth of Soviet military expenditures is particularly impressive, roughly ten percent per annum (in current prices) since 1958, and at least five percent per annum (possibly more) scheduled for the next five years. These growth rates do not include the kind of "cost-push" inflation that has bedeviled the US economy for several years, but do reflect the high cost of technological innovation in the USSR.

Impact on the Soviet Economy

In the absence of an economic model capable of measuring the trade-off between national security expenditures (NSE) and economic growth in the USSR economy, only some qualitative judgments can be offered at this time. Even an economic model, however, could not describe all of the political, social, and institutional consequences of the high level and rapid growth of USSR military expenditures.



More than half of the USSR's machinery and equipment output is allocated to the military. This affects adversely the productivity of labor and capital.

Obviously allocating thirteen to fifteen percent of the Soviet GNP to national security is a heavy burden on their economy, even if we lack the tools to measure the opportunity cost (the production of nonmilitary goods and services that could be realized from resources devoted to defense) of Soviet national security expenditures with precision and confidence. In the near term, the competition for resources between investment and national security must be fierce. Since the outcome of that competition is one of the principal determinants of Soviet economic growth, consumption suffers in the longer term because the total economic pie is smaller in the future than it would have been had NSE shares been smaller in the past.

The economic strain imposed by the Soviet national security expenditures is evident in the distribution of machinery and equipment output between civil and military uses. Well above fifty percent of total machinery and equipment output is allocated to national security. Largely as a consequence of these priorities, only about one ruble in three of new capital investment is spent for machinery and equipment, whereas in other industrialized countries outlays for machinery and equipment normally account for sixty to eighty percent of new capital investment expenditures. Since machinery and equipment contain most of the technology in investment outlays, the growth of productivity of both labor and capital stock is adversely affected.

Manpower

One of the paradoxes of our perception of USSR, Superpower, is that while we know a great deal about the number and characteristics of Soviet weaponry, we don't know how many people the USSR has in uniform. Estimates range from a low of 3,000,000 to as high as 6,000,000 or more. A likely minimum is around 4,500,000 —with as many as 6,000,000 being possible. One authority on the problem recently put the *combat* services at 4,800,000 men.

Aside from the Soviets' refusal to publish data on the number of men they have in uniform, there are a number of vital statistics we don't know: what proportion of eighteen-year-old males are drafted; how many young women enter the services; how many career personnel—mostly officers and warrant officers—there are. Hence, the wide divergence in the estimates.

One thing seems clear: The 1967 law that reduced the term of service from three years (four in the Navy) to two years (three in the Navy for sea duty) was designed to be much more of a universal military training law than its predecessor, which simply assured the Ministry of Defense of as many conscripts as the Politburo would allow. Under the 1967 law, very few eighteen-year-olds are deferred for reasons of health or family dependents. Those deferred to enter higher education establishments are liable for military service if they drop out, or upon graduation, although apparently not all graduates serve in the Armed Forces.

Most career military are officers and the new class of warrant officers—the *praporshchik* and *michman,* created in 1971—to which many former career enlisted men have been converted. One of the peculiarities of the Soviet military is the relatively small number of career enlisted men. In the Soviet services their functions are performed by the warrant officers and junior lieutenants. But again no one knows how many officers there are; half a million appears to be a minimum.

Another peculiarity of the Soviet military establishment is that it provides some assistance to the economy it otherwise burdens so heavily. One of the reasons for high estimates like 6,000,000 men total is the large number of construction troops who do a lot of civilian construction work. These people apparently are mostly conscripts who do not meet the physical and educational requirements of the combat services, but who serve their two years nonetheless. They are given the rudiments of military training, wear uniforms, and all the rest, but work on military and civilian construction projects.

The Soviet military, like almost all other Soviet organizations, helps bring in the farm harvest, bountiful or lean. Each year at harvest time thousands of trucks and their drivers are detached from Soviet military units to assist the collective and State farms. These practices, combined with the biannual turnover of one-fourth of the conscripts, are some of the factors motivating the fervent exhortation to maintain a high degree of readiness at all times, which is difficult to impossible with such practices.

Uniformed Soviet military personnel are not confined to military units. They penetrate every aspect of Soviet society. Many active-duty Soviet officers are assigned to civilian ministries and organizations where they may spend their entire careers, simultaneously climbing the ladders of bureaucratic position and military rank. Apparently each civilian ministry and organization has a designated list of positions that are filled by such active-duty officers assigned to civilian careers, where they look after military interests in peacetime and prepare to mobilize the economy to support a future war. These dual-status personnel are in addition to the military representatives assigned to plants to accept (or reject) military products.

Aside from a small group of Soviet officials, no one knows how many civilians are engaged in producing the goods and providing the services consumed by the Soviet military establishment, but they clearly number many millions. If we assume that the number of civilians employed in supplying and supporting the military establishment is proportional to the military's share of GNP, then the number would be about 15,000,000. More than 8,000,000 probably are directly employed in developing and producing the weapon systems and hardware for space programs.

Other Aspects of the Military Burden

The foregoing review of military expenditures, manpower, and effect on economic growth represent the gross impact of defense on the Soviet economy. There are other aspects of the burden that can be identified but, being as much social as economic, are less susceptible to measurement even if much better data were available. Among these difficult-to-quantify aspects are: the housing shortage and its effect on the birth rate; premilitary training; civil defense; intelligence services; and the real economic costs of the conscripts.

Although the high rate of investment channeled into

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heavy industry is the principal culprit, the high proportion of national resources devoted to the military is one of the causes of the acute housing shortage. Overcrowding in such housing as is available is a fact of life to Russians that few Americans can appreciate. Only recently has the regime approached its decades-old objective of providing all Soviet citizens with the "sanitary norm" of nine square meters (including kitchens and bathrooms) per person. To appreciate what the "sanitary norm" means, pace off a square three long paces on a side in your home or apartment, then just try to imagine what it would be like to live under such crowded conditions.

Crowded housing also is one of the reasons for the drastic decline in the birthrate, particularly among the Slavs, who soon will join the Great Russians as ethnic minorities in the USSR.

A premilitary service training program was instituted as a partial compensation for the 1967 reduction in the term of service. Although still not universal and often spotty in performance, premilitary training consumes a great deal of time and energy for Soviet youths sixteen to eighteen years of age. Instructors are mostly retired military personnel, with some assistance from regular military units. No one knows how much this program costs for instructors, equipment, and material, to say nothing of the uncompensated time of the trainees. We can only say that the cost is not trivial, whatever the results, and that most such outlays are not included in the defense budget line items. On the other hand, there are some small benefits to the civilian economy for those who are trained, *e.g.*, as truck drivers, but who do not enter service.

Soviet civil defense is another many-faceted program, the full dimensions of which are not known with any confidence and the cost of which is largely outside the defense budget. The principal identified components are shelters, evacuation, training and retraining of the entire population, postattack repair and recovery, and various measures designed to reduce damage to the economic system. Routine construction of shelters in apartment buildings apparently ceased around 1960 when urban evacuation was added; however, institutional shelter construction presumably has continued, but the scale, to say nothing of the cost, is unknown. Evacuation plans are to be implemented largely by regular factory and institutional personnel; we don't know how much time is spent by how many people in preparing evacuation plans and conducting practice assemblies of equipment and personnel.

All school children receive civil defense training, including first aid, how to construct temporary fallout shelters, and how to live for several days in all types of shelters. All adults receive similar training. Soviet citizens born in the last twenty years probably will be subjected to three cycles of civil defense training in their lifetimes. Such training may not be greeted with enthusiasm, but it is endured and some of it must be retained by the population.

No information is available on stocks of equipment, materials, food, and medicines intended to begin repair and recovery following a nuclear attack, while feeding the evacuated portion of the population. Furthermore, some measures undoubtedly have been taken to reduce the vulnerability of the economy to nuclear attack, *e.g.*, repeating the World War II practice of stocking extra railroad bridges to replace those bombed out, and constructing hardened and underground industrial facilities. Once again the cumulative cost of all such measures hardly is trivial.

The defense expenditures previously offered do not include the full cost of intelligence services. They include only the pay and maintenance of uniformed personnel and procurement of such hardware as reconnaissance satellites and the boosters that put them into orbit. But all other intelligence service costs and all foreign intelligence operations are not included for lack of data.

Finally, to return to manpower costs. Like most other nations, the USSR bears the inherited cost of pensions for World War II veterans, in addition to retirement pay of those who served long enough to retire in peacetime. All such pensions and benefits are buried in general pension funds, hence are not in the estimates of USSR national security expenditures. Even more importantly, USSR conscripts are paid only pittances. If not conscripted, they presumably would earn something between the average wage for the economy as a whole and the average wage in USSR industry. At such pay rates, Soviet personnel costs conceptually would be comparable to what they would earn if employed in the economy, even after food, uniforms, and housing costs were deducted. This would add several billion rubles to current Soviet defense expenditures. Adding both pensions and comparable (opportunity cost) pay rates would boost Soviet national security outlays by more than ten percent, which would add about two percentage points to the thirteen to fifteen percent already counted as national security's share of the Soviet GNP.

In Sum

The economic and social costs to the USSR of simultaneously aspiring for "qualitative and quantitative" military superiority over the US and NATO while trying to surpass the US economically are very great. Only beleagured little Israel spends more of its GNP on the military and demands more social sacrifices from its citizens in the name of the common defense. The contrast between the national priorities of the USSR compared to the US and Western Europe are stark now, and will become more so by 1980. If one takes Soviet leaders at face value on this issue, the sacrifices are justified by the payoff in Soviet military security and in the successes of Soviet foreign policy. For the next five years at least, the Soviet leaders are committed to more of the same for the sake of "peaceful coexistence." ■

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down on all the others.

But that is only the beginning of the AWACS story.

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AWACS can command and control the total air effort, including strike, air superiority, support, airlift, reconnaissance and interdiction.

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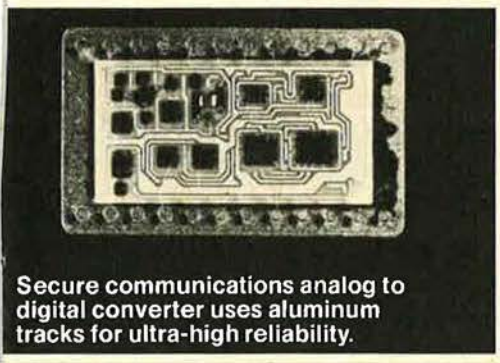
The system is now operating routine target missions at California's Pacific Missile Test Center. Controlling multiple drones with time division multiplex. Handling all-attitude maneuvers. Operating at distances to 250 miles. It has also controlled drones from shipboard installations. And ITCS has never lost a single drone.

Second generations will soon enter fleet certification.

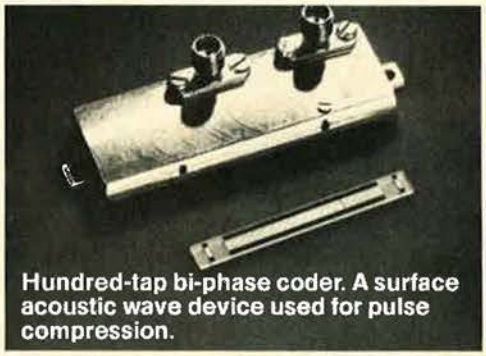
advanced battlefield RPV link.

Motorola combat surveillance drone test during late 1950s.

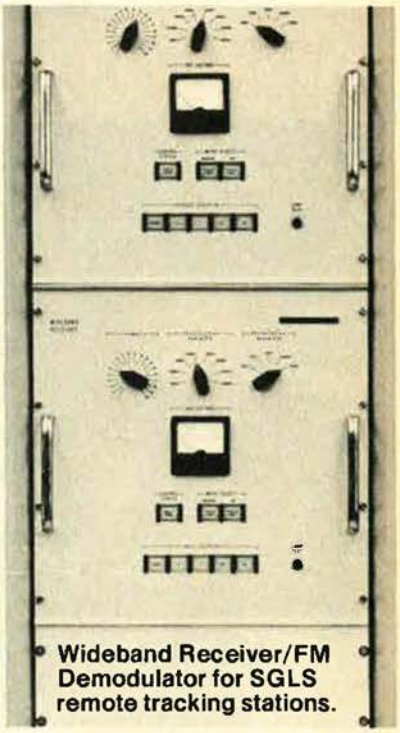
Transversal filter portion of adaptive equalizer compensates for distortion in wideband systems (above 1 gbps).



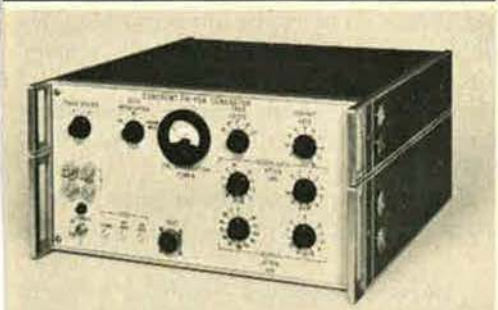
Secure communications analog to digital converter uses aluminum tracks for ultra-high reliability.



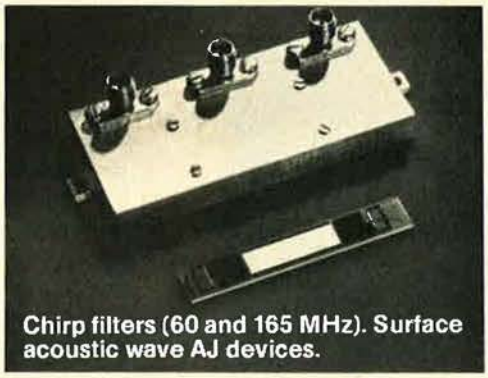
Hundred-tap bi-phase coder. A surface acoustic wave device used for pulse compression.



Wideband Receiver/FM Demodulator for SGLS remote tracking stations.



Unique coherent frequency hopper for simulating variable AJ parameters.



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Soviet Aerospace Almanac

Not since Hitler Germany's war preparations of the 1930s has a major nation at peace devoted such a high percentage of its treasure and manpower to producing weapons and to related science and technology as does the Soviet Union. The puzzling question, in this period of diminished tensions and reduced US defense spending, is why is . . .

THE SOVIET JUGGERNAUT: RACING FASTER THAN EVER

BY EDGAR ULSAMER
SENIOR EDITOR

Defense Secretary Donald H. Rumsfeld disclosed that Soviet investments in military and space R&D result in the USSR "seizing the technological lead or closing the gap" in weapons quality.

SOVIET defense spending over the past decade, according to Secretary of Defense Donald H. Rumsfeld, "has been increasing in real terms, while at the same time US force levels and defense expenditures in real terms have been decreasing. Momentum on the part of the Soviet Union heightens the danger that the US national security posture could lose its deterrent value in the years ahead, unless positive steps are taken now."

Over the past ten years, according to Mr. Rumsfeld, Soviet strategic forces have increased in:

- Intercontinental ballistic missiles, from 224 to about 1,600.
- Sea-launched ballistic missiles (SLBMs), from twenty-nine to 730. (Other estimates place the number of SLBMs as high as 875.)
- Strategic warheads and bombs, from 450 to 2,500 (3,500 by mid-1976 because of new MIRVed systems entering the inventory).

Qualitative improvements, according to the Secretary, include:

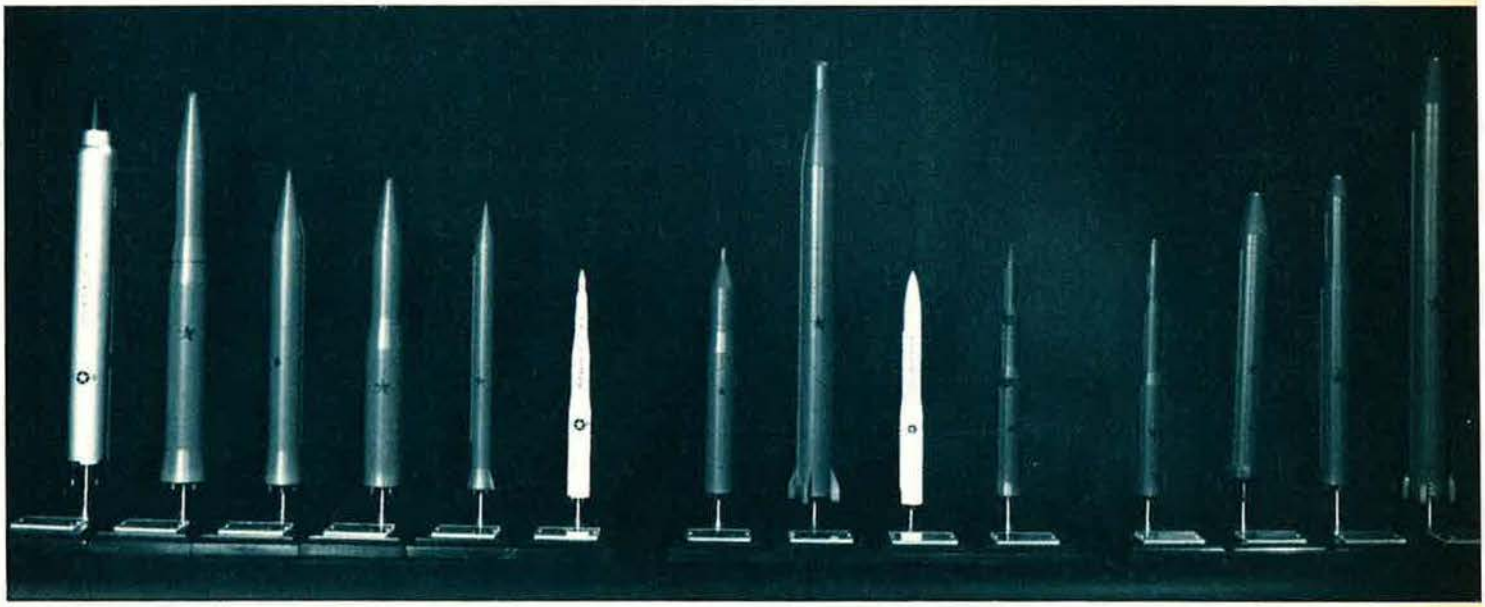
- Four new ICBMs, two of which are now being deployed with multiple independently targetable reentry vehicles (MIRVs).
- A new generation of ballistic missile submarines (SSBNs), one version of which uses a new 4,200-nautical-mile-range SLBM.
- Accuracy improvements that could give Soviet ICBMs a significantly reduced circular error probable (CEP).
- A mobile intermediate-range ballistic missile (IRBM), the SS-X-20.
- Deployment of a fleet of forty SSGN nuclear-powered and twenty-five SSG diesel-powered submarines designed especially to launch "longer range cruise missiles," which, with some range extension, could be used for attacks against "large portions of the US population and industry."
- Production of more than fifty Backfire "B" bombers (with another twenty-five to thirty in the pipeline, according to other sources). Recent assessments continue to show that the Backfire has the capability to strike the United States on intercontinental missions, the Secretary said: "Even without aerial refueling 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 refueling, they could achieve a similar target coverage and still return to their staging bases in the Soviet Union."

In addition to Backfire, Soviet Long-Range Aviation operates some 265 long-range turboprop Bear and turbojet Bison aircraft, 140 of which are configured specifically for use as strategic bombers. Many of the others could be adapted to that mission. About fifty of the

Bison aircraft are being used as aerial tankers but the Soviets could expand that capability by allocating additional Bisons or conversion of the Il-76 Candid jet transport.

• Increasing imbalance in civil-defense posture that "bears directly on our strategic relationship with the Soviets and on the credibility of our deterrent posture." Compulsory CD training now involves "over half" of the Soviet population, there is massive dispersed shelter construction to accommodate the urban population, and the entire effort is now being directed by a Deputy Minister of Defense.

• In the chemical and nuclear warfare environment, the Soviets are increasing both their delivery capability and the ability to protect men and equipment. Secretary Rumsfeld termed Soviet chemical warfare capabilities "particularly worrisome since we do not possess a similar capability. Although the Soviet Union is a signatory of the Geneva Protocol, the USSR currently has an unsurpassed capability to conduct chemical warfare. Highly toxic chemical agents have been developed and standardized. There is considerable information and firm intelligence to support the assessment that the USSR could initiate and sustain large-scale chemical warfare either in a conventional or nuclear conflict."



US Titan ICBM (left) is significantly smaller than the new Soviet monster missile, the SS-18, which can deploy eight MIRVs. SS-19, third from right, has half the throw-weight of the SS-18, carries six MIRVs, yet is not considered a large ICBM under current SALT definitions. Following behind the new Soviet ICBMs is another generation of even more advanced systems, including a yet larger booster and maneuvering RVs.

The Soviet Enigma

Air Force Chief of Staff Gen. David C. Jones points at the enigma involved in the Soviets increasing their military efforts during a period of supposedly reduced tensions: "Soviet defense expenditures are the highest in post-World War II history, and they continue to sustain a substantial real growth rate. If this priority on military spending were fueled by a serious external threat to Soviet security interests, or even a markedly inferior position vis-à-vis the US, the rapid growth of Soviet forces might be viewed with some equanimity. However, the direction and momentum of Soviet spending are far out of proportion to any rational perception of threat or equilibrium. Not since Germany's rearmament in the 1930s has the world witnessed such a single-minded emphasis on military expansion by a major power."

There is no ready explanation for why the Soviet Union, pinched by agricultural shortages, chronically underdeveloped from housing to consumer goods, and with an economic base half the size of this country's, outspends the US in the military sector by about fifty percent. Some analysts suggest the answer lies in the USSR's unchanging, central military credo: To be able to fight any kind of war, under any conditions; and to be able to win not only decisively but with sufficient military force left to remain a viable world power.

Another explanation, anchored in the Soviet emphasis on offensive strategic capabilities coupled with a steadily mounting civil-defense program, dispersal and hardening of industry, and systematic efforts to assure the survivability of the national leadership, must be considered also: The intent to acquire an unambiguous first-strike capability as a means to speed up realization of the Kremlin's dream of global communism.

The four new Soviet ICBMs, once fully deployed, "will confer an ICBM throw-weight advantage of more than four times" the equivalent US capability, according to General Jones. Concurrently, the Soviets are "conducting a more extensive testing to close the qualitative gap which has heretofore helped the US compensate for the Soviet numerical and throw-weight advantages," he added.

Congress' Joint Committee on Atomic Energy recently warned that "the specter of a Soviet first-strike capability with a reserve strike capability may soon be at hand." During the past year, Soviet nuclear-weapon testing intensified "markedly," especially in the multimegaton

SOVIET AIR DEFENSE

Soviet strategic air defense is by far the most massive and expensive in the world, consisting of some 550,000 troops, more than 5,000 radars for early warning and ground control intercept, some 2,600 fighter-interceptors, and almost 12,000 strategic surface-to-air missiles.

The Soviet air defense interceptor force has all-weather capability and can intercept targets at medium or high altitudes. Low intercept capability is limited and lags behind that of USAF. The latter deficiency is being corrected to a degree through the introduction into the inventory of the Su-15 Flagon-E, which is credited by US experts with "a moderately good intercept capability at low altitude." Flagon-E, which entered the interceptor force along with the MiG-25 Foxbat-A in 1975, has new and more powerful turbojet engines to boost both speed and range, as well as advanced air-to-air missiles coupled to upgraded avionics. The aircraft is being equipped with a cannon, presumably to give it a weapon that is less vulnerable to countermeasures.

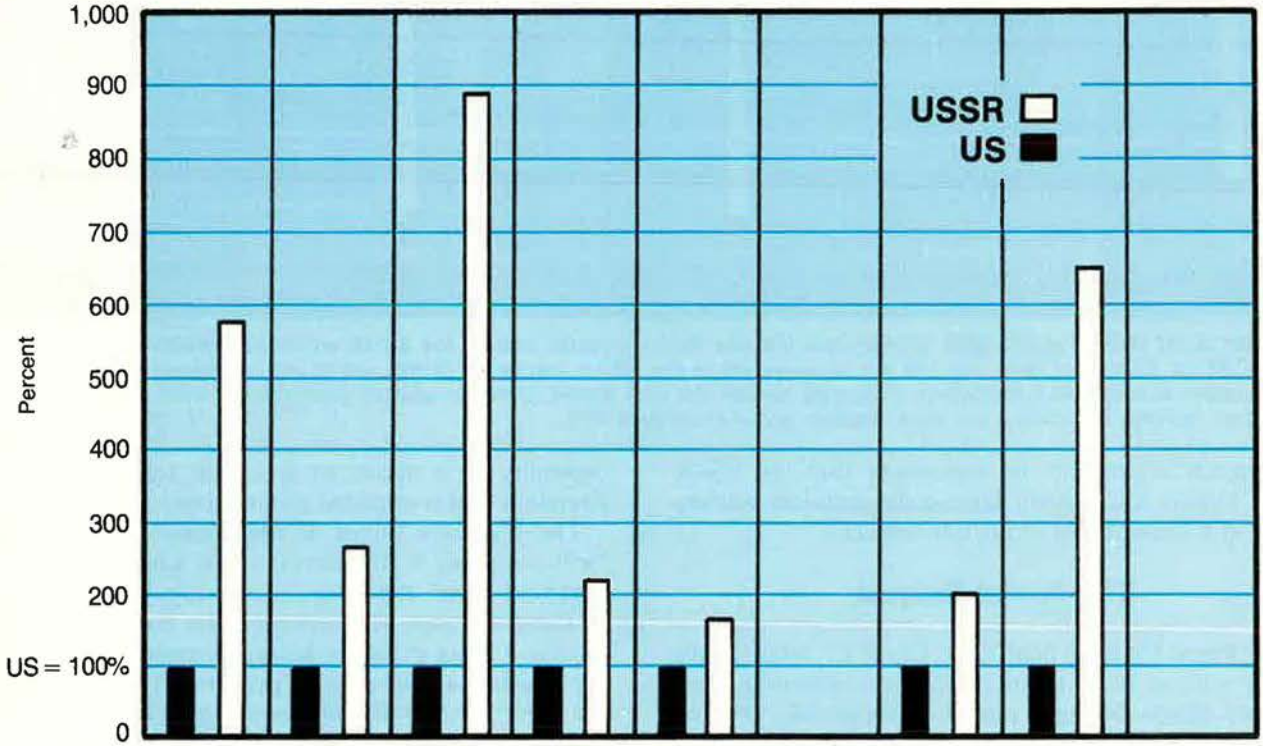
Other aircraft of the Soviet strategic air defense force include MiG-17 Fresco, MiG-19 Farmer-B/E, Su-9 Fishpot-B, Yak-28P Firebar, Tu-128P Fiddler, Su-11 Fishpot, and Su-15 Flagon-A and -D.

category. In light of the Soviet Union's recent ICBM accuracy gains, high-yield warheads seem to make sense mainly as hard-target kill systems and for antiballistic missile defense. (US nuclear testing during 1975 involved only yields in the submegaton range. The possibility of a ban on testing nuclear weapons with yields of more than 150 kilotons going into effect this year may in part account for increased Soviet testing.)

Soviet ICBM development and deployment is in high gear, with a total of about 150 SS-17s, SS-18s, and SS-19s now in place. The annual deployment rate of these new systems is approaching 200. While the SS-17s and -19s are MIRVed, there is as yet no hard evidence that the SS-18 Mod II (up to eight MIRVs observed in tests) has been deployed. The SS-18 Mod I, which *is* deployed, uses a single large warhead. No SS-X-16s appear to be operational as yet in either ground-mobile or fixed-base form, but there are indications that deployment of that mobile weapon is imminent. The SS-X-20, an intermediate-range, MIRVed, ballistic missile that shares components with the SS-X-16, is undergoing extensive testing and can be assumed soon to augment or replace the between 575 and 600 older missiles of this type in the Soviet inventory.

The most puzzling and alarming aspect of Soviet strategic policy is the fact, rarely mentioned by US leaders, that a new, larger family of ICBMs is being developed

US/USSR RELATIVE PRODUCTION RATE ESTIMATES
(AVERAGE 1973-1975)



	Tanks	APC	Artillery	Helicopter	Tactical Aircraft	Bombers	General Purpose	Surface Ships	SSBN
USSR RATE	2,600	3,700	1,400	1,100	950	15	6	39	6
US RATE	450	1,410	156	506	575	0	3	6	0


VINTAGE '76
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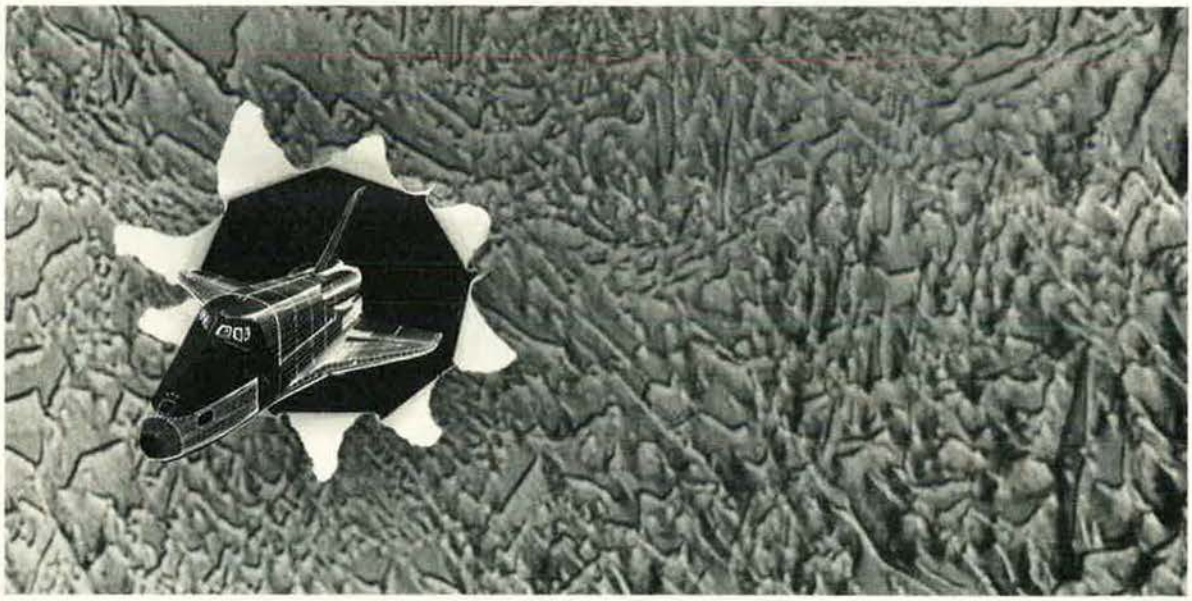
Conversation Pieces

Planning for Breakthroughs in Materials Technology



What can the Space Shuttle and Spacelab programs really be expected to do for technology and, ultimately, for mankind? Well, let's ignore the gee-whiz stuff. Let's stick to practical probabilities, beginning with medical technology.

Manufacturers of serums, vaccines, antibiotics, and other biomedical products, strive constantly for purity. But, on earth, it's very difficult to separate different kinds of living cells. It only takes a tiny minority of unwanted cells to contaminate an almost perfectly purified culture. Minute differences in the electrical charge on each type of cell could be used to achieve significantly better separation if it weren't for gravity. So, suspend your media in zero-g, apply an electrical field and various cells can be withdrawn with the most delicate precision.

Or, suppose you're a metallurgist, interested in alloys; earth's gravity tends to separate the components of many melts as they cool and harden. In zero-g, mixtures tend to stay uniformly mixed. The same goes for cool mixtures of fluids that differ in density. Immiscible on earth, they're easily kept homogeneous in zero-g.

Crystal-growers face similar problems. The benefits that zero-g processing can bring to makers of semiconductors alone are considerable. As for that curious noncrystal, glass, the prospects for optical technology are exciting, to say the least.

One of the greatest attractions of space manufacturing is containerless processing. On earth, even vessels that seem perfectly clean can actually contaminate their contents by reacting at the high temperatures that are essential to many processes. In zero-g, you can contain melts in electrostatic, magnetic, or acoustic fields; power requirements are low yet contaminants are quite easy to keep out.

The combination of zero-g and vacuum, that's available in orbital flight, is expected to facilitate developments in materials technology that range from difficult to impossible on earth. But the breakthroughs, whether they're surprising or reasonably predictable, aren't going to come automatically. It's going to take very careful planning.

At TRW, we have a team of systems engineers working the cost, schedule, and technical tradeoffs right now. They're supported by biologists, chemists, and physicists, who cut their teeth on difficult processing problems. We're working closely with NASA and other government agencies and we're teamed on specific projects with Beckman Instruments, Owens-Illinois, and U.S. Steel. By starting so early and proceeding with care, we hope to help develop new materials that will benefit everybody.

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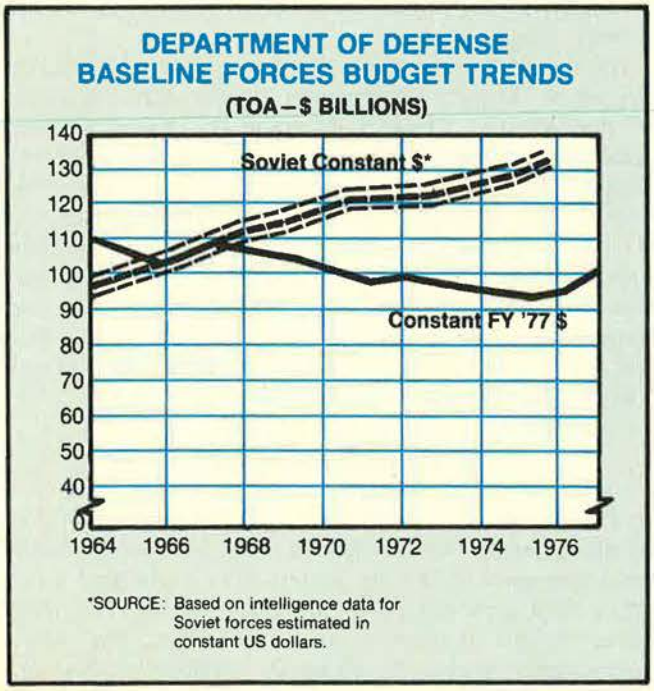
at a vigorous rate. There is evidence that about ten new ICBM systems are under development, in addition to the four large and advanced systems that are presently entering the Soviet inventory. One school of thought

attributes the explosive growth of Soviet ICBM development to the intrinsic inertia of the Soviet bureaucratic process; that is, design teams, once assembled, have to be kept busy. Other analysts don't find this logic compelling and assess the frantic pace of offensive strategic arms development as additional proof for their hypothesis that the USSR is bent on developing total arms



COMPARATIVE STATUS OF US AND SOVIET TECHNOLOGY

(From statement by Malcolm R. Currie, Director of Defense Research and Engineering, to the 94th Congress, February 1976.)

TECHNOLOGY	*STATUS*
High-pressure physics	*USSR leads;* major investment in equipment, investment in programs of intrinsic scientific interest and speculative military applications.
Integrated-circuit fabrication	*US leads.*
Welding	*USSR leads,* with an extensive basic research program leading to many innovations.
Computers	*US leads,* especially in civil, commercial fields.
Titanium fabrication	*USSR has a strong lead.*
High-yield nuclear weapons	*Parity*—USSR has made several unique developments.
High-bypass-ratio turbofans	*US leads.*
High frequency radio-wave propagation	*USSR appears to have a strong lead* in several application areas.
Air-to-air missiles	*US has a strong lead;* no foreseeable USSR counterpart to some systems.
Numerically controlled machine tools	*US leads;* USSR designs around needs.
Avionics	*US has a strong lead* in radars for surveillance, bombing, and air-to-air combat.
Magneto-hydrodynamic power generation	*USSR leads.*
Composite materials	*US leads;* Soviets are making a strong effort to catch up.
Aerodynamics	*Mixed;* US leads in use of computers for design and simulation, but Soviets have developed unusual low-altitude configurations.
Inertial instrumentation	*US leads;* technology is maturing and any significant lead is diminishing.
Antiship missiles	*USSR leads* in deployed systems.
Chemical warfare	*USSR lead* is stable.
Precision-guided weapons	*US leads.*
Satellite-borne sensor technology	*US has strong and increasing lead* in areas where comparisons are possible.
High-energy lasers	*Uncertain;* USSR has large program involving approaches not being pursued by the US.
Artillery technology	*USSR leads* in many areas.

superiority over the US, including an unequivocal first-strike capability.

The Status of Soviet Technology

The relative standing of the USSR and this country in the crucial area of Command Control and Communications (C^3) capabilities is difficult to assess because of incongruities and imponderables. For the time being, the Soviet Union is at a clear disadvantage in computer technology and sophisticated electronics, key to an efficient flexible deterrence posture. This technological lag carries over into C^3 satellites, which depend heavily on technology of this type. The first—and only—Soviet early warning satellite went into operation late last year, years after the three-satellite US system went on line.

But it would be illusory to take comfort in the US lead in this special area. The Soviets lead over the US elsewhere through superior hardening of their rugged and relatively simple C^3 system as well as through far greater survivability of their NCA (National Command Authorities—in the case of the US, the President, Secretary and Deputy Secretary of Defense or their

designated successors). There is evidence of active participation by the Kremlin's top leadership in frequent exercises to assure its survival in case of nuclear war. Perhaps paramount is the makeup of the Soviet C^3 system, which seems to be oriented toward a preemptive all-out strategic posture that requires only relatively simple communications functions.

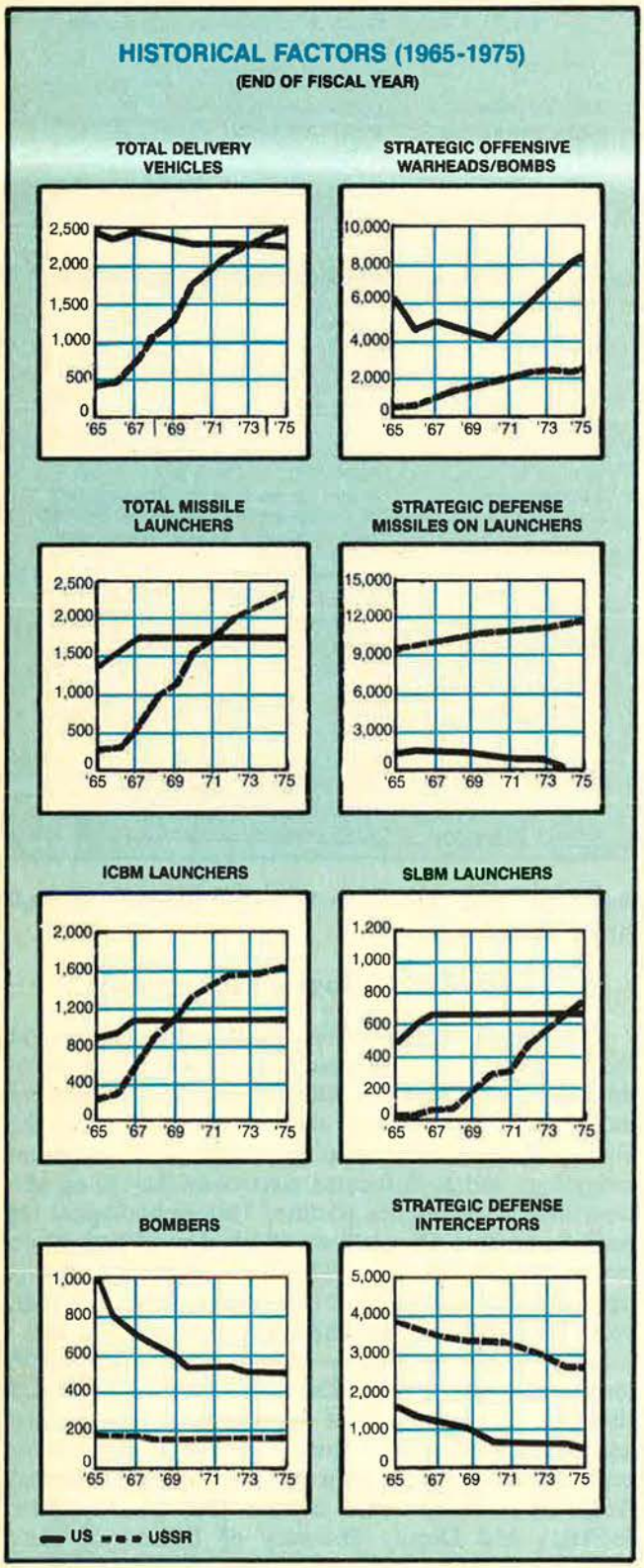
While most Soviet C^3 systems operating in space, or outside of the USSR's network of landlines, appear vulnerable to jamming because of limited spread spectrum and digital technology, Soviet naval communications appear technologically advanced. During the most recent OKEAN global naval exercises, the Soviets showed a sophisticated HF (high-frequency) antenna technology and attendant capability to keep up two-way, worldwide C^3 activities. (Presumably, this system could also serve the Soviet bomber fleet.) There is evidence that the Soviet Union has developed an ELF (extremely low frequency) system needed for attack execution by its SLBM force.

High survivability of the Soviet C^3 system centers on dispersal, redundancy, hardness, concealment, and mobility, including airborne command posts that become especially active during crises. Hardened headquarters have been observed throughout the Soviet Union, Mongolia, and Eastern Europe. The command and control centers for the national leaders of the Soviet government and the armed forces are dispersed within an eighty-mile radius from Moscow and are hardened to an extreme degree.

The USSR's national communications complex consists of extensive networks of cable and open-wire lines, radio-relay links, radio-communications stations, and communication satellites. The number of hardened ground sites associated with this net that extends from Eastern Europe to the Pacific is measured in the thousands. Mobile C^3 platforms include, in addition to airborne command posts, such specialized naval vessels as the *Zhdanov* and *Admiral Senyavin* command cruisers of the *Sverdlov* class.

There is no cause for equanimity regarding other areas of the Soviet strategic effort. The number of Backfire intercontinental bombers either deployed or in the pipeline is between seventy-five and eighty. Soviet advances in antisubmarine warfare (ASW), essential to neutralize the US SLBM force, have been staggering during the past year. Finally, all evidence points to increased Soviet work on laser weapons and other, even more sophisticated weapons of the charged particle beam type, first reported publicly in the pages of AIR FORCE Magazine.

In recent congressional testimony, Adm. Hyman G. Rickover, Deputy Commander of the Naval Systems Command and ERDA's Director for Naval Reactor Development, said that the Soviet Union, coming from behind, has "developed a technology close to our own, and in some cases superior. The Soviet Union leads the United States in areas of technology such as the cruise missile submarine and a 4,200-nautical-mile, submarine-launched ballistic missile. . . . We must confront the implacable fact that not only the quantity but the quality of the Soviet military buildup is continuing at an ominous rate."



Production Capacity

Pointing out that the USSR's submarine force of 335 is almost triple the US total of 118, Admiral Rickover said that since 1968 "the Soviets have introduced more than eight new submarine designs, besides converting older designs to improve their capabilities. They have introduced significantly improved versions of their at-

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The F101-powered B-1 strategic aircraft.

The TF34-powered A-10 close support aircraft.

The F103-powered YC-14
Advanced Medium STOL Transport.

The F103-powered E-4A Advanced Airborne Command Post.

General Electric engines continue to prove they can handle the toughest Air Force assignment.

The B-1, for example, is now successfully airborne. Powered by four advanced-technology F101 augmented turbofans, the B-1 will fly from low-level penetration speeds just under Mach 1 to supersonic speeds at high altitudes. And it will cover a longer mission range with greater survivability and nearly twice the payload of America's current intercontinental bomber.

The A-10, powered by twin GE TF34 high bypass turbofans, is poised to meet its mission requirements, too. The TF34's high thrust-to-weight ratio and low fuel consumption provide the A-10 with unmatched performance capability for its close air support mission. Plus improved short-field takeoffs and landings, exceptional maneuverability and the capability for increased loiter time in the mission area.

Two advanced aircraft are powered by GE's F103 engine. Powering the YC-14 Advanced Medium STOL Transport (AMST), twin F103s will provide that aircraft with outstanding and reliable short-field capabilities plus excellent mission range and payload. Powering the E-4A Advanced Airborne Command Post, four F103 high bypass turbofans give that aircraft the power, reliability and low fuel consumption needed to meet its varied and complex mission objectives.

General Electric engines. Once again, the Task Masters for critical Air Force missions. 205-115

GENERAL ELECTRIC

tack, cruise-missile, and ballistic-missile submarines. In the last seven years they have introduced more new submarine designs than have ever been put to sea, during a comparable period, in all of naval history. The United States, on the other hand, has introduced only two new [designs] in the last fifteen years."

The USSR, according to Admiral Rickover, has the "largest and most modern submarine yards in the world and possesses at least three times the submarine construction capacity of the United States." The yard at Severodvinsk, where most of the Yankee and Delta-class advanced SSBNs are being built, "already has a greater construction capacity than all of the US submarine yards combined."

The total number of Soviet central strategic launch systems, not counting strategic bombers, may already be slightly above the 2,400 ceiling stipulated by the 1974 Vladivostok understanding. Soviet ICBMs deployed at this writing number 1,603, and SLBMs between 700 and 875. The US total is about 2,200 weapon systems, consisting in the main of much older and, in the case of the ICBMs, smaller designs.

Augmenting the purely strategic weapons of the Soviet Union is a Soviet tactical air capability that, according to General Jones, "has improved sharply. Formerly dedicated predominantly to the air defense mission, Soviet tactical aviation has shown a marked shift to an offensive character with the introduction of several new or modernized fighter bombers. Soviet and other Warsaw Pact air forces, already numerically superior to NATO forces, are being supplied with a growing fleet of highly capable tactical aircraft with increased range, speed, and payload." Most of the new aircraft can carry nuclear weapons. This growth in offensive tactical air capability has not led to a diminution in Soviet air defense capability that in terms of manpower "is nearly as large as the entire active US Air Force."

In sum, General Jones warned, "if present US and Soviet trends in total spending in RDT&E, procurement, operations, manpower, etc., are permitted to continue diverging, the US cannot hope to maintain the precarious equilibrium which our technical superiority has so far preserved. Over time, the sheer preponderance of increasing numbers and improved capability of Soviet strategic and general-purpose forces must inevitably tilt the military balance in their favor."

Soviet military manpower in the active-duty force, on the basis of current revisions of the US intelligence community's estimate, stands at between 4,400,000 and 4,700,000. The trained manpower reservoir constituted by reserves and paramilitary organizations is several times that. Vying with the military force strength in long-term importance is the steady increase in scientific and technological manpower. According to Admiral Rickover's testimony, the number of Soviet engineers graduating in 1975 was about 260,000, a number that is expected to increase to more than 280,000 by the early 1980s. This is more than five times the number of US engineering graduates. Ten years from now the Soviets are predicted to have between 750,000 and 850,000 full-time R&D scientists and engineers. Since most of the scientists obtained their degrees since 1950, "youth and boldness could be increasingly evident in future Soviet R&D programs. Because of the pool of

The Case Against Making Haste at SALT

Although the Strategic Arms Limitation Talks and the agreements that have resulted from them have not caused the Soviets to slow down the development and deployment of strategic weapons or the growth of military capabilities in general, the possibility that future accords indeed may do so must not be ruled out. Of itself, that would seem to justify continued, cautious US participation in the present round of SALT.

The case for SALT gains further from a consideration of *realpolitik:* China's antipathy toward US-Soviet détente seems to center on SALT, thus supporting the assumption that continuing the talks will help deter a Sino-Soviet rapprochement. (The rift between the two Communist world powers is of major importance to this country's defense posture. The Defense Department's FY '77 budget request seeks to maintain an essential equivalence with Soviet general-purpose forces *excluding* those that are pinned down along the Sino-Soviet border. Defense Department officials concede that freeing those Soviet forces would upset equivalence; a full reconciliation of the two Communist powers to the point where they might engage in military cooperation would lead to devastating disparity.)

But potential benefits that might accrue to this country from continuing SALT negotiations do not justify rushing into an accord in an election year (and a Party Congress year in the USSR), especially if that were to mean repeating or compounding the US negotiating errors now embodied in SALT I and the preliminary agreement for SALT II, reached at Vladivostok in 1974.

Oversimplified, the weakness of these agreements can be summed up in the term "breakout potential." That potential derives principally from the throw-weight advantage we have accorded the USSR. It gives them a starting position from which they could outdistance the US rapidly and decisively if the agreements were abrogated or not renewed on expiration.

To a lesser degree, the currently intimated resolution of the Backfire/Cruise Missile controversy, which bears on the throw-weight imbalance, is an element of breakout potential. Limiting the range of cruise missiles below present technological capabilities does not penalize the USSR as much as it does the US, because of differences in geography and target systems of the two countries. Permitting the Soviets to deploy some or all Backfire strategic bombers without counting them against the total of central launch systems also would be detrimental since the US advantage in strategic bomber strength partially offsets the Soviet ICBM throw-weight lead.

Historic precedent supports the assertion that arms accords entered into by the US under the pressures of a "political deadline" turn out to be disadvantageous. Even in the context of partisan politics, the advantages of frantically seeking an accord that probably could not be consummated until the next administration takes office, and which stands every chance of being attacked by almost all candidates except the incumbent, are questionable. The solid Soviet grasp of the US election process makes it unlikely that the USSR will get to the "bottom line" of a new accord before the primaries and the elections are over in this country, yet concessions made in haste to create the impression of progress at SALT would be hard to get off the books in subsequent negotiations. US haste at SALT, then, may make hay for the negotiator but harm the national interest.

engineering manpower available to them, Soviet . . . capability to undertake a wider range of increasingly complex military development programs will be enhanced," according to Admiral Rickover.

Overall US technological leadership, according to Secretary Rumsfeld, is "as directly challenged by the Soviet Union as is our military capability. During the past decade, Soviet investment in military and space R&D appears to have at least equaled our own; now it is growing at a more rapid rate. The Soviets have been producing and deploying large quantities of advanced weapons, seizing the technological lead or closing the gap in almost every class of weapon."

MAJOR WEAPONS AND EQUIPMENT —GROUND FORCES
(Jan 1976)

	US	USSR
Tanks	9,000	42,000
APC & Fighting Vehicles	22,000	35–40,000
Artillery	6,000	15–20,000
Heavy Mortars	3,000	5–10,000
Helicopters	9,000	2,500

The US/USSR Production Balance

Possibly the most telling evidence of the Soviet drive toward comprehensive military superiority is the accelerating rate of weapons production across the board. Recent average annual production figures include:

- 2,600 Soviet vs. 450 US tanks.
- 950 Soviet vs. 575 US tactical aircraft. (According to RAF Air Chief Marshal Sir Andrew Humphrey, the Soviet Union produces about 1,700 military aircraft annually, of which more than 700 are high-performance combat aircraft.)
- 1,400 Soviet vs. 156 US artillery pieces.
- 1,100 Soviet vs. 506 US helicopters.
- 3,700 Soviet vs. 1,410 US armored personnel carriers.
- At least fifteen long-range bombers and six SSBNs vs. none for the US in either category.

Soviet Intelligence Activities

Soviet military R&D over the past twenty years has grown at a steady rate of about five percent annually. The growth rate in Soviet intelligence activities is harder to assess but probably has kept pace with and fed Soviet R&D growth. "The scope of Soviet intelligence collection in this country has widened enormously in recent years," according to Admiral Rickover. FBI Director Clarence M. Kelley has said that the number of accredited Soviet representatives in Washington tripled over "the past few years" and stands at about 2,000. The number of visitors from the Soviet Union to the United States now is about 50,000 annually, and "some of them presumably are affiliated with the KGB."

In congressional testimony, Admiral Rickover asserted that "overt intelligence collection is made highly profitable in the United States because unclassified printed materials available in the public domain contain an incredible amount of information on the size and composition of the US military establishment. . . . Unclassified documents sold by the Department of Commerce National Technical Information Service [NTIS], one of the many open channels of information in the United States, provide significant amounts of data of value to the Soviets."

The Chairman of the Joint Chiefs of Staff, Gen. George S. Brown, terms the Soviet espionage apparatus "the most extensive human intelligence system in the world." It operates through GRU (Soviet Chief Intelligence Directorate) "on land, sea, and air [utilizing] modern electronic and optical techniques." General Brown considers the enormous Soviet intelligence effort an increasing threat to US military forces. In his judgment, the Soviet lead in intelligence "is an important factor in the military balance even though it cannot be measured directly in terms of divisions, ships, and airplanes."

The ultimate lesson to US defense planners of relentless, constant Soviet military growth was summed up incisively in a recent statement by Lt. Gen. John W. Pauly, USAF's Deputy Chief of Staff for Plans and Operations: "The current Soviet leadership grew up with and fought for the realization of their current power. In many respects, their prewar policies have tended to preserve that power. . . . However, waiting in the wings is a new young group [fifty-year-olds] of Soviet leaders who didn't fight for this power but simply inherited it. They may well wish to exploit it—both politically and militarily—to test the waters of Western resolve. A major aspect of our future national strategy to control Soviet expansionism will be to confront them with clear and unmistakable risks, whatever the nature of the challenge, so that they conclude the game is not worth the candle. This is where the military and defense come in."

General Pauly's statement should be amended to include the US Congress, whose actions on this year's and next year's defense budgets will determine whether Western resolve will remain credible or not. ■

ARMED FORCES PERSONNEL
(MILLIONS)
(Jan 1976)

		US	USSR
Active		2.1	4.4
Reserve*		1.8	6.8
	Total	3.9	11.2

* Includes Army National Guard and Air National Guard, but excludes retired reserves.

Shown here are the approximate locations of airfields with at least one runway 4,000 feet or more in length, and highway landing strips that can accommodate military aircraft. Fields in the USSR and the other Warsaw Pact countries are marked in red; those of the NATO countries in blue. Airfields in France are not shown since their availability in time of crisis is uncertain. Austria, Sweden, and Switzerland, neutral countries, have been excluded, as has Yugoslavia, which is not a member of the Warsaw Pact.

Military, civilian, and joint-use fields are shown. It is likely

that all civilian fields in the western parts of the Pact area and many of those in the USSR have at least minimum provisions for military use.

In addition to the airfields shown, there are many sod strips in the Pact countries from which military jets operate frequently.

Air fields

Warsaw Pact countries

NATO Countries

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The Soviet Navy's land-based aircraft and sea-based helicopters are becoming an increasingly potent force in the sea-control mission. The addition of new carriers capable of handling V/STOL fighters enhances that capability and will contribute significantly to the USSR's ability to project a military presence on a global scale.

SOVIET NAVAL AVIATION

BY NORMAN POLMAR

SOVIET Naval Aviation is one of the Red Navy's two major striking forces, the other being Soviet submarines armed with antiship missiles. Although the Soviet surface fleet has a large number of missile-armed warships, aircraft and submarine missiles pose the greatest threat to Western maritime interests.

Completion of the first Soviet aircraft carrier in 1976 will mark the start of a new threat from Soviet surface forces because of the ship's ability to concentrate a significant number of high-performance V/STOL aircraft in a remote area. The previous absence of fixed-wing aircraft at sea has been the major difference between the Soviet fleet and the carrier-led fleets of the United States, France, and Great Britain.

Today Soviet Naval Aviation—*Morskaya Aviatsiya*—has about 50,000 personnel and operates just over 1,200 aircraft. This is a greater strength than the entire Royal Air Force if one discounts British training aircraft, but considerably less than US Navy air strength of 7,400 aircraft. (The Soviet Navy relies on the Red Air Forces for most training requirements.)

In the mid-1950s, the Red Navy had some 4,000 aircraft. A decline to its present strength would seem to indicate a diminution of Soviet naval air prestige and capability, but in fact the Soviet Navy, and especially Naval Aviation, today enjoys a major position in the allocation of Soviet resources.

The aircraft carrier *Kiev* at almost 40,000 tons displacement is the largest ship ever built in the Soviet Union; a sister carrier named *Minsk* as well as a third ship of this type are under construction. These ships, packed with sophisticated electronic and weapon sys-

During a training exercise, Ka–25 Hormones land on the ASW helicopter carrier Moskva.

tems, represent a considerable investment of resources. Similarly, several new aircraft types are joining naval air squadrons. Although the current Commander of *Morskaya Aviatsiya* is a general colonel, his predecessor, I. I. Borzov, held the rank of marshal of aviation at the time of his death in June 1974. The head of Naval Aviation was thus senior in grade to all officers of the Soviet Air Forces except the Commander in Chief, Chief Marshal of Aviation P. S. Kutakhov.

Antiship Strike

The combat roles of *Morskaya Aviatsiya* can be addressed in the context of antiship strike, reconnaissance and missile guidance, and antisubmarine warfare.

Beginning shortly after World War II, when the US Navy was predominant on the oceans, Stalin ordered construction of a large conventional fleet, including aircraft carriers. On his death, in March 1953, most of this ambitious program was halted. His successors sought to end the "waste" of resources on surface warships. Instead, the Red Navy was to emphasize land-based aircraft, submarines, and coastal craft.

A Soviet Tu–16 Badger bomber, which has a potent antiship capability, over the British aircraft carrier Ark Royal.

However, the land-based level bombers then sought by the Soviet Navy were of limited value against the US Fleet. Soviet writings demonstrate their awareness that not a single carrier or battleship at sea was sunk by level bombing during the 1939–45 conflicts. In seeking new ways of countering the massive US Fleet, the Soviet Navy, as part of the "revolution in military affairs" of the mid-1950s, began the intensive development of antiship missiles. According to Admiral of the Fleet of the Soviet Union S. G. Gorshkov, head of the Red Navy since 1956, "the course taken was one which required the construction of an ocean-going fleet. . . . Submarines and Naval Aviation, equipped with nuclear weapons, had a leading place in the program."

Admiral Gorshkov's rank is equal to that of Marshal of the Soviet Union; he is thus equal in rank to the Commander in Chief of National Air Defense Forces and senior to the CINCs of the Strategic Rocket Forces, Ground Forces, and Air Forces.

Beginning in the late 1950s, Soviet aircraft were armed with a turbojet antiship missile designated the AS-1 Kennel by the US and NATO. Resembling a scaled-down MiG fighter, a bomber could carry two of these missiles with a standoff range of sixty miles from the target ship. In the early 1960s, large numbers of Tu-16 Badger medium bombers were transferred to *Morskaya Aviatsiya.* These aircraft, with Kennel and then later antiship missiles, joined missile-armed submarines as the primary striking force of the Soviet Navy.

Today, the Navy flies some 290 Badger-C and Badger-G aircraft armed with antiship missiles, probably the 100-mile-plus AS-2 Kipper, 100-mile-plus AS-5 Kelt, and the new AS-6. These aircraft have a potent antiship capability against naval forces operating within range of Soviet airfields. Their tactical radius is nominally 1,500 to 2,000 miles with an air-to-surface missile (ASM), but could be extended by overseas basing and in-flight refueling.

The missile-carrying Tupelov Backfire bomber, believed to have entered service with *Morskaya Aviatsiya* in 1975, has a combat radius estimated at 2,750 to 3,500 miles, significantly extending the ocean areas vulnerable to Soviet naval air attack.

(American intelligence analysts also credit Long-Range Aviation (LRA) Bear-B and -C bombers with AS-3 missiles, and Blinder-B aircraft with AS-4 missiles as having some antiship capabilities. LRA aircraft have participated in antiship exercises, apparently under Navy operational control.)

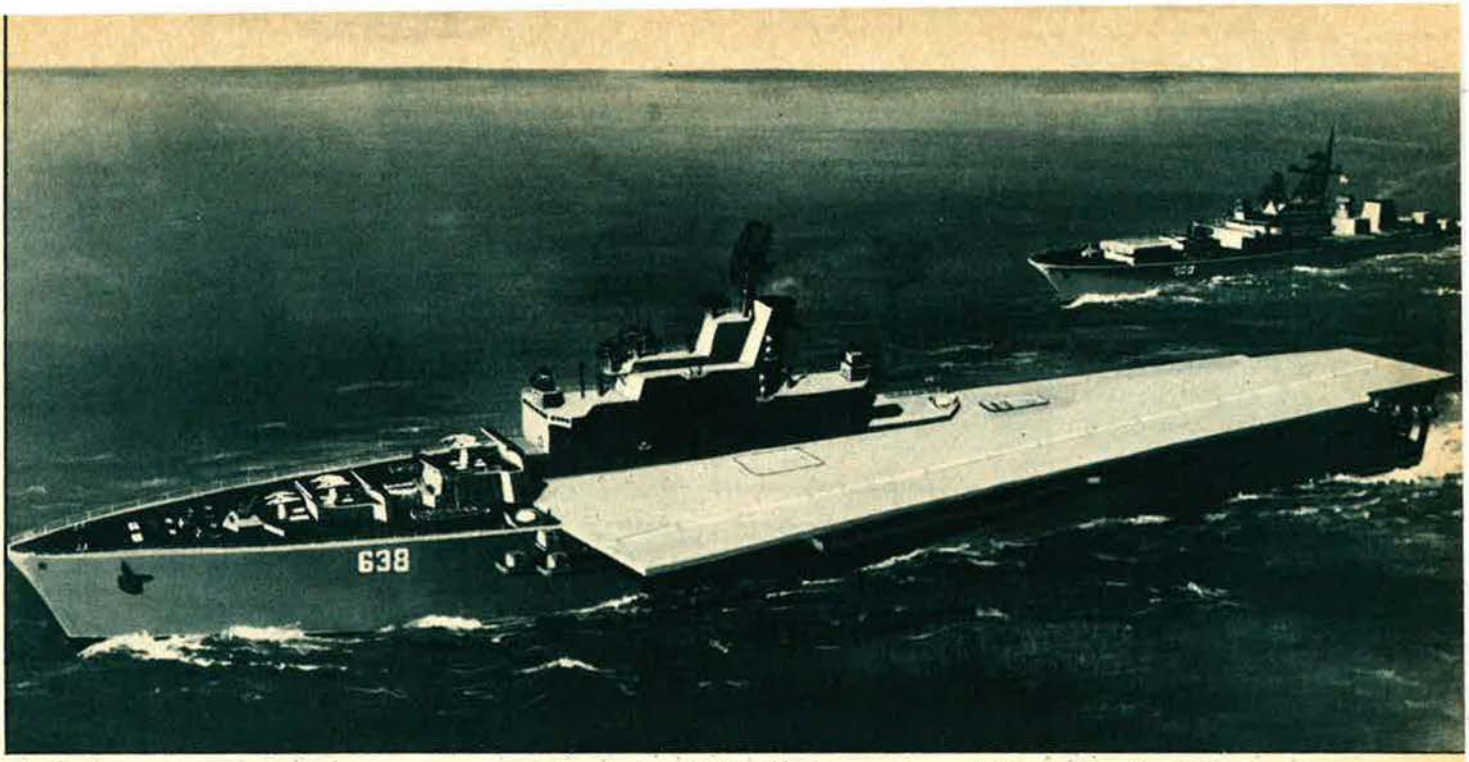
During the Soviet Navy's periodic maneuvers, antiship bomber strikes are flown in close coordination with simulated missile launches from surface ships and submarines. The Soviet Navy has demonstrated the ability to carry out simultaneous air strikes against target ships in the North Atlantic and Western Pacific.

In addition to some 290 missile-armed Badgers, Soviet Naval Aviation flies several Badger-A aircraft in the gravity bombing and advanced trainer roles, and some fifty Tu-22 Blinder-A bombers in the strike role. The Blinder has been rated by US Navy intelligence as "unsuccessful" in the naval strike role, although LRA has a number of Blinder-B aircraft carrying AS-5 Kelt missiles as well as bomb-carrying Blinders.

Also capable of striking enemy ships are a score of Il-28 Beagle light bombers that apparently can be employed in torpedo attacks. These planes are believed to be used mainly for training, but could be used in attacks against merchant ships and possibly lightly armed warships.

Supporting the missile-armed strike aircraft are a few Navy-flown Badgers configured for in-flight refueling. LRA tanker aircraft have also conducted in-flight fuelings of naval aircraft, again demonstrating the high degree of interservice cooperation and the high priorities assigned to some maritime missions.

Another aircraft used in Soviet Naval Aviation's strike operations is a twin-jet Tu-16 Badger variant fitted for electronic reconnaissance and countermeasures Apparently these aircraft, with advanced electronics,



Artist's concept of Soviet V/STOL carrier Kiev *shows design characteristics: guided-missile batteries forward, canted carrier deck aft. In background, a* Krivak-*class guided-missile destroyer.*

would support missile-armed planes in attacks against sophisticated targets.

Reconnaissance and Missile Guidance

Key elements in potential Soviet operations against Western warships and merchantmen are reconnaissance and missile guidance. There are about 100 Soviet naval aircraft configured for these missions. About half are large, turboprop Bear-D aircraft with a range of about 8,000 miles, and half are Badger-Ds. *(See "Gallery of Soviet Aerospace Weapons," pp. 93–107, for detailed descriptions of Soviet aircraft.)* These aircraft use electronic sensors and visual observation to detect surface ships. They can provide the location of enemy ships to strike forces and some, if not all, have the equipment to guide antiship missiles launched by surface ships, submarines, and other aircraft.

Although the large, Bison-C variant of the Mya-4 turbojet bomber has been used for maritime reconnaissance in the past, US Navy sources indicate that this plane is no longer flown by Soviet Naval Aviation. The Soviet Union now seeks to use satellites to detect ships at sea; however, the reconnaissance and weapons-guidance capabilities of the Bears and Badgers flown by Soviet Naval Aviation will be needed for the foreseeable future.

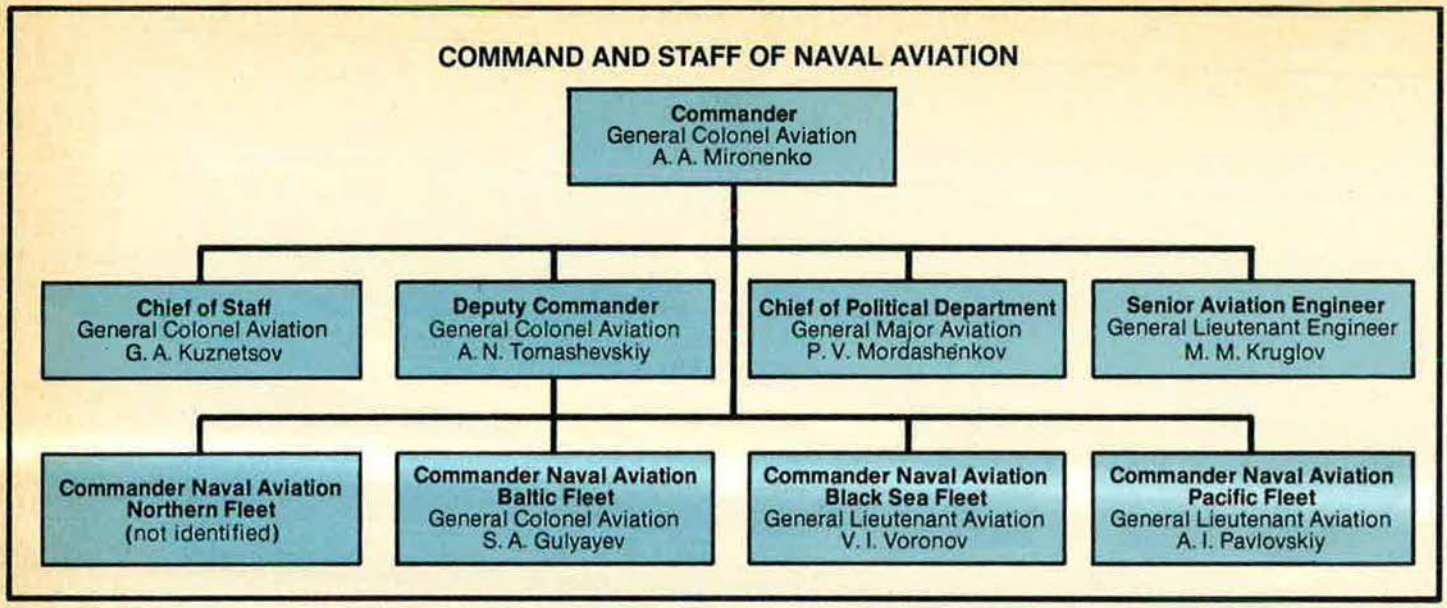
The author, Norman Polmar, is an analyst specializing in aviation and maritime matters. He has written a number of books on these subjects, the most recent being the World Combat Aircraft Directory *(London: Macdonald & Jane's, 1975; to be published soon in the United States by Doubleday & Co.). He also is editor of the United States sections of the annual* Jane's Fighting Ships. *Mr. Polmar has written many articles and participated in several studies related to Soviet naval activities, and has visited the USSR as a guest of the Soviet Navy and of the Soviet Institute of US Studies.*

The naval Bears, like other Soviet land-based aircraft, normally operate from airfields in the USSR. From 1970 onward, Bear-Ds have flown periodically from Cuba, some making flights along the US Atlantic coast, and from 1973 onward from Guinea in western Africa. These flights permit reconnaissance over much of the North Atlantic. Bear-Ds have also operated over the Indian Ocean, apparently overflying Iran en route. It is not known if they have used airfields in Aden or Somalia, but the use of bases in those Indian Ocean states by other Soviet naval aircraft makes Bear-D operations probable. Other Bear-D recce aircraft have operated over the Western Pacific from bases in Soviet Siberia. The smaller Badgers are generally used to keep track of Western warships closer to Eurasian shores. Badgers generally attempt to keep track of major ships of the US Sixth Fleet in the Mediterranean.

Soviet Naval Aviation also appears to have a few An-12 turboprop transport aircraft for electronic reconnaissance. This plane, designated Cub-C by NATO, has been observed over the Norwegian Sea, the eastern Mediterranean, and western Indian Ocean.

The Tu-126 (née Tu-114) Moss aircraft, presumably employed by the Soviets in the Airborne Warning and Control System (AWACS) role, has frequently operated over water. These flights may have had some maritime reconnaissance intent, but the aircraft do not appear to belong to *Morskaya Aviatsiya.*

The incidents-at-sea agreements between the United States and Soviet Union have to some extent restricted reconnaissance overflights of US ships. In the past, some have been low and close, almost creating international incidents, if not accidents. In May 1968, a Badger streaked low over the US carrier *Essex* in the Norwegian Sea and, in turning, struck the water with a



wingtip, crashed, and exploded. There were no survivors. The carrier was not damaged.

Antisubmarine Warfare

The Soviet Union, primarily a land power, has traditionally had only limited need for ocean shipping. That situation is changing. Since the early 1960s, the USSR has maintained a flow of Soviet-flag and Bloc merchant shipping to Cuba. The Vietnam War saw merchant ships carrying most of the material transported from the USSR to North Vietnam; and the Soviet politico-economic interests in Asia, Africa, and South America have further increased Soviet use of the sea and hence vulnerability to US submarines. Thus, there has been an increasing Soviet interest in antisubmarine warfare (ASW) for protecting its shipping.

But far more significant, since the deployment of the first Polaris missile submarine in late 1961, US submarines have threatened the Soviet homeland with submarine-launched ballistic missiles (SLBMs). The Polaris represented an entirely new type of threat because of the relatively short launching and flight times of its SLBMs compared with manned bombers or the early ICBMs based in the United States, and because of the impossibility of pretargeting a moving submarine.

The Soviet approach to ASW has been far different than that of the US Navy. However, there have been some similarities in ASW aircraft development. Soviet Naval Aviation's long-range maritime reconnaissance/ASW force is made up of about seventy-five Be-12 Mail flying boats, an estimated thirty to fifty Il-38 Mays, and a few ASW variants of the Bear. These aircraft appear to be used over the coastal seas of the Soviet Union and such nearby seas as the Mediterranean. Although some have been flown from Egypt with Egyptian markings, they generally do not operate from distant bases as do US Navy maritime patrol squadrons. Thus, the land-based Soviet naval aircraft cannot be considered effective counters to US Polaris/Poseidon submarines operating at their maximum missile range of about 2,500 nautical miles. The Trident I missile submarines, with a range of about 4,000 miles, should begin entering the US fleet in the late 1970s and will further reduce Soviet land-based air ASW effectiveness.

In addition to radar, magnetic, and optical detection equipment, Soviet aircraft can drop expendable sono-

Soviet Naval Aviation

several	Tu-16	Badger-A	bomber-trainer
290	Tu-16	Badger-C/G	bomber (ASM)
50	Tu-22	Blinder-A	bomber
few		Backfire	bomber (ASM)
20	Il-28	Beagle	attack-trainer
50	Tu-16	Badger-D	reconnaissance
50	Tu-95	Bear-D	reconnaissance
few	An-12	Cub-C	reconnaissance (ECM)
75	Be-12	Mail	maritime patrol/ASW
30–50	Il-38	May	maritime patrol/ASW
few	Tu-95	Bear-F	maritime patrol
several	Tu-16	Badger	ECM
75+	Tu-16	Badger	tankers
160	Ka-25	Hormone-A	helicopter-reconnaissance
	Ka-25	Hormone-B	helicopter-ASW
50	Mi-4	Hound	helicopter-ASW
few	Mi-8	Hip	helicopter-minesweeper

Approximately 300 transport, training, and utility aircraft also are operated by Soviet Naval Aviation.

—From Norman Polmar, *World Combat Aircraft Directory* (London: Macdonald & Jane's; New York: Doubleday & Co.).

buoys to radio data to aircraft whose onboard computers perform tactical calculations.

For shipboard ASW, the Soviet Navy operates the turboshaft Ka-25 Hormone-A helicopter. This is an "ugly" bird with the tandem rotors distinctive to Kamov designs. Developed specifically for shipboard operation, it has chin-mounted radar, dipping sonar, and can drop sonobuoys. An internal weapons bay holds torpedoes or depth charges.

The Hormone initially went to sea in 1967, with the "B" configuration, carrying missile guidance gear, flying from missile cruisers and the "A" configuration from the antisubmarine carrier *Moskva.* Apparently only the four *Kresta-I* missile cruisers armed with the long-range Shaddock antiship missile, having an operational range up to about 350 miles, carry the Hormone-B for over-the-horizon targeting. Subsequently, more than a dozen cruisers armed with shorter-range antiship missiles have been built with hangars and landing decks to operate the ASW version of the Hormone.

More significant in antisubmarine warfare are the helicopter carriers *Moskva,* completed in 1967, and the *Leningrad,* finished about two years later. These ships have an unusual configuration, being missile cruisers forward and helicopter carriers aft. The ships are laden with electronic equipment, antiaircraft and antisubmarine missile launchers, guns, and torpedo tubes. Their design is unique and indigenous.

The *Moskva* and *Leningrad* were developed to counter US Polaris submarine operations. As noted earlier, to target Moscow with the initial 1,200-nautical-mile A-1 missile the submarines would have extremely limited operating areas in the Norwegian Sea or Barents Sea. Thus, the ability of a *Moskva*-class ship to concentrate fifteen to twenty helicopters was considered an effective counter to the restricted mobility of submarines with the A-1 missile. However, in mid-1962 the 1,500-mile A-2 missile became operational, followed in 1964 with the 2,500-mile A-3. These long-range missiles gave US strategic submarines sufficiently large operating areas that the *Moskvas* are not a significant threat. No more of this type emerged from the sprawling Nikolayev shipyard complex near the Black Sea.

From September 1968 onward, the two *Moskva*-class ships have periodically operated in the Mediterranean, in an antisubmarine role and to provide political presence. Periodically, they have operated in the Atlantic and the Barents Sea, and in 1974 the *Leningrad* operated in the Red Sea, flying Mi-8 Hip helicopters to sweep mines from the southern end of the Suez Canal. (At the same time, the US Navy was sweeping the canal, using RH-53 Sea Stallions from a helicopter carrier.) These Soviet ships also are capable of an amphibious role. The Soviets are well aware of the potential effectiveness of a few hundred marines landed in the right place at the right time.

Soviet ASW helicopter carrier Leningrad. *Note two Hip minesweeping helicopters on flight deck. They are too large to use shipboard aircraft elevators.*

Soviet Aircraft Carriers

While the intended missions of the *Moskva* and *Leningrad* are obvious, there is much speculation on the roles of the larger carrier *Kiev* and her sister ships. The *Kiev,* some 900 feet long and displacing an estimated 40,000 tons, is also a missile cruiser forward with multiple antiaircraft and antisubmarine weapons. However, the "island" superstructure is offset to starboard, and there is an angled flight deck some 600 feet long. The ship does not have either the catapults or arresting gear of Western fixed-wing aircraft carriers. Rather, she will operate helicopters and V/STOL aircraft, including presumably the Yak-36 Freehand.

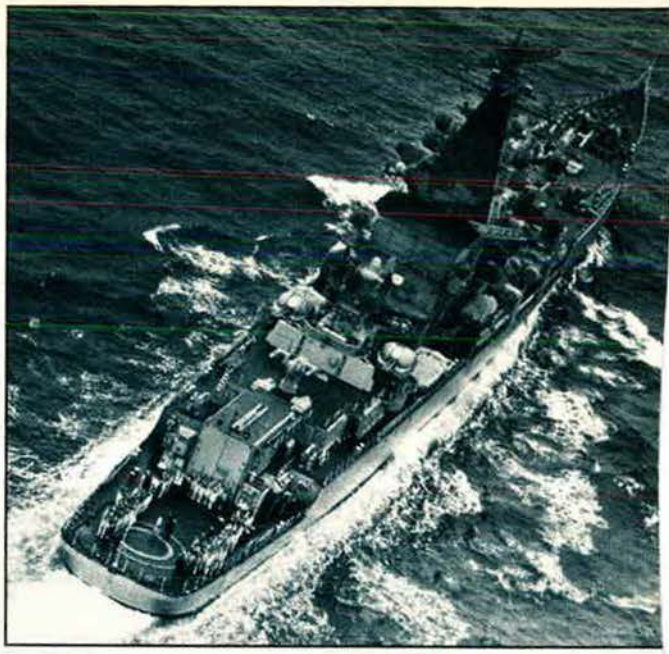
Although the *Kiev* could not stand up against a modern US carrier with the latter's squadrons of high-

performance fighters and attack planes, the Yak-36s and later V/STOLs could have a field day against reconnaissance planes and low-performance combat aircraft in those areas where airfields or carriers are not available to the West, or they could be used in a strike or close air support role. The number of US overseas land bases has been dramatically reduced over the past few years, and the number of US aircraft carriers has declined from twenty-four to thirteen over the past decade.

At this writing, the *Kiev* has not yet operated beyond the Black Sea, nor have Western or Soviet sources released photographs showing aircraft on her deck. However, US officials estimate the *Kiev* could operate either twenty-five V/STOLS of the Yak-36 type or thirty-five to forty helicopters. Some thirty-five of the two types are predicted as the probable "mix" for the *Kiev*.

Estimates are less exact on numbers of *Kiev*-type ships the Soviets can be expected to build. The yard at Nikolayev, where *Kiev* was built, could produce carriers at intervals of about three years. There is at least one additional yard that could immediately undertake the construction of sophisticated warships of that size.

Adm. E. R. Zumwalt, Jr., the US Chief of Naval Operations from 1970 to 1974, has stated: "In my judgment they are going to build a larger number [of *Kiev*-type ships] than the combined number of our carriers, plus sea control ships." That number would indicate a Soviet force of at least twenty carriers. (Significantly, the eight planned US sea control ships, essentially small V/STOL carriers, will not now be built; a more capable but later V/STOL Support Ship is being proposed by the Navy.)



Kresta I *guided-missile cruiser, the first Soviet warship equipped with helicopter hangar, initially went to sea in 1967.*

Naval Aviation Leadership

Soviet Naval Aviation is fully integrated into the Soviet fleet structure. *(See organization chart, p. 72.)*

At the Navy headquarters level, there is the Commander Naval Aviation, currently General Colonel A. A. Mironenko. (Naval Aviation, as other specialized components of the Soviet Navy, uses "military" rather than "naval" ranks.) The fifty-eight-year-old Mironenko, a fighter pilot, became Commander of Soviet Naval Aviation in 1974, having previously served briefly as Chief of Staff, and before that Commander Naval Aviation of the Black Sea Fleet from 1956 to 1971. His long assignment

US Navy F-4 Phantoms shadow a Soviet Tu-95 Bear over the US carrier Kitty Hawk. *Such overflights have become routine.*

with that fleet made him a key figure in the development and operation of the *Moskva*-class helicopter carriers.

Mironenko replaced Marshal of Aviation I. I. Borzov, who commanded Soviet Naval Aviation from May 1962 until his death in June 1974. Borzov, who had been First Deputy Commander of Naval Aviation from 1957 to 1962, was the master architect of the modern Soviet naval air arm. His tours in the two top naval air assignments correspond with the tenure of Admiral Gorshkov as Commander in Chief of the Navy, during which the Red Fleet underwent its transition to one that now can challenge the US Navy.

The Red Navy's aircraft, except for a few training, support, and transport aircraft, are apportioned among the four fleets—Northern, Baltic, Black Sea, and Pacific. Each fleet commander appears to have direct control of his air assets, with a general colonel or general lieutenant commanding the fleet aviation component. A fleet aviation command, like many other Soviet commands, is a long-term assignment. Kuznetsov was air commander in the Northern Fleet from 1966 to 1975. Gulayev has commanded in the Baltic since 1961; Voronov in the Black Sea and Pavlovskiy in the Pacific since 1971.

The composition of a fleet's air arm is classified; however, the Northern and Pacific fleets obviously have most if not all long-range Bear reconnaissance aircraft because of their open-ocean missions. The Baltic Fleet is configured to fight in that enclosed area, while the Black Sea Fleet primarily provides ships and aircraft for Mediterranean operations. Although most Soviet ships in the Indian Ocean come from the Pacific Fleet, land-based air support is provided from the Black Sea Fleet. The helicopter carriers *Moskva* and *Leningrad,* and at least initially the carrier *Kiev,* are assigned to the Black Sea Fleet.

The dramatic increase in Soviet naval operations beyond coastal regions during the past decade has demonstrated a rapid increase in proficiency of most Red Navy components. The Navy's dependence on the Red Air Forces for training and probably other services can be expected to continue. So can the high rate of modernization of Soviet Naval Aviation, currently manifested in the deliveries of the Backfire strike aircraft, Il-38 May patrol/ASW aircraft, and possibly the Yak-36 Freehand V/STOL. In the near future, a new helicopter can be expected to appear for use aboard the *Kiev* and the growing number of Soviet missile cruisers.

The anticipated retirement of Admiral Gorshkov in the near future (he is now seventy-six and in his twentieth year as Navy CINC) may have an adverse impact on the Navy's rate of growth. Similarly, the predicted retirement of Party Chairman L. I. Brezhnev, who saw action with Soviet marines in World War II and was political chief of the Navy in the 1950s, could result in some downgrading of Navy influence.

However, the current capabilities of the Soviet Navy —real and alleged—and its apparent success as a political and military tool have not gone unnoticed in the Politburo. One can expect the Red Fleet to remain a challenge to Western navies for the foreseeable future and that Soviet Naval Aviation, land-based and increasingly aboard ship, will be a main striking force of that fleet. ■

SOVIET WOMEN IN UNIFORM

No almanac on Soviet aerospace forces and the military profession in the USSR would be complete without mentioning women, long an important part of the Soviet Armed Forces. The Soviet Union has the one and only female astronaut—Colonel-Engineer Valentina Nikolayeva-Tereshkova. Valentina Tereshkova made sixty-three parachute jumps before becoming a cosmonaut in 1962. From June 16–19, 1963, she made forty-eight orbits around the earth in Vostok-6. In 1969, she graduated from Zhukovskiy Air Engineering Academy. Valentina is married to a cosmonaut, Andrian Nikolayev.

Marina Popovich, wife of cosmonaut Pavel Popovich, is a test-pilot and holds several records. Svetlana Savitskaya, daughter of Marshal of Aviation Ye. Ya. Savitskiy, holds eight world's aviation records. Helicopter test-pilot Tat'yana Russiyan also holds a world's record.

From 1918 through 1969, for heroic work, combat feats, and bravery displayed in defending the Soviet Union, 1,401,380 Soviet women have been awarded decorations. Ninety-one women have been awarded the highest medal, "Hero of the Soviet Union," among them twenty-nine military pilots. Machine-gunner M. Zh. Mametova, sniper A. N. Moldagulova, nurse's aide Z. I. Mareseva, Party worker A. A. Nikandrova, T-34 tank driver M. V. Oktyabr'skaya, and partisan and underground fighters have also received this highest medal.

The Tambov Higher Military Aviation School for Pilots is named for Major Marina Raskova. She was navigator of a record-breaking aircrew in 1938. In the war, she commanded the Women's Guards Regiment of Night Bombers.

Engineer-Lieutenant Colonel Yekaterina (Timchenko) Oksantyuk, Candidate of Technical Sciences, and Captain Antonina Zubkova have instructed at the Zhukovskiy Academy since the war. Colonel Oksantyuk made 430 combat sorties as navigator in the Guards Taman' Women's Air Regiment and Captain Zubkova was navigator of the 125th Bomber Aviation Regiment.

—H. F. S.

Soviet Aerospace Almanac

How does the Soviet military—particularly its aerospace elements—compare with our armed forces in status, standards, career development, and benefits? The author presents some surprising facts in the most complete unclassified discussion of the subject yet published.

THE MILITARY PROFESSION IN THE USSR

BY HARRIET FAST SCOTT

FEW US Air Force people ever have an opportunity to meet their Soviet counterparts. When those rare contacts take place, they are likely to be at official functions. Within the constrained limits of casual conversation, the American probably will be impressed by the identity of professional interests he shares with Soviet airmen. But despite similarities, which are universal for all professions, there are very real differences between the position of the military in Soviet and American society, and even within the profession in these two countries.

In general, the military occupies a more exalted position in the USSR than it does in the US. The military has always been a central element of the Soviet system, closely integrated with social, political, and economic structures. During most of our 200-year history, the American military has been a somewhat peripheral element except in emergencies. Soviet society has been quite consistently pro-military and militaristic. American society has been consistently antimilitaristic and often antimilitary.

The description of the Soviet military profession that follows is based on several years of personal observation in the USSR and on many years of researching open-source Russian language publications. Many categories of military information that we make available to anyone are either classified in the USSR, or simply not made public. In spite of these limitations, what follows may be useful in forming an impression of the professional competence, character, and dedication of an element of Soviet society that plays a fundamental role in both foreign and domestic affairs.

Ubiquitous Uniforms

A visitor to the USSR is struck by the number of uniforms seen in the streets. There are more than 4,000,000 men and women in the Armed Forces, which include the Security Troops (MVD), the Border Guards (KGB), and Civil Defense units. Universal Military Service has existed since 1939, with relatively few males excused from this obligation. All serve long periods in the Reserves—in the majority of cases to age fifty—after completion of their training. The Reserve Forces are estimated to number about 25,000,000, with many on periodic active duty at any time. As a Western reporter touring the Soviet Union in late 1975 observed, "uniforms are ubiquitous."

In every city there are military commissariats where youths must register for service, candidates are selected for military schools, Reservists are assembled for training, and pensions are calculated for the retired, disabled, and widowed. Huge posters along the roadside and in cities show a man in military uniform and a factory worker standing together, with the caption "The Army and the People Are One."

Officers in the Soviet Armed Forces occupy a very high social and economic position, and can be seen in the best theaters and restaurants, generally with the most attractive and best-dressed women. As a result of the "revolution in military affairs" and the "scientific-technical revolution," about which dozens of books have been written, the role of the officer in the Soviet Armed Forces is increasing. The proportion of officers to noncommissioned officers and enlisted personnel also has shown a marked rise. In World War I, the ratio was from fifteen to nineteen men to each officer; today it is seven to ten. In aviation, rocket troops, and other specialized areas, the proportion is even higher. Soviet regulations require that some complicated equipment be handled only by an officer who also is an engineer or technician, specialties that today compose half of the Soviet officer corps.

While the atmosphere in the USSR is not exactly that of a nation in arms, it is far more military than in any Western country.

Pre-Induction Training

By the time a Soviet youth reaches the induction ag

All pilots get flight pay. Jet and turboprop pilots count time in flying units double for computing retired pay.

of eighteen, he already has undergone many years of preparatory training. According to one Soviet publication, "the preparation of the soldier begins, if you please, in childhood."

In the past decade, scores of books have been written for children—even for preschool children—glorifying the Soviet soldier and sailor. This is in contrast to the Khrushchev era, when even toy guns were not allowed to be sold. From the cradle, Soviet youths now are raised in an environment favorable to the military profession.

From the age of ten to fifteen, Soviet children are members of the Pioneers, today some 25,000,000 strong. In that organization, they learn about the Soviet Armed Forces in *Comrade,* the Pioneer handbook. At the age of fourteen, Soviet young people may join the Young Communist Organization, the Komsomol. It has about 35,000,000 members between fourteen and twenty-eight years of age. Some 3,000,000 Pioneers "graduated" into the Komsomol in 1973.

The Komsomol acts as the spark plug of youth participation in fulfilling Communist Party plans. In the '20s and '30s, the Party slogan "Komsomols—Into the Air!" brought forth tens of thousands of young volunteers for flying and parachute training. In today's Soviet Armed Forces, sixty percent of military personnel are Komsomols. Of these, more than half are in the enlisted ranks, fifteen percent noncommissioned officers, four percent officers, four percent cadets and students at military schools, and fifteen percent office and professional workers. One-third of the Komsomol secretaries are members of the Communist Party.

The training and indoctrinational work of the Komsomol is further advanced by a paramilitary organization, DOSAAF (Voluntary Society for Cooperation with the Army, Aviation, and Fleet). If a Soviet youth wants to learn to fly, become a parachutist or a ham radio operator, drive a car, or shoot a gun, DOSAAF provides the facilities.

DOSAAF is headed by Marshal of Aviation Aleksandr Pokryshkin, a top-ranking Soviet ace of World War II. The number of officers assigned to DOSAAF runs into the thousands. DOSAAF programs emphasize physical fitness and development of skills useful for military service. This organization has its own newspaper, publishes four monthly magazines, and puts out hundreds of books and pamphlets each year. Patriotic education of Soviet youth is a topic of constant concern to both the Communist Party and the Soviet state, and DOSAAF plays a very important role in this education.

Thousands of Armed Forces Komsomols actively assist DOSAAF in the patriotic education of youth and in mass sport activities. Thousands more work with the Young Pioneers in schools and help run the "Zarnitsa" and "Orlenok" military sports games that have been conducted throughout the USSR since 1967. In 1975, 23,000,000 teenagers took part in these games.

In the Armed Forces, the Komsomols are expected to set the example by improving their class ratings, volunteering for dangerous and difficult jobs, and by becoming outstanding athletes. In civilian life, the Komsomol has been active in sponsoring servicemen to "strike constructions," such as the BAM railroad across Siberia, after they complete their regular tour of duty. In the stiff competition for the limited number of places, a good Komsomol record would help an individual in being accepted at one of the military academies or a university.

DOSAAF, the Ministry of Defense, and Civil Defense each have definite responsibilities by law for premilitary training. In the early 1960s, the lowered birthrate of World War II years resulted in a dramatic decline in numbers of young men available for military duty. For example, the number of eighteen-year-old males dropped from more than 2,000,000 in 1959 to 917,000 in 1962. By 1967, the number of eighteen-year-old males once again passed the 2,000,000 mark. If approximately this number were required to serve three years in the armed forces, assuming that twenty percent or less are excused from military service, the number of inductees in the Soviet Armed Forces at a given time would be slightly less than 5,000,000, apparently an inconveniently large number. Therefore, to ensure that the maximum number of males have military training, the period of compulsory service was reduced from three to two years for most of the services.

The lost year of service is made up by giving primary military training in the schools. This has certain side benefits. Earlier physical examinations detect defects in time for correction before growth is completed and military service begun. Additionally, three men can be trained and discharged into the Reserves where only two had been trained before and, last but

Table I. Rank and Corresponding Position for Flying Personnel

FOR FLYING PERSONNEL (except Long-Range)		LONG-RANGE AVIATION (depending on type of aircraft)	
Lieutenant or Sr. Lieutenant	Pilot	Sr. Lieutenant or Captain	Pilot
Sr. Lieutenant	Senior Pilot		
Captain	Flight commander	Captain or Major	Aircraft commander
Major	Squadron commander	Major or Lt. Colonel	Commander of a detachment; deputy squadron commander
Lt. Colonel	Deputy commander or chief of staff of an air regiment		
Colonel	Commander of an air regiment; deputy commander or chief of staff of an air division	Lt. Colonel or Colonel	Squadron commander; deputy commander of an air regiment
Colonel or General Major of Aviation	Commander of an air division; deputy commander of an air corps	Colonel or General Major of Aviation	Commander of an air regiment
General Lt. of Aviation	Commander of an air corps; commander of military district aviation	General Major of Aviation or General Lt. of Aviation	Commander of an air division
General Colonel of Aviation	Commander of an air army; commander of fleet aviation		

Table II. Rank and Corresponding Position for Nonflying Personnel

FOR NONFLYING PERSONNEL	
Jr. Lieutenant, Lieutenant, Sr. Lieutenant	Platoon commander
Sr. Lieutenant	Deputy company or battery commander
Captain	Company or battery commander
Major	Deputy battalion commander
Lt. Colonel	Battalion commander; deputy regimental commander, chief of regimental staff
Colonel	Regimental commander, deputy division commander, chief of division staff
General Major	Division commander, deputy corps commander, chief of corps staff
General Lieutenant	Corps commander, chief of army staff, chief of political department of army
General Colonel	Army commander
General Colonel, General of the Army, Marshal of the Soviet Union	Commanding officer of a military district

Table III. Time in Grade

Rank	Flying personnel	Nonflying personnel
Jr. Lieutenant	1 year	2 years
Lieutenant*	2 years	3 years*
Sr. Lieutenant	2 years	3 years
Captain	3 years	4 years
Major	3 years	4 years
Lt. Colonel	4 years	5 years
Colonel	no set time	no set time

* Those who graduate from 4-year military schools start as "Lieutenants" and serve only 2 years; from a 5-year military school, only 1 year.

Table IV. Time of Service in Posts

FLYING PERSONNEL	
Pilot and senior pilot	3 years
Flight commander	3 years
Deputy squadron commander	2 years
Squadron commander	4 years
Deputy air regiment commander	2 years
Air regiment commander	5 years
NONFLYING PERSONNEL	
Platoon commander	3 years
Deputy company or battery commander	3 years
Company or battery commander	4 years
Deputy battalion commander	3 years
Battalion commander	4 years
Deputy regimental commander, chief of regimental staff	3 years
Regimental commander	5 years

not least, girls can learn basic military skills, if they wish, in addition to their first-aid courses.

Of the USSR's 250,000,000 people, about 15,000,000 in the upper age bracket of Komsomol eligibility or older belong to the Communist Party of the Soviet Union (CPSU). Speaking at a conference on higher military education in 1972, Soviet Minister of Defense Marshal Grechko noted that seventy-one percent of officers were Party members and seventeen percent belonged to the Komsomol.

Apparently an increasing number of NCOs and enlisted men are Party members, but the percentage is far lower than in the case of officers. The large number of Party members among the military leadership makes the Soviet Armed Forces a very important political force in a country that has only one political party.

Pursuing a military career almost automatically means participation in a wide variety of Party work. Marshal Grechko became a member of the Central Committee's Politburo in 1973. The military is well represented on the Central Committee of the CPSU *(see p. 108)*. District and fleet commanders often are members of Republic or local Party bureaus, and the local Party Secretary automatically is a member of the military council in his district.

The Military as a Career

Pre-Commissioning Education

Approximately 140 military and "higher" military schools are spread across the Soviet Union, located in seventy-five cities from Kiev to Vladivostok. These schools provide the main source of the Soviet officer corps. Almost all of the schools now offer four- and five-year courses, in contrast to the three-year courses that were in the majority a decade ago. Graduates are awarded lieutenants' stars and engineering diplomas.

Each service of the Armed Forces, as well as the KGB Border Guard, MVD troops, and Civil Defense, has its own military schools. Between 40,000 and 60,000 officers are commissioned each year from this huge military education system. *(For a more detailed description of the Soviet military school system, see the author's article, "Educating the Soviet Officer Corps," March '75 issue.)*

Entrance to these schools is primarily by competitive examination, with three or more candidates competing for each available place. Graduates of some military preparatory schools, such as the Suvorov and Nakhimov schools, are accepted without the usual examination. To prepare for the entrance examinations, civilian youths and servicemen, ages seventeen to twenty-one, are encouraged to take courses organized at the local garrison officers' clubs. To stimulate interest in the military schools, youth are invited to "open house" visits or to join "Young Cosmonaut" or "Young Aviator" groups.

At present, approximately half of the Soviet officer corps has a "higher" military or specialized education, which equates roughly to a bachelor's degree in the United States. Recently, Minister of Defense Grechko reported that all brigade commanders and ninety percent of regimental commanders now have a higher military education, compared to 1940 when only seven percent had the equivalent.

Promotion

The Soviet officer is commissioned as a lieutenant upon graduation from a higher military school. Future promotions depend on a combination of three things: A favorable effectiveness report or "attestation"; holding a position calling for a higher rank; and completion of time in grade. "Attestations" generally are written every two to three years by the officer's senior commander. An evaluation of the officer's work is given along with a characterization of his political and command qualities. Active participation in Communist Party or Komsomol work is almost essential for promotion. Flying personnel climb the promotion ladder faster than their brother officers in nonflying organizations, as shown in Tables I and II.

The average time served in grade for flying and nonflying personnel of Soviet aerospace forces is shown in Table III; and the approximate time of service in basic line posts, as prescribed by Soviet military law, appears in Table IV.

It should be noted that officers who graduate from military "academies" (which correspond roughly to our staff and war colleges) are placed on a special *nomenklatura* of positions filled only by officers with academy or specialized military education. For this reason, promotion also depends on further schooling.

After five or six years of service, the Soviet officer will try to get into one of the seventeen academies. Air

The author, Harriet Fast Scott, is a frequent contributor to AIR FORCE Magazine. Her article on Soviet civil defense, which appeared in the October 1975 issue, has been reprinted by both government and private agencies. Her translation and analysis of Marshal Sokolovskiy's Military Strategy, *Third Edition, was reviewed in our February issue. Mrs. Scott lived for four years in the USSR while her husband was US Air Attaché in Moscow, and has traveled widely in Russia since then. She and her husband are now Washington-based consultants on Soviet military affairs.*

Force officers will most likely opt for the Gagarin Air Academy near Moscow. A few will want to try the Zhukovskiy Military Air Engineering Academy or the combined-arms Frunze Academy, both in Moscow. Naval pilots usually attend the Naval Academy in Leningrad. The Zhukov National Air Defense Command Academy is located in Kalinin, while the Govorov Radiotechnical Engineering Academy of National Air Defense is in Kharkov. The Dzerzhinskiy "Rocket" Academy is in Moscow, on the riverbank next to the Rossiya Hotel. The would-be student must set up a careful plan of study in order to pass the entrance exams. Two or three years' preparation amounting to 2,000 to 3,000 hours' study has proven to be necessary for most officers.

Entrance examinations for the Gagarin Air Academy generally cover five subjects: Russian language and literature, mathematics and physics, and, depending on the specialty, either tactics, combat equipment, bombing training, navigation, organization of communications, or rear services of the Air Forces.

The academies also offer postgraduate courses leading to degrees of Candidate of Military, Historical, or Technical Sciences. For those who cannot attend the regular course at an academy, there are correspondence courses that are described as being no different from the full-time course.

A Soviet aerospace officer may become a colonel after fourteen years' service, or at about age thirty-six. If his record is good, and his Party credentials in order, he may find himself one of the select who go to the Academy of the General Staff. This is the highest rung in the Soviet professional education ladder. After finishing its two-year course, the colonel is between thirty-eight and forty. He then starts looking for the stars.

The one-star rank may be attained as early as thirty-seven years of age, or as late as fifty-three. The average age is forty. And for the next rank, General Lieutenant of Aviation, the age spread varies from thirty-eight to fifty-seven, with the average at forty-six. The third star —General Colonel of Aviation—may be attained at between forty-six and sixty, with the average being fifty.

Pay, Allowances, and Leave

Exact pay scales for aerospace officers are not published. According to Soviet sources, the average monthly pay has risen from 96.5 rubles in 1965 to 122 rubles in 1970 and was to have reached 150 rubles in 1975. As a point of reference, the minimum wage in the USSR is seventy rubles. (The official exchange rate, established arbitrarily by the USSR, is one ruble = $1.50.)

Enlisted personnel in the Reserves are paid three rubles a month while on active duty, which is generally in line with regular service pay. Sergeants in the Reserves get fifty kopeks a day (one ruble = 100 kopeks).

Officer pay is based on a combination of rank, longevity, position held, and qualifications in a specialty. There is also additional pay for academic degrees and remote-area duty. A lieutenant normally receives about 150 rubles a month combined position pay and allowances. A captain's pay may run from a total of 150 to 200 rubles, but averages about 160 a month. A major gets 140 or 150 rubles for position pay and ninety to 100 for allowances, making a total of 220 or 230 rubles on the average. Lieutenant colonels average about 250 rubles a month. Marshals reportedly get 2,000 a month.

Flying pay depends on a number of factors, and flying assignments count extra for retirement purposes. For example, jet and turboprop flying personnel may count each month served as two months, and all other flying personnel may count one month served as one and a half months for retirement purposes.

In the Soviet Union, to a far greater extent than in the US, real income cannot be measured solely in terms of pay and allowances. For example, officers have access to special food, drug, and department stores that stock goods not available on the open market at any price. While serving abroad they are excused from paying income tax.

Officers with fewer than twenty-five years' service are authorized thirty days annual leave; with more than twenty-five years, forty-five days. All flying personnel are entitled to forty-five days leave a year. To make leave attractive, each military district, fleet, and air defense district has its own resort area. Some are for skiing, others for swimming and boating. Tours arranged by offices of military tourism are very popular. Generally three weeks in length, they may be by bus or on river cruise boats. The shores of the Black Sea, the Crimea, lakes, the Caucasus and Carpathian mountains are favorite areas. (Generals may even rest at some of the famous spas in Eastern Europe.) Package deals run from fifty to 100 rubles per person for three weeks.

The All-Army Military Hunting Society (VVOO) has some 150 hunting and fishing lodges. The Central Officers' Club in Moscow runs five tourist bases, four of them in the Caucasus-Black Sea area. According to the Army publication *Red Star*, in the last five years 560,000 have used the "tour-bases" of the Ministry of Defense and 325,000 have earned "Tourist USSR" pins.

In addition to their forty-five days of annual leave, officers and warrant officers may be sent to sanitoriums for thirty days of rest. The Ministry of Defense runs several of these, the favorite one being in the Crimea. Some of the over-sixty-five marshals credit their vigor and vitality to these long compulsory leave policies.

Subsistence, Housing, and Medical Care

Rations are provided free of charge to all soldiers sailors, cadets, and Reserves when on active duty

Officers of the Strategic Rocket Troops, the elite of Soviet aerospace forces, also have food provided free and in the standards established for flying personnel. There are differing rations such as soldiers' rations (3,547 calories), sailors' and flying rations (4,692 calories), cadet rations, hospital rations, and, curiously, "engineer-technical aviation rations."

Under certain conditions, flying and engineer-technical personnel also either get free rations or pay only half of the cost. Officers serving with Soviet troops abroad, or in certain isolated regions of the USSR, receive free rations. Officers in radar units and command points of National Air Defense, if located above an altitude of 1,500 meters, are given free rations. Soldiers and cadets 190 cm. or taller are allowed extra food, as are paratroopers and rocket troops.

Officers entitled to free rations may, in exceptional circumstances, be paid at the rate of sixty-six kopeks a day in lieu of rations. Servicemen abroad get a tobacco ration. Nonsmokers may opt for 700 gr. sugar instead. Within the Soviet Union, servicemen and cadets get eighty kopeks a month for tobacco.

Under the Soviet system of socialized medicine, health care is provided to all Soviet citizens free or at nominal cost. The quality of medical care is reported to be higher in the military than for civilians.

Quarters on military bases are allotted according to position:

Company or flight commanders	one or two rooms
Battalion or squadron commanders	apartments of two rooms
Regiment or air regiment commanders	apartments of two or three rooms
Division or air division commanders	apartments of three rooms
Army commanders	apartments of four rooms

Living quarters off-base must be provided by the Ministry of Defense for officers attending academies or officers' courses. Housing is still very tight in the Soviet Union. By 1975, it was hoped to raise the average urban living space per person from nine to twelve cubic meters. Cooperative apartments are growing in popularity and many officers take advantage of favorable conditions offered by the Ministry of Defense to enter into such agreements.

Soviet newspapers often carry letters of complaint on housing. *Red Star* recently reported that one of the apartment houses for Kharkov's military garrison had no hot water. A nine-story apartment house in the military area of Grodno was reported to have little or no heat and hot water only on the ground floor. Even cold water was an iffy proposition above the fifth floor. And this had been brought to the attention of the authorities the year before! Odessa Military District boasts one apartment house where complaints on heating and lack of gas for stoves have been voiced since 1972, without results.

Retirement Pay

A most complex problem is determining the amount of retirement pay and benefits. Retirement pay is given: (1) for length of service; (2) for disability; and (3) for old age. Families of deceased and disabled servicemen receive pensions for the loss of the breadwinner. Bonuses may be given on mustering out. As a one-time bonus, an officer may receive a year's pay if he fails to qualify for retirement. There are birth and death benefits.

The size of retirement pay is based on several factors, primarily on the last pay received before leaving the service. Officer pay, as noted, is a combination of position pay plus grade allowances.

Length of service counts in different ways. For instance, one may be eligible for retirement pay on serving twenty-five years or more or on serving twenty to twenty-five years, if over forty. For retirement purposes, time while assigned to jet or turboprop flying duty counts double, and for other flying duty, time and a half. Since July 1959, annual flying norms have to be met; that is, if the norm is ninety hours a year, four months of flying time can be counted only if thirty hours are flown in that period.

Here is an example of the complexity of retirement computations: Officer Kotov served from September 1936 to October 1938, and from June 1941 through August 1971. From July 1942 to April 1958 he was on flying status, including the period May 1943 to February 1945 at the front, and from June 1945 to December 1952 on isolated Kamchatka Peninsula. Thus, he actually served for thirty-two years and three months.

His one year and nine months at the front counts triple. His time on Kamchatka counts double, but only after September 1945. His flying time counts time and a half. Adding it all up, he has forty-six earned years for his pension. He will get fifty percent of his last pay for serving twenty-five years, plus three percent for each extra year up to seventy-five percent of his last pay.

Disability pensions are given in three categories as determined by a medical board, and are of two kinds: war-connected or duty-connected on the one hand, and noncombat or nonservice on the other. These range from thirty percent to seventy-five percent.

Membership in the Soviet regular military establishment rates high economically, politically, and socially. Often military and Party positions are combined, as witnessed by Marshal Grechko, Minister of Defense and a member of the Politburo, and leading generals and marshals who are members of the Central Committee. In addition, generals and marshals frequently hold high positions in areas that we would consider to be in the civilian sector. For example, not only is the Soviet Minister of Civil Aviation a marshal of aviation, but many of the leading aircraft designers hold a high military rank. Party Secretary L. I. Brezhnev was awarded a diamond-studded "marshal's star" when he was promoted, in 1975, to the rank of General of the Army.

The military-Party-industrial hierarchy in the Soviet Union is held together by a common bond. It is a monolith, quite unlike anything in this country. The Soviet government lavishes vast sums on its armed forces—in relation to gross national product, probably three times as much as does the United States. Soviet military forces are large, well-equipped, well-trained, and indoctrinated. Their loyalty and dedication are further assured by the perquisites, privileges, and status that they enjoy. All this is not to be wondered at, for the USSR's Armed Forces are the foundation on which the Soviet system is built. ■

Soviet Aerospace Almanac

During the past year, the USSR continued to outdistance the US in space launches by a factor of three. Well over half the Soviet space payloads were clearly or potentially military-oriented. Here an authority on Soviet space programs reviews . . .

SOVIET SPACE ACTIVITIES IN 1975

BY CHARLES S. SHELDON II

LAST YEAR, the Soviet Aerospace Almanac provided an overall review of the growth and the status of the Soviet space program, noting that the findings were tentative in some respects but probably broadly reflective of the real situation. Russian security measures still sharply limit access to many crucial areas of aerospace activity, and yet it is possible to be more certain of some details now than it was a year ago, as a result of last summer's joint US-USSR manned flight. The review that follows necessarily is based upon open source materials, and some judgments will require amendment in the future.

Facilities and Support

During 1975, Americans were able for the first time to visit the previously secret city of Leninsk and its adjoining vast Baykonur Cosmodrome, already identified as near the railway stop called Tyuratam in Kazakhstan. These visitors were carefully controlled and shown little more than the hotel accommodations in the city, one of the assembly and checkout buildings, and the Soyuz launch pad that has been in use since Sputnik-1. Roads, railways, and night glimpses of scattered lights confirmed that the launch facilities extend over many tens of kilometers.

Americans also visited the new manned flight control center at Kaliningrad on the outskirts of Moscow, and during the joint flight learned that the principal control center, which was managing many other flights at the same time, was at Yevpatoriya in the Crimea. Also in the Moscow area, Americans gained the impression that Zvezdnyy Gorodok, where the cosmonauts live and train, is still expanding.

While the United States was among participating countries providing payloads for a Soviet launch from their even busier launch site at Plesetsk near Archangel, this site has remained off limits to all non-Soviet Bloc visitors. It has belatedly been partially opened to the member-nation scientists of the Interkosmos cooperative space experiment group, in the same manner that Kapustin Yar on the lower Volga has been. All three of the major launch sites have become generally familiar to readers of the aerospace trade press as a result of Landsat pictures.

Launch Vehicles

No recognizably different launch vehicles have appeared during the year 1975. Some fifty-eight successful launches were performed by the original SS-6-derived launch vehicle with improved stages added. These can place up to 7,500 kg in earth orbit. Only five launches used the smallest vehicle derived from the SS-4, which will lift up to 400 kg. There were twelve using the more flexible SS-5-derived launcher, able to put up 900 kg. There have been four successful launches of the largest operational vehicle, the Proton class, able to put up 20,000 kg. Likewise, there have been only three launches of the purely military-type launcher derived from the SS-9, able to put up 4,500 kg. Still another year has passed without the appearance of the very large launcher with perhaps twice the thrust of the Saturn V, despite rumors of its continuing development.

One of the most potentially significant stories of the year, beyond verification, is an East German account of the details for a Soviet shuttle with two completely reusable stages. The details of this pair of delta-wing space gliders were attributed to Chikarin of the USSR State Research Institute for Civil Aviation. The specifics are suspect because it is not Soviet practice to reveal details in advance, but Western observers expect it is possible that an operational Soviet shuttle will appear in the early 1980s, based upon both the logic of Soviet needs and their repeated statements that expendable rockets have become obsolete (an overstatement).

Manned Programs

The year brought four launches of manned Soyuz

vehicles. Soyuz-17 was launched on January 10, 1975, and the two cosmonauts were up for thirty days, spending most of that time in Salyut-4, a civilian space station launched December 26, the previous year. Two more cosmonauts were launched on April 5 to visit Salyut-4, but a partial separation of stages during the launch phase forced an automatic abort, which dropped them about twenty minutes after leaving the pad. They were eventually picked up in rugged mountains about 1,600 km east, near the Chinese border. Soyuz-18 with two cosmonauts was launched on May 24 for a flight of sixty-three days, mostly spent in Salyut-4. Salyut-4 experiments were largely concerned with solar studies, X-ray stars, geophysical phenomena, biology, and earth resources. The crew of Soyuz-18 remained in the station through the separate joint manned operations of the summer.

Soyuz-19 was the mission dedicated to joint operations with Apollo. Launched on July 15, seven and a half hours before Apollo, the Soyuz became the rendezvous target, and two days later, with the ships joined, ceremonial activities ensued, together with some joint experiments. The Soyuz recovery was routine, and was the first seen live on television, a fitting follow-up to the first live pictures of a Soviet launch six days earlier.

There was an unexplained Kosmos precursor flight, 772, related to the manned program on September 29, and then for the first time since Soyuz-2, Soyuz-20 was sent up unmanned to dock with Salyut-4, following launch on November 17. Soviet spokesmen explained that this heralded the successful development of techniques to conduct resupply of space stations to extend their operations indefinitely. They even suggested that ferry Soyuz might take up a crew, and leave them there while returning to earth before resupply missions or second crew deliveries were carried out. Also, an automated emergency rescue capability had been established by the test. At latest report, Soyuz-20 remains docked to Salyut-4, carrying a great variety of biological experiments on board.

Following the operation in 1974 of the Salyut-3 military space station, largely devoted to photographic observation of the earth from lower orbit, the expectation is that at any time a follow-up launch of another such military station can occur.

Science Programs in Earth Orbit

In addition to the biology work associated with Soyuz-20, and the joint flight in July with the Apollo, the Russians flew a twenty-day mission beginning on November 25 with Kosmos-782, which is the third in a series of biological tests. Two years ago, the flight tested the effects of weightlessness; a year ago, the Soviets added a controlled isotopic radiation source to the same kinds of subjects. The most recent incorporated a centrifuge to create the equivalent of gravity. The flight includes not only Soviet specimens, but for the first time adds others from the United States, France, and ones from several Soviet Bloc Interkosmos consortium members.

Interkosmos-13 had been launched on March 27 to do auroral studies at high latitude for the Bloc countries, using the intermediate launch vehicle. This same class of vehicle was used again on April 19 at Kapustin Yar to put up Aryabhata, the first Indian satellite. On June 5, Molniya-1-30 carried the small French technology satellite MAS-2. The other major international science activity was the launch on September 2 of Vertikal-3, an Interkosmos sounding rocket carrying many geophysical experiments to an altitude of 502 km.

An ERTS-1 satellite photo, taken from an altitude of 560 miles, shows some of the road and rail net and launch facilities at the USSR's Baykonur Cosmodrome.

Interkosmos-14, launched December 11, did ionospheric studies for the Bloc countries. Prognoz-4, launched December 22 into an eccentric orbit ranging out to 199,000 km, continued solar flux studies.

During the year a number of military observation Kosmos flights carried unannounced piggybacks, which might have been scientific in nature, but this assessment becomes more dubious with time, as no scientific mis-

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sions for such piggybacks have been acknowledged since Kosmos numbers passed the 500 mark in 1972.

Unmanned Lunar and Planetary Programs

The year 1975 was both disappointing and gratifying in the deep space area. There was no flight of a Luna to the moon, out of keeping with the pattern of other years, and suggesting the possibility of one or more launch failures. Some observers had also expected Soviet launches to Mars to parallel the flights of the Vikings of NASA. But the standard Mars payloads of this period were too heavy to be compatible with the lifting strength of the Proton type of launch vehicle at this particular opportunity, so no flights occurred.

Venus was another story. Venera-9 was launched on June 8 and Venera-10 on June 14. This program had graduated to use of the Proton size of launch vehicle, and, on October 22 and October 25 respectively, they were successful in putting down payloads on the surface of the planet and also establishing long-life orbiters. Before heat overcame the landers, both sent back to earth panoramic views of their surroundings, which undid a number of preconceptions about the planet. There were sharp shadows, suggesting that direct sunlight does reach the surface, and the floodlights on the payloads were not required to illuminate the surroundings.

Rocks, in one location with sharp edges, and in the other somewhat rounded, also dispelled the notion that only sand would be present. Constituents of the atmosphere and soil, temperatures, and pressures were largely as found in previous Soviet flights. Findings of the orbiters have not been released in detail, as their work continues. The missions overall were impressive, considering the hostile environment and the problems of knowing how to get through the dense atmosphere at the right speed and angle.

DISTRIBUTION OF SOVIET SPACE PAYLOADS BY PUTATIVE PROGRAM 1957–1975

[As of Dec. 31, 1975]

Possible Mission	*1975*	*1957–1975 Cumulative*
Military Recoverable Observation	34	328
Communications	37	182
Earth Orbital Science	14	111
Minor Military Mission (which could include some environmental monitoring, radar calibration, or electronic ferreting)	6	94
Navigation and Geodesy	6	46
Electronic Ferreting	6	42
Weather Reporting	4	38
Earth Orbital, Man- or Biology-Related	3	34
Unmanned Lunar Related	0	32
Earth Orbital, Manned	3	29
Venus Related	4	23
Fractional Orbital Bombardment	0	18
Mars Related	0	16
Ocean Surveillance	3	12
Targets for Inspection	0	9
Lunar, Man- or Biology-Related	0	8
Early Warning	2	7
Inspector/Destructor	0	7
Engineering Test	1	6
Orbiting Launch Platform	16	135
TOTAL	139	1,177

Civil Applications

There was no startling new development during the year in Soviet civil applications of space. Three 1975 additions to the regular series of Meteor weather satellites were joined by an experimental version called Meteor-2. These regular weather satellites now use automatic picture transmission (APT) like their American counterparts so that anyone with the appropriate receiver can acquire real-time pictures of the weather. The United States and the Soviet Union are nearing an agreement to make greater use of each others' weather satellites.

Ten more Molniya communications satellites were also placed in orbit during the year, including three of the first series, which may mostly serve governmental purposes; four of the second series, which are the mainstay of the Soviet domestic television distribution network and link with the members of their Intersputnik Soviet Bloc communications system; and three of the third series, which carry further improvements.

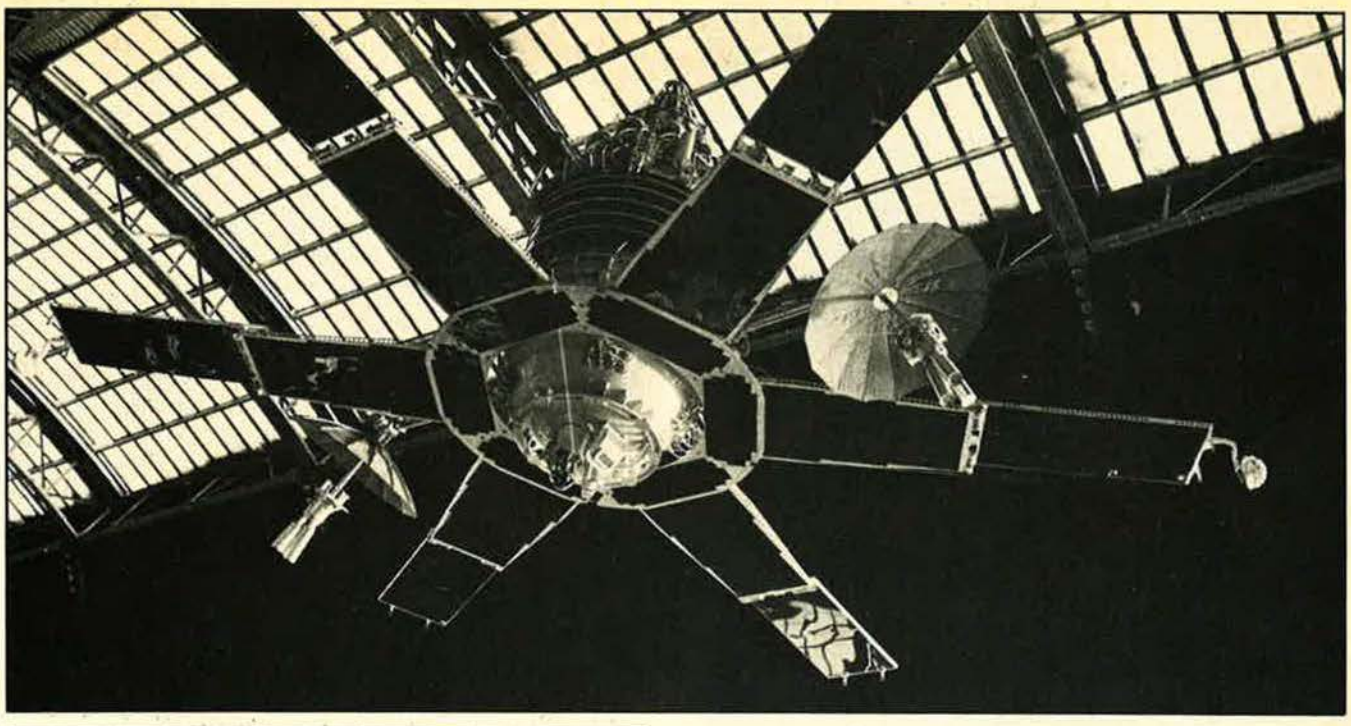
In June and September 1975, the Russians filed with the International Telecommunications Union word of their intent in 1975 and 1976 to put up three twenty-four-hour synchronous Statsionar satellites, five to six years behind schedule. Precursor flights were made in 1974. In December, they filed a further plan to add seven more Statsionar satellites in the next five years. The first Statsionar, also called Raduga, was launched on December 22.

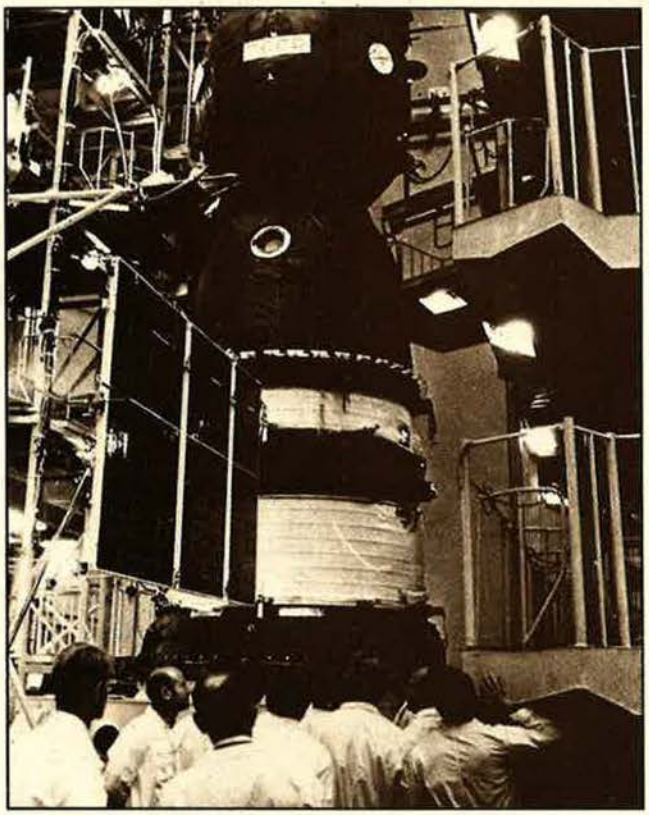
Other potential civil applications of satellites either have not reached operational status or are still reserved for military purposes, and hence their work is obscured behind the common label of Kosmos. This is certainly true of navigation satellites, which are used for military operations, and may apply to experimental work leading toward earth resources survey. Ice reconnaissance, mapping, and geodetic work are all within the Kosmos label, although identifiable in some cases by their outward characteristics of flight patterns.

Military Applications

As in other recent years, military applications flights dominated the Soviet space effort, despite the reluctance of the USSR to acknowledge directly that it engages in such work.

The largest category again was for military photographic observation flights, with thirty-four flown, the





Ten Molniya communications satellites, similar to the one shown above, were put in orbit during 1975. At left, the Soyuz spacecraft for the ASTP mission being readied for launch at Baykonur, about 100 miles east of the Aral Sea.

typical one staying up for twelve to fourteen days. These fall into several subsets, based upon variations in their telemetry patterns and maneuvering. Some are area search or possibly mapping, while more are high resolution and maneuver to lower their perigees and to place themselves more directly over selected targets.

Electronic ferrets are maintained in extensive grids whose orbital planes are forty-five degrees apart. There may be several types of varying capabilities.

Military navigation satellites, now in orbital planes sixty degrees apart, were further extended during the year by the construction of an outwardly similar network, but twenty degrees off from the earlier grid.

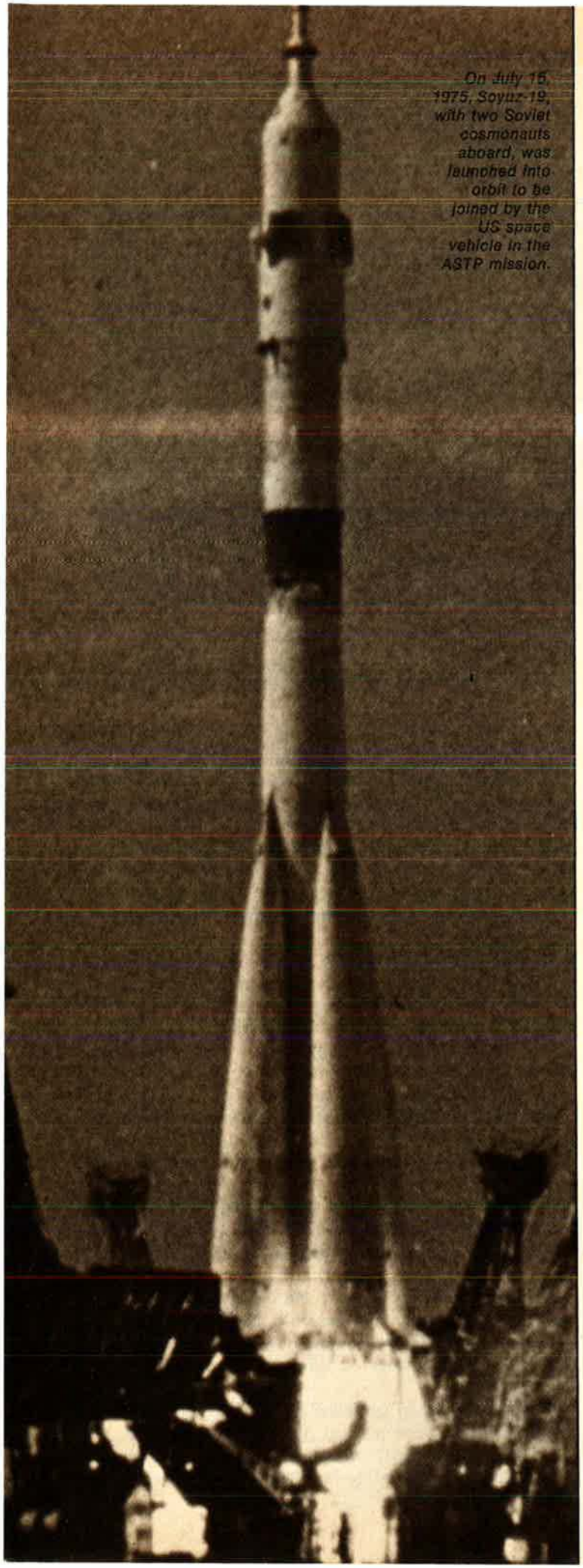
It seems likely that geodetic work was extended by higher flying satellites otherwise similar to the navigation flights, but with fewer of them.

The Soviets continued to launch small payloads that may loosely be referred to as minor military since their exact purpose seems obscure. They might be doing ferreting, or environmental monitoring, or serving radar calibration purposes.

In addition to military use of the Molniya satellites, there are other satellites that almost certainly are also serving communications purposes. However, because they do not fly as high as the Molniyas, they either must operate in a store-dump mode, if they link the Soviet homeland with wide-ranging forces, or they must serve tactical needs in particular theaters.

The Soviet Union is probably building a system of early warning satellites to alert it to missile launchings or to nuclear explosions. Those that are put up about once a year fly orbits almost like the twelve-hour orbits of Molniya, inclined at sixty-three degrees to the equator, and climbing in the northern hemisphere to about 40,000 km. Kosmos-775, launched October 8, went to twenty-four-hour synchronous orbit over the equator, and while it might be a test for a communications or a weather satellite, it is also possible that it represents an extension of the early warning system to give a round-the-clock capability over a third of the globe from its fixed position.

Three more ocean surveillance, radioisotope-powered radar satellites were put up during the year, and, at the conclusion of their missions, their highly polluting powerplants were fired to 1,000-km circular orbits to



On July 15, 1975, Soyuz-19, with two Soviet cosmonauts aboard, was launched into orbit to be joined by the US space vehicle in the ASTP mission.

"cool" for a few centuries. Late in 1974, and again in October 1975, closely related satellites, also put up by the SS-9 derivative, were put into 400-km circular orbits, with some radio signals like the ocean surveillance flights.

Kosmos-699 was exploded at the end of its mission, unlike the lifting to higher orbit of the nuclear-power sources used in the oceans work. This exploding may be done with Kosmos-777 when it reaches the end of its active life. The purpose remains obscure, since the satellite was a little high for regular photographic work and a little low for electronic ferreting as previously performed by the Russians. The exploding of spent or disabled satellites is usually reserved by the Russians for those missions where they do not want to risk compromise of their equipment, whether through landing intact outside Soviet territory or, within the decade, possible retrieval by an American Shuttle flight.

The year 1971 remains the last time the Russians flew either a FOBS (fractional orbital bombardment system) or an inspector/destructor satellite, both of which were very active programs for several years running and possibly brought to operational status.

Aside from all the above-referenced military programs, there have been two other newsworthy stories in the trade press during the year. Unfortunately, neither account can be verified, but they have been so widely reported and speculated about that this review would be incomplete if they were ignored.

The first story is that the Soviet Union has clandestine intelligence collector equipment in various parts of the world and that these feed their findings to Soviet satellites passing within line of sight. It was reported that such sensors were detected near SAC headquarters at Omaha. Another report said that detection devices were found in the Pacific Test Range to keep track of US missile tests.

The second story broke in December 1975. It said that some satellites in twelve-hour and twenty-four-hour synchronous orbit had detected infrared signals from ten to 1,000 times the expected strength of natural phenomena. It was suspected this represented Soviet laser ranging work to locate these US military payloads. While the sensors on these satellites were not disabled, the potential for blinding them was recognized. Further, if similar lasers were concentrated on other US satellites flying in much lower orbit, the effective strength of such energy beams at that distance would be much higher. If this story has foundation, it could represent a sharply changed situation for US military planners. At this writing, the story is too new for us to be able to judge its possible validity and full implications. The only tentative assessment is a DoD suggestion that gas pipeline fires account for the phenomenon.

Policy Directions for the Future

The year 1975 was consistent with the continuing Soviet commitment to maintain a broad space program to meet their military and economic needs, and to keep the new science and technology pipeline filled. While the program for some years may have been to surpass the United States and to create a political

image of world leadership, now a greater emphasis is accorded perceived Soviet needs without as much regard for international comparisons. The continuing high level of activity year after year while the US program has been shrinking is a fair indication of this.

The Soviet program is not without its problems. Despite the high level of activity and the general reliability of most launches to earth orbit compared with the United States, quality control in several forms remains a continuing problem. This has delayed the fully successful use of larger launch vehicles of the Proton and the Saturn V and larger size, which in turn has forced the cutbacks in both deep space and earth orbital station work from what we might otherwise have seen. A principal strength of the Soviet program is its on-going nature with open production lines and a fairly conservative building-block approach.

Until the US Shuttle, intended for use by both NASA and the Air Force, becomes operational in about five years, we can expect the Soviet position of leadership to be further consolidated. American high technology will make up for lack of quantity in some areas, but gives no particular ground for complacency, based upon parallel experience with Soviet aircraft, electronics, naval, and ground-force development.

Should the Soviet Union be successful in developing a reusable space shuttle in close to the same time frame as the United States, the hope that the US Shuttle will necessarily change the balance in the favor of the United States might not be realized. Worse, if there were no American Shuttle and a Soviet reusable system appeared, it is possible that a whole new set of rules on the use of space might be written by the *de facto* situation that would develop. The space equivalent of freedom of the seas might be lost in the face of overwhelming Soviet dominance in volume and variety of their operations.

In the meantime, it is not surprising that US military planners are paying increasing attention to the development of defensive techniques to increase the survivability of US spacecraft. This nation relies on space to provide so many vital services of communications, navigation, weather reporting, early warning, and arms-agreement policing that it would be seriously damaged if these functions could be terminated or greatly reduced by the act of another power.

HISTORICAL TABLE OF SUCCESSFUL LAUNCHES TO EARTH ORBIT OR ESCAPE

[As of Dec. 31, 1975]

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
TOTALS	*649	878

*US launches include four by Italy for the United States

American ASTP crewmen being briefed on operation of the ASTP flight control center at the Cosmonaut Training Center (Star City) near Moscow.

There is a general understanding between the United States and the Soviet Union that they will not interfere with the operations of each other's "national technical means" for keeping informed, but details are not spelled out in any specific or formal sense. The Russians had already demonstrated up to 1971 that they could fly inspector/destructor spacecraft even though these were not used against US payloads, or overtly tested during the last four or five years. It is too early to assess the new rumors of laser probings of US payloads from sites in the western USSR, but the potential is highly ominous.

For the most part, a policy of mutual noninterference has served well the interests of both superpowers; and keeping some balance in capabilities on both sides may be as valuable a means as the circumstances will afford that functions important to both countries can continue to be operated without interference.

The Apollo/Soyuz Test Project (ASTP) opened the door to direct cooperation in a large and more concrete way than previously had been possible between these rival states. If no really substantive follow-on appears, then ASTP will have been a curious anomaly in our history. If further projects grow in their ambitions, we may see evolve a new set of relationships and strategies for space. The likelihood of the latter developments will probably be shaped more by the general political climate and nature of national rivalries than by the technicians.

In the meantime, we should neither panic that the Russians will prove invincible in space, nor write them off as backward bunglers unable to function effectively. Continuing concern and prudence are in order for the United States. ■

Soviet Aerospace Almanac

Though obsessed with secrecy so far as the specifics of their military capability are concerned, the Soviets have produced voluminous literature on their military concepts and doctrine, most of it until recently unavailable in translation. Under Air Force auspices, several significant works have been translated in a series of books on . . .

SOVIET MILITARY THOUGHT

BY JOSEPH D. DOUGLASS, JR.

EARLY in 1973, a new and very different book appeared in GPO advertisements and bookstores across the nation. It was an English translation of the Soviet military text, *The Offensive,* by Col. A. A. Sidorenko. As explained in the preface, this book was the first in a series of significant and representative recent Soviet military writings to be translated and published under the auspices of the United States Air Force. The series, designated "Soviet Military Thought," the preface continues, will be useful to research institutes, universities, and other readers concerned with problems of contemporary Soviet affairs.

In "Soviet Military Thought," the Air Force has initiated the most systematic effort to make the best assortment of these Soviet open publications available since Sokolovskiy's *Military Strategy* and the anthology *The Nuclear Revolution in Soviet Military Affairs* became available in the 1960s. Most of the volumes either were nominated for the Soviet Frunze Prize for excellence in military literature or were issued in the Soviet Union as part of the "Officer's Library"—a series of seventeen books selected to "arm the reader with a knowledge of the fundamental changes which have taken place in recent years in military affairs." It is most worthwhile for us to examine these texts with great care. As former Ambassador Foy Kohler has stated, "However uneasy we may be about Soviet capabilities for secrecy in action, Americans can have no ground for complaining that Moscow hides from us its purposes."

In selecting, translating, and publishing the "Soviet Military Thought" series, the United States Air Force has made this statement practical and meaningful to all of us concerned with the nation's defense, independent of access, position, or Russian language facility. To be sure, this information does not replace the normal intelligence processes and assessments of actual capabilities. However, it can help explain why the Soviets have what they have, and indicate where they are headed. In an authoritarian society such as the Soviet Union, it is especially important for the leadership to communicate with its people through open publications. And, although quantitative measures may be suppressed and relegated to more appropriate classified forms of communications, qualitative descriptions that elaborate on the direction toward which they are headed and that explain the underlying rationale abound in the open publications.

The first book in the series, *The Offensive,* by Col. A. A. Sidorenko, has been exceptionally well received —far beyond most expectations. Upon reading the book, the reason becomes quite clear. It is well-written, dynamic, not obscured by the usual potion of Marxist-Leninist dialectics, and focused on an area of major interest—war in Europe. In effect, the book presents, in terms so clear they are disconcerting, the Soviet "conventional wisdom" on war in Europe. When it was published in Moscow in 1970, *The Offensive* was recommended in "The Soldier's Bookshelf" for reading by officers of the Soviet Army, students, and reserve officers. It represents a popularized version of that portion of *Tactics* concerned with the attack. Colonel Sidorenko was the composing editor for *Tactics,* which was published in 1966 as part of the "Officer's Library," and he received the Frunze Prize for outstanding military literature in 1967.

The Offensive portrays the Soviet strategy toward Europe as offensive; designed to seize and hold territory; nuclear; beginning with a massive surprise nuclear strike; and shock-oriented with immediate and relentless exploitation of the nuclear strike by tanks, combined arms armies, and airborne assault troops. The attack will take on great spatial size because of the decisiveness of the goals and the potential impact of the initial blow. It will be conducted night and day, in any weather, without letup until the enemy is defeated. The question of massing forces and means will be solved in a new way, with heavy reliance placed on "the maneuver of nuclear weapon trajectories" to define the main attack corridors and create the favorable attack ratios required for the breakthrough.

The Offensive is a must for anyone interested in what the Soviets are saying about a NATO-Warsaw Pact confrontation. It is very much in accord with the description of the threat presented to Congress by Secre-

tary of Defense Schlesinger in the spring of 1975 and has been recommended to Congress for a more detailed presentation of Soviet doctrine and strategy.

The second volume in the series is the standard Soviet Communist Party treatise on military doctrine, *Marxism-Leninism on War and Army.* This book was prepared by faculty members of the Lenin Military-Political Academy and is now in its fifth edition. It has also been the recipient of the Frunze Prize and is part of the Soviet "Officer's Library." Because it is difficult, if not impossible, to understand Soviet foreign policy, military affairs, or negotiations at SALT or MBFR without some appreciation of Marxist-Leninist principles, this book is a most important component of Soviet military thought. Here, it should be recognized that doctrine in the Soviet Union is something that is quite precise and different from doctrine as used in the US literature. There is only one military doctrine in the Soviet Union. Soviet military doctrine is *the guidance* of the state, worked out and determined by the *political* leadership on the nature of future war, the methods of waging it, and the preparations of the army and the country for it. The doctrine determines what enemy will have to be faced, what the goals and missions will be, what forces and equipment will be required, and what methods will be used to conduct the war. *Marxism-Leninism on War and Army* is a major Soviet reference for the subject of military doctrine.

The basic ingredients that have consistently made up Soviet doctrine since first announced in 1960 are its offensive character, the importance of nuclear weapons, and the belief that the use of nuclear weapons will cause the war to be decisive in its early phase and, therefore, short. Soviet military doctrine has consistently held that surprise attack is the most probable method whereby "the imperialists will unleash war." Should world war come about, the basic tenets of Soviet military doctrine are that it will be the conflict of two diametrically opposed social systems, that it will be a coalition war that is definitely nuclear, and that it will result in destruction of the capitalist system and the worldwide triumph of the socialist system. This war, particularly nuclear war, is *not* the end of politics, but a continuation thereof to be fought and won. The major change introduced during the 1950s is that nuclear war with the capitalist states is not inevitable and, in the 1960s, that war can also begin conventionally and subsequently escalate to all-out intercontinental war. However, when escalation does come about, it will be sudden, massive, and, most likely, decisive.

Scientific-Technical Progress and the Revolution in Military Affairs, the third volume in the "Soviet Military Thought" series, is the seventeenth volume in the "Officer's Library." It was written in 1973 by a combination of line and Party officers and generals who are recognized spokesmen on Soviet military affairs. Many of them, for example, Colonels V. M. Bondarenko and Ye. I. Rybkin, are frequent contributors to the journal *Communist of the Armed Forces* and other prominent Soviet military publications. General Colonel N. A. Lomov, editor of the book, was formerly assigned to the General Staff Academy and was a consultant to the famed Institute of the USA and Canada. General Major I. I. Anureyev was a contributor to the *Dictionary of Basic Military Terms,* which was part of the "Officer's Library" series, and runner-up to the 1966 Frunze Prize. General Lieutenant M. I. Cherednichenko has written extensively on military affairs and is best known in the Soviet Union for his contributions to all three editions of *Military Strategy.*

The Soviets are clearly very sensitive to the importance of science and technology to both political and military power. The revolution in military affairs was triggered by the nuclear weapon, which, coupled with long-range delivery means, brought about a fundamental reorganization of the Soviet Armed Forces. The qualitative indicators that still characterize modern armed combat are the destructive force and range of nuclear weapons and the speed of military operations, the latter of which has created the need for increased utilization of automatic means of troop control throughout the entire command structure. This is referred to as the

third phase in the revolution—the cybernetic revolution.

The four major themes in the Soviet approach to science and technology are: first, nuclear weapons were the triggering mechanism that set the wheels of the revolution in military affairs rolling; second, the importance of nuclear weapons has not diminished—they are still the most important modern means of combat; third, the revolution did not stop with the nuclear means but, rather, has spread uniformly to items of equipment ranging from small arms to communications, from command control and intelligence to aircraft and tanks; and, fourth, that advances in conventional means, *e.g.,* precision-guided munitions as well as nuclear weapons, are causing further reassessments of operational art and tactics.

The Basic Principles of Operational Art and Tactics, by Col. V. Ye. Savkin, which in US terms treats operations, tactics, laws of war, and laws of armed conflict, was published in the Soviet Union in 1972 and was probably the most important Soviet military publication that year. It is the fourth volume in "Soviet Military Thought." The book examines the evolution of the

The author, Dr. Joseph D. Douglass, Jr., is Director, Center for Theater Nuclear Studies, Systems Planning Corp. Previously, he served as Deputy Director of ARPA's Overseas Defense Research and Tactical Technology Office. Dr. Douglass also has been affiliated with DoD's Weapons Systems Evaluation Group and Sandia Corp., specializing in nuclear war studies. This spring, the Government Printing Office is to publish his book, The Soviet Theater Nuclear Offensive.

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basic military principles that underlie the Soviet operational concept for war in Europe, of which the most demanding aspect is high-speed exploitation. As such, it both reinforces and complements the basic concepts presented in *The Offensive*. The author has served on the faculty of the Frunze Military Academy and is particularly well qualified to write this book of principles of conflict in the nuclear age, having previously written two military texts in the early and mid-1960s on how to achieve high rates of advance under modern combat conditions.

The book investigates the substance, evolution, and significance of the fundamental principles of military art and laws of armed combat and, in particular, the tactical use of nuclear weapons. These principles are intended for use not only by students and young officers but also by all officers and generals of the Soviet Army. These principles are taken very seriously in the Soviet Union. Their discovery and investigation is one of the major functions of the whole field of military science. They not only serve to guide the development of operations and tactics but also to provide important input to military doctrine and its development. This ensures that the doctrine, while providing guidance to the military, also is based on a firm foundation of solid military principles.

The main themes presented in *The Basic Principles of Operational Art and Tactics* revolve around the importance of surprise, the use of massed nuclear strikes at the beginning of combat, the new interpretations of the principle of concentration that are necessary under conditions of modern combat, and the increased role of mobility. The importance of surprise is clear—use of surprise brings success in a battle or operation. Although important in the past, this principle is now paramount. All preparations must be conducted with this in mind. Cover, deceptions, secrecy, and the surprise use of nuclear weapons are all discussed. The use of mass strikes of nuclear weapons at the start of the conflict to attack all targets throughout the entire depth of the defense, it is argued, has acquired an increasingly realistic basis and should now be considered a fundamental principle of military art.

Concentration for the breakthrough under modern conditions has changed. Excessive massing of troops is unnecessary, is dangerous because of their vulnerability to defensive nuclear strikes, and is contrary to the principle of surprise. Concentration is now achieved by the *maneuver of nuclear missile trajectories* to the main axes of attack and by the rapid and coordinated movement of troops to concentrate very quickly at the breakthrough sector, exploit the results of the nuclear strikes, break through, and then disperse again to a nuclear combat posture. All this places increased demands on mobility—a characteristic that is clearly emphasized as the key to surprise, exploitation, and survival.

The fifth volume in "Soviet Military Thought" examines the causes, social character, and types of war; the essence and nature of war; Lenin's concept of a socialist army and the sociological analysis of war; and the role of the ideological struggle in modern warfare. It is entitled, *The Philosophical Heritage of V. I. Lenin and Problems of Contemporary War.* This book, nominated for the Frunze Prize in 1973, was written by a "collective" of authors that included many of the Soviet Union's most outstanding military-political spokesmen. The book's editors, General Major A. S. Milovidov and Col. V. G. Kozlov, have participated in writing several other important recent works, including *Marxism-Leninism on War and Army* and *Methodological Problems of Military Theory and Practice.*

The Philosophical Heritage of V. I. Lenin and Problems of Contemporary War is meant for wide use within the Soviet military. It applies the principles of Leninist methodology and analysis to a variety of significant philosophical problems of modern warfare and development of the Soviet military organization. The editors have stated that it is "designed for officers, generals, and all students of Lenin's military-theoretical heritage" and that "relying on the philosophical heritage of V. I. Lenin, Soviet officers, generals and admirals are endeavoring to analyze more deeply the features of modern war, to advance military theory and practice, to do everything necessary to achieve further consolidation of our nation's strength." It represents doctrinal guidance to the military on the problems of the present and immediate future that deserve their closest attention and consideration.

The latest "Soviet Military Thought" volume, *Concept, Algorithm, Decision (Decision Making and Automation),* was published in Moscow in 1972 as part of the Soviet "Officer's Library." Soviet military writings assert that the "revolution in military affairs" is currently in its third phase. Having acquired nuclear weapons and the means to deliver them, the current phase is concerned with military cybernetics—the science of effectively controlling the armed forces. The thesis of this book is that recent dramatic increases in the speed, complexity, and data base of military decisions, plus multiplication of variety and flexibility of available options, call for urgent improvement in decision-making tools for the control of men and weapons. And, as stated by General of the Army S. M. Shtemenko in the foreword, "The revolutionary transformations of the army and navy call for a scientific approach to the solution of problems of further improvement of military management. The time for extensive adoption of automation in the entire chain of command has arrived."

The widespread adoption of automation and the progression of the cybernetic revolution appear to have run into significant problems in the Soviet Union. In particular, "delay is perceived in the development of the ideological aspect of the problem. The trend toward 'total' automation of management, which saturates scientific-technical propaganda, is not always wholeheartedly sup-

ported, and sometimes considerable skepticism is expressed." The problem as described in the introduction is worth quoting in detail. The "automation" position is, "Here you have the cybernetic industry and its capabilities, so use it. If the capabilities are inadequate tell us what you need and we will do it." The response may trigger many recollections in the reader's own mind. This response, again as presented in the introduction, is, "We are ready and want very much to use cybernetics and you are welcome to expand its capabilities. We place great value on the computer. But tell us how it will help us to solve management problems and prove that it has the advantages which you say it has. Otherwise it will be hard for us to understand how to use it."

This volume in the "Officer's Library" is designed to "ease" this problem. It is structured in three parts: Methods, Means, and Technology. "Methods" covers conceptual models of thinking; the distinction between informational decisions, organizational decisions, and operational decisions in a military context; alternative approaches to making these decisions; group dynamics of the decision-making process; and limitations of unaided intellect. The "Means" part addresses a variety of formal aids to decision-making such as language, concepts of order and sets, and theory of operations (logic and flowchart techniques). The "Technology" section is devoted to computer technology—its intrinsic capabilities and application to military decision-making.

In addition to these volumes in "Soviet Military Thought" that have already been published, there are two recent commercial publications that might well be considered companions to the Air Force series because of their close natural relationship. The first book is the Harriet Fast Scott edition of Sokolovskiy's *Military Strategy*. (*See "Airman's Bookshelf," February '76 and Mrs. Scott's article in this issue, page 76.*) Marshal Sokolovskiy's treatise was the first major publication on the revolution in military affairs. The book first appeared in 1962, with subsequent editions in 1963 and 1968. It is part of the "Officer's Library" and is the basic Soviet reference on military strategy. The Scott edition is particularly valuable in that it indicates the changes that took place as the work progressed from the first edition, published when Khrushchev was Party First Secretary, to the third edition, published after the third year of the Brezhnev regime. Of particular interest in this regard are the doctrinal guidance that signaled the Soviet drive for strategic nuclear superiority, first outlined in the 1962 edition and subsequently elaborated in the 1968 edition, and the detailed analysis in the 1968 edition of the US dialogue that took place in the mid-1960s on damage limiting and limited nuclear war.

The second "companion" is a brief description of *Soviet Sources of Military Doctrine and Strategy*, by Dr. William F. Scott (Col. USAF, Ret.). This is an excellent guide to introduce the novice to Soviet Military literature, both in terms of the role and importance of various publications and authors in the Soviet Union and in terms of annotated chronology of the more important books published, and English translations where available, since 1960. (*See "Airman's Bookshelf," October '75, and Colonel Scott's article in this issue.*)

The Air Force series, "Soviet Military Thought," has been unusually successful. *The Offensive* is now in its sixth printing, and the sixth volume is already in its second printing, for a grand total of more than 30,000 copies purchased. This is not the end. Over the next few years, we can look forward to publication of additional volumes in the "Officer's Library," such as *The Officer's Handbook*, and also to other significant Soviet publications including an anthology of leading articles from important periodicals, and, hopefully, Marshal of the Soviet Union and Minister of Defense A. A. Grechko's book, *The Armed Forces of the Soviet State*.

These books give us the opportunity to understand the Soviet threat in a way heretofore unavailable. As Soviet Minister of Defense Grechko has himself observed in his recent book, "We have never and will never hide the basic, fundamental provisions of our military doctrine." Those of us concerned with national defense might be well advised to pause and sample these fundamental provisions as presented in the excellent translations now available for the first time, and available at giveaway prices. Our sincere thanks to the United States Air Force for providing us with this opportunity. ■

How to Order the "Soviet Military Thought" Series

The six books of the "Soviet Military Thought" series that have been translated by the US Air Force may be ordered from the Superintendent of Documents, US Government Printing Office, Washington, D. C. 20402. They are:

The Offensive, by A. A. Sidorenko. Stock Number 0870–00329. 228 pages. $1.80.

Marxism-Leninism on War and Army. Stock Number 0870–00338. 335 pages. $2.45.

Scientific-Technical Progress and the Revolution in Military Affairs, N. A. Lomov (editor). Stock Number 0870–00340. 279 pages. $2.25.

The Basic Principles of Operational Art and Tactics, by V. Ye. Savkin. Stock Number 0870–00342. 284 pages. $2.30.

The Philosophical Heritage of V. I. Lenin and Problems of Contemporary War, by A. S. Milovidov. Stock Number 0870–00343. 292 pages. $2.35.

Concept, Algorithm, Decision (Decision Making and Automation), by V. V. Druzhinin and D. S. Kontorov. Stock Number 0870–00344. 296 pages. $2.80.

The two commercial publications cited above are: *Soviet Military Strategy* (3d edition), by V. D. Sokolovskiy (editor), translated and edited by Harriet Fast Scott; Crane, Russak and Co., 347 Madison Ave., New York, N. Y.; 1975; 494 pages, $17.50; and *Soviet Sources of Military Doctrine and Strategy*, by William F. Scott; Crane, Russak and Co., 1975; 72 pages, $2.75.

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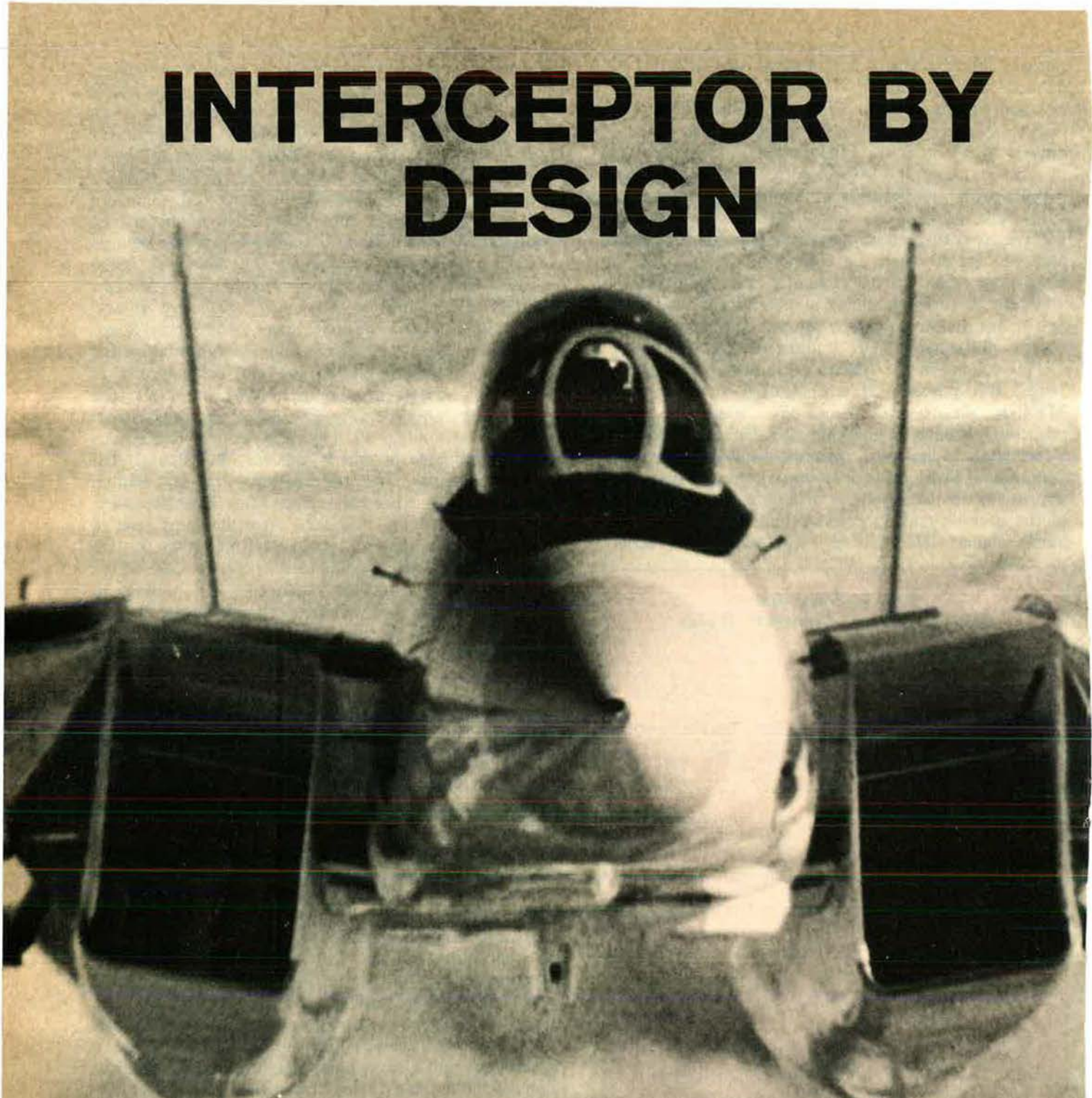

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John W. R. Taylor, the British aerospace authority who prepared this Gallery for AIR FORCE Magazine, is generally acknowledged as the leading expert in aircraft of all nations. His Jane's Supplement appears regularly in this magazine. British spelling, punctuation, and usage have been retained throughout the Gallery. Of necessity, some aircraft and missile specifications are estimated or approximate.

BY JOHN W. R. TAYLOR
Editor, *Jane's All The World's Aircraft*

Bombers and Maritime

—Tass Photo

Beriev M-12 (NATO 'Mail')

Ilyushin Il-38 (NATO 'May')

Myasishchev M-4 (NATO 'Bison-C')

Beriev M-12 (NATO 'Mail')

First displayed in the 1961 Aviation Day fly-past at Tushino Airport, Moscow, this maritime patrol amphibian is standard equipment in shore-based units of the Soviet Naval Air Force, notably in support of the Northern and Black Sea Fleets. About 100 are thought to have been built to replace the piston-engined Be-6 (NATO 'Madge') flying-boats of 1947 vintage. They hold all 18 records for turboprop amphibians currently recognised by the FAI, as well as all 12 records for turboprop seaplanes. Operational equipment includes radar in a nose 'thimble' and an MAD tail-sting.

Power Plant: two Ivchenko AI-20D turboprop engines; each 4,000 shp.
Dimensions: span 97 ft 6 in, length 99 ft 0 in, height 22 ft 11½ in.
Weight: gross 65,035 lb.
Performance: max speed 379 mph, max range 2,485 miles.
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 underwing pylons.

Ilyushin Il-38 (NATO 'May')

This anti-submarine/maritime patrol aircraft was evolved from the Il-18 turboprop airliner in the same way as the US Navy developed the P-3 Orion from the Lockheed Electra transport. The fuselage has been lengthened, and the disposition of specialised internal equipment affected the CG position so much that the wing had to be moved forward a considerable distance. The airliner's passenger windows are no longer needed. Additions include an MAD tail-sting, a large radome under the forward fuselage, and an internal weapon-bay. Il-38s operate widely over the Atlantic and Mediterranean, as the principal shore-based patrol aircraft of the Soviet Naval Air Force. India has ordered an initial batch of three.

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.

Myasishchev M-4 (NATO 'Bison')

About 35 of these Soviet counterparts of the USAF's B-52 continue to operate with the Dalnaya Aviatsiya (Long-Range Aviation) force of 145 intercontinental bombers. Another 50 serve as flight refuelling tankers for this force, carrying a hose-reel unit in their bomb-bay, and the M-4 has also been developed for maritime patrol duties with the Soviet Naval Air Force. The M-4 was first displayed publicly in 1954, when a single example took part in a May Day fly-past over Moscow. It was manufactured subsequently in three major versions, which were allocated the following NATO reporting names:

Bison-A. Long-range strategic bomber, with internal bomb-bays for free-fall nuclear or conventional weapons. Armed with ten 23 mm guns. Up to 50 modified into flight refuelling tankers.

Bison-B. Maritime reconnaissance version, reported in 1964. Glazed nose of 'Bison-A' replaced by 'solid' nose with large superimposed flight refuelling probe. Forward portion of centre bomb-bay doors bulged. Underfuselage blister fairings over electronic equipment. Armament reduced by removal of aft gun turrets above and below fuselage.

Bison-C. Similar to 'Bison-B' in configuration, except for large search radar faired into longer nose, aft of centrally-mounted flight refuelling probe. An example of this version, designated 201-M and powered by four 28,660 lb st D-15 turbojet engines, set up seven payload-to-height records in 1959, including a weight of 121,480 lb lifted to a height of 2,000 m (6,560 ft). *(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, 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 for and aft of weapon-bays, and in tail. Three weapon-bays in centre fuselage.

Tupolev Tu-16 (NATO 'Badger')

Although the twin-jet Tu-16 has been in service more than twenty years, about one-quarter of the 2,000 production models thought to have been built still fly with the medium-range squadrons of the Dalnaya Aviatsiya. The Soviet Naval Air Force also has about 400 for maritime reconnaissance and attack, supported by Tu-16 flight refuelling tankers. Others operate in small numbers with the Iraqi and Egyptian Air Forces, and about 60 have been built in China. Of seven versions identifiable by NATO reporting names, six remain in first-line service, as follows:

Badger-A. The Soviet Air Force's first strategic jet bomber, to which the specification details below apply. Glazed nose. Radome fairing under front fuselage in line with flight deck. Armed with seven 23 mm guns.

Badger-C. Anti-shipping version, first displayed in 1961 Soviet Aviation Day fly-past, with 'Kipper' air-to-surface winged missile carried under centre fuselage. Wide nose radome, in place of normal glazing and nose gun.

Badger-D. Maritime/electronic reconnaissance version, with nose like that of 'Badger-C'. Larger undernose radar fairing. Three more blister fairings in tandem under centre fuselage.

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

Badger-F. Similar to 'Badger-E' but with pylon for an electronic intelligence pod under each wing.

Badger-G. Similar to 'Badger-A' but fitted with underwing pylons to carry two rocket-powered air-to-surface missiles (NATO 'Kelt'). About 275 reported in service with anti-shipping squadrons of Soviet Naval Air Force, replacing earlier 'Badger-Bs' which carried turbojet-powered missiles (NATO 'Kennel') of similar configuration. A few delivered to Egypt launched 25 'Kelts' against Israeli targets during the October 1973 war. The Israelis claimed that only five penetrated the defences, to hit two radar sites and a supply dump in Sinai. *(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.
Accommodation: crew of seven.
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 weapon-bay.

Tupolev Tu-22 (NATO 'Blinder')

This supersonic bomber caused considerable dismay in the West when it put in a surprise appearance at the 1961 Aviation Day display. Retraction of the main landing gear into pods on the wing trailing-edges identified it clearly as a Tupolev design,

and it was viewed as a formidable replacement for existing Soviet long-range strategic bombers. In fact, its range was disappointing and the Dalnaya Aviatsiya is believed to have taken delivery of no more than 200 Tu-22s to supplement its Tu-16s. About 60 were transferred to the Naval Air Force, for reconnaissance and to help protect the sea approaches to the Soviet Union, from bases in the Southern Ukraine and Estonia. An electronic intelligence gathering version has also been reported, and there are suggestions that an interceptor variant has superseded the Tu-28P in the PVO-Strany air defence force.

Blinder-A. Basic medium-range reconnaissance bomber, with fuselage weapon-bay for free-fall bombs.

Blinder-B. Similar to 'Blinder-A' but capability increased by ability to carry an air-to-surface missile (NATO 'Kitchen') with a 460-mile range, recessed into the weapon-bay. Larger radar and partially-retractable flight refuelling probe in nose. Most of 22 Tu-22s in 1967 Aviation Day display at Domodedovo Airport were of this model.

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

Blinder-D. Training version. Cockpit for second pilot in raised position aft of normal 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 26,000 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, in tandem.

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

Tupolev Tu-95 (NATO 'Bear')

First flown in the late Summer of 1954, the Tu-95 quickly proved itself a better combat aircraft than the contemporary four-jet M-4, despite its unique turboprop power plant. In the mid-seventies, it not only remains primary equipment of the Soviet intercontinental strategic bombing force, but has duties that are probably even more important with the Soviet Naval Air Force. All six major versions identified by NATO reporting names continue in service.

Bear-A. Basic long-range strategic bomber, with internal stowage for free-fall nuclear or conventional weapons. Armed with six 23 mm guns. Total of about 110 of this version and 'Bear-B' and 'C' operational.

Bear-B. As 'Bear-A' but equipped to carry large air-to-surface missile (NATO 'Kangaroo') under fuselage, with associated radar in wide undernose radome replacing glazed nose. Displayed first in 1961 Aviation Day fly-past. Now fitted with large flight refuelling nose-probe and used mainly for maritime patrol.

Bear-C. First observed near NATO naval forces in 1964. Differs from 'Bear-B' in having a streamlined blister fairing on the port side of its rear fuselage as well as on the starboard side.

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 nose-wheel doors, over larger or low-pressure tyres. *(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')

The RAF's Chief of Staff said of this twin-jet, variable-geometry bomber a few weeks ago: 'Russian fast, wide-ranging, and high-performance aircraft like "Backfire", armed with stand-off missiles, may soon become an even greater danger to allied shipping than the relatively slow-moving Russian submarines'. This emphasises the potential and versatility of a major combat type first identified in the west more than six years ago. One of the prototypes was observed on the ground near the Tupolev works at Kazan, in Central Asia, in July 1970. Up to twelve pre-production models were tested subsequently, and at least two squadrons are already operational with the Soviet Air Force. 'Backfire' was intended to replace some of the earlier long-range and medium-range bombers, and, according to former US Secretary of Defense James R. Schlesinger, its non-refuelled maximum combat radius of about 3,570 miles, 'coupled with its known flight refuelling capability, would seem to indicate that "Backfire" could be used as an intercontinental as well as a peripheral bomber, the role for which it appears best suited'. Admiral Thomas H. Moorer added: 'When deployed with a compatible tanker force [it] constitutes a potential threat to the continental United States. . . . It weighs two and one-half times as much as an FB-111 and is about four-fifths as large as the B-1'.

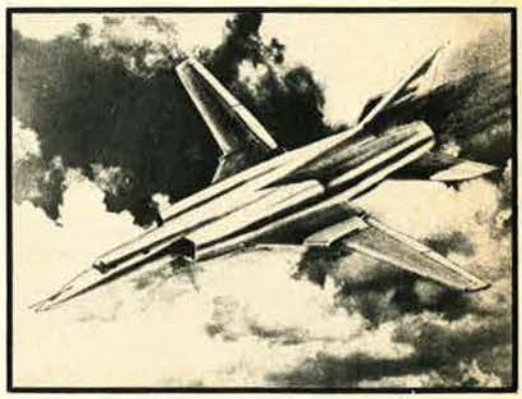
It is believed that 'Backfire' was developed when the shortcomings of the Tu-22 became apparent. Probable design parameters included an over-target speed of Mach 2.25 to Mach 2.5, a maximum unrefuelled range of 5,500–6,000 miles at high altitude, and a low-level penetration capability at supersonic speed. The initial version (NATO **'Backfire-A'**) is thought to have failed to meet the range requirement and only sufficient aircraft for a single squadron were built. Redesign to produce the operational **'Backfire-B'** included an increase in span and virtual elimination of the original, typically Tupolev main landing gear pods. Use of the pods had restricted the variable geometry to the outer wings, as on the Sukhoi Su-17/20, and this could not be changed. The large square-section engine ducts, built on to the sides of the fuselage, are fitted with splitter plates and must embody complex internal variable geometry. The engines are reported to be uprated versions of the 44,090 lb st Kuznetsov NK-144 afterburning turbofans used in the Tu-144 supersonic airliner.

Gross weight of 'Backfire' is believed to be in the region of 272,000 lb. It can carry the full range of Soviet free-fall weapons,

Tupolev Tu-16 (NATO 'Badger-G') of Egyptian Air Force, with 'Kelt' missiles

Tupolev Tu-22 (NATO 'Blinder')

Tupolev Tu-95 (NATO 'Bear') —*Ministry of Defence Photo*



Artist's conception of the latest Tupolev bomber (NATO 'Backfire')

as well as the AS-4 air-to-surface missile (NATO 'Kitchen') and the smaller AS-6. The Soviet Union is also thought to be perfecting counterparts to the USAF's SRAM, and decoys to assist penetration of advanced defence systems.

Fighters

MiG-17 (NATO 'Fresco')

The Soviet designation 'MiG' reflects the fact that early piston-engined and jet fighters from this design bureau were evolved under the partnership of Colonel General Artem I. Mikoyan and a mathematician named Mikhail I. Gurevich. From the MiG-21 onward, Gurevich played no part in design. Mikoyan died in December 1970, but the MiG designation is being perpetuated for all current designs of the bureau he headed.

The MiG-17 was developed from the pioneer Soviet sweptwing MiG-15 in an unsuccessful effort to achieve supersonic performance. 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. Although subsonic, the new fighter was sufficient of an advance over the MiG-15 to begin superseding it in production in 1953. Many thousands were built subsequently. An estimated 800 MiG-17F (NATO 'Fresco-C') day fighter-bombers still serve with the Frontovaya Aviatsiya tactical support units. Several hundred MiG-17PF ('Fresco-D') limited all-weather interceptors, with radar in a central bullet in the air intake, continue to fly with the PVO-Strany air defence forces. Others are deployed widely with the air forces of Russia's allies and friends in eastern Europe, the Middle East, Africa, and Asia. *(Data for MiG-17F follow.)*

Power Plant: one Klimov VK-1A turbojet engine; 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-17PF can carry four 'Alkali' missiles.)

—John Fricker Photo

Chinese-built MiG-19 (F-6) of the Pakistan Air Force, armed with Sidewinder missiles

MiG-19 (NATO 'Farmer')

When this twin-jet fighter entered service in 1955, it was the first Soviet combat aircraft able to exceed Mach 1 in level flight. It has now almost disappeared from service with the PVO-Strany, although examples supplied to other air forces continue to fly with first-line squadrons. In addition, both day and all-weather fighter versions have been produced in large numbers in China, under the designation F-6, and form the basis of the new Chinese F-9 design. Main current Soviet-built versions are as follows:

MiG-19SF ('Farmer-C'). Day fighter-bomber, to which details below apply.

MiG-19PM ('Farmer-D'). Limited all-weather fighter, able to carry four 'Alkali' missiles. Guns deleted. Radar in bullet in centre of air intake and lip fairing.

MiG-19PF ('Farmer-D'). As MiG-19PM but armed with two wing-root guns and no provision for 'Alkali' missiles.

Power Plant: two Klimov RD-9B turbojet engines; each 7,165 lb st with afterburning.
Dimensions: span 29 ft 6½ in, length 48 ft 10½ in, height 13 ft 2¼ in.
Weights: empty 12,700 lb, gross 19,180 lb.
Performance: max speed 902 mph at 32,800 ft, service ceiling 58,725 ft, combat radius 426 miles with external tanks.
Accommodation: pilot only.
Armament: three 30 mm NR-30 guns, two 550 lb bombs, 212 mm air-to-surface rockets, or eight-rocket pods.

—John Charleville Photo

MiG-21 (NATO 'Fishbed-L')

MiG-21 (NATO 'Fishbed')

Smaller and lighter in weight than either of the US types built for the ACF programme, the MIG-21 is the most widely-used fighter in the world. 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 different versions. The initial production model (NATO 'Fishbed-A') was built in only small numbers, with an 11,240 lb st Tumansky RD-11 afterburning turbojet and installed armament of two 30 mm guns. It was generally regarded as being short on range, search capability, and punch; development has concentrated mainly on overcoming these shortcomings.

The E-5 prototype of the MiG-21 flew for the first time in 1955. Major versions now serving with the Soviet tactical air forces (more than 1,350 aircraft) are as follows:

MiG-21F ('Fishbed-C'). Short-range clear-weather fighter, with 12,676 lb st RD-11 engine, internal fuel capacity of 618 gallons, and radar ranging equipment in small air intake centrebody of movable three-shock type. Able to carry underbelly 130 gallon tank. Armed with one 30 mm gun and two K-13 (NATO 'Atoll') air-to-air missiles or sixteen-round pods of 57 mm rockets. 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. RD-11 uprated to 13,120 lb st with afterburning. Internal fuel capacity increased to 753 gallons. Guns deleted. Late production aircraft 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. Type 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 capacity totals only 687 gallons. Two additional pylons can carry either 130 gallon fuel tanks or radar-homing 'Advanced Atoll' missiles to supplement infra-red K-13As on inboard pylons. Pitot boom above nose, but 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 carriage of centre-line tank.

MiG-21MF ('Fishbed-J'). Basically as PFMA, but with lighter-weight, higher-rated Tumansky RD-13-300 turbojet. Rearview mirror above canopy. Entered service with Soviet AF in 1970.

MiG-21SMT ('Fishbed-K'). As MiG-21MF, but with ECM equipment in small removable wing-tip pods. Deep dorsal spine extends rearward as far as parachute brake housing to provide maximum fuel tankage and optimum aerodynamic form.

'Fishbed-L'. Generally, as MiG-21MF, but with short-range navigation and landing system similar to Tacan. *(Data for MiG-21MF follow.)*

Power Plant: one Tumansky RD-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 and Mach 1.06 at low altitude, service ceiling 59,050 ft, range 683 miles on internal fuel or 1,118 miles with three external tanks.
Accommodation: pilot only.
Armament: one twin-barrel 23 mm GSh-23

with 200 rounds. Typical loads on ing pylons for interceptor role in- two K-13A ('Atoll') and two 'Ad- Atoll' air-to-air missiles; two K- d two UV-16-57 (sixteen 57 mm) ods; two drop tanks and two mis- ypical ground attack loads are '6 57 rocket packs; two 1,100 lb 50 lb bombs; or four S-24 240 mm ce missiles.

ATO 'Flogger')

n MiG-23s represent an almost sign compared with the prototype as demonstrated during the 1967 . Day display at Domodedovo. The is an airframe packed with note- worthy features, and offering great flexi- bility in terms of power plant, equipment, and role. On all versions the wings sweep from approximately 19° to 72°, and are fitted with two-section full-span flaps. When the wings are extended, the outer two-thirds of each leading-edge can be drooped. When they are swept, the entire leading-edge of each main panel is seen to have a much greater chord than that of the portion that pivots inside the fixed wingroot glove. The bottom section of the ventral tail-fin is hinged, so that it can fold to starboard to provide ground clearance during take-off and landing. The main landing gear, al- though sturdy and of relatively wide track, does not restrict the carriage of stores under the fuselage and wingroot gloves, and occupies minimal space in the fuselage when retracted. The MiG-23 is said to have be- come fully operational during 1972, since when an estimated 500 have been delivered to Soviet Air Force units. Others have been exported to Egypt (23), Iraq (40), Libya (30), and Syria (40). Photographs of a line-up of Libyan single-seaters disprove reports that only two-seaters have been exported, so that the rear seat can be occupied by a Soviet pilot at all times. Three operational versions have been identified, as follows:

MiG-23B ('Flogger-B'). Single-seat air combat fighter, with one 23 mm GSh-23 twin-barrel gun in belly; five external store pylons, under fuselage centreline, each intake duct, and each wingroot glove. Centre- line pylon can carry drop fuel tank; others have been seen with rails for four unidenti- fied air-to-air missiles. Radar in ogival di- electric nosecone. Afterburning turbojet, esti- mated at 20,500 lb st; variable-geometry air intakes and variable nozzle.

MiG-23U ('Flogger-C'). Tandem two-seater for both operational training and combat use. Identical to MiG-23B except for second cockpit and modified fairing aft of canopy.

MiG-23– ('Flogger-D'). Considerably modi- fied ground attack version, seen only in Soviet Air Force service by early 1976. Up- rated engine, with fixed air intakes and nozzle. Modified nose, without radar. Small sloping window under nose, covering camera or laser rangefinder and marked target seeker. Different underbelly gun. ECM an- tenna above port glove pylon. Additional armour on sides of cockpit. The following details apply to this version:

Power Plant: one unidentified turbojet en- gine; estimated at 24,250 lb st with after- burning. Internal fuel capacity 1,420 US gallons. Provision for ferry tank under each outer wing, if kept extended.
Dimensions: span 46 ft 9 in spread, 26 ft 9½ in swept, length 55 ft 1½ in.
Weights: max weapon load 4,200 lb, gross 39,130 lb.
Performance: max speed Mach 2.5 at height, max ferry range (3 tanks) 1,550 miles.
Accommodation: pilot only.
Armament: one six-barrel 23 mm Gatling- type gun; five pylons for unidentified ex- ternal stores, known to include tactical nuclear weapons.

MiG-25 (NATO 'Foxbat')

Fastest weapon-carrying aircraft in service with any air force in the world, the MiG-25 has become the standard against which the efficiency of western defence systems must be evaluated. Its existence was revealed in 1965, when the Soviet Union requested FAI approval for a speed record of 1,441.5 mph set up by an aircraft designated E-266 around a 1,000 km closed circuit, carrying a two-ton payload. Other records followed, including an absolute height record of 118,898 ft, and speed of 1,852.61 mph over a 500 km circuit, which have not been beaten. Identification of the E-266 as the MiG-25 did not come until early 1973, when Dr. Robert C. Seamans, then US Secretary of the Air Force, described it as 'probably the best Interceptor in production in the world today', adding, 'This Mach 3 aircraft performs both interceptor and reconnais- sance missions, can operate at 80,000 ft, and has a highly capable avionics and mis- sile system'. During the previous two years, MiG-25s had performed high-speed recon- naissance flights off the Israeli coastline and over Sinai, without hindrance. Subse- quently, similar missions have been flown over Iran. Three versions of the MiG-25 have been identified by unclassified NATO report- ing names:

Foxbat-A. Basic interceptor, armed with four air-to-air missiles (NATO 'Acrid') on underwing attachments. Slightly reduced wing leading-edge sweep towards tips.

Foxbat-B. Basic reconnaissance version, with five camera windows and various flush dielectric panels aft of small dielectric nose- cone. Wing leading-edge sweep constant from root to tip.

MiG-25U ('Foxbat-C'). Trainer, of which first photographs were published towards the end of 1975. Generally similar to combat versions, but with new nose, containing separate cockpit with individual canopy, forward of standard cockpit, and at a lower level. No radar or reconnaissance sensors in nose.

In May 1975, an aircraft designated E-266M (presumably with an uprated power plant) recaptured two time-to-height records which had been held for a few months by the McDonnell Douglas F-15 *Streak Eagle*. It also set a new record by climbing to 35,000 m (114,830 ft) in 4 min 11 sec.

In his FY 1975 Defense Department Re- port, then-Secretary Schlesinger commented, 'Should the Soviet Union develop and de- ploy an AWACS-Foxbat "look-down, shoot- down" air defence system, we would have to counter it with new penetration devices and techniques such as the cruise missile, bomber defence missiles, and improved ECM'.

Power Plant: two turbojet engines, probably of Tumansky design; each 24,250 lb st with afterburning.
Dimensions: span 40 ft 0 in, length 69 ft 0 in.
Weight: gross 64,200 lb.
Performance: max speed Mach 3.2 at height, service ceiling 80,000 ft, combat radius 700 miles.
Armament ('Foxbat-A'): Four air-to-air mis- siles (NATO 'Acrid'), two radar homing, two infra-red homing.

Sukhoi Su-9 (NATO 'Fishpot')

When the prototype of this single-seat all-weather fighter ('Fishpot-A') appeared in the 1956 Soviet Aviation Day fly-past, it had a small conical radome above its engine air intake. This was replaced by a conical centrebody radome on the production Su-9 ('Fishpot-B'), which has been operational since 1959 and, with the improved Su-11, continues to equip 25% of the PVO-Strany's force of more than 2,500 interceptors. Al- though similar in general configuration to the contemporary MiG-21, the Su-9 is a larger and more powerful aircraft of rather cleaner design. It normally carries two ex- ternal fuel tanks side by side under its belly.
Power Plant: one Lyulka AL-7F turbojet en- gine; 19,840 lb st with afterburning.
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 of 'Fishpot-C' implies, the Su-11 is an improved version of the Su-9. First displayed publicly at Domo- dedovo in 1967, it has a lengthened nose of less tapered form, with an enlarged centre- body, and two slim duct fairings along the top of the fuselage, as on the Su-7B. Its ar- mament is also much improved, and an uprated version of the AL-7F turbojet is fitted.

MiG-23 (NATO 'Flogger-D')

MiG-23 (NATO 'Flogger-B') of Libyan Air Force. This view emphasises the extended chord of the main wing panels

MiG-25 (NATO 'Foxbat-A') with four 'Acrid' missiles

Sukhoi Su-9 (NATO 'Fishpot-B') —*Tass Photo*

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 missiles (NATO 'Anab') under wings, one radar homing, one infra-red homing.

Sukhoi Su-15 (NATO 'Flagon')

This formidable twin-jet all-weather interceptor was another newcomer at the last big Soviet Aviation Day display in 1967. One prototype and nine standard single-seat fighters took part, together with a purely experimental STOL version with wings of compound sweep and three lift-jet engines mounted vertically in the centre fuselage. Other versions have followed, and Su-15s, Tu-28Ps, Yak-28Ps, and MiG-25s now equip about 50% of the PVO-Strany domestic air defence units. Variants identified by NATO reporting names are as follows:

Flagon-A. Basic single-seater, with simple delta wings identical in form to those of Su-11.

Flagon-B. Experimental STOL version, for R&D only.

Flagon-C. Two-seat training version, with probable combat capability.

Flagon-D. Similar to 'Flagon-A' but with wings of compound sweep, produced by reducing the sweepback at the tips without increasing the span.

Flagon-E. Wings as for 'Flagon-D'. More powerful engine, increasing speed and range. Uprated electronics. Operational since second half of 1973.

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.

Sukhoi Su-15 (NATO 'Flagon-A') with 'Anab' missiles

Tupolev Tu-28P (NATO 'Fiddler')

Largest fighter ever put into squadron service, the Tu-28P has been operated by the PVO-Strany since 1966. Production may have been comparatively small, and there are reports that its place in the interceptor force has been taken by a new version of the Tu-22 (see page 94).

When displayed for the first time at Tushino in 1961, the Tu-28P was armed with two missiles, carried a large blister under its fuselage, and was fitted with ventral fins. The three production which took part in the 1967 Domodedovo dispensed with the ventral fins, but carried double ment of the 1961 aircraft. Desig include half-cone shock-bodies in air intakes, and streamlined r wing trailing-edges into which landing gear units retract.

Power Plant: two unidentified a turbojet engines; each estimated lb st.
Dimensions: span 65 ft 0 in, length 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.

—Tass Photo

Tupolev Tu-28P (NATO 'Fiddler') with 'Ash' missiles

Yakovlev Yak-28P (NATO 'Firebar')

The designation Yak-28 is applied to a series of aircraft employing the same basic airframe and power plant but intended for a variety of military tasks, as replacements for the earlier Yak-25, 26, and 27. Similarity to their predecessors is superficial. As a start, all members of the Yak-28 family are of shoulder-wing layout, whereas the Yak-25/26/27 were mid-wing. Other major changes include the switch to a completely new landing gear, comprising two twin-wheel main units in tandem under the fuselage, with small balancer wheels inset from the wingtips. The pointed fairings forward of the balancer wheel housings are lead-filled for aerodynamic reasons.

The version of the design equipped as a transonic all-weather interceptor is the Yak-28P. Since entering service, it has been fitted retrospectively with a much longer dielectric nosecone, but this does not indicate any increase in radar capability or aircraft performance.

Power Plant: two turbojet engines, believed to be related to the Tumansky RD-11 fitted in the MiG-21; each 13,120 lb st with afterburning.
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.

Attack Aircraft

Sukhoi Su-7 (NATO 'Fitter-A')

Developed in parallel with the Su-9/Su-11 all-weather interceptors, this ground attack fighter differs from them primarily in having a swept wing instead of a delta wing. It made its debut at the same time as the Su-9 prototype, at Tushino in 1956. By 1961, it was able to fly past spectators at the same airport in formations of up to 21 aircraft. Today, about 500 Su-7s are believed to serve with tactical units of the Soviet Air Force. Others have been exported to at least ten countries, and were used in action during the last Indo-Pakistan war and in the Middle East, by India and the Arab combatants respectively. 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 turbojet engine; 22,046 lb st with afterburning.
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 attachments for two 1,650 lb and two 1,100 lb bombs, or rocket pods.

—Tass Photo

Sukhoi Su-7B (NATO 'Fitter-A')

Sukhoi Su-17 and Su-20 (NATO 'Fitter-C')

Among the experimental aircraft displayed at Domodedovo on Soviet Aviation Day in 1967 was a variable-geometry adaptation of the Su-7. Only some 13 ft of each wing was pivoted, outboard of a very large fence; the remainder of the airframe was virtually unchanged. Attachments for an external store were built into each wing fence, but there seemed no reason to expect the variable-geometry Su-7 (known to NATO as 'Fitter-B') to enter production in view of the comparatively small improvement in performance offered by such modification. Discovery of at least one or two squadrons of broadly-similar aircraft in service with the Soviet Air Force in 1972 came as a surprise, but can be explained by the minimal endurance of the standard Su-7 with full afterburning in use. Even a small improvement in range and endurance is worthwhile.

The Su-17 designation quoted for production aircraft operated by the Soviet Air Force is not yet confirmed. They appear to

have slightly different rear fuselage contours from aircraft exported to other air forces, suggesting use of a more powerful engine. Export models are designated Su-20, but the NATO reporting name 'Fitter-C' applies to both versions. Photographs of those serving with the Polish Air Force reveal that they are fitted with a second nose-probe, a deepened dorsal spine fairing between the cockpit canopy and the fin, and a total of eight stores pylons under the fuselage and the fixed portions of the wings. The wing-root guns of the Su-7 are retained; but, instead of the familiar twin centreline external fuel tanks, the Polish aircraft seem to fly normally with two large jettisonable tanks on the outboard wing attachments.

Dimensions: span 41 ft 0 in spread, 29 ft 6 in swept, length 56 ft 0 in.

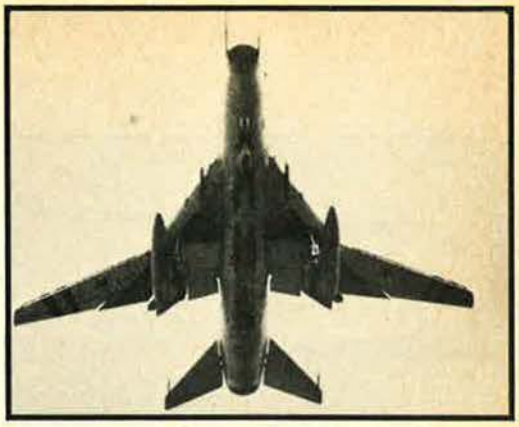
Sukhoi Su-19 (NATO 'Fencer')

Although the new combat aircraft known to NATO as 'Fencer' is operational, few details have yet been published, and no photographs have appeared in the press. Admiral Thomas H. Moorer, former Chairman of the US Joint Chiefs of Staff, has described it as 'the first modern Soviet fighter to be developed specifically as a fighter-bomber for the ground attack mission'. It is believed to be in much the same class as the USAF's F-111, with side by side seating for a crew of two and variable-geometry wings. A provisional drawing was published in the October 1975 AIR FORCE Magazine. Since it appeared, further information suggests that the wings have a constant leading-edge sweep of approximately 70° from root to tip when fully swept, rather than compound sweep, and that twin ventral fins are fitted. The nose shape may also be like that of the 'Flogger-D' version of the MiG-23, instead of ogival, suggesting the presence of a laser seeker/rangefinder and Doppler equipment rather than a large radar. Su-19s have been in service with Soviet Air Force units in the USSR and in East Germany for about a year. The following data should be regarded as provisional:

Dimensions: span 56 ft 3 in spread, 31 ft 3 in swept, length 69 ft 10 in.
Weight: gross 68,000 lb.
Performance: combat radius (lo-lo) over 200 miles.
Armament: one 23 mm GSh-23 twin-barrel gun in belly installation; six weapon pylons under fuselage and wingroot gloves for more than 10,000 lb of guided and unguided air-to-surface weapons.

Yakovlev Yak-28 (NATO 'Brewer-A, B, and C')

The two-seat tactical attack Yak-28 was produced in several versions, known by the NATO reporting names of 'Brewer-A, B, and C'. The basic airframe and power plant are similar to those described for the Yak-28P ('Firebar'), the main differences being in crew accommodation and operational equipment. There is a single cockpit for the pilot, under a small blister canopy, with a glazed nose position for the navigator/bomb-aimer. An internal weapon-bay is located in the centre fuselage, and most Yak-28s have a small radome forward of this. Some have a gun semi-submerged in each side of the fuselage; others have a single gun, on the starboard side. The length of the engine nacelles varies on different versions. All can carry a pointed slipper-type fuel tank under the leading-edge of each outer wing. The number remaining in service with the Soviet tactical air forces is probably small.



Sukhoi Su-17 (NATO 'Fitter-C')

Yakovlev Yak-28 (NATO 'Brewer-E')

Reconnaissance, ECM, and Early Warning Aircraft

Antonov An-12 (NATO 'Cub')

A variant of the An-12 transport is used by the Soviet Air Force and Navy for electronic intelligence (ELINT) operations and is known to NATO as **'Cub-C'**. It has an ogival 'solid' fuselage tailcone, housing electronic equipment instead of a gun position. The glazed nose and undernose radar of other versions are retained. Additional electronic pods are faired into the forward fuselage and ventral surfaces. An aircraft of this type has been photographed in Egyptian Air Force markings.

MiG-21 (NATO 'Fishbed')

Two versions of this supersonic single-seat fighter are equipped as specialised tactical reconnaissance aircraft. The **MiG-21R** ('Fishbed-H') is basically similar to the MiG-21PFMA but has a pod containing forward-facing or oblique cameras, infra-red sensors, or ECM devices, and fuel, mounted on its fuselage centreline pylon. There is a suppressed antenna at mid-fuselage; optional wingtip fairings house further ECM equipment. The **MiG-21RF** ('Fishbed-H') carries similar equipment but is based on the MiG-21MF.

MiG-25 (NATO 'Foxbat-B')

(See page 97.)

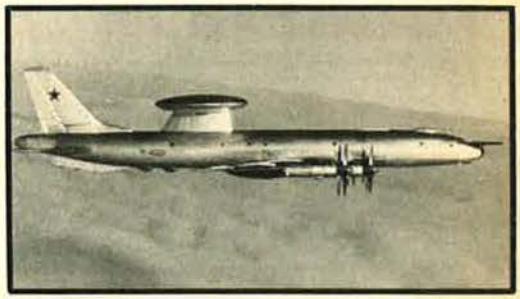
Tupolev Tu-126 (NATO 'Moss')

In 1968, two years before Boeing received an initial contract as prime contractor and systems integrator under the USAF's AWACS (Airborne Warning and Control System) programme, the Soviet Union revealed that it had already flown a counterpart of the projected American AWACS. Allocated the reporting name 'Moss' by NATO, the Soviet aircraft was clearly based on the airframe of the Tu-114 airliner, which had itself been evolved from the Tu-95 strategic bomber. This was logical, as the larger-diameter fuselage of the transport offered maximum space for all the electronic equipment and crew stations needed by a long-endurance AWACS aircraft. The number of cabin windows was reduced to a minimum; additions included a flight refuelling nose-probe, ventral fin, lengthened tailcone, and numerous antennae and blisters for electronic equipment, as well as the early warning radar in a 36 ft rotating 'saucer' above the fuselage. At least ten or twelve aircraft of this type are now operational with the PVO-Strany air defence forces, with the Soviet designation Tu-126. Their primary task is to provide early warning of approaching enemy aircraft, at any height down to sea level, and direct interceptors towards the intruders. 'Moss' might also assist Soviet attack aircraft to elude enemy interceptors picked up by its radar. It is said to operate most effectively over water, with limited 'look-down' capability 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')

Evidence suggests that Yak-28s are being progressively switched from first-line attack to support roles, with the emphasis on electronic countermeasures (ECM), reconnaissance, and training. The version known to NATO as **'Brewer-D'** differs from the original two-seat tactical attack models primarily in having cameras in its weapon-bay. **'Brewer-E'**, deployed in 1970 as the first Soviet operational ECM escort aircraft, has an active ECM pack built into its bomb-bay, from which the pack projects in cylindrical form. There is no radome under the front fuselage, but numerous 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.



Tupolev Tu-126 (NATO 'Moss') —*US Navy Photo*

Transports

—Tass Photo

Antonov An-12 (NATO 'Cub')

Antonov An-12 (NATO 'Cub')

Aeroflot has retired its An-10 turboprop airliners, but the An-12 freight-carrying counterpart of this aircraft continues to be the mainstay of the Soviet military air transport force (A-VDV). About half of the A-VDV's 1,700 fixed-wing aircraft are An-12s; together they could carry two army divisions, totalling 14,000 men and 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 121 ft 4½ in, height 32 ft 3 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')

Antonov An-14 (NATO 'Clod')

First flown on March 15, 1958, this twin-engined light general-purpose aircraft underwent considerable development before entering commercial and military service. Engine power and payload were increased, wing span was extended, and the tail unit was redesigned. The military model was first displayed at Domodedovo in July 1967, and has since been observed in service with the Soviet, East German, and Guinea Air Forces. Passenger access and freight loading are via clamshell doors which close to form the underside of the upswept rear fuselage. Simplicity of servicing and handling were prime objectives of the design, and the An-14 is described as being suitable for operation by pilots of average skill. It is equipped for all-weather operation, will take off from concrete in 328 ft and land in 230 ft with full (1,590 lb) payload.

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 equivalent freight, in main cabin.
Armament: none.

Antonov An-22 (NATO 'Cock')

Antonov An-22 (NATO 'Cock')

The prototype of this huge turboprop freighter made a surprise first public appearance at the 1965 Paris Air Show. It had completed its maiden flight only four months earlier, on February 27. By mid-1967, a total of six An-22s were flying, including the first production model. Three of them participated in the Aviation Day display at Domodedovo in July, demonstrating their military potential by landing batteries of 'Frog-3' rockets and SA-4 ('Ganef') surface-to-air missiles on tracked launchers. Layout follows typical Antonov practice, with anhedral on the outer panels of the high wing, and loading via a rear ramp under the upswept fuselage. Estimates of the number of production An-22s delivered to the Soviet Air Force vary from twelve to thirty. During officially-confirmed record attempts, one of them lifted a 100-ton 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.

—N. B. Rivett Photo

Ilyushin Il-18 of the Yugoslav Air Force (NATO 'Coot')

Antonov An-24 (NATO 'Coke')

More than 50 million passengers and half a million tons of cargo had been carried by Aeroflot An-24s by 1971, eight years after the type entered commercial service. The Soviet Air Force operates An-24s as short-range transports; others have been delivered in small quantities to at least a dozen air forces throughout the world. 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')

Displayed for the first time at the 1969 Paris Air Show, the An-26 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 another transport that 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 seven 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, range 3,230 miles with max fuel, or 1,990 miles with max payload.
Accommodation: crew of five; up to 122 passengers.
Armament: none.

Ilyushin Il-76 (NATO 'Candid')

The prototype of this four-turbofan heavy freighter flew for the first time on March 25, 1971, and was displayed at the Paris Air Show two months later. It was described as an aircraft for 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 tons of freight for a distance of 3,100 miles (5,000 km) in under six hours indicated the Il-76's military potential. An official film released in 1975 shows that it is already in service with the Soviet Air Force, with added rear gun turret, probably as an An-12 replacement. 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.

There is evidence that a version of the Il-76 is under evaluation as a flight refuelling tanker for Tupolev 'Backfire' bombers, as a replacement for the Myasishchev M-4s in current service.

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.

Ilyushin Il-76, commercial version (NATO 'Candid') —Tass Photo

Trainers

Aero L-29 Delfin (NATO 'Maya')

For many years it has been the policy of the Soviet Union to acquire certain categories of small fixed-wing aircraft, helicopters, and sailplanes from the aircraft industries of other members of the Warsaw Pact group of nations. Agricultural and general-purpose aircraft like the Yak-12 and An-2, and helicopters such as the Mi-2—all designed in the Soviet Union—were built under licence, exclusively, in Poland for long periods. Similarly, the L-29 two-seat jet basic and advanced trainer, designed and built in Czechoslovakia, was adopted as standard equipment for all Warsaw Pact air forces except that of Poland. More than 3,000 were built and, with exports to nations outside eastern Europe, now fly with about 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. The details below apply to the standard **L-39.** The fourth prototype has been tested with underwing rocket pods and air-to-air missiles.

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 7,055 lb, gross 9,998 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 and rockets.

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-15UTI (NATO 'Midget') of the Finnish Air Force —C. C. Brunckhorst Photo

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 RD-13 turbojet and four underwing stores pylons.

Sukhoi Su-7U (NATO 'Moujik') of the Egyptian Air Force —Flight Photo

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 minimal. 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') —Tass Photo

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

(See page 94.)

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.

Experimental Aircraft

Yakovlev Yak-36 (NATO 'Freehand')
Two examples of this experimental V/STOL fighter were shown in the 1967 Soviet Aviation Day display at Domodedovo Airport, Moscow. The fact that they operated from the airport, instead of simply taking part in the fly-past, and that good photographs were released subsequently, suggests that they were intended mainly as technology demonstrators. This is borne out by the comparative crudeness of the design. However, about twelve Yak-36s are thought to have been built, and one of them is reported to have carried out sea trials from a specially-installed pad on the flight deck of the helicopter cruiser *Moskva*. As the Soviet Navy will need such an aircraft for operation from its new fleet of carriers, and no other counterpart to the operational British V/STOL Harrier is yet known, the Yak-36 at least offers a pointer to Soviet thinking.
Power Plant: two unidentified turbojet engines, mounted side by side in bottom of front fuselage. Each exhausts through a large-diameter louvred and gridded vectored-thrust nozzle, to provide thrust for both vertical flight and cruise. Bleed-air supply to 'puffer-pipe' reaction control nozzles located at the tail, at the end of a nose-probe, and in each wingtip fairing, for control in hovering and low-speed flight.
Dimensions: span 27 ft 0 in, length 57 ft 6 in, height 14 ft 9 in.
Performance: subsonic.
Accommodation: pilot only.
Armament: two 16-round rocket pods on underwing pylons of one of the prototypes demonstrated in 1967.

Yakovlev Yak-36 (NATO 'Freehand')

Yakovlev improved V/STOL aircraft
Unconfirmed reports suggest that the Yakovlev bureau has evolved a more advanced strike/reconnaissance V/STOL aircraft from the Yak-36. The new aircraft is said to utilise a mixture of vectored thrust and direct jet-lift.

Helicopters

Kamov Ka-25 (NATO 'Hormone')
Several versions of this aircraft are in service, but the only one of which photographs have been published is the important ship-based anti-submarine hunter-killer shown in the accompanying illustration. The prototype, then allocated the NATO reporting name 'Harp', was included in the fly-past of new military aircraft at Tushino Airport, Moscow, in July 1961. It carried a pair of dummy missiles on outriggers. Nothing similar appears to have been fitted to any production Ka-25 ASW helicopters (NATO **'Hormone-A'**), which have an internal armament bay, supplemented by racks for small stores on each side of the fuselage. Equipment varies from one aircraft to another. Some Ka-25s have a streamlined blister fairing at 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. The large undernose search radar also exists in two forms, one needing a larger radome than the other. 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, and a towed magnetic anomaly detector is also carried. Ka-25s, equipped for all-weather operation, fly from cruisers of the *Kresta* and *Kara* classes, and from the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 20 aircraft. They have largely replaced piston-engined Mi-4s in the Soviet Navy's ship and shore based force of around 275 helicopters.
NATO has allocated the reporting name **'Hormone-B'** to a special electronics variant.
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.

—US Navy Photo *Kamov Ka-25 (NATO 'Hormone')*

Mil Mi-2 (NATO 'Hoplite') of the Polish Air Force

—Tass Photo *Mil Mi-6 (NATO 'Hook')*

Mil Mi-2 (NATO 'Hoplite')
An estimated 2,000 modern turbine-powered helicopters provide transport and support with the Soviet Air Force. Smallest of the current types is the Mi-2, designed originally in the Soviet Union as a replacement for the piston-engined Mi-1, but now built exclusively by WSK-Swidnik in Poland. Many hundreds have been delivered since 1965, for commercial use and for service with the air forces of the Soviet Union, Bulgaria, Hungary, Poland, and Romania.
Power Plant: two Isotov GTD-350 turboshaft engines; each 400 or 450 shp.
Dimensions: rotor diameter 47 ft 6¾ in, length of fuselage 37 ft 4¾ in, height 12 ft 3½ in.
Weights: basic operating 5,213 lb, gross 8,157 lb.
Performance: max speed 130 mph at 1,640 ft, service ceiling 13,755 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 service with the Soviet Air Force; others with the air forces of Bulgaria, Egypt, Iraq, 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')

The Soviet armed forces have taken delivery of large numbers of Mi-8s, differing from the airline version in having small circular cabin windows instead of large square panes. Those used as assault transports carry racks for external stores on each side of the cabin. At least thirteen other air forces also operate this aircraft.
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.
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')

The existence of this heavy-lift helicopter was revealed in early 1969, when a prototype set four payload-to-height records. On August 6 of the same year, the earlier records were far exceeded by an Mi-12 which lifted 88,636 lb to 7,398 ft. To ease development, the designers decided to utilise two power plant/rotor packages almost identical with those of the Mi-6 and Mi-10, 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')

A new dimension was added to the mobility and hitting power of the Warsaw Pact forces in eastern Europe in early 1974, when it was 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 new American UTTAS prototypes, the Mi-24 carries eight combat-equipped troops, and is heavily armed to keep down the heads of any enemy in the drop zone. Design features include a fully retractable landing gear and offset tail rotor pylon.

Soviet women pilots have set a series of records in a helicopter designated **A-10.** This is believed to be a new designation for the Mi-24. The records, not yet confirmed, include a speed of 212 mph over a straight course, 200 mph over a 1,000-km circuit, and climb to 6,000 m (19,685 ft) in 7 min 44.5 sec. The following details refer to the version known to NATO as 'Hind-A'. The *earlier* 'Hind-B', without missile pylons, is not thought to be significant.
Power Plant: two unidentified turboshaft engines, expected to give the same power as the engines of the Mi-8 although dimensionally smaller.
Dimensions: rotor diameter 55 ft 9 in, length of fuselage 55 ft 9 in, height 14 ft.
Accommodation: crew of two; 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 pods, each containing thirty-two 57 mm rockets, under stub-wings.

Mil Mi-8 (NATO 'Hip') of the Pakistan Air Force —John Fricker Photo

Mil Mi-10 (NATO 'Harke') —Novosti Photo

Mil Mi-12 (NATO 'Homer') in Aeroflot insignia

Mil Mi-24 (NATO 'Hind-A')

SS-8 (NATO 'Sasin') —Novosti Photo

Strategic Missiles

SS-4 (NATO 'Sandal')

This medium-range ballistic missile (MRBM) is the weapon that precipitated the Cuba crisis in 1962. Its development, via the earlier SS-3 ('Shyster'), drew heavily on wartime German V-2 technology. About 500 are thought to remain operational, mostly near the western borders of the Soviet Union but with a few east of the Urals, targeted on China.
Power Plant: one liquid-propellant sustainer.
Guidance: inertial.
Warhead: alternative nuclear (1 megaton) or high-explosive.
Dimensions: length 68 ft 0 in, diameter 5 ft 3 in.
Launch weight: 60,000 lb.
Performance: max speed Mach 6.5, max range 1,100 miles.

SS-5 (NATO 'Skean')

About 100 of these intermediate-range missiles are believed to supplement SS-4s in the 600-strong Soviet IRBM/MRBM force. The SS-5 is similar in concept to the earlier SS-3/4 series, but larger and without tail-fins. Photographs have shown it inside a silo launcher.
Power Plant: one liquid-propellant sustainer.
Dimensions: length 75 ft 0 in, diameter 8 ft 0 in.
Performance: max range 2,000 miles.

SS-7 (NATO 'Saddler')

Little is published about this oldest ICBM serving with the Soviet Strategic Rocket Forces, except that it burns liquid propellants and is deployed in both hard and soft sites alongside the SS-8. Together, the two missiles make up the total of 209 older ICBMs that are expected to be replaced by submarine-launched ballistic missiles under the terms of the SALT I agreement.

SS-8 (NATO 'Sasin')

This two-stage liquid-propellant ICBM was first displayed in a Moscow military parade in November 1964. Like the contemporary SS-5, it is very much the type of missile that could be expected to follow the crude, first-generation SS-3 and SS-4.

—Novosti Photo SS-9 (NATO 'Scarp')

—Tass Photo SS-14 (NATO 'Scamp')

Warhead: nuclear (5 to 10 megatons).
Dimensions: length 80 ft 0 in, diameter of first stage 9 ft 0 in.
Performance: range 6,500 miles.

SS-9 (NATO 'Scarp')

This mighty three-stage liquid-propellant missile is the heavyweight of the Soviet ICBM force. At the time the SALT I agreement was signed, in May 1972, there were 288 operational SS-9s, with 25 new silos under construction in SS-9 complexes. It is anticipated that all 313 launchers will eventually carry new SS-18 missiles. Meanwhile, there are known to be four versions of the SS-9, identified by the 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 1972 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, the imminence of SS-18 deployment may lead to abandonment of the Mod 4, or its limitation to three-warhead MRV (multiple re-entry vehicle) mode. *(Data for SS-9 Mod 2 follow.)*
Power Plant: three-stage liquid propellant.
Guidance: inertial.
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 are expected to carry SS-17 and/or SS-19 missiles in due course. No photographs of an SS-11 have ever been identified. It is believed to be of similar length to the SS-13, but to resemble the much larger SS-8 in external shape, with no space between its three liquid-propellant stages. The US Department of Defense has stated that the SS-11 has a slightly higher yield than the comparable American Minuteman, but is considerably less accurate. There are three versions:

SS-11 Mod 1. Operational since 1966. Tested at both intercontinental and reduced ranges, suggesting possible targeting against Europe and China. Single re-entry vehicle.

SS-11 Mod 2. No information available. Not operational.

SS-11 Mod 3. Under test, very successfully, since 1969, with three MRVs. Greater targeting flexibility and accuracy has led to rapid deployment.

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.
Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).

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 estimated 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-16

Only solid-propellant missile among the four new Soviet ICBMs that were expected to reach a state of initial operational capability during 1975, the SS-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) for MIRVs. The Department of Defense has suggested that the SS-16 is under development for potential deployment in both silo-based and land-based mobile forms. Its range is estimated at more than 5,000 miles.

SS-17

It is expected that either the SS-17 or the SS-19, or a mixture of the two types, will replace the SS-11, occupying eventually a total of 1,036 silos. Both are liquid-propellant ICBMs with post-boost vehicles. The SS-17, essentially a city destroyer, has been tested with both four large MIRVs and a single large re-entry vehicle. 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. Estimated range is more than 6,300 miles, with three to five times the throw weight of the SS-11.

SS-18

Intended, almost certainly, as a replacement for the SS-9, this extremely formidable two-stage liquid-propellant ICBM has been under test at Tyuratam for some time and may have attained initial operational capability. It has about 30% more throw weight than the SS-9, and has been tested with both a single large RV, offering optimum accuracy, and five to eight relatively large MIRVs dispensed by a PBV similar to that employed in the American Minuteman III and Poseidon missiles. Then-Secretary Schlesinger commented one year ago that 'Given the warhead yield and accuracy currently estimated for the MIRVed version of the SS-18 . . . a force of about 300 of these missiles [permitted under the Interim SALT Agreement] could pose a serious threat to our ICBMs in their silos, even after those silos are upgraded'. Range of the SS-18 is believed to be more than 6,300 miles.

SS-19

The SS-19 is believed to be a replacement for the SS-11. It has been tested only with a MIRVed payload of six re-entry vehicles, twice as many as Minuteman III carries and each twice as big. Although shaped for high-speed atmospheric re-entry, to im-

prove 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 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 existing silos before it could be emplaced.

AS-3 (NATO 'Kangaroo')

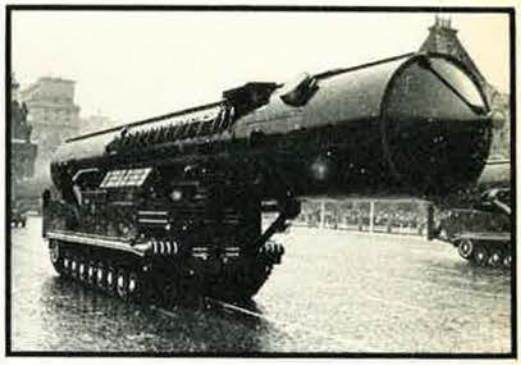
Resembling a sweptwing jet fighter in size and configuration, this air-to-surface missile was displayed for the first time under its Tu-95 carrier aircraft on Soviet Aviation Day, 1961. Little has been seen of it since that time, except for a launch sequence in an officially released Soviet film.
Dimensions: 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-22 supersonic strategic bomber, 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. Like all known air-to-surface missiles carried by Soviet fixed-wing aircraft, it 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 460 miles.

AS-6

Nothing is known for certain about this new missile, reported to be carried by the Tupolev variable-geometry supersonic strategic bomber (NATO 'Backfire'). It is said to resemble the AS-4 in general configuration but tc be smaller, with a launching weight of about 10,000 lb and alternative 1,000 lb nuclear or high-explosive warheads. Propulsion is reported to be by a liquid-propellant rocket motor, with inertial midcourse guidance and active radar terminal homing. Range is said to vary from 155 miles at low altitude to 435–500 miles at high altitudes.



SS-15 (NATO 'Scrooge') —Tass Photo

Airborne Tactical and Defence Missiles

Helicopter missile (NATO 'Swatter')

The Mil Mi-24 assault helicopter ('Hind-A') has wingtip launchers for four anti-tank missiles. No photograph has yet appeared showing external armament on the aircraft. 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.
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')

This is the only Soviet air-to-surface missile known to have been used operationally. During the October 1973 war between Israel and the Arab states, some 25 'Kelts' were launched against Israeli targets by Tu-16s from Egypt. 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 200 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-23 close support aircraft.

NATO 'Acrid'

This is the new 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).

NATO 'Alkali'

First Soviet air-to-air missile to become operational, 'Alkali' continues to equip the older generation of PVO-Strany interceptors, such as the Su-9 and all-weather versions of the MiG-19. 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.

NATO 'Anab'

This solid-propellant air-to-air missile was first observed as armament of the Yak-28P all-weather fighters which took part in the 1961 Aviation Day display at Tushino. It has since become standard also 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 5 to 6.2 miles.

NATO 'Ash'

This large air-to-air missile is standard armament on the Tu-28P. 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).

NATO 'Atoll'

'Atoll' is the Soviet counterpart to the US Sidewinder 1A (AIM-9B), to which it is

almost identical in size, configuration, and infra-red guidance system. It has long been standard armament on home and export versions of the MiG-21. The motor is a solid-propellant rocket.
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'.

Surface-to-Air Missiles

—Tass Photo

SA-1 (NATO 'Guild')

SA-1 (NATO 'Guild')

This missile was first displayed in a Moscow military parade on November 7, 1960. Although it was 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 again appeared on May Day. The SA-1 is not thought to have been supplied to any country outside the Soviet Union.
Dimensions: length 39 ft 0 in, body diameter 2 ft 3½ in.

—Tass Photo

SA-2 (NATO 'Guideline')

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 earlier versions, and may have a nuclear warhead. 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.

—Rex Features Photo

SA-3 (NATO 'Goa') of Egyptian forces

SA-3 (NATO 'Goa')

Soviet counterpart of the American Hawk, the SA-3 is deployed in 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.

—Tass Photo

SA-4 (NATO 'Ganef')

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 30 ft 0 in, body diameter 2 ft 8 in, wing span 7 ft 6 in.
Launching weight: 2,200 lb.
Performance: slant range 43 miles, effective ceiling 80,000 ft.

SA-5 (NATO 'Gammon')

There is reckoned to be a total of 9,800 surface-to-air missile launchers operational at 1,650 sites throughout the Soviet Union, with SA-2s on some 4,500 launchers. 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: 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 attacks 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 1.8 to 2.5 miles, effective ceiling 5,000 ft.

SA-8

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 four-round 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.

SA-N-3 (NATO 'Goblet')

The twin-round surface-to-air missile launchers fitted to many of the latest Soviet naval vessels, including the helicopter cruisers *Moskva* and *Leningrad* 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

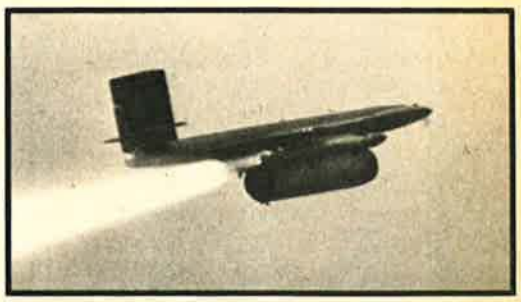
Little is known about this naval close-range surface-to-air weapon system, although at least 31 SA-N-4 installations are known to be operational on five classes of ships of the Soviet Navy. The retractable twin-round 'pop-up' launcher is housed inside a bin on deck. It has been suggested that the missiles might be similar to those used in the land-based mobile SA-8 system.

NATO 'Galosh'

The SALT I agreement permitted each nation 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 eight 'Try Add' engagement radar sites. New construction is expected to add 36 launchers and six radar complexes during the next few years. 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. Soviet ABM test firings have continued, and two new systems are thought to be under development.

SA-5 (NATO 'Gammon' and 'Galosh') missiles —Novosti Photo

SA-6 (NATO 'Gainful') weapon systems of Egyptian Army —Rex Features Photo



Smaller of the two Soviet target drones of which photographs have been released

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. 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 dimethyl-hydrazine, 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. A typical application for the SS-5 is to orbit satellites like Cosmos-655 and -661. Shaped as cylinders, 6 ft long and 3 ft in diameter, with paddle-type solar panels, these are thought to have 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.

RPVs and Target Drones

Little is known about the remotely piloted vehicles and target drones that are operated by the Soviet armed forces. It is known that RPVs are utilised for reconnaissance, in the manner of the USAF's Teledyne Ryan AQM-34 (Model 147) family. There is good reason to believe that a number of Soviet RPVs, despatched on reconnaissance flights over such peripheral countries as Sweden, have been shot down by the defences.

The first target drone of which photographs were released by the Soviet authorities was converted from a conventional manned airplane. It appeared briefly in an official film, before being destroyed by an SA-2 surface-to-air missile, and seemed to be a pilotless conversion of the Yakovlev high-altitude reconnaissance aircraft known to NATO as 'Mandrake'. Counterpart to the USAF's Lockheed U-2, this was a single-seat development of the Yak-25, with the existing fuselage married to a new straight wing of extended span. It is possible that 'Mandrakes' have been adapted as expendable targets on becoming obsolete for their original task.

A much smaller Soviet target drone is shown in the accompanying illustration. Of extremely simple mid-wing monoplane layout, it has unswept, constant-chord aerodynamic surfaces and is powered by a podded turbojet slung under the slim fuselage. Two jettisonable solid-propellant booster rockets are fitted under the wings for take-off.

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 $)

Fiscal Year	US		USSR in FY '77 $		
	Current $	FY '77 $	Low Estimate	Middle Estimate	High Estimate
1964	48.4	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	66.0	98.3	115	120	125
1973	69.6	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			
1977	101.5	101.5			

Expenditures for baseline forces do not include military retirement, military assistance, civil defense, and some more peripheral items. The figures in the above table, released by the Department of Defense in January 1976, indicate that in FY '75, the USSR outspent the US for baseline forces by from thirty-seven to forty-seven percent. In constant dollars, US expenditures for baseline forces in FY '76 were nearly fifteen percent less than in FY '64 (the last pre-Vietnam budget), while Soviet expenditures have increased by at least thirty-seven percent between FY '64 and FY '75.

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 fifteen percent of the USSR's GNP. The US defense budget for FY '75 included $8.6 billion for military RDT&E, compared to an estimated $15.8 billion for the USSR in that year.

PERSONNEL STRENGTH OF SOVIET ARMED FORCES

WW II	11,375,000	1969	4,440,000
1963	3,775,000	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

The above figures include Soviet Border Guards (KGB) and Internal Security Forces (MVD).

In 1975, an estimated 1,370,000 Soviet military personnel were assigned to aerospace forces as follows:

Strategic Rocket Forces	380,000
National Air Defense (PVO)	550,000
Air Forces	440,000

During the same year, USAF military strength was approximately 600,000. 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 602,000.

US military personnel assigned in 1975 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	380,000	9,300[a]
Aerospace defense	550,000	32,000[b]
Other air force tasks	440,000	560,700
	1,370,000	602,000

[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 1975 was approximately 143,000.

[b] Includes 30,000 military personnel assigned to the USAF Aerospace Defense Command and 2,000 military personnel of Army air defense units.

SOVIET/US OFFENSIVE STRATEGIC NUCLEAR FORCES, 1967–74

All figures are from *The Military Balance* (1967–68 through 1975–76 editions), published by the International Institute for Strategic Studies, London, England. For information on range and warhead yield of missiles, and range, speed, and weapons load of bombers, see full text of *The Military Balance* in the December issue of AIR FORCE Magazine, and John W. R. Taylor's "Gallery of Soviet Aerospace Weapons," pages 93–107 of this issue.

The year 1967 was selected as the entry point for this chart, since in that year the US ICBM and SLBM forces reached the numbers of ballistic missiles that have been maintained since that time.

It should be noted that the Soviet Tu-16 Badger medium-range bomber is capable of striking targets in the US. Its range is 4,000 miles, compared to 3,800 for the US FB-111. (The Tu-22 Blinder, which has a range of about 1,400 miles, has not been considered by the editors to be an intercontinental system. The Tupolev supersonic Backfire bomber, more than fifty of which have been produced, is now in operational units. It has intercontinental capabilities and must be taken into consideration in the future.)

When long-range and medium-range bombers of both sides are considered, the USSR has a larger number of intercontinental-capable bombers than does the US, but the maximum weapon load of the US bomber force is approximately double that of the USSR's long- and medium-range bombers combined.

While an accurate assessment of the relative strength of Soviet and US offensive strategic nuclear forces cannot be made from numbers alone, the figures in this chart demonstrate which side has been "racing" in the so-called arms race.

	ICBM		SLBM		Long-Range Bombers		Medium-Range Bombers	
Year	USSR	US	USSR	US	USSR	US	USSR	US
1967	460	1,054	120	656	200[a]	545	800[b]	75[c]
1968	800	1,054	129	656	200	480	750	40
1969	1,050	1,054	159	656	200	450	750	60
1970	1,300	1,054	280	656	190	405[d]	725	35[e]
1971	1,510	1,054	440	656	190	360	700	70
1972	1,530	1,054	560	656	190	390	700	67
1973	1,527	1,054	628	656	190	397	700	66
1974	1,575	1,054	720[f]	656	190	377	700	66
1975	1,618	1,054	784[f]	656	185	375	645	66

[a] About 50 bombers are believed to have been in use as tankers throughout the period.
[b] Includes Tu-16 and Tu-22.
[c] B-58 only, 1967–69.
[d] Number assigned to operational and training units. Additional B-52s are in active storage, ranging from about 100 in 1970 downward to 35 in 1975.
[e] FB-111 only, 1970–75.
[f] Sixty of these missiles, SS-N-4s and SS-N-5s, carried by diesel submarines, are not considered strategic missiles under the terms of the SALT I Interim Agreement.

SOVIET/US STRATEGIC AEROSPACE DEFENSE FORCES, 1972–74

All figures are from *The Military Balance* (1972–73 through 1975–76 editions).

In assessing the overall balance between Soviet and US strategic nuclear capabilities, the bomber forces of each side must be evaluated in relation to the aerospace defense forces of the opponent. Although the US holds a substantial lead in long-range bombers, Soviet aerospace defense forces are many times larger than those of the US.

	Interceptors		Strategic Surface-to-Air Missiles		Antiballistic Missile Launchers	
Year	USSR	US[a]	USSR	US[b]	USSR	US
1972	3,000	593	10,000	839[c]	64	0
1973	2,900	585	10,000	481[d]	64	0
1974	2,650	532	9,800	261	64	0
1975	2,550	374	12,000	0	64	0[e]

[a] Includes both Regular and Air National Guard units.
[b] Includes both Regular and Army National Guard units.
[c] Includes 21 Nike-Hercules batteries and 5 Bomarc-B batteries.
[d] Nike-Hercules only, 1973 and 1974.
[e] The US Safeguard BMD system that became operational in October 1975 has been closed down by congressional denial of operating funds.

COMPARATIVE MILITARY RANKS—US AND USSR

UNITED STATES		SOVIET UNION	
		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
		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
		Senior Lieutenant	Senior Lieutenant
1st Lieutenant	Lieutenant (Junior Grade)	Lieutenant	Lieutenant
2d Lieutenant	Ensign	Junior Lieutenant	Junior Lieutenant

* Stalin is the only man who has held this rank. Awarded June 1945.

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SOVIET MILITARY JOURNALS

Soviet sources list fifty-seven journals and serial publications dealing with military affairs. The total number of copies issued each year by these publications is reported to be more than 34,000,000.

The Soviet military press publishes fifteen leading monthly journals. They are, with initial date of publication in parentheses: *Communist of the Armed Forces* (1920); *Soviet Military Review* (in English, French, Arabic, and Spanish) (1965); *Agitator's Notebook* (1942); *Banner Carrier* (1960); *Soviet Warrior* (1919); *Military Herald* (1921); *Aviation and Cosmonautics* (1918); *Herald of PVO* (1931); *Naval Collection* (1848); *Logistics and Supply of the Soviet Armed Forces* (1940); *Military Medical Journal* (1823); *Equipment and Armaments* (1932); *Military Historical Journal* (1959); *Foreign Military Review;* and the theoretical journal *Military Thought.*

DOSAAF, the paramilitary society, publishes a number of journals, among them: *Military Knowledge, Wings of the Motherland, Radio,* and *Behind the Wheel.*

—H. F. S.

REPRESENTATION OF THE SOVIET ARMED FORCES ON THE CENTRAL COMMITTEE

(As of January 1, 1976)

As this issue of the Soviet Aerospace Almanac is in preparation, delegates are being selected at military district and fleet and service Party conferences to attend the Twenty-fifth Congress of the Communist Party of the Soviet Union. The Congress will have selected a new Central Committee to represent them for the next five years by publication date. In order for the changes in military representation to have more meaning, Harriet Fast Scott has prepared this list of the marshals, admirals, and generals on the old Central Committee, selected in 1971.

On the eve of the Twenty-fifth Congress, CPSU, the eighteen military members on the CPSU Central Committee and their positions as of January 1, 1976, are as follows: (Note that there are two types of representation—members and candidates for membership. Between Congresses, replacement for members can only come from the thirteen candidates.)

Members of the Central Committee:

A. A. Grechko, Marshal of the Soviet Union, Minister of Defense, Politburo Member.

I. I. Yakubovskiy, Marshal of the Soviet Union, First Deputy Minister of Defense, Commander in Chief United Armed Forces of the Warsaw Pact.

V. G. Kulikov, General of the Army, First Deputy Minister of Defense, Chief of the General Staff.

A. A. Yepishev, General of the Army, Chief of the Main Political Administration of the Soviet Army and Navy.

S. L. Sokolov, General of the Army, First Deputy Minister of Defense.

I. G. Pavlovskiy, General of the Army, Deputy Minister of Defense, Commander in Chief of the Ground Troops.

P. F. Batitskiy, Marshal of the Soviet Union, Deputy Minister of Defense, Commander in Chief National Aerospace Defense Forces.

P. S. Kutakhov, Chief Marshal of Aviation, Deputy Minister of Defense, Commander in Chief of the Air Forces.

S. G. Gorshkov, Admiral of the Fleet of the Soviet Union, Deputy Minister of Defense, Commander in Chief of the Navy.

K. S. Moskalenko, Marshal of the Soviet Union, Deputy Minister of Defense, Inspector General.

N. V. Ogarkov, General of the Army, Deputy Minister of Defense.

Ye. F. Ivanovskiy, General of the Army, Commander in Chief Soviet Forces Germany.

N. G. Lyashchenko, General of the Army, Commander of the Central Asian Military District.

I. Ye. Shavrov, General of the Army, Commandant of the Academy of the General Staff.

I. Kh. Bagramyan, Marshal of the Soviet Union, General Inspector.

V. I. Chuykov, Marshal of the Soviet Union, General Inspector.

B. P. Bugayev, Marshal of Aviation, Minister of Civil Aviation.

N. A. Shchelokov, General Colonel, Minister of Internal Affairs.

(Marshals of the Soviet Union **M. V. Zakharov, I. S. Konev,** and **N. I. Krylov,** and General of the Army **S. S. Maryakhin** are deceased. Not included is Soviet Cosmonaut **Valentina Nikolayeva-Tereshkova,** a Colonel-Engineer by rank, who is on the Central Committee primarily as Chairperson of the Soviet Women's Committee.)

Candidates for Membership:

V. F. Tolubko, General of the Army, Deputy Minister of Defense, Commander in Chief Strategic Rocket Troops.

S. K. Kurkotkin, General of the Army, Deputy Minister of Defense, Chief of the Rear Services.

N. I. Smirnov, Admiral of the Fleet, First Deputy Commander in Chief of the Navy.

I. M. Tretyak, General Colonel, Commander of the Belorussian Military District.

A. M. Mayorov, General Colonel, Commander of the Baltic Military District.

P. A. Gorchakov, General Colonel, Member of the Military Council and Chief of the Political Administration of the Strategic Rocket Troops.

K. S. Grushevoy, General Colonel, Member of the Military Council and Chief of the Political Administration of the Moscow Military District.

A. I. Koldunov, General Colonel of Aviation, First Deputy Commander in Chief of National Aerospace Defense Forces.

S. M. Lobov, Admiral of the Fleet, Assistant to the Chief of the General Staff for Naval Affairs.

G. I. Salmanov, General Colonel, Deputy Commander in Chief Ground Troops for Combat Training.

A. L. Getman, General of the Army, Commander All-Union Pioneer Military Sports Games.

N. D. Psurtsev, General Colonel Signals, retired.

V. V. Okunev, General Colonel.

(Marshal of the Soviet Union **S. M. Budennyy** is deceased.)

The Central Committee holds on the average two short plenums a year. Membership on the Central Committee is an indicator of prestige for top Soviet brass. In 1971, when the above membership was selected, there were 241 members and 155 candidates for membership on the Central Committee. The military members compose roughly nine percent of the Central Committee. The selection of Marshal Grechko in April 1973 for membership on the Politburo marks the first time since Marshal Zhukov briefly held Politburo membership in 1957 that the Minister of Defense has been in that body.

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For tactical, highly mobile requirements, Raytheon has developed the AN/TPN-25, a phased array, high performance PAR. Now in production for the U.S. Air Force, the TPN-25 can provide final approach for up to six aircraft simultaneously—even under the severest of weather conditions.

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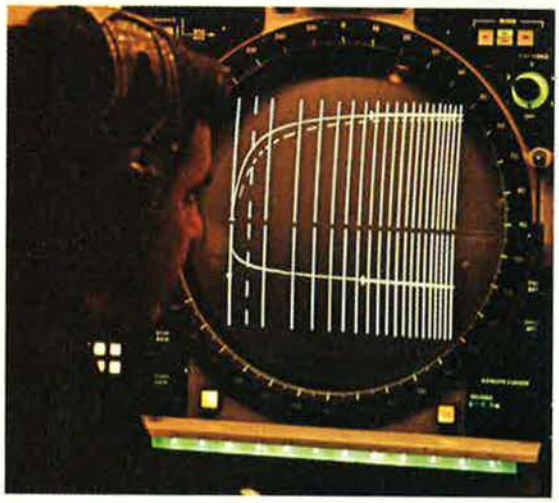

ystems bring 'em in.

Four More Air Force Courses For Civilian Classrooms

The Aerospace Education Foundation is now offering a total of twelve Air Force vocational courses to the civilian education community.

With the active assistance of Senator Barry M. Goldwater, its newly elected Chairman of the Board, the Aerospace Education Foundation is expanding its inventory of Air Force courses in occupational education available to civilian schools. The Foundation is an affiliate of the Air Force Association.

Senator Barry M. Goldwater
Chairman of the Board

In December the Foundation added four more Air Force courses to the eight it has been reproduced for civilian use since early 1973. The new courses are: Instructional System Materials Development; Still Photographer; Still Photojournalism; and Cooking, Baking and Serving (see box for more details).

Air Force courses are available through the Foundation for its cost of assembling, reproducing and handling the course materials. The new courses feature color sound/slide presentations; they are offered in their original format as well as in the video-tape format.

The original eight courses have been disseminated to more than 300 school systems in 45 states. These courses are: Electronic Principles; Auto/Truck Mechanic; Apprentice Carpenter; Structural Engineering Assistant; Aircraft Maintenance Fundamentals; Medical Service Fundamentals; Nurse's Aide; and Food Inspector.

The expansion to twelve courses is the result, primarily, of funding provided by the Jimmy Doolittle Fellow program of the Foundation (described in the March and September 1975 issues of this magazine).

Despite this growth, however, requests for Air Force courses far exceed the number that have been prepared for use in civilian classrooms. Hence the importance of Senator Goldwater's leadership in the Foundation's drive for funds to reproduce additional courses.

Senator Goldwater, in a letter to national business leaders, recently described the Foundation's mission in these words: "It is becoming difficult for young people without salable skills to find employment. Due to school budget problems around the country, there is a lack of high-quality courses in occupational education. Ironically, the military services have developed some of the best courses available in occupational education and the purpose of our Foundation is to transfer these educational programs from military to civilian classrooms."

Senator Goldwater added this appeal for supporting the Foundation: "If your contribution fund permits it . . . . and you would like to sponsor the tax-deductible reproduction of Air Force courses for civilian uses,we can offer you some interesting projects. Meanwhile, I hope you will join us as a Jimmy Doolittle Fellow, and I encourage you to consider a similar affiliation for your organization, for colleagues and associates you may wish to recognize, and for others you may desire to memorialize."

Individuals and groups can become Jimmy Doolittle Fellows with a $1,000 tax-deductible donation to the Foundation. AFA members and units have been instrumental in launching this program.

For additional details on any aspects of the Foundation's activities, please contact Michael J. Nisos, Managing Director, Aerospace Education Foundation, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006. Telephone: (202) 452-7370.

The four new Air Force courses:

Instructional System Materials Development—theory of systems instruction; analysis of training requirements; development of learning objectives; test construction; content, media and sequence; development of instructional system materials; and validation, editing and implementation of instructional system materials.

Still Photographer—fundamentals of photography; laboratory equipment and production; optics; camera systems; photographic materials processing; filters and light sources; photojournalism; printing; copy and reproduction; chemistry and quality control; and color photography.

Still Photojournalism—journalistic process with emphasis on photojournalism sequence; information acquisition techniques; elements of style in writing; communications and human relations; legal and ethical aspects; camera and processing systems; picture-story layout; personality feature; group; spot news; publicity; editorial; sport-in-action photography and final layout.

Cooking, Baking and Serving—preparation, cooking and serving of food; operating, cleaning and maintaining kitchen and dining room equipment.

April 28-29 at Vandenberg AFB, California

The Air Force Association's
1976 Aerospace Strategy Symposium
held during SAC's Ninth Annual
Missile Combat Competition

TOMORROW'S STRATEGIC OPTIONS

The Short Term Needs–The Long Term Needs

This event represents a unique opportunity for AFA and civic leaders and industry officials to obtain comprehensive, authoritative, and topical information about the direction and meaning of changes in the nation's strategic posture, the backbone of US military preparedness.

Speakers (see agenda below) will translate important changes in national strategy and the new defense budget into specifics in terms of the weapon system technology and the advanced R&D required to meet the new threat.

Agenda

Keynoted by The Honorable Thomas C. Reed, Secretary of the Air Force, and General Russell E. Dougherty, CINCSAC. Featured banquet address by The Honorable Robert Ellsworth, Deputy Secretary of Defense.

Deterrence in the Age of Detente
Dr. John F. Lehman, Jr.
Deputy Director, Arms Control and Disarmament Agency

Nuclear Weapons Technology
Maj. Gen. Edward B. Giller, USAF(Ret.)
Director, Weapons Development, Energy Research and Development Administration

Strategic Airlift
Gen. Paul K. Carlton
Commander, Military Airlift Command

Flexible Options vs. A High Nuclear Threshold
Lt. Gen. John W. Pauly
Deputy Chief of Staff, Plans and Operations, USAF

Command and Control
Lt. Gen. Ray B. Sitton
Director, J-3 (Operations), Joint Chiefs of Staff

Technological Options
Gen. William J. Evans
Commander, AFSC

Space: The New Military Frontier
Lt. Gen. Thomas W. Morgan
Commander, SAMSO

Guarding Against Technological Surprise
Dr. George H. Heilmeier
Director, Defense Advanced Research Projects Agency, DoD

The Space Shuttle
Dr. James C. Fletcher
Administrator, NASA

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The Bulletin Board

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

'77 Budget Squeezes Manpower

Further cuts in Air Force (but not the other services) military manpower, establishment of pay caps, removal of the one-percent "kicker" in retirement pay hikes, and lower outlays for travel—these are key people-features in the Administration's FY '77 military budget. The budget also signals another try at removing commissary store subsidies (*see separate report below*) and trims USAF civilian personnel strength by 7,000, to 267,000.

The services will "share the general restraint" in the President's overall $394.2 billion request, the Pentagon said. In terms of numbers of people, however, it doesn't work out quite that way, for both Army and Navy will add personnel.

If Congress approves, the Army will rise from about 775,000 now to 790,000 by end-FY '77 (September 30, 1977). Navy goes from about 530,000 now to 544,000. Air Force, however, currently with about 600,000 members, will be reduced to 571,000.

Assistant Defense Secretary (Comptroller) Terence E. McClary said the strength shifts will "add teeth" to the Army and Navy and "reduce some of the tail" in the Air Force. Navy needs more people to bolster fleet readiness, he said. The Air Force cuts will appear in training and other support activities.

Reminded that USAF manpower has dropped every year since FY '68, McClary could not say when the reductions would end.

While the services in FY '77 are budgeted for much larger weapons and O&M outlays, total spending for personnel will drop about $800 million Defense-wide. Thus, the Department said, personnel costs as a percent of the total military budget will fall to 51.7 percent. It has risen to fifty-four percent the past two years, a rise that was not well received by Congress. Other key budget features:

- **Pay Caps.** Though advertised as a five percent ceiling on pay raises, Defense estimates that increases will average out at 4.5 percent for military people and 4.7 percent for Civil Servants. They hinge on congressional approval of the cap itself and a change in pay rules that will steer a larger slice of pay raises into quarters allowances. Those living in quarters would receive smaller raises than those living elsewhere. The civilian raise figure is based on a revised salary system giving some workers as little as three percent and others more than five percent.

While trying to ditch "comparability" raises next October, the President said he wanted to return to comparability in October 1977.

- **Retired Pay.** This is the main people-type increase, and it's expected to hit $8.4 billion compared to $7.3 billion this fiscal year. Mr. McClary said that about $122 million will be saved next year if Congress agrees to toss out the one-percent kicker. Since 1968, the kicker has been added to CPI raises to cover the lag between the time a raise becomes due and when it went into effect. These new plans do not affect the 5.4 percent retiree pay raise going into effect this month.
- **New Personnel Programs.** There are none of significance, though the budget does contain funds for larger per-diem payments and the Retirement Modernization Act's provisions, should Congress approve them.
- **Travel Fund Cuts.** USAF has already launched a major drive to reduce PCS and related outlays, as this column has reported.

Standards, Discipline Pushed

The Air Force leadership has stepped up its campaign to improve discipline, good grooming, and high standards of conduct. The drive came into focus late last year when Chief of Staff Gen. David C. Jones told an AFA Convention luncheon that discipline must improve. He indicated that offenders would be separated (*see November "Bulletin Board"*).

More recently, the discipline-standards theme has appeared in messages to the field, official publications, and word of mouth. For example, the Chief in a recent TIG Brief, called "for willing adherence to high standards." He warned that "the privilege of continued [Air Force] service is predicated on meeting tougher standards of performance and conduct."

Vice Chief of Staff Gen. William V. McBride, meantime, told commanders to embrace USAF's physical fitness and weight control programs, saying they are vital to maintaining "a well-disciplined, high-quality force." He added that "effective military service demands high standards of endurance, mental alertness, good health, and a proper public image." The latter is for the American public, which draws conclusions about military readiness "partly on what they see," General McBride said.

In a related move, SAC Commander in Chief Gen. Russell E. Dougherty has warned USAF members against "doing your own thing" when it contravenes "doing your country's thing." Deliberate destruction of discipline cannot be tolerated and members who cannot "rationalize their personal requirements with the requirements of the Air Force" should be removed, he declared.

Proper wear of the uniform and general good grooming also continue to be stressed vigorously throughout the service.

Commissary Battle on Again

The Administration once again is trying to phase out commissary store subsidies, a move that would boost customer prices sharply. In a related development, Army and

In mid-November, AFA's Lubbock, Tex., Chapter hosted a dinner meeting at the Lubbock AFB Officers' Club for Chapter members, base airmen, and junior officers. Topic of the meeting was the status of legislation affecting the Air Force today. Main speaker was John O. Gray, AFA Assistant Executive Director. Shown here with Gray (lower left) are (clockwise) Capt. Alan C. Strzemieczny, a Lubbock junior officer who is also Air Training Command's representative on AFA's Junior Officer Advisory Council; George E. Morris, Lubbock Chapter President; and Col. Haynes Baumgardner, USAF (Ret.), a Chapter member. For Mr. Gray (a retired Air Force Reserve brigadier general) this was a nostalgic occasion. As a newly commissioned second lieutenant in 1941, he was the second active-duty officer assigned to the then-Lubbock Army Air Base.

Air Force recently raised the surcharge on commissary sales to four percent. And the latter service disclosed it is setting up an Air Force Commissary Service (AFCOMS) to improve store management and operations.

Last year, the Defense Department tried to remove, over a two-year period, appropriations for paying commissary employees. This would have cut in half the savings (about twenty percent) commissary patrons enjoy. But Congress, urged by the Air Force Association and other military-oriented groups and individuals, rejected the idea. Regular savings continue.

The President in his new budget, however, urged Congress to remove the salary and utility subsidies over a three-year period. The first cut, of $10 million, would apply in FY '77. Assistant Defense Secretary McClary said this approach would eventually drop customer savings to about eleven percent, but he held that through improved operations savings might rise to about sixteen percent. Most store shoppers disagree.

Asked about the plan's chances during the upcoming Congress following the lawmakers' rejection of the previous plan last year, McClary said "they should better understand" the need to make these savings. Meantime, the revived end-the-subsidy push has touched off new protests among the military community.

The increased surcharge, effective February 1, will help support a modest refurbishing program for older commissaries.

Base commanders have been responsible for managing commissary stores, but recent studies have recommended a centralized management setup instead. That is the function of AFCOMS, to be run by a board of directors headed by the Director of Engineering & Services, Hq. USAF.

AFCOMS's head office will be located at Kelly AFB, Tex., with regional offices at McGuire AFB, N. J.; Norton AFB, Calif.; and Ramstein AB, Germany. A central regional office will also be sited at Kelly. Commissary experts working out of the regions will oversee store operations within their areas.

Since no additional manpower is permitted, AFCOMS is taking about 175 people from the present system (bases, commands, etc.) to staff the new organization. The changes could lead to an eventual joint Army-Air Force commissary system, officials indicated. Defense, meantime, was slated to decide by April what commissary stores will be closed. Stores in the Washington, D. C., area reportedly were especially vulnerable.

USAF Has Most Retirees

Even though it's the youngest military service by far, the Air Force now has more retired members than any of the others. It spurted past the Army in FY '75. New official figures show USAF leading Army by 363,701 to 354,031 in the retired list derby.

Air Force's net retiree gain during the year was 27,660, compared to only 11,646 for the Army. Navy gained nearly 13,000, winding up with 272,381. Retired Marine strength inched up to 53,810. Attrition, of course, was much heavier in those services than in the USAF, a pattern that should continue for several years.

Defense-wide, the retiree total stood at 1,043,923, approximately half as large as today's shrunken active-duty force.

The Pentagon's end-FY '75 statistics reveal that USAF's 100,300 officer retirees received average retired pay of $913 per month, well above the $731 and $771 received by retired Army and Navy officers. Most of the difference stems from the much larger numbers of warrant officers on those services' retired lists. USAF, incidentally, has only twenty-seven more warrant officers to retire.

The 263,401 USAF airmen on the retired list drew retired pay averaging $403 per month. That's $5 more than retired soldiers and $30 above retired sailors' pay.

The Pentagon's new figures also reveal that Air Force slashed disability retirements (which bring tax exemptions) more than the other services. USAF actually wound up the year with 48,797 disability retirees (of the 363,701 total), about 700 fewer than a year earlier. Of its total retirees, the number retired for disability is down to about thirteen percent.

Women Pilots Near, Navs Loom

While Hq. USAF at press time had buttoned down most of the particulars involved with next fall's opening of pilot training to female officers, authorities were deciding which aircraft they may fly and whether women may receive navigator training.

Indications are that a few female navigator spaces will be approved. On the aircraft issue, women pilots can't fly combat missions. Most are expected to become instructors or transport pilots, but some officials support a broader range. Even KC-135 tankers have been backed as appropriate for female pilots.

USAF authorities, meanwhile, be-

The Bulletin Board

lieve the twenty upcoming pilot training selectees will be so well qualified and motivated that their elimination rate won't be much different from that for USAF male pilot hopefuls. Currently, about eighteen percent of Air Force pilot trainees wash out of the program. Female selectees must meet the same rigid standards as the men.

Navy, which broke the ice on female pilot training two years ago, has entered two groups of eight pilot trainees. Two from each group washed out, for a twenty-five percent elimination rate.

"Section Officers" Aid AFR, ANG

The lone voluntary recall program for Air Reserve Forces officers is going strong, but it's tough to crack. Vacancies are few and usually far oversubscribed. That's an updated view of the unique, seldom publicized "Statutory" or "Section" officer programs of the Air Force Reserve and Air National Guard.

With voluntary recall opportunities frozen for years, the Section avenue provides the only extended active-duty chance, albeit remote, for active component officers. Each component has 107 authorized Section spaces, captains through major general, though over half call for full colonel. All but a handful are filled.

Section officers normally serve one four-year tour, although a number now manage consecutive tours and compile enough service for active-duty retirement. Assignments are with the Defense Department, the Air Staff, USAF Reserve and Air Guard headquarters, major commands, and other elements. They help develop Reserve Forces programs and advise on Reserve-Guard affairs. One of the major concentrations of Section people is at USAF Reserve Headquarters, Robins AFB, Ga., where thirty-four currently serve.

Both components regard the section officers highly, crediting them, among other things, with making substantial contributions to the "total-force" program the Pentagon is pushing so hard.

When a position does open, Reservists and Guardsmen with the proper qualifications can apply through their units. Section officers—the term stems from several sections of law, such as 265 and 8033, which authorize the appointments—are eligible for ROPA and temporary promotions.

Libraries Next Budget Casualty?

As part of its never-ending search for savings, Hq. USAF recently told the field it "is considering the elimination" of some base libraries.

Performing the needed spadework is the Base Actions Group located at Bolling AFB, D. C. As reported here last month, it is looking into all kinds of base activities for new dollar-squeezing moves. Base and wing commanders the Group has talked with are resisting library closings, a Group spokesman told AIR FORCE Magazine. But he indicated the final result might be the closing of "low use" libraries and those where there is "duplication with community libraries."

The Group, he said, is finding that various ideas it is exploring are good for some bases, not others. An example: beefed-up contracting-out services, while probable winners at sites near large cities (where such services are available), aren't feasible for remote, northern tier-type bases. Thus, the spokesman said, the Group is unlikely to come up with many "across-the-board" actions.

More NCO Prestige Moves

In another step to bolster NCO corps prestige, Headquarters has set up a "Chiefs Group" that will handpick up to 300 chief master sergeants (E-9s) for key assignments. Officials described the move "as a response" to the Chief of Staff's challenge "to broaden the managerial responsibilities and authorities" of senior NCOs. The assignments, to be closely monitored, will be to "specified positions requiring more than normal qualification and experience," USAF said.

Chief of Staff Gen. David C. Jones has felt that many NCOs were not receiving "the maximum in terms of job fulfillment and satisfaction," nor was Air Force receiving full productivity from them. The new Group is located at the Military Personnel Center, Randolph AFB, Tex.

In related moves affecting the NCO corps:

- Authorities are studying plans to improve the prestige of USAF first sergeants.
- A revised Airman Performance Rating for the top three grades has surfaced in the Air Staff and is expected to be field-tested. It's modeled after the new officer effectiveness report that contains the controversial controlled ratings.
- Headquarters said airmen making E-4 after March 1 will be called "senior airmen." This is a switch, as USAF earlier (*see January "Bulletin Board"*) planned to call them "Apprentice E-4s." After meeting certain requirements, including a fifteen-hour NCO orientation course, the senior airmen will be called "sergeant."
- Headquarters announced that about 3,000 first-term airmen will be voluntarily released in May.

Voting Drive Under Way

USAF policy requires that its entire membership be counseled on voting rights, and the machinery is rapidly being established. Counseling begins in April, and records of counseling will be maintained to assure that all members receive it. The Pentagon, meantime, reports that in the 1974 "off-year" elections, only eighteen percent of eligible service members voted (20.9 percent for USAF eligibles), compared with thirty-seven percent for the national electorate.

Short Bursts

From the Director of the Air National Guard comes the stunning news that, effective in April, 250 of the approximately 860 **chief master sergeants (E-9) in the ANG will be demoted and promotions to senior master sergeant (E-8) will be frozen.** Reason, according to Maj. Gen. John Pesch, is a serious supergrade overage problem the organization has not been able to solve through less drastic means. E-9 promotions have been frozen

Ed Gates . . . Speaking of People

Taming PCS Turbulence

For years the military services have wrestled with the PCS travel dilemma. That's the problem that asks the question, how to cut transfers and keep the cost of moving people and their belongings from going out of sight?

Much high-powered thought, along with some hand-wringing, has gone into skull sessions designed to stretch tours and ease the associated personnel turbulence. But until recently the results have been disappointing. The general consensus over three decades—fortified by the wholesale uprootings during three wars—has been that frequent transfers are inevitable and people should understand this when they volunteer for service.

But changes are in the wind. The Defense Department and the services are making their most serious attempt yet to invoke significant rule changes and reverse the steadily rising PCS costs. The Air Force is attacking the problem on a broad front.

In addition, Hq. USAF, for the first time in memory, has stated that it believes the PCS changes it is laying on will indeed permit people to stay longer at one place.

"The frequent moves and short stays of the not-so-distant past . . . are apparently on the way out. Air Force families should benefit in terms of more stabilized assignments," the Military Personnel Center said recently. The USAF study group coming up with the PCS overhaul is headed by the Center's Deputy Commander, Brig. Gen. William P. Acker.

This is one of the rare instances where cutting personnel funds should—and probably will—be applauded service-wide. Short stays and rapid moves, USAF surveys show beyond a doubt, for years have ranked high on the list of negative factors associated with military life. Fewer uprootings should prove a significant morale-builder.

Congress and the Administration have exerted tremendous pressure on the services to trim soaring PCS costs. And rightly so, for the travel-transfer budgets have reached enormous proportions. Air Force's FY '76 PCS budget alone totals nearly $650 million. Defense-wide, the estimated price tag this year is a mighty $1.65 billion—to pay for an estimated 1,800,000 moves. That's almost one move per military member during the year.

Many of these transfers, of course, are "accession" and "separation" moves that are almost impossible to avoid. The Army, for example, attributes sixty percent of its moves to "gains and losses."

Actually, the 1,800,000 moves figure is well below that of recent years, the result of considerably fewer people in uniform. But fewer moves are costing more, due to jarring increases in commercial carrier rates for household goods and Military Airlift Command tariff charges, plus inflation generally. Navy says rate hikes alone will boost its PCS outlays $17 million this fiscal year.

So, what to do in the wake of stiff new demands on the services to come up with savings, and a history of little success in cutting moves? First off, Defense and service officials spent months last year examining the problem from all angles. They came up with dozens of ideas, some of them new or previously discarded as not feasible.

Then the Air Force, late last year, following disclosure of severe PCS fund cutbacks in the FY '77 budget, formed its own "PCS Turbulence" group. High-level Air Staff officials, including the Hq. USAF DCS/Personnel, Lt. Gen. Kenneth L. Tallman, are keeping a close eye on its progress.

Several of the fifty PCS-related items the group took under study have been adopted; others are nearing approval. No specific dollar-saving goals have been established, General Acker said, but he expressed optimism that genuine improvements will result.

The first changes, recently adopted, do the following: (1) create "home basing" for airmen going on short overseas tours; (2) eliminate maximum limits on most Stateside stabilized tours; and (3) launch a country-of-preference option for members who volunteer to serve a year beyond the normal "accompanied" tour abroad. Steps two and three above apply to airmen and officers.

Under the home-basing project, married airmen heading for short overseas tours may return to their current duty station after completing the short tour. They must agree not to move their dependents while away. Those chosen will keep their families at their current on-base quarters, while those living off-base can work their way up the base housing list while the airman is overseas. So, quarters might well be waiting when he returns and the family is reunited. Since in the interim the families stay put, the potential savings from home-basing might be large.

Traditionally, Stateside stabilized tours have been given a maximum length, so that reassignment was mandatory after three or four years. The Acker group wisely turned this around; now these tours are considered a minimum length. Individuals, with some exceptions, will remain until needed elsewhere. This should stretch out many tours and, in the process, save the government a good bit of money and the affected families much wear and tear.

Tours in the Washington, D. C., area are limited by law, though extensions are sometimes granted. Several Air Staff officers, for example, currently have more than eight years of Pentagon duty. The probable USAF record for Pentagon service belongs to a now-retired colonel who spent about eighteen of his thirty years of service within the office of the DCS/Personnel, the very shop the antiturbulence group is part of.

So, long tours are possible, and doubtless will become more likely.

Another change USAF has adopted provides for "career-broadening" job changes on base, rather than by transfer. For example, a navigator might work up to ten hours a week in the base engineer shop. As he gains proficiency, he may receive an AFSC in the secondary skill and thus enhance his career.

Generals, though traditionally shifted around at the drop of a hat, may also stay in place longer, for Defense is pressuring the services to make star assignments a minimum of two years.

Defense also wants standard tours for all officers in command jobs lengthened. And it has told the services to never transfer anyone with too little service remaining to serve a minimum tour at the next base. Another change prevents enlisted members overseas or at sea from being reassigned as a result of reenlistment, unless they are within ninety days of expiration of term of service.

It's a little early to call the war on PCS turbulence a success. But the early indication is favorable. And it would appear that here, at least, is a "people" project of major proportions where reduced funding will draw cheers, not brickbats, from the troops. ■

The Bulletin Board

for more than two years. Those demoted will have first priority for future promotions when vacancies occur. Officials hope to remove the E-8 and E-9 promotion freeze by September.

A recent Hq. USAF letter with charts and attachments makes sense out of the jumble and confusion created by the **retired pay inversion problem.** It's a "must" for any service member wanting to figure out what his retirement pay may be. CBPOs have the letter.

When USAF's annual temporary colonels selection board met last fall, there was keen interest in officer circles as to how **the new OER program** would affect the outcome. The LCs being considered, for the most part, had recently received their first rating under the new program. The results, USAF disclosed recently, indicate quite clearly that **"top block" ratings win the lion's share of promotions** (seventy-nine percent of the new eligibles in the primary zone, for example). Top blockers also captured 120 of the 135 secondary zone hikes to colonel. About twenty percent of the competitors who received second block OERs were selected. And of those with ratings in the dreaded lower third, only twelve were chosen. All told, 907 line officers were on the new list.

Tactical Air Command's veteran civilian personnel chief, **David Barry,** retired recently amid a shower of kudos. "I know of no one who has made a greater contribution to the Air Force Civilian Personnel Program than you have made throughout the years," wrote John T. McConathy, Director of Civilian Personnel, Hq. USAF, to Mr. Barry.

CHAMPUS in-patient charges for dependents have been raised from $3.70 to $3.90 per day. The increase is tied to last fall's five percent active-duty pay raise. Boosting CHAMPUS charges is now regular procedure following raises. The threat of much larger dependent in-patient charges, based on the rank of the sponsor, was reported in this space last month, but has been avoided at least for the moment.

Nearly 400 **active-duty Reserve captains passed over for temporary major** for the first time late last year have a special problem. They can separate in May and collect $15,000 RIF pay. USAF encourages this, to help ease the overall RIF problem. Headquarters also notes that if they leave then, they remain eligible for Reserve participation and promotion, even if they enlist. However, if they remain aboard another year (they may), and are passed over the second time (quite likely), they must leave, but under rules which bar them from Reserve activities and promotion. Here's something else they might consider: If DOPMA becomes law later this year, its expected RIF pay formula is much juicier. Example: for a fourteen-year O-3 the DOPMA payment (ten percent of a year's basic pay times years of service) comes to $24,040.

Senior Staff Changes

PROMOTIONS: To be permanent **Major General:** Ranald T. **Adams**, Jr.; James R. **Allen**; Andrew B. **Anderson**, Jr.; Robert L. **Edge**; Guy E. **Hairston**, Jr.; Edgar S. **Harris**, Jr.; Robert C. **Mathis**; Charles F. **Minter**, Sr.; Gerald J. **Post**; William Y. **Smith**; Lucius **Theus**; Eugene F. **Tighe**; Jr.; William B. **Yancey**, Jr.; James A. **Young.**

To be temporary **Major General**: Frank G. **Barnes**; James R. **Brickel**; Daniel L. **Burkett**; Rupert H. **Burris**; Lynwood E. **Clark**; Richard N. **Cody**; John W. **Collens** III; Richard B. **Collins**; George A. **Edwards**, Jr.; Andrew P. **Iosue**; John E. **Kulpa**, Jr.; Howard W. **Leaf**; Louis G. **Leiser**; Dewey K. K. **Lowe**; James E. **McInerney**, Jr.; Richard E. **Merkling**; Kenneth P. **Miles**; Harry A. **Morris**; William R. **Nelson**; William C. **Norris**; Jack I. **Posner**; John S. **Pustay**; Thomas F. **Rew**; Carl G. **Schneider**; Lawrence A. **Skantze**; Henry B. **Stelling**, Jr.; John C. **Toomay**; Stanley M. **Umstead**, Jr.; Jasper A. **Welch**, Jr.; George M. **Wentsch.**

To be permanent **Brigadier General**: Jesse M. **Allen**; Anderson W. **Atkinson**; Benjamin R. **Baker**; Lynwood E. **Clark**; Richard N. **Cody**; John W. **Collens** III; Bennie L. **Davis**; David B. **Easson**; Lincoln D. **Faurer**; Charles A. **Gabriel**; William D. **Gilbert**; Lovic P. **Hodnette**, Jr.; William J. **Kelly**; John E. **Kulpa**, Jr.; Charles F. G. **Kuyk**, Jr.; Lloyd R. **Leavitt**, Jr.; Louis G. **Leiser**; Ralph J. **Maglione**, Jr.; Richard E. **Merkling**; Kenneth P. **Miles**; Billy M. **Minter**; Edward J. **Nash**; William R. **Nelson**; William L. **Nicholson** III; Robert A. **Rushworth**; George W. **Rutter**; Thomas M. **Ryan**, Jr.; Winfield W. **Scott**, Jr.; Jack W. **Waters.**

CHANGES: M/G William C. Burrows, from Dep. Dir. of Plans, DCS/Plans & Ops., Hq. USAF, Washington, D. C., to DCS/Plans and Programs, J–5, NORAD, and DCS/Plans and Programs, Hq. ADCOM, Ent AFB, Colo., replacing B/G William P. Comstock . . . **B/G William P. Comstock**, from Acting DCS/Plans and Programs, J–5, NORAD, and Acting DCS/Plans and Programs, Hq. ADCOM, Ent AFB, Colo., to Inspector General, NORAD/ADCOM, Ent AFB, Colo. . . . **B/G Harry J. Dalton**, Jr., Acting Dir. of Info., SAF/OI, Hq. USAF, Washington, D. C., to Dir. of Info., SAF/OI, Hq. USAF, Washington, D. C., replacing M/G Guy E. Hairston, Jr. . . . **B/G William W. Hoover**, from Exec. to C/S SHAPE, Brussels, Belgium, to Mil. Asst. to SAF, Hq. USAF, Washington, D. C.

B/G George C. Lynch, from DCS/Compt., Hq. PACAF, Hickam AFB, Hawaii, to Dep. Dir. of Budget, Air Force Compt., Hq. USAF, Washington, D. C., replacing B/G Bobby W. Presley . . . **B/G Bobby W. Presley**, from Dep. Dir. of Budget, Air Force Compt., Hq. USAF, Washington, D. C., to Asst. Compt., Hq. USAF, Washington, D.C. . . . **M/G Hoyt S. Vandenberg**, Jr., from Chief MAAG, Teheran, Iran, to Dep. Dir. of Plans, DCS/Plans & Ops., Hq. USAF, Washington, D. C., replacing M/G William C. Burrows. ■

AEROSPACE DEFENSE COMMAND

IN 1946, the Aerospace Defense Command—initially called Air Defense Command and headquartered at Mitchel Field, N. Y.—took on the job of defending the nation against air attack. Lt. Gen. George E. Stratemeyer, the first commander, had only four fighter squadrons and a few radars to do that job.

By the mid-1950s, the command reached its peak strength with sixty-nine fighter-interceptor squadrons, 1,500 aircraft, interceptor missiles, long-range radars along the coasts and in the interior, Texas Towers, early warning aircraft flying offshore, a network of command and control centers, and 100,000 people.

Today, the command has some 30,000 people, far fewer radars, which are concentrated around the periphery of the nation, and only six regular fighter-interceptor squadrons, equipped with F-106s. The Air National Guard provides another six squadrons of F-106s and five of F-101s, the latter to be phased out in 1976–77.

The manned bomber threat has not diminished. But today, the primary threat has shifted to ballistic missiles, and the Aerospace Defense Command—the name assigned in 1968 to better define its mission in a space-age world—is a changed organization. One mark of the change came last July 1 when ADCOM was designated a specified command, reporting directly to the Joint Chiefs of Staff.

In 1974, then Secretary of Defense James R. Schlesinger reoriented the emphasis of ADCOM when he defined its three-part mission:

- Provide global aerospace surveillance, warning, and assessment of ballistic missile attack.
- Control the sovereign airspace of the US.
- Provide limited defense against bomber attack in event of hostilities.

Gen. Daniel James, Jr., who took command of ADCOM last September, has observed that "the new mission statement only . . . provided a more accurate description of the work we had been doing for a long time."

ADCOM now operates space sensors that provide detection and early warning of ballistic missile attack as well as information to maintain a catalog of all objects in orbit. It has computerized communications and command and control systems to receive, assess, and relay attack information to National Command Authorities in the shortest time possible.

Major improvements have been ordered for ADCOM's ballistic missile attack warning net. The present six-site submarine-launched ballistic missile detection system will be replaced by two new phased-array early warning radars called Pave Paws, one on each coast. Another new phased-array radar, Cobra Dane, is expected to go into operation this year at Shemya, Alaska, to monitor Soviet ballistic missile firings and provide additional space surveillance.

Improvements are also needed to meet the demands of a less well-known mission: defense against space attack. A doubling of objects in orbit by 1985, increased use of maneuverable spacecraft, and the Soviets' use of higher altitude orbits all require improvements in the ADCOM Spacetrack network. Near-term advances are expected in the form of additional ground-based sensors with improved capabilities.

Although ADCOM has evolved into an organization primarily oriented to space, General James emphasizes that "we do not intend to stand down in our efforts to improve those systems designed to detect, warn, and defend against an air strike."

For the near term, the command is implementing a new surveillance system to replace the peacetime functions of the present SAGE system, which was introduced in the 1950s. One phase of the new program calls for sharing Air Force and FAA radars in a Joint Surveillance System (JSS). This system depends heavily on the E-3A Airborne Warning and Control System (AWACS) for detection and command control in crisis or during hostilities.

A project designed to provide long-range aircraft warning is also well under way, with construction of a prototype over-the-horizon backscatter radar authorized in the northeast US. If it proves successful, a second site will be constructed in the northwest.

The command is studying all the newer fighters to determine which could be modified to meet the requirements of a dedicated air defense interceptor as a replacement for the F-106.

Completion of these new systems will mark a major step forward in ADCOM's ability to provide the nation with tactical warning against ballistic missile, space, or bomber attack.

STRATEGIC AIR COMMAND

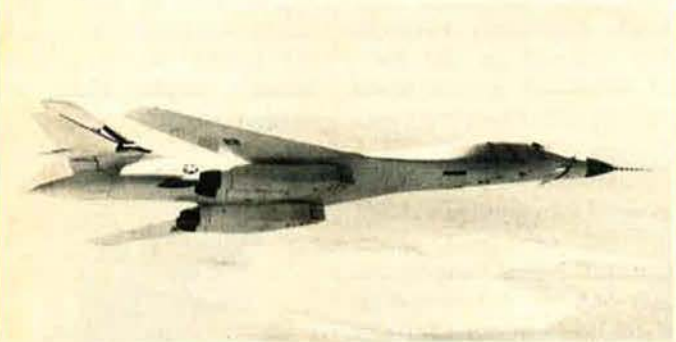
The Strategic Air Command's missile and bomber forces, supported by tanker and reconnaissance units, comprise more than two-

Through two major conventional wars and a series of crises that bore the potential of nuclear conflict, the men and women of USAF's combat commands, supported by all other elements of the Air Force, have served with distinction the interests of this nation and the free world. AFA salutes ADCOM, SAC, and TAC as they celebrate the . . .

30TH ANNIVERSARY OF THE COMBAT COMMANDS

thirds of this country's strategic nuclear capability. As the backbone of the US strategic deterrent, SAC's mission has been to deter war across the spectrum of conflict, but primarily to deter nuclear war.

From SAC's early beginning in 1946, under Gen. George C. Kenney, when some 37,000 people and 279 combat aircraft operated from eighteen Stateside bases, SAC grew to a formidable force of more than 3,200 combat aircraft, 1,060 ICBMs, nearly 283,000 personnel, and sixty-five bases worldwide. Today, under command of Gen. Russell E. Dougherty, SAC maintains a force of fewer than 1,100 operational aircraft, 1,054 ICBMs, 144,000 men and women, and thirty bases. The mission has not changed, but there are fewer resources available to deter or defend against a rapidly expanding threat.



ADCOM, now primarily oriented to space, still has an important air defense mission, and is looking for a replacement for its still capable but aging F-106s (top). The B-1 (above) is a priority requirement if SAC is to retain essential strategic flexibility.

SAC achievements during its first thirty years include: introduction of USAF's first aerial refueling units in 1948; first use of in-flight refueling for mass deployment of fighter aircraft in 1952; and a long series of speed and endurance records, including the first nonstop round-the-world flight in 1949 and the SR-71 record flight from New York to London in one hour and fifty-five minutes eighteen months ago.

Some of SAC's significant milestones are: First all-jet bomber (B-47, 1951); first all-jet tanker (KC-135, 1957); introduction of the ICBM (Atlas and Titan, 1959); America's first supersonic bomber (B-58, 1960); the beginning of continuous operation of the airborne command post (EC-135, February 1961); and achievement of balance between ICBM and bomber alert forces in 1964.

During the Korean War, SAC B-29s dropped 167,000 tons of conventional bombs and destroyed every strategic industrial target in North Korea in three months.

In October 1962, a SAC U-2 high-altitude reconnaissance plane flew over Cuba and took the first photographs of Soviet missiles being installed there. During that crisis, SAC's B-47s were poised for takeoff, its B-52s on airborne alert, the growing missile force ready, and the U-2s providing essential reconnaissance. The command formed a strategic umbrella under which American diplomacy was able to peacefully resolve a tense situation.

In 1964, SAC began its participation in the Southeast Asia conflict that reached a peak in December 1972 during Linebacker II, the "Eleven-Day War." B-52 crews flew some 700 sorties in those eleven days, with SAC tankers providing more than 1,300 sorties to refuel all types of fighter and bomber aircraft. This all-out effort has been credited with aiding significantly in bringing the American involvement in Vietnam to an end.

But SAC's most significant achievement has been its contribution to deterring nuclear war and assuring that US national interests are not compromised by threats of nuclear attack. That achievement gives substance to the motto of Strategic Air Command: "Peace Is Our Profession."

But what of the future? Faced with the rapid Soviet strategic buildup, force modernization is vital to the command, despite tight budgets. The flexibility provided by the manned bomber must be maintained, and thus the B-1 is a priority requirement. Support of our allies remains a national policy and, as foreign bases are denied us or become too costly, a wide-body aircraft capable of delivering large payloads of cargo or in-flight fuel is required.

To counter the mounting threat to the current ICBM force, deployment of an advanced ICBM will become necessary.

Control of all of these forces must continue to be guaranteed to the National Command Authorities. The Advanced Airborne Command Post and reliable surveillance, warning, and communications systems must be improved to provide crisis and battle management.

The men and women of Strategic Air Command have set standards of professionalism and discipline for all the military organizations of the world. The role of the SAC professionals in

:he future will be the same as their role in the past: To make it possible to say every year, as they have for the past thirty years, "This year, we have again helped to deter any threat, any intimidation, or any attack on the free world."

TACTICAL AIR COMMAND

Tactical Air Command, the mainstay of the nation's general-purpose airpower deterrent forces, is making sweeping changes in equipment, force structure, tactics, employment, and training concepts.

Change has been one of the hallmarks of the command from its inception in 1946. TAC began under Maj. Gen. E. R. (Pete) Quesada as one of three major combat commands, but in 1948 is was absorbed by Continental Air Command. Two years later, the Air Force recognized that a special brand of airpower would be needed to deter or fight limited wars. On December 1, 1950, TAC returned to major command status, and met that special need with distinction during the Korean War.

The command pioneered the employment of jet fighters in support of ground forces, and refined airlift and high-speed aerial reconnaissance techniques. The Composite Air Strike Force (CASF), a package of men and equipment tailored for such specific missions as the Lebanon and the Quemoy/Matsu crises, became the basis for TAC's present global mobility.

During the Berlin Crisis of 1961, Air National Guard and Air Force Reserve tactical fighter, reconnaissance, and troop carrier wings were activated under TAC, deployed to Europe, and served as units of United States Air Forces Europe. The next year, TAC low-level reconnaissance photography confirmed the presence of Soviet missile sites in Cuba. TAC strike forces were deployed to bases in the southern US to support the quarantine of the island.

A TAC response in support of national policy also could mean humanitarian assistance wherever it was needed. In 1964, for example, TAC airlift forces evacuated more than 1,500 people from the turbulence of the Congo rebellion.

As US participation in the Vietnam conflict increased, TAC developed special air warfare techniques, improved equipment, and trained personnel for operations in Southeast Asia as units of the Pacific Air Forces (PACAF). Following the seizure of the *Pueblo* by North Korea in early 1968, additional TAC forces, including units of the Air National Guard and Air Force Reserve, were deployed to Korea as well as to Southeast Asia. Finally, TAC-trained aircrews enabled PACAF to carry the war to North Vietnam, and with SAC delivered the decisive blows in late 1972 and early 1973 that brought American involvement to an end and secured the return of our POWS.

The current Air Force program to increase the number of tactical fighter wings to twenty-six is already having a major impact on TAC, with new F-4 Phantom wings recently established at Moody AFB, Ga., and Hill AFB, Utah. TAC also assumed major command responsibilities for Air Force operations south of the continental United States on January 1, when the USAF Southern Command was disestablished.

TAC is entering a revolutionary period of inventory modernization. The F-15 Eagle is now in service with the 1st Tactical Fighter Wing at Langley AFB, Va. The first A-10 close air support aircraft is being delivered to TAC at Davis-Monthan AFB, Ariz., this month. TAC's E-3A Airborne Warning and Control System (AWACS) is scheduled for delivery this fall to Tinker AFB, Okla. Also coming into the future inventory is the F-16, which will complement the A-10 in ground attack, the F-15 in the air-to-air arena, and, through sales to our NATO partners, provide the Alliance greater commonality of weapon systems.

To ensure that TAC's aircraft are used most efficiently, the command is making a major effort to clarify procedures, doctrine, and concepts of employment internally, with USAFE, PACAF, and particularly with the other services. The command has established an aircrew exchange program with USAFE, increased deployments to Europe for both active and Air National Guard units, and initiated a comprehensive range improvement program called "Red Flag" to provide a realistic combat training environment.

TAC's legacy is one of challenge and change to anticipate the future. Gen. Robert J. Dixon, Commander of TAC, has observed, "Today, tactical air equipment, concepts, and operations are in a period of unparalleled transition . . . to meet the constant increase in our potential adversary's capability. The men and women of TAC—active and Reserve—are joined to meet this challenge." ■

TAC, initially equipped largely with propeller-driven aircraft, has recently put the F-15 Eagle into operational service.

AFA News

By Don Steele, AFA AFFAIRS EDITOR

Unit of the Month

THE WRIGHT MEMORIAL CHAPTER, OHIO . . . cited for consistent and effective programming in support of AFA's mission, most recently exemplified in its cosponsorship of AFLC and ASD awards dinners.

The Fourth Annual Aeronautical Systems Division (ASD) Engineering Awards Banquet, cosponsored by ASD and AFA's Wright Memorial Chapter, featured an address by Gen. Bernard A. Schriever, USAF (Ret.). The six top winners, selected from seventeen finalists, are shown with Lt. Gen. James T. Stewart, ASD Commander and the master of ceremonies; AFA National President George M. Douglas; and Chapter President Fred Orazio. They are, from left, Capt. David A. Glasgow, Frank L. Csavina, Robert H. Gilmore, Mr. Douglas, Mr. Orazio, Gene A. Petry, General Stewart, Maj. David A. LaBorde, and Maj. Charles V. Fada.

While in Boston, Mass., recently to participate in an AFA function, AFA National President George M. Douglas visited with Edward Sullivan, Deputy Mayor of the City of Boston, and received a copy of the book Boston: Portrait of a City. *Shown are, from left, AFA National Director Joseph E. Assaf, Mr. Sullivan, Mr. Douglas, and AFA National Director Edward T. Nedder.*

Gen. F. Michael Rogers, left, Commander, Air Force Logistics Command (AFLC), congratulates Perry C. Stewart, right, recipient of an AFA Citation of Honor during the first annual AFLC/AFA Awards Banquet at Wright-Patterson AFB, Ohio. AFA National President George M. Douglas, center, presented the award to Mr. Stewart "for his contributions to significant advancements in the application of the Department of Defense Life Cycle Costing Program that have placed the Air Force in the forefront of this program." Ten other AFLC employees were also honored with awards sponsored by the Wright Memorial Chapter. In recognition of its cosponsorship of this outstanding program and the Fourth Annual Aeronautical Systems Division Banquet, AFA President Douglas names the Wright Memorial Chapter as AFA's "Unit of the Month" for March.

chapter and state photo gallery

At the luncheon observing the 72d anniversary of the first flight by the Wright brothers, program participants admire the portrait of aviation pioneer Calbraith P. Rodgers, who, in 1911, was the first to fly coast to coast. They are, from left, George M. Wood and Lorimer W. Midgett, President and Past President, respectively, the First Flight Society; Paul Garber, Historian Emeritus, Smithsonian Institution; and William M. Magruder, Executive Vice President, Piedmont Airlines, the guest speaker. The portrait, which was painted by Maxine McCaffrey, recipient of AFA's 1975 Gill Robb Wilson Award for Arts and Letters, was unveiled by Mr. Garber for the First Flight Shrine, a collection of portraits honoring those who have accomplished "firsts" in the field of flight. This program, held annually at the site of the first flight, is cosponsored by the Air Force Association, the First Flight Society, the National Aeronautic Association, and the National Park Service, in cooperation with the United States Air Force.

During the Texas State AFA's Winter Quarterly meeting in Fort Worth, Rep. Jim Wright (D-Tex.), center, visits with Maj. Gen. Ralph J. Maglione, left, Director, Legislative Liaison, Office of the Secretary of the Air Force, and the guest speaker at the meeting; and Texas State AFA President Vic Kregel, right.

Gen. George S. Brown, USAF, Chairman of the Joint Chiefs of Staff, was the guest speaker at a joint meeting of the Fort Worth Chapter and the Fort Worth Airpower Council. Following his address, General Brown, center, receives a "Texas branding iron" from Council Chairman Herman Stute, left, and Chapter President Felix Ankele. More than 500 members and guests attended the meeting at the Green Oaks Inn in Fort Worth.

More than 250 friends and admirers of the venerable Bob Reeve attended a recent Anchorage Chapter banquet at the Elmendorf AFB Officers' Club to honor the distinguished pioneer Alaskan aviator, who also is a former Alaska State AFA President, on the eve of his departure to be inducted into the National Aviation Hall of Fame. During the cocktail hour, Mr. Reeve, left, shares a light moment with, from left, Chapter President Edward S. E. Newbury; Gen. Raymond C. Reeves, USAF (Ret.), former NORAD Commander in Chief; and Col. Harry A. Goodall, Vice Commander, Alaskan Air Command.

Rep. Lester L. Wolff (R-N. Y.), center, presents a plaque and an AFA Life Membership to Frank X. Battersby, left, Chairman of the H. H. Arnold Chapter's Executive Council, "for his extraordinary dedication to the mission of the Air Force Association." Chapter President Del Casino, a popular vocalist of the 1940s, is at the right. The presentation was made at the Chapter's recent military ball, which was attended by more than 300 members and guests.

AFA News photo gallery

In preparation for the Lawrence County High School AFJROTC Unit's participation in AFA's annual AFJROTC presentation contest, the H. H. Arnold Memorial Chapter, Tenn., arranged a briefing on the Arnold Engineering Development Center and a discussion of presentation topics and techniques for two of the unit's cadets and their instructor. Following the briefing, they were special guests at the Chapter's dinner meeting. From left, are Maj. Gen. Jessup D. Lowe, USAF (Ret.), and Mrs. Lowe, Chapter escorts for the visitors; Lt. Col. L. V. Maddox, Jr., the unit's Aerospace Education Instructor; Cadets Melanie Maddox and Terry Bailey; and Chapter President Tom Bigger. The trio also visited the University of Tennessee Space Institute and were briefed by Chapter member Robert Kamm, Executive Assistant to the Dean.

At the Texas State AFA's Winter Quarterly meeting luncheon, James H. Straubel, left, AFA's Executive Director, presents AFA's Medal of Merit for 1975 to Texas State AFA Vice President Ralph Knight.

More than 285 members and guests attended the Billy Mitchell Chapter's 19th Annual Billy Mitchell Award Dinner, held recently at the Schlitz Terminal Club House in Milwaukee, Wis. Program participants included, from left, Wisconsin State AFA President Chuck Marotske; Col. Thomas F. Bailey, Commander, 128th Air Refueling Group (TAC), Wisconsin ANG, and recipient of the Chapter's 1975 Billy Mitchell Award; AFA President George M. Douglas, who introduced the speaker; AFA National Director Jack Withers, the master of ceremonies; Astronaut Donald K. "Deke" Slayton, the guest speaker and a recipient of the Billy Mitchell Award in 1966; and Chapter President Kenneth W. Jacobi.

The Hon. Joe F. Meis, Deputy Assistant Secretary of the Air Force (Installations), was the guest speaker at a recent meeting of AFA's Llano Estacado Chapter, New Mexico. Secretary Meis, second from left, chats with members of the Chapter following his presentation. With him are, from left, Wilbur Johnson, representing the Committee of Fifty; Col. Cecil D. Crabb, 27th Tactical Fighter Wing Commander, Cannon AFB; Chapter President Larry Truax; Secretary Meis; and Joe Sisler, who introduced the speaker.

Following his address at a recent meeting of AFA's El Camino Real Chapter, Calif., Col. J. A. "Bill" Saavedra, center, Chief of the Systems Operational Requirements Office for the Space Shuttle at NASA Headquarters, received a Certificate of Appreciation from Chapter President Gerald S. Chapman, right. At left is Chapter Vice President Jim Fitzpatrick, Jr.

Gen. Daniel "Chappie" James, left, Commander in Chief, North American Air Defense Command, was the guest speaker at the annual banquet of the Colorado Wright Brothers Memorial Foundation in Denver. AFA National President George M. Douglas, right, introduced the speaker. Dave Olds, center, a member of AFA's Front Range Chapter of Denver, Colo., is President and Chairman of the Foundation. The Colorado Wright Brothers Memorial Foundation promotes aviation and aviation safety.

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.

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San Antonio, Tex.

Peter J. Schenk
McLean, Va.

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.

James M. Trail
Boise, Idaho

Nathan F. Twining
Hilton Head Island, S.C.

Robert C. Vaughan
San Carlos, Calif.

A. A. West
Newport News, Va.

Chaplain Roy M. Terry
(ex officio)
National Chaplain, AFA
Melbourne Beach, Fla.

Thomas R. Nelson
(ex officio)
National Commander
Arnold Air Society
Provo, Utah

Capt. Monroe S. Sams
(ex officio)
Chairman, JOAC
Executive Committee
Scott AFB, Ill.

CMSgt. David C. Noerr
(ex officio)
Chairman,
Enlisted Council
Norton AFB, Calif.

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Information regarding AFA activity within a particular state may be obtained from the Vice President of the Region in which his state is located.

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Virginia, West Virginia,
Kentucky

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Louisiana, Mississippi,
Alabama

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Utah

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55435
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North Dakota,
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Massachusetts, Vermont,
Connecticut, Rhode Island

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Carolina, Georgia,
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Sherman W. Wilkins
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Northwest Region
Montana, Idaho,
Washington, Oregon,
Alaska

Jack Withers
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Dayton, Ohio 45439
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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

he 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 Academy
- ☐ ROTC Cadet _____ Name of college or university
- ☐ Air Force
- ☐ Other _____ (Branch of service)
- ☐ _____ Academy

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

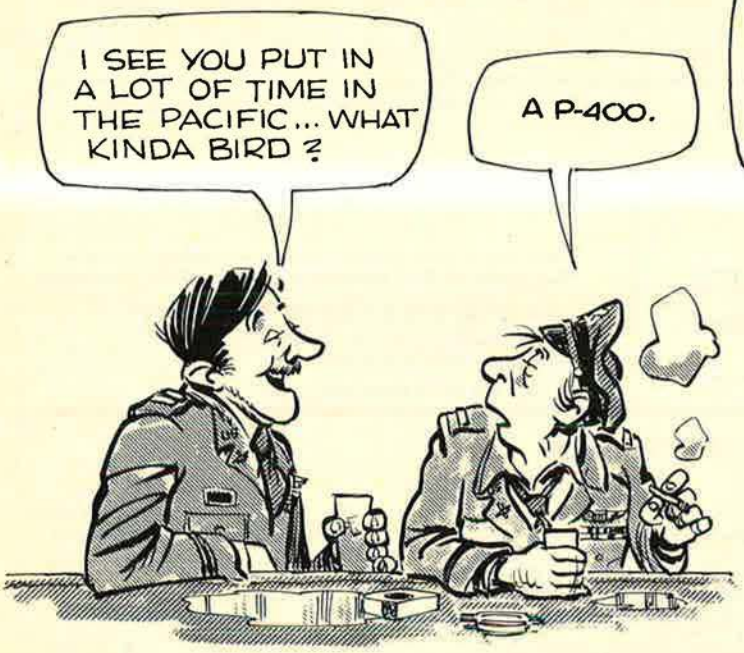
3/76
Form 3676GL App

Application must be accompanied by check or money order. Send remittance to: Insurance Division, AFA, 1750 Pennsylvania Avenue, NW, Washington, D.C. 20006

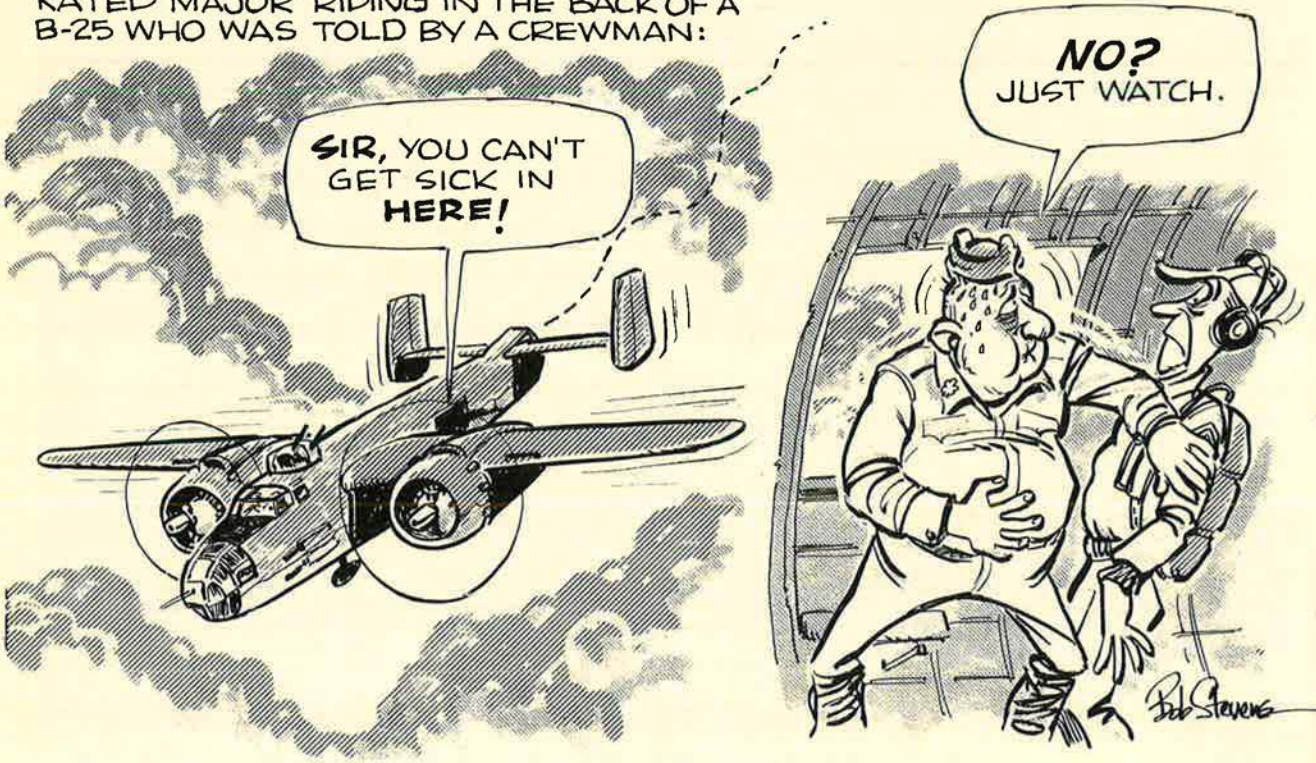
Bob Stevens'

"There I was..."

GREAT AIR BATTLES WERE OFTEN FOUGHT IN O'CLUB BARS and AMONG "DEAD-HEADING" CREWMEN. MOST SUCH BATTLES WERE WON --- A FEW WERE LOST.



THEN THERE WAS THE QUEASY NON-RATED MAJOR RIDING IN THE BACK OF A B-25 WHO WAS TOLD BY A CREWMAN:



A communications center for America's highest command.

Our high command can direct all forces from an airborne command post in the event of national emergency.

This command and control communications center is inside the USAF's giant E-4A Advanced Airborne Command Post.

E-Systems installs and integrates the sophisticated electronics systems on the Boeing E-4A. In September, a third E-4A was delivered to the U.S. Air Force in support of National Command Authorities, representing the highest echelon of the U.S. government and armed forces.

For 15 years, E-Systems has been the nation's number one supplier of electronics for strategic and tactical airborne command posts. It's a role we're proud to claim.

E-Systems, Inc., P.O. Box 6030, Dallas, Texas 75222.

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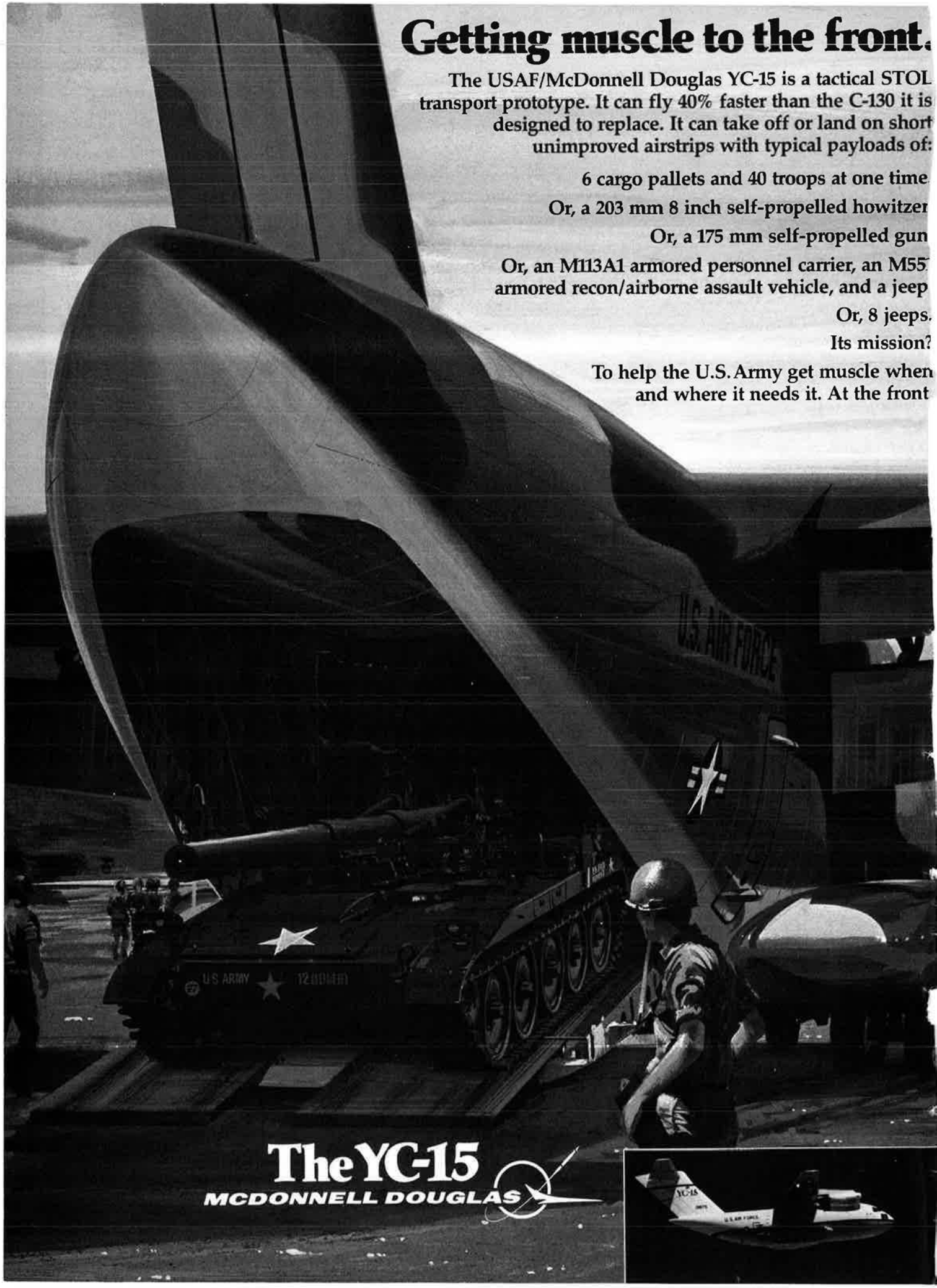

Getting muscle to the front.

The USAF/McDonnell Douglas YC-15 is a tactical STOL transport prototype. It can fly 40% faster than the C-130 it is designed to replace. It can take off or land on short unimproved airstrips with typical payloads of:

6 cargo pallets and 40 troops at one time.

Or, a 203 mm 8 inch self-propelled howitzer.

Or, a 175 mm self-propelled gun.

Or, an M113A1 armored personnel carrier, an M55 armored recon/airborne assault vehicle, and a jeep.

Or, 8 jeeps.

Its mission?

To help the U.S. Army get muscle when and where it needs it. At the front.

The YC-15

MCDONNELL DOUGLAS