

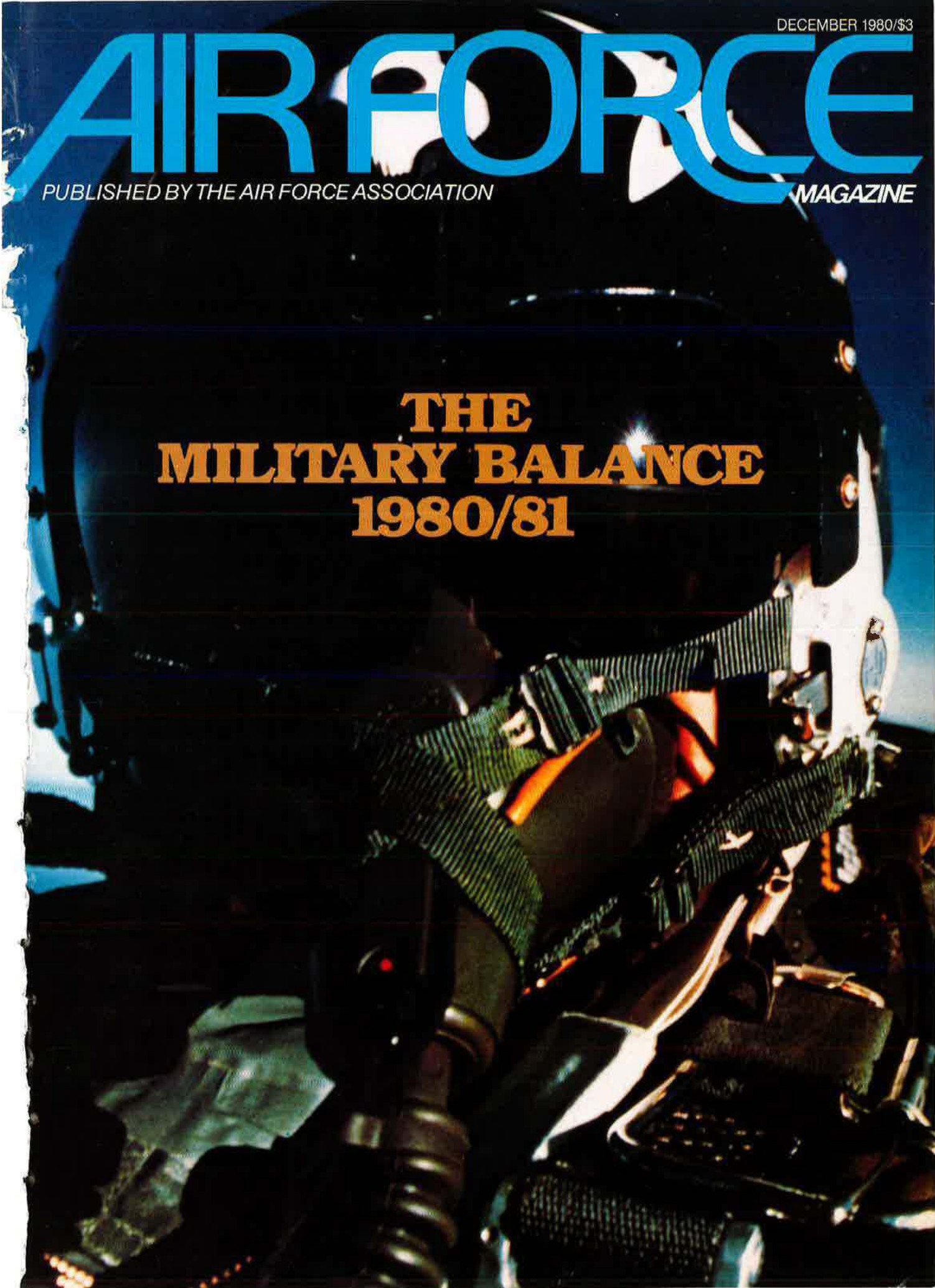
DECEMBER 1980/\$3

AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE

THE MILITARY BALANCE 1980/81



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More recently, the Astronics Division's AFCS for the **LTV A-7** initiated two breakthroughs—control augmentation with control stick steering and a two-channel fail passive AFCS. This system was later modified and put into production for the Lockheed **P-3C** to insure absolute reliability and safety.

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“Vive la République,” shouted Coutelle from aloft. As one revolution was saved, another was being born.

By holding Maubeuge, the French turned back a threat to their Revolution. Meanwhile a revolution in warfare began taking shape as Jean Marie-Joseph Coutelle's pioneering aerial reconnaissance mission opened up a whole new dimension in intelligence gathering. As it happened, this mission served only to boost French morale in the embattled town. The intelligence didn't reach battlefield headquarters where it was needed.

Just weeks later, however, the same balloon played a more direct tactical role. At the battle of Fleurus, the French adjutant general went up with

Coutelle, observed Austrian movements, and dropped frequent dispatches. According to some who were present, these influenced the French general's tactical decisions — which produced a victory that led to French occupation of the Low Countries and the capture of Brussels.

These flights were the beginning of airborne command, control and communications. C³ has come a long way since then. Today's Air Force E-3A Sentry aircraft, for example, carry sophisticated radar that can peer deep into hostile territory. And the on-board IBM data processor quickly translates these



1. May 1794. Reacting to French Revolution, pro-monarchy Allied forces, chiefly Austrians (shown as red bars), have pushed from Low Countries to Sambre River in campaign to capture Paris and crush new government. French government reinforces and consolidates its army (tricolor bars), succeeds in stopping Allied drive.

2. Newly formed French military balloon company, the world's first air corps, enters blockaded but still French-held Maubeuge despite bombardment by Allied force.



many inputs into information that is immediately useful to tactical commanders. Strategic commanders have similar advantages. In one program, SAC bases and missile sites are being linked to command posts by IBM terminals that embody state-of-the-art technology.

To meet the Navy's needs, IBM is providing processors and software for multiple communications systems for submarines.

All of these systems are components of the Worldwide Military Command and Control System (WWMCCS)—for which IBM developed the architecture. Each one posed unique problems. In areas such as integration, information handling,

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3. 2 June: Balloon corps commander J.M.J. Coutelle ascends in 18,000-cubic-foot *L'Entreprenant*. Engineer officer with him observes details of enemy movements—history's first aerial reconnaissance mission.

4. Austrians resent surveillance. On 5th ascent they fire 17-pounder over and under balloon, grazing car. Coutelle defiantly shouts "Vive la République" but also signals crew to pay out cable until out of range.

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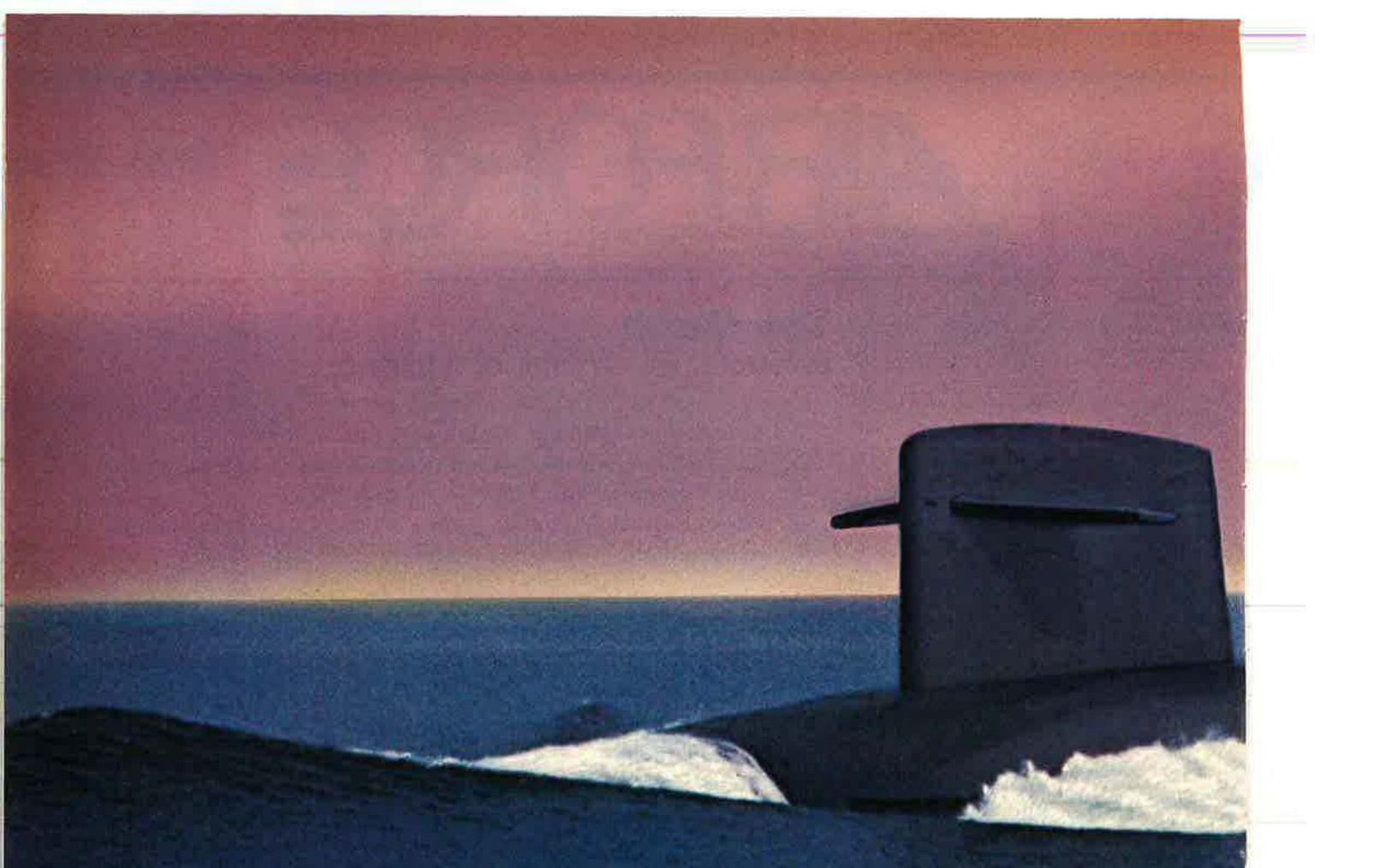
ABOUT THE COVER



The "military balance" can be misunderstood if one counts only aircraft, missiles, and tanks. The human element—the aircrews and the support—can alter the equation. Our cover is detail from MSgt. Herman J. Kokojan's 1977 prize-winning photo, "Bandit Six O'Clock High." "The Military Balance 1980/81" begins on p. 62.

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STANAGER

AN EDITORIAL

Translating Campaign Statements Into Reality

THE "longest campaign" finally ended. Now it is time to get down to business. For President-elect Reagan and his team there is much to be done in many fields. None is so vital to national survival as dealing with the needs of US aerospace power.

The higher-than-expected voter turnout on November 4, with its amazing electoral sweep, produced for Mr. Reagan an undoubted mandate for undertaking the necessary changes. If the election had been close and if the Senate had remained under Democratic control, the changes might have come harder. As it is, the popular will expressed in the voting booths and reflected in House and Senate will, for a reasonable period of time, give Mr. Reagan a chance to set the process in motion.

Long-time observers of the Washington scene do not forecast major difficulties in the apparent conflict between a Democratic House majority and Republican control of the Senate. The reason is that in many programs, the House was heading in the direction the voters wanted, while the Senate lagged behind. Part of the reason was the liberal leanings of some senators now defeated. Another is the need of House members to face the voters every two years instead of six, thus becoming more responsive to shifting sentiments.

At any rate, a profound change demanded by the voters is about to get under way in Washington. Now it is up to President-elect Reagan and the people he appoints to make things happen in ways that will meet the needs. As this issue appears, the Reagan Cabinet nominees have just become known. In the days between now and January 20, the names of many of his sub-Cabinet appointees will surface. But he has close to 2,500 "plum" jobs to fill. Many will still be vacant or occupied by Carter Administration holdovers by the time Mr. Reagan raises his right hand and swears "to preserve, protect, and defend the Constitution of the United States."

The personnel gaps should not be an excuse for delay in starting the work, and all indications are the new President will move smartly, beginning soon after noon on January 20, having set his priorities in order and communicated them to his team beforehand.

At this writing, the priority listing of tasks is not known. But clear indications lie in the responses Mr. Reagan provided to questions posed to him and the other two major Presidential candidates before the election. This was in answer to questions drafted by AFA, the Association of the US Army, and the Navy League. They were posed to Messrs. Reagan, Carter, and Anderson in writing, and written responses were received from all three. Mr. Reagan's answers square well with AFA's Statement of Policy and its policy papers on defense manpower issues and force modernization.

Key answers are mentioned here, so that AFA members can track the action as it unfolds. For, if President Reagan delivers

on his preelection statements, he will have done wonders toward restoring US preeminence in the world arena. (And preeminence, not "parity," is needed for the leadership of the free world.) On the other hand, if he falters and delays, or is unsuccessful in working effectively with the Ninety-seventh Congress, citizen reaction will be quick and sharp because expectations will have been raised but not met.

What then are the priority tasks? Leading the list (and the first question put to the candidates) is how to have adequate numbers of qualified people to man the armed forces, active and reserve. When asked how he would accomplish that, Mr. Reagan replied: ". . . by reversing the policies of the Carter Administration and providing leadership to instill a sense of pride in serving our country." He recognizes the need to improve conditions for military people, and says, "Clearly, equity demands an upward adjustment of pay and allowances and a reversal of the trends that have eroded the traditional service benefits, and specifically medical and educational benefits." He believes that the "key to adequately manned and spirited armed forces is the rekindling of the national will and pride in service to country."

A next priority is keeping skilled, dedicated men and women in the armed forces. Mr. Reagan's response to the associations' question is that his "legislative initiatives to reverse the dangerous outflow of middle-level career military personnel" will include:

- Restoring primacy in commitment to our armed forces.
- Bringing missions and resources into better balance, by providing funds, facilities, and supplies commensurate with training and readiness standards.
- Higher pay to approximate the level of pay and policies in civilian industry for comparable skills.
- Increased allowances for family housing and full reimbursement of travel allowances for temporary duty and family moves.
- Improved educational incentives, such as a restoration of educational benefits from the GI Bill of Rights.
- Increased allowances for medical care when military hospitalization and care are unavailable.
- Providing stability in our personnel and pay policies.
- Ensuring that commanders have authorities (incentives, sanctions) commensurate with their responsibilities.

If Mr. Reagan as President can translate those statements into reality, he will have laid the foundation for accomplishing the other steps necessary in procurement, research and development, force structure, and diplomacy.

If in the process he can ensure that "civilian control" does not mean disregarding professional military judgments, and can cut back the rampant micromanagement now extant, national power will be multiplied.

—F. CLIFTON BERRY, JR



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Fox Abling All the Way

The readers of Fox Able One ["Fox Able One—The First Transatlantic Jet Deployment," October issue] may be interested to know how much better we got at "Fox Abling" as experience was gained. It was even done in the winter.

I took part in Fox Able Thirty-three, the 1954 deployment of the three F-86F squadrons of the 388th Fighter Bomber Wing from Clovis (Cannon) AFB, N. M., to Germany. I flew with the 561st FBS, the last of the three squadrons to depart. Since all squadrons cycled through the same en route bases, we couldn't move until there was room ahead.

The saga goes like this: We departed Clovis AFB on November 25 (Thanksgiving Day), turned around at Alex (England) AFB, La., and went on to Shaw AFB, S. C., where we spent two nights. On November 27, we moved to Dover AFB, Del., where we spent the next five nights. (A side effect of this story was that my wife, who had gone home to Connecticut to await overseas travel, came down to Dover and got herself pregnant.)

On December 2, we moved to Limestone (Loring) AFB, Me., where we spent the next ten frigid nights enjoying SAC hospitality that, at that time, required formal attire at all times in the club. Few of us thought to bring our formals. On December 12, we left the States for Goose Bay, Labrador, where we spent the next fifteen nights, including Christmas. It was cool there, too.

December 27 saw us leap the Atlantic for BW-1 in Greenland. Accustomed by this time to long stays, we had a great arrival party, and were completely shocked when we left the next morning for Iceland. We spent five nights at Keflavik, including New Year's. On January 2, 1955, we flew to Prestwick, Scotland, and after only two nights there, made the final flight to Hahn AB on January 4. Stragglers drifted in for some time thereafter.

Fox Able One did it in 14:10. Our flight was comparable, as I logged 14:20. But what they did in two weeks took us *forty-one* days, and that was

with all the clothes you could carry in an F-86.

Someone started a rumor that Columbus crossed the Atlantic faster than we did. I looked it up and it just ain't so.

Lt. Col. R. J. Vanden-Heuvel,
USAF (Ret.)
Shalimar, Fla.

I very much enjoyed the article "Fox Able One—The First Transatlantic Jet Deployment."

However, and just to set the record straight, I would like to comment on the author's claim that "No longer would fighter aircraft have to be dismantled, shipped by sea, and then reassembled at the point of destination, as was the case during World War II." (Emphasis added.)

The fact is that a flight of ten P-47s deployed from the Republic Aircraft Co. factory at Farmingdale, N. Y., in August 1943, and flew the same North Atlantic route to England. Nine of the aircraft made it to destination. One crashed on landing at BW-1.

I was one of the pilots and, as a matter of interest, so was Sen. Barry Goldwater.

How soon we forget.

Col. L. M. Tannenbaum,
USAF (Ret.)
Cocoa Beach, Fla.

Congratulations and thanks to Col. Frank W. Klibbe, USAF (Ret.), for the wonderful "ferry tale." It was an amazingly well-written story. I loved it and shall save it to read again and again.

Michael J. Del Re
Washington, D. C.

Space Shuttle Shakedown

I have been a reader of AIR FORCE Magazine for more than five years and have always found its contents both enjoyable and informative.

There is, however, one subject that I

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 interest of space or good taste. Names will be withheld on request, but unsigned letters are not acceptable.

hope will be appearing frequently and in detail in AIR FORCE Magazine. That is the role of the Air Force in the Space Shuttle program. I would be very interested in learning about the operations of the Air Force Manned Space Flight Support Group. It is my understanding that this group is active at the Johnson Space Center, the Kennedy Space Center, and Vandenberg AFB, Calif. . . .

It would appear that there are many aspects of the Air Force role in the Space Shuttle program that would be of great interest to your readers.

Please keep up the good work.

Gerald L. Borrieuman
Weyburn, Saskatchewan
Canada

• For a report on the Space Shuttle program, see "Space Shuttle Mired in Bureaucratic Feud," by Edgar Ulsamer, on p. 72 of the September issue.—THE EDITORS

I enjoyed your article entitled "Space Shuttle Mired in Bureaucratic Feud" [September issue, p. 72] by Edgar Ulsamer. It was quite coincidental for me because I am currently writing a paper for the 1981 Air Power Symposium on the role of the Air Force in the space program.

It is inconceivable to me why the Pentagon would want to control the Space Shuttle program, for the mission of the Air Force is interdependent with our space mission. I agree with Mr. Ulsamer that it is indeed fortunate that we have finally realized that the future space programs will play a vital role in national defense.

We must free this program from the bureaucrats and give it to the right Department of Defense agency—the United States Air Force.

2d Lt. Buford L. Burks, USAF
Charleston AFB, S. C.

The Long Run

For months upon months I have read statements from John Loosbrock, Secretary Brown, General Milton, Secretary Mark, General Allen, Chief McCoy, etc., citing a major problem concerning our defense—the exodus

of trained technicians and quality career people from the armed forces.

I have struggled with the bottom line on all this myself, this monetary issue, for countless hours—recalling letters written by those citing duty and honor to our country above personal compensation ("when they were in, money was not the predominant concern"), to those citing the breakup of families and personal hardships suffered by personnel serving their country for less than the local trash collector earns.

For all of us it is a personal decision that cannot be influenced by those attempting to peddle guilt. . . .

. . . [T]he Air Force has invested heavily in my training, from technical school to many months of advanced field training on aircraft systems and management. A wise investment, I feel, for them. It has paid off in these

AIRMAIL

seven years I have worked intimately on complex maintenance of C-5s, C-141s, C-9s, C-130s, T-33s, T-38s, T-39s, F-5s, HH-3s, F-4s, WC-135s, and now E-3As, from Baby Lift to Cope Thunder to North Atlantic AWACS. Considering myself among the best at what I do, would any money really be saved in my loss? In today's dollars what will it cost to bring someone from the beginning to my present skill?

We in maintenance have been doing more for less year after year

and I'm sure many good technicians could and will do even *more*—but not for less and less.

I've seen many of the best separate in recent times, and this trend isn't slowing. The full spectrum of AFSCs, with ten, thirteen, and even seventeen years of service behind them, couldn't *afford* to stay in.

Our pay rates weren't so bad in the early '70s, back when a gallon of gas was thirty-five cents, a car \$5,000, and a house \$30,000. But with today's prices and inflation and interest rates almost doubled, you find the civilian sector has almost kept up—but us?

Our buying power doesn't increase from year to year, or even retain a relatively parallel course. . . . How long can *any man* build on a foundation that is slowly sinking?

Will his national honor waiver? Hardly.

AN OPEN LETTER TO NELLIE LAW

On November 15, long-time magazine staff Editorial Assistant and Special Assistant to the Editor-in-Chief Nellie Law retired from AFA. Following is the text of a letter to her from Managing Editor Richard M. Skinner.

November 5, 1980

Dear Nellie,

Well, you're leaving our midst, and I want you to know we'll miss you. I speak for myself as well as for your colleagues on the staff of AIR FORCE Magazine, and for all your fellow employees here at AFA headquarters. As you retire, after these many years of devoted and dedicated service, you take with you the warm good wishes of us all.

You and I go way back in AFA annals, don't we? We started work here on the same day—back in September 1951—and in those days we were Jack Loosbrock's entire magazine staff. Those were lean days for AFA, when we had to pay the printer in advance before the presses would turn for the new issue of the magazine. Every day brought a new excitement: Sometimes it was something like the arrival of the office's first electric typewriter; other times it was wondering whether or not AFA would be able to meet the next payroll. We worked hard and long hours, and somehow it all got done, and we always managed to have "something on every page."

We've seen AFA and the magazine grow and prosper since those lean years, haven't we? We've served and survived how many pressroom stints at how many AFA conventions from one end of the country to the other, and Jet Age Conferences, and special issues and anniversary issues, and one incredible issue,



Nellie M. Law

back in August 1957, which consisted of an entire history of the Air Force's first fifty years. That one issue alone ran 458 pages and was heavy enough and fat enough to choke a horse, and almost choked us, didn't it?

And not long after that we were in on the creation of SPACE DIGEST, and later launched and nourished our then-new magazine, AEROSPACE INTERNATIONAL. And through it all we churned out a new issue of AIR FORCE each month, and I can honestly say that we couldn't have done it without you, Nellie.

We can both say that we wouldn't have missed a moment of it. But now we'll miss you, Nellie, as you retire. And we'll miss you in so many ways: We'll miss those notations in your own special green ink on manuscript and galley proofs and pages, which through the years have helped so much to keep our content correct and timely, as well as grammatical and accurately spelled and punctuated.


And we'll miss your stewardship over this department, "Airmail" (which is why this message is in the form of a letter to you and on this page, instead of somewhere else in the issue). This is the right spot for a tribute to you, Nell, because this is the part of the magazine you've put together so effectively and so faithfully month after month, issue after issue, for all this time.

And something else we'll miss is your own special five-drawer filing system, probably unique in all of office history, with drawers labeled "Eenie," "Meenie," "Minee," "Mo," and "Havoc." Let me say right here, Nell, that for my money, you're a top-drawer (or "Eenie") worker!

You'll be a tough act to follow, and we'll miss you each month when we must tally up our needs and tell the printer how many copies of the new issue to print, so we'll have enough but not too many magazines. That's another area where your performance through the years has, time and again, saved us from ourselves. And we'll miss your efforts, often heroic but always carried out with calm efficiency, to organize and fulfill special bulk purchases by USAF units of our "Air Force Almanac" and other special issues.

So as you leave us, Nellie, you take with you our thanks for all those efforts—above and beyond—and our warm affection and best wishes for your great happiness in retirement. I would ask only that you leave behind, as part of your legacy, a shoebox of commas and hyphens that we may draw on as needed to assure that future issues may meet the high standards of professionalism that you helped us set for the last twenty-nine years.

With love,
Dick



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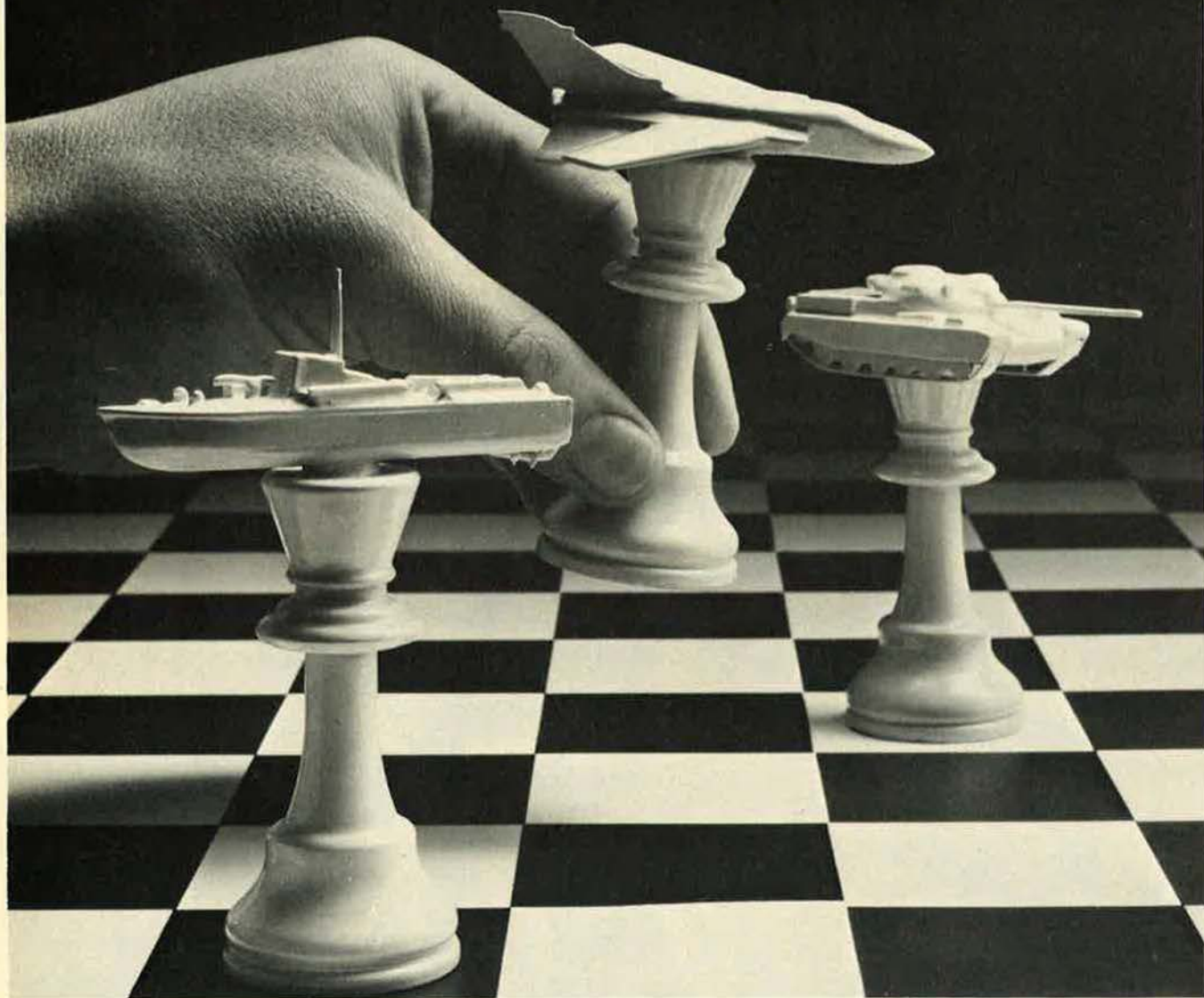
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SSgt. Mark L. Beauchamp, USAF
FPO New York 09571

Engineering Incentive

The article by Ed Gates on the S&T shortfall ["Engineering a Response to the S&T Shortfall," October issue] misses a very important point—a career future for S&T officers.

If the Army Ordnance Corps, Signal Corps, Corps of Engineers, etc., required Combat Infantry Generals at all top positions, the Army would not have sufficient S&T officers either. The companies mentioned in the article, GE, Hughes, TRW, etc., offer more than educational and money gains. They offer an opportunity beyond middle management for S&T people. Without that incentive it is surprising as many S&T officers continue beyond twenty years' service. If you plan a career in industry it is better to start at forty years of age than at fifty years.

I can recall an Air Force directive twenty-five years ago that stated that to command a guided missiles wing you had to be a command pilot. Has the Air Force of today moved very far from that position?

Col. Edward P. Gwynne,
USAF (Ret.)
Satellite Beach, Fla.

More on the B-32

The September issue surprised me. I didn't know that more than a dozen living people even remembered the B-32, let alone enough to get in on a cover! Perhaps a tale of technology perverted . . . would be of interest.

I was a crew commander, and on returning from a familiarization flight, had just pulled up and parked, and looked over to the next slot on the ramp. Another '32 pulled in, but overshoot the spot the ground crew indicated. This was the first aircraft any of us had flown with reversible props. The pilot (I don't recall his name) signaled, "no sweat," reversed the props and blasted the engines, backing smartly to position.

Landing-gear design (I know now) accounts for weight and braking, of course, and for two other loads, spin-up (bringing wheels up to speed on touchdown) and spring-back (the elastic reaction to spin-up).

But evidently the design for spring-back hadn't anticipated braking in reverse, for as the pilot jerked to a stop and grinned at the ground crew, the

AIRMAIL

main gears folded, and the props ground and twisted to scrap. Since V-J Day followed shortly, and the '32s went off to Arizona, I doubt whether a tougher down-lock was ever retrofitted.

It was a great flyer, though, at least after the B-24, with very light control forces. Since it didn't carry the weight of a pressurized fuselage, but had the same power as a B-29, it could run off and hide from them. While we were never shot at in one, our gun camera practice convinced me that, if jumped, I would lay up in a tight turn and let tail and two top turrets blow away any Zeke that joined a circle where his guns couldn't bear, but ours could.

Leonard Horner
Littleton, Colo.

The front cover of the September '80 issue, and the accompanying article on page 37 ["About That B-32 on Our Front Cover" by Maj. Thomas L. Sack, USAF], brought back some memories that I had almost totally forgotten.

Having recently completed a tour of operations in B-17s in the Eighth Air Force in England, and having enjoyed a grand R&R with my lovely wife in Atlantic City, I found myself in early July 1945 at Fort Worth Army Air Field, Tex. (now Carswell AFB), a crew-training organization for the B-32, still coming off the assembly line of the Consolidated factory on the other side of the field.

Although this story came to me second-hand, I believe it to be true because my hearsay source was reliable; it may interest some of your readers.

The general manager of Consolidated's factory at Fort Worth at that time said (according to my source) that work began on the B-29 and the B-32 at the same time and to the same specs, including pressurization of the cabin and a central fire-control system. The engineers at Wright Field, as the development progressed, began to have misgivings about both of those features and decided to hedge their bets. At some point, maybe two years or more down the development road, AAF told Consolidated, in effect, "keep doing what you're doing, but leave those two features out." The result was extensive redesign, which had the effect of delaying production

of the B-32 until the B-29 had proven itself in action.

I never finished my checkout in the B-32; V-J Day came along, and production stopped, and all flying of B-32s stopped except for ferrying them to a boneyard at, as I recall, Walnut Ridge, Ark.

From the flying I did in the airplane, though, I got a very good impression of the B-32. It was a very "honest" airplane. It responded beautifully to the controls. The big, tall vertical stabilizer made the airplane beautifully stable in yaw; although I never got to the point of bombing from it, I thought it would be an outstanding bombing platform.

And those turrets and all those guns! I remember thinking what a jolt all those guns in a group formation over Germany could have delivered to the Me 109s and FW 190s of the Luftwaffe!

I hope that some who knew the B-32 far better than I will write you with more information about this beautiful bird, which came along too late to demonstrate its worth.

Col. George Y. Jumper,
USAF (Ret.)
Loomis, Calif.

A Photographer Remembers

I enjoyed reading General Eaker's tribute to Gen. Frank M. Andrews in your September issue. Both of these officers will be long remembered for their indelible contributions to US airpower.

As the Air Force photographer who was waiting at the field for General Andrews's arrival in Iceland, I can attest to the stunned dismay of the troops who learned he was missing just moments after they were told he was on final approach.

General Eaker had the essentials of the tragedy correct, but I would like to add some interesting details. The accident did not occur at Reykjavik, but at the largest airport in the world at that time, Meeks Field, some thirty miles away. It is now known as Keflavik Airport.

Twelve men, including Bishop Ada Leonard, died in the crash. There was one survivor, a technical sergeant tailgunner. In a previous bomber accident in North Africa he had again been the sole survivor.

Because of the rugged terrain and unfavorable weather, it took three days to locate General Andrews's B-24. Infantry troops from the 5th Division made the discovery and freed the technical sergeant, who had been trapped in his turret uncertain as to the fate of his crew.

At the crash site I stood next to one

AIRMAIL

of the B-24's engines, which had bounced to the top of that lava mountain, and looked right down the active runway. One hundred feet higher and General Andrews would have made it.

Now on quite another subject: The first US pilot, serving with an AAF squadron, to shoot down a German aircraft in the European Theater was Lt. Michael J. Ingelido. The action took place over Iceland on August 14, 1942. While serving with the 33d Fighter Squadron, Lieutenant Ingelido, in his P-39 (they also had P-40Cs), destroyed a Focke Wulf Kurier reconnaissance aircraft.

A short time ago I happened upon an article about the "William Tell '78" competition to determine the "Top Guns" among our present-day fighter pilots. Surprisingly, the top individual scorer in the F-4 was Capt. Michael S. Ingelido, from the 86th Tactical Fighter Wing.

The name is unusual enough to cause me to speculate that Michael J. and Michael S. are possibly father and son. If anyone can confirm this and send me Captain Ingelido's address, I believe I have some photographs of his father he might enjoy having.

John N. Rice
2223 Lake Rd.
Ontario, N. Y. 14519

Hurricanes in Dutch Markings

I have just received the September and October issues of AIR FORCE Magazine and was very much interested in Col. Lester J. Johnsen's article, "You Men on Java Are Not Forgotten," in the September issue. Also, I found Lt. Col. Jim Beavers's article, "The Teachers," of considerable interest.

Colonel Johnsen mentioned, on p. 112, six Hawker Hurricane aircraft of the Dutch Air Force. In this respect, I would like to note that there have been references to Dutch Hurricanes in the East Indies in Dutch and British aviation periodicals in the past, but so far no conclusive evidence has come to light to prove that Hurricanes with Dutch markings ever existed. I have only seen extensively retouched "photos" of Hurricanes in Dutch markings, but these are apparently made from photos of RAF Hurricanes.

As to the Dutch Hurricanes in the East Indies, these were never ordered properly by the Dutch, but more or less handed over in the field by the RAF. Thus, on delivery they probably carried British markings and may never have had Dutch markings when they were hastily put into action. I wonder whether perhaps Colonel Johnsen recollects what type of

markings the Hurricanes did carry, and whether he has any photos of these aircraft. In the light of his hasty evacuation, I suppose such material would have been lost, if it ever existed, but one can never tell.

Regarding Colonel Beavers's contribution, mention is made of AT-6 aircraft. Having a special interest in this type and its history, I would welcome any correspondence and/or loan of materials on this type, which has been used in over seventy countries.

Anton le Nobel
Nicolaas Beetslaan 94
2273 RE Voorburg
Netherlands

The Long Shadow of the Bear

Some months ago I witnessed something that made my blood run cold, and strongly fear that the event is an ongoing situation!

From the vantage point of my balcony in the Condado area of Santurce, Puerto Rico, on a peaceful Saturday afternoon with a cool beer in hand, I observed a high-flying contrail coming north to south on a bearing of about 340 degrees. As it came almost overhead it turned to an easterly heading toward the Navy's AFWTF north range, where a major exercise was being conducted at the time.

Curious, I fetched my binoculars and made out the unmistakable silhouette of the USSR's Bear bomber and its four pairs of counterrotating turboprops and its two aft wing pods.

As a fourteen-year veteran of the Aerospace Defense Command (rest its soul), and, more recently, an aerospace contractor employee (BMEWS and USN's AFWTF), but mostly as a concerned citizen, I can tell you that never, since flying P-38 fighter sorties all day and watching searchlights illuminating "bedcheck Charlie" overhead at night, have I had the feeling I had that day!

Is Puerto Rico, and the Caribbean, to remain an ignored "soft underbelly of America"? Is there no plan for an air defense system here? If Puerto Rico were to become the fifty-first state, as is much discussed these days, is there a change of plans in the mill for this area?

The Navy League magazine, *Sea Power*, June 1980, had a chilling

article—"America's Soft Underbelly: Central America and the Caribbean"—which should be required reading for our defense planners, and others.

Wake up, USA, USAF, DoD!
Maj. Reynold D. B. Schmidt,
USAF (Ret.)
Santurce, Puerto Rico

Airships in Our Future?

A rapid deployment force needs to get our troops and supplies to a point as quickly as possible and intact. How do we do this if the airfield looks like the one on page 78 of your September issue [Rolls Royce ad]?

There is no question that we need airplanes that can carry outsized loads, but do we want to put all our eggs in one basket? Wouldn't we have a more stable supply line if we used a mixture of airplanes and airships? If we look at the million-mile success of the Graf Zeppelin rather than at the ill-fated *Hindenburg* fire, we might get a glimpse of what a modern airship could offer us today. We are talking of a large, metal-clad airship that could carry 150,000 tons across the ocean (unrefueled) and then return (unrefueled).

There have been many studies on airships since the joint Navy, NASA, DOT, and FAA meeting at Monterey, Calif., in 1974. At an AIAA meeting on airships last year at Palo Alto, a paper was presented by Maj. George A. Pasquet, of MAC, entitled "Lighter-Than-Air Craft for Strategic Mobility." This paper dealt with payloads, range, in-flight maintenance, and survivability vs. those of aircraft. Because of its size, the airship can carry defensive weapons, perhaps lasers and missiles, and it can also be repaired in flight, which would assure a completed mission.

Again, let me stress that we need to mix our aircraft with both planes and airships to assure that all missions can be carried out, even without airfields. The CX program should include airships if it is to be successful. After all, the tortoise did beat the hare.

Roy P. Gibbens
Asheville, N. C.

390th Memorial Museum

In order to recall and commemorate the service and sacrifice of the 390th Bombardment Group of WW II, and to pay tribute to the on-going deterrent efforts of this strategic missile wing, the 390th Memorial Museum is being established here at Davis-Monthan AFB.

To tell an accurate and complete story of these units we need the help of both former bombardment group



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The TFE76's core section already has the design maturity

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Which eliminates the high risks associated with the

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of an engine

which has

never been

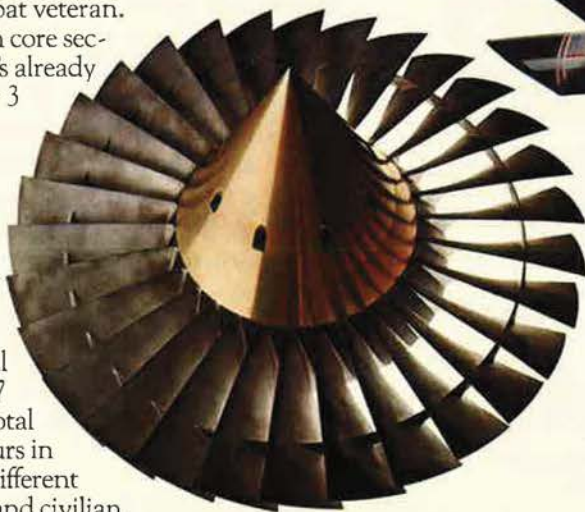
production

A medium

bypass, 1,200 to

1,500 lb. thrust tur

OV-10 Bronco



fan, the core of the TFE76 is based on Garrett's extremely successful, fuel-efficient turboprops: the military T76 and the civilian TPE331. What's more, the TFE76's fan uses the advanced aerodynamics of our latest TFE731 turboprop, the engine that powers 14 of today's leading business jets. Which means you'll benefit from the latest, most cost-effective design concepts.

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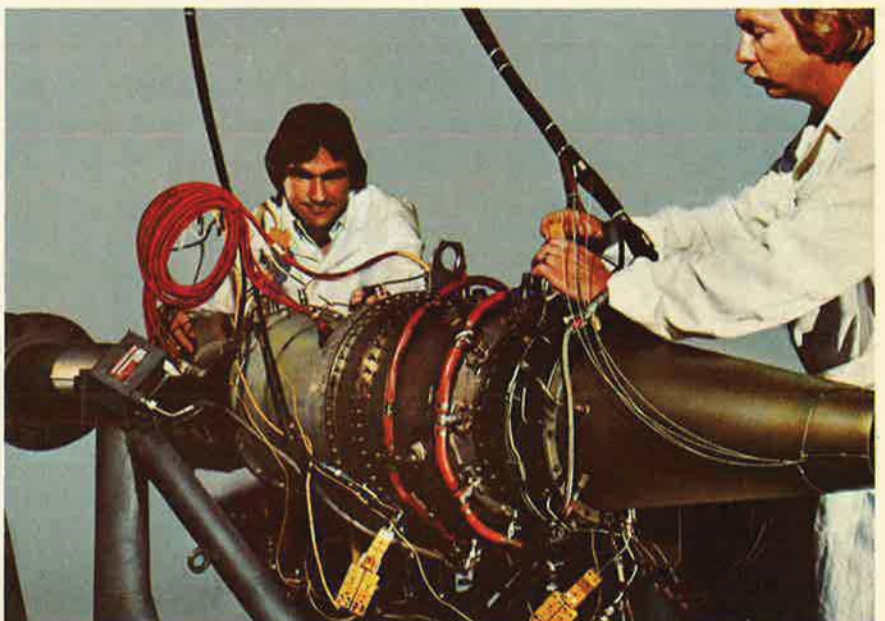
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The lesson to be learned is clear: Garrett's TFE76 is the low risk, high performance choice for the Air Force's NGT. For more information, write: Propulsion Engine Sales, AiResearch Manufacturing Company of Arizona, P.O. Box 5217, Phoenix, AZ 85010. Or call (602) 267-2319.



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and missile wing members. To develop the best displays possible we are in need of photographs, tools, uniform items, and other memorabilia, as well as your favorite anecdotes about your former unit. Your personal experiences are vital to our effort to give our museum the all-important human element.

If you would like to support our efforts, please contact our museum curator at the following address:

390th SMW/HO
Attn: Capt. Geoff Hays
Davis-Monthan AFB, Ariz. 85707

9th Air Force Troop Carrier Command

The Anglo-American Historical Aviation Society was recently formed in England to promote the research of Ninth Air Force Troop Carrier Command bases. The group's first project will be to write the wartime history of Greenham Common and Welford Park and the units that served there.

The Society was formed because its members believe that the history of the troop carrier units, which were the backbone of the Allied invasion of Europe, has long been neglected in favor of the more glamorous Eighth Air Force. The two bases were chosen because of their historical significance and because the American members are now stationed there.

We request that members of the 315th, 434th, 435th, and 438th Troop Carrier Groups and their subordinate squadrons, the 876th Airborne Engineer Aviation Battalion, the 21st Station Complement Squadron, the hospital squadron, and the 101st Airborne Battalion, and any other units that served at either base to write to the Public Affairs Officer at the address below:

1st Lt. Douglas K. Fidler, USAF
Box 513, 7551st ASUPS
APO New York 09607

Pink Uniforms for PT-19

I was a mechanic on TB-29s in the 1950s, 5015th Radar Evaluation ECM Flight A, at Elmendorf AFB, Alaska. I need some help. I am looking for two old US Army Corps officers' pink uniforms for my PT-19, which I fly to military air shows and open houses. I need two old uniforms and Air Corps training patches.

I also need to know where Santa Maria AFB was. My PT-19 was discharged there. I would like to know where it was flown between 1942-1956. It was built in Los Angeles, Calif., by Howard Aircraft Co., 2/5/42, #147 HO serial number with a 220 Continental, then changed to a Ranger 6-440-C5, 200-hp engine.

AIRMAIL

I use a Navy flight suit to wear in the air, but I would like two old two-piece US Army Air Corps flight suits. That is what belonged to the aircraft. . . .

. . . I would like to hear from any old PT-19 pilots and receive old pictures.

Ronald T. Brown
102 Bruno Ave.
Pittsburg, Calif. 94565

Calling Charlie Bobe

We're trying to locate former Sgt. Charles A. Bobe, Serial No. 33072704. In 1943, he was squadron draftsman of the 3d Antisubmarine Squadron, at Fort Dix Army Air Base, N. J. That was the "Bat Out of Hell" Squadron. When the unit became the 819th Bomb Squadron of the 30th Bomb Group and transferred to the Central Pacific with B-24s, Bobe was part of the unit. It is believed he was one of the artists who painted decorative pictures on the noses of his unit's aircraft, both when the squadron was at Wheeler Field and, later, based on Saipan. If so, the undersigned would like to contact him to get information for a forthcoming book.

Steve Birdsall
31 Parkland Rd.
Mona Vale 2103
Sydney, Australia

Book on the FW 190 of WW II

I am writing a book on the German Focke Wulf 190 fighter airplane of World War II—to be published by Docavia in Paris, France—and am interested in getting in touch with former US Air Force personnel who may have photographs of these aircraft.

Of especial interest is photographs, if still in existence, of a famous FW 190 that landed at St. Trond on January 1, 1945. At the time, the 404th Fighter Squadron was stationed at this airfield. It is hoped some photographs of this event have survived. Any other photographs of German fighters of WW II are welcome.

Alain Fleuret
23 Rue des Recloux
ITEUIL
86240 Ligué, France

Nha Trang C-123s

I would like to hear from anyone who might be able to provide photos (slides or prints) of the special mis-

sion C-123s that flew in SEA, including 1st Flight at Nha Trang and the NC/AC-123 Black Spots. No photo too bad, any desired. All originals will be promptly returned. Your assistance greatly appreciated, and all letters answered.

Lt. Bernard V. Moore II
7th Special Ops Sqdn.
PSC Box 1336
APO New York 09057

Collectors' Corner

Wanted: Air Defense Command patches. I am trying to build an official display of the now-retired command. Also, anyone having any extra AAF and USAF cloth patches they can donate or sell for my personal collection, please contact

TSgt. George Gottsammer, USAF
6907 S. James St.
Rome, N. Y. 13440

I am a collector of fighter unit, command, and squadron patches, medals, ribbons, and other types of Air Force or other military pins. Anyone having any of these I urge to contact me. I will trade, or if you would like to give, and will buy if reasonable. Any of these will be of great help to my collection.

Donald Goddard
404 Pittsburgh Dr.
Jupiter, Fla. 33458

I am a collector of Air Force aircraft photos and squadron, group, and wing patches of flying units. I have some for trade but would prefer to purchase items available.

I am also interested in any photos and books on old models of the Northrop F-89 Scorpion.

Gordon D. Homme
Box 4-1117
Anchorage, Alaska 99509

An avid collector of aviation patches, I am looking for any tactical fighter squadron patches to augment my collection. I am especially interested in patches from units flying the A-10 (333d, 356th, 433d, etc.).

Any help will be greatly appreciated and I would be happy to pay for any of these patches.

Edward Cossette
12 Watson Dr.
Rochester, N. H. 03867

I collect fighter units patches, and I would like to know of anyone willing to sell or give me any such USAF patches. If you have some please contact:

Jeff Gerhart
9872 Hollow Glen Pl.
Silver Spring, Md. 20410

IN FOCUS...

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

Washington, D. C., Nov. 3
**Toward a Potent Rapid
Deployment Joint Task Force**

The Strategic Air Command has formed a Strategic Projection Force of global reach, high responsiveness, and vast conventional firepower. The force is available to the National Command Authorities and the Joint Chiefs of Staff in support of theater commanders or by coalescing with the Rapid Deployment Force into the Rapid Deployment Joint Task Force. Gen. Richard H. Ellis, SAC's Commander in Chief, told this column that the force is composed of twenty-eight B-52Hs, ten KC-135s, four RC-135s, two U-2Rs, two EC-135s, four to eight KC-135Qs (the tankers of the SR-71 force), and two SR-71s.

The force, General Ellis said, is designed to operate in a "stand-alone, night, all-weather, low-level penetration role" and basically tailored to the Southwest Asian area. With a mission radius of up to 2,500 miles, including 500 miles at low-level flight without refueling, the Strategic Projection Force can be deployed within twenty-four hours and employed within thirty-six to forty-eight hours, provided POL, munitions, and some support equipment have been prepositioned. The newly created force—which has been exercised several times, including a full-up field exercise (except for the SR-71s) flown against the Red Flag test range, at Nellis AFB, Nev., in September—is compatible with the existing runways and other facilities at bases in the Middle East and adjacent areas to which the US is seeking access rights, according to General Ellis.

The Strategic Projection Force (SPF) has its own intelligence fusion center that utilizes the resources of all relevant national agencies as well as the reconnaissance portion of the force itself. The SPF's fusion center, regardless of location, will be in direct contact with the fusion center at Hq. SAC. The force is being provided with secure short- as well as long-range communication capabilities via satellite and UHF links. Because of its ability to "stand back" out of reach of

Soviet fighters, and by flying night missions, SPF won't require air cover. The "stand-alone" quality of the force probably will be beefed up in the future by the addition of E-3A AWACS and EF-111 tactical support jamming aircraft.

SAC plans to upgrade the backbone of the force, the B-52Hs. The command selected the "H" models rather than the B-52Ds because of their greater range, better bombing accuracy, and enhanced penetration capability. The initial upgrade of the SPF's B-52Hs—subject to a pending request to reprogram \$4 million of FY '81 funds—calls for the installation of rails on the wing pylons to approximately double the aircraft's bomb-carrying capability from twenty-seven 500-pound or 750-pound bombs to fifty-one. A second enhancement effort—also pending—involves the addition of advanced technology subsystems to reduce CEP (circular error probable, meaning accuracy) by almost a factor of three.

This modification program initially will involve two prototype aircraft to demonstrate the feasibility of this classified technique. Thereafter, the full force is to be modified. Lastly, there are tentative plans to modify the aircraft's bomb bay in the manner of the B-52D, the so-called "belly mod," to boost bomb-carriage capacity from fifty-one to 108 bombs. With both the rail and bomb bay mods removable, the SPF's twenty-eight B-52Hs experience no performance degradation when assigned to the SIOF (single integrated operational plan or strategic nuclear) mission.

Even though the new force—when called up—draws down the ninety-six B-52Hs assigned to the SIOF by almost one-third, it would not affect the SIOF force as long as the latter is in a day-to-day alert posture, according to General Ellis. Reason is that "we pass those alert sorties to other 'H' units," he explained. On the other hand, if the SIOF force is shifted to higher alert status and the twenty-eight SPF aircraft have not returned from their special mission, the former would be degraded. Whether the twenty-eight

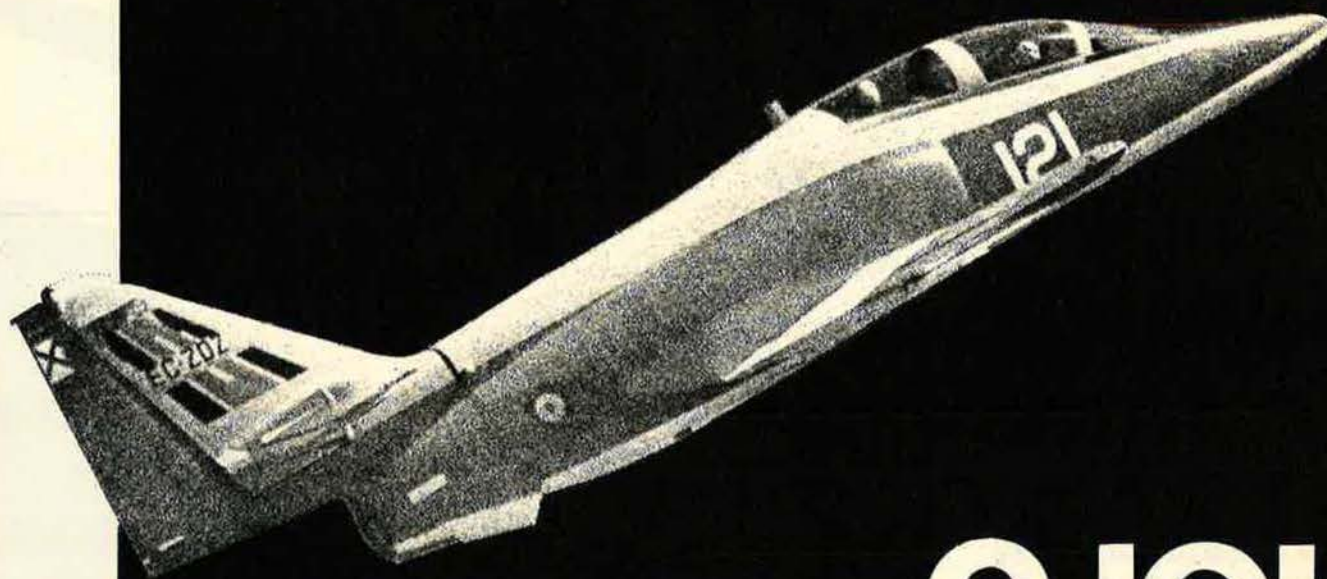
aircraft in question are assigned to the SIOF or SPF mission during periods of crisis is to be determined by the Joint Chiefs of Staff and the NCA.

The Military Space Mission

In planning long-term exploitation of space for national security purposes, the Air Force Systems Command's Space Division at Los Angeles, Calif., is coming up with blueprints for a comprehensive space strategy and even an "orbital force structure." Fundamental to these visionary concepts is the thesis that there will evolve two different classes of future military satellites. The first type, Lt. Gen. Richard C. Henry, the Space Division's Commander, believes, will involve systems that must be available for rapid launch under hostile conditions. The other category will be made up of spacecraft that can be placed on orbit by the National Space Transportation System (the Space Shuttle and IUS, for Inertial Upper Stage)—or an eventual follow-on system—under peacetime conditions.

The first category probably will consist of command control communications and intelligence (C³I) systems of moderate size and crucial importance. The weapon-like, "military" characteristics of spacecraft of this type require ballistic missile-type launchers. The Air Force's MX ICBM—in conjunction with its concealed basing mode—is seen as the front-running candidate for reliable, secure launch vehicles of this type. Spacecraft designed for rapid launch under hostile conditions will be fundamentally different from the present generation of satellites.

In the main, that difference will boil down to a shelf life similar to that of a weapon system, and sufficient ruggedness to survive launch under hostile fire. Such spacecraft obviously must be stored on top of an MX launcher for months on end yet be ready to go without time-consuming checkout. Present systems are made ready for launch, placed on top of their launch vehicle, checked out,



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and placed into orbit without significant delay. If there is a delay, and the spacecraft sits on top of the launch vehicle longer than scheduled, its various components—such as batteries and station-keeping mechanisms—have to be rechecked prior to launch.

The category of satellites that can be put on orbit under peacetime conditions won't necessarily be less essential to the prosecution of war than the first category. But since they won't be replaceable under wartime conditions, these systems, when necessary, must be designed with sufficient endurance and survivability to function over protracted periods of hostility. Key traits that might make this possible center on high and other unique orbits, proliferation, including spares that can be called up in case of failure of the first-line systems, hidden spacecraft, systems that can evade hostile space interceptors, and sensor packages that "piggyback" on nonmilitary satellites.

Space systems that can't be replaced reliably yet are essential for the conduct of war must be made survivable not only in terms of the spacecraft involved but also their ground terminals and the mission data, or bit stream, that moves between them. Loss of any one of these elements makes the remaining two useless. A major step toward reducing the vulnerability of space systems is development of "autonomous" satellites that use fault-tolerant computer technologies, space-sextants, and on-board data processing and thus don't depend on constant control from the ground.

The fault-tolerant computer, under development by the Space Division in concert with the Jet Propulsion Laboratory (which pioneered related technologies for NASA's Voyager space program), uses advanced techniques of fault diagnosis and correction to enable malfunctioning spacecraft to "heal themselves." General Henry told this column that fault-tolerant computers might be feasible within three to five years from now.

Future "autonomous" satellites, by processing more information on-board, will be able to filter out the vast amounts of raw sensor data that at present are being telemetered to ground-based computers. As the amount of data to be transmitted to the ground decreases, the chance for protecting the vital information that must be "down-linked" increases. Further, such electronic warfare (EW) techniques as spread spectrum or frequency-hopping stratagems can

IN FOCUS...

be applied to data links of space systems to make them jam resistant.

In a similar vein, the use of traveling wave tubes to boost on-board power generation—perhaps to a level of about 100 watts—also will increase the survivability of data links.

The survivability of ground terminals could be boosted by reducing their numbers and making them both redundant and mobile. For this reason, USAF is working on schemes to internet satellites through orbital cross links involving laser communications devices. Orbital cross links are being considered, for instance, as a partial gap-filler for the proposed Strategic Satellite System (SSS) that Congress scuttled. While not as capable as the highly survivable and jam-resistant SSS, orbital cross links could improve the flexibility, endurance, and survivability of the C³ system that controls this country's nuclear-capable forces worldwide.

First and foremost, internetted satellite systems would reduce or eliminate the need for ground stations abroad, probably the politically and militarily most fragile element of space systems. Mobile ground stations that look like conventional vans—and thus presumably will be reasonably survivable—are being developed for the Defense Support Program (DSP, also known as the Early Warning Satellite system) and will be used in the CONUS.

Two other factors can contribute to the survivability of space systems and, therefore, are being emphasized by the Air Force. Obviously, it is impossible to harden a spacecraft sufficiently to withstand the radiation and electromagnetic pulse unleashed by a nuclear weapon detonating in its vicinity. But there is good reason to believe that the individual spacecraft making up a constellation of satellites—such as the eighteen-satellite Navstar GPS system—can be spaced sufficiently apart so that no single weapon can destroy more than one target. Keeping enough distance between satellites to force a potential aggressor into a one-on-one attack is now official Air Force doctrine. This "safe" distance is about 3,000 nautical miles. Another obvious way of deterring nuclear attacks on US military spacecraft is to keep them at orbits high enough so that Soviet

ASATs—at least for the foreseeable future—won't be able to reach them. That would almost certainly be true in case of satellites on geostationary (22,300 miles above the surface of the earth) orbits. So far, Soviet ASATs have not shown intercept capabilities beyond low orbital altitudes.

Yet another form of survivability that space systems depend on is predicated on warning and surveillance capabilities to detect threats with enough lead time to counter them. The advent of infrared mosaic sensors that stare over a wide field of view (like the human eye) rather than scan (in the manner of a searchlight) suggests that eventually it will be possible to carry out the surveillance, detection, and warning function in space rather than from the ground, as is the case now.

Radar satellites remain the only viable means for all-weather surveillance of terrestrial areas of interest from space. The Soviets use radar satellites for ocean surveillance, a relatively easy application that requires only limited resolution. The Space Division is examining a far more ambitious application of space-based radar, namely the eventual replacement of the DEW (distant early warning) line. Whether or not this can be done cost-effectively is not yet clear, however.

For the near term, AFSC's Space Division is concentrating on two principal goals, correction of the fragility of the current generation of spacecraft and their launch vehicles, and making space useful to units in the field and individual ships at sea. In the latter instance, the Navstar Global Positioning System represents a major step forward. In General Henry's view, it offers an "order of magnitude improvement in our capacity to navigate and will help rewrite tactical doctrine." Navstar, a constellation of eighteen—and eventually perhaps twenty-four—satellites, provides highly accurate and reliable positioning and navigation information on a worldwide basis. It is the first space system designed for broad use by tactical forces, down to the battalion and squadron level.

A potential key factor in bolstering the reliability of space systems and their launch is the National Space Transportation System. The Space Division acts as the Defense Department's executive agent on the Shuttle program. From the military point of view, the Shuttle's primary virtue is reliability. Even though the Air Force refined and perfected the Titan launch system over a period of years, its reliability in the case of geosyn-

chronous launches remains at .90 and .95 for low-altitude launches. The Shuttle, operating in concert with IUS by contrast, is expected to obtain a reliability of .99, according to the Space Division Commander.

Reason for this expected improvement is that both the Shuttle and IUS were designed with key emphasis on reliability, whereas Titan III is a "single-string" system, meaning it lacks redundancy in its guidance and other essential systems. And further, the Shuttle/IUS combination, once matured, should prove more "responsive" than Titan III. It takes an average of seventy days to prepare a Titan system for launch. The Shuttle is intended to eventually achieve a two week "turn-around" rate. (First turn-around, however, is expected to stretch out to 240 days.)

Neither Titan III nor the National Space Transportation System is meant to function under wartime conditions. A recent study of the Shuttle's launch facilities at the Kennedy Space Center in Florida and at Vandenberg AFB, Calif., caused NASA and the Air Force to agree that neither site could be protected against mortar or long-range artillery fire. Steps are being taken, however, to protect these facilities from flat-trajectory weapons, mainly rifle fire.

While from a military point of view a fully reusable "single-stage-to-orbit" system offers major advantages, most Air Force space experts accept the fact that the heavy national investment in the Shuttle militates against development of a follow-on system in the foreseeable future. The emphasis, therefore, is on evolutionary improvements of the National Transportation System. As the system matures, the first set of objectives, in General Henry's view, should be engine improvements as well as weight reduction of the Orbiter, the Shuttle's flyable and reusable upper stage. Later on, it might become possible to decouple the main engine from the Orbiter. Rather than flying the bulky and heavy main engine into orbit, which is inefficient, ways might be found to drop it off before the Orbiter reaches full altitude. The engine could be recovered and refurbished in a manner similar to the Shuttle's two rocket booster motors.

By taking only the Orbiter into orbit, a number of significant advantages would accrue to the system: payload would be boosted, orbital maneuverability would be increased, and with a far lighter Orbiter flying back to the ground the system could be made far more flexible. This set of improvements would contribute toward an

IN FOCUS...

important military goal—to provide the Shuttle with a heavy lift capability. This is essential for linking the Shuttle with a Space Tug, a vehicle that is lofted and deployed by the Shuttle to ascend to geosynchronous equatorial orbits to deliver or retrieve refurbishable spacecraft and return to the Orbiter.

If the history of military aeronautics is a guide to the future of military astronautics, today's high-flying visions of where the Air Force might be going in space are apt to become tomorrow's commonplace.

New Soviet Submarine

Recent Soviet progress in nuclear-powered submarine technology has been remarkable and reflects in part payoffs from a host of new initiatives that include attack, cruise missile launching, and ballistic missile launching designs. The USSR's latest submarine, code-named "Oscar," is the world's fastest and largest submersible. US estimates credit Oscar with unprecedented top speed, possibly as high as fifty-five knots. Oscar thus appears to be far faster than the previous record-holder, the Alpha attack submarine that can travel at speeds of slightly more than forty knots.

The latest US design, the Trident SSBN, is significantly slower than even the Soviet Alpha. The Soviet subs outperform their US counterparts because of advanced hydrodynamics and superefficient powerplants, according to US naval experts. Oscar, which is somewhat larger than the 30,000-ton Typhoon, the Soviet Union's latest SLBM-launching submarine, appears to be a cruise-missile carrier. Oscar is thought to carry a large number of SS-NX-19s, a supersonic cruise missile that flies at speeds of about Mach 2.5 over a range of up to 480 km.

At this time it is not clear how the Soviet Navy will use Oscar—only one boat of this type is thought to exist—but land targets, surface ships such as carriers, and US SSBNs (SLBM-launching subs) seem suited for its SS-NX-19 cruise missiles. Meanwhile, US analysts assessing intelligence information concerning the Typhoon's MIRVed SLBM have established that this weapon is approximately of the same size and presum-

ably has about the same payload as the US Air Force's MX ICBM.

Washington Observations

★ Recent press reports about an alleged letter by Secretary of Defense Harold Brown to Chief of Naval Operations Adm. T. B. Hayward concerning the interaction between the growing Soviet antisubmarine warfare (ASW) threat to the Navy's SLBM force and MX are misleading. Admiral Hayward indeed wrote to Dr. Brown in September of this year, complaining that OSD was creating the specter of broad vulnerability of the US Navy's fleet ballistic missile force to emerging Soviet ASW capabilities in order to bolster the case for MX. Dr. Brown, according to authoritative sources, commented on the CNO's letter in short notes on the margin. The Secretary's comments did not agree with Admiral Hayward's contention that the growing Soviet ASW threat was a fabrication in support of MX. Rather, Dr. Brown exhorted the Navy to take steps to cope with the Soviet ASW capabilities.

★ PD-59, the recently enacted Presidential Decision to commit the US formally to a countervailing, flexible nuclear options policy has revived interest among Pentagon and congressional experts in testing Minuteman ICBMs from operational silos. The US has never tested ICBMs from operational silos because plans to do so—at various times—were blocked in Congress for environmental reasons. Yet, operational testing can contribute to ICBM accuracy—obviously a key factor in a countervailing (counterforce) strategy—in a significant way. The magnetic field and gravitational peculiarities vary between individual silos and can exert significant influence on missile guidance systems. These anomalies can't be measured reliably and fully, short of actually observing an ICBM as it comes out of a given silo. Such operational flight testing can yield important guidance information regardless of whether the missile is launched in a northerly direction (toward the Soviet Union) or not. The Soviets, for years, have test-launched ICBMs in a northerly direction (toward the US but of course without reaching US territory).

★ An aspect of the so-called "Stealth" technology that is receiving ever-increasing attention in Congress and by the Air Force involves the O&M costs of a bomber force employing this technique. These costs appear to be far higher than for conventional designs. ■

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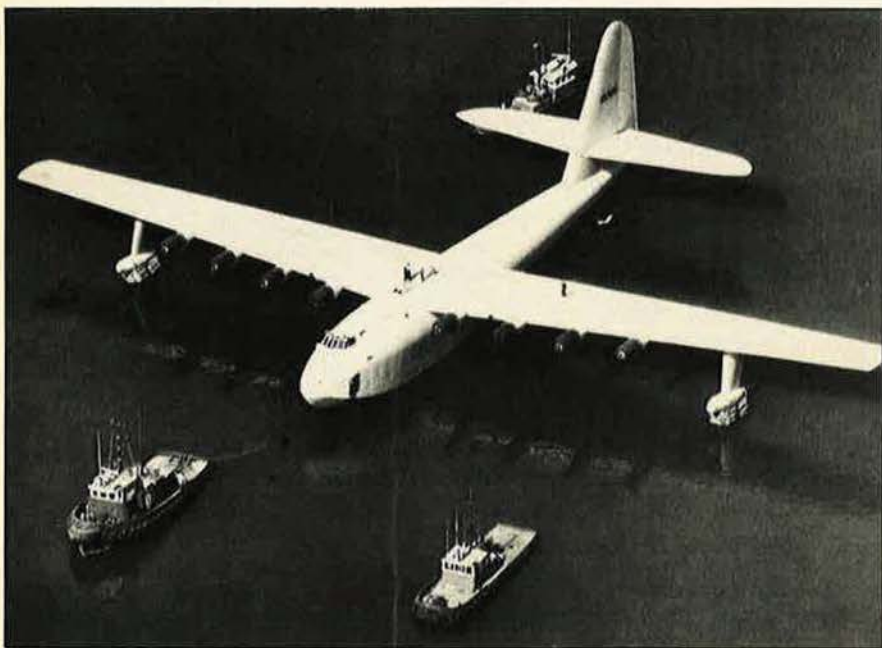
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AEROSPACE WORLD

News, Views & Comments

By William P. Schlitz, SENIOR EDITOR



Tugboats are dwarfed by the giant Hughes Flying Boat as they maneuver the behemoth across the harbor at Long Beach, Calif. The craft, the creation of eccentric multimillionaire and air pioneer Howard Hughes, flew only once. Spruce Goose will be readied as a tourist attraction. (Wide World Photos)

Washington, D. C., Nov. 7

★ Air Force aircraft and personnel have been cited in helping to pull off what has been termed the greatest maritime rescue in US history.

In early October, the cruise ship *Prinsendam* burned out of control and later sank in the icy and turbulent waters in the Gulf of Alaska. The ocean liner's 500 passengers and most of the crew had taken to open lifeboats and were being dealt a harsh time by the elements.

Among others responding to the emergency were an HC-130 and HH-3 Jolly Green Giant from the 71st Aerospace Rescue and Recovery Squadron, Elmendorf AFB, Alaska.

Pararescue specialists SSgt. John Cassidy and Sgt. Jose Rios arrived on the scene aboard the HH-3 and in wet suits went into the water and then into the boats to aid the victims. When rough weather and other factors interrupted helicopter rescue operations, the two remained with the boats into the night.

During the rescue operation, the HH-3, piloted by Capt. John Walters, hoisted people out of the lifeboats and crewmen off the deck of the burning liner. Capt. (Dr.) Don Hudson, of Elmendorf's 43d Tactical Fighter Squadron, and pararescue special-

ists SMSgt. Gene Nardi, SSgt. Dan Humphreys, and SSgt. Russell Tanner, landed by the HH-3 aboard the first ship to arrive on the scene, the supertanker *Williamsburgh*, and treated survivors there.

The HC-130, piloted by Capt. Dave Briski, was diverted from the rescue operation to search for and guide to safety a Canadian Forces CH-46 that had lost its bearings because of instrument failure.

Because of the efforts of these men and others, all passengers and crew were saved.

★ NASA will undertake a study to determine what effect the erratic work schedules of many airline pilots have on their performance.

Airline pilots who fly globally through many time zones suffer from "desynchronization," which throws their body rhythms—particularly the wake/sleep cycle—out of synchronization. Biologists claim this disorientation could have caused air disasters.

NASA's study will take more than two years and will follow fifty airline pilots through their routines, recording sleep, diet, and perhaps such physiological factors as temperature and heart rates.

The space agency also plans to use specially built simulators to put airline crews through various kinds of



An Air Force KC-135 tanker refuels a McDonnell Douglas/USAF KC-10A advanced tanker/cargo aircraft near the Sierra Nevadas of California during a recent test flight. Boom configuration allows KC-10s to refuel each other, as well.

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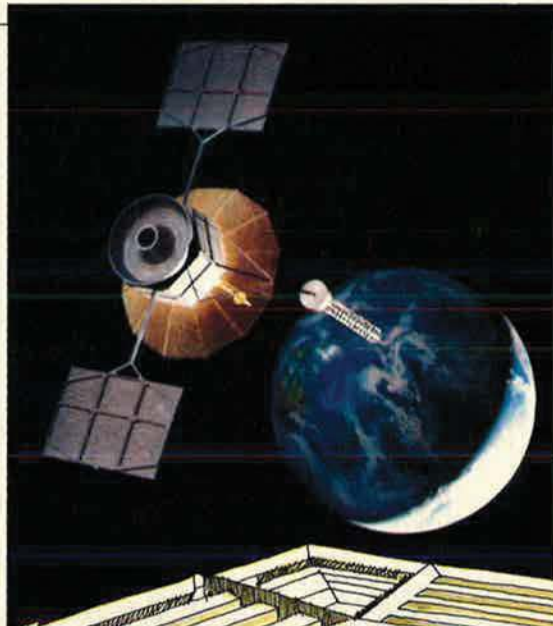
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Flight 4, launched October, 1980, completes the system's global coverage for Navy and Air Force tactical users.

Flight 5 will provide an on-orbit spare by mid-1981 to assure vital continuity of service for the next few years.

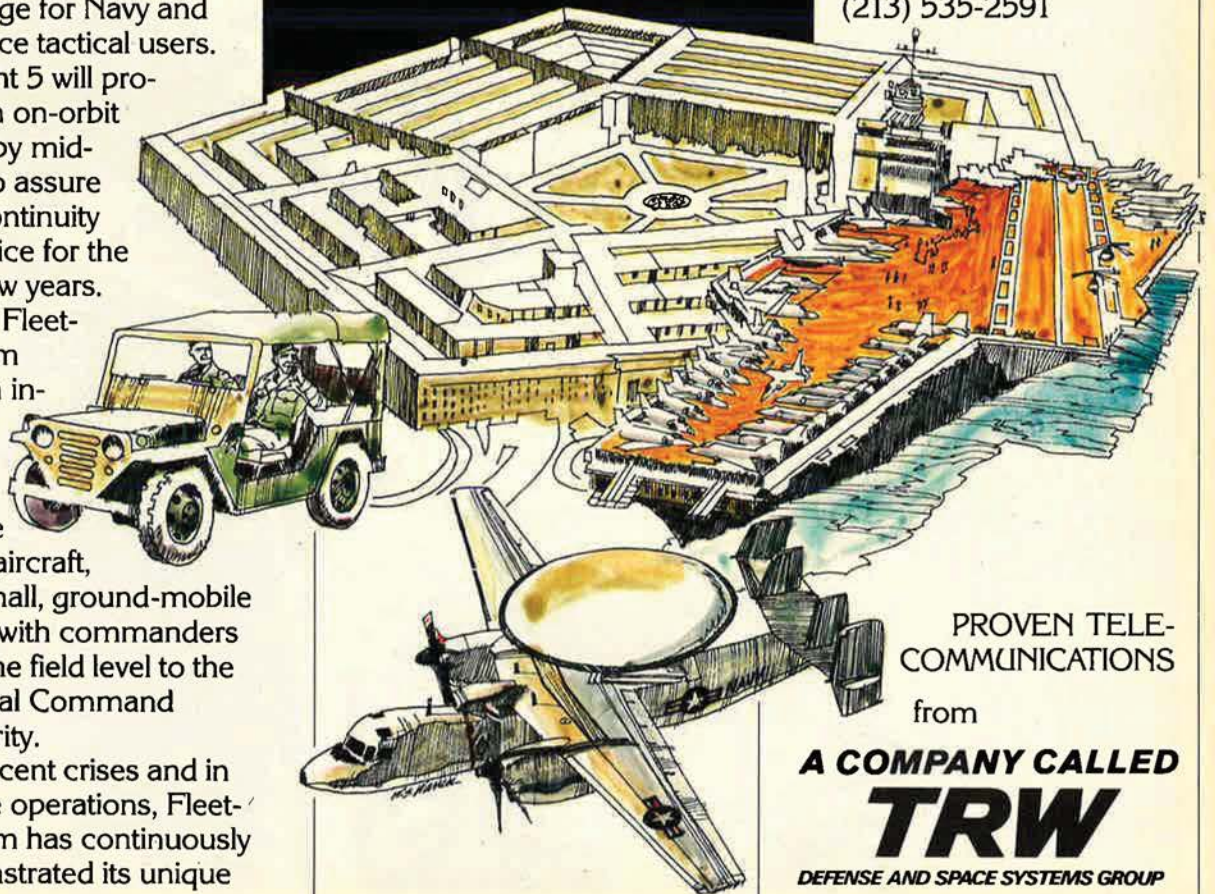
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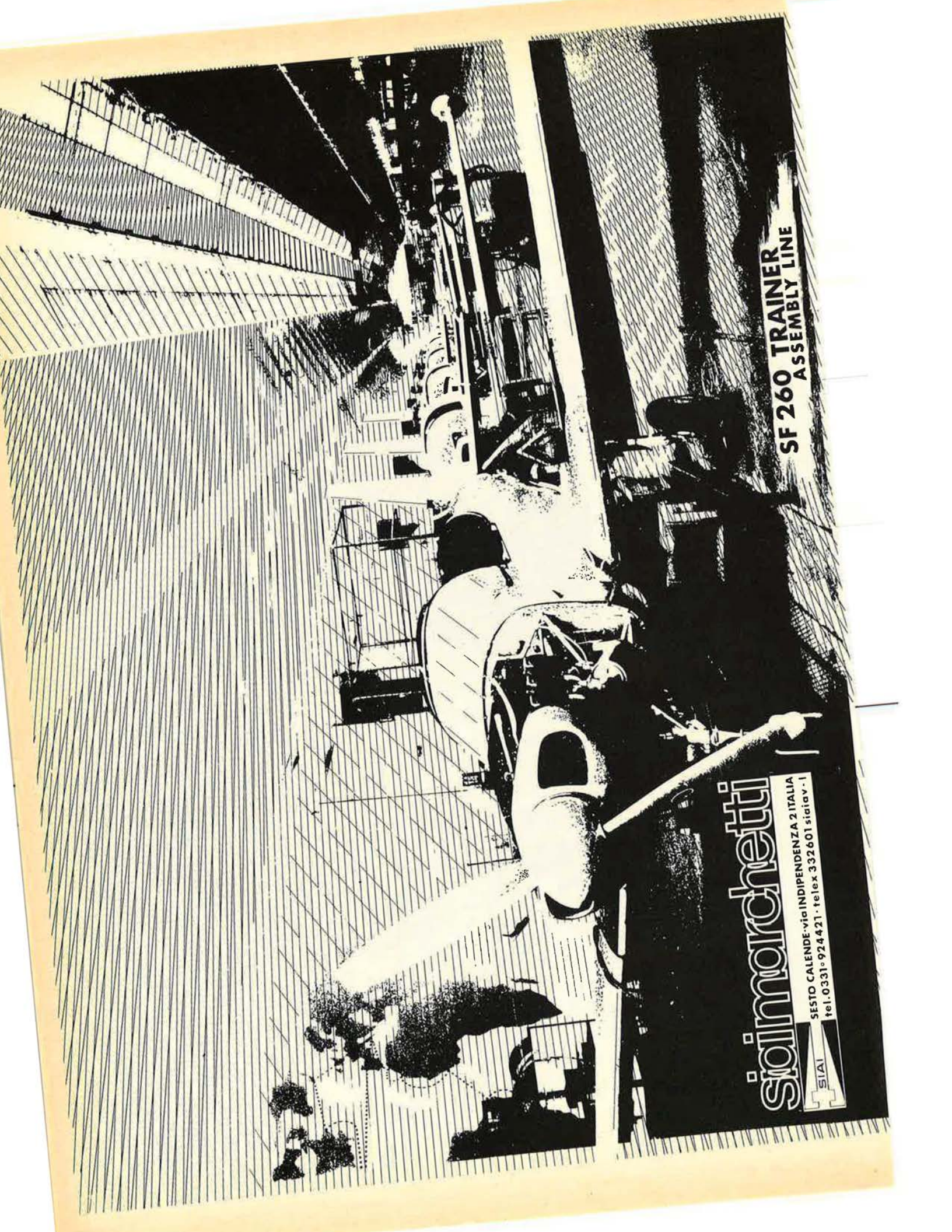
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stress on a systematic basis and under realistic conditions, officials said.

The study, which could become the basis for an FAA modification of existing regulations, should at least reveal what sets of circumstances to avoid, NASA said.

★ Transportable control centers that use computers to monitor military communications networks are undergoing a one-year field test at Fort Huachuca, Ariz., by USAF, the Navy, Army, and USMC.

AEROSPACE WORLD

Developed by AFSC's Electronic Systems Division, Hanscom AFB, Mass., the truck-mounted, camper-size control centers are linked to such tactical communications equipment as message and circuit-switching

facilities and short- and long-range radios. One test involves routing both analog and digital message traffic through the control centers to determine how well they can automatically arrange message traffic according to priority and also code classified messages.

Another test involves checking the performance of monitoring circuits to determine how well they pinpoint where repairs are required. This material appears on a television-like screen for maintenance personnel, or can be transmitted in printed form or electronically to higher headquarters.

Two models of the control center—known as the Communications Nodal Control Element—are under test. One is a two-shelter unit that provides automatic telephone exchange service equivalent to that of a city of 30,000 people. The second is designed for a smaller network.

The equipment was developed by Martin Marietta, Orlando, Fla., with engineering support by MITRE Corp. of Bedford, Mass. Testing will continue until next summer, when the Air Force plans to award a production contract, officials said.

★ Weather satellite GOES-D, orbited in mid-September, has been checked out by NASA and turned over to the National Oceanic and Atmospheric Administration.

The GOES series of satellites furnish the cloud pictures familiar to most television newscast viewers. The new satellite has aboard instrumentation to be used experimentally to determine three-dimensional—vs. previous two dimensional—profiles of heat and moisture distribution in the atmosphere, to help in assessing the severity of storms as they build. GOES-D is to be placed in geostationary orbit to view North and South America and much of the Pacific (and thus will be of particular interest to the Pacific fishing industry).

The GOES satellites beam pictures to users every thirty minutes around the clock, and can even provide information on frost conditions. Equipment aboard receives and relays information from river and rain gauges, tide gauges, seismometers, buoys, automatic weather stations, and other instruments. Some sound an alarm when conditions they are monitoring exceed predetermined parameters.

In addition, the GOES satellites carry instruments that detect solar protons, alpha particles, solar electrons, and X-rays and magnetic fields. This data is useful in high-altitude jet-

"Pappy" Boyington Visits

"Robert Conrad with wrinkles." That's the way Gregory "Pappy" Boyington described himself during his recent appearance as a guest lecturer at the Smithsonian Institution's Aviation Lecture Series. The retired Marine Corps colonel was in Washington, D. C., for a reunion of his VMF Squadron 214. Boyington led them to fame in the Pacific during World War II, and the squadron was popularized by Robert Conrad in the television series "Baa Baa Black Sheep."

The outspoken Boyington, in testimony of his popularity among adults and youngsters alike, drew a crowd of almost 800, one of the largest at an Aviation Series Lecture. More than a quarter of the people watched on closed-circuit monitors because the National Air and Space Museum theater had been filled to capacity.

Earlier in the day, Black Sheep Squadron members and their families visited the Paul E. Garber Preservation, Restoration, and Storage Facility in Silver Hill, Md., to dedicate an F4U-1D Corsair scheduled to go on display at the Air and Space Museum. Armed with six .50-caliber Browning machine guns on each aircraft, Boyington's squadron took the fight to the enemy during two six-week combat tours in late 1943 and early 1944.

Like a true commander, Boyington, a Medal of Honor winner, delegated the chore of formal remarks at the Smithsonian to squadron members Bruce Matheson and Don Fisher. Matheson provided the historical perspective. He described how the squadron established air supremacy over the Japanese, using Boyington's tactic of the fighter sweep. His description of the Corsair provided glimpses of what life was like for its pilots. Matheson outlined, for instance, how the characteristic gull wings and elongated nose made a crash landing survivable. If a plane couldn't land coming back from a mission, a crew member sometimes opted for shallow ditching rather than bail out. Fisher shared personal anecdotes about individual squadron members in the audience. Then Boyington took the mike to answer questions. They ranged from queries about the Black Sheep television series to the nation's military readiness, and Boyington was as entertaining as he was blunt in answering them.

The Smithsonian Aviation Lecture Series runs from September through May, usually monthly. Actual dates are dictated by the availability of the lecturers. On December 1, three World War II aviators, two RAF and one Luftwaffe, were to look back on the Battle of Dunkirk. A December 10 presentation is to feature a discussion of German warplanes.

—Maj. Thomas L. Sack, USAF



Colonel Boyington in the cockpit of a restored Corsair during a visit to National Air and Space Museum's restoration and storage facility.

liner operations, manned and unmanned spaceflight, electrical distribution, and communications. The satellites, built by Hughes Aircraft Co., have a seven-year design life.

GOES-E, scheduled for launch in March of 1981, will keep tabs on a large part of the Atlantic, South America, and the eastern half of the US. GOES-F, to be orbited in 1982, will track severe storms in the mid-continental US, and probably will

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serve as an in-orbit spare for D and E.

The GOES satellites are part of the World Weather Watch project, which



Recent maiden flight of the second of three prototypes of the Tornado Air Defense Variant (ADV), the Royal Air Force's latest long-range interceptor. This particular aircraft will be used for weapon-systems integration and development. The trination swingwing Tornado is capable of speeds in excess of Mach 2 at altitude.

includes NOAA's near-polar-orbiting series called TIROS, a Japanese satellite, and a European Space Agency satellite.

★ The Air Force has set up a Deputy Commander for Space Operations (DCSO) within AFSC's Space Division to provide operational support for future DoD Space Shuttle missions.

New head of DCSO is Maj. Gen. John E. Kulpa, who will report directly to Space Division Commander Lt. Gen. Richard C. Henry. General Kulpa, in a dual role, will remain Director of Special Projects, Secretary of the Air Force.

Besides support, DCSO is to plan for DoD Shuttle crew training and procedures and provide in-orbit support for DoD Shuttle missions. For example, it will manage payload integration, ground and launch operations support, and flight operations for all national security missions.

As part of the reorganization, the Air Force Satellite Control Facility, Sunnyvale, Calif.; Det. 2, Manned Space Flight Support Group, Houston, Tex.; and the newly created Directorate of Operations Support and Payload Integration will report to DCSO.

Col. Nathan Lindsay, the current Deputy Director, Liaison and Administration, Office of Space Systems in the Pentagon, is the new Director of Operations Support and Payload Integration, charged with ensuring that DoD satellites are compatible with the Shuttle Orbiter and with DoD command and control facilities.

★ A number of Air Force Communications Command units are already

J. Kenneth Haviland Alive and Well . . .



Hurricane pilot Haviland during the final days of the Battle of Britain.

And teaching at the University of Virginia. In the September issue of AIR FORCE Magazine appeared a Battle of Britain interview with former RAF Wing Commander Bob Stanford-Tuck. In a sidebar to the main story entitled "Yanks in the RAF" we described J. Kenneth Haviland as one of seven Americans who fought for the RAF in the battle and was killed in the war. Not so. Ken outlived the battle and the war, the lone survivor of the seven.

He was posted to the RAF's 151 Squadron from flying school during the concluding days of the battle and flew Hurricanes. Later on, he piloted night-fighting Defiants and Mosquitoes. In the closing days of the war, he was adjutant of the only B-17-equipped RAF squadron, whose job was to drop aluminum chaff to confuse enemy radar.

Ken was born in the US in 1921. When his American father died in 1925 he was taken to the UK by his British mother and raised there. He was a member of the RAF Volunteer Reserve when the war broke out.

Ken received a B.S. from Nottingham University in 1946 and left England for Canada in 1947. There he belonged to a Reserve squadron of the RCAF and flew Vampires.

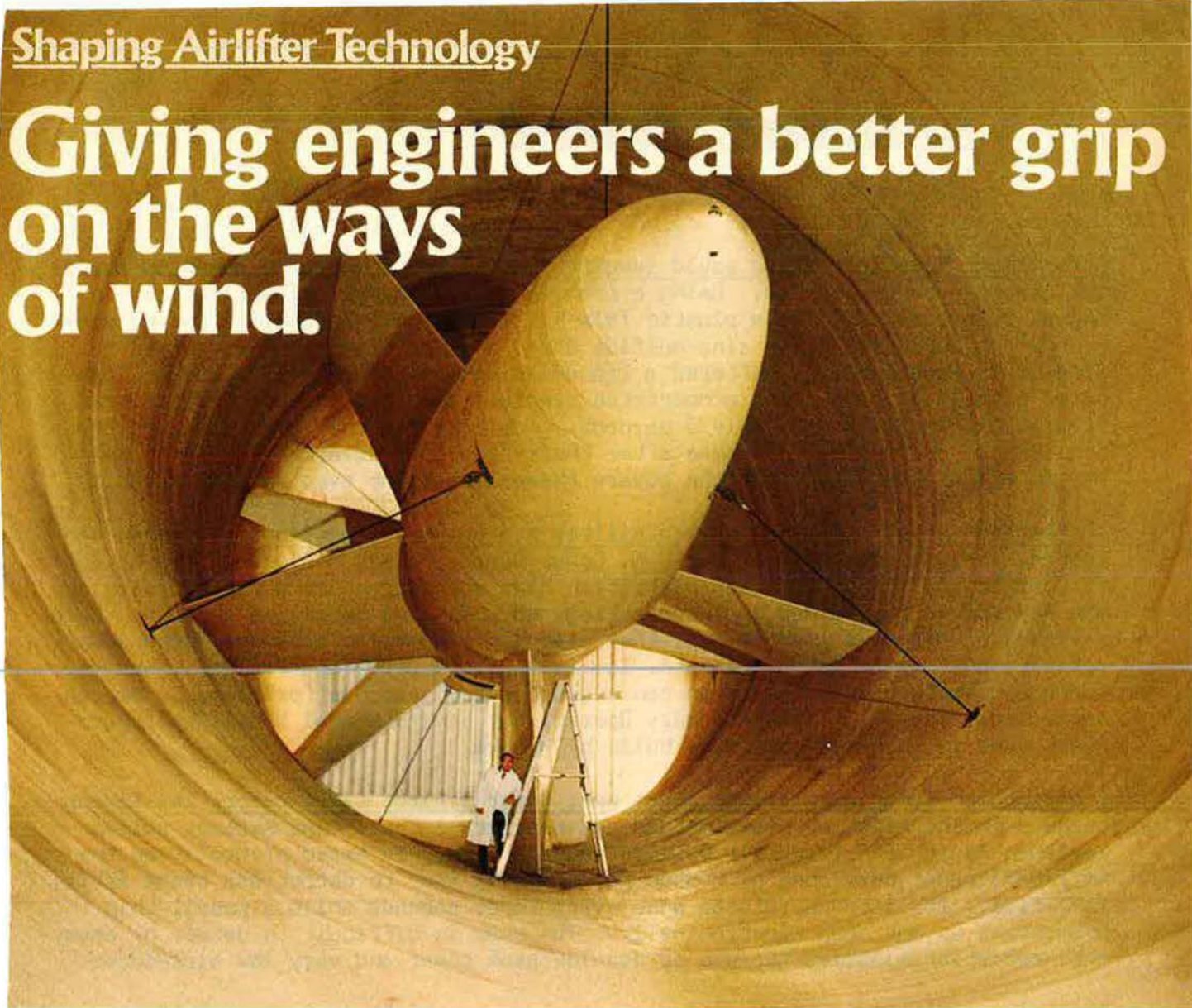
In 1951, Ken went to work for Chance Vought in Dallas, Tex., and later for LTV. He received his doctorate from MIT in 1962 and was offered his post in the Department of Aeronautical Engineering at the University of Virginia in 1967.

We apologize to Professor Haviland for the error, and wish him a long continuation of his teaching career. At the same time, we are grateful to his students and colleagues for telling us we were wrong.

—W.P.S.

Shaping Airlifter Technology

Giving engineers a better grip on the ways of wind.



You're looking at the business end of the largest privately owned low-speed wind tunnel in America. The chances are, the automobile you drive was tested there in full size to help auto makers reduce wind drag and improve fuel consumption.

But the tunnel's main use relates to airlifters, where Lockheed-Georgia has unmatched leadership throughout the world. Because the tunnel is so huge, Lockheed engineers are able to test models of airlifters and their components that are significantly larger than those that can be tested in any other low-speed tunnel. The larger the model, the more accurate the data that comes from tests. And ultimately that pays off in fuel economy, better short field performance, more range, bigger payloads—better airlifters.

Lockheed built this type of tunnel because low speed plays a critical role in an airlifter's performance. Low speed frequently is more difficult to handle than supersonic speeds.

If big is best in low speed tunnels, small is beautiful in the facility shown at right. It's Lockheed's unique transonic blow-down facility. It too gives Lockheed engineers a major advantage in their airlifter work.

This chamber can operate at higher pressure levels than any other blow-down facility in America—pressures 12 times greater than those in the atmosphere in which we live.

This means a small model of an airlifter can be tested in conditions that more nearly simulate full-scale flight than is possible in all other blow-down chambers. It enables Lockheed engineers to work with higher Reynolds numbers than those possible elsewhere. The payoff in these higher Reynolds numbers is the same as in the low-speed wind tunnel—more accurate test data, better airlifters.



When it comes to designing, building and supporting airlifters, the people at Lockheed-Georgia know how. They have more airlifter experience, by far, than anyone else.

Lockheed-Georgia

SCIENCE/SCOPE

A resilient plastic coating could lengthen the lives of infrared domes on Maverick air-to-ground missiles. Using a process called plasma polymerization, Hughes researchers placed a plastic film 5.1 micrometers thick on a curved section of an anti-reflection zinc-sulfide dome. The section, when subjected to fine-grain sandblasting, suffered a transmission loss of only 1.7 percent, compared with 18.5 percent for a noncoated sample. The film reduced the infrared transmission qualities by only 3 percent. Not only did the tests indicate the feasibility of reusing the domes after their frangible covers have been blown off in flight, but also that the covers themselves might even be eliminated.

Information supplied by weather satellites has become significant in search and rescue missions conducted by the U.S. Coast Guard. Field offices of the National Oceanic and Atmospheric Administration have oceanographers and meteorologists who are specially trained in interpreting and analyzing satellite imagery. When a vessel or plane is lost at sea, they evaluate wind velocities and directions, activities of major ocean currents, low-level cloud cover and fog data, and sea surface temperatures. They then can suggest where search efforts should be concentrated. The GOES (Geostationary Operational Environmental Satellite) spacecraft used in these efforts were built by Hughes.

A new medium-range air defense radar can, for the first time, detect low-flying targets in the midst of heavy ground-and-weather clutter. The system, called Variable Search and Track Air Defense Radar (VSTAR), is based primarily on the AN/TPQ-37 radar developed by Hughes for the U.S. Army to detect and track artillery fire. Its antenna rotates once every three seconds while a pencil-thin beam scans up and down electronically. The beam is difficult to detect by enemy anti-radiation missiles because it has low peak power and very low side-lobes.

Digital modifications to the weapon control system of the U.S. Navy F-14 Tomcat will enable the fighter to meet evolving threats through the 1990s. Enhanced tactical capabilities include electronic countermeasures, improved missile launch zones, coherent air combat maneuvering modes, and a digital display system. The key changes to the Hughes AN/AWG-9 system are the addition of a programmable signal processor and its companion radar data processor. These units can perform up to 7.2 million operations per second. The modifications will allow the F-14 to fully incorporate the improved AIM-54C Phoenix missile.

Computers are freeing electronics engineers from monotonous tasks and giving them more time to be creative. With Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) systems, engineers sketch designs on terminal screens and let computers create final drawings. They can have the computers assemble their parts or circuits and simulate the way they actually would work. In an important step toward "paperless" production, the computers also convert designs into coded form to run automated machinery in manufacturing. One custom CAD/CAM center at Hughes helped to significantly reduce development costs of the AN/APG-65 radar, built under contract to McDonnell Douglas Corp. for the F/A-18 Hornet.

Creating a new world with electronics

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gearing up for Space Shuttle operations scheduled to commence next year.

Among them:

- The 1866th Facility Checking Squadron, Scott AFB, Ill., is providing NASA engineers with data on how tactical air navigation (TACAN) equipment can most effectively predict the Shuttle's progress and how to eliminate the effects of weather on TACAN predictions.

- The 1835th Electronics Installation Squadron, Vandenberg AFB, Calif., is keeping watch over the installation of communications cables and upgrading that and video cable linking the operations building and launch site.

- The 1925th Communications Squadron, Edwards AFB, Calif., will provide air traffic clearance for the first four Shuttle landings, to take place at Edwards. Folks at the 1925th will also provide cable for NASA's Shuttle landing system equipment and maintain the telephone circuits

AEROSPACE WORLD

between NASA's Hugh L. Dryden Flight Research Center and Edwards AFB.

- The 1829th Electronics Installation Group, Keesler AFB, Miss., will map the radio frequency field intensity level at the eastern launch site at Cape Canaveral, Fla.

- The 2080th Communications Squadron's Communications-Electronics Support Office in Los Angeles will provide telephone connections, a secure voice drop, a communications security program, and radio frequency management, a major responsibility.

- The 1957th Communications Group, Hickam AFB, Hawaii, will support the orbital flight test program.

★ DoD has established a Joint Electronic Warfare Center at Kelly AFB, Tex., that will be manned by EW experts from all the services.

First Director of the center is Maj. Gen. Doyle E. Larson, USAF; staffing is at seventy-two, including civilians, but is scheduled to rise to about 170 by late 1984, officials said.

The center is collocated with USAF's Electronic Security Command, also commanded by General Larson at Kelly, and with the Air Force Electronic Warfare Center.

The center is to evaluate capabilities and vulnerabilities of US equipment and tactics and conduct research into future EW requirements, officials said.

Its charter calls for the center to provide timely EW combat analysis support directly to the US military forces, as well as EW support of joint operations planners.

It will also provide comprehensive analytical support of the EW aspects of military operations and EW technical assistance to the Secretary of Defense, the JCS, the services, the unified and specified commands, and other DoD agencies, officials said.

Electronic warfare became common practice during the air war over North Vietnam, where increasing use of electronically guided anti-aircraft defenses fostered equally sophisticated electronic countermeasures and tactics by US forces. Electronic warfare in the last several decades has spread to every combat arena—land, sea, or air; in the case of the Soviet Union and the Warsaw Pact, it is integral to operational combat units.

★ DoD is warning World War I, II, Korean-era, and some Vietnam-era veterans with less-than-honorable discharges that an important deadline is coming up.

Veterans discharged before April 1, 1966, now have a chance of discharge review and possible upgrading if they file an application before April 1, 1981.

Many veterans from World War II and Korea have had their discharges upgraded over the last two years, Defense officials said. Applications for discharge review are confidential. Contact:

Discharge Review
P. O. Box 21
St. Louis, Mo. 63166

★ The Air Force Technical Applications Center, Patrick AFB, Fla., on October 1 was designated a Direct Reporting Unit (DRU). The center, formerly under AFSC, is tasked with

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monitoring global compliance with the 1963 International Nuclear Limited Test Ban Treaty.

Under terms of the treaty, signatory countries are prohibited from testing nuclear devices in the atmosphere, under water, or in space. The center collects and analyzes technical information from several sources to evaluate foreign compliance with the treaty.

In addition, the center conducts research on methods of detecting nuclear explosions in all environments to enhance military capabilities as well as to contribute to arms control.

★ At this writing, Soviet cosmonauts Valery Ryumin and Leonid Popov in orbiting space station Salyut-6 continued their extended stay in space after breaking the world space endurance record on October 1.

On that date they exceeded the previous mark of 175 days thirty-six minutes set in August 1979 by Vladimir Lyakhiv and Ryumin, who has now spent a total of more than a year in space. A forty-one-year-old engineer, he is on his third space mission. Popov, a thirty-four-year-old Soviet Air Force pilot, is on his first space mission.

The two cosmonauts have kept

AEROSPACE WORLD

themselves busy with experiments and exercise and have also welcomed aboard a number of visitors: Hungary's first cosmonaut and his Soviet mission commander in May; the first Vietnamese space traveler and his Soviet mission commander in July; and the first Cuban spaceman and his Soviet mission commander in September.

★ Olive Ann Beech, chairman of the board of Beech Aircraft Corp., has been selected to receive the 1980 Wright Brothers' Memorial Trophy.

Mrs. Beech is the first woman and first general aviation figure to be thus honored. Her selection is based on her contributions to aviation over nearly five decades and "particularly for her leadership in helping develop the US's general aviation industry to its position of worldwide preeminence," said the National Aeronautic Association, which sponsors the award.

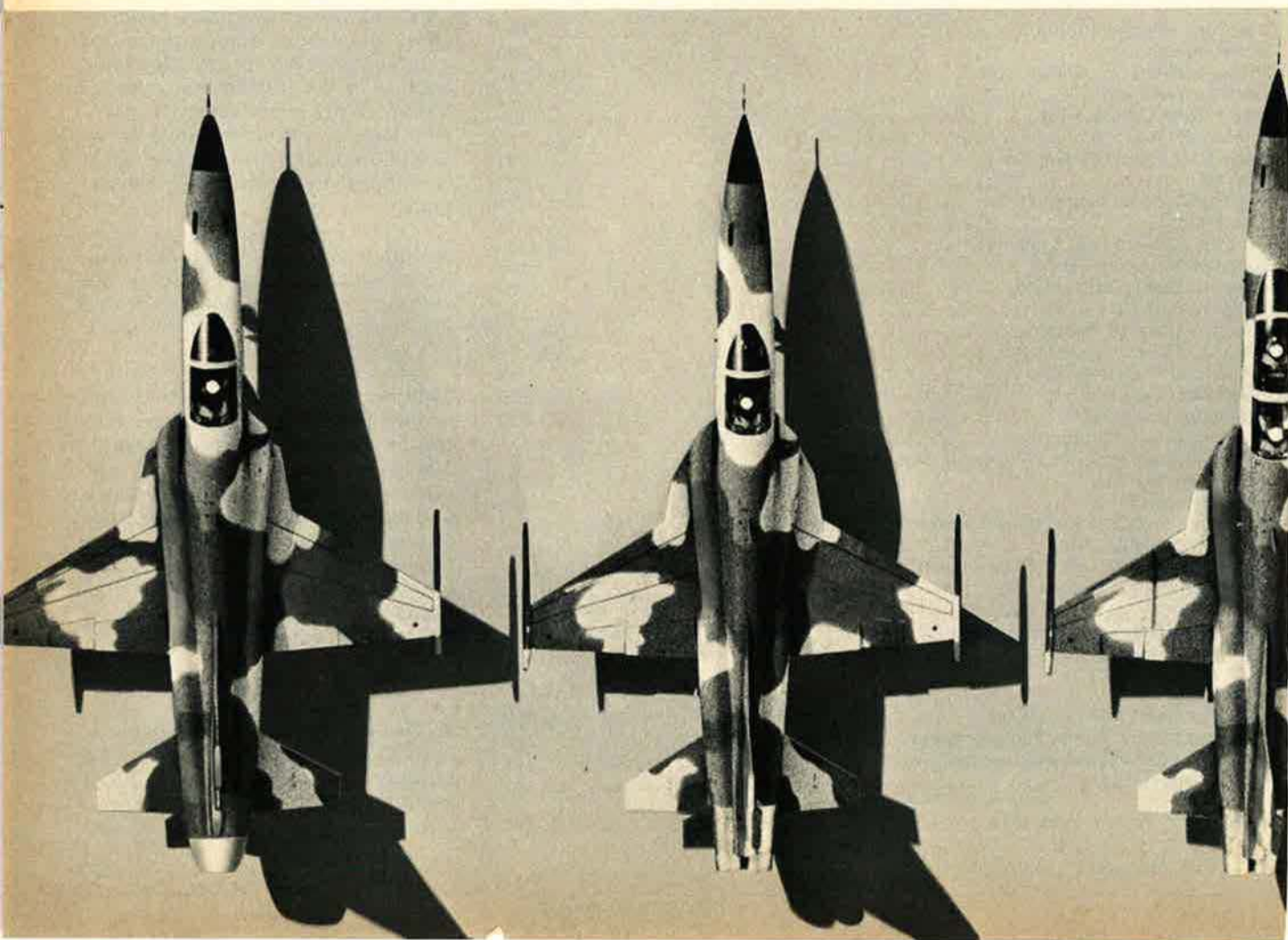
Mrs. Beech cofounded the Beech Aircraft Corp. in 1932 with her late husband, Walter H. Beech. She served as secretary-treasurer and director from 1932 until her husband's death in 1950, when she took over as chairman and president until 1968. She has since served as chairman.

Throughout her career, Mrs. Beech has been a champion of general aviation and its evolving role in business, industry, and agriculture, and the nation's transportation system. During her years at Beech, the company has grown from ten employees to more than 10,000 and annual sales exceeding \$600 million.

Presentation of the trophy will take place in mid-December in Washington, D. C.

★ Defense Secretary Harold Brown has given the green light for limited production of the Patriot air defense missile, so that the missile can be fully field-tested over the next two years before a final decision on full-scale production.

The Patriot, designed to destroy bomber and fighter threats against ground forces through the 1990s, recently completed engineering development, development tests, and operational tests by Army troops.



The missile, the US's most advanced ground air defense system, is capable of destroying multiple aircraft simultaneously over a wide range of altitudes, maneuvers, and countermeasures, and in all weather. It employs a phased-array radar and a new guidance system with a digital computer.

Patriot is to replace the Nike Hercules as the Army's weapon to engage high-altitude aircraft and assume much of the medium- and low-altitude mission of the Improved Hawk system.

The Patriot program is managed by US Army Materiel Development and Readiness Command, Huntsville, Ala. Prime contractor is Raytheon Co., Lexington, Mass. Martin Marietta Aerospace Corp., Orlando, Fla., Division, is a principal subcontractor.

★ The Air Force has initiated field surveys in Dry Lake Valley, Nev., and Pine and Wah Wah Valleys, Utah, possible MX missile sites.

The aim is to test procedures for site identification and develop legal descriptions for land withdrawal if the two states are selected as a deployment area.

About thirty people, drawn from the Bureau of Land Management, the Air

Force's Ballistic Missile Office at Norton AFB, Calif., the Army Corps of Engineers, and survey contractor Fugro National, Inc., will form teams to conduct the surveys. They'll employ such disciplines as biology and archeology in the surveys to give the Air Force the option of deciding on shelter sites that "minimize impact on the environmental resources and are compatible with current use of the land," officials said.

The initial surveys in the two states should be completed by year's end, with a similar program being planned for the Texas/New Mexico area.

★ **NEWS NOTES**—**Dorman Cannon** and **Ronald Erhart**, of Bell Helicopter Textron, Fort Worth, Tex., have been named **test pilots of the year** by the Society of Experimental Test Pilots for demonstrating that the XV-15 aircraft can take off and land like a helicopter and cruise like a conventional aircraft, with speeds of about 350 mph.

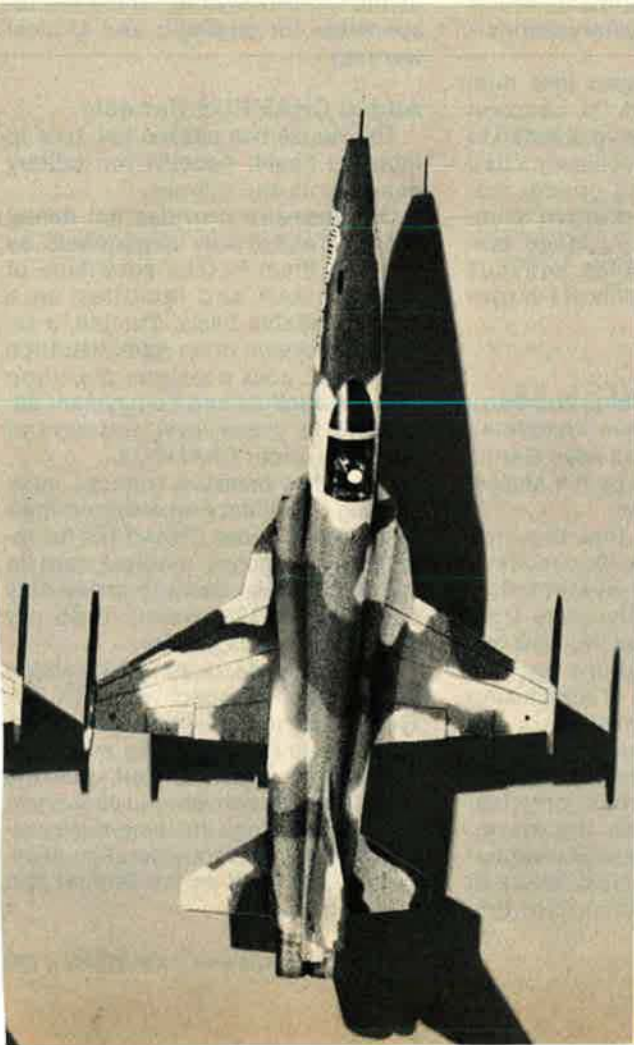
The **Defense Audiovisual Agency**, designed to **consolidate and manage common audiovisual resources**, has begun operations at Norton AFB, Calif. It will handle large audiovisual production, acquisition (contracting), operational test and evaluation,

depository, and distribution (library) functions. It and components at Arlington, Va.; Tobyhanna Army Depot, Pa.; Quantico, Va.; the Pentagon; Anacostia Naval Station; and Washington Navy Yard (all in the District of Columbia) will support all the military services, DoD, and other federal agencies.

Dr. Stephen P. Synnott, a Voyager Project navigator at the Jet Propulsion Lab, Pasadena, Calif., has discovered a **sixteenth moon orbiting Jupiter**. He found a fifteenth last spring.

Maj. Gen. John R. Alison, (USAF (Ret.)), former AFA President and Life Member, has been elected **Chairman of the Board** of the National Aeronautic Association following four years as President of the organization. NAA is urging US pilots to become **part of aviation history on December 17, 1980**, by establishing official aviation records on the seventy-seventh anniversary of the Wright brothers' first powered flight.

"**Golden Bear**," the **first C-141 delivered to an operational unit** more than fifteen years ago, has completed modification to the stretched B version and returned to the 60th MAW, Travis AFB, Calif., where it has logged 27,500 hours of flight. ■



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CAPITOL HILL

By Kathleen G. McAuliffe, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., October 24 CX Troubles

The General Accounting Office (GAO), watchdog agency of the Congress, has sent a report to the Secretary of Defense recommending that DoD not proceed with the CX, USAF's proposed new outsize cargo transporter.

GAO cited lack of resolution by the Air Force of the range and load limitations for CX, the yet-to-be-completed strategic mobility requirements study mandated by Congress, and the lack of approval of a Mission Element Need Statement (MENS) for the aircraft as reasons for stalling the program.

The Air Force has since submitted requests for proposals (RFP) to contractors on design and costs for full-scale engineering development.

DoD officials state that the RFPs were released only after perusal of the GAO report. However, in light of the critical shortfall in current airlift capability, DoD decided delaying the RFPs would only further delay the 1987 Initial Operating Capability (IOC) date, which is already later than desired.

An Air Force spokesman said that while the USAF has defined mission scenarios for CX, the defense contractors will tell how best to accomplish the requirements. Further, the RFP results will be an integral part of the mobility requirements study for Congress, due February 1, 1981.

It is important to note that the contractors will be funding their own proposal efforts and will not be reimbursed from CX program funds after an appropriation level is reached.

DoD will have an official response to the GAO report within sixty days of its receipt.

Curbing Strategic Trade

The fast approaching end of the Ninety-sixth Congress erases hopes of final action this year on a proposal by Sen. Jake Garn (R-Utah) to put stricter control on the sale of US technology to the Soviet Union and Eastern bloc nations. The bill states that the "failure to control the trans-

fer of national security sensitive technology and commodities to the Soviet Union and other countries . . . has led to significant improvement of Soviet bloc military capabilities, thereby enabling it to pose a greater threat to the security of the United States."

The legislation, which will be revived in 1981, is designed to eliminate the chaotic nature of strategic trade decision-making by concentrating the authority over export licensing in a new Office of Strategic Trade (OST), reporting directly to the President.

Currently several agencies, often with conflicting responsibilities, have a hand in strategic trade policy. The proposed OST would receive initial export licensing applications and oversee the commodity control list, and control the munitions list, now under the State Department, which regulates the sale of military technology to other countries.

Senator Garn charged that dual technologies intended for peaceful export purposes are being diverted to military usage. He specifically cited the sale of ball-bearing grinder machines that have been diverted to improve the advanced guidance systems of new Soviet ICBMs, and thus increased the vulnerability of our own ICBM force.

False Alert Study

Sens. Gary Hart (D-Colo.) and Barry Goldwater (R-Ariz.) have completed an investigation into the false alarms experienced last June by the Missile Attack Warning System.

The study showed that the incidents resulted from faulty circuits in the communication system that transmits and distributes data from launch warning sensors. NORAD has employed communications specialists to develop means of minimizing the possibility of recurrence.

The Senators' review concluded that false alerts may occur in the future because of certain physical phenomena triggering the alarm, misinterpretation of sensor information, or simple mechanical failure in the complex launch warning network.

The report filed by Senators Hart and Goldwater made two recommendations related to management of the Missile Attack Warning System.

First, the Secretary of Defense is to submit to Congress by March 1, 1981, a study on the fragmented management of the entire warning system with the idea of putting it under one commander, ideally at the Strategic Air Command or the Air Defense Center.

And second, the acquisition of automatic data processing (ADP) for the system must be exempted from the procurement procedures used by the General Services Administration (GSA), a process that results in long, bureaucratic delays. DoD, rather than GSA, must have complete authority over procurement of ADP for critical command and control systems, such as the NORAD system, which are responsible for strategic and tactical warning.

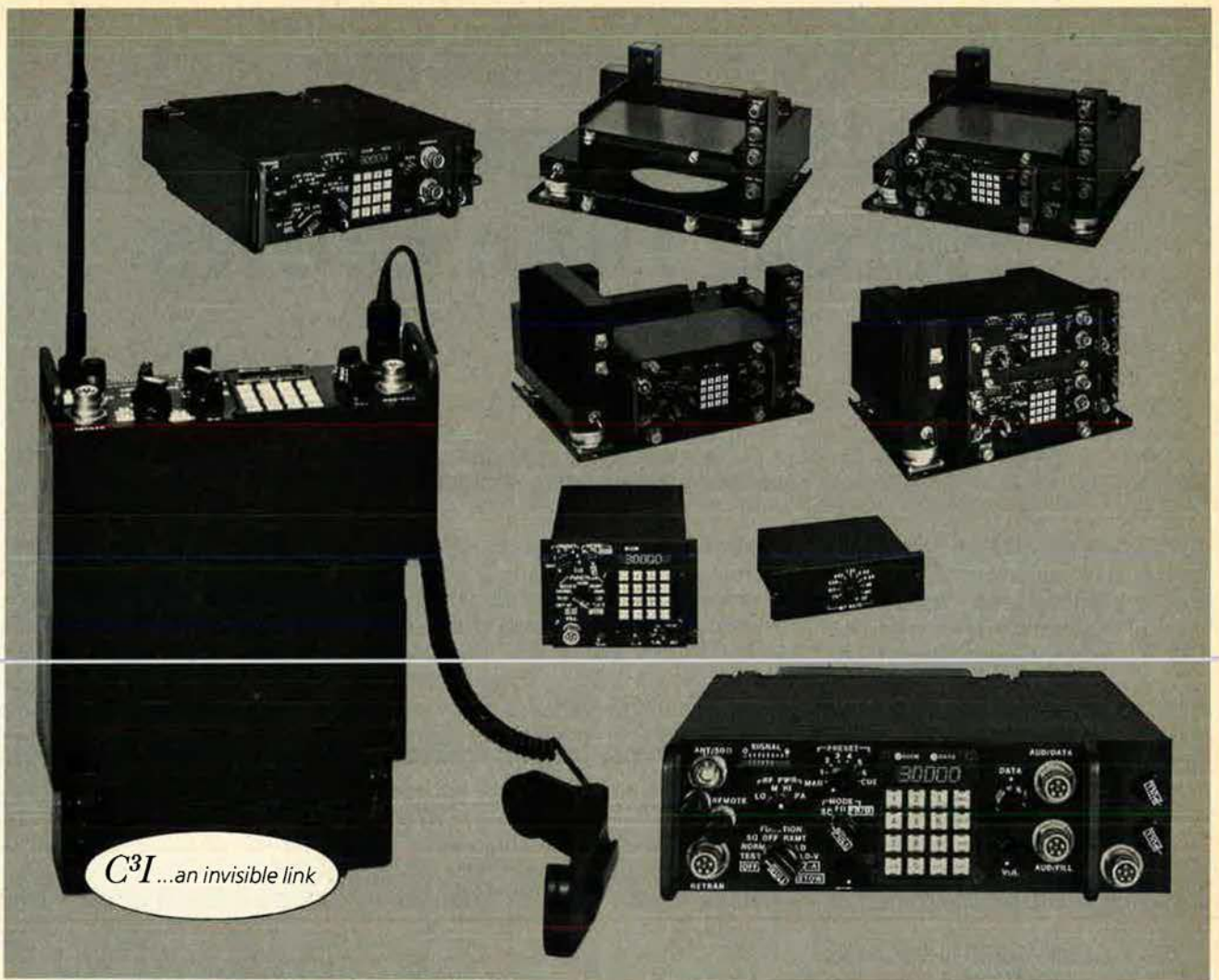
Added CHAMPUS Benefits

The House has passed two bills to increase health benefits for military dependents and retirees.

One measure provides full dental care for active-duty dependents by allowing them to take advantage of military staff and facilities on a space-available basis. The bill, a revamped version of an Administration proposal, also provides a sliding scale deductible and co-payment according to grade level and type of coverage under CHAMPUS.

The other measure reduces cost-sharing for military retirees and their dependents under CHAMPUS for inpatient emergency medical care to match the lower costs to active-duty dependents—\$25 overall or \$5 per day, whichever is greater.

The proposals, costing \$95 million and \$5 million respectively in FY '81, are pending in the Senate Armed Services Committee. The two measures will probably have to wait until the new Congress convenes in January to see passage since the lame-duck session will only see consideration of essential bills such as the Budget and Appropriations. ■



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In the understandable concern by Congress and the news media over the safety and viability of the aging Titan II ICBM system, the heroic conduct of the crews involved in the recent accident, initially at least, received little recognition.

The US Senate Honors Heroic Titan Crews

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

AT 6:36 p.m. CDT on September 18, 1980, a member of a Titan II missile combat crew performing routine maintenance at complex 374-07—located near Damascus, Ark.—inadvertently dropped a three-pound socket. The tool fell and somehow pushed back a safety boot around the missile. Falling another seventy feet, the socket impacted on the missile thrust mount, bounced off, struck the missile, and punctured the first-stage fuel tank containing about 230,000 pounds of liquid fuel.

The accident caused a fire in the engine, the launch duct, and the spray activation system of the seventeen-year-old missile. In spite of the heroism and professionalism of the missile combat crew and of a rapidly assembled missile potential hazard team (MPHT), the Titan II ICBM exploded at 3:00 a.m. CDT the next morning. Twenty-two Air Force people were injured by the blast, one fatally, and another one seriously. A subsequent investigation by the office of the US Surgeon General found no evidence of nuclear radiation at or near the site of the explosion.

Col. John Moser, the Commander of the 308th Strategic Missile Wing, of which complex 374-07 was part, said about the performance of the airmen at the site, "People just don't realize what these men went through. We had some real heroes out there, and I'm proud to be associated with them."

Following the accident, Secretary of the Air Force Dr. Hans Mark convened a special review group—

headed by Gen. Bennie L. Davis, Commander of the Air Training Command—to "explore the present and future safety and supportability of the Titan II and provide possible alternatives if safety is deemed suspect. Team members will focus on policies, plans, procedures, and training as these relate to actions during crisis situations. The group will address the possible effects of a mishap on the civilian community. Additionally, the team will reevaluate the recent Titan II Weapon Condition and Safety Report provided to Congress in May 1980 for the report's validity and the viability [and] supportability of its recommendation and subsequent actions."

Asked whether or not the Air Force plans to dismantle the remaining fifty-three Titan II ICBM sites, Dr. Mark informed the House Armed Services Committee during special hearings concerning the accident that "the Titan II still serves a useful deterrent purpose for this country." Adding that there are no plans at this time to dismantle the system, he acknowledged, however, that "it is logical to presume that as new ICBM systems become operational and can cover area targets, older systems will be retired from service."

Gen. Robert C. Mathis, the Air Force's Vice Chief of Staff, commented to this writer about the importance of the Titan II (LGM-25C) weapon system to US strategic deterrent capabilities in unequivocal terms: "The Titan II weapon system is of real strategic value. The

Titan II, with its large payload, is the most effective large area soft-target weapon in the ICBM inventory. Even though the Titan II represents a relatively small portion of our ICBM force, it contributes a significant portion of the damage expectancy to the assigned target base. The importance of the Titan II continues to increase as its target base expands, and it remains essential for our strategic deterrent posture."

Additionally, leverage provided by the Titan II force in connection with present and future arms-control negotiations could be crucial. With its single warhead with a yield of slightly above nine megatons (about fifty-two times more powerful than the MIRVed Mk 12 warhead of Minuteman III or almost eight times greater than the yield of Minuteman II's single warhead), the remaining fifty-three Titan IIs (fifty-four permitted under SALT II) represent the only large ICBMs in the US inventory. Under the terms of SALT II, the Titan IIs can't be replaced by a modern large US ICBM even though the accord allows the Soviets 308 (or 326 depending on the counting definition) heavy, modern ICBMs.

US Senate Pays Tribute to Heroic Crew

On September 24, 1980, the US Senate approved Senate Resolution 529 introduced by Sen. Dale Bumpers (D-Ark.). Key elements of Senator Bumper's introductory remarks and the text of the entire resolution are reprinted from the *Con-*

gressional Record of September 24:

Mr. Bumpers: Mr. President, I am proud to introduce a resolution honoring the heroism of the United States Air Force Missile Hazard Team Members and Security Policemen who risked their lives during the Titan II ICBM accident near Damascus, Ark., last week. [After describing the cause of the accident, he went on to say:]

The maintenance men working on the Titan II evacuated immediately to the launch control center where they and the four-man combat crew stayed for more than two hours, monitoring instruments and keeping in touch with the missile wing command post. Then it became clear that the 100,000 gallons of water released automatically into the silo to dilute the fuel had not solved the problem. Instead, the vapor readings increased and they—the crew—were ordered to evacuate through the eighty-foot-high emergency escape hatch. Following the crew's evacuation and after a period of assessment, a plan of action was developed that called for action by the missile hazard team. This team readied itself to enter the silo to repair the damage.

Two propellant transfer specialists, SrA. John Devlin of Cincinnati, Ohio, and SrA. Rex Hukle of Mulvan, Kan., volunteered to enter the missile facility personnel access point to assess the damage and hopefully

provide more information on how to control and alleviate the potentially disastrous situation. In protective suits, they carefully entered the stairwell, taking readings on portable vapor detectors. Slowly advancing down four flights of steps, they found limited traces of fuel vapor.

Their oxygen supply nearing exhaustion, the two men were ordered to return to the control point to report what they had found to a backup crew.

After the first two propellant transfer specialists reported their findings, SSgt. David Livingston of Heath, Ohio, and Sgt. Jeff Kennedy of Portland, Me., volunteered to continue the investigation to retrace the men's steps, and proceed further.

As Livingston and Heath opened the second blast door in the entrance stairwell, some forty feet below the surface, their fuel vapor detectors indicated a maximum reading. With these high vapors, an explosion was a distinct possibility. They were ordered to retreat by the senior official on the scene. Just as they exited the access portal area leading to the surface, the explosion jarred the area, tossing them some forty feet into the air. Just a minute or two more and everyone would have been clear, according to Air Force officials.

TSgt. Donald Green, a Florida native, and TSgt. Jimmy Roberts of San Antonio, Tex., were part of the team of Air Force security police evacuating civilians from a two-mile radius of

the site. Green described the explosion in this manner: "The explosion lit up the sky, and our radio went dead. The silence was awesome. We thought we were the only two left alive." Roberts described the experience similarly: "I instinctively put on my gas mask, but I thought everyone around was dead."

They sped to the silo in their security police truck to see if anyone was alive.

Roberts said he thought there might be additional explosions, but he "knew there was a man on the complex that needed us. We heard Kennedy cry for help on the radio. He was still alive and had managed to get to a truck, and I was going after him. Nothing else was on my mind."

As Roberts and Green arrived on the missile complex, they rammed their truck into a fence to make a hole so they could search for survivors, using the lights of their vehicles. "The area looked like the surface of the moon: the visibility was terrible." Green added. "We decided to split up to find the missing Sergeant."

Roberts began a zigzag pattern across the complex and soon couldn't even see his partner: "I thought he had dropped into the hole. I was about out of breath, but I kept going. I just had to find him," explained Roberts. "I was looking for the truck to get Kennedy when I found Livingston. I told him I would carry him out. He was alive, conscious, hurt. I picked him up like I was cradling a baby, but it was hard to breathe with the gas mask. I carried him about a hundred yards and nearly stumbled. . . . I was exhausted. I put him in a fireman's carriage over my shoulder and finally made it to the edge of the complex where others helped me."

According to Air Force officials, Roberts at this point in his report paused to regain his composure: "Telling this story is too hard to do," he said later.

When Roberts reached safety with Livingston, he learned that Kennedy had been rescued by others.

Mr. President, by adopting the Resolution I have just sent to the desk, this body can join in a tribute to Sergeant Livingston, who died of the injuries sustained during the explosion, and the other brave men involved in the tragic incident. The heroic and unselfish sacrifices of Air Force personnel like Livingston, Roberts, Devlin, Hukle, Kennedy, Green, and the other members of the missile hazard team listed in the Resolution, constitute a team effort which ought to inspire us all. ■

Senate Resolution 529

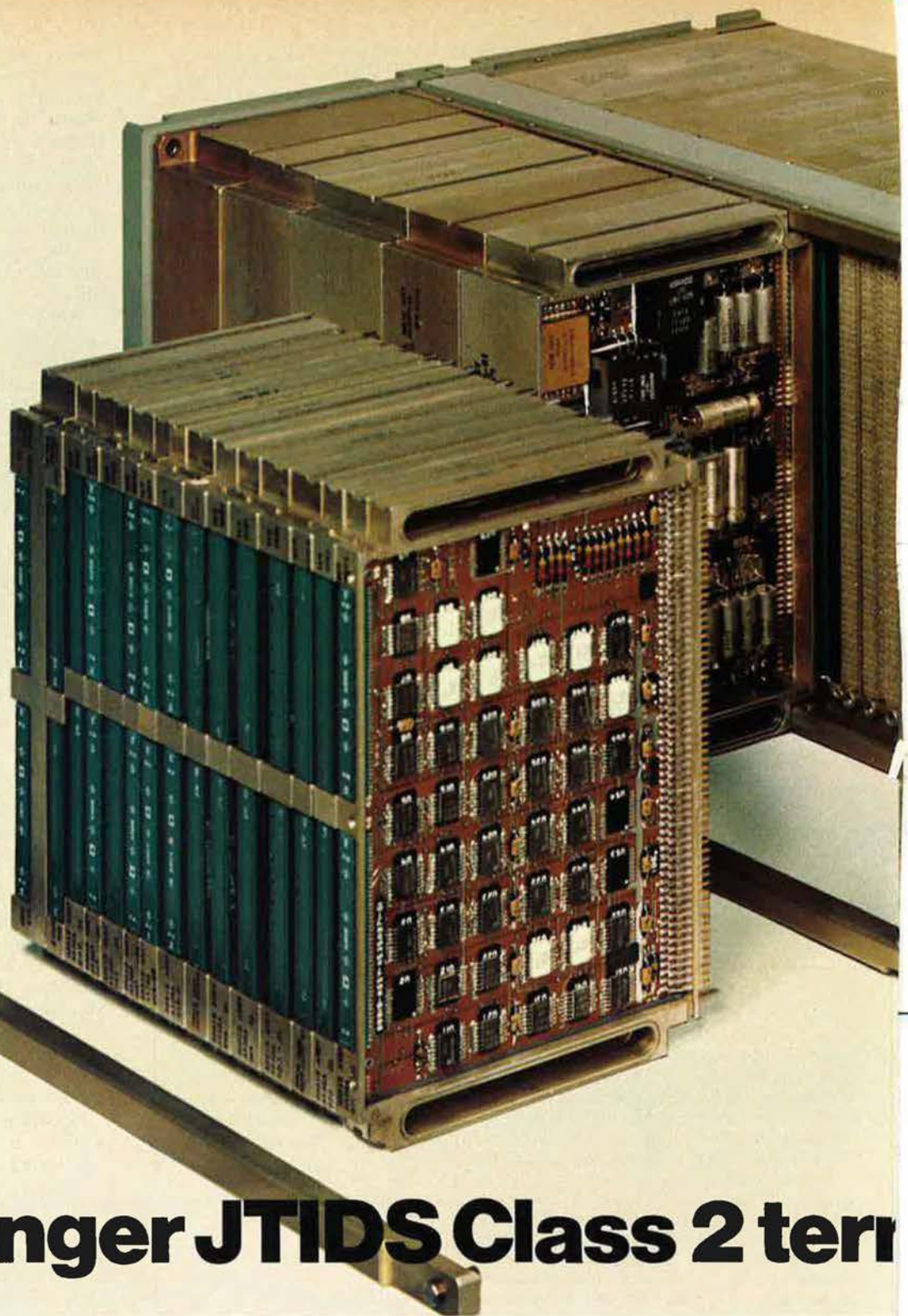
Whereas, the Members of the United States Senate were deeply saddened by the death of US Air Force Sgt. David Livingston of Heath, Ohio, and of the serious injuries to USAF Sgt. Jeff Kennedy of Portland, Me., USAF SrA. Rex W. Hukle of Mulvan, Kan., and USAF SrA. John G. Devlin of Cincinnati, Ohio, on September 19, 1980, while they were on an official but voluntary mission for the US Air Force at a Titan II intercontinental ballistic missile site near Damascus, Ark.; and

Whereas, USAF TSgt. Jimmy Roberts of San Antonio, Tex., and USAF TSgt. Donald Green of Old Town, Fla., promptly returned to the missile complex following the explosion of the Titan II missile at 3:02 a.m. on September 19, 1980, to locate and hopefully rescue Sergeants Livingston and Kennedy; and

Whereas, USAF Col. James L. Morris of Marietta, Ga., USAF MSgt. Ronald Christal of Birmingham, Ala., USAF SSgt. Archie G. James of Coward, S. C., TSgt. Michael A. Hanson of Wichita, Kan., TSgt. Davis Rossborough of Groveland, N. Y., USAF Lt. Col. Jimmie D. Gray of Kokomo, Ind., USAF Maj. Wayne L. Wallace of Wyandotte, Okla., Capt. George H. Short of Chattanooga, Tenn., USAF Capt. Michael T. Mazzaro, USAF SSgt. Silas L. Spann, Jr., of Jackson, Miss., USAF SrA. James R. Sandaker of Evansville, Minn., USAF Sgt. Stephen L. Riva of East Alton, Ill., USAF A1C J. P. Tallman, Jr., of San Antonio, Tex., USAF Airman Patrick C. Roylan of Bridgefield, Conn., USAF A1C Gene M. Schneider of Wilmington, Del., and civilian Richard L. English of Sartell, Minn., were also bravely attempting to determine the status of the leaking and clearly dangerous Titan II missile at that site; and

Whereas, the exemplary and brave actions of all members of this US Air Force team brought honor to the United States Air Force and this Nation;

Now Be It Resolved that the Members of the US Senate here assembled, by this Resolution, pay tribute and respect to the heroism of these courageous and patriotic men.



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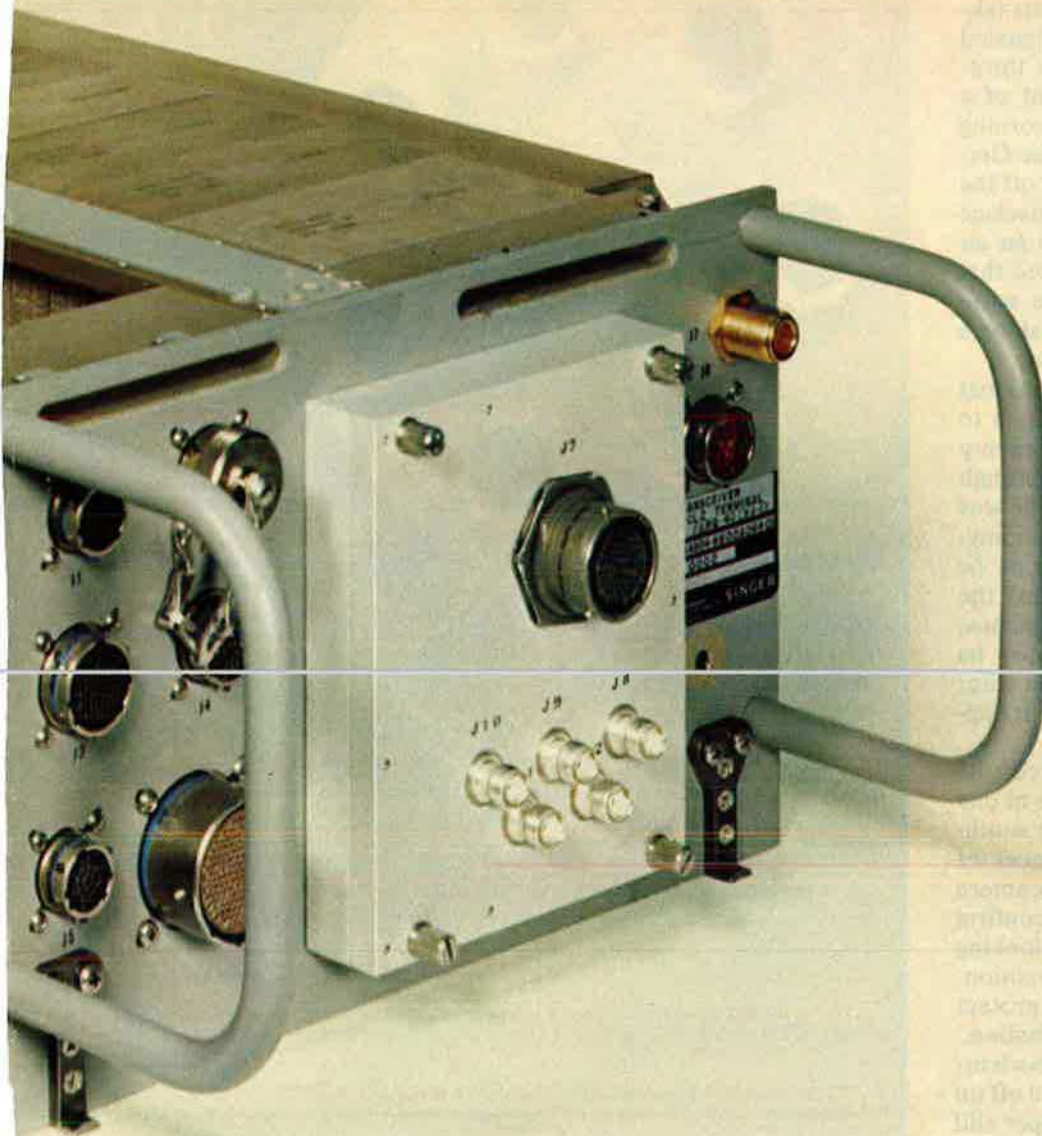


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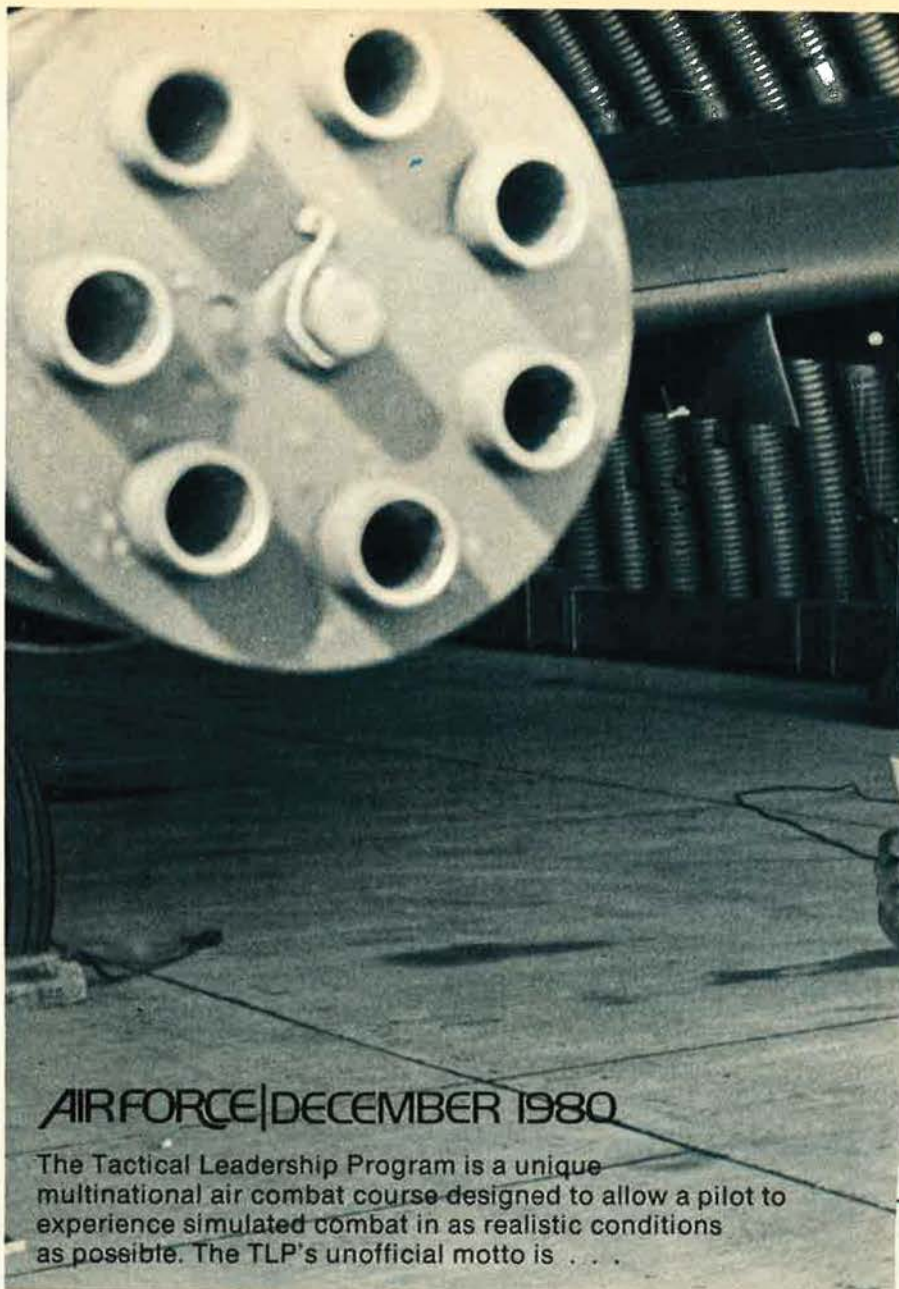
AT THE last minute, the German fighter pilot spotted the two American Warplanes. Without taking his eyes from them, he signaled his wingman, pushed up his throttles, and rolled in, confident of a kill—maybe two. The early morning sun, low on the horizon of the German central plains, reflected off the black Maltese cross on the fuselage of his sleek fighter. He was an air defender and had been briefed that American aircraft would be withdrawing at low level after making a strike deep into his homeland.

He was tired after his long combat air patrol (CAP) and had begun to fear he would miss seeing the enemy streaking at treetop height through his assigned sector. But now he was eager and alert, adrenalin pumping. He rechecked his gunsight as he pulled his diving turn toward the second of the two American planes. If he weren't spotted, he knew he could probably get the leader after he took care of the wingman. It happened that way sometimes.

Grunting against the G forces, he automatically noted the time of day and the fact that he was just southwest of Hamburg. Both pieces of information plus his gun-camera film would be important to confirm his kills. He knew without looking that his wingman was in position, having trained endlessly to protect his leader when in attack formation.

The leader, Luftwaffe Oberleutnant Manfred Franzke, eased off on the stick as his gunsight pipper slid toward the second plane. "God!" Franzke thought, "He's low!" The American was less than 100 meters above the ground, about 250 feet, so the German knew he couldn't reef his own plane around enough, after the initial attack, to pounce on the leader. The star and bars on number two's fuselage stood out clearly through the gunsight-combining-glass as Franzke centered his pipper on the engine area.

Just as the German tightened his finger on the trigger, both Americans suddenly racked their planes up on wing. Trailing wingtip vortex streamers, they pulled sharply into Franzke, spoiling his tracking solution. Unable to turn inside the more maneuverable planes, Franzke, followed by his wingman, broke sharply upward. Now he knew the only way to nail the two US types



AIR FORCE | DECEMBER 1980

The Tactical Leadership Program is a unique multinational air combat course designed to allow a pilot to experience simulated combat in as realistic conditions as possible. The TLP's unofficial motto is . . .

'You Fight Like You Train'

BY MARK E. BERENT



German Air Force Maj. John Miller gives final briefing to A-10 "mud-mover" pilot Capt. Dean Dodson, USAF.

miles from Warsaw Pact (Warpac) borders. They result when missions involving multinational fighters are launched by the Tactical Leadership Program (TLP) situated at Jever, a Luftwaffe air base in northern Germany, just west of the North Sea port of Wilhelmshaven.

TLP is the brainchild of the late Marshal of the Royal Air Force Sir Andrew Humphrey. In April 1976, he suggested that a program was needed to enhance combat potential of the allied air forces in the European central region. In less than eighteen months, the six-member Allied Air Forces Central Europe (AAFCE) agreed to establish Phase One of the TLP at Fürstenfeldbruck, an air base near Munich offered by the German Ministry of Defense (MOD). AAFCE is composed of air forces of Belgium, Canada, Germany, Holland, the United Kingdom, and the United States.

Initially the course ran two weeks and was classroom only, with more than 330 aircrew members attending between January 1978 to June 1979. Simultaneously, the AAFCE staff worked on Phase II: a month-long course of classroom seminars plus a tactical flying program. AAFCE considered Machrihanish Air Base in the United Kingdom and Aviano Air Base in Italy before Jever was offered by the German MOD.

Jever was the obvious choice, in keeping with the TLP's unofficial motto that "You fight like you train." Most important are its weather and surrounding terrain, exactly what a fighter pilot would encounter if war started. Almost as important, Jever's recently deactivated F-104 training squadron offered facilities such as an operations building, a bunker for academic and war-game training, and maintenance hangars. Additionally, USAF authorized TLP to use aircraft shelters belonging to their collocated operating base at the field.

On September 24, 1979, opening ceremonies at Jever marked the beginning of the first four-week course while the Chiefs of five AAFCE air forces signed the Memo of Understanding among them. (The Cana-

would be to call in the other air defender element on high CAP. He pressed the mike button on the throttle.

"OK, Kej. You've got two at your ten o'clock low, headed north," he transmitted in barely accented American English.

"Roger on that, Deny 72, we have them. Rolling in . . . NOW!" came the crisp reply, in Oxfordian English, from the first of two Danish fighters rolling in, one after the other, to tackle the fleeing Americans.

Franzke sighed as he disengaged. He signaled his wingman to join up and headed toward Jever, his home base in northern Germany. He

knew he'd get a razzing back in Ops from the USAF flight leader, Maj. Marv Bass, whose wingman, Capt. Dean Dodson, he had just tried to shoot down.

Had the Oberleutnant scored, Dodson would not have been "shot down." Rather, his airplane would have appeared on the eval room screen as an A-10 platform pierced by the pipper on the gun-camera film of Franzke's F-4 Phantom jet fighter.

Tactical Leadership Program

The story of the fight, and others like it, while reminiscent of WW II years, occurs daily over West Germany, sometimes as close as twenty

dians had to temporarily withdraw owing to other priorities.)

AAFCE now schedules eight TLP courses per year and has slots for up to thirty-six aircrews manning eighteen aircraft. Generally, twelve unallocated slots are available each year for participants from other allied air forces, such as those of Canada, Denmark, and France. AAFCE works a mix in each class of twelve air-to-ground (A/G) and six air-to-air (A/A) aircraft to better simulate mission requirements.

The staff of TLP has one or more representatives from each country that signed the Memorandum of Understanding. Each aircrew member has several years of European tactical flying behind him and is usually a graduate of a weapons school in his home country or a course such as Red Flag run in the US at Nellis AFB, Nev. They are all current in NATO aircraft, including the F-4, Jaguar, Buccaneer, NF-5, G-91, or Mirage V.

Twelve-Hour Work Days

The participants in each course are squadron-level combat-ready, senior aircrew on flight or section leader status and are handpicked by their units to represent them at Jever. After the first week of academics, each participant is supplied with an aircraft, ground crew, and maintenance equipment from his home base. He will then fly up to fifteen TLP missions.

A typical work day can easily last more than twelve hours. The aircrews are billeted in single rooms in the Offizierheim (Bachelor Officer Quarters), where they arise shortly after 6:00, trudge down the immaculate marble halls to the communal shower, then dress and take breakfast at the Officer's Mess. By 7:15, they are ready for the bus to take them through a security checkpoint to TLP Ops on the flight line. Some prefer to walk the few blocks through the damp morning seacoast mist. All are talking or joking about yesterday's sorties or are discussing the mission for the day. There is a natural and easy camaraderie between these multinational flyers who speak "fighter-pilot" and English, the international language of aviation.

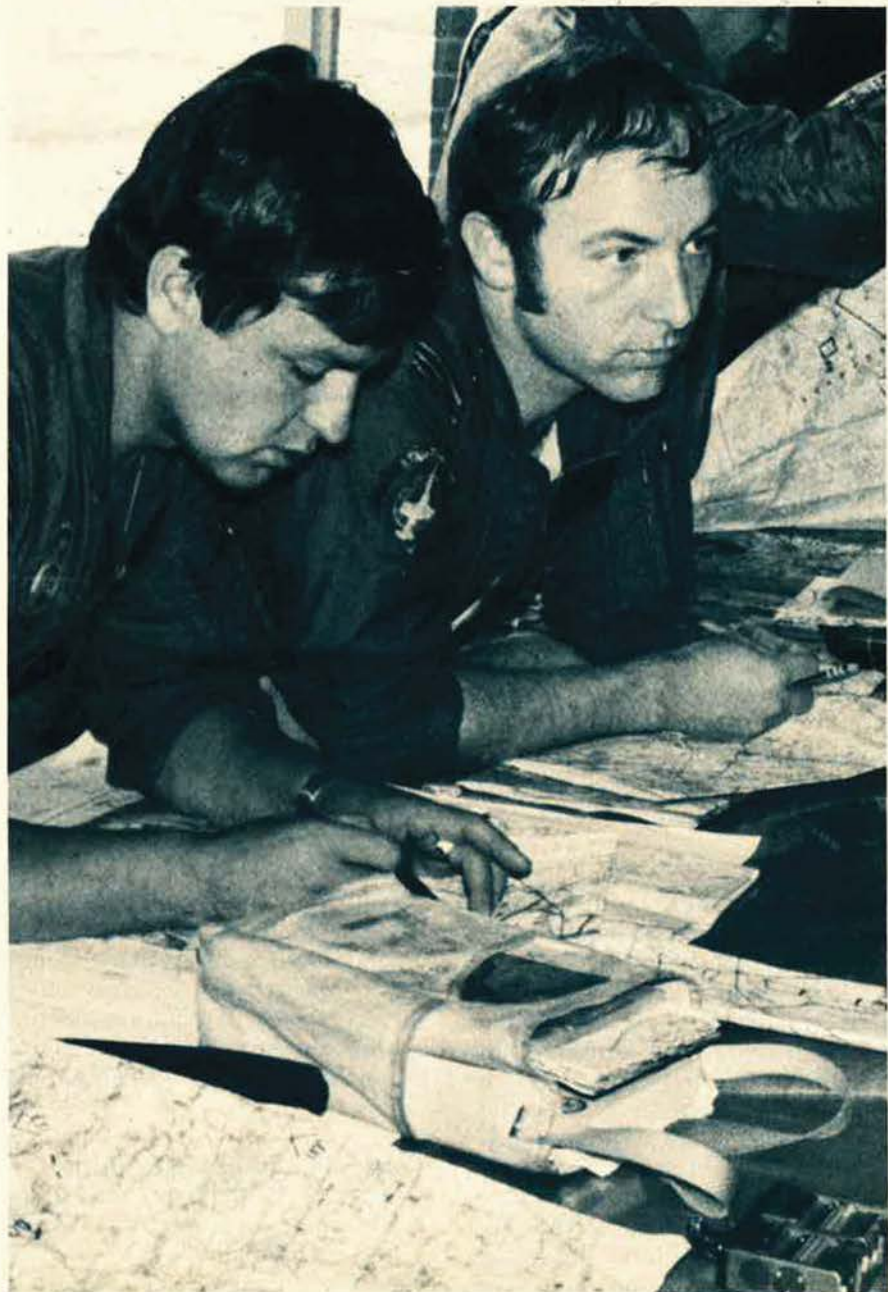
While they are en route to TLP Ops, the staff, commanded by

Luftwaffe Lt. Col. Hans Hartl, is getting a final weather check to see how it will affect the day's flying schedule. All is well, the mist will burn off within the hour, so he and his deputy commander Lieutenant Colonel Kriegeskotten-Bartsch, also Luftwaffe and known as Colonel KB, lead the way to the main briefing room.

To call the pilots from the lounge, a sergeant clangs a large bell in the hall at precisely 7:29. At 7:30, the morning briefing begins. Air base personnel are in place with up-to-the-minute charts and overlays depicting the European and local, current and forecasted weather, North Sea state, what runway is in use,

what navigation and communication gear is up, and what's happening during the NATO Reforger exercise. Finally, an intelligence officer briefs on any significant changes or incidents involving Warpac countries. The aircrew members are restless now. They want the go-ahead for today's mission: air-to-ground for the attacking mud movers, air-to-air for the defenders.

Then the professional TLP staff takes over the briefing. Squadron Leader Hilton Moses of the RAF gets up and gives a general Rules of Engagement reminder to the mud movers. USAF Maj. Jim Kula does the same for the "air defenders."



The Electronic Warfare Officer, USAF Maj. Ray Roback, and the Ground Liaison Officer, US Army Maj. Paul Green, both give pertinent information for today's sorties, as does USAF Capt. Bill Miedema on Intelligence.

Then the air defenders and mud movers split into two groups, each to plot ways to foil the other while accomplishing their respective missions. While the groups are split, they receive specific mission-essential information that is "secret" from the other. At no time do staff members attempt to influence either the attack or defense plans of the participants. Note it is "participants," not "students."

Enhancing Combat Ability

Popular misconception categorizes TLP as a NATO fighter pilot school to train pilots or to standardize NATO tactics. This is not so. Officially put, the purpose is "To promote interoperability and enhance the combat capability of AAFCE tactical fighter aircrews, in time of peace, by placing them in seminars and flying operations closely relating to actual combat conditions." In other words, the participants have a forum to exchange tactical ideas and concepts, formulate new ones, and actually get a chance to try them out. And they can do this without ruffling any senior planner's file folders. Stan-

dardization is, to some degree, a natural by-product. But probably the most important carry-away value of the course is that graduates are qualified to put together and lead a multinational attack or defensive force.

The ground attack aircraft have more involved routing and planning than the air defenders. For this mission they must meticulously plot ingress and egress through enemy defensive positions, how best to strike the target, what their alternatives are, and how to respond to interception either inbound or outbound. You know they are serious when they use 1:50,000-scale charts. Burdened with maps and data, they are driven to their airplanes in an olive-drab Volkswagen bus with Luftwaffe insignia on the side panels.

Two ground attackers, Major Bass and Captain Dodson, arrive at their big A-10 airplanes. They are met by 2d Lt. Alison Hentges, leader of the nine maintenance people supporting the Bentwaters A-10s. Bass and Dodson preflight, assisted by crew chiefs Sgt. Michael Hanna and A1C Russ Woolever. It didn't take the American team long to adapt to local terminology such as "bowsers" (fuel trucks) and "earthing points" (for electrical grounding). Regarding the A-10, Sgt. Deborah Bell remarks she almost prefers SAC's KC-135, because "I had more to do. The [A-10] doesn't require maintenance."

Meanwhile, Leutnant Franzke and his F-4 backseater, Jörg Dietsche, have set up and briefed the air defenders' role. They consist of Maj. Wolfgang Alt and Lt. Ossi Enke in the second F-4 and Lts. Kej Hjortlund and Fot Hansen of the Danish Air Force in F-104s. (It's interesting to note that Danish pilots are assigned permanent tactical call signs, such as Kej and Fot, when they get their wings.)

Most flying is done in restricted corridors allowing low-level navigation at 500 feet with links to Low Flying Areas (LFAs) where cruise is authorized down to 250 feet. Since high-speed at low altitude is the name of the strike game in Europe, the pilots, more serious than joking, refer to CAP at 500 feet as medium altitude and at 250 feet as a low-altitude CAP.



Opposite page: TLP pilots planning their sorties. Above: Aircraft maintenance Sgt. Deborah Bell prepares to stow the pins on an A-10. Left: A-10 crew chief A1C Russell Woolever salutes off his pilot prior to a TLP mission.

Flying Rules of Engagement

Franzke is leading the air defenders today. After his two-element CAP is briefed, they go to preflight their airplanes and take off to patrol an area of more than 2,000 square miles located east of Bremen. They have already planned the CAP altitudes and tactics based on who has a "lead nose" and who has PD (pulse Doppler), which affords look-down, shoot-down capability. They know the strike aircraft will be egressing through their territory, but they are not sure exactly where. And they can't sneak up on mud-mover frequency since they don't know what it is. So they patrol, heads on a swivel.

Bass and Dodson find and hit their primary target. On the ground, staff personnel, who have flown to the target area in a helicopter on loan from the Dutch, film their strike with a video tape recorder. The advantages are obvious when it's time to debrief. Then the two A-10s start their high-speed, low-level withdrawal to safety. Franzke

PROGRAM OBJECTIVES

- Improve leadership skills of selected tactical fighter crews.
- Improve the ability of AAFCE units to find and destroy targets.
- Increase effectiveness of multinational attack force operations.
- Become familiar with new technology, weapon systems, and tactics used in their employment.
- Provide a multinational environment with opportunities for self-evaluation of national equipment and attack plans.
- Establish an information library of new weapons, weapon systems, and their operational test programs and results.

finally spots them, dives in, aborts his run, and orders Kej and Fot to attack. The attack is made and broken off after a prebriefed number of maneuvers set by the flying safety rules of engagement.

These flights, plus Belgian F-104s, Dutch NF-5s, and RAF Phantoms, recover at Jever, and the crews assemble in the big room. Before the formal debrief begins, the pilots and navigators are talking excitedly among themselves, hands flying the maneuvers they have just



A-10 pilot Maj. Marv Bass, USAF, prepares his attack route for a TLP mission with hopes of evading the air defenders.

performed. The bell rings, the formal portion has begun. Now the "Killer Staff" takes over.

Squadron Leader Moses silences the remaining hum of conversation. He and a very tough Dutch major named Frans Hartgers (who speaks English, French, and German with awesome fluency), steer the mission leaders through the general debriefing. Moses tells them to explain their basic attack and defense plans then to go into what went well and what went wrong. "Save the 'There I was . . . there you were' and the 'If you didn't pull nineteen Gs, etc.'" until the individual debriefs, gentlemen," he commands.

Meanwhile, Jim Kula, whose

eyes reveal flying experience beyond his thirty-three calendar years, has been reviewing all the air-to-air film that supports, rarely discredits, pilot claims. With him is TLP staff member Belgian Maj. Bruno de Wouters doing the same with the air-to-ground film.

The mission leaders debrief, state their claims, their tactics, and learning points for the mission. Kula and de Wouters back up or disallow the claims. Then the staff dissects their tactics. There is not, Hartgers says, any *one* way to fly a mission, or fake a SAM out of its smoke, or attack a target. There is no TLP "answer," he insists. "Expect the unexpected," says Hart-



Maj. John Miller of the German Air Force observes two RAF crew members examining their strike film, above. Left, RAF Flight Lieutenant Steve Riley starts to debrief an air-to-air mission he has just led.

gers who, later that day, was to throw an extra Initial Point at the troops after they were airborne.

Staff and participants quickly exchange questions and comments, highly professional, and very esoteric. Then, too soon, the general and individual debriefs are over and it is time for lunch. The afternoon flying session promises an even more advanced version of what took place in the morning. If it

is to be a particularly heavy day, the men may not leave TLP Ops until after 8:00. Then it's off to the Mess for dinner and perhaps a Friesengeist for a night cap. But they never stop rehashing the day's missions.

The staff sees no great conceptual changes for the future; in their view, the program is running quite well the way it is. They may incorporate more electronic warfare, perhaps

During his USAF active-duty career Mark E. Berent flew more than 1,000 combat hours in various aircraft, including the F-100 and F-4. He maintains current proficiency in single and multiengine prop and jet aircraft. He writes on international aviation matters for this and other magazines, and is also a novelist, with his second adventure book in process. His first coauthored novel, *Brass Diamonds*, is now in bookstores.

TYPICAL COURSE CONTENT

Seminars: Sixty-one hours of instruction, discussion, and war-game participation.

Flying: Fifteen sorties of air defense, offensive air support, interdiction, offensive counterair, and combined missions planned, briefed, and led by participants in their own aircraft.

Visiting Aircraft: F-111, F-15, F-16, Harrier.

phase in some Wild Weasels. And it would be nice if they had some of their own airplanes with which to better observe the participants as well as keep their proficiency up without the tiring commute to their support bases. They could also use a way to provide annually or semi-annually a one- or two-day commanders' course for high-ranking NATO officers.

Actually, TLP is one of the few programs unfouled by pretentious rank or burgeoning bureaucracy. Since it is not a NATO program, it has no NATO manning. The officers and airmen filling staff slots are literally gifts from their national air staffs. Aid such as an on-station OV-10 for part of the course, F-15s to beef up the air defenders, and the F-5 Aggressor Squadron are frequently volunteered to the program by USAFE. Unfortunately, some NATO army commanders haven't, as yet, fully realized the training value TLP missions provide their air defense and low-level radar sites.

Current O&M costs (FY '80) per participating aircrew for the four-week course are calculated at DM10,000 (about \$5,714). Participating nations are billed each quarter by Bonn. Each nation absorbs the direct costs of staff salaries, TDY for participants, and direct aircraft operating costs.

The Tactical Leadership Program is a success story from any viewpoint, fiscal or tactical. As Brig. Gen. Jerry Tietge, Commander of the 86th TFW at Ramstein, put it, "TLP is the best program since the inception of NATO. It's totally oriented to the threat and the mission."



The "correlation of forces" have not all come together to give the rulers of the USSR the unquestioned mastery they seek. But in the military sphere, both nuclear and conventional, the USSR is ascendant in many respects. The result is a willingness for . . .

Power Projection, Soviet Style

BY CMDR. STEVE F. KIME, USN
ASSOCIATE DEAN OF FACULTY, THE NATIONAL WAR COLLEGE

IT WAS not too long ago that one rarely heard about the "projection" of Soviet military power. Now we seem to be talking of it often. Our President was seized of the problem sufficiently to assert that the invasion of Afghanistan had made a "dramatic change" in his "opinion of what the Soviets' ultimate goals are."

In the future, historians may well point out that the Soviet Union at the threshold of the 1980s found itself in a position at last to prosecute a foreign policy that had always harbored expansionist goals. Western critics are already telling us that American intercontinental nuclear superiority was frittered away in a feckless attempt to convince Soviet leaders that they should adopt Western notions of arms control and deterrence. Even our allies no longer accept without reservation US political and economic leadership of the industrialized world. The

post-Vietnam, post-Watergate malaise that infected US foreign and domestic policymaking in the '70s lingers on. Even if this is exaggerated, from the Soviet point of view the environment for projecting power and influence has changed.

But history may choose not to be kind to either one of us. Soviet aggressiveness and apparent recent successes, when compared to current US helplessness and impotency, may be distorting our view. The fact is that the USSR's record at projecting its power beyond the Eurasian periphery is a mixed one. Soviet staying power has not been great. Given the rate at which former colonial powers have been withdrawing during the last quarter of a century, it is amazing that the Soviet Union has not done much better.

So what causes the sense of fundamental change that

has seemed at times recently to be so palpable? It is worth the effort to look at the nature of the change that seems to be in the air, the factors underlying and affecting Soviet attitudes toward using military power abroad, and the implications of all of this for US policymakers.

The Nature of the Change

First, what has *not* changed? Certainly the priorities in the minds of Soviet leaders have not changed. The maintenance of power at home for an entrenched, bureaucratic elite and the security of the Soviet homeland remain first concerns, even obsessions. The pretensions of an internationalist ideology and the lure of opportunities in the Third World do not move the current Soviet regime to accept grave risks. They prefer to cultivate options to be exercised in the safest possible environment. This does not mean that ultimate Soviet objectives are not served; it simply means that they are not served by every Soviet action everywhere. Soviet leaderships have never been particularly daring. But they have had a tremendous capacity for shoving unattainable goals into the future and for opportunistically grasping whatever can be safely snatched in the present. This is not new, but understanding this would help Western observers to comprehend broader Soviet foreign and military policies as well as Soviet policies and activities associated with the projection of military power.

Three very important things *have* changed. First, the Soviet-US military relationship has changed. Most important in this relationship is the dramatic shift in the balance of strategic nuclear military power. This shift is vital because it involves the threat to Soviet territory, and changes all Soviet military calculations involving the security of the homeland. Second, there has been an important change in global perceptions of US resolve. Soviet leaders could hardly fail to notice that the US has been unwilling or unable to counter projections of Soviet power and that allies of the US have been less than inspiring in their support. Third, mainly because of the changes just noted, the Soviet evaluation of the dangers attendant to a generally more aggressive policy in the world has changed, and is probably still changing. It is correct to note that the Soviets tend to be careful, pragmatic people who meticulously calculate potential risk against potential opportunity. But this means that it is just as important to examine possible *opposition* to Soviet aggressiveness at all levels of conflict and peacetime relations as it is to look at the Soviets themselves.

The Military Dimensions

By far the most significant "projection" of Soviet military power lay in the increasingly widespread perception of the USSR as at least the equal of the US as an intercontinental nuclear superpower. Further, this is not merely a perception. The fact is that the Soviets have relentlessly built an awesome arsenal during an era of arms control. Perversely, the West might have exaggerated the impact of the Soviet strategic buildup by expecting too much of strategic arms control. There was an erroneous notion abroad in the West that Soviet behavior at all levels of conflict and peacetime relations would be modified to be more acceptable if they were



Representing two elements of Soviet military might, opposite page, strategic missiles being paraded through Red Square, and, above, in the tactical arena, armored personnel vehicles in attack formation during combat exercises.

only recognized as a truly equal superpower. An increased sense of security in the strategic nuclear relationship has only made Soviet leaders more confident and assertive in a continued competition for world power and influence.

In the broad "correlation of forces" in the world that Soviet spokesmen constantly talk about, the strategic nuclear development that has made the USSR a superpower is clearly the most important achievement of the past two decades. In fact, it is only in military power that the USSR has "arrived." The economic, political, and social aspects of the correlation of forces may come along in due course, but success in these realms is still off in the future and must arrive in the wake of Soviet military power.

For our purposes here, we must recognize that intercontinental nuclear power has a positive as well as a negative effect on the projection of more limited Soviet military power. We in the West quickly understood the negative, or deterrent, effect: Advocates of Soviet expansionism could invoke Soviet superpower status, but had to consider that a threat directly to the Soviet homeland was involved. For a while, they had to consider a greater threat to the Soviet Union than to the United States. The Soviets, however, also understood the positive effect of nuclear superpower status on the utility of Soviet power at lower levels of conflict. It became increasingly clear throughout the '70s that the USSR did not intend to be handcuffed everywhere and at all times by nuclear deterrence. After all, Soviet territory has always been under some kind of potential threat. The fact that US territory was for the first time placed at immediate risk in a crisis militated in favor of the projection of Soviet military power.

To some extent, Soviet strategic power neutralizes US power. Certainly the current strategic balance must give US decision-makers pause in any potential confrontation where US and Soviet interests merge. A threat to bring down nuclear devastation in any unequal relationship is one thing and may be credible. A threat to commit mutual suicide where vital national interests are not clearly at stake is quite another thing and may not be believable at all.

Next, we should look at the natural capacities for the

projection of Soviet military power that geopolitics and history have engendered. These capacities are "spin-offs" of Soviet continental power and are inherent in the massive forces maintained in the USSR and at her periphery. After all, Soviet history teaches that "projection begins at home." Ask the East Europeans, the Baltic peoples, the Finns, the Mongolians, and, of course, the Afghans.

The Soviet view of war is a continental view. The war that Soviet forces, Soviet propaganda, and Soviet doctrine address is a big war. Forces are justified and built for dominating the Eurasian landmass, but the doctrine for doing this can hardly be called defensive. The Soviet intention is to carry the conflict away from Soviet borders. Disposition of military force in mass at the periphery is required, and is worth the enormous price to the Soviet economy. So manpower and equipment for "projecting" beyond Soviet borders are taken for granted in the Soviet order of things. In other words, Soviet policymakers and planners may not build forces



Under the Soviet system, the nation's youth are instilled with strong feelings of patriotism from an early age. Here, recruits are administered the oath of allegiance.

to use in Budapest, Prague, or Kabul (or Belgrade or Ankara), but military forces are in place if they so choose to use them.

Similarly, Soviet naval and air forces are available for roles *beyond* the Eurasian periphery. They are justifiable in terms of strategic offensive and defensive roles and for continental conflict, but their utility at the lower end of the potential conflict spectrum became increasingly clear as the full implications of the changing nuclear balance were understood and the Soviet view of the US as a competitor changed.

For example, the Soviets have not built naval forces to intervene against significant opposition. That is not their game. But they were quick to understand the implications of the nuclear age for denial, interposition, showing the flag, and "gunboat diplomacy." The seas are the backyard of the US, just as Eurasia is the natural turf of the resident superpower on the continent. If the US could use the threat of escalation to make a credible peacetime presence and a military policy on the Continent, it should be no surprise that the Soviet Union discovered that the naval flag of an intercontinental nuclear superpower might similarly yield high returns on limited investment. Just as the US does not really have to pre-

tend to be the dominant land power in Eurasia, the Soviet Union does not have to be, and probably cannot be, a traditional seapower.

Soviet naval construction is impressive enough, and we understand it fairly well. The important unanswered questions about Soviet naval policy for the remainder of this century do not have as much to do with naval hardware as with the increasing license for the expression of naval power that the Soviets seem to be finding. This license is directly related to the unwillingness of the US to behave like a great naval power. There are surely limits to how much the Soviet Navy can and will do (just as we seem to be finding limits of our military policy in Europe), but those limits are far from clear. Whatever the limits might be, the nature of the opposition is a critical element in determining them. To the extent that the Soviets act like a traditional seapower, and especially to the extent that they choose to project naval power in the manner of classical great naval powers, they do so because they are not firmly opposed by their primary competitor who is, after all, a natural seapower. On the Continent the choice of who dominates the conventional military balance is theirs, and the exercise of the superiority is subject to the restrictions of the nuclear age. On the high seas the choice is ours, and we are subject to similar restrictions. But if the US chooses not to exercise its advantage in the naval arena, we can expect the Soviet Union to be ever more aggressive at projecting her naval power.

The Political Dimensions

There is an important internal political dimension to the maintenance of a global Soviet military image. Part of that image is the ability to wield conventional Soviet military power. The "threat" is important in Soviet internal politics, and so is the ability to meet the threat. Though it is sometimes hard to believe, Czechoslovakia and Afghanistan can be depicted as threats in Soviet politics. In any case, Soviet citizens are not left with doubts about their government's resolve and capacity to use the Soviet elephant gun on the mice that might dare to nibble at the Motherland's periphery. NATO and the People's Republic of China (PRC), as a result, then look more manageable.

The exercise of Soviet power helps to compensate for domestic political and economic inadequacies, and it helps to promote the legitimacy of the Soviet system. Anyone who knows Soviet history knows that a regime that failed to maintain massive military forces would fail to tap a vast reservoir of support from the populace. Military power is the medium in which love of the homeland, patriotism, national paranoias, and the Soviet form of rule are mixed.

Soviet support for Wars of National Liberation helps promote in the Soviet polity the image of a country, and a leadership, at the head of a righteous "going concern." Maybe we have little, and are progressing slowly, but we are on the side of history and of change, or so the Soviet citizen is encouraged to think. Failures in the Third World can be played down, but there is a genuine need for a success now and then. A few ships, or even aircraft, in distant areas have meaning in Soviet domestic politics as well as on the international scene. Ships that can be said to discourage a greater navy from acting de-



While the US began as a global power in the postwar era and gravitated to something less, the USSR began as a dominant continental power and grew to something much more.

cisively, or which can be present, even unopposed, at some minor time of Third World troubles, can yield significant internal political benefits for a regime that needs all the legitimacy it can muster.

The politics of managing Third World clients also has important military facets. Economic and cultural "projections" of Soviet influence have fleeting utility. The Soviet model is simply not as attractive to *risen* Third World leaders as Marxist-Leninist pronouncements and Soviet weapons are to *rising* ones. Third World leaders are, however, interested in the military instruments needed to stay in power. Military aid and advice are, therefore, a vital part of Soviet/Third World relations, and are relevant to potential projections of Soviet military power. Clients become tied to Soviet weaponry, spare parts, and even doctrine and tactics. In crises the

critical needs of dependent regimes and the compatibility of Soviet equipment combine to make Soviet participation more logical and more likely.

The presence of Soviet power abroad has international political impact, but the exercise of Soviet power on the international scene is not an end in itself: there must be meaning internally in the USSR. In the final analysis, all the perceived risks and the benefits promised in any potential opportunities must relate back to those first concerns of an aging leadership striving to maintain power in a nation where the security of the homeland is a national obsession.

The Doctrinal Dimensions

In the USSR, doctrine is where the military and political dimensions converge. The above discussion of political and military facets of Soviet policy suggests that there is a distinction in the Soviet mind between distant projections of military power and the more or less "natural" extension of Soviet military capacities at the periphery. Soviet military power in the nuclear age is relevant in any significant crisis on the globe, but it is far more relevant in some than in others. Soviet doctrine indicates that the leadership has a keen appreciation of the difference between the aura of Soviet power on the ground in Eurasia and the longer-range "spin-off" of nuclear superpower status. Perhaps the Soviets were quicker to appreciate this difference than were US policymakers because in the postwar era the US began as a universally relevant and potent global power and gravitated backward to something less, while the USSR began as a dominant continental power and grew to be much more than that.

In any case, Soviet leaders seem to understand both



In the air, the USSR can strike intercontinentally with a manned bomber force.

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the limits and the opportunities for the use of military power far from Soviet borders. They cultivate and entertain military options at long distances, but they judge such options more in terms of opportunities than in terms of necessities in the service of Soviet national interests. Such necessities exist only in Eurasia and in the intercontinental nuclear equation.

Though ultimate Soviet goals to dominate world affairs are never surrendered, though internationalist ideology and a global superpower image are useful in Soviet politics, and though we will undoubtedly be faced with future uses of Soviet military might in the Third World, there is no formal Soviet military doctrine for the projection of power. There is, however, a clear understanding that Soviet military power has, as Soviet spokesmen say, an "external function" in support of Soviet foreign policy.

Soviet military doctrine, reflecting the realities of Soviet politics and history, is concerned with the big war—it is oriented around major conflict and the security of the homeland. The stakes worth actually fighting for, and worth taking significant risk of escalation involving Soviet territory, are in Eurasia. In distant places the Soviets do not think in terms of military doctrine or strategy. Instead, they deal in an *ad hoc* manner with a changing, sometimes confusing, environment where they must meticulously balance risk and opportunity. They seek to make such calculations as much as possible in the political realm, and to divorce them from genuine Soviet security concerns.

At their periphery, the Soviets contemplate potential uses of military force as matters closely associated with their continental view of war, and with the foibles and phobias endemic to their history and their form of rule. They think in terms of balancing the risk of action with the risk of inaction. Supreme political and military matters, thus doctrine at the highest level, are involved. Some danger of the "big war" is mixed with the ever-present expansionism that perceptive observers have always sensed in Russia. When Westerners look at Eurasian projections of Soviet military power, they often fall into the trap of justifying them as defensive moves. We should not fail to remember the expansionist impulses that lay behind Soviet calculations: It would help to remember that Catherine the Great was advised in the eighteenth century that "that which ceases to grow begins to rot."

Conclusions and Implications

The reader at this point may feel that I have deemphasized distant projections and paid excessive attention to continental projections of Soviet military power.

Perhaps I have, but the intention is not to emphasize different priorities in the two kinds of projections of military power, but rather to point out that they have quite different natures. In Eurasia and its maritime approaches, the use of Soviet military power is inextricably intertwined with the totality of Soviet power. At distances from the USSR, the use of military power is much more nearly disconnected from the totality of Soviet power. They prefer it that way but, while it makes Soviet adventures safer, it also makes distant uses of Soviet power more vulnerable and thus necessarily more responsive to resolute opposition.

Nuclear-age geomilitary considerations have altered the distinctions between traditional continental and traditional seapowers, but they have not completely eliminated the differences. It is clear that *intercontinental* military power overlaps and alters the traditional categories, but it is not yet clear how much or even how this is true, because the intercontinental military balance has not settled out. A major problem is that we have not yet seen the full implications of the change that is currently in the air. The context for the projection of Soviet military power, up close or far away, is changing. The intercontinental nuclear balance continues to shift, and this carries with it a changed relevance of nuclear deterrence to lower-level political and military activity.

The Soviet risk/opportunity calculus in the Third World may be changing. While we have not yet seen formal doctrine or military construction in response to this change, we have seen *ad hoc* responses and long-term deployments of military hardware. Increasing numbers of out-of-area ship-days for the Soviet Navy, ferrying Cubans, and advising Ethiopians are harbingers of *something*, if not of Soviet troops on the ground in Africa or Latin America. The Soviet invasion of Afghanistan is probably different in genre from long-distance projections of Soviet military power, but it has important implications in Eurasia and the Middle East. It is patently clear that the threat of triggering US/NATO power is no longer sufficiently credible to discourage continental extensions of Soviet power, if indeed it ever was.

Global perceptions of Western resolve, and perhaps even of Western politico-military economic capacity, are changing. In the Third World, this is potentially of signal importance to the Soviet attitude toward using military instruments of diplomacy. A risk vs. opportunity calculus is meaningless if risk is zero. While it may be generally accurate to assert that the "big-war" syndrome in the USSR can be a constraint in far-flung places, it is only a constraint if the prospect of war is real. Either the threat of escalation to intolerable levels of conflict or the threat of credible opposition in an arena of potential limited conflict must be present. There must be *some* kind of potential opposition or the most limited application of force by even the most cautious Soviet leadership will inevitably carry the day.

This brings us back home, because it is the nature of the opposition to Soviet expansionism that will be most critical for the rest of this millennium. This is particularly true of uses of Soviet naval power. A viable opponent who acts like a great seapower would drastically limit Soviet options on the high seas and in the Third World. ■

In Aeronautics Affordability Is King

In stretching the life span of existing aeronautical systems as well as in designing, building, and procuring new ones, the Air Force faces a host of challenges and constraints that extend from a shrinking industrial base to galloping cost growth.

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

THE Air Force is reviewing the hallowed traditions of weapons procurement and acquisition and coming up with iconoclastic thoughts. Instead of emphasizing conquest of new technological worlds, there is increasing concern with such mundane tasks as "making do," incrementally improving existing things (which has spawned a new acronym, P³I, or preplanned product improvement), and doing things better more cheaply. The imperative of the '80s, as Lt. Gen. Lawrence A. Skantze, Commander of AFSC's Aeronautical Systems Division, said in summing up current trends, is to boost manufacturing productivity as the key to "systems affordability" as well as to wring maximum performance and life span out of existing systems by retrofitting them with "better sensors, better armament, better EW [electronic warfare components], and better communications."

Systems affordability clearly is more than a short-lived buzz word. Latest Defense Department compilations show that overall cost growth for major weapon systems is approaching an annual level of twenty percent, fed by inflation, a shrinking base of subcontractors, depressed buy rates, and increasing shortfalls in technically trained personnel. The formula for alleviating these assorted ills is diverse, complex, and in some aspects, radical.

Since labor-intensive operations detract from productivity and profitability, they are key targets in the drive toward systems affordability. Techniques that stress materials forming and bonding in place of labor-intensive riveting and advanced automation schemes are obviously part of the answer. New materials technologies are another.

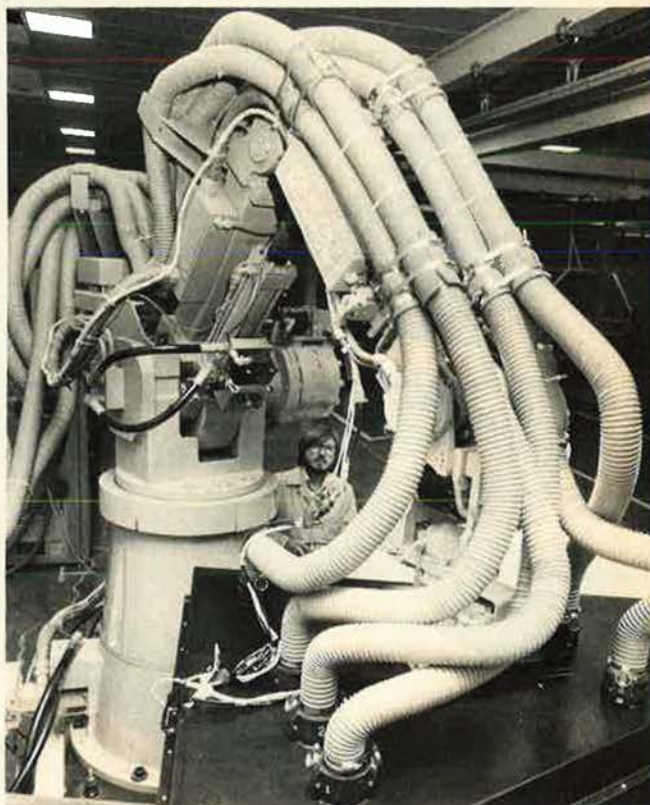
There is evidence that the manufacturing of composite materials is approaching a level of maturity that might take them out of the limbo of costly experimentation and permit their widespread use in airframes of all types. To

date, the great expectations associated for almost two decades with advanced composites have proved elusive, largely because too much hand labor goes into the manufacturing process. Compounding the problem is a vicious-circle syndrome, meaning that because of their high manufacturing costs, composites are being confined to narrow applications in airframe skins; but by limiting demand for composite materials industry has only limited incentive for investing in efficient mass production processes. The Aeronautical Systems Division, therefore, is providing seed money for the development of optimized composites factories. Northrop Corp., for instance, has been commissioned to carry out basic research on how to lay out such a factory, with emphasis on thoroughly automated processes. This \$2.2 million study is to be completed by September 1982.

The underlying objective is to achieve manufacturing efficiencies and economies that make it attractive to use advanced composites in airframe structures on a large scale. Clearly, it will take a good deal of investment at high risk to bring about efficient, automated composites manufacturing plants. Military as well as commercial aviation probably will have to join forces and provide the needed risk capital, General Skantze suggests.

For the time being, the ASD Commander admits, use of advanced composites in aeronautical engines does not look promising. Eventually, however, such composite materials as carbon/carbon laminates—developed for nozzles of ICBMs and SLBMs—might become usable in the hot sections of aircraft engines.

Another area of manufacturing modernization that in



AFWAL is providing seed money for the development of integrated composite fabrication centers. Northrop Corp. (whose "factory of the future" is shown above), is involved, along with General Dynamics and Grumman.

General Skantze's view shows great promise is a combination of computer-aided design and manufacturing into a cohesive, streamlined process. Two payoffs accrue from this approach. The computer can be used to design and manufacture components in an optimal manner. Further, because the process is fully automated, it is "not only repeatable but the quality could be close to 100 percent," the ASD Commander said. Although the prospects for modernization and productivity gains are great, General Skantze cautions that aerospace is only a small portion of the market and thus can't bring about a reindustrialization of America singlehandedly.

Cracks in the Industrial Base

Also, the drive to rejuvenate aerospace manufacturing and increase productivity is not likely to reach fruition as long as investment spending remains at the present relatively low levels. The problem is not being helped by weaknesses in the industrial base. The Senate Armed Services Committee, for instance, recently projected a rather sobering view of trends in the defense industry, asserting that "many potential suppliers of defense material are giving increasing emphasis to commercial contracts that appear to offer better opportunities for profit and business stability than cyclical defense business." Pointing out that for the first time

since World War II commercial aircraft production now exceeds that of the Department of Defense, the committee found that "the delivery schedules of entire weapon systems have been affected by serious bottlenecks in forgings and castings, optical components and sensors, and semiconductors."

Lastly, the Senate Armed Services Committee warned that "significant shortages of and dependence on overseas sources for key raw materials—especially cobalt, titanium, and asbestos—and semifinished commodities are also impacting on the pace of the US defense program, especially because of the demands of high technology for exotic materials."

Yet another factor aggravating this condition is what Rep. James D. Santini (D-Nev.), Chairman of the House Subcommittee on Mines and Mining, terms the "resource war" that is being waged by the Soviet Union. That country, he charged during recent subcommittee hearings, "has moved into the international resource arena armed with a strategy that extends beyond economic competition but falls just short of conventional military conflict." Increasing domestic consumption combined with a "rapidly deteriorating mineral resource position" changes the USSR from an exporter to an importer of nonfuel minerals, thus causing the Soviet Union to resort to "economic cannibalism designed to



Several aerospace companies are working on enhancement programs of existing tactical aircraft. Included are McDonnell Douglas's F-15 "Strike Eagle" (shown here), as well as General Dynamics's F-16 XL and a two-seater version of Fairchild's A-10.

destroy the process of economic activity" of the free world, he warned. Manganese, an essential ingredient in steel making, for instance, is one of the vital minerals that is being kept off the world market by the Soviets, he charged.

Boeing's Chief Executive Officer T. A. Wilson told Representative Santini's subcommittee that the raw material problem of defense industry is becoming acute, with some of the materials in short supply coming almost solely from foreign sources in politically vulnerable areas. "We need to improve substantially our strategic stockpile and its management," the Boeing executive testified.

While there are no easy or quick solutions to the scarce materials problem, considerable progress is being made in new metal alloys forming processes that result in "superalloys," potentially capable of being substituted for scarce, exotic metals such as cobalt.

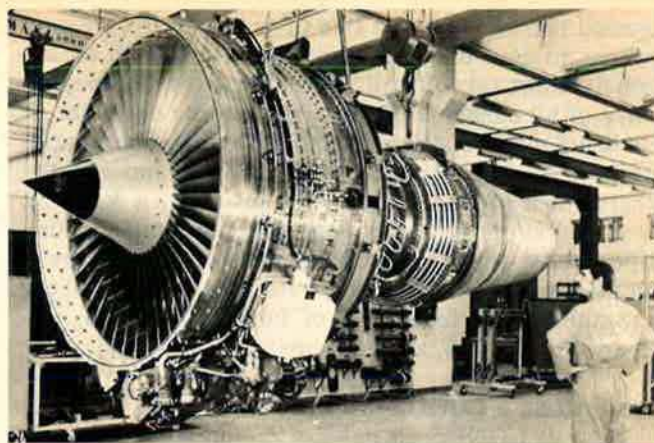
KC-135 Reengining

A key example of USAF's spartan "make-do" approach is the KC-135 reengining program that was launched in January 1980, with a contract award to Boeing covering relevant research and development. USAF's present inventory of KC-135 tanker aircraft stands at 642. As OSD and Air Force witnesses testified before Congress, the aircraft can be expected to last well into the twenty-first century. But the J57 engine on the aircraft was designed in the 1950s and is marred by high fuel consumption, high noise, high emission of pollutants, and low power output.

By reengining the KC-135s it is possible to boost the aircraft's offload capability and assure its viability for years to come. Dr. William J. Perry, Under Secretary of Defense for Research and Engineering, told Congress earlier this year that KC-135s using the CFM56 engine (jointly developed by General Electric and SNECMA of Paris, France) score fuel offload increases of between thirty to 200 percent over the conventional model. Additionally, if, as currently proposed, 300 KC-135s are eventually reengined, fuel consumption can be cut by about 100,000,000 gallons a year because of the high fuel efficiency of the new power plant.

But, as Gen. Lew Allen, Jr., USAF's Chief of Staff, points out, "While the fuel savings associated with reengining are significant, the primary justification for this program is the additional aerial refueling capability that could be generated." The latter, he stresses, "is necessary to support not only our strategic bombers but also our airlift and tactical fighter forces." By 1990, according to detailed Air Force studies, aerial refueling requirements will be about twice the present capacity. Increased refueling requirements result in part from the increased drag imposed by the air-launched cruise missiles (ALCMs) that will be deployed on B-52s over the next few years, according to Dr. Perry.

Yet another important plus is provided by the reengined KC-135. Its takeoff roll can be cut by as much as fifty percent to permit operation from shorter runways in NATO areas or US dispersal bases. Cost of the modification, according to Dr. Perry, will be amortized over a period ranging from eight to seventeen years, depending on the number of aircraft modified and the price of fuel.



The advanced high-bypass CFM56 turbofan engine, shown above, will be used to upgrade a portion of the KC-135 tanker force. Reengined KC-135s will have greatly increased offload capacity.

Cost of the modification, according to current estimates based on a program involving 300 aircraft, should be about \$17.5 million per aircraft. This figure includes cost of the engine—a dual-rotor high bypass ratio turbofan—as well as beefed-up landing gears and a larger horizontal stabilizer.

Installation of CFM56 engines on a KC-135A will get under way in 1982 and is to be followed by testing at the Air Force Flight Test Center at Edwards AFB, Calif., and operational testing elsewhere. (For CFM56 details, see September issue, p. 65.)

Tactical Aircraft Plans

Although there is no immediate requirement, the Air Force is keeping open a number of options to develop a new tactical aircraft. Included here are derivatives of existing aircraft as well as an advanced technology design. (Whether or not the so-called "Stealth" technology is included can't be discussed for security reasons.) Among the derivative designs is an enhanced F-15 tailored for the air-to-ground role. This project is funded mainly out of pocket by McDonnell Douglas and its associated contractors. (See *Strike Eagle* report in the November, '80 issue, p. 49.) General Dynamics, in similar fashion, is working on an enhanced F-16 XL, which uses a delta wing. Lastly, Fairchild is proposing a two-seat version of its A-10 for the night attack role. USAF's reaction to the latter remains lukewarm, primarily because of the assumption that LANTIRN (Low Altitude Navigation Targeting Infrared for Night) will largely obviate the need for such a design, and secondarily, because of the additional crew requirement.

So far as V/STOL is concerned, the Air Force's attitude remains largely skeptical, although pertinent studies involving TAC and ASD continue. As General Skantze explains, V/STOL must be viewed in a total tac air force structure context. The pivotal question, he said, is whether V/STOL "could become an overall requirement, particularly in Europe. For the time being, that isn't necessarily so." Militating against V/STOL, he suggests, is that both the F-15 and F-16 are "high-performance aircraft that can get off the runway quickly. They can even stop short."

In the case of the A-10, it is possible to use JATO (jet-

assisted takeoff) units on two of the aircraft's weapon stations to get off the ground rapidly and with an extremely short takeoff roll. Because of the interdependence of all elements of the tactical force structure, it would not make much sense to convert only one component of the force structure to V/STOL and not the others. In a practical sense, for instance, a V/STOL close air support component that depends on air-superiority fighters lacking that capability is a "nonstarter," General Skantze stresses, adding that the advisability and feasibility of building V/STOL air-superiority fighters, at best, appear questionable.

The F-15 as a CONUS Interceptor

So far as CONUS air defense requirements are concerned, General Skantze suggests that the F-15 equipped with Advanced Medium-Range Air-to-Air Missiles (AMRAAMs) "could be able to do the job. This combination could result in a good, long-range interception system with semiautonomous capabilities." The F-15, he adds, can carry a large number of these missiles, and with its upgraded radar system can engage up to four targets simultaneously. The F-16, in combination with AMRAAM, also becomes "a potent" interceptor, but is handicapped in relation to the F-15 because it lacks a search radar. Key features of AMRAAM, which is currently in a competitive validation phase involving Hughes Aircraft and Raytheon, are its ability to operate both within and beyond visual range, high average velocity, launch and leave, and multiple target attack.

Even though the AMRAAM missile won't reach production status until 1984, options for eventually enhancing its performance are under way already. A major concern is with enhancing "end-game" performance, meaning the missile's ability to perform high G maneuvers as it closes on its target. Two technology efforts focus on this requirement, with special emphasis on high-altitude and extended-range performance. One project centers on the development of ducted rocket motors (DRM), and the other is known as the Technology Integration of Missile Subsystems (TIMS) effort. DRM, which is a special form of ramjet, includes both fixed fuel flow approaches to provide high initial speed with low thrust levels for long times of flight with high terminal maneuverability as well as variable fuel flow to extend range and enhance high-altitude performance. TIMS, as its name implies, concentrates on refining missile components, including the use of lifting body airframes to increase G capability.

The AFTI Program

Key technology demonstrations by the Air Force, the Navy, and NASA with potential for applications in the next generation of tactical combat aircraft are channeled into AFTI, the Advanced Fighter Technology Integration program of AFWAL's Flight Dynamics Laboratory at Wright-Patterson AFB, Ohio. (Congress last year canceled the Enhanced Tactical Fighter program—meant to achieve evolutionary improvements of existing technology relatively quickly—and recommended instead that USAF and the Navy concentrate on technology options for a new fighter for the 1990s.)

AFTI's goal is broad: To look for, validate, and dem-

onstrate those technologies—and their integration—that improve subsonic and transonic maneuver, tracking and kill capability in air-to-air and air-to-ground combat, and boost aircraft survivability. Although extensively revamped since its beginning in the mid-1970s, AFTI continues to pursue its objectives along several paths. Funded at a modest \$10.5 million in FY '81, the program's budget is to grow to \$30.2 million in FY '86.

One of the program's three principal components is AFTI/F-16. Serving the Air Force as well as the Navy and NASA, this project was launched formally in December 1978 to develop and demonstrate an ambitious set of new technologies by 1984. Among the project's objectives are development of advanced, multimode digital flight controls and their subsequent integration with sophisticated fire-control systems; advanced control modes encompassing such "nonclassical" flight vehicles as CCV (control configured vehicles) and direct side force and direct lift control; and improved pilot/crew-station interfaces.

Nonclassical flying goes back to the Wright brothers, but in a practical sense is rooted in the fly-by-wire (FBW) primary flight control technique, a closed loop information system that continuously feeds back into the flight control computer cockpit data from an aircraft's motion sensors and transmits electrical command signals to the control surface actuators. The mechanical linkages between the pilot's control column and the actuators are replaced by electrical wire harnesses. In place of the conventional center stick there is a small sidestick controller that serves as the "input" to a flight control computer that processes and modifies this information, combined with data from the control surface sensors. The computer's output then "flies" the aircraft.

Reliable fly-by-wire control opens the door to designs of relaxed static stability, a key element of nonclassical flying. A stable airplane returns to level flight after a disturbance; the unstable airplane does not. If turbulence raises its nose, for instance, the aircraft will continue to climb more and more steeply. The stable airplane obviously is easier to fly, but it exacts a high price for its predictable aerodynamic performance. Inherent stability requires increased fuselage length and large tail surfaces, thereby increasing drag and reducing maneuverability. A number of techniques have evolved for providing unstable flight vehicles with artificial stability. In the process, performance under all flight conditions and speed regimes is improved.

Among the most dramatic and revolutionary advanced control modes pursued by AFTI/F-16 are direct side force and direct lift control, fuselage aiming or "decoupling," and weapon line pointing. These techniques make it possible through closely coupled interaction of sophisticated vertical and horizontal control surfaces to point the aircraft and its weapons in a direction different from its flight path or to adjust its flight path laterally or vertically without having to rotate pitch, yaw, and roll axes of the aircraft. The result is that the aircraft's flight path—or the relationship between its longitudinal axis and its flight path—can be changed without pulling Gs. In terms of defensive capability, an aircraft with direct force control and fuselage decoupling is an extremely elusive quarry for both enemy fighters and SAMs.



The Advanced Fighter Technology Integration (AFTI) program of AFWAL's Flight Dynamics Laboratory is broken into three parts. AFTI/F-16 is shown above.

Applied to offensive tasks, a fighter using these features, once locked on a target in the air or on the ground, can utilize fuselage pointing to maintain attack positions for long periods of time and with a wide choice of attack flight paths.

Coupled with a digital flight control system, these performance gains can be further magnified. The AFTI/F-16's digital computer, a Bendix 930 processor, enables the pilot to tailor the control system to a range of flight modes and tasks, including, eventually, weapon selection, sensor video, and radar mode. Once matured, this combination of technologies should enable a pilot who is getting jumped by "hostiles" to simply punch the "air-to-air" mode button on the computer rather than having to go through the complex and cumbersome procedures of present-generation fighters.

The first phase of the AFTI/F-16 program concentrates on integration of the advanced digital flight control system with aircraft avionics. The second phase involves adding sensor systems and integration of the flight-control system with the aircraft's fire-control system. Subsequently, the aircraft's air-to-air and low-level weapons delivery capabilities will be tested at the Red Flag facilities. The Navy's primary short-term interest in the program is in exploring the potential of digital flight controls for future V/STOL designs.

The AFTI/F-16 is undergoing modification at General Dynamics' Fort Worth, Tex., plant and is scheduled to begin flight testing at Edwards AFB, Calif., in July of next year.

Other AFTI Elements

Another key element of AFTI is the AFTI/F-111 (Mission Adaptive Wing) project. The objective is to develop

and test smooth, variable-camber wings on an F-111 test-bed and to mate this technology with a digital control system that optimizes wing camber automatically for various flight conditions. Major payoffs from this technology are improved cruise efficiency and greater maneuverability. First flight of the aircraft using manual variable-camber control is slated for August 1982. The AFTI/F-111 is to flight-test variable camber under automatic control in FY '84.

The Mission Adaptive Wing eases a fundamental problem of conventional airfoils: because of the cambered configuration of aerodynamic lifting surfaces, the airstream flowing over those surfaces can reach sonic speed even though the vehicle is flying in the transonic range. This can occur at speeds as low as Mach 0.70 and causes a standing shockwave. The results are airflow separation, an increase in drag, and buffeting. Considerable progress is being made in combating the so-called shock-boundary layer phenomenon through advanced airfoil shaping, such as the supercritical wing, which pays off through less drag and buffeting and thus greater range, better fuel efficiencies, and the ability to fly faster transonically.

The Mission Adaptive Wing takes aerodynamics into a more advanced realm. Present technology compromises wing shapes in some flight modes in order to optimize them for others. At present, the only technique for changing wing camber is through leading edge slots and trailing edge flaps, slots, and slats. But these devices cause high drag and aerodynamic flow separation because they are uneven. By contrast, the ideal wing should be variable yet have smooth contours. Further, such a wing should provide high camber at low-to-medium subsonic speeds, become supercritical (or "sloped rooftop" airfoils) at transonic speeds, and change to essentially symmetrical airfoil configuration during supersonic flight. Hence the Mission Adaptive Wing involves an arrangement of flexible skin covering, a mechanism that can be deflected mechanically. The resulting wing system can be essentially redesigned in flight, either by the control system or the pilot.

The third major element of AFTI is a conceptual follow-on to the two projects in progress. Concept definition of this project is to start in FY '82. A range of technologies are to be demonstrated. Key objectives here are STOL (short takeoff and landing), rough-field landing gears, and low speed/high angle of attack control and lift.

This program may also demonstrate the so-called 2-D, for two-dimensional, vectoring, and reversing nozzle. Maneuverable and integrated with the airframe, a vectoring nozzle can apply thrust in directions different from the longitudinal axis of the aircraft. Its possible benefits, broadly, are lower drag because of high streamlining; improved lift and reduced takeoff and landing distances because of thrust vectoring and reversing; and higher combat maneuverability, also due to thrust vectoring or modulation in the instantaneous maneuvering regime.

Related work in progress at AFWAL's Aero Propulsion Laboratory and NASA—although not part of AFTI—involves variable cycle engines that modulate bypass ratios and other functions. The pilot, thus, can optimize engine performance for a range of prevailing

flight regimes, from takeoff to subsonic or supersonic conditions. This program, in concert with the multifaceted AFTI project, is building a technology base that should enable the Air Force to gestate within a few years a dramatically new fighter aircraft of unmatched performance.

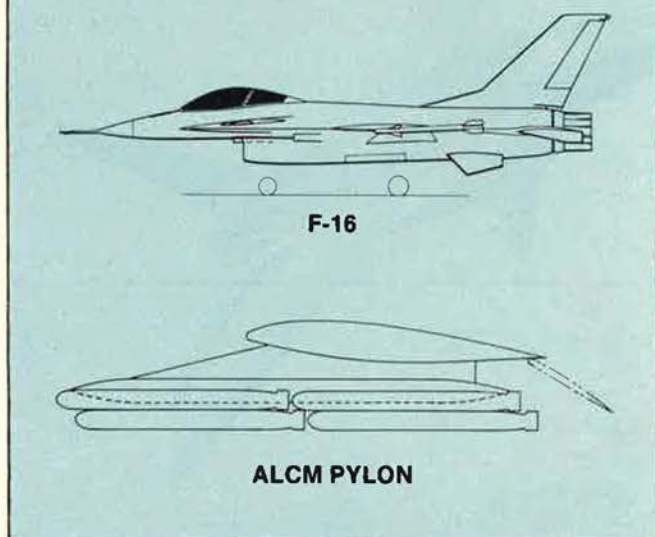
Return of the RPVs?

Few aerospace technologies have had more violent ups and downs than the field of RPVs (remotely piloted vehicles). Germinated by an AFSC-funded Rand study of a decade ago, RPVs burst upon the scene larger than life size as the answer to nearly all things aeronautical (*See October '70 issue of AIR FORCE Magazine, "Remotely Piloted Aircraft—Weapon Systems of the Future."*) But the dream of low-cost, invincible air-superiority fighters and of hordes of superefficient close ground support systems, all controlled remotely and without risking human life, began to falter in the mid-1970s after some brave starts and critical successes, such as the Compass Cope long-endurance, high-performance RPV.

Postmortems by congressional committees tend to attribute the reasons for this disenchantment with RPVs to greater than anticipated costs and technological difficulties. Clearly the step-up from preprogrammed reconnaissance drones that proved so successful during the Southeast Asian war and elsewhere to RPVs "flown" in real time by a remotely located pilot has proved more difficult than originally assumed. But after several years in suspended animation, unmanned automated vehicles—in fact, "smart" drones rather than RPVs in the classical sense—may be getting their second wind. The weapon system that may become the progenitor of a family of sophisticated drones is Locust, a miniature harassment vehicle under joint USAF/German Armed Forces development. Locust, according to General Skantze, represents "a very serious and perhaps the first real commitment to integrate RPVs into USAF's force structure."

The Air Force "might acquire between 5,000 and 10,000 units, if we indeed can come up with a low cost harassment vehicle that autonomously targets itself against emitting radars," he said. The ASD Commander pointed out, however, that the tendency to maximize the P_k (probability of kill) of any given Locust vehicle—and hence to drive up unit cost—might endanger the program. These ground-launched weapons, in effect sophisticated model airplanes equipped with a warhead, are preprogrammed to fly into specified target areas, where they loiter until their sensors detect a radar emitter. Once they do, they ride the radar beam into the target and destroy it. The hostile radar's only real "countermeasure" is to go off the air. Either way, Locust achieves its objective, which is to put the enemy's ground-based air defense system out of commission to give the ingressing friendly fighter force a free ride. ASD's assessment is that if only every third of these vehicles actually achieves a "kill," they will by sheer weight of numbers "literally shut down the other side's radar system." The flyaway unit cost goal of the Locust program, General Skantze said, is set in the \$14,000 to \$15,000 range. Source selection of a joint US/German contractor team to build Locust is under way.

SIZE COMPARISON



True-to-life size comparison of B-52 wing with four ALCMs mounted on pylon and F-16 underscores the aerodynamic effect of cruise-missile carriage on USAF's strategic bomber force. Upgraded, long-range ALCMs would be slightly larger than the first-generation weapons depicted here.

Locust appears capable of adaptation to a range of other targets, including tanks and aircraft on the ground. Since this minidrone is built of largely nonmetallic materials and is, therefore, almost impervious to radar detection, it could be said to be a Stealth design. Locust's quality of launch from the rear echelon, flying to orbits over preselected target areas, and then conducting autonomous search, make it attractive eventually to couple the weapon with a variety of sensors.

Air-breathing Strategic Systems

Nowhere is ASD's quandary over having to balance out—within constrained budgets—short-term "fixes" against long-term "cures" more acute than in the strategic sector. The imperative of keeping the B-52 viable as a multirole weapon system in the face of increasing threats and aging falls into the former category. While Congress has given the Administration a mandate to bring a new multirole bomber into the inventory by 1987, such a weapon system, even under the best of circumstances, is not likely to achieve full operational status until about 1990. Additionally, there is increased expectation on the part of the Defense Department and the Air Force that the B-52 will serve as USAF's principal cruise-missile carrier well into the 1990s. As a result, ASD is carrying out a \$2.6 billion modification and modernization program involving about 170 G and ninety-six H models. A key element of this program is an offensive avionics update that will correct bombing navigation system reliability and maintainability problems, increase weapon system effectiveness, and provide a launch platform for ALCM. First test flight of a B-52 retrofitted with the upgraded avionics suite occurred in September.

Additionally, 120 G models are being modified to serve as cruise-missile carriers. Modification entails the installation of pylons needed for external carriage of cruise missiles, enlarging of the weapons bay, and the addition of "strakelets." At the insistence of the Soviet SALT II negotiators, the strakelets—which enable the USSR's intelligence systems to differentiate between B-52s modified for ALCM carriage and those that are not—must be permanent installations. SALT II, which has not been and may never be ratified, counts ALCM-equipped aircraft as "MIRVed" systems. Hence, the need to provide generically defined identification of ICBMs, SLBMs, and aircraft that fall into this category.

Initially the B-52Gs will carry twelve ALCMs externally. This total will be increased to twenty when the aircraft are modified to carry eight additional ALCMs internally. Modification of the G models is to proceed at a rate of four and a half aircraft per month. The first squadron (fourteen aircraft) of modified, ALCM-equipped B-52s is scheduled to achieve operational status in December 1982. Acquisition of the full complement of ALCMs (3,418 missiles) won't be completed until 1987, however. (*See specially modified B-52G on November '80 cover.*)

Upgraded ALCMs Under Consideration

ALCM—whose progenitors include the German V-1 "buzz bomb" of World War II and a series of American World War I inventions—is a 1,500-mile-range subsonic air-breathing missile that resists detection because of optimized radar cross section and by penetrating enemy airspace at extremely low altitude. ALCM, whose official designation is AGM-86B, can fly complicated routes to its target with the aid of a terrain contour matching (TERCOM) guidance system. TERCOM compares surface characteristics encountered during the flight with computerized map data stored in its guidance system. Used in conjunction with inertial navigation and a radar altimeter, TERCOM provides pinpoint accuracy for ALCM well within the "lethal zone" of its nuclear warhead. The ALCM procurement program was transferred recently from the Joint Cruise Missile Project Office (JCMPO), operated by the Navy as the executive agency, to ASD. JCMPO continues to furnish Boeing Aerospace (the prime contractor) with the missile's engine (the F107-MR-101 turbofan design built by Williams Research Corp.) and the TERCOM (built by McDonnell Douglas Astronautics). Unit cost of the ALCM, according to the Defense Department, is about \$1 million.

A senior Defense Department official recently told this writer that planning for improved, second-generation ALCMs is under way. The degree of urgency involved, of course, is a function of how rapidly and effectively the Soviets build up their defenses against the first-generation ALCM. Betting by senior Defense officials at this time is that the Soviets will seek to develop standoff defenses that go after the carriers. The reasoning behind this hypothesis is that the Russians aren't apt to concentrate on interception of ALCMs in the terminal area—involving either SAMs or fighters—on a one-on-one basis. As one Pentagon executive put it, the latter "would be extremely difficult since cruise missiles represent such small targets, on the order of about 1,000 times smaller than a B-52 in radar cross section."

If the Soviets build up their ability to intercept cruise-missile carriers over long distance, it would become necessary to increase the range of ALCMs. A range increase of about 800 miles appears feasible, involving a simple "stretching" of ALCM to provide increased fuel capacity and engine improvements that are being pursued by a number of manufacturers, according to the Defense official. The required lengthening of the missile would not pose any problems for the carrier aircraft.

New Bomber Options

There is a "certain body of opinion that has concluded that penetration will become more and more difficult—as will base escape—and that if you want to hit fixed targets you can do it better with missiles," according to General Skantze. As a result, most concepts for a new bomber gravitate toward a multipurpose design, including the ability to cope with mobile and other targets of opportunity under both strategic and tactical warfare conditions. The Air Force, therefore, requested its Scientific Advisory Board to conduct intensive, parametric studies of various design options, "looking across the spectrum from largely penetrator *cum* ancillary general-purpose capability concepts to the other way around," General Skantze explained.

The studies were predicated on two "starting points, 1981 and 1985; included intensive industry participation; and focused on new manufacturing technologies in terms of affordability," the ASD Commander said. The study concluded that if a near-term solution—in the order of the congressional deadline of first aircraft delivery by 1987—is picked the logical choice is "a B-1 design incorporating upgrades. These upgrades would include reduced radar cross section, and confine the aircraft to subsonic performance and hence reduced wingsweep," according to General Skantze. Conversely, the Board estimated that it would take until 1992 before a completely new multirole strategic aircraft could come off the production line. Such a design probably would incorporate variable bypass engines, variable camber wings, reduced radar cross section, advanced radar absorbent materials (RAM), highly miniaturized, high-performance avionics, and composite materials, the SAB concluded.

Operational payoffs of such a long-range combat aircraft (LRCA) would include an unrefueled operating range in the order of at least 6,000 nautical miles, a payload for sensors and weapons in the 20,000- to 100,000-pound range, and provisions to incorporate a rapid-fire laser weapon. Such a design probably would use a supercritical or variable-camber wing, rather than variable sweepwing to achieve rapid base escape and high speeds at treetop levels. If laser weapons can't be used by LRCA, the likely choices for bomber defense weapons are defensive missiles—possibly AMRAAM derivatives or the Advanced Strategic Air-Launched Missile (ASALM), a multi-Mach weapon with a range of up to 600 nautical miles, General Skantze suggested.

There is some inclination in Congress as well as in USAF to build a mixed force of manned strategic systems involving initially B-1 derivatives and eventually fully optimized, completely new aircraft using at least some "low observable" or "Stealth" technology. ■

THE MILITARY BALANCE 1980/81

As Compiled by The International Institute for
Strategic Studies, London

FOREWORD

AIR FORCE Magazine takes pleasure in presenting to its readers "The Military Balance, 1980/81," compiled annually by The International Institute for Strategic Studies in London. This exclusive US presentation of "The Military Balance" has appeared in AIR FORCE Magazine each year since 1971. It provides the magazine's readers access to an international standard reference compiled by the recognized leading international authority in the field.

"The Military Balance" is such a handy reference because it is so comprehensive, and provides the most detailed, unclassified yet authoritative, quantitative assessment of military power and defense expenditures by the nations of the world. It is not a comprehensive as-

essment of the balance of power, either globally or regionally. It does not take into account the realities of geography, efficiency, vulnerability, or politics, except as mentioned in the balance sections.

Nations are grouped geographically, but there is special reference to the principal regional defense pacts and alignments, such as NATO and the Warsaw Pact. A separate section treats the United States and USSR separately, subdividing the comparisons into sections on strategic forces and general-purpose forces.

As in the past, we have excluded some tabular materials because of space limitations. These exclusions are minor, and deal mainly with tables on the smaller nations and arms production in developing countries. Readers wishing the entire volume may obtain it direct from The

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ABBREVIATIONS

<	under 100 tons	GDP	gross domestic product	n.a.	not available
-	indicates part of establishment is detached	GDR	German Democratic Republic	Neth	Netherlands
AA	anti-aircraft	Ger	German (West)	nm	nautical miles
AAM	air-to-air missile(s)	GLCM	ground-launched cruise missile(s)	OCU	operational conversion unit(s)
AB	airborne	GNP	gross national product		
ABM	anti-ballistic missile(s)	GP	general-purpose		
AC	aircraft	gp	group		
AD	air defence	GW	guided weapon(s)	para	parachute
AEW	airborne early warning	hel	helicopter(s)	pdr	pounder
AFV	armoured fighting vehicle(s)	how	howitzer(s)	Pol	Polish
ALBM	air-launched ballistic missile(s)	hy	heavy	Port	Portuguese
ALCM	air-launched cruise missile(s)	ICBM	inter-continental ballistic missile(s)	RCL	recoilless launcher(s)
amph	amphibious	indep	independent	recce	reconnaissance
APC	armoured personnel carrier(s)	inf	infantry	regt	regiment
Arg	Argentinian	IRBM	intermediate-range ballistic missile(s)	RL	rocket launcher(s)
armd	armoured			RV	re-entry vehicle(s)
arty	artillery	km	kilometres	SAM	surface-to-air missile(s)
ASM	air-to-surface missile(s)	KT	kiloton (1,000 tons TNT equivalent)	SAR	search and rescue
ASW	anti-submarine warfare			sig	signal
ATGW	anti-tank guided weapon(s)	LCA	landing craft, assault	SLBM	submarine-launched ballistic missile(s)
ATK	anti-tank	LCM	landing craft, medium/mechanized	SLCM	sea-launched cruise missile(s)
Aus	Australian	LCT	landing craft, tank	SOV	Soviet
AWACS	airborne warning and control system	LCU	landing craft, utility	SP	self-propelled
AWX	all-weather fighter(s)	LCVP	landing craft, vehicles and personnel	spt	support
				sqd	squadron
bbr	bomber	LHA	amphibious general assault ship(s)	SRAM	short-range attack missile(s)
bde	brigade	log	logistic	SRBM	short-range ballistic missile(s)
bn	battalion or billion(s)	LPD	landing platform(s), dock	SSBN	ballistic-missile submarine(s), nuclear
Br	British	LPH	landing platform(s), helicopter	SSM	surface-to-surface missile(s)
bty	battery	LSD	landing ship(s), dock	SSN	submarine(s), nuclear
Can	Canadian	LSM	landing ship(s), medium	sub	submarine
cav	cavalry	LST	landing ship(s), tank		
cdo	commando	lt	light	TA	Territorial Army
Ch	Chinese (PRC)	m	million(s)	tac	tactical
cmd	command	MARV	manoeuvrable re-entry vehicle(s)	tk	tank
COIN	counter-insurgency	MCM	mine counter-measures	tp	troop
comms	communications	mech	mechanized	tpt	transport
coy	company	med	medium	trg	training
det	detachment	MICV	mechanized infantry combat vehicle(s)	UNDOF	United Nations Disengagement Observation Force
div	division	MIRV	multiple independently-targetable re-entry vehicle(s)	UNFICYP	United Nations Force in Cyprus
ECM	electronic counter-measures	mod	modified	UNIFIL	United Nations Interim Force in Lebanon
ELINT	electronic intelligence	mor	mortar(s)	UNTSO	United Nations Truce Supervisory Organization
engr	engineer	mot	motorized	USGW	underwater-to-surface guided weapon
eqpt	equipment	MR	maritime		
EW	early warning	MRBM	medium-range ballistic missile(s)	veh	vehicle(s)
FAC(G)	fast attack craft (gun)	MRCA	multi-role combat aircraft	V(/s)TOL	vertical (/short) take-off and landing
FAC(M)	fast attack craft (missile)	MRL	multiple rocket launcher(s)		
FAC(P)	fast attack craft (patrol)	MRV	multiple re-entry vehicle(s)	Yug	Yugoslav
FAC(T)	fast attack craft (torpedo)	msl	missile		
FB	fighter-bomber(s)	MT	megaton (1 million tons TNT equivalent)		
fd	field				
FGA	fighter(s), ground-attack				
flt	flight				
Fr	French				
FRG	Federal Republic of Germany				

International Institute for Strategic Studies, 23 Tavistock St., London WC2E 7NQ, England. The cost is \$11.00, postpaid.

Some notes on terminology. We have retained IISS's system of abbreviating military weapons and units, and its British spelling and usage (as in "programme"). A list of abbreviations used in the text appears above.

Where a \$ sign is used, it refers to US dollars. Figures

for defense expenditures are expressed in US dollars, showing current and past expenditures as reported or compiled by IISS. Defense expenditures for the USSR and China are estimates, with explanatory notes at the ends of the sections on those countries.

IISS is responsible for the facts and judgments in the document. AIR FORCE Magazine has added photos and captions, and we are responsible for them.

The United States and the Soviet Union

AMERICAN STRATEGIC FORCES

The second Strategic Arms Limitation Talks agreement (SALT II), signed in June 1979, has not been ratified so far by either side. Modernization has proceeded within the context and limits imposed by SALT I and stipulated in the Vladivostok Accord of 1974, and, for the time being at least, both sides appear to be observing the provisions of SALT II.

Modernization of the US ICBM force consists of upgrading the yield and accuracy of 300 of the *Minuteman III* missiles with the Mk-12A warhead, which will reduce the Circular Error of Probability (CEP) from some 900 to about 600 feet. This programme should be completed by the end of 1981. The *Minuteman II* design is now 15 years old; the *Minuteman III* is 10. During the year there has been continuing debate over the concept of the MX ICBM. A total figure of 200 is planned, and the missiles are expected to carry ten Mk-12A warheads. As yet no decision has been reached concerning a mobile deployment of this weapon.

The retrofit programme of *Trident C-4* SLBM (range 4,000 nm, 8 × 100-KT MIRV), replacing *Poseidon C-3* SLBM in the *Lafayette*-class submarines, has begun. Three boats are now in service, with 9 more scheduled for renovation. Retirement of 10 older SSBN will take place this year and next. The introduction of the new 24-tube *Ohio*-class is due to begin shortly, but again the date of the end of the 11-boat programme is not yet known. Development of a follow-on *Trident* SLBM (the D-5, range 6,000 nm, 14 × 150-KT MIRV or, possibly, MARV) continues.

The strategic bomber force strength remains about what it has been for some years. Four prototype aircraft remain from the cancelled B-1 programme, of which one is reported in flying condition. Of the two ALCM designs reported last year, the Boeing AGM-86A was selected as the production weapon. This will carry a W-80 200-KT nuclear warhead, similar to that on the short-range attack missile (SRAM-B), at high subsonic speeds. A total procurement of 3,418 missiles is planned, with some 250 expected to be delivered by December 1981, by which time one squadron of 16 B-52G aircraft will have been modified to carry them. Eventually all 151 B-52G will be modified to carry ALCM. The 90 B-52H will also have

ALCM avionics. At the same time, a programme for improving existing avionics of the B-52G and B-52H is planned. The US strategic warhead total is 9,200.

Defence against a strategic missile attack continues to be accorded a low priority. The US never took up fully the options permitted under the June 1972 ABM Treaty (one ABM complex for the capital and one for some ICBM) and she has now dismantled her *Safeguard* system, originally designed to protect ICBM, although research and development into anti-ballistic missile technology, newer defence technologies, and the defence of key sites continues. The replacement of most of the 474N SLBM early-warning system by another, the FPS-115 *Pave Paws*, is nearly complete, as is the reorganization of the machinery for co-ordinating the surveillance and tracking of objects entering North American air space. A new early-warning system became operational in September 1979, but this generated a series of false alarms in 1980, raising concern over the reliability of some of its components. The disbandment of an Air National Guard (ANG) interceptor squadron, reported as planned for 1979, did not take place.

As a result of an Executive Order issued in July 1979, planning and development of civil-defence policies is now the responsibility of the Federal Emergency Management Agency. The general thrust of its planning appears to focus upon the evacuation of some urban populations. Preservation of the national decision-making and command authority continues to depend primarily upon the maintenance of an airborne capability, rather than the system of underground shelters and dispersion primarily used by the USSR and China, though there is a modest shelter system.

SOVIET STRATEGIC FORCES

The Soviet Union appears to have reached something of a plateau in her ICBM modernization programme, although reports persist that four new ICBM are under development. The SS-9, introduced in 1965, has now been retired and has been replaced by the SS-18, which offers greater accuracy and flexibility at the cost of a slightly reduced maximum range. Testing of this SS-18 with a single 18–25-MT warhead, allegedly to be used against deep underground shelters, is reported. Replacement of a

portion of the SS-11 inventory by the SS-17 also appears to have been completed. More than half the ICBM force is now less than ten years old. Within the IRBM force the SS-4 is being replaced by the SS-20 at a rate of 1 every 5 days, which is slightly more rapid than earlier deployments of 1 every 7 days suggested. There is no indication of the fate of the missiles withdrawn, but the storage of at least a proportion of these ICBM/IRBM is considered probable.

The strategic submarine fleet follows a similar pattern. However, the rate of modernization has also been slightly slower than hitherto assessed. Four of the *Yankee-II*-class boats have now been withdrawn, apparently for conversion to attack submarines. There are four new *Delta*-class, all of them *Delta-I* (12 tubes). It remains to be seen whether this indicates a trend to a larger number of the smaller *Delta*-class boats or merely a phase of a production run. The older *Golf-I*-class boats, though not covered by the SALT agreement, have almost all been withdrawn from service. The reported new *Typhoon* class has not yet been seen in service.

The previous mix of *Dear* and *Bison* long-range bombers remains unchanged. The numbers of medium bombers have increased slightly with the introduction of more *Backfires* at the expense of the *Blinders*.

The total of strategic nuclear delivery vehicles is 2,488, down 16 from last year's 2,504. The reduction stems from the continuing shift from the *Yankee-II* to the *Delta-I* submarines. The substitution of the SS-N-8 in *Delta-I* boats for the SS-N-6 in the *Yankee-II*s represents no change in the number of warheads, since both are single-warhead SLBM. However the replacement of the SS-11 by SS-19 and the increase in the numbers of SS-18 could potentially result in an increase of about 10% in ICBM warheads, bringing the overall warhead total to about 6,000, 1,500 short of the 7,500-warhead total expected by about 1985. The average yield of these warheads continues to be higher than the average yield of American warheads.

Strategic defence continues to be provided by extensive air-defence radars, SAM, interceptors, and the complex of *Galosh* ABM launchers around Moscow. Older interceptors are being replaced by more modern aircraft. No new types of interceptor aircraft have been noted, but the MiG-25 *Foxbat* has reportedly been exercising in a 'look-down/shoot-down' mode. A re-evaluation of the SAM holdings suggests the numbers are rather higher than previously estimated. Types remain the same, although a new weapon, the SA-10, is now beginning to appear. During the past year half the 64 *Galosh* ABM have been withdrawn from service; whether this is a prelude to a modernization programme or an enduring reduction is not yet clear.

AMERICAN GENERAL-PURPOSE FORCES

Common to all US forces has been the difficulty of recruiting and retaining skilled men. Personnel shortages are reportedly adversely affecting the performance of some units, and this is most noticeable in the US Navy. New equipment is now being introduced. The new M-1 *Abrams* tank is in production, as are the M-2 infantry fighting vehicle (IFV) and M-3 cavalry fighting vehicle (CFV). The M-60 tank, first in service in 1959/60, is being

upgraded. In the Navy, 3 new *Los Angeles*-class nuclear submarines were delivered this year and 28 others are planned or under construction, to bring the total to 40 by 1990. The first of the 16 planned *Aegis*-class guided-missile cruisers is under construction, as are 5 more *Spruance*-class destroyers, *Perry*-class frigates, and a number of smaller vessels. The status of the Marine Corps is under review, with the prospect of use in a wider role under the Rapid-Deployment Force (RDF) concept (requiring new equipment, such as the M-198 155mm how and the M-110 203mm sp gun). Since early 1980 the US has deployed two carrier task groups to the Indian Ocean. This is a total of about 25 ships, 18 of which are combatants. The pre-positioning of heavy equipment in hired logistic shipping in the Indian Ocean has already begun, and the procurement of specialized roll-on/roll-off (Ro-Ro) ships is planned for this and other contingencies. The USAF is attempting to improve its training and readiness, but purchases of new equipment are limited to existing contracts and to the planned procurement of 60 additional A-10 *Thunderbolt II* close-support aircraft. All three services report shortages of spare parts, and some units appear to have difficulty in maintaining an adequate state of combat readiness in consequence.

SOVIET GENERAL-PURPOSE FORCES

Soviet equipment programmes continue to provide new equipment for their three forces. In the Army the familiar PT-76 light tank appears to be retiring, its role being assumed by the BTR-50P replacement—the BMP MICV. The older SSM, *FROG*, *Scud*, and *Scaleboard* tactical nuclear delivery vehicles, are being replaced by new SSM, the SS-21, SS-22, and SS-23, all with greater ranges and presumably greater accuracy and with at least comparable warheads. In the Navy two new titanium-hulled *Alpha*-class nuclear-powered attack submarines, and a new *Kirov*-class cruiser are now reported on trials. *Victor-II* SSN production continues. Two new cruise missiles are also reported, the SS-N-9 and SS-N-12, both with longer ranges than their predecessors. New *Kara*-class cruisers, *Krivak* frigates, and a number of smaller vessels, many of them with missiles, are also under construction. There is increasing evidence that at least one large carrier is under construction, together with a large nuclear-powered surface combatant. In the air there has been a steady increase in aircraft numbers, although no new types have been reported.

The Soviet Union has withdrawn a tank division from East Germany, deploying it in a western Military District. Although there have been many reports that additional tank units have been assigned to the Eastern Europe-based divisions, no firm evidence of such deployment has been received. Soviet ships continue to operate in the Indian Ocean with an average strength of 26, of which some 10 are combatants. Long-range and maritime air reconnaissance continues.

The Afghanistan operation has obviously given the Soviet Union practice in her mobilization procedures. It has no doubt provided experience for those officers and men involved in the planning and execution of the operation itself. It has been apparent that a force designed and prepared for a war on European lines took

time to adjust to low-intensity conflict, and some lack of flexibility and understanding of the problems involved have been noted. Reports clearly indicate that the Soviet

Union has placed great reliance on the armed helicopter for dealing with insurgency, and greater use of this system may be expected.

THE UNITED STATES

Population: 221,600,000.
 Military service: voluntary.
 Total armed forces: 2,050,000 (150,000 women).
 Estimated GNP 1979: \$2,368.8 bn.
 Defence expenditure 1980-81: \$142.7 bn.
 (Expected Outlay in Fiscal 1981. Budget Outlay \$158.2 bn; Total Obligational Authority \$158.7 bn.)

Strategic Nuclear Forces:

(Manpower included in Army, Navy, and Air Force totals.)

OFFENSIVE:

(a) Navy: 656 SLBM in 41 SSBN.
 31 *Lafayette* SSBN: 3 with 16 *Trident I* C-4, 28 with 16 *Poseidon* C-3 (9 to be retrofitted with C-4).
 5 *Washington*, 5 *Allen* SSBN, each with 16 *Polaris* A-3 (6 to convert to SSN by 1981).
 (8 *Ohio* SSBN, each with 24 *Trident* C-4, building.)

(b) Strategic Air Command (SAC):

ICBM: 1,054 in 26 strategic msl sqns.
 9 sqns with 450 *Minuteman II*, 11 with 550 *Minuteman III*.
 6 sqns with 54 *Titan II*. (Note: 1 of these *Titan II* missiles was destroyed in a fire and explosion on September 19, 1980, in a silo near Damascus, Ark.—The Editors)
 (On order: 200 MX.)

Aircraft: Some 430 combat aircraft.

Long-range bombers: 338.
 16 sqns with 151 B-52G, 90 B-52H.
 5 sqns with 75 B-52D.
 Trainers: 22 B-52F.
 Medium-range bombers: 65.
 4 sqns with 65 F-111A.
 Active reserve: a further 3 FB-111A, 31 B-52 (perhaps 4D, 21 G, 6 H).
 Storage: 203 B-52 (all series).
 ASM: 1,250 SRAM.
 Strategic recce and cmd: 1 sqn with 10 SR-71A.
 1 sqn with 10 U-2C/R.
 1 sqn with 4 E-4A/B.
 3 sqns with 27 RC/EC-135.
 Tankers: 34 sqns with 517 KC-135A.
 (On order: 25 TR-1A recce ac.)

DEFENSIVE:

North American Defence Command (NORAD), a joint US-Canadian organization with HQ at Colorado Springs, includes:

Aircraft (excluding Canadian and tac units):

Interceptors: 327.
 (i) Regular: 6 sqns with 148 F-106A.
 (ii) Air National Guard (ANG): 3 sqns with 63 F-101B, 2 with 40 F-4D, 5 with 76 F-106A.
 AAM: *Genie*, *Falcon*, *Super Falcon*.

Warning Systems:

(i) *Satellites*: 1 over Eastern Hemisphere, 2 over Western. (Surveillance and warning system to detect launch of SLBM, ICBM, and fractional orbital bombardment systems (FOBS).)
 (ii) *Space Detection and Tracking System* (SPADATS): USAF 496L *Spacetrack* (6 sites in US), USN *SPASUR* and civilian agencies, Space Defense Center at NORAD Combat Operation HQ. (Satellite tracking, identification, and cataloguing control.)
 (iii) *Ballistic Missile Early Warning System* (BMEWS): 3 stations in Alaska, Greenland, and England. (Radars to detect and track ICBM and IRBM.)
 (iv) *Distant Early Warning* (DEW) Line: 31 stations roughly along the 70° N parallel.

(v) *Pinetree Line*: 24 stations in Central Canada.
 (vi) 474N: 1 station each on US East, Gulf, and West coasts; those on East and West coasts being replaced by *Pave Paws* phased-array radars. (SLBM detection and warning net.)
 (vii) *Perimeter Acquisition Radar Attack Characterization System* (PARCS): 1 north-facing phased-array 2,000-mile system at inactive ABM site in North Dakota.
 (viii) *Cobra Dane Radar*: phased-array system at Shemya, Aleutians. (Detection of ICBM, SLBM, satellites.)
 (ix) *Back-up Interceptor Control* (BUIC): all stations but 1 semi-active. (AD command and control.)
 (x) *Semi-Automatic Ground Environment* (SAGE): 6 locations (2 in Canada); combined with BUIC and Manual Control Centre (MCC) in Alaska (SAGE, BUIC, and MCC are all being replaced by Joint Surveillance System (JSS), with 8 Region Operations Control Centres; 5 in US, 1 in Alaska, 2 in Canada). (Coordinating surveillance and tracking of objects in North American airspace.)
 (xi) *Ground radar stations*: 3 manned by ANG, some 47 by the Federal Aviation Administration (FAA) (to be replaced as surveillance element of JSS).

Army: 774,000 (56,840 women).
 4 armd divs.
 6 mech divs. (One National Guard bde is incorporated in 1 mech and 3 inf divs.)

4 inf divs.
 1 airmobile div.
 1 AB div.
 1 armd bde.
 4 inf bdes.
 3 armd cav regts.
 4 *Pershing*, 8 *Lance* SSM bns.
 Army Aviation: 1 air cav combat bde; indep bns assigned to HQ for tac, tpt, and medical duties.
 Tanks: some 10,900 med, incl 1,825 M-48A5, 1,555 M-60, 6,195 M-60A1, 540 M-60A2 with *Shillelagh* ATGW, 615 M-60A3, 152 M-1 *Abrams*, 1,400 M-551 *Sheridan* lt tks with *Shillelagh*.

APV: some 22,000 M-577, M-114, M-113 APC.
Arty and Msls: about 2,500 105mm, 155mm towed guns/how; 4,000 175mm sp guns and 105mm, 155mm, and 203mm sp how; 3,500 81mm, 2,000 107mm mor; 6,000 90mm and 106mm RCL; 107,000 *TOW*, 7,000 *Dragon* ATGW; *Copperhead* GW; 108 *Pershing*, *Lance* SSM.

AA *arty and SAM*: some 600 20mm and 40mm towed and SP AA guns; some 20,000 *Vulcan* 20 mm AA guns; *Redeye*, *Stinger* SAM; *Chaparral* SAM systems; *Nike Hercules* and *Improved HAWK* SAM (to be replaced by *Patriot*).

Aircraft/Hel: about 550 ac, incl 200 OV-10/10, 350 RU-21/C-12; hel incl about 1,000 AH-1G/Q/S, 4,000 UH-1/19, 55 UH-60A, 500 CH-47/54, 2,500 OH-6A/58A.
 Trainers incl about 200 T-41/42 ac; 250 TH-55A hel.

(On order: 689 M-60A3, 310 M-1 med tks; 550 M-113A1 *TOW*, 1,100 M-901 *Improved TOW* APV, 119 M-2 inf, 100 M-3 cav APV; 450 M-198 155mm, 232 M-109A2/3 155 mm sp how; 10 MLRS (300 rockets) MRL; 485 *Roland*, 795 *Improved HAWK* SAM; 298 AH-1S, 195 UH-60A hel.)

DEPLOYMENT:

Continental United States (including Alaska and Canal Zone):

Strategic Reserve:

(i) 1 mech, 1 AB divs, 1 armd bde;
 (ii) To reinforce 7th Army in Europe, 2 armd, 3 mech, 2 inf, 1 airmobile divs, 1 armd cav regt,

1 inf bde. (One armd, 1 mech divs, 1 armd cav regt have hy eqpt stockpiled in W. Germany.)

(iii) Alaska, 1 bde;
 (iv) Panama, 1 bde.

Europe: 214,165.

(i) Germany: 201,998. 7th Army: 2 corps (incl 2 armed, 2 mech divs, 1 armd, 1 mech, 1 cav bdes plus 2 armed cav regts), 3,000 med tks. (Includes those stockpiled for the strategic reserve formations.)

(ii) West Berlin: 4,400. HQ elements and 1 inf bde.

(iii) Greece: 569.

(iv) Italy: 3,760.

(v) Turkey: 1,200.

Pacific:

(i) South Korea: 30,400, 1 inf div (less 1 inf bde), 1 AD arty bde with 12 *Improved HAWK* btys.
 (ii) Hawaii: 1 inf div less 1 bde.

RESERVES: 535,000. A further 746,500 have some reserve obligation.

(i) Army National Guard: 345,500, capable after mobilization of manning 2 armd, 1 mech, 5 inf divs, 21 indep bdes (3 armd, 8 mech, 10 inf; 4 in regular army divs), plus reinforcements and support units to fill regular formations.

(ii) Army Reserves: 190,000; 49,000 a year do short active duty. 12 trg divs, 1 mech, 2 indep inf combat bdes, 1 tk, 2 inf, 15 indep arty bns, 130 indep aviation units with 566 ac.

Navy: 528,000 (21,600 women); 173 major combat surface ships, 81 attack submarines.

Submarines, Attack:

74 nuclear: 12 *Los Angeles* with *Harpoon* SSM and *SUBROC*; 52 with *SUBROC* (1 *Lipscomb*, 1 *Narwhal*, 37 *Sturgeon*, 13 *Thresher*), 5 *Skipjack*, 4 *Skate*, 1 *Tullibee*.
 7 diesel (to be 5 in 1981): 3 *Barbel*, 1 *Grayback*, 2 *Tang*, 1 *Darter*.

Aircraft carriers: 14 (1 more building).

3 nuclear: 2 *Nimitz* (91,400 tons), 1 *Enterprise* (89,600 tons). 11 conventional: 4 *Kitty Hawk* and *Kennedy* (78/82,000 tons), 4 *Forrestal* (76/79,000 tons), 2 *Midway* (62,200 tons, 1 has no air wing), 1 *Intrepid* (trg, no ac assigned).

12 normally carry 1 air wing (70-95 ac) of 2 fighter sqns with 24 F-14A or 24 F-4J, 3 attack (2 with 24 A-7E, 1 AWX with 10 A-6E), 1 recce with 3 RA-5C or 3 RF-8G, 2 ASW (1 with 10 S-3A ac, 1 with 8 SH-3A/D/G/H hel), 1 ECM with 4 EA-6B, 1 AEW with 4 E-2B/C, 4 KA-6D tankers and other specialist ac.

Other surface ships:

8 nuclear-powered GW cruisers with *Standard* SAM, ASROC: 3 *Virginia*, 2 *California*, 1 *Truxtun*, 1 *Long Beach*, 1 *Bainbridge* with *Harpoon* SSM.

17 GW cruisers with SAM, ASROC: 9 *Leahy*, 8 *Belknap* with 1 hel.

37 GW destroyers with SAM, ASROC: 10 *Coontz*, 4 *Sherman/Hull*, 23 *Adams*.

43 gun/ASW destroyers, most with SAM or ASROC: 30 *Spruance*, 13 *Sherman/Hull*.

13 GW frigates with SAM, ASROC, hel: 7 *Perry*, 6 *Brooke*.

59 gun frigates with ASROC (52 with 1 hel): 46 *Knox*, 10 *Garcia*, 1 *Glover*, 2 *Bronstein*.

2 *Asheville* large patrol craft.
 1 *Pegasus* GW hydrofoil with *Harpoon* SSM.

3 *Aggressive* ocean minesweepers.

65 amph warfare ships: 1 *La Salle*, 2 *Blue Ridge* cmd; 5 *Tarawa* LHA; 7 *Iwo Jima* LPH; 12 *Austin*, 2 *Raleigh* LPD; 5 *Anchorage*, 8 *Thomaston* LSD; 20 *Newport* LST, 5 *Charleston* amph cargo ships.

114 LCU: 60 Type 1610, 31 Type 1466, 23 Type 501.

54 replenishment and 20 depot and repair ships.

(On order and funded (5 years): 6 SSBN, 22 SSN, 1 nuclear carrier, 1 *Aegis* GW cruiser, 5 destroyers, 33 GW frigates, 5 GW hydrofoils, 11 auxiliaries.)

Ships in reserve:

3 subs, 6 aircraft carriers, 4 battleships, 8 cruisers, 8 destroyers, 46 log support and 41 troop, 19 cargo and tanker ships, 3 LST, 2 LPC, 22 ocean minesweepers. (279 cargo-ships, 162 tankers could be used for auxiliary sealift.)

Aircraft: 12 attack carrier air wings; some 1,200 combat aircraft.

26 fighter sqns: 14 with 168 F-14A, 12 with 144 F-4.

36 attack sqns: 12 med with 110 A-6E, 24 lt with 300 A-7E.

10 recce sqns with 30 RF-8.

24 land-based MR sqns with 260 P-3B/C.

11 ASW sqns with 110 S-3A.

13 AEW sqns with 52 E-2B/C.

19 ASW hel sqns: 12 with 72 SH-3A/D/G/H, 7 lt with SH-2F.

17 misc spt sqns with 14 C-130F/LC-130/EC-130Q, 7 C-118, 2 C-9B, 16 CT-39, 13 C-131, 6 C-117, 20 C-1, 10 C-2, 44 UC-12B, 36 EA-6B ac; 24 RH-53D, CH-46, SH-3, SH-2B/C hel.

1 aggressor trg sqn with 15 F-5E/F.

19 trg sqns with T-1A, T-2B/C, T-28/-29B/-34/-38/-44, TA-4J/F, TA-7C, TS-2A, TE-2 ac; TH-1, UH-1D, TH-57A hel.

AAM: *Sparrow*, *Phoenix*.

ASM: *Standaard*, *Butipup*, *Shrike*.

(On order: 811 F-18 fighters, 3 EC-130Q EW ac, 20 CH-53E *Super Stallion*, UC-12B hel.)

DEPLOYMENT AND BASES (average strengths of major combat ships; some based overseas in Mediterranean and Western Pacific, rest rotated from US):

Second Fleet (Atlantic): 5 carriers, 64 surface combatants. Norfolk (HQ), Mayport, Roosevelt Roads (Puerto Rico), Charleston, Philadelphia, Brooklyn, New London, Newport, Boston, Guantanamo Bay (Cuba), Argentia (Newfoundland), Keflavik (Iceland), Holy Loch (Britain).

Third Fleet (Eastern Pacific): 4 carriers, 67 surface combatants. Pearl Harbor (HQ), San Francisco, San Diego, Long Beach, Adak (Alaska).

Sixth Fleet (Mediterranean): 5 subs, 2 carriers, 12 surface combatants. Gaeta (HQ), Naples (Italy), Rota (Spain).

Seventh Fleet (Western Pacific): 7 subs, 2 carriers, 26 surface combatants. Yokosuka (Japan, HQ), Subic Bay (Philippines), Apra Harbor (Guam), Midway.

Dets serve in the Indian Ocean (2 carrier task forces: 2 carriers, some 18 surface combatants). Middle East Force (Persian Gulf): 1 cmd ship, 4 surface combatants.

RESERVES: 88,000. A further 335,600 have some Reserve obligation.

Ships in commission with the Reserve include 23 destroyers, 3 amph warfare ships, 22 ocean minesweepers, 2 log ships.

2 carrier wings: 6 attack sqns with A-7B, 4 fighter with F-4N, 2 recce with RF-8G, 2 AEW with E-2B, 3 ECM with EA-6A, EKA-3.

2 MR wings: 13 sqns with P-3A/B.

1 tac spt wing: 2 composite sqns with TA-4J, 6 spt sqns with C-9, C-118, C-130.

1 hel wing: 7 hel sqns (4 ASW with SH-3D, 2 lt attack with HH-1K, 1 SAR with HH-3).

Marine Corps: 189,000 (5,085 women).

3 divs, each of 9 inf, 1 recce, 1 engr, 1 amph bns, 1 arty regt.

2 SAM bns with *Improved HAWK*.

575 M-60A1 med tks; 950 LVTP-7 APC; 175mm SP guns; 105mm, 155mm towed, 155mm, 203mm SP how; 230 81mm mor; 106mm RCL; *TOW*, *Dragon* ATGW; *Redeye* SAM.

3 Air Wings: 35,600; 416 combat aircraft.



Expanding the US's global reach is the KC-10 tanker/cargo aircraft. Six have been ordered and additional USAF acquisitions are expected.

12 fighter sqns with 144 F-4N/S.

13 FGA sqns: 3 lt with 78 AV-8A *Harrier* v/STOL, 5 lt with 60 A-4M, 5 med with 60 A-6A/E.

1 recce sqn with 10 RF-4B.

2 ECM sqn with 20 EA-6B.

2 observation sqns with 24 OV-10A.

3 assault pt/tanker sqns with 36 KC-130F.

24 hel sqns: 6 hy with 126 CH-53D, 9 med with 162 CH-46F, 6 lt with 96 UH-1N, 3 attack with 72 AH-1J/T.

6 trg sqns with some 40 A-4M/TA-45, A-6C, AV/TAV-8A, F-4J/N ac; CH-46F, CH-53D hel.

AAM: *Sparrow*, *Sidewinder*.

RESERVES: 33,300. A further 82,400 have some Reserve obligation.

1 div and 1 Fleet marine force, 1 regt, 50 combat and spt bns.

1 air wing: 2 fighter sqns with 24 F-4N, 6 attack sqns with 72 A-4E/F, 1 observation sqn with 16 OV-10A/D, 1 tpt/tanker sqn with 12 KC-130, 7 hel sqns (1 attack with 16 AH-1G, 2 heavy with 18 CH-53, 3 medium with 54 CH-46, 1 light with 21 UH-1E), 1 SAM bn with *HAWK*.

Air Force: 555,100 (53,230 women); about 3,700 combat aircraft. (Excluding ac in SAC and NORAD; incl ac in ANG and Air Force Reserve.)



Since the mid-1970s, the all-weather F-15 Eagle has progressively replaced the F-4 Phantom as USAF's primary air-superiority aircraft.

DEPLOYMENT:

Continental United States:

2 Marine Amphibious Forces (MAF), each with 1 div, 1 air wing.

Pacific:

(i) Japan: 1 MAF (1 div, 1 air wing), 1 Marine Amphibious Unit (MAU), 1 bn landing team. (Marine Amphibious Units are 5-7 amph ships with a Marine bn embarked. Only 1 in Mediterranean and 1 in Pacific are regularly constituted. 1 Bn Landing Team (MAU less hel) also deployed in the Pacific; 1 occasionally formed for the Atlantic.)

(ii) Hawaii: 1 bde (from div in US).

26 wings, comprising 79 FGA sqns: 32 with 868 F-4, 16 with 360 F-15, 3 with 72 F-16, 5 *Wild Weasel* (1 with 24 F-105G, 4 with 84 F-4G), 11 with 282 F-111A/D/E/F, 3 with 72 A-7D, 9 with 216 A-10A.

6 tac recce sqns with 192 RF-4C.

3 AWACS sqns with 20 E-3A.

1 defence system evaluation sqn with 21 EB-57 (a second forming, to have EF-111A).

11 tac air control sqns: 6 with 88 OV-10 and O-2E, 1 with 7 EC-130E, 1 with 11 EC-135 ac, 3 with 27 CH-3 hel.

5 special operations sqns: 4 with 20 AC-130 ac, 1 with CH-3, UH-1 hel.

4 aggressor trg sqns with 55 F-5E.

17 OCUS: 1 with F-16, 7 with F-4, 1 with F-5, 2 with F-15, 2 with F-101/106, 3 with A-10, 1 with RF-4C.
 1 tac drone sqn with 7 DC-130A.
 14 tac airlift sqns with 276 C-130.
 17 hy tpt sqns: 4 with 74 C-5A, 13 with 241 C-141.
 7 SAR sqns with 30 HC-130 ac, 76 HH-3/53, 11 HH-1 hel.
 3 medical tpt sqns with 23 C-9.
 2 weather recce sqns with 14 WC-130, 29 WC-135.
 Hel incl 138 UH-1N, 21 HH-3E, 51 HH/CH-53.
 28 trg sqns: 8 F-16B, 300 T-33A, 662 T-37B, 690 T-38, 113 T-39, 100 T-41A/C, 13 T-43A, 3 C-5A, C-130E, C-141A, 2 UV-18A (DHC-6).
 AAM: *Phoenix, Sidewinder, Sparrow*.
 ASM: *Bullpup*.
 ARM (anti-radiation msls): *Shrike, Standard*.
 (On order: 248 F-16, 90 F-15 fighters; 379 A-10 FGA.)

DEPLOYMENT:

Continental United States (incl Alaska):

- (i) Tactical Air Command: 82,000. 9th and 12th Air Forces; 42 fighter sqns, 3 tac recce sqns, 4 tac air spt sqns, 10 tac airlift sqns.
- (ii) Military Airlift Command (MAC): 64,500. 21st and 22nd Air Forces; 6 wings.

THE SOVIET UNION

Population: 265,500,000.

Military service: Army and Air Force 2 years, Navy and Border Guards 2-3 years.
 Total armed forces: 3,658,000. (Excludes some 500,000 internal security troops, railroad and construction troops.)
 Estimated GNP 1979: 422.5 bn roubles. (See "Foreword," p. 62. Official exchange rate 1979, \$1 = 0.657 roubles.)
 Estimated defence expenditure: see p. 70.

Strategic Nuclear Forces:

(For characteristics of nuclear delivery vehicles, see Table 1 pp. 128-129.)

OFFENSIVE:

- (a) *Navy*: 1,003 SLBM in 87 subs (955 SLBM within SALT Agreement).
 10 D-III SSBN, each with 16 SS-N-18 (more building).
 4 D-II SSBN, each with 16 SS-N-8.
 19 D-I SSBN, each with 12 SS-N-8.
 1 Y-II SSBN with 12 SS-NX-17 (trials).
 29 Y-I SSBN, each with 16 SS-N-6 *Sawfly*, (4 more believed converting to attack subs).
 1 H-III SSBN with 6 SS-N-8.
 7 H-II SSBN, each with 3 SS-N-5 *Serb*.
 13 G-II diesels, each with 3 SS-N-5 (3 in reserve).
 3 G-class diesels: 1 G-III (with 4 SS-N-8), 1 G-IV (with 5 SS-N-6), 1 G-V (missile trials boat). (These 48 launchers are not considered strategic missiles under the terms of the Strategic Arms Limitation (Interim) Agreement.) 3 G-I, (3 SS-N-4 *Sark* each) have been withdrawn but not yet reported as scrapped.
 (Typhoon-class, possibly 24 SS-N-18, building.)
 - (b) *Strategic Rocket Forces* (SRF): 385,000 (50,000 civilians). (The SRF and PVO-Strany, separate services, have their own manpower.) 6 operational rocket armies, organized in divs, regts, bns and bty; probably 1 msl per bty; 300 launch control HQ; 3 msl test centres.
- ICBM*: some 1,398.
 580 SS-11 *Sego* (some converting to SS-19). (Figures may vary slightly during conversion.)
 60 SS-13 *Savage*.
 150 SS-17 (mostly mod 1, 4 MIRV).
 308 SS-18 (mostly mod 2, 8-10 MIRV), have replaced SS-9.
 300 SS-19.

Europe: US Air Force, Europe (USAFE): 75,400. 3rd Air Force (Britain), 16th Air Force (Spain); units in Italy, Greece, and Turkey), 17th Air Force (Germany and Netherlands), 1 AD sqn in Iceland. 27 fighter sqns, plus 5 in US on call (6 with 108 A-10, 10 with 204 F-4C/D/E, 4 with 72 F-15, 7 with 156 F-111E/F); 2 tac recce sqns, plus 3 in US on call, with 48 RF-4C, 24 F-4G *Wild Weasel*; 2 tac airlift sqns (plus 6 in US on call) with 32 C-130.

Pacific: Pacific Air Forces (PACAF): 31,200. 5th Air Force (Japan, Okinawa, 1 wing in Korea), 13th Air Force (Philippines). 9 fighter sqns (6 with F-4, 3 with F-15); 1 tac recce sqn with RF-4; 1 special operations sqn with OV-10; det with 2 E-3A AWACS.

RESERVES: 150,000. A further 452,300 individuals have some Reserve obligation.

- (i) Air National Guard: 93,400; about 800 combat aircraft.
 10 interceptor sqns; 31 fighter sqns (4 with 80 F-105B/D, 9 with 160 F-4C, 14 with 320 A-7D, 4 with 78 A-10); 9 recce sqns (1 with 20 RF-101C, 8 with 135 RF-4C); 19 tac tpt sqns (18 with 150 C-130A/B/E/H, 1 with 16 C-7A); 4 tac air spt sqns with 50 OA-37B; 16 tanker sqns with 128 KC-135; 2 special

electronics sqns (1 with 20 EB-57B, 1 with 20 EC-130); 2 SAR sqns (1 with 8 HC-130 ac, 1 with HH-3E hel).

- (ii) Air Force Reserve: 56,700; about 190 combat aircraft.
 8 fighter sqns (3 with 69 F-105D, 4 with 92 A-37B, 1 with 20 F-4C); 17 tac tpt sqns (11 with 140 C-130A/B, 4 with 70 C-123K, 2 with 38 C-7); 1 recce drone sqn with DC-130 ac, E/CH-3 hel; 3 tanker sqns with 24 KC-135; 1 special operations sqn with 10 AC-130; 1 weather recce sqn with 4 WC-130; 4 SAR sqns (2 with 13 HC-130 ac, 2 with 20 HH-3E, HH-1H hel). 18 Reserve Associate Military Airlift sqns (personnel only): 4 for C-5A, 13 for C-141A, 1 aero medical for C-9A.
- (iii) Civil Reserve Air Fleet: 373 long-range commercial ac (DC-8/10, Boeing 707/747; 123 cargo/convertible, 250 passenger).

Coast Guard: Some 37,000; 40 destroyer-size vessels, 7 icebreakers, 76 patrol craft, some 50 aircraft and 120 hel, incl HC-130, HC-131, HU-16 ac, HH-3F, HH-52A hel.

Coast Guard Reserve: 11,600 (a further 9,700 have some Reserve obligation); 151 vessels.

IRBM and MRBM: some 600 deployed (perhaps 500 in western USSR, rest east of Urals).

60 SS-5 *Skean* IRBM.
 160 SS-20 IRBM (mobile; launchers capable of being reloaded).
 380 SS-4 *Sandal* MRBM.

Reserves: 520,000 personnel; a proportion of the msls withdrawn from service.

(c) *Long-Range Air Force* (LRAF): 45,000; some 850 combat aircraft. 3 Air Armies (2 in Europe, 1 Far East): 9 divs. (There are also staging and dispersal points in the Arctic.)
 Long-range bombers: 156.

113 Tu-95 *Bear* A/B, 43 Mya-4 *Bison* (some 75 *Bear* have AS-3 *Kangaroo* ASM).
 Medium-range bombers: 518.

318 Tu-16 *Badger*, 125 Tu-22 *Blinder*, 15 Tu-26 *Backfire* A, 60 Tu-22M *Backfire* B (all with ASM).
 Recce: 34.

4 Tu-95 *Bear* C/D/E, 15 Tu-16 *Badger* D/E/F/K, 15 Tu-22 *Blinder* C.
 ECM: 100 Tu-16 *Badger* H/J.
 Tankers: 45.

35 Mya-4 *Bison* A, 10 Tu-16 *Badger*.

DEFENSIVE:

Air Defense Force (PVO *Strany*): 550,000; (The SRF and PVO-*Strany*, separate services, have their own manpower.) 10 Air Defence Districts, numerous AD formations, 14 specialist schools. It includes:

ABM: 64 ABM-1 *Galosh* (some 32 reported nonoperational); range over 320 km, warheads nuclear, presumably MT range.

1 regt (4 bns) at 4 sites around Moscow.
Aircraft: about 2,600; organized in regts and sqns.

Interceptors: some 600 MiG-23 *Flogger* B, 330 MiG-25 *Foxbat* A, some 430 Su-9 *Fishpot* B, Su-11 *Fishpot* C, 800 Su-15 *Flagon* D/E/F, 135 Tu-28P *Fiddler*, 320 Yak-28P *Firebar*.
 AAM incl AA-6 *Acrid*, AA-7 *Apex*.

Airborne Warning and Control Aircraft: 10 modified Tu-126 *Moss*, 8 Il-86 *Camber*.
 Trg ac incl 40 Su-11, 120 Su-15, 20 MiG-15, 60 MiG-17, 50 MiG-23, 50 MiG-25, 10 Yak-28.

SAM: About 10,000 launchers in some 1,200 fixed sites: some 12,000 SA-1 *Guild*, SA-2 *Guideline*, SA-3 *Goa*, SA-5 *Gammon*; SA-10 now entering service (limited anti-cruise-mls capability).

AA artillery: 23mm, 57mm, 85mm, 100mm, 130mm guns.

Warning Systems: Some 7,000, incl satellites and EW and ground control intercept radars.

(i) *Satellites*: 1 geostationary over the Atlantic (anti-SLBM). 2 *Molniya*-type with elliptical orbits (anti-ICBM).

(ii) *Over-the-Horizon* (Backscatter) radars: 3 (possibly 4), near Minsk, near Nikolayev (Caucasus), and in the Far East; targeted on the US and polar areas.

(iii) *Long-range early-warning radars*: At least 5 reported sites, possibly 12 more. Mostly *Hen*-series (e.g. *Hen House*), range 6,000 km, covering approaches from the west, north-east, south-east and, possibly, south.

(iv) *Intermediate-range radars*: *Dog House* and *Cat House*, associated with the Moscow ABM complex, range about 3,000 km.

(v) *ABM-associated control radars*: *Try Add* (with *Galosh*).

(vi) *High-altitude, aircraft-associated radars*: *Tall King*, 600 km range.

(vii) *Missile-associated short range radars*: *Yo-Yo* (with SA-1); *Fan Song*, *Spoon Rest* (SA-2); *Flat Face*, *Squat Eye*, *Low Blow* (SA-3).

(viii) *Gun-associated radars*: *Fire Can*, *Flap Wheel*.

Civil Defence: 2 widespread shelter programmes down to city level include some 75 cmd posts within 120 km of Moscow, and accommodation for at least 110,000 officials.

Army: 1,825,000 (perhaps 1,400,000 conscripts). 46 tk divs.
 119 motor rifle divs.
 8 AB divs.

Tanks: 50,000 IS-2/3, T-10, T-10M hy, T-54/55/62/64/72 med (most fitted for deep wading) and PT-76 lt.

AFV: 62,000 BRDM scout cars; BMP and BMD MICV; BTR-40/50/60/152, OT-64, MT-LB APC.

Artillery: Some 20,000 100mm, 122mm, 130mm, 152mm, and 180mm towed guns/how and 122mm and 152mm sp guns; 7,200 82mm, 120mm, 160mm, and 240mm mor; 2,700 122mm, 140mm, and 240mm MRL; 10,800 76mm, 85mm, 100mm towed and ASU-75/85 sp ATK guns; AT-2 *Swatter*, AT-3 *Sagger*, AT-4 *Spigot*, AT-5 *Spandrel*, AT-6 *Spiral* ATGW.

AA Artillery: 8,000 23mm, 57mm towed, ZSU-23-4 and ZSU-57-2 sp guns.

SAM (mobile systems): SA-4 *Ganef*, SA-6 *Gainful*, SA-7 *Grail*, SA-8 *Gecko*, SA-9 *Gas-kin*, SA-11.

SSM (nuclear-capable): about 1,300 launchers

(units organic to formations), incl *FROG*, SS-21 (replacing *FROG*), *Scud A/B*, SS-22 (replacing *Scud*), SS-12 (being replaced by SS-23).

DEPLOYMENT AND STRENGTH:

Central and Eastern Europe: 30 divs (15 tk, 15 motor rifle): East Germany, 9 tk, 10 motor rifle; Poland, 2 tk; Hungary 2 tk, 2 motor rifle; Czechoslovakia 2 tk, 3 motor rifle. 10,500 med tks. (Excluding from the area tks in reserve, replaced by new ones but not withdrawn.)

European USSR Military Districts (MD): 67 divs (23 tk, 38 motor rifle, 6 AB): Baltic, 3 tk, 5 motor rifle, 2 AB; Belorussian, 9 tk, 2 motor rifle, 1 AB; Carpathian, 2 tk, 9 motor rifle; Kiev, 7 tk, 4 motor rifle; Leningrad, 8 motor rifle, 1 AB; Moscow, 2 tk, 4 motor rifle, 1 AB; Odessa, 6 motor rifle, 1 AB.

Central USSR: 6 divs, (1 tk, 5 motor rifle): Ural, 1 tk, 2 motor rifle; Volga, 3 motor rifle.

Southern USSR: 24 divs (1 tk, 21 motor rifle, 2 AB): N. Caucasus, 1 tk, 5 motor rifle; Trans-Caucasus, 11 motor rifle, 1 AB; Turkestan, 5 motor rifle, 1 AB.

Sino-Soviet border: 46 divs (6 tk, 40 motor rifle): Central Asian, 1 tk, 6 motor rifle; Siberian, 5 motor rifle; Transbaykal, 3 tk, 7 motor rifle; Far Eastern, 1 tk, 29 motor rifle; Mongolia, 1 tk, 2 motor rifle. (Siberian, Transbaykal, and Far East may combine.)

Afghanistan: perhaps 5 motor rifle, 1 AB (parent MD unknown; incl with MD totals above).

Soviet divs have three degrees of combat readiness: Category 1, between three-quarters and full strength, with complete eqpt; Category 2, between half and three-quarters strength, complete with fighting vehicles; Category 3, about one-quarter strength, possibly complete with fighting vehicles (some obsolescent).

The 30 divs in Eastern Europe are Category 1. About half those in European USSR and the Far East are in Category 1 or 2. Most of the divs in Central and Southern USSR are likely to be Category 3. Tk divs in Eastern Europe have some 335 med tks, motor rifle divs up to 266, but elsewhere holdings may be lower.

Navy: 433,000 (some 75% conscripts), incl 59,000 Naval Air Force, 12,000 Naval Infantry, and 8,000 Coastal Artillery and Rocket Troops; 289 major surface combat ships. 257 cruise-missile and attack subs (91 nuclear, 166 diesel). A further 25 major surface combat ships and 115 attack submarines are in reserve.

Submarines, cruise-missile:

45 nuclear: 1 P-class (10 msl tubes), 15 C-class (8 SS-N-7 *Siren* each), 29 E-II (4 with 8 SS-N-12, 25 with 8 SS-N-3 *Shaddock* each). 23 diesel: 16 J-class (4 SS-N-3 each), 5 *W-Long Bin* (4 SS-N-3 each), 2 *W-Twin Cylinder* (2 SS-N-3 each).

Submarines Attack:

46 nuclear: 2 A-, 13 N-, 16 V-I-, 10 V-II-, 5 E-I-class. 143 diesel: 60 F-, 10 R-, 10 Z-IV-, 45 W-, 4 B-, 10 T-, 4 coastal Q-class.

Surface ships:

2 *Kiev* carriers of 43,000 tons (2 more building) with SS-N-12 SSM, SA-N-3/-4 SAM, SUW-N-1 ASW msls, 14 Yak-36 *Forger* A/B VTOL ac, 16 Ka-25 *Hormone* A/B hel.

2 *Moskva* ASW hel carriers with SA-N-3, SUW-N-1, 18 Ka-25 hel.

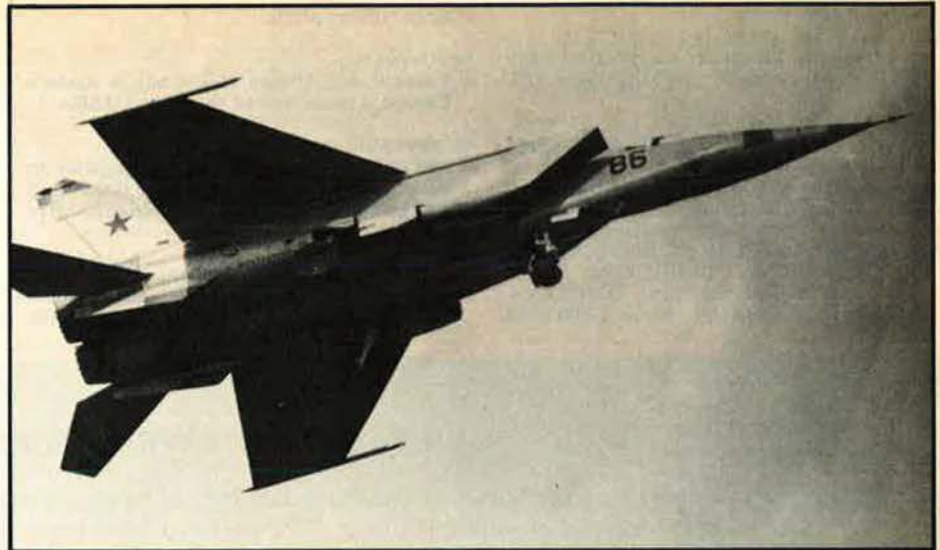
17 ASW cruisers (more building) with SA-N-3 SAM, SS-N-14 ASW msls, 1 hel: 7 *Kara*, 10 *Kresta-II*.

8 GW cruisers with SA-N-1, SS-N-3: 4 *Kresta-I* (with 1 hel), 4 *Kynda*.

(1 nuclear-powered 25,000-ton *Kirov* GW cruiser with SSM and SAM nearing completion; more building.)

12 cruisers: 11 *Sverdlov* (1 with SA-N-2, 2 with SA-N-4 SAM, 2 with hel), 1 *Chapaev* (trg).

75 destroyers (9 SSM, 30 SAM, 36 gun): 4 *Kildin* (1 with 1 SS-N-1, 3 with 4 SS-N-2), 5 modified *Kashin* with 4 SS-N-2; 14 *Kashin* (13



A heavyweight among Soviet interceptors is the MiG-25 Foxbat, the world's fastest and highest-climbing weapon-carving aircraft.

with 4 SA-N-1, 1 trials), 8 Kanin, 8 modified *Kotlin* (2 SA-N-1); 18 *Kotlin*, 18 *Skory*.

(Some ships in these listings have been reclassified since the previous edition.)

173 frigates (63 GW, 110 gun): 26 *Krivak-I/II* (4 SS-N-14 ASW, 4 SA-N-4) (more building), 2 *Koni* (4 SA-N-4), 35 *Grisha-I/II/III* (2 SA-N-4); 6 *Grisha-II* (may be with KGB), 20 *Mirka*, 48 *Petya*, 36 *Riga*.

21 GW corvettes: 2 *Tarantul* (4 SS-N-2), 19 *Nanuchka* (6 SS-N-9, 2 SA-N-4).

131 FAC(M) (11 hydrofoil): 1 *Sarancha* (4 SS-N-9, 1 SA-N-1), 10 *Matka* (2 SS-N-2); 70 *Osa-I*, 50 *Osa-II* (4 SS-N-2).

188 FAC(T): 64 *Poti*, 88 *Stenka*, 1 *Slepen* (trials), 1 *Babochka*, 34 *Turya* hydrofoils.

80 patrol craft: 35 *Shersten*, 45 SO-1.

40 coastal patrol craft< (mostly KGB); 20 *Zhuk*, 20 *Pchela* hydrofoils.

149 ocean minesweepers: 17 T-58, 28 *Natya*, 49 *Yurka*, 55 T-43 (5 more are T-43/AGR radar pickets).

154 coastal minesweepers: 3 *Andryusha*, 4 *Zhenya*, 72 *Vanya*, 30 *Sonya*, 10 *Sasha*, 35 *Evgenya*<.

59 minesweeping boats<: 40 K-8, 10 *Ilyusha*, 4 *Olya*, 5 TR-40.

Some 93 amph ships, incl 1 *Ivan Rogov* (more building), 14 *Alligator*, 13 *Ropucha* LST, 55 *Polnochny*, 10 MP-4 LCT.

Some 40 LCU: 20 *Vydra*, 20 SMB-1.

52 hovercraft: 8 *Aist*, 11 *Lebed*<, 33 *Gus*<.

Some 212 log ships, 57 oilers, 91 supply ships, 64 fleet support ships.

54 intelligence collection vessels (AGI). Some 110 civilian oceanographic and hydrographic research vessels could augment this category.

Ships in active reserve: 10 Z-, 90 W-, 15 Q-class subs; 1 *Sverdlov* cruiser; 12 *Skory* destroyers; 12 *Riga* frigates; 20 T-43 minesweepers.

NAVAL AIR FORCE: 59,000; some 775 combat aircraft.

Four Fleet Air Forces; organized in air divs, each with 2-3 regts of HQ and 2 sqns; recce, ASW, tpt organized in indep regts or sqns.

Strike bbrs: some 70 Tu-22M *Backfire* B with AS-4 *Kitchen* ASM.

Med bbrs: 250 Tu-16 *Badger* C/G with AS-2 *Kipper/AS-5 Kelt/AS-6 Kingfish*, 30 TU-16 *Badger* A, some 40 Tu-22 *Blinder* A.

FGA: 45 Yak-36 *Forger* A/B VTOL, 45 *Fitter* C/D.

ASW: some 40 Tu-95 *Bear* E, 50 Il-38 *May*, 90 Be-12 *Mail*.

MR/ECM: some 40 Tu-16 *Badger* D/E/F, 40 *Bear* D, 5 *Blinder* C, 30 An-12 *Cub* C.

Tankers: 74 Tu-16 *Badger*.

ASW hel: 70 Mi-14 *Haze*, 180 Ka-25 *Hormone* A/B. 200 misc tpts and trainers, and tpt hel.

NAVAL INFANTRY (Marines): 12,000.

5 naval inf regts (each 3 inf, 1 tk bn), one assigned to each of Northern, Baltic, and Black Sea Fleets, two to Pacific Fleet.

T-54/-55 med, PT-76 lt tks; BMP MICV, BTR-60P APC; BM-21 122mm MRL; ZSU-23-4 SP AA guns; SA-9 SAM.

COASTAL ARTILLERY AND ROCKET TROOPS: 8,000.

Hy coastal guns, SS-C-1B *Sepal* SSM (similar to SS-N-3) to protect approaches to naval bases and major ports.

DEVELOPMENT AND BASES (average strengths, excluding SSBN and units in reserve):

Northern Fleet: 130 subs, 80 major surface combat ships, 80 bombers. Severomorsk (HQ).

Motovskij Gulf, Polyarny, Severodvinsk, Archangelsk.

Baltic Fleet: 25 subs, 40 major surface combat ships, 120 bombers. Baltiysk (HQ), Kronshadt, Tallin, Liepaja.

Black Sea Fleet (incl Caspian Flotilla and Mediterranean Sqns): 25 subs, 85 major surface combat ships, 90 bombers. Sevastopol (HQ), Tuapse, Poti, Odessa, Nikolayev.

Pacific Fleet: 80 subs, 80 major surface combat ships, 100 bombers. Vladivostok (HQ), Petropavlovsk, Sovyetskaya Gavan, Magadan.

(Detachments from this fleet serve in the Indian Ocean; facilities also at Da Nang and Cam Ranh Bay, Vietnam.)

Air Force: 475,000. (Excluding *PVO-Strany* and Long-Range Air Force.)

Tactical Air Force: 195,000; some 5,000 combat aircraft.

16 Air Armies of varying strengths (totalling 112 regts, 7 indep sqns), organized in divs of 3 regts (each regt usually of a single ac type in 3 sqns, totalling 50 ac).

FGA: some 1,000 MiG-21 *Fishbed* J/K/L/N, 400 MiG-27 *Flogger* D, 165 Su-7 *Fitter* A, 640 Su-17 *Fitter* C/D, 370 Su-24 (Su-19) *Fencer*, 60 Yak-28 *Brewer* A/B/C.

Fighters: 850 MiG-21 *Fishbed* C/D/F, 900 MiG-23 *Flogger* B.

Recce: 170 MiG-25 *Foxbat* B/D, 250 *Fishbed* H, 175 *Brewer* D, 40 *Fitter* H.

ECM: 20 Brewer E, 5 An-12 Cub B/C ac, 30 Mi-4 Hound C hel.

Hel: Some 3,200: 300 Mi-1/-2 Hare/Hoplite, 170 Mi-4 Hound A, 380 Mi-6 Hook, 1,600 Mi-8 Hip B/C/E, 10 Mi-10 Harke, 750 Mi-24 Hind A/B/C/D/F.

Trainers: Some 1,100.

AAM: AA-1 Alkali, AA-2 Atoll, AA-3 Anab, AA-5 Ash, AA-7 Apex, AA-8 Aphid.

ASM: hel-borne AT-2 Swatter, AT-6 Spiral.

Military Transport Aviation: 125,000; some 1,550 aircraft. Organized in regiments.

Incl some 600 An-12 Cub, 40 An-24/-26 Coke/Curl, 20 Il-14 Crate, 20 Il-18 Coot, 8 Il-62 Classic, 20 Tu-134 Crusty med, 75 Il-76 Candid, 60 An-22 Cock hy. Some 1,400 civil

Aeroflot med- and long-range ac could augment military airlift.

DEPLOYMENT:

4 Tactical Air Armies (1,700 ac) in eastern Europe, 1 in each of 12 MD in the USSR.

RESERVES (all services):

Soviet conscripts have a Reserve obligation to age 50. Total Reserves could be 25,000,000, of which some 5,000,000 have served in last five years.

Soviet forces abroad: Afghanistan, 85,000; Cuba, 7,500; Ethiopia, 1,200; Iraq, 1,000; Libya, 1,000; Mali, 1,800; Mauritania, 200;

Vietnam, 4,000; Syria, 2,500; South Yemen, 1,500.

Para-Military Forces: 460,000.

200,000 KGB border troops, 260,000 MVD security troops. Border troops equipped with tks, SF guns, AFV, ac, and ships; MVD with tks and AFV.

Part-time military training organization (DOSAAF) conducts such activities as gliding, shooting, parachuting, and pre-military training of those 15 and over in schools, colleges, and workers' centres. Claimed active membership 80 million, with 5 million in instructors and activists; effectives likely to be much fewer.

SOVIET DEFENCE EXPENDITURE

No single figure for Soviet defence expenditure can be given, since precision is not possible on the basis of present knowledge. The declared Soviet defence budget is thought to exclude a number of elements such as military R&D, stockpiling, and civil defence—indeed some contend that it covers only the operating and military construction costs of the armed forces. The official defence budget for 1980 of 17.1 bn roubles equals about 6% of the total government expenditure, or 2.8% of GNP, according to non-Soviet estimates of the latter.

Furthermore, Soviet pricing practices are quite different from those in the West. Objectives are set in real terms with no requirement for money prices to coincide with the real costs of goods and services. The rouble cost of the defence effort may thus not reflect the real cost of alternative production forgone and in turn, a rouble value of defence expressed as a percentage of Soviet GNP measured in roubles may not reflect the true burden.

If rouble estimates are then converted into dollars to facilitate international comparisons, the difficulties are compounded, because the exchange rate chosen should relate the purchasing power of a rouble in the Soviet Union to that of a dollar in the USA. The official exchange rate is considered inadequate for this purpose, and there is no consensus on an alternative.

An alternative approach—estimating how much it would cost to produce and man the equivalent of the Soviet defence effort in the USA—produces the index number problem: faced with the American price structure, the Soviet Union might opt for a pattern of spending different from her present one. This particular method tends to overstate the Soviet defence effort relative to that of the USA.

Accordingly, the estimates produced by a number of methods are given below, both in roubles and dollars, together with official figures for the defence budget published by the Soviet Union. Estimates produced by China are also given but their basis is not known.

Source		Price base	SOVIET UNION Defence expenditure				1970-1979	
			1970	1975	1978	1979	% annual growth rate	Burden (% of GNP)
Billions of Roubles								
CIA	(1)	1970	40-45	50-55	56-61	58-64	4.5	11-13
Lee	(2)	1970	43-49	72-79	91-101	99-111	8-10	14-15
Lee	(2)	Current	43-49	67-76	88-100	—	—	—
China	(3)	Current	49	72.5	92.5	102	8.26	15+
USSR	(4)	Current	17.9	17.4	17.2	17.2	n.a.	n.a.
Billions of Dollars								
CIA	(5)	1978	105	120	148	152	5	—
CIA	(6)	Current	66-99	105-108	148	165	—	—
Lee	(7)	1970	80-105	97-133	116-154	124-162	5	—

(1) Estimated Soviet Defense Spending in Roubles, CIA SR 78-10121, June 1978.

(2) W. T. Lee, 'Soviet Defense Expenditures in the 10th FYP', *Osteuropa Wirtschaft*, No. 4, 1977; W. T. Lee, *The Estimation of Soviet Defense Expenditures, 1955-75: An Unconventional Approach* (New York: Praeger, 1977).

(3) *Peking Review*, November 1975, January 1976. Extrapolation to 1979 using the Chinese growth rate.

(4) Official declared budget.

(5) *Soviet and US Defense Activities 1970-79: A Dollar Cost Comparison*, CIA SR 80-10005, January 1980. 1970 and 1975 figures taken from diagram.

(6) *Ibid.*; 1979 prices converted to current ones using wholesale price index.

(7) W. T. Lee, 'Soviet Defense Expenditures' in W. Schneider and F. P. Hoerber (eds), *Arms, Man & Military Budgets, Issues for Fiscal Year 1977* (New York: Crane Russak, 1976). 1979 figures by extrapolation.

The Warsaw Pact

TREATIES

The Warsaw Pact is a multilateral military alliance formed by the 'Treaty of Friendship, Mutual Assistance and Co-operation' which was signed in Warsaw on 14 May 1955 by the Governments of the Soviet Union, Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania; Albania left the Pact in September 1968. The Pact is committed to the defence only of the European territories of the member states.

The Soviet Union is also linked by bilateral treaties of friendship and mutual assistance with Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania. Members of the Warsaw Pact have similar bilateral treaties with each other. The essence of East European defence arrangements is not therefore dependent on the Warsaw Treaty as such. The Soviet Union concluded status-of-forces agreements with Poland, East Germany, Romania, and Hungary between December 1956 and May 1957 and with Czechoslovakia in October 1968; all remain in effect except the one with Romania, which lapsed in June 1958 when Soviet troops left Romania.

ORGANIZATION

The Political Consultative Committee consists, in full session, of the First Secretaries of the Communist Party, Heads of Government, and the Foreign and Defence Ministers of the member countries. The Committee has a Joint Secretariat, headed by a Soviet official and consisting of a representative from each country, and a Permanent Commission, whose task is to make recommendations on general questions of foreign policy for Pact members. Both are located in Moscow.

Since the reorganization of the Pact in 1969 the non-Soviet Ministers of Defence are no longer directly subordinate to the Commander-in-Chief of the Pact but, together with the Soviet Ministers, form the Council of Defence Ministers, which is the highest military body in the Pact. The second military body, the Joint High Command, is required by the Treaty 'to strengthen the defensive capability of the Warsaw Pact, to prepare military plans in case of war and to decide on the deployment of troops'. The Command consists of a Commander-in-Chief and a Military Council. This Council meets under the chairmanship of the C-in-C and includes



WARSAW PACT

- | | |
|--|------------|
| 1. Bulgaria | 4. Hungary |
| 2. Czechoslovakia | 5. Poland |
| 3. German Democratic Republic (East Germany) | 6. Romania |

the Chief-of-Staff and permanent military representatives from each of the allied armed forces. It seems to be the main channel through which the Pact's orders are transmitted to its forces in peacetime and through which the East European forces are able to put their point of view to the C-in-C. The Pact also has a Military Staff, which includes non-Soviet senior officers. The posts of C-in-C and Chief-of-Staff of the Joint High Command have, however, always been held by Soviet officers, and most of the key positions are still in Soviet hands.

In the event of war, the forces of the other Pact members would be operationally subordinate to the Soviet High Command. The command of the air defence system covering the whole Warsaw Pact area is now centralized in Moscow in peacetime and directed by the C-in-C of the Soviet Air Defence Forces. Among the Soviet military headquarters in the Warsaw Pact area are the Northern Group of Forces at Legnica in Poland; the Southern Group of Forces at Budapest; the Group of Soviet Forces in Germany at Zossen-Wünsdorf, near

Berlin; and the Central Group of Forces at Milovice, north of Prague. Soviet tactical air forces are stationed in Poland, East Germany, Hungary, and Czechoslovakia.

The Soviet Union has deployed short-range surface-to-surface missile (SSM) launchers and nuclear-capable

aircraft in Eastern Europe. Most East European countries also have short-range SSM launchers, but there is no evidence that nuclear warheads for their missiles have been supplied. Longer-range Soviet SSM and aircraft are based in the Soviet Union.

The divisions of all East European Warsaw Pact countries are of three categories with different manning, and hence readiness, levels. Category 1 formations are at up to three-quarters of establishment strength; Category 2 at up to half; and Category 3 little more than cadres.

BULGARIA

Population: 8,900,000.

Military service: Army and Air Force 2 years,

Navy 3 years.

Total regular forces: 149,000 (94,000 conscripts).

Estimated GNP 1979: \$34.8 bn.

Defence expenditure 1980: 790 m leva (\$1.14 bn).

\$1 = 0.69 leva.

Army: 105,000 (70,000 conscripts).

8 motor rifle divs.

5 tk bdes.

4 arty regts.

3 AA arty regts.

1 mountain bn.

2 recee bns.

3 SSM bdes with *Scud*.

200 T-34, 1,600 T-54/-55, 100 T-62, T-72 med tks; 290 BRDM-1/-2 scout cars; 1,500 BTR-60, 35 OT-62 APC; 400 122mm, 100 152mm guns/how; 82mm, 350 120mm, 160mm mor; BM-21 122mm MRL; 36 *FROG-7*, 50 *Scud* SSM; 350 57mm, 76mm, 85mm, and 100mm ATK guns; 130 82mm RCL; *Sagger*, *Snapper* ATGW; 250 57mm, 85mm, 100mm towed, ZSU-23-4, and ZSU-57-2 SP AA guns; SA-6/-7 SAM.

RESERVES: 200,000.

Navy: 10,000 (6,000 conscripts).

4 ex-Sov subs: 2 R-, 2 W-class.

2 *Riga* frigates.

3 *Poti* corvettes.

8 patrol craft: 6 SO-1, 2 *Kronshtadt*.

4 FAC(M) (3 *Osa-I*, 1 *Osa-II*) with *Styx* SSM.

14 FAC(T): 6 *Shersten*, 8 P4<.

18 MCM vessels: 2 T-43 ocean, 4 *Vanya* coastal, 8 PO-2, 4 *Yevgenya* < inshore.

18 *Vydra* LCU, 9 MFP D-3 landing craft.

Hel: Mi-14 ASW, 6 Mi-2, Mi-4 SAR.

Bases: Varna, Burgas, Sozopol, Atiya.

RESERVES: 20,000.

Air Force: 34,000 (18,000 conscripts); some 210 combat aircraft.

6 FGA sqns with 64 MiG-17, some MiG-23.

8 interceptor sqns: 6 with 80 MiG-21, 2 with 36 MiG-17.

2 recee sqns with 24 MiG-17.

1 tpt regt with 10 Il-14, 4 An-24, 2 Tu-134, 9 An-2.

1 hel regt with 30 Mi-2, 40 Mi-4/-8, Mi-24, Ka-26.

Trg ac incl 80 L-29, Yak-11/-18, 30 MiG-15UTI.

AAM: AA-2 *Atoll*.

26 SA-2, 8 SA-3 SAM bns.

1 para regt.

RESERVES: 20,000.

Para-Military Forces: 15,000 border guards with med tks, AFV, arty; 12,000 construction



The Czechoslovakian-built Aero L-39 trainer is phasing out the L-29 in the air forces of all Warsaw Pact nations except Poland.

troops; 12,000 security police; 150,000 volunteer People's Militia.

CZECHOSLOVAKIA

Population: 15,400,000.

Military service: Army 2 years, Air Force 3 years.

Total regular forces: 195,000 (118,000 conscripts).

Estimated GNP 1979: \$85.4 bn.

Defence expenditure 1980: 22.4 bn koruny

(\$3.52 bn).

\$1 = 6.36 koruny.

Army: 140,000 (100,000 conscripts).

5 tk divs.

5 motor rifle divs.

1 AB regt.

2 ATK regts.

2 arty bdes.

2 AA arty bdes.

3 SSM bdes with *Scud*.

3,400 T-54/-55, 100 T-62, 100 T-72 med tks; 680 OT-65, BRDM scout cars; 400 BMP MICV, 3,000 OT-62/-64/-810 APC; 150 100mm, 600 122mm, 50 130mm, 120 152mm guns/how; 122mm SP guns; 81mm, 120mm mor; 300 RM-70 122mm, M-51 130mm MRL; 40 *FROG*, 27 *Scud* SSM; 125 82mm RCL; 150 *Sagger* ATGW; M-53 12.7mm, ZU-23-4, 500 57mm towed, ZSU-23-4, M-53/59 30mm, ZSU-57-2 SP AA guns; SA-4/-6/-7 SAM.

RESERVES: 300,000.

Air Force: 55,000 (18,000 conscripts); 471 combat aircraft.

12 FGA sqns: 6 with 80 Su-7BM/U, 12 MiG-23BM, 3 with 42 MiG-21/-21U, 3 with 30 MiG-17.

18 interceptor sqns with 252 MiG-21/-21U.

3 recee sqns: 1 with 25 MiG-21RF, 2 with 30 L-29/-39.

2 tpt regts with 6 An-24, 40 Il-14, 1 Tu-134, Let L-410M.

1 hel regt, 3 indep hel sqns with Mi-1/-2, 50 Mi-4, 20 Mi-8, Mi-24.

Trg ac incl 150 L-29, 24 L-39, Zlin 326.

AAM: AA-2 *Atoll*.

5 SAM regts: 60 btys with SA-2/-3.

RESERVES: 50,000.

Para-Military Forces: 11,000 border troops in 28 bns, some AFV, ATK guns; about 120,000 part-time People's Militia; 2,500 Civil Defence troops.

GERMAN DEMOCRATIC REPUBLIC

Population: 16,800,000.

Military service: 18 months.

Total regular forces: 162,000 (92,000 conscripts).

Estimated GNP 1979: \$75.3 bn.

Defence expenditure 1980: 13.1 bn ostmarks

(\$4.79 bn).

\$1 = 2.73 ostmarks.

Army: 108,000 (67,000 conscripts).

2 tk divs.

4 motor rifle divs.

2 arty, 2 AA arty regts.

2 AB bns.

2 ATK bns.

2 SSM bdes with *Scud*.

About 2,600 T-54/-55, T-72 med tks (600 T-34 in storage); about 60 PT-76 lt tks; 880 BRDM-1/-2 and FUG-70 scout cars; 500 BMP MICV, 1,000 BTR-50P/-60P-152 APC; 335 122mm, 100 130mm, 152mm guns/how; 250 120mm mor; 180 RM-70 122mm MRL; 24 *FROG-7*, 18 *Scud* B SSM; 120 100mm ATK guns; AT-3 *Sagger*, AT-5 *Spandrel* ATGW; 72 57mm, 48 100mm towed, 96 ZSU-23-4 SP AA guns; SA-4/-6/-7/-9 SAM.

DEPLOYMENT: Algeria, Angola, Ethiopia, Mozambique, S. Yemen, Syria.

RESERVES: 250,000.

Navy: 16,000 (10,000 conscripts).

2 *Rostock* frigates (ex-Sov *Koni*).

12 *Hai* large patrol craft.

15 *Osa-I* FAC(M) with *Styx* SSM.

48 FAC(T): 18 *Shersten*, 30 *Libelle* <.

51 *Kondor I/II* coastal minesweepers.

12 *Frosch* LST.

2 *Kondor I/II* intelligence collection vessels (AGI).

1 hel sqn with 8 Mi-4, 5 Mi-8.

Bases: Rostock/Warnemünde, Peenemünde, Sassnitz, Wolgast, Tarnowitz.

RESERVES: 25,000.

Air Force: 38,000 (15,000 conscripts); 347 combat aircraft.

4 FGA sqns: 3 with 35 MiG-17, 1 with 12 MiG-23MF.

19 interceptor-recce sqns with 300 MiG-21F/MF/FL/R/U.

3 tpt sqns with 20 Il-14, 15 Tu-134, An-2, An-14.
6 hel sqns with 40 Mi-2/4, 70 Mi-8, Mi-24D/F.
Trg ac incl Yak-11, L-29/39, Zlin 226, MiG-15UTI.

AAM: AA-2 Atoll. ASM: AT-6 Spiral ATGW.
5 AD regts with 120 57mm and 100mm AA guns.
5 SAM regts with SA-2/3.

RESERVES: 30,000.

Para-Military Forces: 71,500, 46,500 border guards, some tks, AFV, 18 coastal patrol craft; 25,000 security troops. 500,000 Workers' Militia.

HUNGARY

Population: 10,700,000.

Military service (incl Border Guard): 2 years.

Total regular forces: 93,000 (58,000 conscripts).

Estimated GNP 1979: \$41.9 bn.

Defence expenditure 1980: 16.56 bn forints

(\$1.08 bn).

\$1 = 15.37 forints.

Army: 72,000 (50,000 conscripts) incl Danube Flotilla.

1 tk div.

5 motor rifle divs.

1 arty, 1 AA arty regts, 1 SSM bde with Scud.

1 SAM regt with SA-6.

1 AB bn.

About 1,250 T-54/55, 60 T-72 med, 100 PT-76 lt tks; 30 BMP-1 MICV; about 700 BRDM and FUG-63 scout cars; 1,500 PSZH (FUG-70) APC; 250 122mm (18 sp), 80 152mm guns/how; 300 82mm, 100 120mm mor; 40 BM-21 122mm MRL; 24 FROG, 12 Scud SSM; 150 85mm ATK guns; 100 Sagger, Snapper ATGW; 200 57mm towed, 50 ZSU-23-4 and ZSU-57-2 SP AA guns; 20 SA-6, 300 SA-7, 50 SA-9 SAM.

Danube Flotilla (3,500).

10 100-ton patrol craft, some river MCM, 5 small landing craft.

Air Force: 21,000 (8,000 conscripts); 170 combat aircraft.

9 interceptor sqns with 150 MiG-21/21U.

2 FGA sqns with 20 MiG-23.

1 tpt regt with 24 An-2/24/26, Il-14.

Hel: 30 Mi-1/2, 35 Mi-4/8, Mi-24, Ka-26.

Trg ac incl Yak-11/18, L-29, MiG-15UTI.

AAM: AA-2 Atoll.

A major advantage the Warsaw Pact enjoys over NATO is general commonality of weapons, including this 152-mm self-propelled howitzer.



2 SAM bns with SA-2.
(On order: 40 MiG-23 FGA.)

RESERVES (all services): 143,000.

Para-Military Forces: 15,000 border guards (11,000 conscripts); 60,000 part-time Workers' Militia.

POLAND

Population: 35,700,000.

Military service: Army, internal security forces, Air Force 2 years; Navy, special services 3 years.

Total regular forces: 317,500 (185,000 conscripts).

Estimated GNP 1979: \$146.1 bn.

Defence expenditure 1980: 70.4 bn zloty (\$4.67 bn).

\$1 = 15.06 zloty.

Army: 210,000 (154,000 conscripts).

5 tk divs.

8 motor rifle divs.

1 AB div.

1 amph assault div.

3 arty bdes, 1 arty, 5 AA arty regts.

3 ATK regts.

4 SSM bdes with Scud.

2,400 T-54/55, 100 T-72 med, 100 PT-76 lt tks; 2,000 OT-65 and BRDM-1/2 scout cars; 5,500 BMP, OT-62/64 APC; 400 76mm, 85mm, 100mm, 122mm, 250 152mm guns/how; 122mm SP guns; 600 82mm, 120mm mor; 250 BM-21 122mm, 140mm MRL; 54 FROG-3/7, 36 Scud SSM; 680 76mm, 85mm towed, ASU-85 SP ATK guns; 73mm, 82mm, 107mm RCL; Snapper, Sagger ATGW; 400 23mm, 57mm, 85mm, and 100mm towed, 100 ZSU-23-4 SP AA guns; SA-6/7/9 SAM.

DEPLOYMENT: Syria (UNDOF): 129.

Navy: 22,500 (6,000 conscripts).

4 W-class submarines.

1 Kotlin destroyer with 2 Goa SAM.

13 Osa FAC(M) with Styx SSM.

15 Wisla FAC(T) <.

16 large patrol craft: 13 Obluze, 3 Oksywie (some coastguard).

24 ocean minesweepers: 12 Krogulec, 12 T-43.

15 K-8 minesweeping boats.

23 Polnocny LCT, 3 Marabut, 15 Eichstaden LCA.

3 intelligence vessels (AGI): 1 B-10, 2 Moma.

1 Naval Aviation Regt (52 combat aircraft):

3 FGA sqns with 42 MiG-17.

1 recce sqn with 10 Il-28.

2 hel sqns with 25 Mi-1/2/4.

Bases: Gdynia, Hel, Swinoujscie, Kolobrzeg.

Air Force: 85,000 (25,000 conscripts), 12 brigades; some 700 combat aircraft.

18 FGA sqns: 3 with 35 Su-7/7U, 3 with 35 Su-20, 12 with 150 MiG-17.

33 interceptor sqns with some 400 MiG-17/21/21U.

6 recce sqns with 72 MiG-15/21, 5 Il-28, 4 Il-14.
2 tpt regts with 9 An-2, An-12, 12 An-26, 12 Il-14,
2 Tu-134, 5 Yak-40.

3 hel regts with 165 Mi-1/2, 19 Mi-4, 26 Mi-8, Mi-24.

300 trainers: TS-8, TS-11 MiG-15UTI, Yak-18.

AAM: AA-2 Atoll.

9 SAM regts with 240 SA-2/3 at some 45 sites.

RESERVES (all services): 605,000.

Para-Military Forces: 95,000, 18,000 border troops (Ministry of Interior), 77,000 internal security and internal defence troops (incl 21,000 construction troops). Some tks, AFV, ATK guns; 34 patrol craft (coastguard). 350,000 Citizen's Militia.

ROMANIA

Population: 22,200,000.

Military service: Army and Air Force 16 months, Navy 2 years.

Total regular forces: 184,500 (110,000 conscripts).

Estimated GNP 1979: \$91.2 bn.

Defence expenditure 1980: 12.5 bn lei (\$1.47 bn).

\$1 = 8.5 lei.

Army: 140,000 (95,000 conscripts).

2 tk divs.

8 motor rifle divs.

3 mountain bdes.

2 arty bdes, 3 arty, 2 AA arty regts.

2 ATK regts.

1 AB regt.

2 SSM bdes with Scud.

200 T-34, 1,500 T-54/55/72 med tks; 800 BRDM scout cars; 1,500 BTR-50/60, TAB-70/72 (BTR-60) APC; 150 76mm, 50 85mm, 600 122mm, 150 152mm guns/how; 130 SU-100 SP guns; 1,000 82mm, 200 120mm mor; 122mm, 150 130mm MRL; 30 FROG, 20 Scud SSM; 57mm ATK guns; 260 76mm and 82mm RCL; 120 Sagger, Snapper ATGW; 400 30mm, 37mm, 250 57mm, 85mm, 100mm towed, ZSU-23-4 SP AA; SA-6/7 SAM.

Navy: 10,500 (5,000 conscripts).

3 Poti corvettes.

5 Osa FAC(M) with Styx SSM.

3 Kronshadt large patrol craft.

17 ex-Ch Shanghai FAC(G).

44 FAC(T): 20 ex-Ch Hu Chwan hydrofoils, 18 Shanghai, 6 ex-Sov P4 <.

28 river patrol craft.

14 minesweepers (4 ex-GDR M-40 coastal, 10 ex-Sov T-301 inshore); 8 ex-Pol TR-40, 8 VD-

141 minesweeping boats <.

4 Mi-4 SAR hel.

Bases: Mangalia, Constanta, Tulcea (Danube).

Air Force: 34,000 (10,000 conscripts); 328 combat aircraft.

6 FGA sqns with 70 MiG-17.

12 interceptor sqns with 240 MiG-21F/PF/U.

1 recce sqn with 18 Il-28.

1 tpt regt with 3 Il-14, 4 Il-18, 1 Il-62, 10 An-24, 6 An-26, 5 Li-2, 1 Boeing 707.

1 hel regt: 10 Mi-4, 25 Mi-8, 45 Alouette III.

Trg ac: 50 L-29, 50 MiG-15UTI, 60 IAR-823.

AAM: AA-2 Atoll.

108 SA-2 at about 18 SAM sites.

RESERVES (all services): 502,000.

Para-Military Forces: 37,000, 17,000 border, 20,000 security troops with AFV, ATK guns.

About 700,000 Patriotic Guard.

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The North Atlantic Treaty

TREATIES

The Brussels Treaty of 1948 commits its signatories—Belgium, Britain, France, Luxembourg, and the Netherlands—to give one another 'all the military and other aid and assistance in their power' if one is the subject of 'armed aggression in Europe'. West Germany and Italy subsequently joined. The Treaty's duration is 50 years.

The North Atlantic Treaty was signed in 1949 by Belgium, Britain, Canada, Denmark, France, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, and the United States; Greece and Turkey joined in 1952, and West Germany in 1955. The Treaty unites Western Europe and North America in a commitment to consult together if the security of any one member is threatened, and to consider an armed attack against one as an attack against all, to be met by such action as each of them deems necessary, 'including the use of armed force, to restore and maintain the security of the North Atlantic area'.

The Paris Agreements of 1954 added a Protocol to the Treaty aimed at strengthening the structure of NATO and revised the Brussels Treaty. Since 1969 members of the Atlantic Alliance can withdraw on one year's notice.

ORGANIZATION

The Organization of the North Atlantic Treaty is known as NATO. The governing body of the Alliance, the North Atlantic Council, which has its headquarters in Brussels, consists of Ministers from the fifteen member countries, who normally meet twice a year, and of ambassadors representing each government, who are in permanent session.

In 1966 France left the integrated military organization, and the 14-nation Defence Planning Committee (DPC) was formed, on which France does not sit. It meets at the same level as the Council and deals with questions related to NATO integrated military planning and other matters in which France does not participate. The exact status of Greece, which left the DPC in autumn 1974, is under discussion.

Nuclear planning is undertaken in the Nuclear Planning Group (NPG), established as a permanent NATO committee in 1966. It meets twice a year at defence-minister level and more often at ambassadorial and staff



THE NORTH ATLANTIC TREATY ORGANIZATION

- | | |
|--|-----------------|
| 1. Belgium | 7. Greece |
| 2. Britain | 8. Italy |
| 3. Canada (not included in map) | 9. Luxembourg |
| 4. Denmark | 10. Netherlands |
| 5. France | 11. Norway |
| 6. Germany: Federal Republic of (West Germany) | 12. Portugal |
| | 13. Turkey |

levels. The Secretary-General is chairman of the NPG during ministerial and ambassadorial meetings.

The NPG has 12 members (France, Iceland, and Luxembourg do not participate). Its task is to undertake the detailed work required as a basis for preparation of nuclear policy and to formulate policy proposals for final approval by the Council/DPC.

The Eurogroup, which was set up in 1968, is an informal consultative body of the West European members of the Alliance (with the exception of France and Iceland). Its activities have included the European Defence Improvement Programme (1970) and agreement on principles of co-operation in the fields of armaments (1972), training (1973), and logistics (1975). Discussion in the Eurogroup of the need to extend European armaments co-operation led to the formation in 1976 of the Independent European Programme Group (IEPG), open to all

European members of the Alliance but independent of it. Its membership now includes France and the eleven Eurogroup members.

The Council and its Committees are advised on politico-military, financial, economic, and scientific aspects of defence planning by the Secretary-General and an international staff. The Council obtains its military advice from the Military Committee, which gives policy direction to NATO military commands. The Military Committee consists of the Chiefs-of-Staff of all member countries except France, which maintains a liaison staff, and Iceland, which is not represented; in permanent session the Chiefs-of-Staff are represented by Military Representatives, who are located in Brussels together with the Council. The Military Committee has an independent Chairman and is served by an international military staff. The major NATO commanders are responsible to the Committee, although they also have direct access to the Council, DPC, and Heads of Government.

The principal military commands of NATO are Allied Command Europe (ACE), Allied Command Atlantic (ACLANT), and Allied Command Channel (ACCHAN).

The NATO European and Atlantic Commands participate in the Joint Strategic Planning Systems at Omaha, Nebraska, but there is no Alliance command specifically covering strategic nuclear forces. The United States has, however, committed a small number of ballistic-missile submarines (and Britain all hers) to the planning control of SACEUR and a larger number to SACLANT.

The Supreme Allied Commander Europe (SACEUR) and the Supreme Allied Commander Atlantic (SACLANT) have always been American officers, and the Commander-in-Chief Channel (CINCCHAN), one of the two Deputies to SACEUR and the Deputy SACLANT, British; the other Deputy to SACEUR is German. SACEUR is also Commander-in-Chief of the United States Forces in Europe (CINCUSEUR).

(I) ALLIED COMMAND EUROPE (ACE) has its headquarters, known as SHAPE (Supreme Headquarters Allied Powers in Europe), at Casteau, near Mons, in Belgium. It is responsible for the defence of all NATO territory in Europe except Britain, France, Iceland, and Portugal, and for that of all Turkey. It also has general responsibility for the air defence of Britain.

The European Command has some 7,000 tactical nuclear warheads in its area, although 1,000 are in the process of being withdrawn. The number of delivery vehicles (aircraft, missiles, and howitzers) is over 3,000, spread among all countries excluding Luxembourg. The nuclear explosives, however, are maintained in American custody, with the exception of certain British weapons (there are also French nuclear weapons in France). There is a large number of low-yield weapons, but the average yield of bombs is about 100 kilotons, and of missile warheads, 20 kilotons.

About 66 division-equivalents are earmarked for assignment or assigned to SACEUR in peacetime. The Command also has some 3,200 tactical aircraft, based on about 200 standard NATO airfields, backed up by a system of jointly financed storage depots, fuel pipelines, and signal communications. Most land and air forces stationed in the Command are assigned to SACEUR, while naval forces are normally earmarked. During 1978 a deci-

sion was taken to deploy an integrated force of AWACS aircraft to improve early-warning and the control of intercepter fighters. These and the British *Nimrod* AEW aircraft will be compatible.

The 2nd French Corps of three divisions (which is not integrated in NATO forces) is stationed in Germany under a status agreement reached between the French and German Governments. Co-operation with NATO forces and commands has been agreed between the commanders concerned.

The following Commands are subordinate to Allied Command Europe:

(a) *Allied Forces Central Europe* (AFCENT) has command of both the land forces and the air forces in the Central European Sector. Its headquarters are at Brunssum in the Netherlands, and its Commander (CINCCENT) is a German general.

The forces of the Central European Command include 26 divisions, assigned by Belgium, Britain, Canada, West Germany, the Netherlands, and the United States, and about 1,400 tactical aircraft.

The Command is sub-divided into Northern Army Group (NORTHAG) and Central Army Group (CENTAG). NORTHAG, responsible for the defence of the sector north of the Göttingen-Liège axis, includes the Belgian, British, and Dutch divisions and four German divisions and is supported by 2nd Allied Tactical Air Force (2 ATAF), composed of Belgian, British, Dutch, and German units. One newly-formed American brigade is stationed in the NORTHAG area. American forces, seven German divisions, and the Canadian battle group are under CENTAG, supported by 4 ATAF, which includes American, German, and Canadian units and an American Army Air Defense Command. Allied Air Force, Central Europe (AAFCE) was set up in 1974 to provide centralized control of air forces in this sector.

(b) *Allied Forces Northern Europe* (AFNORTH) has its headquarters at Kolsaas, Norway, and is responsible for the defence of Denmark, Norway, Schleswig-Holstein, and the Baltic Approaches. The commander (CINCNORTH) has always been a British general. Most of the Danish and Norwegian land, sea, and tactical air forces are earmarked for it, and most of their active reserves assigned to it. Germany has assigned one division, two combat wings, and her Baltic fleet. Apart from exercises and some small units, US naval forces do not normally operate in this area.

(c) *Allied Forces Southern Europe* (AFSOUTH) has its headquarters at Naples, and its commander (CINCSOUTH) is an American admiral. Its main responsibilities are to deter aggression, to safeguard the sea lanes of communication in the Mediterranean, and to defend the territorial integrity of Greece, Italy, and Turkey. It is also responsible for the air defence of the Southern Region in peace and war and for naval operations in the Mediterranean and Black Seas. Ground forces include 22 division-equivalents from Turkey and 8 from Italy, as well as the tactical air forces of these countries. Greece might provide a further 13 division-equivalents and her tactical air force. Other forces have been earmarked for AFSOUTH, as have the US Navy's Sixth Fleet and naval forces from Italy. Naval forces from Turkey will act in support of NATO's plans in the Region, as might those from Greece. The ground-defence system is based upon two separate

commands: the Southern (LANDSOUTH), comprising Italy and the approaches to it, under an Italian commander, and Southeastern (LANDSOUTHEAST), comprising Turkey, under a Turkish commander. Command arrangements for Greece await the resolution of Greece's relationship to the integrated military structure of NATO. There is also an overall air command (AIRSOUTH), and there are two naval commands (NAVSOUTH and STRIKEFORSOUTH) responsible to AFSOUTH, with headquarters in Naples.

Maritime patrol aircraft from Southern Region nations and the United States operate in the Mediterranean, coordinated by Maritime Air Forces Mediterranean (MARAIRED), a functional command of NAVSOUTH. French aircraft participate. Submarine Force Mediterranean (SUBMED), another functional command of NAVSOUTH, is responsible for the conduct of submarine operations throughout the Mediterranean. COMARAIRED and COMSUBMED are American rear admirals.

The Allied Naval On Call Force Mediterranean (NAVOCFORMED) consists of a ship from each of the allied powers concerned with the Southern Region, including the United Kingdom and the United States, and is normally activated twice each year for a month.

(d) *United Kingdom Air Forces* (UKAIR) has its headquarters at High Wycombe, England.

(e) *ACE Mobile Force* (AMF), with headquarters at Seckenheim, Germany, has been formed with particular reference to the northern and south-eastern flanks. Formed by seven countries, it comprises seven infantry battalion groups, an armoured reconnaissance squadron, six artillery batteries, helicopter detachments and ground-support fighter squadrons, but has no air transport of its own. The composition of the Force varies depending on the flank to which it is to be deployed. Approximately half of the forces listed are declared for each flank.

(II) ALLIED COMMAND ATLANTIC (ACLANT) has its headquarters at Norfolk, Virginia, and is responsible for the North Atlantic area from the North Pole to the Tropic of Cancer, including Portuguese coastal waters. The commander is an American admiral.

In the event of war, its duties are to participate in the strategic strike and to protect sea communications. There are no forces assigned to the command in peacetime except Standing Naval Force Atlantic (STANAVFORLANT), which normally consists, at any one time, of four destroyer-type ships. However, for training purposes and in the event of war, forces which are predominantly naval are earmarked for assignment by Britain, Canada, Denmark, Germany, the Netherlands, Portugal, and the United States. There are six subordinate commands: Western Atlantic, Eastern Atlantic, Iberian Atlantic, Striking Fleet Atlantic, Submarine Command, and STANAVFORLANT. The nucleus of the Striking Fleet Atlantic has been provided by the United States Second Fleet with some five attack carriers; carrier-based aircraft share the nuclear strike role with missile-firing submarines.

(III) ALLIED COMMAND CHANNEL (ACCHAN) has its headquarters at Northwood, near London. The commander (CINCCCHAN) is a British admiral. The wartime role of Channel Command is to exercise control of the English Channel and the southern North Sea. Many of the smaller warships of Belgium, Britain, and the Netherlands are earmarked for this Command, as are some maritime aircraft. There are arrangements for co-operation with French naval forces. A Standing Naval Force, Channel (STANAVFORCHAN) was formed in 1973 to consist of mine counter-measures ships from Belgium, Germany, the Netherlands, and Britain; other interested nations might participate on a temporary basis. Its operational command is vested in CINCCCHAN.

BELGIUM

Population: 9,910,000.
 Military service: 8 or 10 months. (Conscripts serve 8 months if posted to Germany, 10 months if serving in Belgium.)
 Total armed forces: 87,900 (22,500 conscripts).
 Estimated GDP 1979: \$111.74 bn.
 Defence expenditure 1980: (NATO definition): 113.77 bn francs (\$3.74 bn).
 \$1 = 30.46 francs (1980), 29.43 francs (1979).

Army: 63,000 (incl Medical Service, 18,100 conscripts).
 1 arm'd bde.
 3 mech inf bdes.
 3 recce bns.
 2 mot inf bns.
 1 para-cdo regt.
 3 arty bns.
 1 ssm bn with 4 *Lance*.
 2 SAM bns with 60 *HAWK*.
 5 engr bns (3 fd, 1 bridge, 1 eqpt).
 4 aviation sqns.
 334 *Leopard*, 62 M-47 med, 133 *Scorpion* lt tks; 153 *Scimitar* AFV; 1,136 APC (M-75, AMX-VCI, 266 *Spartan*); 21 105mm, 14 203mm how; 96 M-108 105mm, 26 M-44, 41 M-109 155mm, 10 M-110 203mm SP how; 5 *Lance* SSM; 80 JPK C-90 SP ATK guns; 180 *Milan* ATGW; 43 *Striker* AFV with *Swingfire* ATGW; 115 20mm, 55 *Gepard* 35mm SP AA guns; 60 *HAWK* SAM; 12

Islander ac, 73 *Alouette* II hel.
 (On order: 514 MICV, 525 M-113 APC; 240 *Milan* ATGW; Improved *HAWK* SAM.)

DEPLOYMENT: *Germany*: 25,000; 1 corps HQ, 1 div HQ, 1 arm'd, 1 mech inf bdes.

RESERVES: 111,000: 10,000 train every year, 1 mech, 1 mot inf bde train every three years.

Navy: 4,400 (800 conscripts).
 4 E-71 frigates with *Exocet* SSM, *Sea Sparrow* SAM.
 7 ocean minehunters (ex-US Type 498).
 6 coastal minesweepers/minehunters (ex-US Type 60).
 14 *Herstal* inshore minesweepers.
 2 log support and cmd ships (for MCM).
 6 river patrol boats.
 3 *Alouette* III, 1 S-58 hel.

Bases: Kallo, Nieupoort, Ostend, Zeebrugge.

RESERVES: 4,500.

Air Force: 20,500 (3,600 conscripts); 142 combat aircraft.
 5 FB sqns: 3 with 54 *Mirage* 5BA/D, 2 with 36 F/TF-104G (being replaced by F-16A/B).
 2 AWX sqns: 1 with 17 F-16A, 1 with 17 F/FT-104G (being replaced by F-16A/B).
 1 recce sqn with 18 *Mirage* 5BR.
 2 tpt sqns with 12 C-130H, 2 Boeing 727QC, 3 HS-748, 5 *Merlin* IIIA, 2 *Falcon* 20.
 1 SAR hel sqn with 4 HHS-1, 5 *Sea King*.

Trg ac incl 33 SF-260MB, 3 sqns with 33 *AlphaJet*, 15 F-16B.

AAM: *Sidewinder*.
 8 SAM sqns with *Nike Hercules*.
 (On order: 83 F-16A fighters; 5 EMB-121 tpt ac; *Super Sidewinder* AAM; 43 BDX APC.)

Para-Military Forces: 16,300 Gendarmerie with 62 FN arm'd cars, 5 *Alouette* II, 3 *Puma* hel.
 (On order: 80 BDX APC.)

BRITAIN

Population: 55,902,000.
 Military service: voluntary.
 Total armed forces: 329,204 (incl 16,209 women and 8,500 enlisted outside Britain).
 Estimated GNP 1979: \$381.3 bn.
 Defence expenditure 1980-81: £10.78 bn (\$23.70 bn; NATO definition: \$24.45 bn. NATO budget content standardizes national.)
 \$1 = £0.455 (1980), £0.487 (1979).

Strategic Forces:
SLBM: 4 *Resolution* SSBN, each with 16 *Polaris* A3 msls with 3 MRV.
 Ballistic Missile Early Warning System (BMEWS) station at Fylingdales.

Army: 167,250 (incl 6,250 women and 8,200 enlisted outside Britain, of which 7,100 are Gurkhas).

1 corps, 4 armd, 1 arty div HQ.
 10 armd regts.
 9 armd recce regts.
 48 inf bns (incl 1 demonstration bn).
 5 Gurkha inf bns.
 3 para bns (2 in inf, 1 in para role).
 1 special air service (SAS) regt.
 1 msl regt with *Lance* SSM.
 3 AD regts with *Rapier* SAM.
 18 arty regts (1 hy, 13 fd, 1 GW, 1 cdo, 1 ATK, 1 locating).
 10 engr regts (incl 4 armd divs, 1 amph).
 6 army aviation regts.

900 *Chieftain* med (60 in reserve), 271 FV101 *Scorpion* lt tks; 243 FV601 *Saladin* armd cars; 290 FV107 *Scimitar*, 1,429 *Ferret*, 200 *Fox* recce; 2,338 FV432, 600 FV603 *Saracen*, 60 FV103 *Spartan* APC; 100 105mm pack how and lt guns; 155 FV433 *Abbot* 105mm, 73 FH-70, 50 M-109 155mm, 31 M-107 175mm, 16 M-110 203mm sp guns/how; *Lance* SSM; *Carl Gustav* 84mm, 120mm RCL; *Milan*, *Swingfire* ATGW; FV102 *Striker*, 178 FV438/FV712 AFV with *Swingfire* ATGW; *Blowpipe*, *Rapier/Blindfire* SAM; 100 *Scout*, 7 *Alouette II*, 20 *Sioux*, 158 *Gazelle*, 30 *Lynx* hel; landing craft (2 lt, 3 tk, 14 med).
 (On order: 122 FH-70 155mm how, 48 M-109A2 sp how; *LAW* RL; *Milan*, *TOW* ATGW; 48 *Blowpipe* SAM; 25 *Gazelle*, 84 *Lynx* hel.)

DEPLOYMENT AND ORGANIZATION:

United Kingdom. United Kingdom Land Forces (UKLF): United Kingdom Mobile Force (UKMF)—6th Field Force with 5 (3 regular, 2 TA) inf bns and log spt gp; 7th Field Force with 3 regular, 2 TA units; 8th Field Force (3 regular, 2 TA bns for Home Defence); 1 bn gp (for ACE Mobile Force (Land)), 1 SAS regt (part), 1 Gurkha inf bn. HQ Northern Ireland: 3 inf bde HQ, 1 armd recce regt, variable number of major units in inf role (5 resident inf bns, 8 units in inf role), 1 SAS, 3 engr sqns, 2 army aviation sqns and 1 flt.

Germany. British Army of the Rhine (BAOR): 55,000: 1 corps HQ, 4 armd divs, 5th Field Force, 1 arty div. Berlin Field Force: 3,100.

Brunei: 1 Gurkha inf bn.

Hong Kong: 7,100: Gurkha Field Force with 1 British, 3 Gurkha inf bns, 1 hel, 1 engr sqns, spt units.

Cyprus: 1 inf bn less 2 coys, 1 armd recce sqn, 1 hel flt and log support with UNFICYP (817); 1 inf bn plus 2 inf coys, 1 armd recce, 1 engr spt sqns, 1 hel flt in garrison at Sovereign Base Areas.

Gibraltar: 1 inf bn, 1 engr team.

Belize: 1 inf bn, 1 inf bn (part), 1 armd recce tp, 1 arty bty, 1 lt AD tp, 1 engr sqn (part), 1 hel flt.

RESERVES: 131,700 Regular Reserves. 63,292 Territorial Army (TA): 2 armd recce regts, 38 inf bns, 2 SAS, 2 fd, 3 lt AD, 7 engr regts. 7,850 Ulster Defence Regiment (11 bns).

Navy: 72,240 (incl Fleet Air Arm, Royal Marines, 3,835 women, and 300 enlisted outside Britain); 70 major surface combat vessels.

Submarines, attack: 27

11 nuclear (5 *Swiftsure*, 5 *Valiant*, 1 *Dreadnought*), 16 diesel (13 *Oberon*, 3 *Porpoise*).

Surface Ships:

1 ASW carrier (*Invincible*) on trials: 5 *Sea Harrier* v/STOL, 9 *Sea King* hel.

2 ASW/cdo carriers (*Hermes*, *Bulwark*): 1 with 5 *Harrier* v/STOL, 9 *Sea King* hel; 1 with 5 *Sea King*, 12 *Wessex* 5 hel, *Seacat* SAM.

1 *Tiger* hel cruiser with 4 *Sea King* hel, *Seacat* SAM.

12 GW destroyers; 5 *County* (2 trg; all 5 with 1 *Wessex* ASW hel, *Seaslug*, *Seacat* SAM, 4 also with *Exocet* SSM); 1 Type 82 with *Sea Dart* SAM, *Ikara* ASW; 6 Type 42 with *Sea Dart*, 1 *Lynx* ASW hel.

54 frigates: 51 GP (2 Type 22 with *Exocet* SSM, *Sea Wolf* SAM, 2 *Lynx* hel; 8 Type 21, 5 with *Exocet*, *Seacat* SAM, 1 *Wasp/Lynx* hel; 26 *Leander*, all with *Seacat*, 1 *Wasp/Lynx*, 8 with



The Anglo-French-developed Jaguar is a close-support and tactical-strike aircraft that doubles as an advanced and operational trainer.

Exocet, 8 with *Ikara* ASW; 7 *Tribal*; 8 *Rothsay* (trg) with *Seacat* and 1 *Wasp* hel; 1 Type 41 AA; 1 Type 61 ac direction with *Seacat*; 1 Type 12 ASW (trg).

37 minesweepers/minehunters: 1 *Hunt*, 1 *Abdiel*, 30 *Ton* (5 trg), 5 inshore.

26 patrol craft: 7 *Island*, 6 *Ton*, 4 *Bird*, 1 FAC(P), 2 *Loyal*, 2 *Ford* (trg), 3 *FPB* (trg), 1 Boeing hydrofoil (trials).

2 LPD with *Seacat* SAM (1 trg).

Amphibious vessels incl: 1 spt ship, 1 transport, 6 landing ships, 3 landing craft, 16 LCM, 41 LCVP.

13 survey, 1 ice patrol, 1 Royal Yacht/hospital, 7 depot/support ships, 15 tankers.

6 hovercraft: 1 VT-2, 3 SRN-6, 1 BH-7, 1 SRN-5 (trg).

Included above are 3 nuclear, 5 diesel subs, 1 cdo carrier, 1 hel cruiser, 2 GW destroyers, 16 frigates, 1 assault ship, 3 minesweepers, 2 minehunters, 1 spt ship, 1 amph tpt, 1 landing ship, 1 depot ship, 3 tankers in reserve or undergoing refit.

(On order: 3 ASW carriers, 4 SSN (3 *Trafalgar*, 1 *Swiftsure*), 8 Type 42 destroyers, 4 Type 22 frigates, 4 *Hunt* MCM.)

Bases: Devonport, Faslane, Portland, Portsmouth, Rosyth.

THE FLEET AIR ARM:

2 sqns (1 OCU) with 9 *Sea Harrier* FRS-1 v/STOL fighters.

5 ASW hel sqns with 31 *Sea King* HAS-2/2A (3 sqns embarked).

47 ASW flts: 24 with *Wasp* HAS-1, 2 with *Wessex* HAS-3, 21 with 21 *Lynx* HAS-2.

2 cdo assault sqns; 1 with 8 *Wessex* HU-5, 5 *Sea King* HU-4; 1 with 12 *Wessex* HU-5.

8 SAR and trg hel sqns: 1 with 12 *Wessex* HAS-3, 3 with 36 *Wessex* HU-5, 1 with 16 *Sea King* HAS-1/-2/-2A, 1 with 10 *Wasp* HAS-1, 1 with 9 *Lynx* HAS-2, 1 with 18 *Gazelle* HT-2.

1 comms sqn and 3 flts with 3 *Sea Heron* C-2, 1 *Heron* C-4, 5 *Sea Devon* C-20, 1 *Devon* C-2/2, 3 *Chipmunk* T-40 ac; 5 *Wessex* HU-5 hel.

1 observer trg sqn with 12 *Jetstream* T-2, 1 trg flt with 9 *Chipmunk* T-10.

1 fleet requirements and direction trg unit with 10 *Canberra* T-4/TT-18/T-22, 21 *Hunter* T-8C/GA-11.

(On order: 29 *Sea Harrier* FRS-1/T-4 v/STOL, 3 *Hunter* T-8M, 4 *Jetstream* T-2 ac; 21 *Sea King* HAS-2, 15 *Sea King* HU-4, 40 *Lynx* HAS-2 hel.)

THE ROYAL MARINES: 7,574.

1 cdo bde with 5 cdo gps (1 forming), 1 log regt, 1 lt hel sqn, spt units.

120mm RCL; SS-11, *Milan* ATGW; *Blowpipe* SAM; 12 *Gazelle* AH-1, 6 *Scout* AH-1 hel.

(On order: 4 *Lynx* (hel).)

DEPLOYMENT:

Falkland Islands: 1 marine det.

RESERVES (Naval and Marines): 28,300 Regular and 6,000 Volunteers.

Air Force: 89,714 (incl 6,124 women); about 713 combat ac.

6 strike/attack sqns with 48 *Vulcan* B-2 (to be disbanded from 1981).

5 strike/attack sqns with 60 *Buccaneer* S-2A/B.

6 strike/attack sqns with 72 *Jaguar* GR-1.

3 close support sqns with 48 *Harrier* GR-3/T-4.

9 interceptor sqns: 2 with 24 *Lightning* F-6/F-3 (3rd with 12 to form 1983, 12 more ac in active reserve), 7 with 88 *Phantom* FGR-2/FG-1.

5 recce sqns: 1 with 8 *Vulcan* SR-2, 2 with 24 *Jaguar* GR-1, 2 with 22 *Canberra* PR-7/9.

1 AEW sqn with 11 *Shackleton* AEW-2.

4 MR sqns with 28 *Nimrod* MR-1/1A, MR-2.

2 tanker sqns with 16 *Victor* K-2.

1 strategic tpt sqn with 11 VC-10C1.

4 tac tpt sqns with 45 C-130H (+ 11 active reserve).

3 comms sqns with 6 HS-125 CC1/2, 4 *Andover*, 6 *Pembroke*, 13 *Devon* ac, 2 *Whirlwind*, 1 *Gazelle* hel.

Queen's Flt with 3 *Andover* ac, 2 *Wessex* hel.

4 ECM/target facilities/calibration sqns with 46 *Canberra*, 5 *Andover* E-3/C-1.

OCUS with 9 *Vulcan* B-2, 2 *Tornado* GR-1, 14, *Buccaneer* Mk 2, 24 *Phantom* FGR-2, 26 *Jaguar* GR-1/T-2, 9 *Lightning* F-3/T-5/F-6, 4 *Hunter* T-7A, 22 *Harrier* GR-3/T-4, 4 *Nimrod* MR, 7 *Canberra* B-2/T-4, 1 *Andover*, 5 C-130, 3 *Victor* K-2 ac; 4 *Wessex* HC-2, 5 *Puma* HC-1, 2 *Sea King* HAR-3, 4 *Whirlwind* hel.

3 tac weapons units with 60 *Hunter* F-6/GA-9/T-7, 46 *Hawk* T-1, 2 *Jet Provost*.

8 hel sqns: 5 tac tpt (3 with 40 *Wessex*, 2 with 26 *Puma* HC-1), 3 SAR with 14 *Whirlwind*, 8 *Wessex*, 10 *Sea King*.

Trg units with 70 *Hawk* T-1, 151 *Jet Provost*, 11 *Jetstream* T-1, 113 *Bulldog* GR-3, 144 *Tornado* (out of 220 GR-1 FGA, 165 F-2 ad planned), 11 *Nimrod* AEW-3, 77 *Hawk*, 9 VC-10 tankers, 33 CH-47D *Chinook*, 7 *Puma* hel, AIM-9L *Sidewinder*, *Sky Flash* AAM, *Sea Eagle* ASM.)

AAM: *Sidewinder*, *Sparrow*, *Red Top*, *Firestreak*.

ASM: *Martel*.

8 SAM sqns: 2 with *Bloodhound* 2, 6 with *Rapier*.

(On order: 28 *Harrier* GR-3, 144 *Tornado* (out of 220 GR-1 FGA, 165 F-2 ad planned), 11 *Nimrod* AEW-3, 77 *Hawk*, 9 VC-10 tankers, 33 CH-47D *Chinook*, 7 *Puma* hel, AIM-9L *Sidewinder*, *Sky Flash* AAM, *Sea Eagle* ASM.)

ROYAL AIR FORCE REGIMENT:
 4 wing HQ.
 6 fd and 6 SAM sqns.

(On order: *Scorpion* lt tks, *Spartan* APC.)

DEPLOYMENT:

The Royal Air Force includes an operational home command (Strike Command), responsible for the UK Air Defence Region and the Near and Far East, and 1 overseas command (RAF Germany: 10,800). Sqns are deployed overseas as follows:

Germany: 2 Phantom FGR-2, 2 Buccaneer, 5 Jaguar, 2 Harrier, 1 Wessex, 1 Bloodhound, 4 Rapier sqns, 1 fd sqn RAF Regt.

Cyprus: 1 Whirlwind (incl 4 ac with UNFICYP); periodic dets of other ac; 1 fd sqn RAF Regt.

Hong Kong: 1 Wessex.

Belize: Harrier GR-3 FGA (4 ac), Puma hel, 1 Rapier det RAF Regt.

RESERVES: 28,000 Regular; about 400 Volunteer.

CANADA

Population: 23,890,000.

Military service: voluntary.

Total armed forces: 78,646.

Estimated GNP 1979: \$US 224.4 bn.

Defence expenditure 1980-81: \$Can 5.05 bn (\$US 4.24 bn); NATO definition not available. \$US 1 = \$Can 1.19 (1980), \$Can 1.16 (1979).

Army (Land Forces): 12,675. (The Canadian Armed Forces were unified in 1968; personnel not identified by service total 45,317.)

Mobile Command (about 19,000 land and air). (Mobile Command commands army combat forces, and Maritime Command all naval forces. Air Command commands all air forces, but Maritime Command has operational control of maritime air forces, and HQ 4 ATAF in Europe operational control of 1 CAG. There are also a Communications Command and a Canadian Forces Training System.)

2 bde gps each comprising:

1 armd regt, 3 inf bns, 1 arty regt (2 close spt, 1 btys), 1 engr regt, spt units.

1 special service force comprising:

1 armd regt, 1 inf bn, 1 AB regt, 1 arty regt (3 close spt btys), 1 engr regt, spt units.

1 mech bde gp comprising:

1 armd regt, 2 inf bns, 1 med arty, 1 engr regts, spt units, 1 lt hel sqn.

114 Leopard C-1 med tks; 174 Lynx, 45 Cougar AFV; 827 M-113, 151 Grizzly APC; 58 105mm pack, 170 105mm how, 50 M-109 155mm SP how; 820 Carl Gustav 84mm RCL; 149 TOW ATGW; 57 40mm AA guns; 103 Blowpipe SAM. (On order: 135 Cougar AFV; 90 Grizzly APC.)

DEPLOYMENT:

Europe: One mech bde gp of 3,000 with 57 Leopard med tks, 375 M-113 APC/recce, 24 M-109 155mm SP how, 11 CH-136 (Kiowa) hel, 2,500 additional tps in Canada as reinforcements.

Cyprus (UNFICYP): 515.

Syria/Israel (UNDOF): 220.

Other Middle East (UNTSO): 20.

RESERVES: about 15,500 Militia; 100 combat arms units plus spt units (all in Mobile Command), plus 1,560 in Communications Reserves.

Navy (Maritime): 5,327.

Maritime Command (about 9,300).

3 Oberon submarines.

4 DD280 ASW hel destroyers, each with 2 Sea King hel and Sea Sparrow SAM.

19 ASW frigates (2 Annapolis with 1 hel; 4 Mackenzie, 4 Improved Restigouche with ASROC; 6 St Laurent with 1 hel; 3 Restigouche in reserve).

3 replenishment spt ships (2 with 3 Sea King hel each).

6 coastal patrol ships (trg).

6 small patrol craft.

(On order: 6 destroyers).

DEPLOYMENT:

Atlantic: 3 subs, 13 surface (1 in reserve), 2 replenishment spt ships with hel.

Pacific: 10 surface (2 in reserve), 1 replenishment spt ships.

Bases: Halifax, Esquimalt.

RESERVES: about 3,250.

Air Force (Air): 15,327; some 247 combat aircraft.

Air Command (23,000).

10 Tactical Air Group (10 TAG):

2 fighter sqns with 20 CF-5, 4 CF-5D.

5 hel sqns with 31 CH-135, (UH-1N), 36 CH-136 (Kiowa).

1 Canadian Air Group (1 CAG, Europe):

3 fighter sqns with 54 CF-104 and 6 CF-104D.

Air Defence Group (NORAD-assigned):

3 AWX sqns with 36 CF-101 Voodoo.

1 ECM sqn with 7 CF-100, 3 CC-117 (Falcon 20), 17 T-33.

1 AWX OCU sqn with 8 CF-101 Voodoo.

4 main, 17 auxiliary sites of Distant Early Warning (DEW) Line.

24 long-range radar sites (Pine Tree Line).

Maritime Air Group:

3 maritime patrol sqns, 1 trg and 1 testing sqn with 22 CP-107 Argus (being replaced by 18 CP-140 Aurora).

1 MR, 1 trg and 1 reserve sqns with 15 CP-121 (modified) Tracker.

2 ASW hel sqns and 1 trg sqn with 32 CH-124 (Sea King).

2 utility sqns with 9 T-33, 3 CP-121 ac, and 2 CH-135 hel.

Air Transport Group:

4 tpt sqns: 2 with 24 CC-130E/H, 1 with 5 CC-137 (Boeing 707), 1 with 7 CC-109 Cosmopolitan, 2 CC-132 (DHC-7R), 4 CC-117.

4 tpt/SAR sqns with 14 CC-115 (DHC-5), 8 CC-138 (DHC-6) ac, 3 CH-113 Labrador, 7 CH-113A Voyageur, 3 CH-135 hel.

1 SAR unit with 3 CH-113 Labrador.

3 trg sqns: 1 with 14 CF-5A, 21 CF-5D; 1 with 10 CF-104, 10 CF-104D; 1 with 4 CC-130E, 4 CC-129 (C-47).

(On order: 113 F-18A, 24 F-18B Hornet fighters.)

RESERVES: 950 Air Reserve Group; 4 wings with DHC-3, DHC-6, 5 C-47.

DENMARK

Population: 5,124,000.

Military service: 9 months.

Total armed forces: 35,050 (11,850 conscripts).

Estimated GDP 1979: \$66.2 bn.

Defence expenditure 1980: kr 7.99 bn (\$1.35 bn).

\$1 = 5.91 kroner (1980), 5.18 kroner (1979).

Army: 21,000 (8,600 conscripts).

3 mech inf bdes, each with 1 tk, 2 mech, 1 arty bns, 1 recce sqn, 1 engr coy, spt units.

2 mech inf bdes, each with 1 tk, 2 mech, 1 arty bns, 1 engr coy, spt units.

1 indep recce bn.

Some indep mot inf bns.

120 Leopard 1, 200 Centurion med, 48 M-41 lt tks; 630 M-113, 68 M-106 mortar-armed APC; 24 155mm guns; 144 105mm, 96 155mm, 12 203mm how; 72 M-109 155mm SP how; 120mm mor; 252 106mm RCL; TOW ATGW; 224 L/60 and L/70 40mm AA guns; Hamlet (Redeye) SAM; 9 Saab T-17 lt ac; 12 Hughes 500A hel. (On order: 840 TOW ATGW.)

DEPLOYMENT: Cyprus (UNFICYP): 1 bn (365).

RESERVES: 4,500 Augmentation Force, subject to immediate recall; 41,000 Field Army Reserve, comprising 12,000 Covering Force Reserve (to bring units to war strength and add 1 mech bn to each bde) and 29,000 to provide combat and log support; 24,000 Regional Defence Force,

with 21 inf, 7 arty bns, ATK sqns, spt units; 56,200 Army Home Guard.

Navy: 6,200 (1,500 conscripts).

6 submarines (2 Narhavalen, 4 Delfinen).

3 frigates: with Harpoon SSM, Sea Sparrow SAM; 2 Peder Skram, 1 Niels Juel.

5 Hvidbjørnen fishery-protection frigates, each with 1 hel.

2 Triton corvettes (to be replaced by Niels Juel frigates end-1980).

10 Willemoes FAC(M) with Harpoon SSM.

6 Sølvøen FAC(T).

22 large patrol craft: 8 Daphne, 3 Agdlea, 2 Maagen, 9 Barsø.

24 coastal patrol craft.

7 minelayers: 4 Falster, 2 Lindormen, 1 Lange-land.

8 ex-US Type 60 coastal minesweepers.

8 Alouette III, 3 Lynx hel.

(On order: 2 frigates, 15 Harpoon SSM, Sea Sparrow SAM, 5 Lynx hel.)

Bases: Copenhagen, Korsør, Frederikshavn.

RESERVES: 4,500; Navy Home Guard 4,860. 20 coastal patrol craft.

Air Force: 7,850 (1,750 conscripts); 108 combat aircraft.

1 FB sqn with 20 F-35XD Draken.

2 FB sqns with 32 F-100D/F (being replaced by 56 F-16).

2 interceptor sqns with 40 F-104G.

1 recce sqn with 16 RF-35XD Draken.

1 tpt sqn with 8 C-47, 3 C-130H.

1 SAR sqn with 8 S-61A hel.

Trainers: 2 F-16B, 2 TF-35XD Draken, 22 Saab T-17.

8 SAM sqns: 4 with 36 Nike Hercules, 4 with 24 Improved HAWK.

AAM: Sidewinder. ASM: Bullpup.

(On order: 56 F-16A/B fighters, 10 Gulfstream III MR/lt tpt ac.)

RESERVES: 7,500; Air Force Home Guard 11,900.

FRANCE

Population: 54,000,000.

Military service: 12 months.

Total armed forces: 494,730, including 10,250 on inter-service central staff (263,080 conscripts).

Estimated GNP 1979: \$566 bn.

Defence expenditure 1980: fr 88.6 bn (\$20.22 bn).

\$1 = 4.38 francs (1980), 4.29 francs (1979).

Strategic Forces:

SLBM: 80 in 5 SSBN, each with 16 M-20 msls (1 more building). (M-4 msl to replace M-20.)

IRBM: 18 in 2 sqns, 1 with 9 SSBS S-3 msls, 1 with S-2 (to be replaced by S-3).

Aircraft:

Bombers: 6 sqns with 33 Mirage IVA (AN-22 nuclear bombs).

Tankers: 1 wing with 11 KC-135F.

Reserve: 15 Mirage IVA (incl 12 recce).

Army: 321,320, incl Army Aviation, 203,830 conscripts, 6,500 women.

1 army HQ.

3 corps HQ.

8 armd divs.

4 motor rifle divs.

1 alpine div.

1 air-portable mot div (Marines).

1 para div.

1 lt bde (overseas intervention).

Berlin sector force (1 armd regt, 1 inf regt).

5 SSM regts with 32 Pluton.

5 SAM regts: 3 with 60 HAWK, 2 with 24 Roland I.

1,220 AMX-30 med, 1,050 AMX-13 lt tks; 10 AMX-10RC, 485 Panhard EBR hy, 690 AML lt armd cars; 560 AMX-10 MICV, 1,630



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It's not the simple will to win. It's more basic than that.
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We take pride in designing better products, better systems,
in conceiving more imaginative, inventive solutions, and in
improving on previous excellence.

Guidance and Control Systems

Guidance and Control Systems continues to strengthen its position as world leader in both the development and production of inertial navigation and guidance equipment for aircraft and missiles.

- Cruise Missiles

We have delivered 115 LN-35 production guidance sets for the DoD Cruise Missile project. These and subsequent LN-35 guidance sets will be deployed on cruise missiles throughout the U.S. Air Force and U.S. Navy surface and submarine forces.

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Our LN-39 Inertial Navigation Unit was selected for the USAF Standard Inertial Navigation program with immediate application for the A-10 aircraft.

Our large-scale production of sophisticated, high-technology products is supported by an aggressive R&D philosophy which investigates possible future product applications, currently typified by two successful lines of development.

- Strapdown Inertial Systems

The LR-80 strapdown AHRS has been selected for the U.S. Army Advanced Attack Helicopter, the AH-64A. Our small LP-81 strapdown inertial measurement unit has been selected for the U.S. Navy ADCAP MK-48 Torpedo.

- Ring Laser Gyro

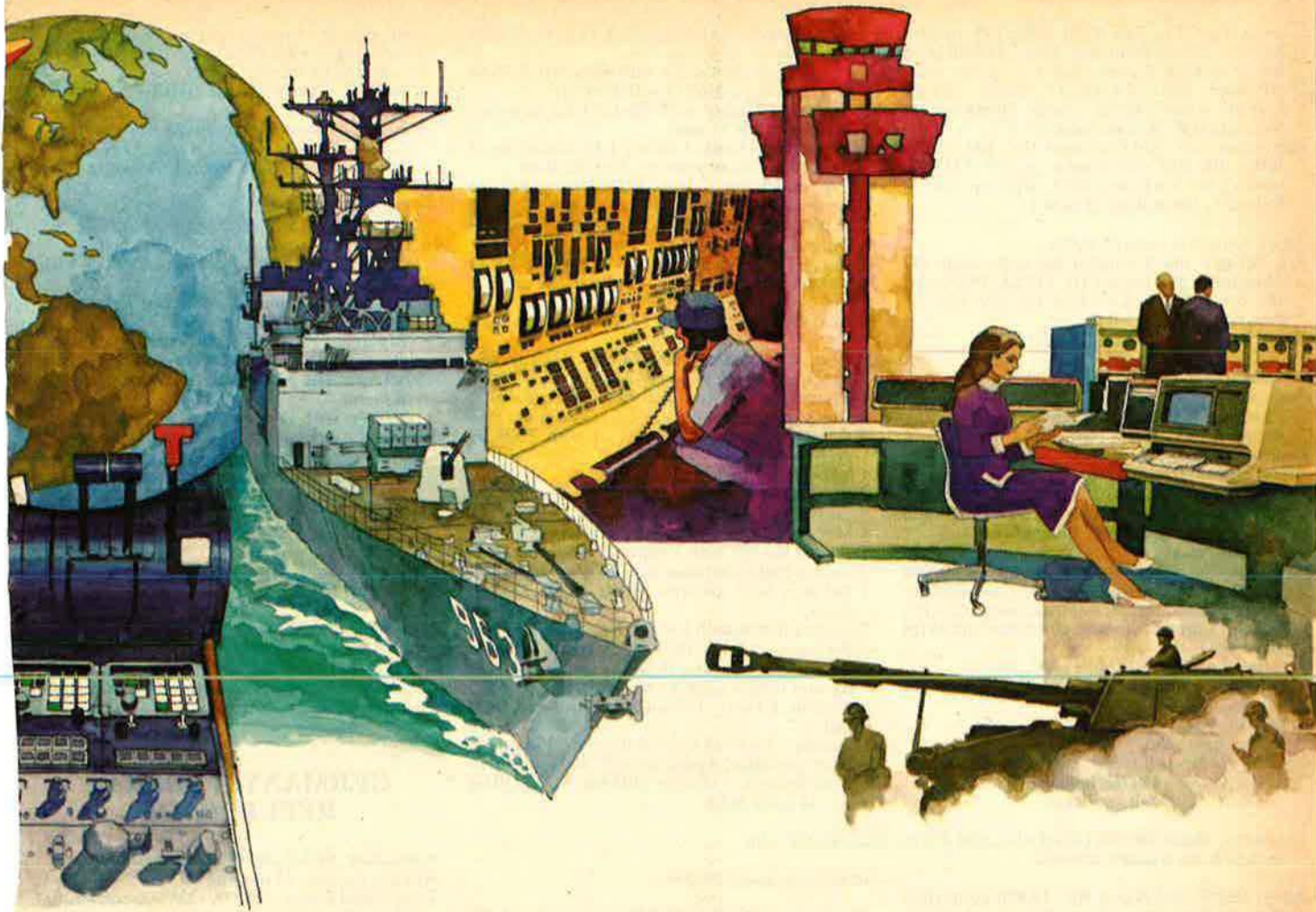
Our family of Ring Laser Gyros, range in size from the high-accuracy 28 cm gyro to the ultra-small 6 cm gyro. Litton was recently selected by the Naval Weapons Center, China Lake for the Ring Laser Gyro Alternate Source, Phase Two program. Our high accuracy 28 cm path length gyro will soon be in service onboard the Airbus A-310.

Mellonics

Mellonics continues as a major developer of software, data processing, systems engineering, analytical services, training and field engineering support to government, industry and international clients. Typically:

- Telemetry, tracking and commanding software to provide real-time control and monitoring of spacecraft
- High technology engineering support services to DoD agencies; training, weapons system testing, doctrine evaluation, system deployment studies and mission-specific scientific support
- Sophisticated full-service Computer Center to support both government and industry. This Center provides both interactive and batch processing services supported by a full range of software packages available for customer use, an extensive data entry capability and customer-oriented analyst support
- "Total capability" development of software for government and industry. Our staff provides quality software on time and within schedule and cost constraints.

Litton qu



Aero Products

Aero Products is a world leader in the design, development and application of commercial Inertial Navigation Systems and Omega Navigation Systems.

- Customers include more than 98 airlines
- Over 3000 Omega navigation systems world-wide

Unique applications include:

- Integrated Track Guidance Systems (ITGS) for photogrammetry and spraying with high-precision lane flying capability
- INS-based Flight Inspection System provides real-time inflight inspection of radio navigation aids including ILS.

Aero Products is deeply committed to research and development of new-generation avionics, including LED advanced display panels, Strapdown Inertial Systems and Ring Laser Gyro Technology. Our LTN-90 ring laser gyro INS has been selected by Airbus Industries for their new A-310 aircraft.

Data Systems

Data Systems is one of the world's foremost manufacturers of military electronic systems for command and control data processing, display, weapons control, electronic identification, and digital communications.

- TACFIRE provides automation for the U.S. Army artillery fire control center
- MISSILE MINDER provides automation for U.S. Army artillery ground-to-air missiles

- TACTICAL AIR OPERATIONS CENTER (TAOC) provides the U.S. Marine Corps with automation of their total Air Defense System

Data Systems is completely responsible for the electronics suite on the Spruance Class (DD-963) Destroyer and the LHA general-purpose amphibious assault ships. Our new C³ family of battery-powered, hand-held intelligent digital terminals advance the state-of-the-art in communications, and are used for composing, editing, transmitting, receiving and displaying multi-color messages and graphics.

Datalog

DATALOG aggressively maintains world leadership in the research, development, and production of sophisticated graphic data transmission/reproduction equipment and systems:

- AN/UXC-4 TACTICAL DIGITAL FACSIMILE (TDF) Developed under NAVELUX management, under the auspices of the Joint Tactical Communications Office (TRI-TAC) for multi-service use.
- FASTFAX/2000 A subminute, secure, digital facsimile transceiver terminal, interoperable with the AN/UXC-4
- OVERLAY GENERATOR To produce multi-color transparent map overlays
- POLICEFAX SYSTEMS To transmit and receive fingerprints and criminal data rapidly and accurately.

Non-impact, high-speed digital electronic line printers fulfill dual requirements of portability and ruggedness. These printers are used in the TACFIRE Artillery Fire Direction System and other key DoD programs.

Amecom

Amecom continues its leadership role in electronic support and electronic warfare systems.

- Development and deployment of the AN/ALR-59 Passive Detection System on the US Navy's E-2C aircraft
- AN/BLD-1 Passive Shipboard System
- AN/ALQ-125 Tactical Electronic Reconnaissance (TEREC) for the USAF RF-4C aircraft.

Amecom applies modern Time Division Multiplex communications and advanced microprocessor technology to solve complex air traffic control communication requirements.

- The Amecom 3080 Integrated Communications Switching System is in production for FAA and other national aviation agencies.

Our shipboard High Frequency communications systems are onboard:

- Spruance Class destroyer (DD-963)
- Kidd Class guided missile destroyer (DDG-993)
- Ticonderoga Class guided missile cruiser (CG-47)

Amecom's success in the totally integrated systems method of design and implementation of shipboard communications results in the optimization of communications systems for all size naval platforms.

ity; a matter of Litton pride

AMX-13 VTT, 540 VAB APC; 195 105mm AU-50, 220 155mm F-3 how, 210 155mm BF-50 sp how; *Pluton* SSM; 315 120mm mor; 105/6mm RCL; SS-11/-12, *Milan*, *HOT*, *ENTAC* ATGW; 40mm towed, 30mm SP AA guns; *HAWK*, *Roland* SAM.
 (On order: 145 AMX-30 med tks; 180 AMX-10RC, 100 ERC-905 armd cars; 225 AMX-10 MICV, 1,595 VAB APC; *HOT*, *Milan* ATGW; 20 *Roland* I, 100 *Roland* II SAM.)

ARMY AVIATION (ALAT): 6,450.

7 lt hel gps and 5 combat hel regts with 190 *Alouette* II, 69 *Alouette* III, 132 SA-330 *Puma*, 166 SA-341F, 5 SA-342M *Gazelle* hel, 28 *Broussard*, 80 L-19 lt ac.
 (On order: 128 SA-342M *Gazelle*.)

DEPLOYMENT:

Europe:
Germany: 47,000; 3 armd divs.
Berlin: 2,000; 1 armd regt, 1 inf regt.
Overseas Dependencies:
 There are four overseas comds: Antilles-Guyana (2 inf regts, 3 engr bns), South Indian Ocean (1 para regt, 1 engr bn, 1 inf coy), New Caledonia (1 inf regt), Polynesia (1 inf/engr regt.)
Other Overseas:
 Some 18,000 from all services are deployed elsewhere abroad (numbers vary according to local circumstances); eqpt includes 162 AFV, 64 hel, 13 combat vessels, 10 combat and 16 tpt ac.
Central African Republic: 400.
Djibouti: 3,500; 2 inf regts, 2 armd sqns, 2 arty btys.
Gabon: 500.
Ivory Coast: 430.
Lebanon (UNIFIL): 668; engr coy, log unit.
Saudi Arabia: 450 (technical advisers).
Senegal: 1,300 (all services).

RESERVES: about 280,000 (10 inf divs, and 4 divs formed from military schools).

Navy: 69,950 incl Naval Air, 18,800 conscripts (650 women); 48 major surface combat vessels. 4 comds: 2 home (CECLANT, CECMED), 2 overseas (ALINDIEN, ALPACI).
 21 submarines (4 *Agosta*, 9 *Daphne*, 2 *Arethuse*, 6 *Narval*).
 2 *Clemenceau* med attack carriers (each with 40 ac).
 1 *Jeanne d'Arc* hel carrier (trg ship) with *Exocet* SSM (capacity 8 hel).
 1 command cruiser with *Exocet* SSM, *Masurca* SAM.
 20 destroyers: 1 C-70 with *Exocet* SSM, *Crotale* SAM, 2 *Lynx* hel; 2 *Suffren* with *Exocet*, *Malafon* ASW/SSM, *Masurca*; 3 Type F-67 with *Exocet*, *Crotale*, 2 hel; 1 Type 56 with *Malafon*, 1 hel; 3 Type T-53 (1 ASW with *Exocet*, 1 hel, 2 air-direction); 9 Type T-47 (4 with *Tartar*

SAM, 5 ASW with *Malafon*); 1 Type C-65 with *Malafon*.
 24 frigates: 9 *Rivière* (8 with *Exocet*); 5 Type E-52; 10 Type A-69 (3 with *Exocet*).
 5 FAC(M): 4 *Trident* with SS-12, 1 *La Combattante* with SS-11 SSM.
 15 large patrol craft: 5 *Sirius*, 1 *Le Fougueux*, 4 ex-Can *La Dunkerquoise*, 5 ex-Br *Ham*.
 5 *Circe* minehunters, 10 ex-US *Aggressive* ocean minesweepers/minehunters.
 17 coastal minesweepers: 5 *Sirius*, 12 ex-US *Adjudant* (6 in reserve).
 2 LSD, 5 LST, 4 log spt ships, 47 LCM (36<).
 8 tankers, 5 depot ships, 1 maintenance ship.

Bases: Cherbourg, Brest, Lorient, Toulon.

NAVAL AIR FORCE: 13,000; 145 combat aircraft.
 3 attack sqns with 36 *Super Etendard*.
 1 interceptor sqn with 15 F-8E(FN) *Crusader*.
 2 ASW sqns with 24 *Alizé*.
 5 MR sqns: 4 with 28 *Atlantic*, 1 with 7 SP-2H *Neptune*.
 1 recce sqn with 7 *Etendard* IVP.
 2 OCU with 11 *Etendard* IVM, 12 *Magister*, 8 Nord 262, 5 *Alizé*.
 4 ASW hel sqns with 10 *Super Frelon*, 22 *Lynx*.
 1 assault hel sqn with 5 *Super Frelon*.
 2 SAR/trg/liaison hel sqns with 24 *Alouette* II/III.
 1 hel OCU with *Alouette* II/III, *Super Frelon*, *Lynx*.
 7 comms flights with 8 *Alizé*, 8 *Falcon*, 8 SP-2H *Neptune*, C-47, DC-6A, 3 Nord 262, 11 *Navajo* ac, *Alouette* II/III, *Super Frelon* hel.
 7 trg and liaison sqns with 6 Nord 262, C-54, 5 *Falcon*, 8 *Paris*, 15 *Rallye* ac, *Alouette* II/III hel.
 (On order: 3 subs, 5 C-70 destroyers, 1 frigate, 2 ASW corvettes, 2 minehunters, 36 *Super Etendard* fighters, 5 *Mystère* 20H MR, 6 CAP-10 trg ac, 14 *Lynx* hel.)

MARINES: 1 bn.

RESERVES: about 50,000.

Air Force: 103,460 (40,450 conscripts, 4,360 women); 460 combat aircraft.
Air Defence Command (CAFDA): 6,300.
 8 interceptor sqns: 2 with 30 *Mirage* IIIC, 6 with 90 *Mirage* F-1C (1 more forming end-1980, 1 OCU with 15 *Mirage* F-1B to form 1981).
 4 liaison and comms flts with 30 *Magister*, T-33A, and *Broussard*.
 6 SAM sqns with 24 *Crotale* (6 more forming by 1981).
Air-defence system: Automatic *STRIDA II*.
AAM: R-530, R-550 *Magic*, *Sidewinder*.
Tactical Air Force (FATAC): 7,400.
 5 strike sqns: 3 with 45 *Jaguar*, 2 with 30 *Mirage* IIIE (AN-52 nuclear weapons).
 12 FB sqns: 5 with 75 *Mirage* IIIE, 2 with 30

Mirage 5F, 5 with 75 *Jaguar* A.
 3 recce sqns with 45 *Mirage* IIIR/RD (to be replaced by *Mirage* F-1R).
 2 OCU: 1 with 20 *Mirage* IIIB/BE, 1 with 20 *Jaguar* A/E.
 8 liaison/comms flts with 25 *Magister*, 30 T-33A, 10 *Broussard*, 5 *Paris*, 3 *Frégate*, 7 *Noratlant*, 2 *Mystère* 20 ac, 13 *Alouette* II/III hel.
AAM: Super 530.
ASM: AS-30, AS-37 *Martel*.
Air Transport Command (COTAM): 4,600.
 7 tac tpt sqns: 3 with 56 *Transall* C-160, 4 with 48 *Noratlant*.
 1 OCU with 19 *Transall*, *Noratlant*, *Frégate*.
 4 tpt sqns, plus misc units: 90 DC-8F, *Frégate*, *Mystère* 20, DHC-6, *Caravelle*, *Paris*, *Broussard* ac, 12 *Puma*, 3 *Alouette* III hel.
 5 hel sqns with 33 *Alouette* II, 24 *Alouette* III, 8 *Puma*.
 1 hel OCU with 17 *Alouette* II/III, 2 *Puma*.
Training Command (CEAA): Some 400 aircraft, incl 33 *AlphaJet*, *Magister*, T-33A, *Mystère* IV, *Falcon*, 40 *Flamant*, *Noratlant*, *Broussard*, *Paris*, 30 CAP-10, 25 CAP-20.
 (On order: 20 *Mirage* F-1B, 40 F-1R, 50 *Mirage* 2000 fighters; 67 *AlphaJet* trg ac; 25 *Transall* tpts; 24 *Crotale* SAM.)

RESERVES: 120,000.

Para-Military Forces: 78,600 Gendarmerie (5,000 conscripts) with 33 AMX-13 lt tks, 155 AML armd cars, 155 VRBG APC, 41 *Alouette* II/III hel. 6,900 Service de Santé (230 conscripts).

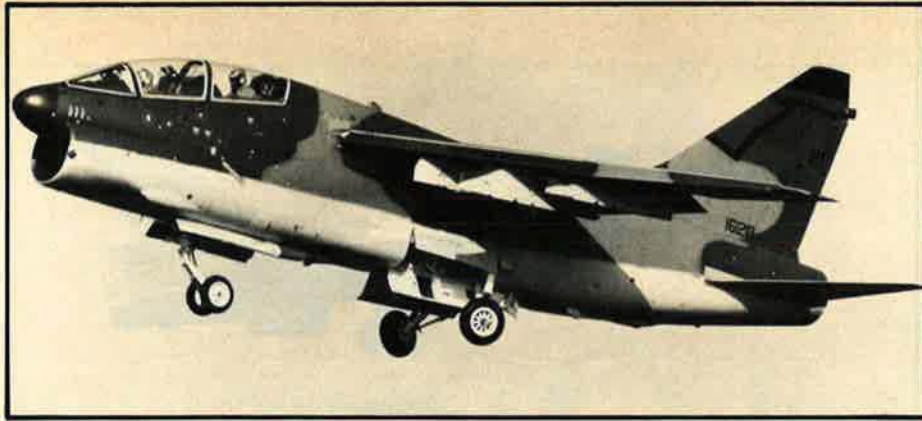
GERMANY: FEDERAL REPUBLIC OF

Population: 61,315,000 (incl West Berlin).
Military service: 15 months.
Total armed forces: 495,000 (225,000 conscripts) (The military divisions of the Ministry of Defence, Central Military Agencies, and Central Medical Agencies comprise 11,300 military personnel. The overall strength of the armed forces includes 6,000 reserve duty training positions; mobilization strength about 1,250,000.)
Estimated GNP 1979: \$761 bn.
Defence expenditure 1980: DM 38.85 bn (\$20.56 bn); NATO definition: \$25.12 bn.
 \$1 = DM 1.89 (1980), DM 1.86 (1979).

Army: 335,200 (176,000 conscripts).
Field Army: 272,000 (under reorganization; complete late 1981). 3 corps: 12 divs (6 armd, 4 armd inf, 1 mountain, 1 AB) totalling 69 tk, 64 armd inf., 12 para bns.
 17 armd bdes (each with 3 tk, 1 armd inf, 1 armd arty bns).
 15 armd inf bdes (each with 1 tk, 3 armd inf, 1 armd arty bns).
 1 mountain bde.
 3 AB bdes (each with 1 tk, 4 para bns).
 1 SAM regt with 36 *Roland* (2 more forming).
 11 AA regts each with 36 *Gepard* 35mm SP.
 15 SSM bns: 11 with 26 *Honest John*, 4 with 26 *Lance*.
 3 army aviation comds, each with 1 lt, 1 med tpt regt.
Territorial Army: 38,000.
 3 Territorial Commands, 6 Military Districts, 6 Home Defence mech inf bdes (each with 2 armd, 2 inf, 1 arty bns and manned, on average at 60%). 6 more Home Defence bdes planned (each with 1 tk, 2 mech inf, 1 fd arty bns): weapons storage units only in peace time. Security troops: 15 Home Defence Regiments (45 mot inf bns), 150 coys, 300 security platoons: defensive, comms, military police, and service units on mobilization.
 1,289 M-48A2/A4, 2,437 *Leopard* I, 100 *Leopard*



The Franco-German AlphaJet, initially developed as a trainer, also has been given close-air-support and battlefield reconnaissance roles.



Initial flight of the TA-7H trainer built for the Greek Air Force by Vought Corp. Greek pilots will transition from the two-seater to the single-seat A-7H.

2 med tks; 408 Spä Pz-2 *Luchs*, 1,898 SPz 11-2, 289 SPz 12-3 (HS-30) armd cars; 2,136 *Marder* MICV, 270 TP2-1, 4,030 M-113 APC; 256 105mm, 18 155mm, 164 FH-70 155mm how; 586 M-109 155mm, 149 M-107 175mm, 77 M-110 203mm SP guns/how; 1,062 120mm mor; 208 *LARS* 110mm MRL; 26 *Honest John*, 26 *Lance* ssm; 770 J Pz 4-5 90mm SP ATK guns; 203 106mm RCL; 174 SS-11, 1,793 *Milan*, 347 *TOW* ATGW, 142 RJPz-(HOT) SP ATGW; 1,745 20mm, 255 40mm towed, 420 *Gepard* 35mm SP AA guns; 879 *Redeye*, 2 *Roland* SAM; 5 PAH-1, 190 UH-1D, 224 *Alouette* II/III, 6 BO-105M, 108 CH-53G hel.
 (On order: 1,700 *Leopard* 2 tks; 786 TP2-1 APC; 52 FH-70 155mm, improved 203mm how; 182 *Milan* ATGW, 762 RJPz-(TOW), 174 RJPz-(HOT) SP ATGW; 110 *Roland* II SAM; 207 PAH-1, 94 BO-105M hel.)

Navy: 36,500, incl Naval Air Arm and 11,000 conscripts.
 24 submarines (18 Type 206, 6 Type 205).
 11 destroyers: 3 *Adams* with *Tartar* ssm and *ASROC*; 4 *Hamburg* with *Exocet* ssm; 4 ex-US *Fletcher* (1 to be retired January 1981).
 6 *Köln* frigates.
 6 corvettes: 5 *Thetis*, 1 *Hans Bürkner*.
 30 FAC(M) with *Exocet* ssm: 10 Type 143, 20 Type 148.
 10 Type 142 FAC(T).
 18 *Lindau* coastal minesweepers/minehunters.
 21 *Schütze* fast coastal minesweepers.
 18 inshore minesweepers: 10 Type 394, 8 Type 393.
 11 *Rhein* depot, 8 *Lüneberg* spt ships, 6 tpts, 7 tankers.
 21 Type 520 LCU, 28 Type 521 LCM.

Bases: Flensburg, Wilhelmshaven, Kiel, Olpenitz.

NAVAL AIR ARM: 146 combat aircraft.
 3 FB sqns with 97 F-104G.
 1 recce sqn with 30 RF-104G.
 2 MR sqns with 15 *Atlantic*, 4 ECM *Atlantic*.
 1 SAR hel sqn with 21 *Sea King* Mk 41.
 1 utility sqn with 20 Do-28-2 ac.
 Trg: 9 TF-104F, 4 P-1497.
 ASM: AS-20, AS-30, AS-34 *Kormoran*.
 (On order: 6 Type 122 frigates, 10 Type 143A FAC(M), 6 Type 320 *Troika* MCM, 112 *Tornado* MRCA, 4 *Westwind* ac, 12 *Lynx* hel.)

Air Force: 106,000 (38,000 conscripts); 561 combat aircraft.

Tactical Command.
 8 FB sqns with 144 F-104G.
 4 FB sqns with 60 F-4F.
 6 lt FGA sqns with 126 G-91R3 (2 converting to 18 *AlphaJet*; 7 sqns, 126 *AlphaJet* planned).
 4 recce sqns with 60 RF-4E (12 in store) to incl FGA capability.

1 OCU with 118 TF-104G.
 8 ssm sqns with 72 *Pershing* IA.
Air Defence Command.
 4 interceptor sqns with 60 F-4F.
 3 SAM regts (each of 2 bns of 4 btys) with 216 *Nike Hercules* launchers.
 3 SAM regts (each of 3 bns of 4 btys) with 216 *Improved HAWK* launchers.
 4 aircraft control and warning regts.
AAM: Sidewinder.
Transport Command.
 3 tpt sqns with 75 *Transall* C-160.
 5 hel sqns with 92 UH-1D.
 1 special air mission sqn with 4 Boeing 707-320C, 3 C-140 *Jetstar*, 6 HFB-320 *Hansa Jet*, 3 VFW-614, 6 Do-28D2 *Skyservant* ac, 4 UH-1D hel.
Training Command.
 Primary trg unit with 45 P-149D.
 Pilot trg wing (Sheppard Air Force Base, Texas, USA) with 35 T-37B, 41 T-38A.
 Combat trg wing (Luke Air Force Base, Arizona, USA) with 30 F-104G (+ 10 in store), 17 TF-104G (+ 11 in store).
 Combat trg sqn (Goose Bay, Canada) 15 F-4.
 Ocu (George Air Force Base, California, USA) with 10 F-4E.
 Miscellaneous liaison, range, and base flts with 10 F-4F, 12 G-91, 3 *Noratlant*, 17 OV-10B/Z, 120 Do-28D.
 (On order: 125 *Tornado* (86 FGA, 39 trainers), 130 *AlphaJet* FGA, 7 HFB-320 lt tpts, 175 *Roland* SAM.)
RESERVES: 750,000 (all services).

GREECE

Population: 9,530,000.
 Military service: 24-32 months.
 Total armed forces: 181,500 (131,000 conscripts).
 Estimated GNP 1978: \$32.5 bn.
 Defence expenditure 1980: 71.25 bn drachmas (\$1.77 bn); NATO definition not available.
 \$1 = 40.17 drachmas (1980), 36.6 drachmas (1978).

Army: 140,000 (105,000 conscripts).
 1 armd div.
 11 inf divs (some mech).
 2 armd bdes.
 1 para-cdo bde.
 1 marine inf bde.
 12 arty bns.
 2 ssm bns with 8 *Honest John*.
 1 SAM bn with 12 *Improved HAWK*.
 14 army aviation coys.
 350 M-47, 800 M-48, 170 AMX-30 med, 190 M-24 lt tks; 180 M-8 armd cars; AMX-10P MICV, 460 M-59, 800 M-113, *Mowag* APC; 100 75mm

pack, 80 105mm, 240 155mm how; M-52 105mm, M-44 155mm, M-107 175mm, M-110 203mm SP guns/how; *Honest John* ssm; 550 106mm RCL; SS-11, *Cobra*, *TOW*, *Milan* ATGW; 40mm, 75mm, 90mm AA guns; *Improved HAWK*, *Redeye* SAM; 1 *Super King Air*, 2 *Aero Commander*, 20 U-17A ac; 5 Bell 47G, 22 UH-1D, 50 AB-204B/-205 hel.
 (On order: 115 AMX-30 med tks, AMX-10P MICV, 144 M-101A1 105mm how, 11 M-109 155mm how, 37 *Chaparral* SAM, 6 CH-47 hel.)

RESERVES: about 250,000.

Navy: 17,000 (11,000 conscripts).
 10 submarines: 7 Type 209, 2 ex-US *Guppy*, 1 ex-US *Balao*.
 12 ex-US destroyers: 5 *Gearing* (1 with 1 hel), 6 *Fletcher*, 1 *Sumner*.
 4 ex-US *Cannon* frigates.
 11 FAC(M): 9 *La Combattante* II/III (8 with *Exocet*, 1 with *Penguin* ssm), 2 with SS-12 ssm.
 14 FAC(T): 7 *Jaguar*, 1 *Vosper Brave*, 1 *Ferocity* < 5 *Nasty* <.
 3 large, 3 coastal patrol craft.
 2 coastal minelayers.
 14 coastal minesweepers (9 MSC-294, 5 ex-US *Adjutant*).
 1 LSD, 10 LST, 5 LSM, 6 LCU, 13 LCM, 14 LCA, 34 LCPV.
 (On order: 1 Type 209 sub, 5 FAC(M) with *Penguin*, 6 AB-212 ASW hel, 32 *Harpoon* ssm.)

Bases: Patrai, Salamis, Thessaloniki, Suda Bay.

RESERVES: about 20,000.

Air Force: 24,500 (15,000 conscripts); 264 combat aircraft.
 3 strike sqns with 57 A-7H.
 5 FB sqns: 3 with 50 F-4E, 2 with 33 F/TF-104G.
 5 interceptor sqns: 3 with 43 F-5A, 2 with 38 *Mirage* F-1CG.
 1 recce sqn with 18 RF-5A, 8 RF-4F.
 Ocu with 9 F-5B.
 1 MR sqn with 8 HU-16B *Albatross* ac, 4 *Alouette* III hel.
 3 tpt sqns with 12 C-130H, 20 C-47, 30 *Noratlant*, 1 *Gulfstream*, 7 CL-215.
 3 hel sqns with 12 AB-205, 2 AB-206A, 10 Bell 47G, 8 UH-19D, 35 UH-1D.
 Trainers incl: 5 TA-7H, 20 T-41A, 1 sqn with 16 T-37C, 1 sqn with 36 T-2E.
AAM: *Sparrow*, *Sidewinder*, *Falcon*, R-550 *Magic*.
 1 SAM bn with *Nike Hercules*.
 (On order: 10 CH-47C hel, 300 *Super Sidewinder* AAM.)

RESERVES: about 20,000.

Para-Military Forces: 26,000 Gendarmerie, 100,000 National Guard. Coastguard with patrol craft.

ITALY

Population: 57,100,000.
 Military service: Army and Air Force 12 months, Navy 18 months.
 Total armed forces: 366,000 (231,500 conscripts).
 Estimated GNP 1979: \$317 bn.
 Defence expenditure 1980: 5,780 bn lire (\$6.58 bn); NATO definition not available.
 \$1 = 878.5 lire (1980), 838 lire (1979).

Army: 253,000 (180,000 conscripts).
 3 corps HQ.
 1 armd div (1 armd, 3 mech bdes).
 3 mech divs (each of 1 armd, 1 mech bde).
 1 indep mech bde.
 5 indep mot bdes.
 5 alpine bdes.
 1 AB bde.

2 amphibious battalions.
 1 missile brigade (1 *Lance* SSM, 3 *HAWK* SAM battalions).
 550 M-47, 300 M-60A1, 745 *Leopard I* med tks;
 4,100 M-106, M-113, M-548, and M-577 APC;
 1,500 guns/how, incl 334 105mm pack,
 155mm, 20 FH-70 155mm, 203mm; 100 M-44,
 205 M-109E 155mm, 36 M-107 175mm, 150
 M-55 203mm sp guns/how; 81mm, 107mm,
 120mm mor; 6 *Lance* SSM; 57mm, 106mm RCL;
Mosquito, *Cobra*, SS-11, *TOW* ATGW; 230
 40mm AA guns; 22 *Improved HAWK* SAM.
 (On order: 105 *Leopard* med tks; 400 M-113 APC;
 160 FH-70 155mm towed, SP-70, M-109
 155mm sp how; *TOW* ATGW.)

ARMY AVIATION: 20 units with 35 O-1E, 80 SM-1019 lt ac; hel incl 70 AB-47G/J, 36 AB-204B, 98 AB-205A, 140 AB-206A/A-1, 25 CH-47C, 5 A-109.
 (On order: 60 A-129, 1 CH-47C, 10 AB-212 hel.)

DEPLOYMENT: *Lebanon* (UNIFIL): 340.

RESERVES: 550,000.

Navy: 42,000, incl 1,500 air arm, 1,000 Marines and 23,000 conscripts.

9 submarines: 2 *Sauro*, 4 *Toti*, 2 ex-US *Tang*, 1 ex-US *Guppy III*.

1 *Vittorio Veneto* hel carrier with 9 AB-212 ASW hel, *Terrier* SAM.

2 *Andrea Doria* cruisers with 4 ASW hel, *Terrier*.
 4 GW destroyers: 2 *Audace* with 2 ASW hel, *Tartar* SAM; 2 *Impavido* with *Tartar*.

2 *Impetuoso* destroyers.
 14 frigates: 4 *Lupo* with *Otomat* SSM, *Sea Sparrow* SAM, 1 ASW hel; 2 *Alpino* with 2 hel; 4 *Bergamini* with 1 hel; 4 *Centaurio* (to retire end-1980).

8 corvettes: 4 *De Cristofaro*, 4 *Albatross*.
 5 *Sparviero* hydrofoils with *Otomat* SSM.

4 FAC: 2 *Freccia* (1 with *Sea Killer* SSM), 2 *Lampo*.

4 ex-US *Aggressive* ocean, 13 ex-US *Adjutant* and 17 *Agave* coastal, 8 *Aragosta* inshore minesweepers.

2 ex-US *De Soto County* LST, 19 ex-US LCM.
 2 *Stromboli* replenishment tankers.

1 Marine inf bn with M-113A1, LVTP-7 APC, 81mm mor, 106mm RCL.

(On order: 2 *Sauro* subs, 1 hel carrier, 6 *Maestrale* frigates, 2 SSM hydrofoils, 4 minehunters.)

Bases: La Spezia, Taranto, Ancona, Brindisi, Augusta, Messina, La Maddalena, Cagliari, Naples, Venice.

NAVAL AIR ARM:
 5 ASW hel sqns with 24 SH-3D, 24 AB-204AS, 35 AB-212.
 (On order: 35 AB-212, 6 SH-3D.)

RESERVES: 160,000.

Air Force: 71,000 (28,500 conscripts); some 310 combat aircraft.

6 FGA sqns: 1 with 18 F-104G, 3 with 54 F-104S, 2 with 36 G-91Y.

3 lt attack/recce sqns with 54 G-91R/R1/R1A.
 6 AWX sqns with 72 F-104S.
 2 recce sqns with 30 F/RF-104G.
 2 MR sqns with 14 *Atlantic*.
 1 ECM/recce sqn with 6 PD-808, 11 EC-47.
 3 tpt sqns: 2 with 32 G-222, 1 with 10 C-130H.
 4 comms sqns with 26 P-166M, 32 SIAI-208M, 8 PD-808, 2 DC-9, 1 DC-6 ac; 2 SH-3D, 20 AB-47 hel.
 4 SAR sqns with 23 AB-204, 20 HH-3F hel.
 1 OCU with 15 TF-104G.
 6 trg sqns with 70 G-91T, 100 MB-326/-339, 14 P-166M, 20 SF-260M ac; 35 AB-47J, 5 AB-204B hel.

AAM: AIM-7E *Sparrow*, AIM-9B *Sidewinder*.
 8 SAM groups with 96 *Nike Hercules*.
 (On order: 100 *Tornado* MRCA, 100 MB-339 trg, 12 G-222 tpts.)

RESERVES: 28,000.



First flight in December 1979 of the multinational F-16 built in the Netherlands and destined for the Norwegian Air Force.

Para-Military Forces: 84,500 *Carabinieri* (1 mech bde with 13 bns, 1 AB bn, 2 cav sqns) with 29 M-47 tks, 9 Fiat 6616, 120 M-6, M-8 armd cars, 200 M-113 APC, 23 AB-47, 2 A-109, 5 AB-205, 23 AB-206 hel. 71,519 Public Security Guard (16 mot, 4 rescue bns) with 30 VTC 6614 armd cars, 3 P-64B ac, 1 AB-47J, 2 A-109, 13 AB-206A, 2 AB-212 hel. 45,000 Finance Guards with 20 AB-47J, 61 NH-500M hel, patrol craft.
 (On order: 41 Fiat 6616 armd cars.)

203mm how; 82 AMX 105mm, 118 M-109 155mm, 24 M-107 175mm, M-110 203mm sp guns/how; 6 *Lance* SSM; 107mm, 136 120mm mor; *Carl Gustav* 84mm, 106mm RCL; *LAW* RL; *TOW* ATGW; 40 L/70 40mm towed, 95 *Gepard* 35mm SP AA guns; 59 *Alouette III*, 24 BO-105 hel.
 (On order: 445 *Leopard 2* med tanks, 350 *Dragon* ATGW.)

DEPLOYMENT: *Germany*: 1 armd bde, 1 recce bn. *Lebanon*: (UNIFIL) 1 bn (816).

RESERVES: 145,000; 1 armd, 2 mech inf bdes, corps troops and 1 indep inf bde would be completed by call-up of reservists. A number of inf bdes could be mobilized for territorial defence.

Navy: 16,580 (2,100 conscripts, 2,920 Marines, 1,500 naval air arm).

6 submarines: 2 *Zwaardvis*, 2 *Potvis*, 2 *Dolfijn*.
 2 *Tromp* GW destroyers with *Harpoon* SSM, *Tartar*, *Sea Sparrow* SAM, 1 *Lynx* hel (flagships).

5 *Friesland* destroyers (being replaced by *Kortenaer* frigates).

9 frigates: 3 *Kortenaer* with *Harpoon* SSM, *Sea Sparrow* SAM, 1 *Lynx* hel; 6 *Van Speijk* with *Harpoon* SSM, *Seacat* SAM, 1 hel.

6 *Wolf* corvettes.
 5 *Balder* large patrol craft.
 3 *Onversaagd* MCM spt ships; 15 *Dokkum* coastal minehunters, 16 *Van Straelen* inshore minesweepers.

2 *Poolster* fast combat spt ships.
 (On order: 2 subs, 9 frigates, 15 minehunters.)

Bases: Den Helder, Flushing, Curacao.

MARINES:
 2 amphib combat gps.
 1 mountain/arctic warfare coy.

NAVAL AIR ARM:
 2 MR sqns with 7 SP-13A *Atlantic*, 10 P-2 *Nep-tune*.
 1 SAR hel sqn with 6 *Lynx* HAR-25.
 2 ASW hel sqns with 10 *Lynx* HAS-27, 10 *Wasp*.
 (On order: 13 P-3C *Orion* ASW, 2 F-27 MR ac; 8 *Lynx* ASW hel.)

DEPLOYMENT: *Netherlands Antilles*: 1 destroyer, 1 amphib combat det, 1 MR det (3 ac).

RESERVES: about 20,000; 9,000 on immediate recall.

LUXEMBOURG

Population: 364,000.
 Military service: voluntary.
 Total armed forces: 660.
 Estimated GDP 1979: \$4.69 bn.
 Defence expenditure 1980: 1.48 bn francs (\$48.6 m); NATO definition: \$49 m.
 \$1 = 30.46 francs (1980), 29.4 francs (1979).

Army: 660.
 1 lt inf bn.
 1 indep coy.
 81mm mor; *TOW* ATGW.

Para-Military Forces: 430 Gendarmerie.

NETHERLANDS

Population: 14,000,000.
 Military service: Army 14 months, Navy and Air Force 14-17 months.
 Total armed forces: 114,980 (49,600 conscripts.) (There are 3,900 regulars and 500 conscripts in the Royal Military Constabulary and interservice bodies.)
 Estimated GNP 1979: \$151.3 bn.
 Defence expenditure 1980: 10.85 bn guilders (\$5.24 bn); NATO definition: \$5.24 bn.
 \$1 = 2.07 guilders (1980), 2.01 guilders (1979).

Army: 75,000 (43,250 conscripts).
 2 armd bdes.
 4 mech inf bdes.
 1 SSM bn with *Lance*.
 3 army aviation sqns (Air Force crews).
 468 *Leopard I*, 340 *Centurion* med, 130 AMX-13 lt tks; 1,087 AMX-VCI and M-113, 750 YP-408, 860 YPR-765 APC; 105mm, 155mm,

203mm how; 82 AMX 105mm, 118 M-109 155mm, 24 M-107 175mm, M-110 203mm sp guns/how; 6 *Lance* SSM; 107mm, 136 120mm mor; *Carl Gustav* 84mm, 106mm RCL; *LAW* RL; *TOW* ATGW; 40 L/70 40mm towed, 95 *Gepard* 35mm SP AA guns; 59 *Alouette III*, 24 BO-105 hel.
 (On order: 445 *Leopard 2* med tanks, 350 *Dragon* ATGW.)

DEPLOYMENT: *Germany*: 1 armd bde, 1 recce bn. *Lebanon*: (UNIFIL) 1 bn (816).

RESERVES: 145,000; 1 armd, 2 mech inf bdes, corps troops and 1 indep inf bde would be completed by call-up of reservists. A number of inf bdes could be mobilized for territorial defence.

Navy: 16,580 (2,100 conscripts, 2,920 Marines, 1,500 naval air arm).

6 submarines: 2 *Zwaardvis*, 2 *Potvis*, 2 *Dolfijn*.
 2 *Tromp* GW destroyers with *Harpoon* SSM, *Tartar*, *Sea Sparrow* SAM, 1 *Lynx* hel (flagships).

5 *Friesland* destroyers (being replaced by *Kortenaer* frigates).

Air Force: 19,000 (4,000 conscripts); 161 combat aircraft.
 2 FB sqns with 36 F-104G (to get F-16).
 1 FB sqn with 18 F-16 (in conversion).
 3 FB sqns with 53 NF-5A.
 1 FB/trg sqn with 18 NF-5B.
 1 AWX interceptor sqn with 18 F-104G.
 1 recce sqn with 18 RF-104G.
 1 tpt sqn with 12 F-27.
 AAM: AIM-9 *Sidewinder*.
 4 SAM sqns with *Nike Hercules*.
 11 SAM sqns with *Improved HAWK* (8 in Germany).
 (On order: 84 F-16 FGA, incl F-16B trainers; 25 *Shorad/Flycatcher* AA systems.)

RESERVES: about 6,000.

Para-Military Forces: 3,900 Gendarmerie, 4,208 Home Guard; 3 divisions comprising nine districts with 87 brigades.

NORWAY

Population: 4,100,000.
 Military service: Army 12 months, Navy and Air Force 15 months.
 Total armed forces: 37,000 (26,750 conscripts).
 Estimated GNP 1979: \$46.0 bn.
 Defence expenditure 1980: 7.99 bn kroner (\$1.57 bn); NATO definition not available.
 \$1 = 5.08 kroner (1980), 5.10 kroner (1979).

Army: 18,000 (15,250 conscripts).
 1 bde gp of 3 inf bns in North Norway.
 Indep armd sqns, inf bns and arty regts.
 78 *Leopard*, 38 M-48 med, 70 NM-116 (M-24/90) lt tks; M-113 APC; 250 105mm, 155mm how; 130 M-109 155mm sp how; 107mm mor; *Carl Gustav* 84mm, 106mm RCL; *ENTAC*, *TOW* ATGW; Rh-202 20mm, L/70 40mm AA guns; 24 O-1E, 24 L-18 lt ac.

DEPLOYMENT: *Lebanon* (UNIFIL): 1 bn, 1 service coy, 1 medical coy, 1 hel ft (952).

RESERVES: 122,000: 11 Regimental Combat Teams (bdes) of about 5,000 men each, spt units and territorial forces; 21 days' refresher training each 3rd/4th year. Home Guard (all services) 85,000 (90 days initial service).

Navy: 9,000, incl 1,600 coast artillery, 6,000 conscripts.
 15 Type 207 *Kobben* submarines.
 5 *Oslo* frigates with *Penguin* SSM, *Sea Sparrow* SAM.
 3 corvettes: 2 *Sleipner*, 1 *Vadsø*.
 34 FAC(M) with *Penguin* SSM: 20 *Storm*, 8 *Hauk*, 6 *Snøgg*.
 11 *Tjeld* FAC(T).
 2 *Vidar* coastal minelayers, 9 ex-US MSC-60 coastal minesweepers, 1 minchunter.
 1 *Horten* depot ship.
 7 LCT: 2 *Kvalsund*, 5 *Reinøysund*.
 6 patrol ships.
 36 coast arty btys.
 (On order: 6 *Hauk* FAC(M), 1 inshore minesweeper, 3 fishery protection ships.)

Bases: Horten, Bergen, Harstad, Tromsø.

RESERVES: 22,000. Coastguard established as part of navy; 12 armd vessels (3 patrol vessels on order).

Air Force: 10,000 (5,500 conscripts); 123 combat aircraft.
 3 FGA sqns with 54 F-5A.
 1 FGA sqn with 18 CF-104G/D.
 1 AWX sqn with 16 F-104G (converting to F-16).
 1 recce sqn with 12 RF-5A.
 1 MR sqn with 7 P-3B.
 1 OCU with 14 F-5B, 2 F-16.
 2 tpt sqns: 1 with 6 C-130H, 3 *Falcon* 20S; 1 with

5 DHC-6 ac, 8 UH-1B hel.
 1 SAR hel sqn with 10 *Sea King* Mk 43.
 3 hel sqns: 2 with 26 UH-1B, 1 with 6 *Lynx* ASW.
 27 *Saab Safir* trainers.
 AAM: *Sidewinder*. ASM: *Bullpup*.
 4 lt AA bns with L/70 40mm guns.
 1 SAM bn (4 btys) with 128 *Nike Hercules*.
 (On order: 70 F-16 fighters; 1 *Sea King* hel; 40 *Roland II*, RBS-70 SAM.)

RESERVES: 18,000. 7 lt AA bns for airfield defence with L/60 40mm guns.

PORTUGAL

Population: 9,900,000.
 Military service: Army 16 months, Navy 24 months, Air Force 21-24 months.
 Total armed forces: 59,540 (35,760 conscripts).
 Estimated GNP 1979: \$21.8 bn.
 Defence expenditure 1980: 35.26 bn escudos (\$698.9m); NATO definition: \$698 m.
 \$1 = 50.45 escudos (1980), 48.05 escudos (1979).

Army: 37,000 (30,000 conscripts).
 6 regional commands (4 military regions, 2 island commands).

1 inf bde.
 1 tk regt.
 3 cav regts.
 15 inf regts.
 1 cdo regt.
 3 fd, 1 coast arty regts, 1 indep fd arty bn.
 1 AA/coast arty bn.
 2 engr regts.
 1 sig regt.
 2 indep inf bns.
 34 M-47, 23 M-48A5 med, 11 M-24 lt tks; 34 *Panhard* EBR hy, 27 *AML* lt, 32 *Ferret* Mk 4 armd cars; 75 M-113, 79 *Chaimite* (*Commando*) APC; 95 5.5-in. guns, 157 M-101A1, 35 M-18 105mm guns/how; 54 107mm, 81 120mm mor; 12 90mm, 47 106mm RCL; 6 *TOW* ATGW; 56 150mm, 152mm, 234mm coast arty; 288 40mm AA arty.
 On order: 200 *TOW* ATGW.

Navy: 13,040, incl 2,250 Marines, 3,260 conscripts.
 3 *Albacore* submarines.
 17 frigates: 4 *Belo*, 3 *Silva*, 6 *Coutinho*, 4 *Andrade*.
 10 *Cacine* large patrol craft.
 8 coastal patrol craft.
 4 *São Roque* coastal minesweepers.
 2 LCT, 12 LCM, 1 LCA.
 6 auxiliaries.

Base: Lisbon.

Air Force: 9,500, incl 2,000 para, 2,500 conscripts; 40 combat aircraft.
 1 FGA sqn with 18 G-91R3, 6 G-91T3, 16 G-91R4.
 2 tpt sqns with 5 C-130H, 22 *CASA* C-212 *Aviocar*.
 2 hel sqns with 24 *Alouette III*, 10 SA-330 *Puma*.
 Trainers incl 18 T-33A, 25 T-37C, 6 T-38A, 25 *Chipmunk*, 32 Reims-Cessna FTB 337G ac, 12 *Alouette III* hel.
 3 para bns.
 (On order: 20 A-7P FGA ac, 12 A-109A hel (4 with *TOW*.)

Para-Military Forces: 13,000 National Republican Guard, 16,400 Public Security Police, 6,900 Fiscal Guard.

TURKEY

Population: 45,500,000.
 Military service: 20 months.

Total armed forces: 567,000 (374,000 conscripts).
 Estimated GNP 1978: \$45.3 bn.
 Defence expenditure 1979-80: 64.8 bn liras (\$2.59 bn); NATO definition not available.
 \$1 = 25 liras (1979), 25 liras (1978).

Army: 470,000 (310,000 conscripts). (About half the divs and bdes are below strength, much eqpt is unserviceable.)

1 armd div.
 2 mech inf divs.
 14 inf divs.
 6 armd bdes.
 4 mech inf bdes.
 7 inf bdes.
 1 para bde, 1 cdo bde.
 4 ssm bns with *Honest John*.
 3,000 M-47, 500 M-48 med tks; 2,000 M-113, M-59 and *Commando* APC; 1,500 75mm, 105mm, 155mm, and 203mm how; 400 105mm, 210 155mm, 36 175mm sp guns; 1,750 60mm, 81mm, 4.2-in. mor; 18 *Honest John* SSM; 1,200 57mm, 390 75mm, 800 106mm RCL; 85 *Cobra*, SS-11 *TOW* ATGW; 900 40mm AA guns; 2 DHC-2, 18 U-17, 6 *Cessna* 206, 3 *Cessna* 421, 7 Do-27, 9 Do-28, 20 *Beech Baron*, 40 *Champion Citabria* 150S trg ac; 100 AB-205/-206, 20 Bell 47G, 48 UH-1D hel.
 (On order: 193 *Leopard* med tks; *TOW*, *Milan* ATGW.)

DEPLOYMENT: *Cyprus*: 1 corps of 2 inf divs (26,000), 180 M-47/-48, 150 M-113.

RESERVES: 400,000.

Navy: 45,000 (34,000 conscripts).
 14 submarines: 4 Type 209, 9 ex-US *Guppy*, 1 *Tang*.
 12 ex-US destroyers: 5 *Gearing* with *ASROC*, 5 *Fletcher*, 1 *Sumner*, 1 *Smith*.
 2 *Berk* frigates, each with 1 hel.
 12 FAC(M): 3 *Lürssen* with *Harpoon* SSM, 9 *Kartal* with *Penguin* SSM.
 7 *Jaguar* FAC(T).
 50 large patrol craft (incl 2 ex-US *Asheville*, 6 PC-1638, 4 PGM-71, 3 SAR 33 type), some with Gendarmerie.
 4 83-ft coastal patrol craft.
 1 *Nusret*, 6 coastal minelayers.
 25 minesweepers: 12 ex-US *Adjutant*, 4 ex-Can MCB, 5 ex-Ger *Vege sack* coastal, 4 ex-US *Cape* inshore.
 4 ex-US LST, 34 LCT, 16 LCU, 20 LCM.
 1 ex-Ger deport ship (trg).
 1 ASW sqn with 12 S-2E *Tracker*, 2 TS-2A.
 3 AB-204B, 6 AB-212 ASW hel.
 (On order: 1 Type 209 sub, 3 FAC(M), *Harpoon* SSM, 10 AB-212 ASW hel.)

Bases: Gölcük, Istanbul, Izmir, Eregli, Iskenderun.

RESERVES: 25,000.

Air Force: 52,000 (30,000 conscripts); 290 combat aircraft.
 12 FGA sqns: 4 with 70 F-4E, 3 with 46 F-5A/B, 3 with 50 F-100C/D/F, 2 with 26 F/TF-104G.
 3 interceptor sqns: 1 with 20 F-5A/B, 2 with 30 F-104S.
 3 recce sqns with 30 RF-5A, 4 F-5B, 8 RF-4E, 6 RF-84F.
 5 tpt sqns with 7 C-130E, 16 *Transall* C-160, 30 C-47, 3 C-54, 3 *Viscount* 794, 2 *Islander*, 2 *CASA* C-212, 6 Do-28, 3 *Cessna* 421 ac; 5 UH-19, 6 HH-1H, 10 UH-1D hel.
 Trainers incl 40 T-33A, 40 T-37, 30 T-38A, 30 T-41, 50 F-100C/F.
 AAM: *Sidewinder*, *Sparrow*, *Falcon*.
 ASM: AS-12, *Bullpup*.
 8 SAM sqns with 170 *Nike Hercules*.
 (On order: 40 F-104, 12 G-91, 6 RF-4E, 30 T-38A ac; *Sidewinder*, *Sparrow* AAM.)

Para-Military Forces: 120,000 Gendarmerie (incl 3 mobile bdes), large patrol craft.

Other European Countries

Albania: Albania joined the Warsaw Pact in 1955 but left it in 1968, moving into a closer relationship with China. After Mao's death, Chinese aid was progressively reduced. Since 1978 little military aid has been received from any source. The Constitution precludes the establishment of foreign bases or the stationing of foreign troops in Albania.

Austria: The State Treaty of 1955, which re-established Austrian independence, prohibited Austria from acquiring nuclear weapons, long-range artillery, chemical and biological weapons, self-propelled missiles, submarines, assault craft, manned torpedoes, and sea mines. Austria's constitution contains a declaration of permanent neutrality. A small arms industry supplies the armed forces and a few foreign sales.

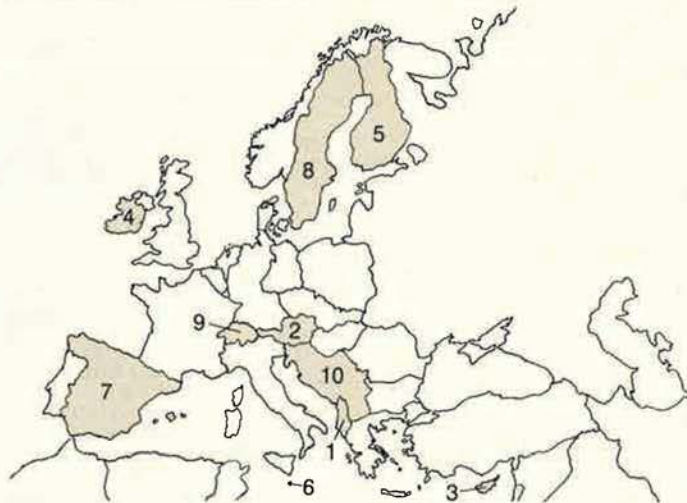
Cyprus: Independent as a bi-national state in 1960, the Turkish occupation of the northern part of Cyprus since July 1974 has effectively produced two entities, each with its own small armed forces. Both Greece and Turkey are also entitled, under an associated Treaty of Alliance with the Republic, to maintain a contingent in the island. Britain—a signatory with Greece and Turkey of the 1959 Treaty of Guarantee which guarantees the independence, territorial integrity, and security of the Republic—maintains a garrison in two Sovereign Base Areas. Future arrangements are under discussion. The United States maintains a signals establishment. The Soviet Union provided arms to the Greek-Cypriots in 1964. The United Nations has a peace-keeping force (UNFICYP) in the island.

Eire: Independent since 1922, Eire buys little equipment. Britain, France, Sweden, and the US have all sold to her at one time or another.

Finland: A 1948 Treaty of Friendship and Co-operation entitles the USSR to intervene should an aggressor invade Finland. Finland has her own defence industry, but buys her major arms from the USSR and Sweden, together with some equipment from Britain, France, and the United States.

Malta: After independence in 1964, Malta had a defence agreement with Britain. Negotiations with Britain over the island's use as a NATO base were concluded in 1972; NATO and Italy bore part of the cost of this base. This treaty expired in 1979, and British troops were withdrawn.

Spain: Following her Civil War in 1936-9, Spain re-



OTHER EUROPEAN COUNTRIES

- | | | |
|------------|------------|----------------|
| 1. Albania | 4. Eire | 8. Sweden |
| 2. Austria | 5. Finland | 9. Switzerland |
| 3. Cyprus | 6. Malta | 10. Yugoslavia |
| | 7. Spain | |

mained neutral during World War II. In 1953 an agreement granted the United States air base rights at Torrejón, Morón and Zaragoza, and an air and naval base at Rota, in exchange for arms. These rights were renegotiated in 1976. Morón remains as a stand-by base, and nuclear weapons have been withdrawn from Rota, virtually closing it. The agreement is to be renegotiated in 1981. Spain has her own arms industry.

Sweden: Neutral in both world wars, Sweden has had a permanent peace-keeping organization since 1964 to provide personnel for UN duties. Her self-defence organization is largely supported by a domestic defence industry but some external purchases have been made, mainly from the United States.

Switzerland: Permanently neutral since 1815, Switzerland belongs to no defence organization. Her small arms industry produces most of her equipment, but France, Britain, and the US have also supplied materiel.

Yugoslavia: Expelled from the Cominform in 1948, she has since maintained ties with each bloc. She has no defence alliances but has purchased most of her military equipment from the USSR.



The mechanized division of the Austrian Army is equipped with M-47 and M-60A1 medium tanks, like the one above.

ALBANIA

Population: 2,770,000.
 Military service: Army 2 years; Air Force, Navy and special units 3 years.
 Total armed forces: 41,000 (22,500 conscripts).
 Estimated GNP 1974: \$1.1 bn.
 Defence expenditure 1979: 835 m leks (\$170 m).
 \$1 = 4.92 leks.

Army: 30,000 (20,000 conscripts). (Spare parts are in short supply; some equipment may be unserviceable.)

1 tk bde.
 8 inf bdes.
 2 arty regts.
 1 AD regt.
 8 lt coastal arty bns.
 70 T-34, 15 T-54, 15 T-59 med tks; BRDM-1 scout cars; 20 BA-64, BTR-40/50/152, K-63 APC; 76mm, 85mm, 122mm, 152mm guns/how; SU-76 SP guns; 120mm mor; 107mm RCL; 45mm, 57mm, 85mm ATK guns; 37mm, 57mm, 85mm, 100mm AA guns; SA-2 SAM.

RESERVES: 100,000.

Navy: 3,000 (1,000 conscripts).
 3 ex-Sov W-class submarines.
 4 ex-Ch *Hoku*-class FAC(M) with *Styx*-type SSM.
 2 ex-Sov *Kronshtadt* large patrol craft.
 42 FAC(T)<: 32 ex-Ch *Hu Chwan* hydrofoils, 10 P-4.
 6 ex-Ch *Shanghai-II* FAC(G).
 10 PO-2K patrol craft.
 5 ex-Sov minesweepers: 2 T-43 ocean, 3 T-301 inshore.

Bases: Durres, Valona, Sazan Island, Pasha Liman.

Air Force: 8,000 (1,500 conscripts); 100 combat aircraft.
 6 interceptor sqns with 20 MiG-15/F-2, 30 MiG-17/F-4, 30 MiG-19/F-6, 20 MiG-21/F-7.
 1 tpt sqn with 4 Il-14, 10 An-2.
 2 hel sqns with 30 Mi-4.
 Trainers incl 10 MiG-15UTI.

RESERVES: 5,000.

Para-Military Forces: 13,000. Internal security force 5,000; frontier guard 8,000.

AUSTRIA

Population: 7,540,000.
 Military service: 6 months, followed by 60 days reservist, 30-90 days specialist for 12 years.
 Total armed forces: 50,300 (34,000 conscripts; total mobilizable strength 160,000). In addition some 70,000 reservists called up for trg during the year.
 Estimated GNP 1979: \$56.5 bn.
 Defence expenditure 1980: 12.42 bn schilling (\$915 m).
 \$1 = 13.57 schilling (1980), 13.65 schilling (1979).

Army: 46,000 (32,000 conscripts).
 1 mech div of 3 mech bdes, each with 1 tk, 1 mech inf, 1 armd arty and/or 1 armd ATK bns.
 28 *Landwehrstammregimente* (trg regts) to train and form reserves.
 3 ordnance (log) regts.
 3 arty bns.
 3 AA arty bns.
 3 engr bns.
 5 sigs bns.
 100 M-47, 120 M-60A1 med tks; 460 Saurer 4K4F APC; 20 SFKM2 155mm guns; 108 105mm, 36 M-114 155mm how, 38 M-109 155mm SP how; 230 81mm, 100 M-2/M-30 107mm, 100 120mm mor; 18 Steyr M-51 130mm MRL; 240 M-52/M-55 85mm towed, 153 *Kuerassier* SP ATK guns; 480 M-40 106mm RCL.
 (On order: 50 M-60A3 med tks, 18 M-109A2 155mm SP how.)

Deployment: *Cyprus* (UNFICYP): 1 inf bn, (314); *Syria* (UNDOF): 1 bn (532); *Other Middle East* (UNTSO): 13.

RESERVES: 8 reserve bdes (each of 3 inf, 1 arty, 1 engr/ATK bns) and 26 inf regts (*Landwehr*) distributed among 8 regional military comds. 870,000 have a reserve commitment.

Air Force: 4,300 (2,000 conscripts); 34 combat aircraft. (Austrian air units, an integral part of the Army, are listed separately for purposes of comparison.)
 4 FB sqns with 34 Saab 105Ö.
 1 tpt wing with 2 *Skyvan*, 12 *Turbo-Porter*.
 7 hel sqns with 21 AB-204B, 25 AB-206A, 4 AB-212, 24 *Alouette III*, 12 OH-58B, 2 S-65Oe (HH-53).

1 trg sqn with 19 Saab 91D.
 Other ac incl 17 Cessna L-19, 3 DHC-2.
 3 indep AD bns with 370 20mm Oerlikon, 72 35mm GDF-001, 60 L/70 40mm towed, M-42 SP AA guns; *Super-Bat* and *Skyguard* AD system.
 (On order: 20 AB-212 hel.)

Para-Military Forces: 11,250 Gendarmerie.

CYPRUS

Population: 835,500 (660,000 Greek, 148,500 Turkish, 27,000 Other).

1. GREEK-CYPRIOI FORCES
 Military service: 26 months.
 Total armed forces: 9,000 (reducing to about 8,000).
 Defence expenditure 1979: £C 7.0 m (\$0.36 m).
 \$1 = £C 0.3573 (1979).

Army: 9,000. (Greek-Cypriot National Guard, mainly composed of Cypriot conscripts, but with some seconded Greek Army officers and NCOS.)

1 armd bn.
 2 recce/mech inf bns.
 18 inf bns (under strength).
 15 arty and spt units.
 10 T-34 med tks; 10 BTR-50 APC; 20 Marmon-Harrington armd cars; 120 100mm, 105mm, and 25-pdr guns and 75mm how; 40mm, 3.7-in. AA guns.

RESERVES: 21,000.

Para-Military Forces: 3,000 armed police.

2. TURKISH-CYPRIOI SECURITY FORCE
 About 4,500 men, organized in a number of inf bns. Some T-34 med tks.

RESERVES: 5,500 first-line, 10,000 second-line.

EIRE

Population: 3,364,880.
 Military service: voluntary.
 Total armed forces: 14,790.
 Estimated GNP 1979: \$15 bn.
 Defence budget 1980: £E 144 m (\$285 m).
 \$1 = £E 0.506 (1980), £E 0.49 (1979).

Army: 13,370 (to increase to 15,900).
 4 mobile bdes: each with 2 inf bns (1 has 3), 1 fd arty regt (1 also has 1 AA regt), 1 motor sqn, 1 engr, 1 ordnance, 1 supply/tpt coys.
 2 indep inf bns.
 4 *Scorpion* lt tks; 16 AML-90, 32 AML-60 armd cars; 55 Panhard VTT/M3, 17 *Unimog*, 5 *Timoney* APC; 48 25-pdr gun/how; 6 M-56 105mm how; 199 60mm, 226 81mm, 72 120mm mor; 446 *Carl Gustav* 84mm, 96 PV-1110 90mm RCL; *Milan* ATGW; 26 L/60, 2 L/70 40mm AA guns.
 (On order: 4 *Scorpion* lt tks, M-56 105mm how, *Milan* ATGW, 7 L/70 AA guns, RBS-70 SAM.)

Deployment: *Lebanon* (UNIFIL): 1 bn+ (672), 4 AML-90, 13 VTT/M3. *Cyprus* (UNFICYP): 7. *Other Middle East* (UNTSO): 21.

RESERVES: 18,199. 421 first line, 17,787 second line. 4 second line Reserve Army Groups (garrisons): 2 with 6 inf bns (1 has 4, 1 has 2), 2 fd arty regts (1 has 1), all with 1 engr, 1 supply/tpt coy.

Navy: 783.
 4 corvettes.
 3 ex-Br *Ton* coastal MCM (fishery protection).
 1 armed training ship.

Base: Cork.

RESERVES: 5 coys: 386.

Air Force: 637; 16 combat aircraft.
1 COIN sqn with 6 *Super Magister*.
1 COIN/trg sqn with 10 SF-260WU, 2 *Chipmunk*.
1 liaison sqn with 7 Cessna 172H.
1 hel sqn with 8 *Alouette III*, 1 *Gazelle* hel.
1 comms flt with 3 *King Air*, 1 HS-125-700.
(On order: 1 Cessna 172H ac, 1 *Gazelle* hel.)

FINLAND

Population: 4,780,000.
Military service: 8-11 months (11 months for officers and NCOs).
Total armed forces: 39,900 (31,900 conscripts; total mobilizable strength about 700,000).
Estimated GNP 1979: \$40.9 bn.
Defence expenditure 1980: 2.57 bn markka (\$656 m).
\$1 = 3.92 markka (1980), 3.97 markka (1979).

Army: 34,400, incl 3,000 Frontier guards (28,000 conscripts).
1 armd bde.
7 inf bdes.
3 fd arty regts.
2 coast arty regts.
7 indep inf bns.
2 indep fd, 3 indep coast arty bns.
1 AA arty regt, 4 indep AA arty bns.
1 SAM bn with SAM-79 (SA-3 *Goa*).
T-54/-55 med, PT-76 lt tks; BTR-50P/-60 APC; 76mm, 74 105mm, 122mm, 130mm, 150mm, 152mm, 155mm guns/how; 81mm, 120mm mor; 55mm, *Miniman* 74mm, 95mm RCL; SS-11 ATGW; 20mm, 23mm, 30mm, 35mm, 40mm, 57mm towed, ZSU-57-2 SP AA guns; SAM-79 (SA-3), SAM-78 (SA-7) SAM.

DEPLOYMENT: Syria (UNDOF): 388. Cyprus (UNFICYP): *Other Middle East* (UNTSO): 21. Pakistan (UNMOGIP): 4.

Navy: 2,500 (1,900 conscripts).
1 ex-Sov *Riga* frigate.
2 *Turunmaa* corvettes.
5 FAC(M) with MTO (*Styx*) SSM: 4 ex-Sov *Osa-II*, 1 *Isku*.
13 FAC(G)<: 12 *Nuoli*, 1 *Vasama*.
5 large patrol craft: 3 *Ruissalo*, 2 *Rihtniemi*.
1 minelayer, 6 *Kuha* inshore minesweepers.
1 HQ and log/trg ship (minelayer).
13 small LCU/tpts, 9 utility/spt ships.
(On order: 1 *Vartv* FAC, 5 log ships.)

Air Force: 3,000 (2,000 conscripts); 50 combat ac.
2 fighter sqns with 17 MiG-21F, 2 MiG-21bis, 12 J-35S, 6 J-35F, 6 J-35B *Draken*.
1 OCU with 4 MiG-21U, 3 J-35C.
1 tpt sqn: 7 C-47 ac; 1 hel flt with 12 Mi-8, 1 Hughes 500.
Trainers incl 60 *Magister*, 25 Saab *Safir*.
Liaison ac: 5 *Cherokee Arrow*, 2 Cessna 402.
AAM: AA-2 *Atoll*, *Falcon*.
(On order: 18 MiG-21bis fighters, 50 *Hawk*, 30 Leko-70 trg ac.)

RESERVES (all services): 700,000 (32,000 a year do training).

Para-Military Forces: 4,000 frontier guards, 5 large, 10 coastal patrol craft.

MALTA

Population: 338,000.
Military service: voluntary.
Total armed forces: 800.
Estimated GNP 1978: \$760 m.

Defence expenditure 1978-9: £M 3.7 m (\$10.3 m).
\$1 = £M 0.360 (1979), £M 0.393 (1978).

Army: 800.
1 inf bn.
1 engr bn.
2 *Susa* FAC(M) with SS-12 SSM.
12 launches/patrol craft<.
1 AB-206, 4 AB-47G, 3 *Alouette III*, 1 *Super Frelon* hel.

Para-Military Forces: 3,000 pioneers.

SPAIN

Population: 37,720,000.
Military service: 15 months.
Total armed forces: 342,000 (230,000 conscripts).
Estimated GNP 1979: \$165 bn.
Defence expenditure 1979: 336.9 bn pesetas (\$4.8 bn).
\$1 = 69.91 pesetas (1979), 80.22 pesetas (1978).

Army: 255,000 (190,000 conscripts).
Immediate Intervention Force:

1 armd div } each with 2 bdes.
1 mech div }
1 mot div }
1 para bde.
1 armd cav bde.
1 arty bde.
1 airportable bde.
Territorial Defence Force:
2 mountain divs.
9 indep inf bdes.
1 reserve inf bde.
1 mountain bde.
1 arty bde (incl 1 SAM bn).

Overseas Forces:

5 inf regts.
3 Foreign Legion regts.
6 coast arty/AA regts.
3 engr regts.
4 lt cav gps (bn+).
4 *Regulares* inf gps.
2 cdo, 2 special sea coys.

Army Aviation: HQ, 5 hel sqns, schools.
275 AMX-30, 370 M-47E, 110 M-48 med, 180 M-41 lt tks; 60 AML-60, 80 AML-90 armd cars; 50 BMR-600 MICV, 400 M-113 APC; 860 105mm, 200 122mm, 80 155mm, 24 203mm guns/how; 48 M-108 105mm, 10 M-44, 70 M-109 155mm, 12 M-107 175mm, 4 M-110 203mm SP guns/how; 216mm, 300mm, 381mm MRL; 60mm, 860 81mm, 105mm, 400 120mm mor; 90mm, 106mm RCL; SS-11, *Milan*, *Cobra*, *Dragon* ATGW; 54 35mm, 280 40mm, 150 90mm AA guns; 200 88mm, 6-in, 12-in, 15-in coast arty guns; *Nike Hercules*, *Improved HAWK* SAM; 9 CH-47C, 3 *Puma*, 70 UH-1B/H, 5 *Alouette III*, 1 AB-206A, 10 OH-13, 13 OH-58A hel.
(On order: 140 AMX-30 med tks; 450 BMR-600 MICV, 248 M-113 APC; 18 M-109 155mm SP how; TOW ATGW; 28 *Skyguard* AD systems; 69 BO-105, 18 OH-58A hel.)

DEPLOYMENT: *Balearic Islands*: 8,600; 3 inf, 2 coast/AA regts, 1 engr bn, 1 lt cav gp, 1 cdo coy. *Canary Islands*: 16,000; 2 inf, 1 Foreign Legion, 2 coast/AA regts, 2 engr bns, 2 lt cav gps, 1 cdo coy. *Ceuta/Melilla*: 19,000; 2 armd cav, 2 Foreign Legion, 2 coast/AA, 2 engr regts, 4 *Regulares* gps, 1 lt cav gp, 2 special sea coys.

Navy: 49,000 (12,500 Marines), 40,000 conscripts.
8 submarines (4 *Daphne*, 3 ex-US *Guppy* IIA, 1 ex-US *Balao*).
1 ex-US *Independence* ac carrier (7 AV-8A, 18 hel).
11 destroyers: 7 with 1 hel (2 *Roger de Lauria*, 5

ex-US *Gearing* with *ASROC*), 4 ex-US *Fletcher*.

16 frigates: 4 F-30 with *Harpoon* SSM, *Sea Sparrow* SAM; 5 *Baleares* with *Standard* SAM, *ASROC*; 1 *Audaz*, 1 *Alava*, 1 *Pizarro*, 4 *Atrevida*.

12 FAC(P): 6 *Lazaga*, 6 *Barcelo*.

70 coastal patrol craft<.

4 ex-US *Aggressive* ocean, 11 *Nalon* coastal MCM.

2 attack tpts, 1 LSD, 3 LST, 7 LCT, 2 LCU, 6 LCM.

1 FGA sqn with 6 AV-8A *Matador*, 2 TAV-8A.

1 comms sqn with 4 *Commanche*.

5 hel sqns with 9 SH-3D, 12 AB-212, 11 Bell 47G, 11 Hughes 500HM, 5 AH-1G.

4 Marine lt inf regts and 2 indep gps.

(On order: 4 *Agosta* subs; 1 aircraft carrier; 4 frigates; 5 AV-8A FGA; 8 AB-212, 3 SH-3D hel; *Harpoon* SSM; *Aspide* SAM.)

Bases: Ferrol, San Fernando, Cadiz, Cartagena.

Air Force: 38,000; 177 combat aircraft.

Air Defence Command:

5 interceptor sqns: 2 with 36 F-4C(S); 2 with 20 *Mirage IIIE*, 6 *IIID*; 1 with 24 *Mirage F-ICE*.

Tactical Command:

3 FB sqns with 16 F-5A, 2 F-5B, 11 HA-220 *Super Saeta*.

2 recce sqns with 19 RF-5A, 4 RF-4C, 9 AR-10C (HA-220).

1 MR sqn with 2 P-3A, 4 P-3C.

5 liaison flts with 12 O-1E, 27 Do-27, 8 C-212.

AAM: *Sparrow*, *Sidewinder*, R-550 *Magic*.

Transport Command:

7 sqns with 7 C-130H, 3 KC-130H, 1 DC-8-52, 10 CASA-207 *Azor*, 60 C-212 *Aviocar*, 10 DHC-4, 5 *Aztec*, 1 *Navajo*, 1 *Falcon*, 5 *Convair* 440, 3 *Mystere* 20.

Training Command:

2 OCU with 24 F-5B.

5 sqns with 35 F-33C *Bonanza*, 6 CASA C-101, 42 HA-200A/B *Saeta*, 24 T-33A, 14 T-34, 60 T-6, 8 *King Air*, 18 *Baron* ac; 34 AB-47 and AB-205 hel.

4 SAR sqns: 3 with 3 F-27-400MPA, 3 HU-16A, 6 Do-27 ac, 17 AB-205/-206, 3 *Alouette III*, 9 *Puma* hel; 1 with 7 CL-215.

(On order: 48 *Mirage* F-1 fighters; 2 P-3C *Orion* MR; 5 C-130H, 1 KC-130H, 7 CL-215 tpts; 54 CASA C-101 trainers; 17 Hughes 300C hel; *Super Sidewinder* AAM.)

RESERVES (all services): 1,085,000.

Para-Military Forces: 64,000 *Guardia Civil*, 40,000 *Policia Armada*.

SWEDEN

Population: 8,300,000

Military service: Army and Navy 7½-15 months, Air Force 8-12 months.

Total armed forces: 66,100 (47,500 conscripts; there are normally some 120,000 more conscripts (105,000 army, 10,000 navy, 5,000 air force) plus 15,000 officer and NCO reservists doing 11-40 days refresher training at some time in the year. Obligation is 5-8 times per reservist between ages 20 and 47; mobilizable to about 800,000 in 72 hours).
Estimated GNP 1979: \$103 bn.

Defence expenditure 1980: Kr 15.79 bn (\$3.59 bn).
\$1 = 4.40 kronor (1980), 4.36 kronor (1979).

Army: 44,500 (36,000 conscripts).

Peace establishment:

48 non-operational armd, cav, inf, arty, AA, engr and sig trg regts for basic conscript trg.

War establishment (700,000 on mobilization):

4 armd bdes.

20 inf bdes.

4 *Norrland* bdes.



The multirole Saab-Scania AJ-37 Viggen equips six fighter and ground-attack squadrons in the Swedish Air Force. It is also flown as a trainer.

50 indep inf, arty and AA arty bns.
26 Local Defence Districts with 100 indep bns and 400-500 indep coys.
300 Strv-101, Strv-102 (*Centurion*), 300 Strv-103B med, 200 Ilv 91 lt tks; Phv 302 APC; 105mm, 150mm, 155mm how; 155mm SP guns; 81mm, 120mm mor; *Miniman* 74mm, *Carl Gustav* 84mm, PV-1110 90mm RCL; RB-53 *Bantam* ATGW; 20mm, 40mm AA guns; RB-69 (*Redeye*), RBS-70, RB-77 (*Improved HAWK*) SAM; 65 Sk-61C (*Bulldog*) ac; 15 HKP-3 (AB-204B), 22 HKP-6 (*Jet Ranger*) hel.
(On order: FH-77 155mm how, TOW ATGW.)

DEPLOYMENT: Cyprus (UNFICYP): 428.

Navy: 11,800, incl coast arty (6,900 conscripts).
14 submarines (3 *Näcken*, 5 *Sjöormen*, 6 *Draken*).
6 destroyers: 2 *Halland*, with RB-08 SSM; 1 *Södermanland* with RB-08, RB-07 (*Seacat*) SAM (3 more in reserve).
2 *Rigby* frigates (in reserve).
12 *Hugin* FAC(M) with RB-12 (*Penguin*) SSM.
22 FAC(T): 12 *Spica* T-131, 6 *Spica* T-121, 4 T-42.
6 *Hano* med, 28 small coastal patrol craft.
2 *Alvsborg* minelayers, 1 minelayer/trg ship.
9 coastal minelayers.
12 *Arkö* coastal, 18 inshore minesweepers.
9 LCM, 70 LCU.
15 mobile, 45 static coastal arty btys with 75mm, 105mm, 120mm, 152mm, 210mm guns; RB-08, RB-52 SSM.
5 HKP-2 (*Alouette* II), 10 HKP-4 (Vertol 107), 10 HKP-6 hel.
(On order: 4 *Hugin* FAC(M), 1 minelayer.)

Bases: Stockholm, Karlskrona, Göteborg, Karlin.

Air Force: 9,800 (4,600 conscripts); 430 combat aircraft (+ stored ac incl 20 J-35F *Draken*).
11 FGA sqns: 6 with 90 AJ-37 *Viggen*, 5 with 60 SK-60B/C (Saab 105).
12 AWX sqns: 9 with 160 J-35F *Draken*, 3 with 60 J-35D (to be replaced by JA-37 *Viggen*).
6 recce/MR sqns with 60 SH/SF-37 *Viggen*.
2 tpt sqns with 3 C-130E/H, 2 *Caravelle*, 6 C-47.
5 comms sqns with 65 SK-60A/B.
Trainers incl 125 SK-60A/B/C, 57 SK-61, 20 SK-35C *Draken*, 50 SK-50 *Safir*, 17 SK-37 *Viggen*.
Hel incl 9 HKP-2, 7 HKP-3, 10 HKP-4B.
AAM: *Sidewinder*, RB-27 (*Falcon*), RB-28 (*Improved Falcon*).
ASM: RB-04E, RB-05A, RB-75 (*Maverick*).
Semi-automatic control and surveillance system, *Stril* 60, co-ordinates all AD components.

(On order: 75 JA-37 *Viggen* interceptors, 3 C-130H tpts, *Skyflash* AAM.)

RESERVES: voluntary defence organizations (all services) 500,000.

SWITZERLAND

Population: 6,298,000.
Military service: 17 weeks recruit training followed by reservist refresher training of 3 weeks for 8 out of 12 years for *Auszug* (age 20-32), 2 weeks for 3 years for *Landwehr* (33-42), 1 week for 2 years for *Landsturm* (43-50).
Total armed forces: about 3,500 regular and 15,000 recruits (mobilizable to 625,000 in 48 hours). (Two recruit intakes a year (Jan/Jun) each of 15,000. Some 300,000 reservists a year do refresher training.)
Estimated GNP 1979: \$96.5 bn.
Defence expenditure 1980: S. fr3.28 bn (\$1.80 bn).
\$1 = 1.79 francs (1980), 1.68 francs (1979).

Army: 580,000 on mobilization.
War establishment:
3 fd corps, each of 1 armd, 2 inf divs.
1 mountain corps of 3 mountain inf divs.
23 indep bdes (11 frontier, 6 territorial, 3 fortress, 3 redoubt).
Indep units (3 hy arty, 2 engr, 2 sigs regts, 1 armd car bn).
320 *Centurion*, 150 Pz-61, 330 Pz-68 med tks; 1,250 M-113 APC; 105mm guns; 260 M-190U 155mm SP how; 81mm, 120mm mor; 75mm, 90mm, 105mm ATK guns; 83mm RL; 106mm RCL; *Bantam* ATGW; 10 patrol boats.
(On order: 60 Pz-68 med tks, 225 M-113 APC, 207 M-109 155mm SP how, *Dragon* ATGW.)

Air Force (Aviation Corps, an integral part of the Army): 45,000 on mobilization (maintenance by civilians); 377 combat aircraft.
16 FGA sqns: 3 with 100 *Venom* FB-50, 4 with 72 F-5E/F, 9 with 147 *Hunter* F-58/T-68.
2 interceptor sqns with 32 *Mirage* IIIS.
1 recce sqn with 18 *Mirage* IIIRS, 8 *Venom* FB-54.
8 lt ac sqns with 18 *Turbo-Porter*, 3 *Bonanza* ac, 21 *Alouette* II, 79 *Alouette* III hel.
Other ac incl 31 *Pilatus* P-2, 68 P-3, 37 *Vampire* T-55, 65 *Vampire* Mk 6, 3 *Mirage* IIIBS, 3 *Twin Bonanza*, 6 Do-27, 3 Ju-52.
AAM: *Sidewinder*, AIM-26B *Falcon*. ASM: AS-30.

1 air force fd bde (3 regts, 1 para coy, 1 lt ac wing).
1 air base bde with 3 regts.
1 AD bde with 1 SAM regt of 2 bns (each with 32 *Bloodhound*) and 7 AA arty regts with 20mm and 35mm AA guns, *Skyguard* AA fire control systems.
3 comd and comms regts, 1 log regt.
(On order: 2 *Mirage* IIIB, 36 F-5E, 6 F-5F.)

RESERVES: Militia 621,500.

YUGOSLAVIA

Population: 22,130,000.
Military service: Army and Air Force 15 months; Navy 18 months (to be 15 months).
Total armed forces: 264,000 (145,000 conscripts).
Estimated GNP 1978: \$45 bn.
Defence expenditure 1980: 73 bn dinars (\$3.6 bn).
\$1 = 20.09 dinars (1980), 18.69 dinars (1979).

Army: 190,000 (130,000 conscripts).
8 inf divs.
8 indep tk bdes.
15 indep inf bdes.
1 mountain bde.
1 AB bde.
12 fd, 12 AA arty regts.
6 ATK regts.
1,500 T-34/-54/-55, M-47, about 650 M-4 med, some PT-76 lt tks; M-3, M-8, BRDM-2 scout cars; M-980 MICV, BTR-50/60P/-152, M-60 APC; 76mm, 105mm, 122mm, 130mm, 152mm, 155mm guns/how; SU-76, SU-100, 105mm SP guns/how; 81mm, 120mm mor; 128 MRL; *FROG-7* SSM; 57mm, 75mm, 100mm towed, ASU-57, M-18 76mm, M-36 90mm SP ATK guns; 57mm, 75mm, 82mm, 105mm RCL; *Snapper*, *Sagger* ATGW; 20mm, 30mm, 37mm, 40mm, 57mm, 85mm, 88mm, 90mm, 94mm towed, ZSU-23-4, ZSU-57-2 SP AA guns; SA-6/-7/-9 SAM.
(On order: 700 M-980 MICV.)

Navy: 30,000, incl 15,000 Marines (8,000 conscripts).
6 submarines: 1 *Sava*, 3 *Heraj*, 2 *Sutjeska*.
1 *Split* destroyer (in reserve).
3 corvettes: 2 *Mornar*, 1 *Le Fougueux*.
16 FAC(M) with *Styx* SSM: 6 *Rade Koncar*, 10 ex-Sov *Osa-I*.
15 ex-Sov *Shershen* FAC(T).
19 large patrol craft: 10 *Kraljevica*, 9 Type 131.
27 minesweepers: 4 *Vukov Klanac* coastal, 10 inshore (4 *Ham*, 6 M-117), 13 river<.
21 LCU/minelayers, 15 601-type LCA.
1 ASW sqn with Ka-25, Mi-8, *Partizan* hel.
1 marine bde.
25 coast arty btys with *Samlet* SSM; M-44 85mm, M-54 130mm, M-37 152mm guns.
(On order: 1 sub, 1 frigate, 8 FAC(M), 1 LST.)

Bases: Lora/Split, Pula, Sibenik, Ploce, Kotov.
Air Force: 44,000 (7,000 conscripts); 346 combat ac.
15 FGA sqns with 12 *Kraguj*, 130 *Galeb/Jastreb*.
9 interceptor sqns with 126 MiG-21F/PF/M.
3 recce sqns with 40 *Galeb/Jastreb*.
OCU with 18 MiG-21U, 20 *Jastreb*.
3 tpt regts: 15 C-47, 2 Il-18, 6 Yak-40, 2 An-12, 13 An-26, 4 Li-2, 1 Boeing 727-200.
60 *Galeb/Jastreb*, 3 T-33, 30 UTVA-75 trainers.
3 hel tpt regts: 5 AB-205, 14 Mi-1, 18 Mi-4, 12 Mi-8, 10 *Whirlwind*, 20 *Partizan* (*Gazelle*) hel.
AAM: AA-2 *Atoll*.
8 SA-2, 6 SA-3 SAM bns.
(On order: 94 *Partizan* hel.)

Para-Military Forces and Reserves: 500,000 Reservists, 16,000 Frontier Guards, 1,000,000 Territorial Defence Force.

The Middle East and North Africa

BILATERAL AGREEMENTS WITH EXTERNAL POWERS

The Soviet Union signed a fifteen-year Treaty of Friendship and Co-operation with Iraq in April 1972, and a further agreement, involving three bases, in December 1978. The latest known Soviet military agreement with Syria was signed in October 1979. A Treaty of Friendship and Co-operation, signed with South Yemen in October 1979, was ratified in February 1980. All three countries subsequently received significant arms deliveries. The Soviet Union has also sold arms to Algeria, Morocco, Kuwait, Sudan, and the Yemen Arab Republic (North Yemen). Egypt signed a Treaty of Friendship and Co-operation with the Soviet Union in May 1971 and abrogated it in March 1976. The Soviet Union, formerly a major arms supplier, has delivered no significant arms supplies to Egypt since then. Some supplies may be still coming from other Warsaw Pact nations.

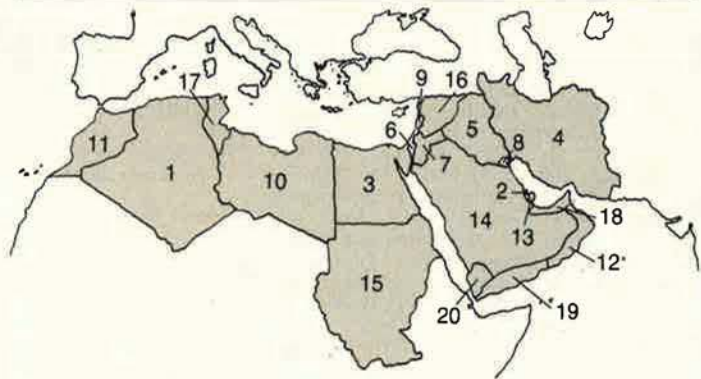
The Defence Ministers of Bulgaria and the People's Democratic Republic of Yemen (South Yemen) signed a Protocol for Co-operation on 2 April 1980.

The United States has varying types of security assistance programmes in the region. Military aid to Iran ceased in February–August 1979 but has continued on a grant, credit, or cash sale basis to Egypt, Israel, Jordan, Kuwait, Lebanon, Morocco, Saudi Arabia, and Tunisia. An agreement with Oman to provide economic and military aid in exchange for permission to use Masirah as a staging base is under consideration. An agreement with Bahrain permits the US Navy to use port facilities.

China signed a Treaty of Friendship with North Yemen in 1964 under which some economic development took place and minor arms were provided. China has also supplied arms and spare parts to Egypt under an arms agreement signed in 1978/9. Arms have also been supplied to Sudan.

Britain concluded treaties of friendship with Bahrain, Qatar, and the United Arab Emirates (UAE) in August 1971. Iran ended her military purchases in January 1979. Britain is now supplying arms to Bahrain, Egypt, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Sudan, and the UAE.

France has a continuing arms supply arrangement with Morocco and has supplied arms, equipment, and ammunition to a number of countries including Abu Dhabi,



THE MIDDLE EAST AND NORTH AFRICA

- | | |
|-------------|---|
| 1. Algeria | 12. Oman |
| 2. Bahrain | 13. Qatar |
| 3. Egypt | 14. Saudi Arabia |
| 4. Iran | 15. Sudan |
| 5. Iraq | 16. Syria |
| 6. Israel | 17. Tunisia |
| 7. Jordan | 18. United Arab Emirates (UAE) |
| 8. Kuwait | 19. Yemen Arab Republic (North) |
| 9. Lebanon | 20. Yemen: People's Democratic Republic (South) |
| 10. Libya | |
| 11. Morocco | |

Egypt, Iraq, Kuwait, Libya, Qatar, Saudi Arabia, and Tunisia.

The United Nations withdrew the 4,000-man United Nations Emergency Force (UNEF) from the Sinai on 24 July 1979; its duties were assumed by the United Nations Truce Supervisory Organization (UNTSO), which has been active in the region since 1949.

The United Nations also deploys in the Golan Heights the 1,290-man Disengagement Observer Force (UNDOF), made up of contingents from Austria, Canada, Finland, and Poland.

The United Nations Interim Force in Lebanon (UNIFIL) consists of 5,900 men from France, Fiji, Ghana, Ireland, Italy, Netherlands, Nigeria, Norway, and Senegal.

ARRANGEMENTS WITHIN THE REGION

Algeria, Bahrain, Djibouti, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, the PLO,

Qatar, Saudi Arabia, Somalia, Syria, Tunisia, and North and South Yemen are members of the League of Arab States. (Egypt's membership was suspended in March 1979.) Among its subsidiary bodies are the Arab Supreme Defence Council, comprising Foreign and Defence Ministers, set up in 1950, the Permanent Military Committee (1950) of Army General Staffs, which is an advisory body, and the Unified Arab Command (1964).

Syrian forces, which had entered the fighting in Lebanon in April 1976, and which then totalled some 13,000, were augmented by a symbolic Lebanon Peace-keeping Force of Libyan, Saudi, and Sudanese troops. Fighting continued, and a 30,000-man Arab Deterrent Force, mostly Syrian, was approved at Riyadh on 18 October 1976. Subsequently this Force comprised forces from Lebanon, Kuwait, the Palestine Liberation Army (PLA), Sudan, and the United Arab Emirates. All but the Syrian and PLA contingents have now been withdrawn.

Egypt concluded a defence pact with Syria in November 1966, and with Jordan in May and Iraq in June 1967. These established a joint Defence Council and a Joint Command. The loosely-associated Eastern Front Command, set up by Iraq, Jordan, and Syria in March 1969, disappeared in December 1970. Iraq and Syria concluded defence pacts in May 1968 and July 1969, and a third, calling for full military union, in October 1978. Little of substance has resulted, and unification seems to have been abandoned following a dispute in July 1979. Jordan and Syria have since set up a joint consultative body to

co-ordinate military policy. The Federation of Arab Republics, formed by Libya, Syria, and Egypt in April 1971, provided for a common defence policy and a Federal Defence Council, and an Egyptian was appointed Commander-in-Chief of all Federation Forces in January 1973. This agreement was not actively implemented and must be presumed to be in abeyance.

Algeria and Libya signed a defence agreement in December 1975, and Egypt another with Sudan in January 1977. A 1977 agreement between Mauritania and Morocco was abrogated in August 1979. An understanding between Saudi Arabia and Iraq is believed to have been signed in 1979.

Arms movements in the region are complex. Egypt has supplied arms to Morocco. Algeria and Libya reportedly supply arms to Polisario guerillas, and most countries have supplied arms to the Palestinian guerillas. In some cases a third nation funds the recipient's foreign arms purchases.

In 1975 an Arab Organization for Industrialization (AOI) was set up in Egypt to encourage indigenous Arab arms production. Initially under the aegis of Saudi Arabia, Qatar, the UAE, and Sudan, this project was ended following Egypt's rapprochement with Israel. Egypt is attempting to continue it with British and US support.

In 1979 Iraq, Kuwait, Qatar, Saudi Arabia, and the UAE agreed to set up an \$8-bn arms industry in the UAE to replace the AOI.

ALGERIA

Population: 19,500,000.
Military service: 6 months.
Total armed forces: 101,000.
Estimated GDP 1979: \$32 bn.
Defence expenditure 1980: 2.70 bn dinars (\$705 m).
\$1 = 3.83 dinars (1980), 4.04 dinars (1979).

Army: 90,000.
1 armd bde.
1 mech bde.
4 mot inf bdes.
1 AB/special force bde.
3 indep tk bns.
58 indep inf bns.
2 para bns.
5 indep arty bns.
11 AD bns.
4 engr bns.
12 coys desert troops.
600 T-54/-55/-62/-72 med, 50 AMX-13 lt tks;
200 armd cars, incl AML, BRDM-2; BMP-1
MICV, 830 BTR-40/-50/-60/-152 APC; 340
85mm, 122mm, and 152mm guns/how; 140
SU-100 and ISU-122/-152 SP guns; 180
120mm and 160mm mor; 85 BM-21 122mm,
140mm, and 240mm MRL; 50 FROG-4/-7 SSM;
230 75mm, 76mm, and 85mm ATK guns;
Sagger ATGW; 440 57mm, 85mm, 100mm
towed, 100 ZSU-23-4 and ZSU-57-2 SP AA
guns; SA-7, 30 SA-6/-9 SAM.

RESERVES: up to 100,000.

Navy: 4,000.
6 ex-Sov SO-1 large patrol craft.
17 ex-Sov FAC(M) with Styx SSM: 3 Osa-I, 8
Osa-II, 6 Komar-
6 ex-Sov P-6 FAC(T) (2 unarmed trg).
2 ex-Sov T-43 ocean minesweepers (in reserve).
1 ex-Sov Polnocny LCT.

2 F-28 MR ac.
(On order: 1 F-28.)

Bases: Algiers, Annaba, Mers el Kebir.

Coastguard: 2 P-6 FAC(T), 16 Baglietto FAC(G) (6 Gemini 36, 10 Type 20<).

Air Force: 7,000; 278 combat aircraft.
1 lt bbr sqn with 24 Il-28.
3 interceptor sqns with 90 MiG-21MF.
6 FGA sqns: 2 with 20 Su-20, 2 with 70 MiG-17, 2
with 20 MiG-23S.
1 recce sqn with 10 MiG-25R.
1 COIN sqn with 24 Magister.
OCU with 20 MiG-15.
1 tpt sqn with 8 An-12, 12 F-27.
6 hel sqns with 4 Mi-6, 10 Mi-4, 12 Mi-8, 20
Mi-24, 5 Puma, 6 Hughes 269A.
Other ac incl 1 King Air, 3 Super King Air, 3
Queen Air, 2 CL-215.
Trainers incl MiG-15/-17/-21UTI, Su-7U, 19
Yak-11/-18, 6 T-34C, 12 Beech Sierra.
AAM: AA-2 Atoll.
SAM: 18 SA-2.

Para-Military Forces: 10,000 Gendarmerie.

BAHRAIN

Population: 373,000.
Estimated GNP 1977: \$1.7 bn.
Total armed forces: 2,500.
Defence expenditure 1979: 37.5 m dinar (\$98 m).
\$1 = 0.384 dinars (1979), 0.388 dinars (1978).

Army: 2,300.
1 inf bn.
1 armd car sqn.
8 Saladin armd, 8 Ferret scout cars; 93 Panhard
M-3 APC; 6 81mm mor; 6 120mm RCL; RBS-70
SAM.
(On order: 17 Panhard M-3 APC.)

Coastguard: 200.
2 TNC-45 FAC(M) with Exocet SSM.
2 Lürssen 38-metre FAC(G).
14 coastal patrol craft.
1 hovercraft.
2 landing craft: 1 Loadmaster, 1 60-ft.

Police: 2,500.
2 Scout, 3 BO-105, 2 Hughes 369D hel.

EGYPT

Population: 40,460,000.
Military service: 1 year.
Total armed forces: 367,000.
Estimated GDP 1979: \$16.5 bn.
Defence expenditure 1979-80: £E 1.5 bn
(\$2.17 bn).
\$1 = £E 0.692 (1979).

Army: 320,000, incl Air Defence Command.
2 armd divs (each with 1 armd, 2 mech bdes).
3 mech inf divs.
5 inf divs (each with 2 inf bdes).
1 Republican Guard Brigade (div).
3 indep armd bdes.
7 indep inf bdes.
2 airmobile bdes.
1 para bde.
4 arty bdes.
2 hy mor bdes.
1 ATGW bde.
6 cdo gps.
2 SSM regts (up to 24 Scud).
850 T-54/-55, 750 T-62 med, 80 PT-76 lt tks; 300
BRDM-1/-2 scout cars; 200 BMP-1 MICV,
2,500 OT-62/-64, BTR-40/-50/-60/-152, Walid,
50 M-113A2 APC; 1,300 76mm, 100mm,
122mm, 130mm, 152mm, and 180mm guns/
how; about 200 SU-100 and ISU-152 SP guns;
300 120mm, 160mm, and 240mm mor; 300
122mm, 132mm, 140mm, and 240mm RL; 30
FROG-4/-7, 24 Scud B, Samlet SSM; 900

57mm, 85mm, and 100mm ATK guns; 900 82mm and 107mm RCL; 1,000 *Sagger*, *Snapper*, *Swatter*, *Milan*, *Beeswing*, *Swingfire*, and *TOW* ATGW; 350 ZSU-23-4 and ZSU-57-2 SP AA guns; 20 SA-7/-9, *Crotale* SAM.
(On order: 244 M-60 med tks; 550 M-113A2 APC; 100 M-106A2 and M-125A2 mor carriers; *Swingfire* ATGW; 12 btys *Improved HAWK* SAM.)

AIR DEFENCE COMMAND (75,000): 360 SA-2, 200 SA-3, 75 SA-6 SAM; 2,500 20mm, 23mm, 37mm, 40mm, 57mm, 85mm, and 100mm AA guns; missile, gun and EW radars.

RESERVES: about 500,000.

Navy: 20,000. (Spares for Soviet equipment are scarce: active holdings being reduced to 1/3 of listed total; replacement by Western material planned.)

10 ex-Sov submarines: 6 W- (1 in reserve), 4 R-class.
5 destroyers: 4 ex-Sov *Skory* with *Styx* SSM, 1 ex-Br Z-class.
3 ex-Br frigates: 1 *Black Swan*, 1 *Hunt*, 1 *River* (sub spt ship).
18 FAC(M): 8 ex-Sov (4 *Osa*-1 with SA-7, 4 *Komar* with *Styx* SSM), 9 *October 6* <, 1 *Ramadan* < with *Otomat* SSM.
12 ex-Sov SO-1 large patrol craft.
26 ex-Sov FAC(T): 2 *Shersten*, 20 P-6 <, 4 P-4 <.
4 ex-Sov *Shersten* FAC(G).
14 ex-Sov minesweepers: 10 ocean (6 T-43, 4 *Yurka*), 4 inshore (2 T-301, 2 K-8).
3 SRN-6 hovercraft.
3 ex-Sov *Polnocny* LCT.
14 ex-Sov LCU: 10 *Vydra*, 4 *SMB*.
6 *Sea King* ASW hel.
(On order: 5 *Vosper Ramadan* FAC(M), 15 SRN-6 hovercraft, *Otomat* SSM.)

Bases: Alexandria, Port Said, Mersa Matruh, Port Suez, Hurgada, Safaqa.

RESERVES: about 15,000.

Air Force: 27,000; about 363 combat aircraft. (See note above on Soviet equipment.)

1 bbr regt with 23 Tu-16 (some with AS-5 ASM).
4 FB regts: 2 with 35 F-4E, 50 MiG-21/PFM/F, 40 Ch F-6; 1 with 30 MiG-17F; 1 with 46 *Mirage* IIIIE/DE.
4 FGA/strike sqns: 3 with 60 Su-7BM; 1 with 18 Su-20, 14 *Mirage* 5.
3 interceptor sqns with 45 MiG-21MF/U.
(Further ac in reserve incl up to 100 MiG-21, 20 MiG-23S/U, 100 MiG-17, 60 Su-7, 25 Su-20.)
ELINT ac: 2 EC-130H.
Tpts incl 20 C-130H, 26 Il-14, 16 An-12, 1 *Falcon*, 1 *Boeing* 707, 1 *Boeing* 737.
Hel incl 20 Mi-4, 12 Mi-6, 55 Mi-8, 27 *Com-mando*, 54 *Gazelle*.
Trainers incl 50 MiG-15UTI, 100 L-29, 40 *Gomhouria*, 36 Yak-11.
AAM: AA-2 *Atoll*, R-530, *Sparrow*, *Sidewinder*.
ASM: AS-1 *Kennel*, AS-5 *Kelt*, *Maverick*.
(On order: 40 F-16, 20 F-6, 30 F-7 fighters; 20 *Gazelle* hel; *Sparrow*, *Sidewinder* AAM; *Maverick* ASM; Ch CSA-1 SAM.)

RESERVES: About 20,000.

Para-Military Forces: 49,000: National Guard 6,000, Frontier Corps 6,000, Defence and Security 30,000, Coast Guard 7,000.

IRAN

Population: 38,250,000.

Military service: 18 months.

Total armed forces: 240,000. (Pre-1979 manpower and holdings shown. Present totals are believed to be considerably less, and serviceability, particularly of ships and aircraft,

is low.)

Estimated GNP 1978: \$76.1 bn.

Defence expenditure 1980: 300 bn rials (\$4.2 bn).

\$1 = 71.5 rials (1980). 70.45 rials (1978).

Army: 150,000.

3 armd divs.

3 inf divs.

4 indep bdes (1 armd, 1 inf, 1 AB, 1 special force).

4 SAM bns with *HAWK*.

Army Aviation Command.

875 *Chieftain*, 400 M-47/-48, 460 M-60A1 med, 250 *Scorpion* lt tks; BMP MICV, about 325 M-113, 500 BTR-40/-50/-60/-152 APC; 1,000+ guns/how, incl 75mm pack, 330 M-101 105mm, 130mm, 112 M-114 155mm, 14 M-115 203mm towed, 440 M-109 155mm, 38 M-107 175mm, 14 M-110 203mm SP; 72 BM-21 122mm MRL; 106mm RCL; *ENTAC*, SS-11, SS-12, *Dragon*, *TOW* ATGW; 1,800 23mm, 35mm, 40mm, 57mm, and 85mm towed, 100 ZSU-23-4 and ZSU-57-2 SP AA guns; *HAWK* SAM.

Ac incl 40 Cessna 185, 6 Cessna 310, 10 O-2A, 2 F-27, 5 *Shrike Commander*, 2 *Falcon*.

205 AH-1J, 295 Bell 214A, 50 AB-205A, 20 AB-206, 90 CH-47C hel.

RESERVES: 400,000.

Navy: 20,000, incl Naval Air.

3 destroyers with *Standard* SSM: 1 ex-Br *Battle*

with *Seacat* SAM, 2 ex-US *Sumner* with 1 hel.

4 *Saam* frigates with *Seakiller* SSM and *Seacat* SAM.

4 ex-US PF-103 corvettes.

9 *Kaman* FAC(M) with *Harpoon* SSM.

7 large patrol craft: 3 *Improved* PGM-71, 4 *Cape*.

3 ex-US coastal, 2 inshore minesweepers.

14 hovercraft: 8 SRN-6, 6 BH-7.

2 landing ships, 1 ex-US LCU.

1 replenishment, 2 fleet supply ships.

3 Marine bns.

Bases: Bandar Abbas, Booshehr, Kharg Island, Korramshar, Bandar-e-Enzli.

NAVAL AIR:

1 MR sqn with 6 P-3F *Orion*.

1 assault hel sqn with 6 S-65A.

1 ASW hel sqn with 20 SH-3D.

1 MCM hel sqn with 6 RH-53D.

1 tpt sqn with 6 *Shrike Commander*, 4 F-27, 1 *Mystère* 20.

Hel incl 4 AB-205A, 14 AB-206, 6 AB-212.

Readers must keep in mind that data for Iran and Iraq were compiled by the IISS and published before hostilities broke out between those two countries.

—THE EDITORS

Air Force: 70,000; 445 combat ac.

10 FGA sqns with 188 F-4D/E.

8 FGA sqns with 166 F-5E/F.

4 interceptor/FGA sqns with 77 F-14A.

1 recce sqn with 14 RF-4E.

2 tanker/tpt sqns with 13 *Boeing* 707, 9 *Boeing* 747.

5 tpt sqns: 4 with 54 C-130E/H; 1 with 18 F-27, 3 *Aero Commander* 690, 4 *Falcon* 20.

Hel: 10 HH-34F, 10 AB-206A, 5 AB-212, 39 Bell 214C, 2 CH-47C, 16 *Super Frelon*, 2 S-61A4.

Trainers incl 45 F33A/C *Bonanza*, 9 T-33.

AAM: *Phoenix*, *Sidewinder*, *Sparrow*.

ASM: AS-12, *Maverick*, *Condor*.

5 SAM sqns with *Rapier*, 25 *Tiger* cat.

Para-Military Forces: 75,000. Gendarmerie and Revolutionary Guards with Cessna 185/310 lt ac, 32 AB-205/-206 hel, 32 patrol boats.

IRAQ

Population: 13,110,000.

Military service: 21-24 months.

Total armed forces: 242,250 (177,200 conscripts).

Estimated GNP 1979: \$21.4 bn.

Defence expenditure 1979: 789.3 m dinars (\$2.67 bn).

\$1 = 0.295 dinars (1979).

Army: 200,000 (150,000 conscripts).

3 corps HQ.

4 armd divs (each with 2 armd, 1 mech bdes).

4 mech divs.

4 mountain inf divs.

1 Republican Guard armd bde.

2 special forces bdes.

100 T-34, 2,500 T-54/-55/-62, 50 T-72, 100

AMX-30 med, 100 PT-76 lt tks; about 2,500

AFV, incl 200 BMP MICV, BTR-50/-60/-152,

OT-62, VCR APC; 800 75mm, 85mm, 122mm,

130mm, and 152mm guns/how; 120 SU-100,

120 ISU-122 SP guns; 120mm, 160mm mor;

BM-21 122mm MRL; 26 *FROG*-7, 12 *Scud* B

SSM; *Sagger*, SS-11, *Milan* ATGW; 1,200

23mm, 37mm, 57mm, 85mm, 100mm towed,

ZSU-23-4 and ZSU-57-2 SP AA guns; SA-7

SAM.

(On order: T-62, AMX-30 med tks; *Sucuri* SP ATK

guns; EE-9 *Cascavel*, *Jararaca* armd cars;

Panhard, EE-11 *Urutu* APC; SP-74, SP-73 SP

how; *Scud* B SSM; SS-11, 360 *HOT* ATGW.)

RESERVES: 250,000.

Navy: 4,250 (3,200 conscripts).

12 ex-Sov FAC(M) with *Styx* SSM: 4 *Osa*-I, 8

Osa-II.

5 ex-Sov large patrol craft: 3 SO-1, 2 *Poluchat* <.

12 ex-Sov P-6 FAC(T) <.

10 ex-Sov coastal patrol craft: 4 *Nyryat* II, 6 < (2

PO-2, 4 *Zhuk*).

5 ex-Sov minesweepers: 2 T-43 ocean, 3

Yevgenya inshore.

4 ex-Sov *Polnocny* LCT.

(On order: 1 *Yug*, 4 *Lupo* frigates, 6 corvettes, 1

spt ship.)

Bases: Basra, Umm Qasr.

Air Force: 38,000 (10,000 AD personnel); 332 combat aircraft.

1 bbr sqn with 12 Tu-22.

1 lt bbr sqn with 10 Il-28.

12 FGA sqns: 4 with 80 MiG-23B, 3 with 40 Su-7B, 4 with 60 Su-20, 1 with 15 *Hunter* FB-59/FR-10.

5 interceptor sqns with 115 MiG-21.

2 tpt sqns with 9 An-2, 8 An-12, 8 An-24, 2 An-26,

12 Il-76 (6 civilian), 2 Tu-124, 13 Il-14, 2

Heron.

11 hel sqns with 35 Mi-4, 15 Mi-6, 78 Mi-8, 41

Mi-24, 47 *Alouette* III, 10 *Super Frelon*, 40

Gazelle, 3 *Puma*, 7 *Wessex* Mk 52.

Trainers incl MiG-15/-21/-23U, Su-7U, *Hunter*

T-69, 10 Yak-11, 40 L-29, 50 L-39, 48 AS-202/

18A, 16 *Flamingo*.

AAM: AA-2 *Atoll*. ASM: AS-11/-12, AM-39.

SAM: SA-2, SA-3, 25 SA-6.

(On order: 150 MiG-23/-25/-27, 60 *Mirage* F-

IC-1B fighters; C-160 tpts; 40 PC-7 *Turbo-*

Trainer; *Super Frelon*, *Gazelle*, *Lynx*, 36

Puma, 3 Mi-8, Mi-24, 6 AS-61TS, 8 AB-212

ASW hel; *Super* 530 AAM.)

Para-Military Forces: 4,800 security troops,

75,000 People's Army.

ISRAEL

Population: 3,900,000.

Military service: men 36 months, women 24 months (Jews and Druses only; Muslims and Christians may volunteer). Annual training for reservists thereafter up to age 54 for men, up to 25 for women.

Total armed forces: 169,600 (125,300 conscripts); mobilization to 400,000 in about 24

hours.
 Estimated GDP 1979: \$16.4 bn.
 Defence expenditure 1980-81: \$1 21 bn. (\$5.2 bn).
 \$1 = \$40.31 (1980), \$1 25.44 (1979). (The Israeli £ was replaced by the shekel, at the rate of 10 to 1, in early 1980.)

Army: 135,000 (120,000 conscripts, male and female), 375,000 on mobilization.
 24 armd bdes.
 9 mech bdes.
 9 inf bdes.
 9 arty bdes.
 5 para bdes.
 (11 bdes (5 armd, 4 inf, 2 para) normally kept near full strength; 6 (1 armd, 4 mech, 1 para) between 50% and full strength; the rest at cadre strength.)
 3,050 med tks, incl 1,000 *Centurion*, 650 M-48, 810 M-60, 400 T-54/-55, 150 T-62, *Merkava* I/II; 65 PT-76 lt tks; about 4,000 AFV, incl AML-60, 15 AML-90 armd cars; RBY *Ramta*, BRDM recce vehs; M-2/-3/-113, BTR-40/-50P(OT-62)/-60P/-152, *Walid* APC; 500 105mm, 450 122mm, 130mm, and 155mm towed, 120 M-109 155mm, L-33 155mm, 60 M-107 175mm, 48 M-110 203mm SP guns/how; 900 81mm, 120mm, and 160mm mor (some SP); 122mm, 135mm, 240mm RL; *Lance*, *Ze'ev* (Wolf) SSM; 106mm RCL; *TOW*, *Cobra*, *Dragon*, SS-11, *Sagger*, *Picket* ATGW; about 900 *Vulcan/Chaparral* 20mm msl/gun systems, 30mm and 40mm AA guns; *Redeye* SAM.
 (On order: 325 M-60 med tks; 800 M-113 APC; 175mm towed, 200 M-109A1B 155mm, M-107 175mm SP guns; *Lance* SSM; *TOW*, *Dragon* ATGW.)

Navy: 6,600 (3,300 conscripts), 10,000 on mobilization.
 3 Type 206 submarines.
 22 FAC(M): 10 *Reshef* with *Gabriel* and *Harpoon* SSM, 12 *Saar* with *Gabriel*.
 38 coastal patrol craft<: 35 *Dabur*, 3 ex-US PBR.
 3 ex-US LSM, 6 LCT.
 3 *Westwind* 1124N MR ac.
 Naval cdo: 300.
 (On order: 3 *Reshef* FAC(M), 2 Qu-9-35 corvettes, 2 *Flagstaff* II hydrofoils with *Harpoon* SSM, 3 *Westwind* MR ac.)
 Coastguard: 4 patrol craft<.

Bases: Haifa, Ashdod, Sharm-el-Sheikh, Eilat.

Air Force: 28,000 (2,000 conscripts, AD only), 37,000 on mobilization; 481 combat aircraft.
 12 FGA/interceptor sqns: 1 with 25 F/TF-15, 5 with 130 F-4E, 3 with 30 *Mirage* IIICJ/BJ, 3 with 80 *Kfir*-C2.
 6 FGA sqns with 200 A-4E/H/M/N *Skyhawk*.
 1 recce sqn with 12 RF-4E, 2 OV-10E; 4 E-2C AEW ac.
 Tpts incl 10 Boeing 707, 24 C-130E/H, 20 C-47, 2 KC-130H (tankers), 14 *Arava*, 2 *Islander*.
 Liaison: 23 Do-27, 15 Do-28D, 5 Cessna U-206, 3 *Westwind*.
 Trainers incl 24 TA-4H, 50 *Kfir*, 70 *Magister*, 16 *Queen Air*, 30 *Super Cub*.
 Hel incl 11 *Super Frelon*, 35 CH-53G, 6 AH-1G/S, 23 Bell 205A, 20 Bell 206, 12 Bell 212, 25 UH-1D, 19 *Alouette* II/III.
 15 SAM bns with *Improved Hawk*.
 AAM: *Sidewinder*, AIM-7E/F *Sparrow*, *Shafir*.
 ASM: *Luz*, *Maverick*, *Shrike*, *Walleye*, *Bullpup*.
 (On order: 15 F-15, 67 F-16A, 8 F-16B fighters; 30 Hughes 500 hel gunships; 600 *Maverick* ASM; 600 *Sidewinder* AAM.)

RESERVES (all services): 460,000.

Para-Military Forces: 4,500 Border Guards and 5,000 *Nahal* Militia.

JORDAN

Population: 3,104,000.
 Military service: selective conscription.
 Total armed forces: 67,200.
 Estimated GNP 1979: \$2.69 bn.
 Defence expenditure 1979: 114 m dinars (\$381 m).
 \$1 = 0.300 dinars (1979).

Army: 60,000.
 2 armd divs (each 3 armd bdes).
 2 mech inf divs (each 2 mech, 1 inf bdes).
 1 indep tk bde.
 4 SP arty regts.
 2 AA bdes, incl 6 btys with 48 *Improved HAWK* SAM.
 3 special forces bns.
 300 M-47/-48, 14 M-60, 295 *Centurion* med tks; 140 *Ferret* scout cars; 930 M-113, 32 *Saracen*

APC; 16 155mm guns; 54 105mm, 60 155mm towed, 21 M-52 105mm, 16 M-44, 90 M-109 155mm SP how; 16 155mm guns; 400 81mm, 107mm, and 120mm mor; 315 106mm and 120mm RCL; 88 *TOW*, 74 *Dragon* ATGW; *Vulcan* 20mm, 200 M-42 40mm SP AA guns; *Redeye*, *Improved HAWK* SAM.
 (On order: 278 *Shir I* (*Chieftain*), 100 M-60A3 med tks; 178 M-113 APC; 78 M-109 155mm, 29 M-110 203mm SP how; 100 M-163 *Vulcan* 20mm AA guns; *Improved HAWK* SAM.)

Navy: 200.
 9 small patrol craft.

Base: Aqaba.

Air Force: 7,000; 58 combat aircraft.
 1 FGA sqn with 24 F-5E/F.
 2 interceptor sqns with 24 F-5E/F.
 1 OCU with 8 F-5A, 2 F-5B.
 Tpts: 3 C-130B/H, 1 Boeing 727, 1 *Falcon* 20, 4 C-212A *Aviocar*.
 Hel: 15 *Alouette* III, 2 S-76.
 Trainers: 8 T-37C, 11 *Bulldog*, 2 *Dove*, 4 F-5B.
 AAM: *Sidewinder*.
 (On order: 36 *Mirage* F-1, 26 F-5E/F fighters; 10 Bell AH-1H, 4 S-76 hel.)

RESERVES: 30,000.

Para-Military Forces: 10,000. 3,000 Mobile Police Force, 7,000 Civil Militia.

KUWAIT

Population: 1,318,000.
 Military service: 18 months.
 Total armed forces: 12,400.
 Estimated GNP 1977: \$11.9 bn.
 Defence expenditure 1979: 274 m dinars (\$979 m).
 \$1 = 0.277 dinars (1979), 0.275 dinars (1977).

Army: 10,000.
 1 armd bde.
 2 inf bdes.
 1 SSM bn.
 70 *Vickers*, 50 *Centurion*, 160 *Chieftain* med tks; 100 *Saladin* armd, 20 *Ferret* scout cars; 130 *Saracen* APC; 10 25-pdr guns; 80 AMX 155mm



A McDonnell Douglas-built F-15 air-superiority fighter of the Israeli Air Force.

SP how; FROG-7 SSM; HOT, TOW, Vigilant, Harpoon ATGW; SA-6/-7 SAM.
(On order: Scorpion lt tks, 175 M-113 APC, arty, TOW ATGW.)

Navy: 500 (coastguard).
43 coastal patrol craft <
3 88-ft landing craft.
(On order: 4-5 FAC(M).

Air Force: 1,900, excluding expatriate personnel, 50 combat aircraft.
2 FB sqns with 30 A-4KU.
1 interceptor sqn with 18 Mirage F-1C, 2 F-1B.
Tpts: 2 DC-9, 2 L-100-20, 1 Boeing 737-200.
3 hel sqns with 24 SA-342K Gazelle, 10 Puma. Trainers incl 2 Hunter T-67, 6 TA-4KU.
AAM: R-550 Magic, Sidewinder. ASM: Super 530. SAM: 50 Improved HAWK.
(On order: Improved HAWK).

Para-Military Forces: 15,000 Police.

LEBANON

Population: 2,800,000.
Military service: conscription.
Total armed forces: 23,000.
Estimated GNP 1977: \$2.9 bn.
Defence expenditure 1980: £L 980 m (\$286.5 m).
(Plus £L 3 bn (\$955 m) spread over 10 years to rebuild the armed forces.)
\$1 = £L 3.42 (1980), £L 3.03 (1977).

Army: 22,250.
2 arm'd recce bns.
12 inf bns.
1 arty bn.
Saladin arm'd cars; 80 M-113, Saracen APC; 10 122mm, 18 155mm guns; Milan, TOW ATGW.
(On order: 100 AMX-13 lt tks, 200 Saladin arm'd cars, 228 M-113A2 APC, 18 155mm guns, 400 RPG RL.)

Navy: 250.
3 large, 3 Byblos < coastal patrol craft.
1 LCU.
(On order: 8 FAC.)

Air Force: 500; 7 combat aircraft.
1 FGA sqn with 6 Hunter F-70, 1 T-66.
1 interceptor sqn with 9 Mirage IIIEL/BL (not in use).
1 hel sqn with 12 Alouette II/III, 5 AB-212, 4 Gazelle (with SS-11/-12 ASM).
Trainers: 6 Bulldog, 6 Magister.
Tpts: 1 Dove, 1 Turbo-Commander 690A.
AAM: R-530.
(On order: 6 AB-212, Gazelle, Puma hel.)

Para-Military Forces: Internal Security Force: 5,000; 40 Saladin arm'd cars, 5 Saracen APC.

LIBYA

Population: 2,933,000.
Military service: conscription.
Total armed forces: 53,000.
Estimated GDP 1979: \$19.0 bn.
Defence expenditure 1978: 130 m Libyan dinars, (\$448 m).
\$1 = 0.296 dinars (1979), 0.290 dinars (1978).

Army: 45,000.
12 tk bns.
24 mech inf bns.
1 National Guard bn.
2 arty, 2 AA arty bns.
1 special forces gp.
1 SSM bn.
2,400 T-54/-55/-62/-72 med tks; 200 BRDM-2, 100 Saladin, 300 EE-9 Cascavel arm'd, 140 Ferret scout cars; 250 BMP micv, 900BT R-40/-

50/-60, OT-62/-64, Fiat 6614 and M-113A1 APC; some 600 M-101 105mm, 122mm, 130mm, 152mm towed, M-1974 122mm and M-109 155mm SP how; 250 B-11 107mm, BM-21/RM-70 122mm and M-51 130mm MRL; 106mm RCL; 450 81mm, 120mm, 160mm, and 240mm mor; 3,000 Vigilant, Milan, and Sagger ATGW; 12 FROG-7, 30 Scud-B SSM; 450 23mm, 30mm, L40/70, 57mm towed and ZSU-23-4 SP AA guns; SA-7/-9 SAM.
(On order: 200 Lion (Leopard 1) med tks, Fiat 6616 arm'd cars, 200 Urutu APC.)

Navy: 4,000.
3 ex-Sov F-class submarines.
1 Vosper Mk 7 frigate with Seacat SAM (being refitted with Aspid SAM).
1 Vosper 440-ton corvette.
14 FAC(M): 2 Combattante with Otomat SSM, 9 ex-Sov Osa-II with Styx SSM, 3 Susa with SS-12 SSM.
4 Garian, 6 Thornycroft large patrol craft.
1 Thornycroft coastal patrol craft.
2 PS-700 LST, 3 Polnocny LCT.
1 LSD (log spt/headquarters ship).
(On order: 3 Daphne-class subs, 4 Wadi M'ragh corvettes with Otomat SSM, 8 Combattante II FAC(M).

Bases: Tripoli, Benghazi, Darna, Tobruk, Burayghah.

Air Force: 4,000; some 287 combat aircraft. (Some may be in storage. Soviet, Pakistani, and Palestinian pilots also fly Libyan aircraft.)
1 bbr sqn with 17 Tu-22 Blinder A.
1 interceptor sqn and 1 OCU with 50 MiG-23 Flogger E, 35 MiG-25 Foxbat A, 20 MiG-21.
4 FGA sqns and OCU with 30 Mirage IIIE, 10 IIIB, 40 5D/DE, 10 5DD, 50 MiG-23 Flogger F.
1 recce sqn with 10 Mirage IIIR, 10 5DR, 5 MiG-25R/U (Soviet crews).
2 trg sqns with 38 Galeb.
2 tpt sqns with 7 C-130H, 1 Boeing 707, 9 C-47, 1 Il-76, 14 DHC-6, 9 F-27, 1 Falcon, 2 Jetstar, 1 Corvette 200, 2 King Air.
Trainers incl Tu-22 Blinder C, 6 Mirage F-1BD, 2 Mystere 20, 5 MiG-23U, 30 L-39, 12 Magister, Falcon ST2, 170 SF-260S.
4 hel sqns with 10 Alouette III, 6 AB-47, 5 AB-206, 1 AB-212, 8 Super Frelon, 20 CH-47C, 12 Mi-8, 26 Mi-24.
AAM: AA-2 Atoll, R-550 Magic.
3 SAM bdes with 30 Crotale, 300 SA-2/-3/-6 SAM.
(On order: 32 Mirage F-1AD/ED fighters; 20 G-222, 10 Twin Otter tpts; 90 SF-260 trainers; 1 AB-212, Gazelle, 1 AS-61A hel; Super 530 AAM.)

MOROCCO

Population: 20,000,000.
Military service: 18 months.
Total armed forces: 116,500.
Estimated GNP 1979: \$15.2 bn.
Defence expenditure 1979: 3.62 bn dirham (\$676 m).
\$1 = 3.95 dirham (1979).

Army: 105,000. (Some reorganization appears to be taking place. Organization to be used with caution.)
5 arm'd groups.
12 mech inf regts.
1 light security bde.
1 para/mountain bde.
8 arty groups.
1 AA bde.
2 Royal Guard bns.
9 camel corps bns.
2 desert cav bns.
8 engr bns.
150 M-48, 30 T-54 med, 80 AMX-13 lt tks; 650 arm'd cars, incl 36 EBR-75, 30 AMX-10, 100 AML-90 and M-8; 364 M-113, 240 VAB, 40 M-3 half-track, 70 OT-62/-64, 30 UR-416, M-3

APC; M-11. 5mm, 40 85mm, 100 105mm, 12 130mm, 20 M-114 155mm towed, 24 AMX-105 105mm, 36 AMX-155, 36 M-109 155mm SP how; 360 81mm, 70 82mm, 320 120mm mor; 36 BM-21 122mm MRL; 20 M-56 90mm, 121 Kuerassier 105mm SP ATK guns; 75mm, 106mm RCL; ENTAC, Dragon, TOW ATGW; 100 20mm, 37mm, 57mm, and 100mm AA guns; SA-7, 10 Chaparral, Crotale SAM; 4 Alouette II, 3 Gazelle, 6 A-109 hel.
(On order: AML-90, 70 AMX 10RC arm'd cars, 160 VAB APC, 40 M-163 Vulcan 20mm SP AA.)

Navy: 4,500 (600 Marines).
2 PR-72 FAC(G).
4 large patrol craft.
11 coastal patrol craft.
4 landing ships (3 Batral).
1 naval inf bn.
(On order: 1 Descubierta frigate, 4 Lazarga FAC(G).)

Bases: Casablanca, Safi, Agadir, Kenitra, Tangier.

Air Force: 7,000; 90 combat aircraft. (Further ac, incl 2 MiG-15, 12 MiG-17 FGA in storage.)
4 FB sqns 13 F/RF-5A, 5F-5B, 50 Mirage F-1CH.
1 COIN sqn with 22 Magister.
1 tpt sqn with 12 C-130H, 1 Gulfstream, 6 King Air, 10 Broussard.
2 hel sqns with 40 AB-205A, 8 AB-206, 5 AB-212, 40 Puma, 4 HH-43B SAR, 4 Bell 47G, 6 CH-47C.
Trainers: 12 T-34C, 10 AS-201/18 Bravo, 28 SF-260M, 7 AlphaJet.
AAM: Sidewinder, R-550 Magic.
(On order: 10 Mirage F-1CH, 20 F-5E fighters; 6 OV-10 COIN; 10 Do-28D tpts; 17 AlphaJet trg ac; 24 Hughes 500MD hel; Maverick ASM.)

Para-Military Forces: 30,000, incl 11,000 Sureté Nationale.

OMAN

Population: 930,000.
Military service: voluntary.
Total armed forces: 14,200. (Excluding expatriate personnel.)
Estimated GNP 1977: \$2.55 bn.
Defence expenditure 1980: 304 rial omani (\$879 m).
\$1 = 0.346 rial (1980), 0.346 rial (1977).

Army: 11,500.
2 bde HQ.
8 inf bns.
1 Royal Guard regt.
3 arty regts (2 lt, 1 med).
1 sigs regt.
1 arm'd car sqn.
1 engr sqn.
1 para sqn.
Scorpion lt tks; 36 Saladin arm'd cars; 5 25-pdr, 36 105mm guns; 81mm, 120mm mor; TOW ATGW; 4 ZU-23-2 AA guns.

Navy: 900.
3 corvettes (1 Royal Yacht, 2 ex-Neth Wildervank).
6 Brooke Marine large patrol craft (2 with Exocet SSM).
4 75-ft coastal patrol craft (marine police).
1 log spt ship (amph).
3 Loadmaster landing craft, 2 LCU.
(On order: 3 Skima-12 hovercraft, 1 FAC(M).)

Bases: Muscat, Raysut.

Air Force: 1,800; 38 combat aircraft.
1 FGA/recce sqn with 12 Hunter FGA-6, 4 T-7.
1 FGA sqn with 8 Jaguar S(O) Mk 1, 2 T-2.
1 COIN/trg sqn with 12 BAC-167.
3 tpt sqns: 1 with 3 BAC-111, 1 Falcon; 2 with 7



A C-130E of the Saudi Arabian Air Force. Various versions of the Lockheed-built Hercules provide the major component of this Mideast nation's airlift capability.

Defender, 14 *Skyvan*.
Royal flt with 1 *Gulfstream*, 1 VC-10 tpts, 2 AS-202 *Bravo* trainers, 1 AB-212 hel.
1 hel sqn with 16 AB-205, 2 AB-206, 5 AB-214B.
2 AD sqns with 28 *Rapier* SAM.
(On order: 2 DHC-5D tpts, 250 *Sidewinder* AAM).

Para-Military Forces: 3,300 tribal Home Guard (*Firqats*). Police Air Wing: 1 *Learjet*, 2 *Turbo-Porter*, 2 *Merlin* IVA ac; 4 AB-205, 2 AB-206 hel.

1 Royal Guard Regt (3 bns).
3 arty bns.
2 para bns.
18 AA arty btys.
10 SAM btys with *HAWK*.
280 AMX-30, 100 M-60 med tks; 200 AML-60/90 armd, *Ferret*, 50 *Fox* scout cars; 150 AMX-10P MICV, 200 M-113, Panhard M-3 APC; 105mm pack, 105mm and 155mm SP how; 75mm RCL; *TOW*, *Dragon* ATGW; AMX-30 30mm, M-42 40mm SP AA guns; *HAWK*, *Crotale* SAM.
(On order: 370 AMX-30, 150 M-60 med tks; 94 V-150 *Commando*, AML-90 armd, 50 *Fox* scout cars; Panhard M-3, 200 AMX-10 APC; *Dragon*, 50 *TOW* ATGW; M-163 *Vulcan* 20mm, 86 35mm SP AA guns; *Redeye*, *Shahine*, *Crotale*, 6 btys *Improved HAWK* SAM.)

Navy: 1,500.
3 *Jaguar* FAC(T).
1 large patrol craft (ex-US coastguard cutter).
72 coastal patrol craft < (coastguard).
4 MSC-322 coastal minesweepers.
2 ex-US LCM, 4 ex-US LCU.
(On order: 4 corvettes with *Harpoon*; 9 FAC(M) with *Harpoon* SSM; *Exocet* SSM.)

Bases: Jiddah, Al Qatif/Jubail, Ras Tanura, Damman, Yanbo, Ras al Mishab.

Air Force: 14,500; 136 combat aircraft.
3 FB sqns with 65 F-5E.
1 interceptor sqn with 15 *Lightning* F-53, 2 T-55.
3 OCU with 24 F-5F, 16 F-5B, 12 *Lightning* F-53, 2 T-55.
2 tpt sqns with 34 C-130E, 25 C-130H, 6 KC-130H, 2 *Jetstar*, CASA C-212.
2 hel sqns with 12 AB-206, 12 AB-205, 10 AB-212.
Other ac incl 1 Boeing 707, 2 *Falcon* 20 tpts, 2 *Alouette* III, 1 AB-206, 1 Bell 212, 2 AS-61A, KV-107 hel.
Trainers: 39 BAC-167, 12 Cessna 172G/H/L.
AAM: *Red Top*, *Firestreak*, *Sidewinder*, R-530, R-550 *Magic*. ASM: *Maverick*.
(On order: 45 F-15 fighters; 15 TF-15 trainers; 1 Boeing 747, 20 CASA C-212-200 tpts; 660 *Sidewinder* AAM; 916 *Maverick* ASM.)

Para-Military Forces: 20,000 National Guard in 20 regular and semi-regular bns; 150 V-150 *Commando* APC. 6,500 Frontier Force and Coastguard; 70 small patrol boats, 8 SRN-6 hovercraft. General Civil Defence Administration units.

QATAR

Population: 220,000.
Total armed forces: 4,700.
Estimated GNP 1977: \$1 bn.
Defence expenditure 1978: 238 m ryal (\$61 m).
\$1 = 3.87 ryal (1979), 3.95 ryal (1977).

Army: 4,000.
2 armd car regts.
1 tk bn.
1 Guards inf bn.
2 inf bns.
2 arty bns.
24 AMX-30 med tks; 20 EE-9 *Cascavel* armd, 10 *Ferret* scout cars; 30 AMX-10P MICV, 8 *Saracen* APC; 4 25-pdr guns, 6 155mm how; 81mm mor.
(On order: *HAWK* SAM.)

Navy: 400, incl Marine Police.
6 Vosper Thornycroft large patrol craft.
29 coastal patrol craft < (2 75-ft, 2 45-ft, 25 *Spear*.)

Base: Doha.

Air Force: 300, 4 combat aircraft.
3 *Hunter* FGA-6, 1 T-79.
1 *Islander* tpt.
2 *Whirlwind*, 4 *Commando*, 2 *Gazelle*, 3 *Lynx* hel.
Tigercat SAM.

(On order: 6 *AlphaJet* trainers.)

SAUDI ARABIA

Population: 8,224,000.
Military service: conscription.
Total armed forces: 47,000.
Estimated GDP 1979: \$94.6 bn.
Defence expenditure 1980-81: 68.9 bn Saudi riyals (\$20.7 bn).
\$1 = 3.33 riyals (1980), 3.77 riyals (1979).

Army: 31,000.
1 armd bde (being increased to 2).
1 mech bde.
3 inf bdes.

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Army: 65,000.
2 armd bdes.
7 inf bdes.
1 para bde.
3 arty regts.
3 AD arty regts.
1 engr regt.
70 T-54, 60 T-55 med, 30 Ch Type 62 lt tks; 50 *Saladin* armd, 60 *Ferret* scout cars; 100 BTR-40/-50/-152, 60 OT-64, 49 *Saracen*, 45 V-150 *Commando*, 50 AMX-10P APC; 55 25-pdr, 40 100mm, 20 M-101 105mm, 18 122mm guns/how; 30 120mm mor; 30 85mm ATK guns; 80 40mm, 80 37mm, 85mm AA guns; SA-7 SAM.
(On order: 50 M-60A1 med tks, 100 M-113 APC.)

Navy: 1,500.
6 large patrol craft (2 ex-Yug *Kraljevica*, 4 PBR).
6 ex-Yug '101' FAC(G).
3 70-ton coastal patrol craft.
2 ex-Yug DTK-221 LCT, 1 DTM-231 LCU <.

Base: Port Sudan.

Air Force: 1,500; 36 combat aircraft.
2 FGA/interceptor sqns with 24 *Mirage* 50.
1 FGA sqn with 12 MiG-17F/F-4.
1 tpt sqn with 6 C-130H, 5 An-24, 4 F-27, 1 DHC-6, 4 DHC-5D, 8 *Turbo-Porter*, 6 EMB-110P2.
1 hel sqn with 10 Mi-8, 12 *Puma*.
Trainers incl 5 BAC-145, 6 *Jet Provost* Mk 55 (some in storage).
AAM: AA-2 *Atoll*.
(On order: 10 F-5E, 2 F-5F, 12 Ch F-6 fighters; 2 C-130 tpts; 6 BO-105 hel.)

Para-Military Forces: 3,500: 500 National Guard, 500 Republican Guard, 2,500 Border Guard.

SYRIA

Population: 8,800,000.
Military service: 30 months.
Total armed forces: 247,500.
Estimated GDP 1979: \$9.2 bn.
Defence expenditure 1980: \$Syr 15.87 bn (\$4.04 bn).
\$1 = \$Syr 3.93 (1979, 1980).

Army: 200,000, incl 140,000 conscripts.
3 armd divs (each 2 armd, 1 mech bde).
2 mech divs (each 1 armd, 2 mech bdes).
2 indep armd bdes.
4 indep mech bdes.
2 arty bdes.
5 cdo regts.
1 para regt.
2 SSM regts: 1 with *Scud*, 1 with *FROG*.
32 SAM btys with SA-2/-3/-6/-9.
2,200 T-54/-55, 600 T-62, 120 T-72 med tks; BRDM recce vehs; BMP MICV, 1,600 BTR-40/-50/-60/-152, OT-64 APC; 800 122mm, 130mm, 152mm, and 180mm guns/how; ISU-122/-152 SP guns; 122mm, 140mm, 240mm MRL; 15 *FROG*, 36 *Scud* SSM; 82mm, 120mm, 160mm mor; 57mm, 85mm, 100mm ATK guns; *Snapper*, *Sagger*, *Swatter*, *Milan* ATGW; 23mm, 37mm, 57mm, 85mm, 100mm towed, ZSU-23-4, ZSU-57-2 SP AA guns; SA-7/-9 SAM; 25 *Gazelle* hel.
(On order: 130 T-72 med tks, SP arty, *FROG* SSM, *HOT* ATGW, SA-6/-8/-9 SAM, *Gazelle* hel.)

DEPLOYMENT:
Lebanon: (Arab Deterrent Force): 35,000.

RESERVES: 100,000.

Navy: 2,500.
2 ex-Sov *Petya* I frigates.
18 FAC(M) with *Styx* SSM: 6 ex-Sov *Osa*-I, 6 *Osa*-II, 6 *Komar* <.
8 ex-Sov P-4 FAC(T) <.
1 ex-Fr CH large patrol craft.

SUDAN

Population: 18,378,000.
Military service: conscription.
Total armed forces: 68,000.
Estimated GDP 1977: \$6.15 bn.
Defence expenditure 1977-78: \$S 84.9 m (\$242.6m).
\$1 = \$S 0.35 (1978), \$S 0.34 (1977).

3 ex-Sov minesweepers; 1 T-43 ocean, 2 *Vanya* coastal.
(On order: FAC(M).)

Bases: Latakia, Tartus.

RESERVES: 2,500.

Air Force: 45,000 (incl AD command); about 395 combat ac. (Some aircraft believed to be in storage.)

7 FGA sqns: 4 with 60 MiG-17, 1 with 20 Su-7, 2 with 30 Su-20.

4 FGA/interceptor sqns with 60 MiG-23.

12 interceptor sqns: 1 with 25 MiG-25, 11 with 200 MiG-21PF/MF.

2 tpt wings with 2 AN-12, 3 An-24, 4 An-26, 2 *Mystère* 20F.

Trainers incl 60 L-29, MiG-15UTI, 32 MBB-223 *Flamingo*.

Hel incl 4 Mi-2, 8 Mi-4, 70 Mi-8, 4 Ka-25 ASW, 35 *Gazelle*.

AAM: AA-2 *Atoll*.

(On order: MiG-23/-27 fighters, 18 AB-212, 21 *Super Frelon* hel, AAM.)

AIR DEFENCE COMMAND: 15,000. (Under Army Command, with Army and Air Force manpower.)

50 SAM btys with SA-2/-3, 25 with SA-6, AA arty, and radar.

Para-Military Forces: 9,500: 8,000 Gendarmerie, 1,500 Desert Guard (Frontier Force). Palestine Liberation Army Brigade of 6,000 with Syrian officers (nominally under PLO). 500,000 workers militia.

TUNISIA

Population: 6,390,000.

Military service: 12 months selective.

Total armed forces: 28,600.

Estimated GNP 1979: \$6.99 bn.

Defence expenditure 1979: 45.5 m dinars (\$114 m).

\$1 = 0.40 dinars (1980), 0.41 dinars (1979).

Army: 24,000.

1 armd regt.

2 armd rece regts.

2 combined arms regts.

1 Sahara regt.

1 arty regt.

1 AA arty regt.

2 para-cdo regts.

1 engr bn.

Aviation wing.

40 AMX-13, 20 M-41 lt tks; 20 *Saladin*, 15

EBR-75, 10 AML armd cars; 30 M-113A1, 50

Fiat 6614 APC; 40 105mm, 10 155mm how;

60mm, 81mm, 82mm, and 107mm mor; 45

Kuerassier 105mm SP ATK guns; SS-11 ATGW;

45 37mm and 40mm AA guns; 1 Hughes

500MD, 6 AB-205, 6 UH-1N hel.

(On order: 30 M-113A1, 70 Fiat 6614 APC; 1,200

TOW ATGW; 26 M-163A1 20mm *Vulcan* SP AA

guns; RBS-70, 328 *Chaparral* SAM; 12 AB-205

hel.)

Navy: 2,600 (500 conscripts).

1 ex-US *Savage* frigate.

4 large patrol craft (1 ex-Fr *Le Fougeux*, 3 P-48

with SS-12 SSM).

2 Vosper Thornycroft 103-ft FAC(P).

2 ex-Ch *Shanghai-II* FAC(G).

2 ex-US *Adjutant* coastal minesweepers.

12 coastal patrol boats<.

Bases: Tunis, Susa.

Air Force: 2,000 (500 conscripts); 14 combat aircraft.

1 fighter/trg sqn with 10 MB-326B/K, 4 MB-326L.

Trainers: 12 SF-260WT, 6 SF-260C, 12 T-6, 12 *Saab Safr*.

Liaison ac: 4 S-208A.

Hel: 8 *Alouette* II, 6 *Alouette* III, 4 UH-1H, 1 *Puma*.

Para-Military Forces: 2,500 Gendarmerie (3 bns), 1,000 National Guard.

UNITED ARAB EMIRATES (UAE)

Population: 920,000.

Military service: conscription.

Total armed forces: 25,150. The Union Defence

Force and the armed forces of the United Arab Emirates (Abu Dhabi, Dubai, Ras Al Khaimah, and Sharjah) were formally merged in May 1976.

Estimated GDP 1978: \$12.0 bn.

Defence expenditure 1979: 2.88 bn dirhams

(\$750 m).

\$1 = 3.84 dirhams (1979), 3.88 dirhams (1978).

Army: 23,500.

1 Royal Guard 'bde'.

4 armd/armd car bns.

7 inf bns.

3 arty bns.

3 AD bns.

45 *Scorpion* lt tks; 6 *Shorland*, 150 AML-90 armd cars; AMX VCI, Panhard M-3 APC; 22 25-pdr, 105mm guns; 6-10 AMX 155mm SP how; 81mm mor; 120mm RCL; *Vigilant* ATGW; *Rapier*, *Crotale*, RBS-70 SAM.

(In store: 70 *Saladin* armd, 60 *Ferret* scout cars, 12 *Saracen* APC.)

(On order: 20 *Lion* med, 35 *Scorpion* lt tks.)

Navy: 900.

6 *Jaguar* FAC(G).

6 Vosper Thornycroft large patrol craft.

3 Keith Nelson coastal patrol craft<.

(On order: 10 P-1200 FAC.)

Base: Abu Dhabi.

Air Force: 750; 52 combat aircraft.

2 interceptor sqns with 26 *Mirage* 5AD, 3 5RAD, 3 5DAD.

1 FGA sqn with 7 *Hunter* FGA-76, 2 T-77.

1 COIN sqn with 10 MB-326KD/LD, 1 SF-260WD.

Tpts incl 2 C-130H, 1 Boeing 720-023B, 1 G-222, 4 *Islander*, 1 *Falcon*, 3 DHC-4, 4 DHC-5D, 1 Cessna 182.

Hel incl 4 AB-205, 6 AB-206, 3 AB-212, 7 *Alouette* III, 9 *Puma*.

AAM: R-550 *Magic*.

ASM: AS-11/-12.

(On order: 1 G-222 tpt, *Lynx* hel.)

Para-Military Forces: Marine Police; 20 coastal patrol boats.

YEMEN ARAB REPUBLIC (NORTH)

Population: 5,300,000.

Military service: 3 years.

Total armed forces: 32,100.

Estimated GNP 1977: \$1.5 bn.

Defence expenditure 1979: 360 m riyals (\$79 m).

\$1 = 4.56 riyals (1979), 4.54 riyals (1977).

Army: 30,000 (20,000 conscripts).

2 inf divs (10 inf bdes, incl 3 reserve).

2 armd bdes.

1 para bde.

2 cdo bdes.

5 arty bns.

2 AA arty bns.

64 M-60, 300 T-34, 500 T-54/-55 med tks; 50 *Saladin* armd, *Ferret* scout cars; 12 M-106 mor-armed, 76 M-113, 350 BTR-40/-152, *Walid* APC; 200 76mm and 122mm guns; 50 SU-100 SP guns; 200 82mm and 120mm mor; 65 BM-21 122mm MRL; 82mm RCL; *LAW* RL; 20 *Vigilant* ATGW; 37mm, 57mm towed, 18 ZSU-23-4, 72 M-163/167 *Vulcan* SP AA guns. (On order: 150 BTR APC; 155mm how; *TOW*, *Dragon* ATGW.)

Navy: 600.

3 ex-Sov P4 FAC(T)<.

5 ex-Sov patrol craft<: 2 *Zhuk*, 3 *Poluchat*.

2 LCM.

Base: Hodeida.

Air Force: 1,500; 49 combat aircraft. (Some aircraft are believed to be in storage.)

4 fighter sqns: 1 with 10 MiG-21, 1 with 12 MiG-17F, 1 with 12 F-5E, 1 with 15 Su-22.

Tpts: 2 C-130H, 3 C-47, 2 *Skyvan*, 1 Il-14, 1 An-24, 3 An-26.

Trainers: 4 F-5B, 4 MiG-15UTI.

Hel: 1 Mi-4; 6 AB-206, 6 AB-212, 2 *Alouette*.

AAM: AA-2 *Atoll*.

(On order: 30 MiG-21, 5 Su-22 fighters; 5 btys SA-2 SAM.)

Para-Military Forces: 20,000 tribal levies.

YEMEN: PEOPLE'S DEMOCRATIC REPUBLIC (SOUTH)

Population: 2,120,000.

Military service: 2 years.

Total armed forces: 23,800.

Estimated GNP 1978: \$500 m.

Defence expenditure 1978-79: 19 m dinars (\$56 m).

\$1 = 0.345 dinars (1979), 0.34 dinars (1978).

Army: 22,000 (to rise to about 40,000 by 1982).

1 mech bde.

10 inf bdes.

1 marine bde.

1 SAM regt.

375 T-34/-54/-55/-62 med tks; 10 *Saladin* armd, 10

Ferret scout cars; 200 BTR-40/-152 APC; 18

25-pdr, 105mm pack, 122mm and 130mm how

120mm mor; BM-21 122mm MRL; 122mm RCL

140 37mm, 57mm, 85mm towed and ZSU-23-

SP AA guns; SA-3/-7/-9 SAM.

Navy: 500 (subordinate to Army).

4 ex-Sov *Osa* FAC(M) with *Styx* SSM.

2 ex-Sov SO-1 large patrol craft.

2 ex-Sov P-6 FAC(T)<.

2 ex-Sov *Zhuk* FAC(P)<.

1 *Pozharny* harbour patrol craft.

3 *Spear* coastal patrol craft<.

1 ex-Sov T-58 ocean minesweeper.

3 ex-Sov *Polnocny* LCT.

1 ex-Sov LST.

3 LCA.

Bases: Aden, Mukalla.

Air Force: 1,300; 111 combat aircraft. (Some are believed to be in storage, and some are believed flown by Soviet and Cuban crews.)

1 lt bbr sqn with 12 Il-28.

4 FGA sqns: 2 with 37 MiG-17F, 1 with 10

MiG-21, 1 with 12 Su-20/-22.

3 interceptor sqns with 40 MiG-21F.

1 tpt sqn with 4 Il-14, 3 An-24.

1 hel sqn with 6 Mi-24, 8 Mi-8, some Mi-4.

Trainers: 3 MiG-15UTI.

AAM: AA-2 *Atoll*.

Para-Military Forces: Popular Militia. 15,000 Public Security Force.

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Sperry Update

12

**A timely report of Sperry Flight Systems activities
in the airline, defense, space and general aviation markets.**

Beech 1900, Fokker F-27 to fly with Sperry.

Sperry continues to bring advanced automatic flight control technology to the commuter airline market with a new digital system for the Beech 1900, and the dual channel SPZ-600 system for the Fokker F-27.

Beech will offer two Sperry options for its new turboprop 1900, the digital DFS-500 integrated autopilot/flight director, and the flight director system alone. The integrated system will provide, for the first time in a commuter aircraft, the high reliability and self-monitoring capability of a digital system with reduced installation weight and volume. Sperry's Avionics Division plans to deliver DFS-500 hardware prior to first test flights of the aircraft.

Fokker has chosen the SPZ-600 system for future production of the turboprop F-27. It will provide Category II approach capability with two flight directors for commuter and low level maritime patrol operations. Retrofit of the integrated dual channel system will be offered for existing F-27s following system certification in the aircraft late in 1981.

Sperry digital flight instruments delivered to airline customers.

Sperry's Commercial Division has shipped the first production articles of its latest digital flight instruments for commercial airliners for installation in Lufthansa's Boeing 737s. The RD-800J horizontal situation indicators, like the RD-800s delivered earlier for Pan American Airways Lockheed L-1011s, feature a digital microprocessor which brings a new level of reliability, maintainability and simplicity to electromechanical cockpit displays.

The microprocessor-based indicator design has less power drain and allows low-density packaging, resulting in less heat buildup and longer instrument life.



Sperry electronic displays aboard Strike Eagle F-15.

Sperry's Defense and Space Systems Division is providing a set of advanced electronic displays for the rear cockpit of the McDonnell Douglas F-15 Strike Eagle Advanced Fighter Capability Demonstration program.

The Strike Eagle two-seat version of the F-15 is designed to give the aircraft night and all-weather attack capability while retaining the full air-to-air combat advantages of standard F-15s. Sperry's Strike Eagle aft cockpit display group includes four Integrated Multipurpose CRT displays for the navigator-weapons officer along with two Programmable Display Generators and an Electronic Map Storage Unit.

The aft display group will let the Strike Eagle crew take full advantage of high resolution capabilities in the new Hughes APG-63 synthetic aperture radar, plus low-light TV and forward looking infrared sensors.

Digital Flight Guidance System aboard newly certified DC-9 Super 80.

The first McDonnell Douglas DC-9 Super 80 is now in service with Swissair following FAA certification with a Sperry Digital Flight Guidance System (DFGS). The super-quiet, fuel-efficient Super 80 is the first airliner in commercial service with an all-digital integrated autopilot/flight director system incorporating extensive automatic maintenance and performance monitoring capability.

The Super 80 soon will be FAA certified for automatic landing

capability to Category IIIa weather minimums (50 ft. decision height, 700 ft. runway visual range). Like all previous DC-9s, the Super 80 is certified for operation by a two-pilot crew. McDonnell Douglas had announced 87 firm orders totalling more than \$1 billion for the Super 80 at the time of delivery to Swissair.

Sperry single-pilot IFR OK'd for AStar helicopter.

The Aerospatiale AS-350 AStar utility helicopter has been certified for full IFR single-pilot operation with a Sperry HelCIS Helipilot automatic flight control system.

The latest in a line of Sperry helicopter single-pilot IFR certifications dating back to 1975 gives the AStar hands-off automatic flight capability with dramatic reduction in pilot workload and fatigue. Sperry Avionics Division single-pilot IFR stabilization and guidance systems have been certified on nine different helicopter models from five manufacturers.

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PHOENIX, ARIZONA 85036

Sub-Saharan Africa

MULTILATERAL AGREEMENTS

The Organization of African Unity (OAU), constituted in May 1963, includes all internationally recognized independent African states except South Africa. It has a Defence Commission—responsible for defence and security co-operation and the defence of the sovereignty, territorial integrity, and independence of its members—which has rarely met. In July 1978 the OAU agreed that this be reactivated to consider the establishment of an African Intervention Force. In 1979 the Force was approved in principle, and planning for its formation, funding, and equipping ordered.

BILATERAL AGREEMENTS

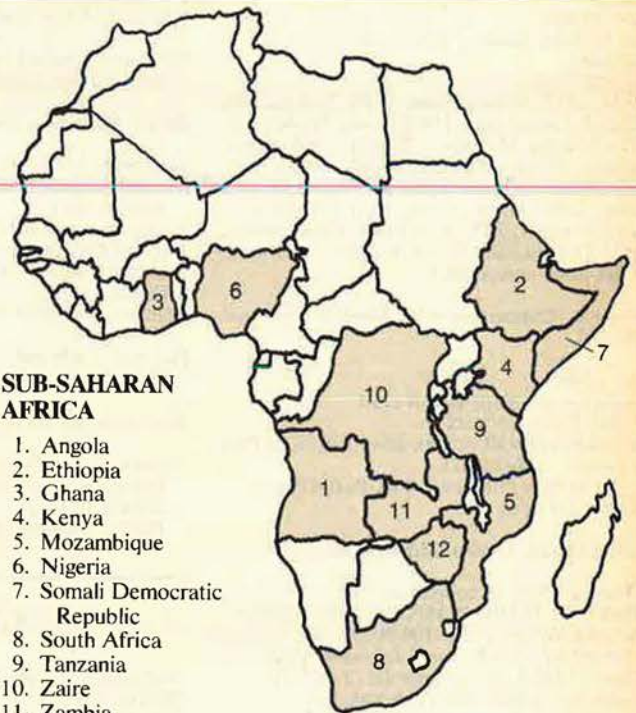
The US has had mutual defence and assistance agreements with Ethiopia (1975), Ghana (1972), Kenya (1980), Liberia (1972), Mali (1972), Niger (1962), Senegal (1962), and Zaire (1972); some may now be in abeyance. An agreement is under negotiation with Somalia to allow limited US access to Somali facilities.

The Soviet Union's 1974 Treaty of Friendship and Co-operation with Somalia was abrogated in November 1977. She has others with Angola (October 1976), Mozambique (March 1977), and Ethiopia (November 1978, ratified April 1979). Military aid has been given to Angola, Ethiopia, Guinea, Guinea-Bissau, Mali, Mozambique, Nigeria, Somalia, and Uganda. Soviet naval facilities constructed in Somalia are no longer in use, and the Soviet Union has transferred her operations to the South Yemen. Guinea was used as a Soviet staging and maritime reconnaissance base until 1977.

China has military assistance agreements with Cameroon, Equatorial Guinea, Guinea, Mali, and Tanzania, and has given aid to Mozambique and Zaire.

Britain maintains overflying, training, and defence agreements with Kenya and is working closely with Zimbabwe.

France signed defence and/or military co-operation agreements with Benin, the Cameroons (February 1974), the Central African Republic, Chad (status obscure), Congo, Gabon (1974), Ivory Coast, Madagascar, Mali (since terminated), Mauritania, Niger, Senegal (March 1974), Togo, Upper Volta, and Zaire. The agreement with the Central African Republic was terminated briefly



SUB-SAHARAN AFRICA

1. Angola
2. Ethiopia
3. Ghana
4. Kenya
5. Mozambique
6. Nigeria
7. Somali Democratic Republic
8. South Africa
9. Tanzania
10. Zaire
11. Zambia
12. Zimbabwe

(May–September 1979) before the change of government. France concluded an agreement with Djibouti which permits her to station forces there.

Belgium has a military co-operation agreement with Zaire, and France has assisted in training Zairean forces.

Spain maintains close links with Equatorial Guinea.

Cuba has given military aid to the Congo, Guinea, Somalia, Ethiopia, and Algeria. She has some 20,000 men in Angola, training the Angolan armed forces and assisting with internal security, and 16–17,000 in Ethiopia. Cuba, Soviet, and East German advisers are present in a number of other African countries.

Some military links exist between South Africa and Israel, and between Mozambique and Bulgaria.

ARRANGEMENTS WITHIN THE REGION

In 1961 the Central African Republic, Chad, the

Congo, and Gabon formed the Defence Council of Equatorial Africa, with French help. Chad's present position in relation to the Council is unclear.

Kenya and Ethiopia signed a Treaty of Friendship and Co-operation in January 1979.

Prior to the 1980 Rhodesian elections, South Africa gave aid and deployed troops to Rhodesia. These ar-

rangements have now ceased.

Egypt and Morocco have given military assistance to Zaire. Libya has supported guerillas and secessionists in the civil war in Chad and has intervened in Tunisia. A Tanzanian force of some 10,000 remains in Uganda following the signing of a 2-year military agreement in December 1979.

ANGOLA

Population: 6,658,000.

Military service: 2 years.

Total armed forces: 32,500. (Some 19,000 Cubans and 2,500 East Germans operate ac and by eqpt with the Angolan forces. Some Portuguese also serve, and there are some 200 Soviet advisers and technicians.)
\$1 = 25.5 escudos (1975).

Army: 30,000.

2 mot inf bdes (each of 1 tk, 2 inf bns.)

17 inf bdes.

4 AA arty bdes.

85 T-34, 150 T-54 med, some 50 PT-76 lt tks; 200 BRDM-2 armd cars; 150 BTR-40/-50/-60/-152, OT-62, some M-3 APC; 120 guns, incl 76mm, 105mm, 122mm, 500 82mm and 120mm mor; 100 BM-21 122mm MRL; ZIS-3 76mm ATK guns; 2,000 75mm, 82mm, and 107mm RCL; Sagger ATGW; ZPU-4 14.5mm, 37mm towed, ZSU-23-4, 40 ZSU-57-2 SP AA guns; SA-7 SAM. (Eqpt totals uncertain.)

RESERVES: 'Organization of Popular Defence' 200,000.

Navy: 1,000.

5 ex-Port *Argos* large patrol craft.

2 ex-Sov *Shereshen* FAC(T).

7 coastal patrol craft <; 1 ex-Sov *Zhuk*, 6 ex-Port (1 *Jupiter*, 5 *Bellatrix*).

2 LCT: 1 ex-Sov *Polnocny*, 1 ex-Port *Alfange*.

9 ex-Sov T-4 LCM.

Bases: Luanda, Lobito, Moçamedes.

Air Force: 1,500; 29 combat aircraft.

15 MiG-17F, 12 MiG-21MF, 2 G-91R4 fighters.

Tpts incl 6 *Noratlant*, 2 L-100-20, 3 C-47, 6 An-2, 5 An-26, 4 *Turbo-Porter*, 2 *Islander*, 10 Do-27.

Hel incl 17 Mi-8, 30 *Alouette* III, 2 Bell 47.

Trainers incl 3 MiG-15UTI, 6 Yak-11.

AAM: AA-2 *Atoll*.

ETHIOPIA

Population: 31,100,000.

Military service: conscription.

Total armed forces: 229,500. (Some 16,500 Cubans and about 300 Warsaw Pact technicians and advisers serve with the Ethiopian forces and operate ac and by equip. Some South Yemeni troops may also serve.)

Estimated GNP 1979: \$3.0 bn.

Defence expenditure 1980: 1.1 bn birr (\$385 m).

\$1 = 2.86 birr (190), 2.09 birr (1979).

Army: 225,000. (Incorporating 150,000 People's Militia.)

14 inf and mot inf divs with some 12 tk bns.

1 lt div.

4 para/cdo bdes.

30 arty bns.

2 engr bns.

40 M-47, 100 T-34, 500 T-54/-55 med tks; 12 V-150 *Commando* armd cars; BRDM-2 scout cars; 40 BMP-1 MICV, about 70 M-113, 500 BTR-40/-60/-152 APC; 75mm, 52 105mm, 150 122mm, 130mm, 152mm, 12 155mm towed, 12

M-109 155 sp how; 60mm, 81mm, 82mm, 120mm, 280 M-2/-30 4.2 in, 107mm, 120mm mor; BM-21 122mm MRL; Sagger ATGW; 37mm towed, ZSU-23-4, ZSU-57-2 SP AA guns; SA-2/-3/-7 SAM.

Navy: 1,500.

1 ex-US *Barnegat* frigate (trg ship).

1 ex-Neth *Wildervank* coastal minesweeper.

9 large patrol craft: 1 ex-Yug *Kraljevica*, 4 ex-US PGM, 4 105-ft *Sewart*.

4 ex-Sov *Osa-II* FAC(M) with *Styx* ssm.

2 ex-Sov *Mol* FAC(T).

4 *Sewart* 15-ton coastal patrol craft.

2 ex-US LCM, 2 LCVP.

(Of these, 8 patrol craft, 1 FAC(M), 2 FAC(T) are believed operational.)

Bases: Massawa, Assab.

Air Force: 3,000; 100+ combat aircraft.

6 FGA sqns: 1 with 7 F-5A/E, 1 with 17 MiG-17, 3 with 50 MiG-21, 1 with 20 MiG-23.

1 COIN sqn with 6 T-28A, Saab T-17 *Supporter*.

1 tpt sqn with 14 An-12, 4 An-22, 3 C-47, 2 C-54, 6 C-119G, 3 *Dove*, 1 Il-14, 1 DHC-3, 3 DHC-6, 2 Do-28.

Trainers incl MiG-21U, 20 *Safir*, 11 T-33A, 2 F-5B.

Hel incl 6 AB-204, 3 *Alouette* III, 10 Mi-6, 12 Mi-8, Mi-24, 6 UH-1H, 1 *Puma*.

RESERVES (all services): 20,000.

Para-Military Forces: 169,000. 9,000 mobile emergency police force; 150,000 People's Militia, in 10 divs with mor, ATK guns; 10,000 People's Protection bdes.

GHANA

Population: 11,400,000.

Military service: voluntary.

Total armed forces: 17,450.

Estimated GNP 1978: \$10.8 bn.

Defence expenditure 1979-80: 426 m cedi (\$155 m).

\$1 = 0.364 cedi (1980), 1.35 cedi (1978).

Army: 14,700.

2 bdes (6 inf bns and spt units).

1 recee bn.

1 mor bn.

1 fd engr bn.

1 sigs bn.

1 AB bn.

60 Mowag *Piranha*, 26 *Saladin* armd, 23 *Ferret* scout cars; M-56 105mm how; 81mm, 10 120mm mor; *Carl Gustav* 84mm RCL.

DEPLOYMENT: *Lebanon* (UNIFIL): 1 bn (865).

Navy: 1,200.

2 *Kromantse* ASW corvettes.

2 Type 45 FAC(M) with *Exocet* (2 Type 57 on order)

4 patrol craft (2 ex-Br *Ford*).

1 ex-Br *Ton* coastal minesweeper.

4 *Spear* II coastal patrol craft.

1 ex-Br LCT (trg ship/workshop).

Bases: Secondi, Tema.

Air Force: 1,550; 12 combat aircraft.

1 COIN sqn with 6 MB-326F, 6 MB-326K.

2 tpt sqns with 8 *Islander*, 6 *Skyvan* 3M.

1 trg sqn with 12 *Bulldog*.

1 comms/liason sqn with 6 F-27, 1 F-28, 5 C-47.

Hel: 2 *Alouette* III, 2 Bell 212.

Para-Military Forces: 4,000, 3 Border Guard bns.

KENYA

Population: 15,800,000.

Military service: voluntary.

Total armed forces: 14,750.

Estimated GNP 1979: \$6.3 bn.

Defence expenditure 1977: 1.4 bn shillings (\$168 m).

\$1 = 7.49 shillings (1979), 8.35 shillings (1977).

Army: 12,000.

2 bde HQ.

1 armd bn (forming).

1 armd car bn.

6 inf bns.

2 arty bns.

1 air cav bn (forming).

1 engr bn.

1 tpt bn.

12 Vickers Mk 3 med tks; 3 *Saladin*, 30 AML-60/-90 armd cars; 15 UR-416, 10 Panhard M-3 APC; 8 105mm lt guns; 20 81mm, 8 120mm mor; 56 *Carl Gustav* 84mm, *Wombat* 120mm RCL; *Milan*, 8 *Swingfire* ATGW; 2 Hughes 500MD *Scout* hel.

(On order: 38 Vickers Mk 3 med tks; *Rapier* SAM; 30 Hughes 500MD hel (15 *Defender* with TOW ATGW, 15 *Scout* with chain gun).)

Navy: 650.

7 large patrol craft: 4 Brooke Marine (1 37.5-metre, 3 32.6-metre), 3 Vosper 31-metre.

Base: Mombasa.

Air Force: 2,100; 20 combat aircraft.

1 FGA sqn with 10 F-5E, 2 F-5F.

1 COIN sqn with 5 BAC-167 *Strikemaster*, 3 *Hawk*.

1 trg sqn with 14 *Bulldog*.

2 lt tpt sqns: 1 with 6 DHC-4 *Caribou*, 1 with 6 DHC-5D *Buffalo*, 6 Do-28D.

Other ac incl 1 *Turbo Commander*, 2 *Navajo*.

Hel: 10 *Puma*, 2 Bell 47G, 2 Hughes 500D.

AAM: *Sidewinder*.

(On order: 9 *Hawk* T-52 trainers.)

Para-Military Forces: 1,800 police (General Service Unit); Police Air Wing, 9 Cessna lt ac.

MOZAMBIQUE

Population: 10,170,000.

Military service: 2 years.

Total armed forces: 24,300. (Chinese, Cuban, East German, Romanian, and Soviet advisers are reported with Mozambique forces.)

Estimated GNP 1978: \$16.0 bn.

Defence expenditure 1978: 2.77 bn escudos (\$177 m).

\$1 = 33.51 escudos (1978).



A military truck convoy in a desert area led by a South African armored vehicle.

Army: 22,800.

7 bdes.

350 T-34/-54/-55 med, some 50 PT-76 lt tks; 150 BRDM armd cars; 250 BTR-40/-152 APC; 76mm, 85mm, 105mm, 122mm, 130mm, 152mm guns/how; BM-21 122mm MRL; 60mm, 82mm 120mm mor; 82mm RCL; Sagger ATGW; 23mm, 37mm, 57mm AA guns; SA-3, SA-7 SAM.

Navy: 700.

9 coastal patrol craft<: 1 ex-Sov *Poluchat*, 2 *Zhuk*, 6 ex-Port (1 *Antares*, 3 *Jupiter*, 2 *Bella-trix*).

Bases: Maputo, Beira, Nacala, Pemba, Metangula.

Air Force: 800; 36 combat aircraft.

2 sqns with 36 MiG-17/-19/-21.
Tpts incl 2 An-26, 7 Zlin, 4 Cessna 182.
Trg ac: 5 Cessna 152.
Hel: 4 *Alouette* II/III, 10 Mi-8.

NIGERIA

Population: 76,420,000.

Military service: voluntary.

Total armed forces: 146,000.

Estimated GDP 1978: \$35 bn.

Defence expenditure 1980: 987 m naira (\$1.7 bn).

\$1 = 0.58 naira (1980), 0.64 naira (1979).

Army: 130,000. (Planned to reduce to 120,000 in 1980.)

4 inf divs.

1 Guards bde.

4 arty bdes.

4 engr bdes.

4 recce regts.

64 T-55 med, 50 *Scorpion* lt tks; 20 *Saladin*, 15 AML-60/-90 armd, 75 *Fox* scout cars; 8 *Saracen* APC; 32 105mm, 122mm, 130mm guns/how; 81mm mor; 76mm ATK guns; 20mm, 40mm towed, ZSU-23-4 SP AA guns.

DEPLOYMENT: *Lebanon* (UNIFIL): 1 bn (700).

Navy: 8,000.

1 *Nigeria*-class ASW frigate.

4 *Hippo*-class corvettes (2 Vosper Thornycroft Mk 9 with *Seacat*, 2 Mk 3).

3 large patrol craft (4 Brooke Marine, 4 Abeking & Rasmussen).

2 RoRo 1300 LST.

5 coastal patrol boats.

(On order: 1 *Meko* 360 frigate; 6 FAC(M)(3 Lürssen S-143 with *Otomat*, 3 *La Combattante* with *Exocet* SSM); *Seacat* SAM.)

Bases: Apapa (Lagos), Calabar.

RESERVES: 2,000.

Air Force: 8,000; 21 combat aircraft. (There are additional unserviceable AFV and aircraft.)

3 FGA/interceptor sqns: 1 with 3 MiG-17, 2 with 18 MiG-21MF.

2 tpt sq with 6 C-130H, 1 F-27, 3 F-28, 1 *Gulfstream* II.

Hel incl: 20 BO-105C/D, 13 *Puma*, 10 *Alouette* III, 3 *Whirlwind*.

3 trg/service sqns with 2 MiG-15UTI, 2 MiG-21U, 25 *Bulldog*, 15 Do-27/-28, 3 *Navajo*, 20 L-29.

AAM: AA-2 *Atoll*.

(On order 12 *AlphaJet* FGA, 6 CH-47C hel.)

SOMALI DEMOCRATIC REPUBLIC

Population: 3,530,000.

Military service: voluntary.

Total armed forces: 61,550.

Estimated GNP 1978: \$425 m.

Defence expenditure 1979: 598 m shillings (\$95 m).

\$1 = 6.295 shillings (1978, 1979).

Army: 60,000.

3 corps, 7 div HQ.

3 tk/mech bdes.

16 inf bdes.

3 cdo bdes.

13 fd, 10 AA arty bns.

60 T-34, 40 + T-54/-55, 40 *Centurion* med tks; 50 BRDM-2 scout cars; 150 BTR-40/-50/-60, 100 BTR-152, Fiat 6614 APC; about 100 76mm, 85mm, 80 122mm, 130mm guns/how; 81mm mor; 100mm ATK guns; 106mm RCL; *Milan* ATGW; 150 14.5mm, 37mm, 57mm, and 100mm towed 20 ZSU-23-4 SP AA guns; SA-2/-3 SAM. (Spares are short, and not all equipment is serviceable.)

(On order: Fiat 6614 APC.)

Navy: 550.

2 ex-Sov *Osa-II* FAC(M) with *Styx* SSM.

7 ex-Sov FAC(T): 4 *Mol*, 3 P-6<.

5 ex-Sov *Poluchat* large patrol craft.

1 ex-Sov *Polnocny* LCT, 4 ex-Sov T-4 LCM<.

Bases: Berbera, Mogadishu, Kismayu.

Air Force: 1,000; 33 combat aircraft.

1 lt bbr sqn with 3 Il-28.

2 FGA sqns with 11 MiG-17.

1 fighter sqn with 7 MiG-21MF.

1 COIN sqn with 12 SF-260W.

1 tpt sqn with 3 An-2, 3 An-24/-26, 3 C-47, 1 G-222, 2 Do-28, 4 P-166DL.

1 hel sqn with 4 Mi-4, 4 Mi-8, 1 AB-204.

Trainers incl 6 P-148, 15 Yak-11, 4 MiG-15UTI.

AAM: AA-2 *Atoll*.

(On order: 5 G-222 tpts, 6 SM-1019 lt ac.)

Para-Military Forces: 29,500: 8,000 Police; 1,500 border guards; 20,000 People's Militia.

SOUTH AFRICA

Population: 28,800,000.

Military service: 24 months.

Total armed forces: 86,050 (66,250 conscripts; total mobilizable strength 404,500).

Estimated GNP 1979: \$54.3 bn.

Defence expenditure 1980: 2.07 bn rand (\$2.56 bn).

\$1 = 0.81 rand (1980), 1.85 rand (1979).

Army: 71,000 (6,000 White, 3,000 Black and

Coloured regulars, 2,000 women, 60,000 conscripts).

1 corps, 2 div HQ (1 armd, 1 inf).

1 armd bde.

2 mech bdes.

4 mot bdes.

1 para bde.

9 fd, 4 med, 7 lt AA arty regts. (Cadre units, forming 2 divs when brought to full strength on mobilization of Citizen Force.)

1 missile regt.

15 fd engr sqns.

3 sigs regts, 3 sigs sqns.

Some 250 *Centurion*, 40 *Sherman*, 20 *Comet* med tks; 1,600 AML *Eland* Mk IV armd cars; 230 scout cars incl *Ferret*; 1,000 *Ratel*, 280 *Saracen* APC, 500 lt APC incl *Hippo*, *Rhino*; 125 25-pdr, 15 5.5in, G-5 150mm towed, 50 *Sexton* 25-pdr, 15 M-7 105mm SP guns; 40 155mm towed, 50 M-109A1 155mm SP how; 127mm MRL; 81mm, 200 120mm mor; 900 6-pdr (57mm) and 17-pdr (76mm) ATK guns; M-67 90mm, 106mm RCL; SS-11, *ENTAC* ATGW; 20mm, 55 K-63 twin 35mm, 25 L/70 40mm, 15 3.7-in AA guns; 18 *Cactus* (*Crotale*), 54 *Tiger-cat* SAM.

RESERVES: 120,000 Active Reserve (Citizen Force). Reservists serve 30 days per year for 8 years.

Navy: 4,750 (1,250 conscripts).

3 *Daphne* submarines.

3 *President* ASW frigates (each with 1 *Wasp* hel).

6 *Minister* (*Reshef*) FAC(M) with *Gabriel* SSM.

6 *Dvora* FAC(M) with single *Gabriel* SSM.

5 ex-Br *Ford* large patrol craft (1 survey vessel).

10 ex-Br *Ton* minesweepers (some as patrol craft).

(On order: 6 *Minister* FAC(M).)

Bases: Simonstown, Durban.

RESERVES: 10,000 Citizen Force.

Air Force: 10,300 (4,000 conscripts); 204 combat aircraft (incl 96 with Citizen Force).

Strike Command:

2 lt bbr sqns: 1 with 6 *Canberra* B(I)12, 3 T-4; 1 with 6 *Buccaneer* S-50.

1 fighter sqn with 32 *Mirage* F-1AZ.

2 AWX/FGA recce sqns: 1 with 22 *Mirage* IIIICZ/BZ/RZ/RD2Z, 1 with 14 *Mirage* F-1CZ.

Maritime Command:

2 MR sqns: 1 with 7 *Shackleton* MR-3, 1 with 18 *Piaggio* P-166S.

1 tpt spt sqn with 11 C-47B.

1 ASW flt with 11 *Wasp* HAS-1, *Alouette* II (trg).

Transport Command:

3 tpt sqns: 1 with 7 C-130B, 9 *Transall* C-160Z; 1 with 5 DC-4, 15 C-47; 1 with 4 HS-125 *Mercurius*, 3 C-47, 1 *Viscount* 781, 5 *Swearingen* *Merlin* IVA.

5 hel sqns: 2 with 40 *Alouette* III, 2 with 40 *Puma*, 1 with 15 *Super Frelon*.

Other hel incl 17 *Alouette* III, 40 SA-330, 25 AB-205A.

Light Aircraft Command (army assigned):

4 liaison sqns: 20 Cessna 185A/D/E, 20 AM-3C *Bosbok*, 30 C-4M *Kudu*.

Training Command:

Training schools with 60 T-6G *Harvard*, 100 MB-326M/K *Impala* I/II, 29 *Mirage* III (16 EZ, 10 D2Z, 3 DZ), 5 C-47 ac, 10 *Alouette* III hel.

AAM: R-530, R-550 *Magic*. ASM: AS-20/-30.

RESERVES: 25,000 Active Citizen Force; 6 COIN/trg sqns with 96 *Impala* I, T-6G.

Para-Military Forces: 110,000 Commandos; inf bn-type protective units in formations of 5+; 12 months initial, 19 days annual trg. 13 Air Cdo sqns with private ac. 35,500 South African Police (19,500 White, 16,000 Non-white), 20,000 Police Reserves.

TANZANIA

Population: 17,500,000.
 Military service: voluntary.
 Total armed forces: 51,850.
 Estimated GNP 1979: \$3.9 bn.
 Defence expenditure 1979: 2.5 bn shillings
 (\$303 m).
 \$1 = 8.25 shillings (1979).

Army: 50,000.
 2 div HQ.
 9 inf bdes.
 1 tk bn.
 2 arty bns.
 2 mor bns.
 2 AA arty bns (6 btys).
 1 SAM bn with SA-3.
 2 ATK bns.
 2 sigs bns.
 20 Type 59 med, 20 Type 60, 20 Type 62, 6
Scorpion lt tks; 60 BTR-40/152, 20 K-63 APC;
 76mm, 122mm guns; 82mm, 120mm mor;
 M-20 75mm RCL; BM-21 122mm MRL;
 14.5mm, ZU-23, 37mm AA guns, SA-3/6/7
 SAM.

DEPLOYMENT: Uganda: some 10,000.

Navy: 850.
 9 FAC(G): 6 ex-Ch *Shanghai* II, 3 ex-GDR P-6<.
 8 FAC(T)<: 4 ex-Ch *Hu Chwan* hydrofoils, 4 ex-
 Sov P-4.
 13 coastal patrol craft<: 1 ex-Sov *Poluchat*, 4
 ex-GDR, 4 ex-Ch; 4 Vosper Thornycroft 75-ft
 in Zanzibar.
 2 ex-Ch LCM.

Bases: Dar es Salaam, Zanzibar.

Air Force: 1,000; 19 combat aircraft.
 3 fighter sqns with 8 MiG-21, 3 MiG-17/F-4, 8
 MiG-19/F-6.
 1 tpt sqn: 1 An-2, 3 HS-748, 4 DHC-5D, 1 F-28.
 Trainers: 2 MiG-15, 11 *Cherokee*, 6 Cessna 310.
 Hel: 2 Bell 47G, 6 AB-205, 6 AB-206.
 (On order: 2 DHC-5D tpt ac, 4 AB-205 hel.)

Para-Military Forces: 1,400 Police Field Force
 and a police marine unit; 35,000 Citizen's
 Militia.

ZAIRE

Population: 28,200,000.
 Military service: voluntary.
 Total armed forces: 20,500.
 Estimated GDP 1978: \$2.3 bn.
 Defence expenditure 1979: 92 m zaires (\$50.5
 m).
 \$1 = 1.73 zaires (1979), 1.75 zaires (1978).

Army: 18,500.
 1 inf div (4 bdes, 1 inf bn, 1 armd sqn).
 1 indep armd bde.
 1 para bde (2 para bns).
 1 special force bde.
 1 Presidential Guard unit.
 38 ex-Ch Type-62 lt tks; 95 AML-60, 40 AML-90
 armd cars; 90 M-113, 60 M-3 APC; 75mm pack,
 122mm, 130mm guns/how; 82mm, 120mm
 mor; 107mm RL; 57mm ATK guns; 75mm,
 106mm RCL; 20mm, 37mm, 40mm AA guns.

Navy: 1,000.
 4 ex-Ch *Shanghai* II patrol boats.
 24 patrol craft<: 14 coastal (incl 6 Sewart, 3 N.
 Korean P-4, 3 ex-US), 10 river.

Base: Matadi.

Air Force: 1,000; 29 combat aircraft.
 1 fighter sqn with 10 *Mirage* 5M/5DM.



The Italian-built MB-326GB has a dual role for the Zambian Air Force: It is employed both as a trainer and in counterinsurgency tasks.

2 COIN sqns with 8 MB-326K, 6 AT-6G, 5 AT-
 28D.
 1 liaison sqn with 20 Reims Cessna FTB-337.
 1 tpt wing with 6 C-130H, 2 DC-6, 2 DHC-4A, 3
 DHC-5D, 4 C-54, 8 C-47, 2 Mu-2, 1
Mystère-20.
 1 hel sqn: 5 *Alouette* III, 5 *Puma*, 1 *Super Frelon*.
 Trg ac incl 15 Cessna 310, 15 Cessna 150, 13
 MB-326GB, 12 SF-260MC.

Para-Military Forces: 35,000: 8 National Guard,
 6 Gendarmerie bns.

ZAMBIA

Population: 5,730,000.
 Military service: voluntary.
 Total armed forces: 14,300.
 Estimated GNP 1978: \$2.54 bn.
 Defence expenditure 1979: 488.8 m kwacha
 (\$387.9 m).
 \$1 = 1.26 kwacha (1979), 0.828 kwacha (1978).

Army: 12,800.
 1 armd regt.
 1 armd recce bn.
 4 inf bns.
 1 arty bn, 2 AA arty btys.
 1 engr, 1 sigs sqn.
 30 T-54 med tks; 50 BRDM-1/2, 28 *Ferret* scout
 cars; 18 105mm, 30+ 122mm MRL; 24 20mm
 AA guns; SA-7 SAM.
 (On order: T-55 med tks, armd cars, APC.)

Air Force: 1,500; 37 combat aircraft.
 2 FGA sqns: 1 with 12 MiG-19/F-6, 1 with 6
Galeb, 6 *Jastreb*.
 1 COIN/trg sqn with 13 MB-326GB.
 2 tpt sqns: 1 with 2 Yak-40, 2 DC-6, 5 DHC-4, 7
 DHC-5, 10 C-47, 1 HS-748; 1 with 4 DHC-2, 10
 Do-28.
 1 liaison sqn with 20 Saab *Safari*.
 Trainers incl 2 MiG-21UTI, 6 *Chipmunk*, 8 SF-
 260MZ, 12 BT-6.
 1 hel sqn with 12 AB-205, 5 AB-206, 1 AB-212, 17
 Bell 47G, 6 Mi-8.
 1 SAM unit with 12 *Rapier*, 3 *Tigercat*.
 (On order: 16 MiG-21 FGA.)

Para-Military Forces: 1,200; Police Mobile Unit

(PMU), 1 bn of 4 coys (700); Police Para-
 Military Unit (PPMU), 1 bn of 3 coys, 2 hel
 (500).

ZIMBABWE

Population: 7,300,000 (230,000 White).
 Military service: Serving conscripts finish 12-18
 month tour; voluntary thereafter.
 Total armed forces: 13,500 (to be about 50,000).
 Zimbabwe African National Liberation Army
 (ZANLA) and Zimbabwe People's Revolu-
 tionary Army (ZIPRA) personnel to amalga-
 mate with Regular Army. Final proportion of
 each group not yet reported. Some 35,000 will
 form economic Task Forces.
 Estimated GDP 1978: \$US 3.3 bn.
 Defence expenditure 1980-81: \$Z 308 m
 (\$US 444 m).
 \$US1 = \$Z 0.694 (1980), \$R 0.768 (1978).

Army: 12,000.
 3 bde HQ.
 1 armd car regt.
 3 inf bns.
 1 arty regt.
 6 indep inf coys.
 3 engr, 3 sigs sqns.
 6 T-34, 40 T-54/-55 med tks; 45 AML-90 *Eland*
 armd, 15 *Ferret* scout cars; UR-416, *Hippo*,
Hyena, *Leopard* lt APC; 25-pdr, 5.5-in guns/
 how; 81mm mor; 106mm RCL; 20mm AA guns.

Air Force: 1,500; some 37 combat aircraft.
 1 lt bbr sqn with 5 *Canberra* B-2, 2 T-4.
 2 FGA sqns: 1 with 8 *Hunter* FGA-9, 1 with 5
Vampire FB-9.
 1 COIN/recce sqn with 17 SF-260W.
 1 trg/recce liaison sqn with 43 AM-3C *Genet*.
 1 tpt sqn with 11 C-47.
 2 hel sqns with 40 *Alouette* II/III, 10 Bell/AB
 205A.

RESERVES: Serving conscripts under 38: 30-day
 obligation. Men 38-49: 15 days until Sep-
 tember 1980, none thereafter.

Para-Military Forces: Zimbabwe Police: 7,500
 active, 35,000 reservists. Being reorganized.



The Companion Trainer Aircraft: The advantage is with the Beechcraft C-12.

The logic of the CTA program is crystal clear: Save money, fuel, and wear and tear on vitally important B-52's by reducing their training flight hours.

The logical candidate for the Companion Training Aircraft is equally clear: the Beechcraft C-12.

- Ample space and gross weight for the OAS and ECM suites, and for a five-man combat crew and an instructor/evaluator.
- Ample endurance for the four-hour training mission.
- Off-the-shelf availability of an aircraft already in the USAF inventory.
- A contract maintenance program through which Beech now performs all C-12 maintenance and parts support for

the USAF (and which can be expanded easily to accommodate the CTA C-12's).

More persuasive than any of these, however, are two important facts about cost. By comparison with a typical business jet, the C-12:

- Costs half as much initially.
- Uses much less fuel (15 million gallons per year—or 40,000 gallons per day—less fuel when the program is in full swing).

How well can the C-12 simulate the bomber mission? Human factors experts assert that the training missions can be scaled to give B-52 crews realistic workouts at the C-12's 240 knot mission speed. And even with propellers, the C-12's free-turbine power plants

respond much like B-52 engines.

A few reminders:

- The C-12 is an airplane the USAF has already learned to count on for reliability.
- Civilian versions of the C-12 have captured more than 50% of the business turboprop market.

With advantages like these, the C-12 must be acknowledged a serious candidate for Companion Trainer Aircraft.

For more information, please write to Beech Aircraft Corporation, Aerospace Programs, Wichita, Kansas 67201.



EF-111. NEWEST ELECTRONIC WARRIOR.



Eastern Europe has the densest thicket of electronic defenses in the world today.

The EF-111 Tactical Jamming System was developed by the Air Force and Grumman specifically to counter this potential threat—to provide cover for air-to-ground operations along the front line, and to support penetrating strike forces.

In a comprehensive four-year development and test program—the last six months conducted by Air Force personnel at Mountain Home Air Force Base in Idaho—the EF-111 significantly exceeded the operational

reliability and “blue suit” maintainability standards set by the Air Force and Department of Defense.

Tests of the EF-111 system in a simulated Eastern European air-defense environment demonstrated its ability to detect and automatically assign jammers to counter and negate every type of threat encountered.

The need for the EF-111 is a well-established USAF requirement. EF-111 provides the capability to disrupt the Warsaw Pact radar net with support jamming in both standoff and escort roles.

The EF-111. It can do the

job. And with a built-in growth capability to cope with new and more sophisticated threat radars, it will continue to do the job in the future.

The EF-111. A real answer to a real need.

Grumman Aerospace Corporation, Bethpage, Long Island, New York 11714.



50 years

China

Chinese defence policy has for many years maintained a balance, at times uneasy, between the two extremes of nuclear deterrence and People's War. The former aims to deter strategic attack, the latter, by mass mobilization of the population, to deter or repel conventional land invasion. Mao's death in September 1976 and the subsequent attacks on the 'Gang of Four' removed the strongest supporters of the strategic concept that men are more important than weapons. There are indications of an effort to develop more modern general-purpose forces in order to meet more limited military contingencies than the extremes of nuclear deterrence or mass war.

Reports suggest that a slow programme of modernization of the People's Liberation Army (PLA) continues, with some reorganization of forces, the gradual phasing out of Soviet equipment, and its replacement by Chinese designs. Though owing much to Soviet 1950s technology, this modernization will improve Chinese capabilities, even though the PLA's general arms inventory still falls behind that of nations with advanced technology. Budgetary limitations still exercise serious constraints and will continue to delay full modernization (see the note on defence expenditure on p. 107).

NUCLEAR WEAPONS

The research programme continued in 1979, but no nuclear tests have been recorded since 1978. The total then was at least 25 since testing started in 1964. A nuclear force capable of reaching large parts of the Soviet Union and Asia is operational. The stockpile of weapons, both fission and fusion, is believed to amount to several hundreds and probably will continue to grow. Fighter aircraft could be used for tactical delivery, and for longer ranges there is the Tu-16 medium bomber, with a radius of action up to 3,000 km. MRBM with a range of some 1,800 km are operational, but may be replaced by IRBM, also operational now, with a range of about 2,500 km. The missile forces are controlled by the Second Artillery, the missile arm of the PLA.

A multi-stage ICBM with a limited range of 6,000–7,000 km was first tested in 1976, and some have been deployed. An ICBM thought to have a range of some 13,000 km has also been under development, but there are no reports of its deployment as yet. A successful full-range test took place in May 1980. The missile has been successfully used (and thus tested) as a launcher for satel-

lites. China has also one G-class submarine with missile launching tubes, but does not appear to have missiles for it. All the present missiles are liquid-fuelled, but solid propellants are being developed.

CONVENTIONAL FORCES

The PLA embraces all arms and services, including naval and air elements. China is organized in 11 Military Regions (MR) with 29 Military Districts (MD) and divided into Main and Local Forces. Main Force (MF) divisions, which comprise the field army, are commanded by the Ministry of National Defence, although some reports suggest that command is being transferred to the MR in which they are stationed and which are already responsible for their administration. They are available for operations in any region and are better equipped. Local Forces (LF), which include Border Defence and Internal Defence units, are predominantly infantry, are less well equipped, and are intended to defend their own Provinces together with para-military units. Command of them may be vested in the MR.

Artillery, Engineer, Railway, and Production and Construction Corps units are controlled directly by the Ministry of National Defence. Infantry units account for most of the ground-force manpower and 118 of the 185 MF divisions; there are only 11 armoured divisions.

The naval and air elements of the PLA have only about one-fifth of the total manpower, compared with about a quarter for their counterparts in the Soviet Union, but naval strength is increasing, and the equipment for both arms is also steadily being modernized. The PLA, which is essentially a defensive force, lacks facilities and logistic support for protracted large-scale operations outside China.

Major weapons systems produced include F-7/-8/-12 and A-5 fighters, SA-2-type SAM, Type 59 medium, Types 60/63 amphibious, and Type 62 light tanks and K-63 APC. One Han-class nuclear attack submarine, and R- and W-class medium-range diesel submarines are being built, together with SSM destroyers, frigates, and fast patrol boats; a second nuclear-powered attack submarine is now under test and may be in service shortly. China has shown increasing interest in acquiring Western military technology. Britain has sold aircraft engines, artillery, and fire-control equipment and radar, and the United States has sold computers and radars.

BILATERAL AGREEMENTS

In 1950 China signed a 30-year Treaty of Alliance and Friendship with the Soviet Union which contained mutual defence obligations. This expired on 10 April 1980 and has not been renewed. There is a mutual defence agreement with North Korea, dating from 1961, and an

agreement to provide free military aid. There are non-aggression pacts with Afghanistan, Burma, and Kampuchea (Cambodia). Chinese military equipment and logistic support have been offered to a number of countries. Major recipients of arms have included Albania, Egypt, Pakistan, and Tanzania.

CHINA

Population: 1,024,890,000.

Military service: selective. Army 3 years, Air and Army technicians 4 years, Navy 5 years. (Technicians may volunteer for 15 years.) (The People's Liberation Army is one service; naval and air components are listed separately for purposes of comparison.)

Total regular forces: 4,450,000 (including railway construction corps troops).

GNP and defence expenditure—see note following.

Strategic Forces:

OFFENSIVE:

(a) Second Artillery:

ICBM: 4 CSS-3 (range 3,200–3,800 nm/6,000–7,000 km) 1–3 MT. (A new ICBM, the CSS-4, with an estimated range of 7,000 nm (13,000 km) and a warhead of 5–10 MT, is believed to be in production.)

IRBM: 65–85 CSS-2 (range 2,500 km) 1–3 MT.

MRBM: Some 50 CSS-1 (range 1,800 km) 15 KT.

(b) Aircraft:

3 regts with 90 Tu-16 med bbrs.

DEFENSIVE:

(a) Ballistic missile EW phased-array radar complex (West China).

(b) Air Force AD system, capable of limited defence of key urban and industrial areas, military installations, and weapon complexes, with up to 4,000 naval and air force fighters,

about 85 CSA-1 (SA-2) SAM and over 10,000 AA guns.

(c) A civil defence shelter and evacuation system exists in Beijing and other key cities.

Army: 3,600,000.

Main Forces (Field Army):

Some 35 armies, each normally of 3 divs, comprising:

11 armd divs.
118 inf divs.

40 field, anti-tank, and AA arty divs.
16 railway and construction } under

enrg divs } central

150 indep regts } control.

Local Forces (29 provinces, 2–3 divs each):
85 inf divs.

130 indep regts (incl Border Guard).
11,000 Sov IS-2 hy, T-34 and domestic Type 59 med, 600 Types 60/63 (PT-76) amph and Type

62 lt tks; 2,000 K-63, Types 55/56 (BTR-40/152) APC; 16,000 76mm, 85mm, 100mm, 122mm, 130mm, and 152mm guns/how, incl SU-76/-85/-100, Type-54 122mm, ISU-122, and SU-152 sp arty; FROG-type ssm; 32,000 60mm, 82mm, 120mm, and 160mm mor; 3,500 40mm, 107mm, 132mm, and 140mm RL; 57mm, 75mm, 82mm RCL; 76mm, 85mm, 100mm ATK guns; AT-3 Sagger/Sagger-type ATGW; Types 58/56 14.5mm, 37mm, 57mm, 85mm, 100mm AA guns.

DEPLOYMENT:

China is divided into 11 Military Regions (MR), in turn divided into 29 Military Districts (MD). Main Force (MF) divs are administered by MR, but may still be controlled centrally. Divs may

be 'class A' (first line), 'class B' (with fewer tks and partly horse-drawn tpt) or 'class C' (with fewer tks, arty, eqpt, and personnel). Local Force (LF) divs are class C.

Distribution of MF and LF divs, excluding arty and engrs, may be:

North-east: Shenyang MR (Heilongjiang, Jilin, Liaoning MD): 3 armd, 18 inf; 17 LF.

North: Beijing MR (Hebei, Shanxi MD): 5 armd, 28 inf; 12 LF.

A new MD, Nei Monggol (Inner Mongolia), believed to be forming; allocation of forces from present MD unknown.

North-west: Lanzhou MR (Gansu, Ningxia, Qinghai, Shaanxi MD): 1 armd, 8 inf; 4 LF.

West: Ürümqi MR (East, North, and South Xinjiang MD): 6 inf; 8 LF.

South-west: Chengdu MR (Sichuan, Xizang MD): 9 inf; 6 LF.

South: Kunming MR (Guizhou, Yunnan MD): 6 inf; 5 LF.

Guangzhou MR (Guangdong, Guanxi, Hainan, Hinan MD): 12 inf; 11 LF. (There are 2–3 divs of border tps in each of these MR.)

Centre: Wuhan MR (Henan, Hubei MD): 11 inf, 3 AB (Air Force); 7 LF.

East: Jinan MR (Shandong MD): 1 armd, 8 inf; 3 LF.

Nanjing MR (Anhui, Jiangsu, Zhejiang MD): 1 armd, 6 inf; 6 LF.

Fuzhou MR (Fujian, Jiangxi MD): 6 inf; 6 LF.

Navy: 360,000 incl 38,000 Naval Air Force and 38,000 Coast Defence Forces; 38 major surface combat ships, 97 attack subs.

1 Han SSN (a second is on trials).

1 G-class submarine with SLBM tubes. (China is not known to have any missiles for this sub,



The Chinese Air Force counterpart of the Soviet MiG-19, the F-6, during night operations.



China's F-9 fighter is a copy of the Soviet MiG-21 shown here.

which may be fitted with six tubes.)
 97 subs (74 R-, 21 W-class, 2 Ming). (Includes training vessels.)
 12 destroyers with CSS-N-1 (Styx-type)/Styx ssm: 8 Lüda (Kotlin-type) (more building), 4 Anshan (ex-Sov Gordly).
 17 frigates: 8 with CSS-N-1 ssm (3 Kiang Hu, 5 Chieng Tu (ex-Sov Riga)), 4 Kiang Tung with SAM, 5 Kiang Nan (Riga-type).
 9 patrol escorts (1 ex-Japanese, 2 ex-Br, 1 ex-Aus).
 181 FAC(M) with Styx-type ssm: 91 Holo/Osa, 90 HokulKomar<.
 21 large patrol craft: 20 Kronshtadt, 1 ex-US Type 173.
 25 Hainan FAC(P).
 398 FAC(G): 15 Shanghai I, 350 Shanghai II, 6 Hai Kou, 25 Swatow<, 2 Shantung hydrofoils<.
 225 FAC(T)<: 70 P-6, 130 Hu Chwan, 25 P-4 (40 more in reserve).
 About 100 coastal and river patrol craft.
 17 T-43 ocean minesweepers.
 15 ex-US 511-1152 LST, 13 LSM, 16 inf landing ships, some 300 LCU, 150 LCM.
 500 coast and river defence craft (most<).

DEPLOYMENT AND BASES:

North Sea Fleet: about 500 vessels (over half<);

incl 2 sub sqns, deployed from the Yalu River to south of Lianyungang. Qingdao (HQ), Lüda, Lüshun, Huludao, Weihai, Chengshan.
 East Sea Fleet: about 750 vessels (about 400<); deployed from south of Lianyungang to Dongshan with air, AD, and coastal-missile units. Ningbo (HQ), Zhoushan, Taohua Dao, Haimen, Wenzhou, Fuzhou.
 South Sea Fleet: about 600 vessels (perhaps half<); deployed from Dongshan to the Vietnamese frontier with 1 sub sqn. Zhanjiang (HQ), Shantou, Guangzhou, Haikou, Yulin, Beihai.

NAVAL AIR FORCE: 38,000; about 800 shore-based combat aircraft, organized in 3 bbr and 6 fighter divs. Incl about 150 B(Hong)-5 torpedo-carrying and ex-Sov Tu-2 lt bbrs; some 600 fighters, incl F(Jian)-4/-6/-7, ex-Sov MiG-19 interceptors; F-6 recce and 20 ex-Sov Be-6 MR ac; 40 H(Zhi)-5 hel; some 60 lt tpt ac. Naval fighters are integrated into the AD system.

Air Force: 490,000, incl strategic forces and 220,000 AD personnel; some 5,200 combat ac. 10 Military Air Regions, HQ Beijing; organized into air divs, each with 3 regts of 3 sqns. Med bbrs: 95 B(Hong)-6/Tu-16 Badger, a few

ex-Sov Tu-4 Bull.
 Lt bbrs: about 450 B-5, some 100 ex-Sov Tu-2. FGA: about 500 F-2 and A(Qiang)-5 (F-6 bis).
 Fighters: about 3,900 F(Jian)-4/-5/-6/-7, some F-12.
 Recce: Some 130 F-6, B-5.
 Tpts: Some 550 fixed-wing, incl some 300 Y(Yun)-5/An-2, about 100 ex-Sov (Li-2, 50 Il-14/-18, some An-12/-24/-26), 18 Trident, C-46. (These could be supplemented by about 500 ac from the Civil Aviation Administration, with about 150 large tpts.)
 Hel: 350, incl H(Zhi)-5/-6, 13 Super Frelon.
 Trainers: incl BT-5, BT-6, TF-2, TF-4, TF-6.
 AAM: AA-2 Atoll/Atoll-type.
 Airborne tps: 3 divs.

Para-Military Forces: There are two classes of Militia. The Basic Militia (ages 16-30) comprises men who have, or will have, military service, grouped in the Armed Militia; up to 5 million organized into about 75 cadre divisions and 2,000 regts. The Ordinary Militia (ages 17-48); several million, including the Urban Militia, receive some basic training but are generally unarmed. Some play a local AD role. The Civilian Production and Construction Corps: some 4 million, organized into military-style units, serve in border areas.

GROSS NATIONAL PRODUCT AND DEFENCE EXPENDITURE

GROSS NATIONAL PRODUCT

There are no official Chinese figures for GNP or National Income. Western estimates have varied greatly, and it is difficult to choose from a range of figures, variously defined and calculated. The CIA has estimated GNP for 1977 to be \$373 bn, while a recent British estimate for 1980 is \$628 bn.

DEFENCE EXPENDITURE

The official Chinese defence expenditure figure, raised in 1979 for the first time, at 20,320 yuan (\$12.9 bn) was 18% of planned government expenditure. This figure is not, however, comparable to Western defence estimates, since it excludes a number of items, notably pay and allowances for the troops. Chinese pricing practices

are not known in detail, but they are certainly different from those in the West. The official budget figure, then, may not reflect the opportunity costs of even those elements it does cover, which are principally weapons and equipment.

Estimating how much it would cost to produce and man the equivalent of the Chinese defence effort in the US is speculative. A figure of roughly 10% of GNP, or about \$40.6 bn in 1978, is generally accepted in the West. This is not unreasonable when it is considered that the American defence budget, catering for more highly capital-intensive forces, only allocates 26% of its resources to procurement. If China's allocations were similarly distributed, her total defence budget would be nearly \$50 bn. A recent British estimate for 1980 is \$56.9 bn.

Other Asian Countries and Australasia

BILATERAL AGREEMENTS

The United States has had bilateral defence treaties and agreements with Australia, India, Pakistan, Indonesia, Japan, Taiwan, the Republic of Korea, and the Philippines. That with Taiwan lapsed on 1 January 1980, although some arms supply and production arrangements continue. Under several other arrangements in the region she also provides military aid on either grant or credit basis to Indonesia, Korea, Malaysia, the Philippines, and Thailand, and she sells military equipment to many countries, notably Australia, Japan, and Korea. There are major bases in Japan, Korea, and the Philippines. The 1973 Diego Garcia Agreement between the British and American Governments provides for the development of the US naval communications facility on the island into a US naval support facility. This is now being protested by the Government of Mauritius.

The Soviet Union has Treaties of Friendship, Co-operation, and Mutual Assistance with Afghanistan, India, Bangladesh, Mongolia, the Democratic People's Republic of Korea, and Vietnam. Military assistance agreements exist with Sri Lanka (Ceylon).

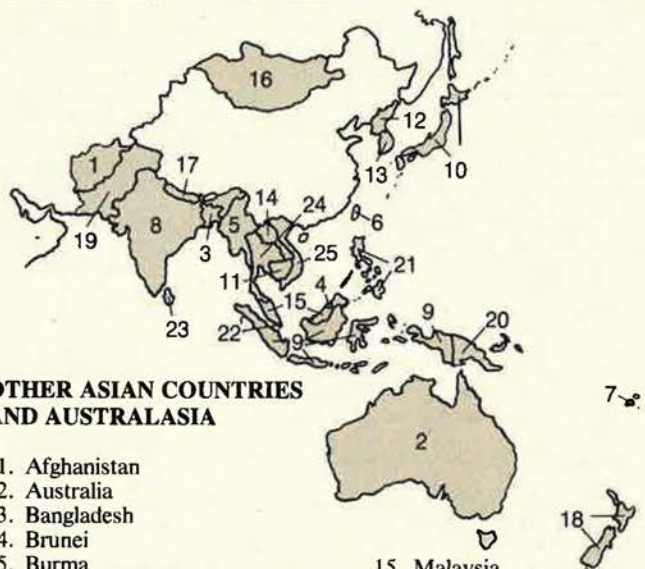
Australia has supplied defence equipment to Singapore and Indonesia and has a defence/aid agreement with Malaysia.

In July 1977 Vietnam and Laos signed a series of agreements which contained military provisions and a border pact and appears to have covered the stationing of Vietnamese troops in Laos. A similar series of agreements seems to have been negotiated between Vietnam and the Heng Samrin regime in Kampuchea following the fall of Pol Pot and Ieng Sary.

MULTILATERAL AGREEMENTS

In 1955 the South-East Asia Collective Defence Treaty brought the Treaty Organization, SEATO, into being. In 1975 the SEATO Council decided to phase the Organization out, and it was formally closed on 30 June 1977.

Australia, New Zealand, and the United States are members of a tripartite treaty known as ANZUS, which was signed in 1951 and is of indefinite duration. Under this Treaty each agrees to 'act to meet the common danger' in the event of attack on either metropolitan or



OTHER ASIAN COUNTRIES AND AUSTRALASIA

1. Afghanistan
2. Australia
3. Bangladesh
4. Brunei
5. Burma
6. China: Republic of (Taiwan)
7. Fiji
8. India
9. Indonesia
10. Japan
11. Kampuchea (Cambodia)
12. Korea: Democratic People's Republic (North)
13. Korea: Republic of (South)
14. Laos
15. Malaysia
16. Mongolia
17. Nepal
18. New Zealand
19. Pakistan
20. Papua New Guinea
21. Philippines
22. Singapore
23. Sri Lanka (Ceylon)
24. Thailand
25. Vietnam

island territory of any one of them, or on armed forces, public vessels, or aircraft in the Pacific.

Five-Power defence arrangements, relating to the defence of Malaysia and Singapore and involving Australia, Malaysia, New Zealand, Singapore, and Britain, came into effect on 1 November 1971. These stated that, in the event of any externally organized or supported armed attack or threat of attack against Malaysia or Singapore, the five governments would consult together for the purpose of deciding what measures should be taken, jointly or separately. Britain withdrew her forces from Singapore, except for a small contribution to the integrated air-defence system, by 31 March 1976. New Zealand troops remained, as did Australian air forces in Malaysia.

AFGHANISTAN

Population: 14,800,000.
Military service: 2 years.
Total armed forces: 40,000. (Actual strength suspect due to defections. Equipment has been lost, and there is confusion between Soviet and Afghan holdings of identical equipment.)
Estimated GNP 1979: \$2.9 bn.
Defence expenditure 1977-78: 2.73 bn afghanis (\$61 m).
\$1 = 45 afghanis (1977).

Army: 32,000.
3 corps HQ.
10 inf divs.
3 armd bdes.
3 mountain inf bdes.
1 arty bde, 3 arty regts.
3 cdo regts.
1 para regt.
200 T-34, 900 T-54/-55, 100 T-62 med, 60 PT-76 lt tks; BMP MICV, 800 BTR-40/-50/-60/-152 APC; 900 76mm, 100mm, 122mm, and 152mm guns and how; 100 120mm mor; 50 132mm MRL; 76mm, 100mm ATK guns; *Sagger*, *Snapper* ATGW; 350 37mm, 57mm, 85mm, and 100mm towed, 20 ZSU-23-4 SP AA guns; SA-7 SAM.

RESERVES: 150,000.

Air Force: 8,000; perhaps 160 combat aircraft.
3 lt bbr sqns with Il-28.
8 FGA sqns: 2 with MiG-19, 4 with MiG-17, 2 with Su-7BM.
3 interceptor sqns with MiG-21.
2 tpt sqns with An-2, An-26, An-24, Il-18.
4 hel sqns with Mi-4, Mi-8, Mi-24.
Trainers incl MiG-15/-17UTI/-21U, Il-28U, L-39.
AAM: AA-2 *Atoll*.
1 AD div: 1 SAM bde (3 bns with 100 SA-2), SA-3; 1 AA bde (2 bns with 37mm, 85mm, 100mm guns), 1 radar bde (3 bns).

RESERVES: 12,000.

Para-Military Forces: 30,000 Gendarmerie.

AUSTRALIA

Population: 14,360,000.
Military service: voluntary.
Total armed forces: 71,011.
Estimated GNP 1979: \$US 117.7 bn.
Defence budget 1980-81: \$A 3.54 bn (\$US 3.90 bn).
\$1 = \$A 0.908 (1980), \$A 0.875 (1978).

Army: 32,010.
1 inf div HQ.
3 task force HQ.
1 armd regt.
1 recce regt.
1 APC regt (+1 cav sqn).
6 inf bns.
4 arty regts (1 med, 2 fd, 1 AD).
3 fd engr, 1 fd survey regts.
2 sigs regts.
1 Special Air Service regt.
1 aviation regt.
2 tpt regts (1 air tpt spt).
90 *Leopard* AS1 med tks; 791 M-113 APC, incl 63 recce AFV with 76mm gun (45 with *Scorpion*, 18 with *Saladin* turret); 34 5.5-in guns; 248 105mm how; 51 M-40 106mm RCL; 93 *Redeye*, 20 *Rapier* SAM; 18 *Porter*, 11 *Nomad* ac; 49 Bell 206B-1 hel; 37 watercraft.
(On order: 8 *Rapier* SAM, 10 *Blindfire* AD radar.)

DEPLOYMENT: *Egypt* (UNTSO): 12; *India* *Kashmir* (UNMOGIP): 7.

RESERVES: 23,260 (with trg obligations) in com-

bat, spt, log and trg units (to rise to 30,000).

Navy: 16,930 (incl Fleet Air Arm).
6 *Oxley*-class (*Oberon*) submarines.
1 aircraft carrier (capacity 8 A-4G, 6 S-2G ac, 6 *Sea King* hel).
3 *Perth* (ex-US *Adams*) ASW destroyers with *Tartar* SAM, *Ikara* ASW msls.
1 modified *Daring*-class destroyer (trg).
6 *River*-class frigates with *Seacat* SAM, *Ikara*.
3 modified *Br Ton*-class coastal MCM.
1 PCF-420, 12 *Attack*-class large patrol boats.
1 amphibious heavy tpt ship, 1 training ship (ex-ocean ferry), 1 destroyer tender, 5 landing craft.
(On order: 4 FFG-7 frigates (2 due in service in 1980), 1 *Durance*-type replenishment ship, 14 PCF-420 large patrol craft.)

FLEET AIR ARM: 20 combat aircraft.
1 FB sqn with 6 A-4G *Skyhawk*.
1 ASW sqn with 6 S-2G *Tracker*.
1 composite sqn with 8 S-2G, 2 HS-748.
1 ASW hel sqn with 6 *Sea King* Mk 50.
1 utility/SAR hel sqn with 8 *Wessex* 31B, 4 Bell UH-1B, 3 Bell 206B.
1 trg sqn with 8 MB-326H, 3 TA-4G, 4 A-4G.
In storage: 5 S-2G ac, 11 *Wessex* 31B, 1UH-1B hel.

Bases: Sydney, Melbourne, Jervis Bay, Brisbane, Cairns, Darwin, Cockburn Sound.

RESERVES: 3,652 (with trg obligations).

Air Force: 22,071; some 115 combat aircraft.
2 strike/recce sqns with 20 F-111C (converting 4 to RF-111C).
3 interceptor/FGA sqns with 48 *Mirage* IIIIO.
1 recce/trg sqn with 13 *Canberra* B-20/-21.
2 MR sqns: 1 with 10 P-3B *Orion*, 1 with 10 P-3C.
1 OCU with 14 *Mirage* IIIIO/D.
5 tpt sqns: 2 with 24 C-130E/H, 2 Boeing 707-320C; 2 with 18 DHC-4; 1 with 2 BAC-111, 2 HS-748, 3 *Mystère* 20.
1 Forward Air Controller flight with 6 CA-25.
1 hel tpt sqn with 6 CH-47 *Chinook*.
3 utility hel sqns with 45 UH-1B/H *Iroquois*.
Trainers incl 70 MB-326, 8 HS-748T2, 30 CT-4 *Airtrainer*.
AAM: *Sidewinder*, R-530.
(27 *Mirage* IIIIO/D FGA, 6 *Chinook* hel in reserve.)

DEPLOYMENT: *Malaysia/Singapore*: 2 sqns with *Mirage* IIIIO, 1 flt with DHC-4, UH-1H hel.

RESERVES: 600 (with trg obligations) in 5 Citizens Air Force sqns.

BANGLADESH

Population: 87,000,000.
Military service: voluntary.
Total armed forces: 72,000.
Estimated GDP 1979: \$9.5 bn.
Defence expenditure 1979: 1.76 bn taka (\$115.4 m).
\$1 = 15.3 taka (1979).

Army: 65,000.
5 inf div HQ.
12 inf bdes (27 inf bns).
2 armd regts.
9 arty regts.
3 engr bns.
30 T-54 med tks; 30 105mm, 5 25-pdr guns/how; 81mm, 50 120mm mor; 57mm ATK guns; 106mm RCL. (Spares including those for the Navy are short, some equipment is unserviceable.)

Navy: 4,000.
2 ex-Br frigates (1 Type 61, 1 Type 41).
4 large patrol craft (2 ex-Yug *Kraljevica*, 2 ex-Ind *Akshay*).

4 *Pabna* river patrol boats<. 1 trg ship.

Bases: Chittagong, Dacca, Khulna, Kaptai.

Air Force: 3,000; 27 combat aircraft.
2 FGA sqns with 3 MiG-21MF, 24 Ch F-6.
1 tpt sqn with 1 An-12, 1 An-24, 3 An-26.
1 hel sqn with 4 *Alouette* III, 6 Bell 212, 6 Mi-8.
Trainers incl 2 MiG-21U, 8 *Magister*, 12 Ch BT-6.
AAM: AA-2 *Atoll*.
(On order: 12 F-6 FGA.)

Para-Military Forces: 30,000 Bangladesh Rifles, 36,000 Armed Police Reserve.

BRUNEI

Population: 210,000.
Military service: voluntary.
Total armed forces: 2,850. (All services form part of the Army.)
Estimated GNP 1978: \$970 m.
Defence expenditure 1979: \$B 373 m (\$US 171.1 m).
\$US 1 = \$B 2.18 (1979), \$B 2.31 (1978).

Army: 2,400.
2 inf bns.
1 armd recce sqn.
1 special boat sqn.
1 engr tp.
16 *Scorpion* lt tks; 24 *Sankey* APC; *Sultan* AFV; 16 81mm mor.
(On order: *Rapier/Blindfire* SAM.)

Navy: 350.
3 *Waspada* FAC(M) with *Exocet* SSM.
6 coastal patrol craft (3 *Perwira*)<.
3 river patrol boats<.
2 *Loadmaster* landing craft.

Base: Muara.

Air Force: 100; no combat aircraft.
1 HS-748 tpt, 2 *Cherokee* lt ac.
Hel: 3 Bell 205A, 3 Bell 206, 7 Bell 212 (1 VIP).
(On order: 6 BO-105.)

Para-Military Forces: 1,750 Royal Brunei Police.

BURMA

Population: 34,200,000.
Military service: voluntary.
Total armed forces: 173,500.
Estimated GDP 1978: \$4.7 bn.
Defence expenditure 1977-78: 1.09 bn kyat (\$164 m).
\$1 = 7.03 kyat (official) (1978).

Army: 159,000.
4 lt inf divs.
2 armd bns.
110 indep inf bns.
3 arty bns.
1 AA bty.
Comet med tks; 40 *Humber* armd, 45 *Ferret* scout cars; 50 25-pdr, 5.5-in guns/how; 120 76mm, 80 105mm how; 120mm mor; 50 6- and 17-pdr ATK guns; 10 40mm, 3.7-in AA guns. (Spares including those for the Navy and Air Force are short; some equipment is unserviceable.)

Navy: 7,000 (800 marines).
2 ex-Br frigates (1 *River*, 1 *Algerine*).
4 corvettes: 2 ex-US (1 *PCE-827*, 1 *Admirable*), 2 *Nawarat*.
36 gunboats (15<).
35 river patrol craft<.

1 ex-US LCU.
8 ex-US LCM.
(On order: 3 *Osprey* large, 6 *Carpentaria* coastal patrol boats.)

Bases: Bassein, Mergui, Moulmein, Seikiy, Sinmalaik, Sittwo.

Air Force: 7,500; 17 combat aircraft.
2 COIN sqns with 6 AT-33, 11 SF-260MB.
Tpts incl 1 F-27, 4 FH-227, 7 Pilatus PC-6/6A, 6 Cessna 180, 6 DHC-3.
Hel incl 10 KB-47G, 2 KV-107/II, 7 HH-43B, 10 *Alouette III*, 14 UH-1.
Trainers incl 16 PC-7 *Turbo-Trainer*, 10 T-37C.
(On order: 9 SF-260MB, 6 Cessna 180, 16 PC-7 *Turbo-Trainer*.)

Para-Military Forces: 38,000 People's Police Force, 35,000 People's Militia.

CHINA: REPUBLIC OF (TAIWAN)

Population: 18,000,000.
Military service: 2 years.
Total armed forces: 438,200.
Estimated GDP 1979: \$32.3 bn.
Defence expenditure 1977-78: \$NT 63.47 bn (\$US 1.75 bn).
\$US1 = \$NT 35.95 (1979), \$NT 37.97 (1978).

Army: 310,000.
2 armd divs.
12 hy inf divs.
6 lt inf divs.
2 AB bdes.
2 armd cav regts.
4 special forces gps.
1 SSM bn with *Honest John*.
4 SAM bns: 2 with *Nike Hercules*, 2 with *HAWK*.
200 M-47/48 med, 625 M-41 lt tks; 1,100 M-113 APC; 550 105mm, 300 155mm guns/how; 350 M-116 75mm pack, 90 203mm, 10 240mm towed, 225 M-108 105mm SP how; 81mm mor; *Kung Feng* 126mm SP RL; *Honest John*, *Hsiung Feng* SSM; 150 M-18 76mm SP ATK guns; 500 106mm RCL; *Kun Wu* ATGW; 300 40mm AA guns (some SP); 80 *Nike Hercules*, *HAWK*, 20 *Chaparral* SAM; 118 UH-1H, 2 KH-4, 7 CH-34 hel.
(On order: 75 M-48 med tks; 100 M-109 155mm, 25 M-110 203mm SP how; 1,000 TOW ATGW; 280 *Improved HAWK* SAM.)

DEPLOYMENT: *Quemoy*: 60,000; *Matsu*: 20,000.

RESERVES: 1,000,000.

Navy: 30,200.
2 ex-US *Guppy*-II submarines (trg).
22 ex-US destroyers: 10 *Gearing* with 1 hel (1 with *Gabriel* SSM, 7 with *ASROC*), 8 *Sumner* (3 with *Gabriel* SSM), 4 *Fletcher* with *Chaparral* SAM.
9 ex-US APD-37/87 frigates.
3 ex-US *Auk*-class corvettes.
4 FAC(M) with 4 *Hsiung Feng* (*Gabriel*-type) SSM.
6 FAC(T): 4 ex-US 71ft/79ft, 2 Japanese built.
14 ex-US *Adjutant* and 268-class coastal minesweepers, 7 MCM boats.
2 LSD, 22 LST, 4 LSM, 22 LCU.
(On order: *Harpoon*, *ASROC*, *Gabriel* SSM, 284 *Improved Sea Chaparral* SAM.)

RESERVES: 45,000.

Bases: Tsoying, Makung (Pescadores), Kee-lung.

Marines: 31,000.
2 divs.
M-47 med tks; LVT-4 APC; 105mm, 155mm how; 106mm RCL.

RESERVES: 35,000.

Air Force: 67,000; 388 combat aircraft.
12 fighter sqns with 90 F-100A/F, 200 F-5A/E.
3 interceptor sqns with 63 F-104G.
1 recce sqn with 8 RF-104G.
1 MR sqn with 9 S-2A, 18 S-2E.
1 SAR sqn with 8 HU-16B ac, 10 UH-1H hel.
Tpts incl 30 C-46, 50 C-47, 1 C-118B, 40 C-119, 1 C-123, 1 Boeing 720B.
Trainers incl 55 PL-1B *Chien Shou*, 50 T-CH-1, 32 T-33, 30 T-38, F-5B/F, 3 TF-104G, 6 F-104D, F-100F.
Hel incl 95 UH-1H, 7 UH-19, 10 Bell 47G, 12 Hughes 500MD ASW.
AAM: *Sidewinder*, *Shafir*.
ASM: *Bullpup*.
(On order: F-5E/F fighters, *Maverick* ASM.)

RESERVES: 90,000.

Para-Military Forces: 100,000 militia.

FIJI

Population: 620,000.
Military service: voluntary.
Total armed forces: 1,420.
Estimated GDP 1978: \$710 m.
Defence expenditure 1978: F\$ 3.1 m (\$3.6 m).
\$1 = F\$ 0.865 (1978).

Army: 1,300.
2 inf bns.
Engr and spt units.
4 25-pdr guns/how.

DEPLOYMENT: *Lebanon* (UNIFIL): 1 bn (865).

Navy: 120.
3 ex-US *Redwing* coastal minesweepers.
1 marine survey vessel.

Base: Suva.

Para-Military Forces: 900 Police.

INDIA

Population: 672,000,000.
Military service: voluntary.
Total armed forces: 1,104,000.
Estimated GNP 1979: \$96 bn.
Defence expenditure 1980-81: 36 bn rupees. (\$4.4 bn).
\$1 = 8.17 rupees (1980), 8.19 rupees (1979).

Army: 944,000.
2 armd divs.
17 inf divs.
10 mountain divs.
5 indep armd bdes.
1 indep inf bde.
2 para bdes, 1 cdo bde.
14 indep arty bdes, incl about 20 AA regts, 4 arty observation sqns and indep flts.
950 T-54/55, 70 T-72, 1,100 *Vijayanta* med, 50 PT-76, AMX-13 lt tks; 700 BTR-50/152, OT-62A/64A APC; about 2,000 75mm, 25-pdr (mostly towed), about 300 100mm, 105mm (incl pack, *Abbot* SP how), 550 130mm, 5.5-in, 155mm, 203mm guns/how; 500 120mm, 160mm mor; 106mm RCL; SS-11, *ENTAC* ATGW; 57mm, 100mm ATK guns; 30mm, 40mm towed, ZSU-23-4 SP AA guns; 40 *Tiger*cat SAM; 40 *Krishak*, 20 *Auster* AOP-9 lt ac; some *Alouette III*, 38 *Cheetah* (Lama) hel.
(On order: 700 T-72 med tks, 75 *Cheetah* hel.)

RESERVES: 200,000. Territorial Army 40,000.

Navy: 47,000, incl Naval Air Force.
8 ex-Sov F-class submarines.
1 ex-Br *Majestic*-class aircraft carrier (capacity 18 *Sea Hawk*, 4 *Alizé*).

1 ex-Br *Fiji*-class cruiser (trg).
29 frigates: 6 *Leander* with *Seacat* SAM, 1 hel; 2 ex-Br *Whitby* with *Styx* SSM; 12 ex-Sov *Petya II*; 7 trg (3 ex-Br *Leopard*, 1 *Hunt*, 2 *Black Swan*, 1 *River*); 2 ex-Br *Blackwood* (coastguard).
4 ex-Sov *Nanuchka* corvettes with SSM, SAM.
16 ex-Sov *Osa-I/II* FAC(M) with *Styx* SSM.
1 *Abhay* large patrol craft.
5 *Poluchat* large patrol craft (coastguard).
4 ex-Sov *Natya* ocean, 4 ex-Br *Ton* coastal, 3 *Ham* inshore minesweepers.
1 ex-Br LST.
6 ex-Sov *Polnocny* LCT.
(On order: 3 *Kashin* destroyers, 2 modified *Leander* frigates, 2 *Nanuchka* corvettes, FAC(M), 2 *Natya* minesweepers, 6 *Polnocny* LCT.)

Bases: Bombay, Vishakapatnam, Cochin, Calcutta, Goa, Port Blair.

NAVAL AIR FORCE: 2,000; 50 combat aircraft.
1 attack sqn with 25 *Sea Hawk* (10 in carrier).
1 ASW sqn with 17 *Alizé* (4 in carrier).
2 MR sqns with 5 *Super Constellation*, 3 II-38.
4 ASW hel sqns with 15 *Sea King*, 5 Ka-25.
1 SAR/liaison hel sqn with 10 *Alouette III*.
3 trg/comms sqns with 7 HJT-16 *Kiran*, 4 *Vampire* T-55, 5 *Defender*, 2 *Devon* ac, 4 Hughes 300 hel.
(On order: 8 *Sea Harrier* FGA, 3 II-38 MR, 8 *Kiran* COIN/trg ac.)

Air Force: 113,000; some 630 combat aircraft.
3 lt btr sqns with 60 *Canberra* B(I)58/B(I)12/B-66.
17 FGA sqns: 4 with 64 Su-7BM/U, 4 with 64 *Hunter* F-56/56A, 3 with 50 HF-24 *Marut* I/IT, 5 with 80 *Gnat* Mk 1, 1 with 16 *Jaguar* GR-1, 2 T2.
14 interceptor/FGA sqns with 252 MiG-21PF/FL/PFMA/MF/M/bis/U.
1 recce sqn with 18 *Canberra* PR-57 (to be replaced by MiG-25).
OCU with 24 *Hunter* F-56/T-66/T-66D.
Trg and conversion sqn with *Canberra* T-4/T-13/T-67, *Hunter* F-56/T-66, MiG-21, Su-7, *Gnat*.
11 tpt sqns: 1 with 16 HS-748, 2 with 32 C-119G, 2 with 28 An-12, 2 with 24 DHC-3, 3 with 40 C-47, 1 with 14 DHC-4.
1 comms sqn with 2 Tu-124, 6 HS-748, C-47, *Devon*.
12 hel units: 6 with 40 Mi-4, 3 with 40 Mi-8, 3 with 60 *Chetak* (*Alouette III*).
Trainers incl 70 HT-2, 110 *Kiran* I/1A, 15 *Marut*, 45 *Iskra*, 20 HS-748 ac, *Chetak* hel.
AAM: AA-2 *Atoll*.
ASM: AS-30.
20 SAM sqns with 120 SA-2/3.
(On order: 150 *Jaguar* (110 to be locally built), MiG-21/bis, 100 *Ajeet* (*Gnat* Mk 2) fighters; 5 MiG-25 recce; An-32, 10 HS-748 tpts; 40 *Iskra* trainers; 45 *Chetak* hel.)

Para-Military Forces: About 200,000 Border Security Force, 100,000 in other organizations.

INDONESIA

Population: 149,600,000.
Military service: selective.
Total armed forces: 241,800.
Estimated GDP 1979: \$43.1 bn.
Defence budget 1980: 1,300 bn rupiahs (\$2.07 bn).
\$1 = 627.8 rupiahs (1980), 625 rupiahs (1979).

Army: 181,000. (About one-third of the army is engaged in civil and administrative duties.)
1 armd cav bde (1 tk bn, spt units) (in KOSTRAD or Strategic Reserve Command).
13 inf bdes (90 inf, 14 arty, 13 AA, 10 engr bns, 1 bn in KOSTRAD).

2 AB inf bdes (6 bns).
4 fd arty regts. 4 AA arty regts.
1 engr regt.

Army Aviation:

1 composite sqn; 1 hel sqn.
100 M-3A1, 350 AMX-13, 75 PT-76 lt tks; 75 *Saladin* armd, 55 *Ferret* scout cars; 1,000 AMX-VCI MICV, *Saracen*, 60 V-150 *Commando*, 130 BTR-40/-152 APC; 50 76mm, 40 105mm (incl 105mm lt), 122mm guns/how; 81mm, 200 120mm mor; 106mm RCL; ENTAC ATGW; 20mm, 40mm, 200 57mm AA guns; 2 C-47, 2 Aero *Commander* 680, 1 Beech 18, Cessna 185, 18 *Gelatik* ac; 16 Bell 205, 7 *Alouette* III, 6 BO-105 hel.

Navy: 35,800, incl Naval Air and 12,000 Marines. (Some equipment and ships non-operational for lack of spares.)

4 submarines: 2 ex-Sov W-class, 2 Type 209.
7 frigates: 4 ex-US *Jones*, 3 ex-Sov *Riga* (2 *Patimura* in reserve).
3 *Fata Hilla* corvettes with *Exocet* SSM.
22 large patrol craft; 6 ex-Sov *Kronshtadt* (1 in reserve), 3 ex-US PC-461 (2 in reserve), 5 ex-Yug *Kraljevica*, 3 *Kelabang*, 2 *Attack*, 3 ex-US PGM-39.
4 PSSM Mk 5 FAC(M) with *Exocet* SSM.
4 Lürssen TNC-45 FAC(T).
8 coastal patrol craft: 2 *Spear*, 6 Australian De Havilland.
5 ex-Sov T-43 ocean minesweepers (2 R-class coastal in reserve).
3 comd/spt ships.
~~9 LST, 3 LCU, 38 LCM.~~
1 marine bde (2 regts).

Bases: Gorontalo, Jakarta, Surabaya.

NAVAL AIR: 1,000; 12 combat aircraft.
2 MR sqns with 12 *Nomad*.
5 HU-16, 6 C-47, 3 Aero *Commander* ac; 4 Bell 47G, 6 *Alouette* II/III, 4 BO-105 hel.
(On order: 1 trg frigate, 6 *Nomad* MR ac.)

Air Force: 25,000; 48 combat aircraft.
3 FGA sqns with 12 F-5E, 4 F-5F, 16 CA-27 *Avon-Sabre*.
1 COIN sqn with 16 OV-10F.
Tpts incl 10 C-130B, 1 L-100-30, 1 C-140 *Jetstar*, 21 C-47, 1 *Skyvan*, 8 F-27, 7 DHC-3, 6 CASA C-212, 2 Aero *Commander*, 12 Cessna 207/401/402, 18 *Gelatik*.
2 hel sqns with 4 UH-34D, 2 Bell 204B, 17 *Puma*, 28 Bell 47.
Trainers incl 4 T-6, 10 T-33A, 16 T-34C1, *Airtourer*, 30 LT-200.
(On order: 14 A-4, 2 TA-4 FGA; 25 CASA C-212, 3 Transall C-160 tpts; 8 *Hawk* T-53, 20 AS-202 *Bravo* trg ac; 21 *Musketeer*, 2 *King Air* lt ac; 16 BO-105, 6 *Puma* hel.)
(In storage: 22 Tu-16, 10 Il-28, 40 MiG-15/-17, 35 MiG-19, 15 MiG-21 ac, 20 Mi-4, 9 Mi-6 hel.)

Para-Military Forces: 12,000 Police Mobile bde; about 100,000 Militia.

JAPAN

Population: 116,500,000.
Military service: voluntary.
Total armed forces: 241,000.
Estimated GNP 1979: \$1,091 bn.
Defence budget 1980: 2,230 bn yen. (\$8.96 bn).
\$1 = 248.85 yen (1980), 207.7 yen (1979).

Army: 155,000.
1 mech div.
12 inf divs (7-9,000 men each).
1 tk bde.
1 AB bde.
1 composite bde.
1 arty bde. 2 AD arty bdes.
1 sigs bde.
5 engr bdes.
8 SAM gps (each of 4 btys) with *HAWK*.

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1 hel wing and 34 aviation sqns.
540 Type 61, 200 Type 74 med, 70 M-41 lt tks; 600 Type 60 and Type 73 APC; 900 75mm, 105mm, 155mm, and 203mm guns/how; 500 Type 74 105mm and Type 75 155mm SP RL; Type 30 SSM; 1,800 81mm and 107mm mor (some SV and SX-60 sp); 10 Type 75 130mm SP RL; 1,000 57mm, 75mm, *Carl Gustav* 84mm, 105mm, and 106mm RCL; Type 64, KAM-9 ATGW; 200 35mm twin, 37mm, 40mm, 75mm, 90mm AA guns; *HAWK* SAM; 30 L-19, 20 LM-1/-2, 7 LR-1 ac; 2 AH-1S, 58 KV-107, 55 UH-1H, 80 UH-1B, 22 OH-6D, 13 H-13 hel.
(On order: 26 Type 75 155mm SP how; *HAWK* SAM; 5 LR-1 ac; 2 KV-107, 10 OH-6D, 8 UH-1H.)

RESERVES: 39,000.

Navy: 42,000 (including Naval Air).
14 submarines (1 *Yushio*, 7 *Uzushio*, 5 *Oshio* (one trg), 1 *Fuyushio*).
33 destroyers: 1 *Shirane* with *Sea Sparrow* SAM, *ASROC*, 3 S-61B ASW hel; 2 *Haruna* with *ASROC*, 3 ASW hel; 2 *Tachikaze* with *Tartar*, *Standard* SAM, *ASROC*; 4 *Takatsuki* with *ASROC*, 2 hel; 1 *Amatsukaze* with *Standard* SAM, *ASROC*; 6 *Yamagumo* with *ASROC*; 3 *Minegumo* (2 with 2 hel; 1 with *ASROC*, no hel); 2 *Akizuki*; 3 *Murasame*; 7 *Ayanami* (2 trg); 2 *Harukaze*.
15 frigates: 11 *Chikugo* with *ASROC*, 4 *Isuzu*.
12 large patrol craft: 8 *Mizutori*, 4 *Umitaka*.
5 FAC(T).
~~9 coastal patrol craft.~~
3 MCM spt ships, 33 coastal minesweepers (3 *Hatsushima*, 19 *Takami*, 11 *Kasado*), 6 *Nana-go* MCM boats.
2 trg ships (1 *Azuma*, 1 *Katori*).
6 LST (3 *Miura*, 3 *Atsumi*).

Bases: Yokosuka, Kure, Sasebo, Maizuru, Ominato.

NAVAL AIR: 12,000; 148 combat aircraft.
11 MR sqns with 130 P-2J, P2V-7, S2F-1, 18 PS-1.
7 hel sqns with 7 KV-107 MCM, 63 HSS-2 ASW.
1 tpt sqn with 4 YS-11M, 1 S2F-C, 1 S2F-U.
5 SAR flts with 4 US-1 ac, 2 S-62A hel.
Trainers incl 6 YS-11T, 5 TC-90, 30 B-65, 8 T-34, 40 KM-2 ac; S-61A, 7 Bell 47G, 4 OH-6J hel.
(On order: 3 submarines, 6 destroyers, 2 frigates, 8 coastal minesweepers, *Harpoon* SSM; 45 P-3J, 13 *Sierra* 200 MR, 8 KM-2, 3 US-1, 3 TC-90 ac; 12 HSS-2, 3 S-61A hel.)

RESERVES: 600.

Air Force: 44,000; 356 combat aircraft.
3 FGA sqns with 44 F-1, 18 F-86F.
10 interceptor sqns: 5 with 150 F-104DJ, 5 with 130 F-4EJ.
1 recce sqn with 14 RF-4E.
3 tpt sqns with 10 YS-11, 30 C-1A.
1 SAR wing with 23 MU-2, 8 T-34A ac, 26 KV-107, 7 S-62 hel.
11 trg sqns with 57 T-1A/B, 54 T-2A, 30 T-3, 168 T-33A, 46 T-34A, 17 F-104DJ, 12 F-86, 4 C-46, 3 YS-11E, 4 MU-2J.
AAM: AAM-1, *Sparrow*, *Falcon*, *Sidewinder*.
6 SAM gps with *Nike-J*.
A Base Defence Ground Environment with 28 control and warning units.
(On order: 92 F-15J/DJ, 10 F-4EJ, 20 F-1 fighters, 18 T-2, 24 T-3 trainers, 1 C-1A, 2 MU-2 tpts, 4 E-2C AEW ac; 4 KV-107 hel.)

KAMPUCHEA (CAMBODIA)

Population: 4,000,000 (estimated).

Armed Forces: The former Khmer Liberation Army had about 12 divs before the invasion by Vietnam in December 1978. The country is now occupied by some 21 Vietnamese divs

(180-200,000 men). Resistance Groups: Democratic Kampuchea, 20,000-30,000; small arms, incl mor. Right-wing, *Khmer Serai*, 10,000.

KOREA: DEMOCRATIC PEOPLES'S REPUBLIC (NORTH)

Population: 17,580,000.
Military service: Army, Navy 5 years; Air Force 3-4 years.
Total armed forces: 678,000.
Estimated GNP 1980: \$10.5 bn.
Defence expenditure 1980: 2.74 bn won (\$1.3 bn). (It is uncertain whether this covers all defence expenditure, and there is no consensus on a suitable exchange rate for the dollar conversion.)
\$1 = 2.05 won.

Army: 600,000.
8 corps HQ.
2 tk divs.
3 mot inf divs.
35 inf divs.
3 AA arty divs.
4 armd bdes.
4 recce bdes.
4 inf bdes.
8 lt inf bdes.
22 special forces (cdo) bdes.
2 indep tk regts.
5 indep inf regts.
100 arty bns.
82 rocket bns.
4 SSM bns with *FROG*.
1 river crossing regt (3 bns).
3 amphib bns (engrs).
5 AB bns.
300 T-34, 2,200 T-54/-55/-62 and Type 59 med, 100 PT-76, 50 Type 62 lt tks; 1,000 BTR-40/-50/-60/-152, K-63 APC; 4,000 guns/how up to 152mm; 9,000 82mm, 120mm, and 160mm mor; 1,900 RL incl BM-21 122mm MRL; 1,500 82mm RCL; 45mm, 57mm, 76mm, 85mm, 100mm ATK guns; 9 *FROG*-5, 30 *FROG*-7 SSM; 5,000 AA guns, incl 37mm, 57mm, 85mm, 100mm towed, ZSU-23-4, ZSU-57-2 sp; SA-7 SAM.

RESERVES: 260,000, 23 divs.

Navy: 31,000.
16 submarines (4 ex-Sov W-, 12 ex-Ch R-class).
4 *Najin* frigates.
18 ex-Sov FAC(M): 8 *Osa*-I, 10 *Komar* with *Stryx* SSM.
25 large patrol craft: 3 ex-Sov (2 *Tral*, 1 *Artilerist*), 15 SO-1, 3 *Sariwan*, 4 ex-Ch *Hai Nan*.
134 FAC(G): 20 ex-Sov MO-IV<; 16 ex-Ch (8 *Shanghai*, 8 *Swatow*<), 4 *Chodo*, 4 K-48, 60 *Chaho*<, 30 *Chong-Jin*.
165 FAC(T): 78 ex-Sov (4 *Shershen*, 62 P-6<, 12 P-4<); 87<(6 *Sinpo*, 15 *Iwon*, 6 *An Ju*, 60 *Ku Song*).
70 coastal patrol craft< (10 ex-Sov KM-4, 60 *Sin Hung*).
80 *Nampo* landing craft<, 7 LCU, 15 LCM.
Samlet coast defence msls; 2 sites.

RESERVES: 40,000.

Bases: Wonsan, Nampo.

Air Force: 47,000; 615 combat aircraft.
3 lt bbr sqns with 85 Il-28.
13 FGA sqns with 20 Su-7, 340 MiG-15/-17/-19.
12 interceptor sqns with 120 MiG-21, 50 MiG-19.
Tpts incl 200 An-2, 40 An-24, 10 Il-14/18, 1 Tu-154.
Hel incl 20 Mi-4, 20 Mi-8.
Trainers incl 70 Yak-18, 100 MiG-15UTI-21U, Il-28, 30 BT-6.
AAM: AA-2 *Atoll*.

4 SAM bdes (40 bns) with 250 SA-2 in 45 sites.

Para-Military Forces: 38,000 security forces and border guards; civilian militia with small arms, some AA arty.

KOREA: REPUBLIC OF (SOUTH)

Population: 38,200,000.

Military service: Army and Marines 2½ years, Navy and Air Force 3 years.

Total armed forces: 600,600.

Estimated GNP 1978: \$46.0 bn.

Defence expenditure 1980: 2,010 bn won (\$3.46 bn).

\$1 = 580.5 won (1980), 484 won (1978).

Army: 520,000.

5 corps HQ.

1 mech inf div.

20 inf divs.

2 armd bdes.

2 indep inf bdes.

7 special forces bdes.

2 AA arty bdes.

7 tk bns.

36 arty bns.

2 SSM bns with *Honest John*.

2 SAM bdes (3 *HAWK*, 2 *Nike Hercules* bns).

1 Army Aviation bde.

60 M-60, 800 M-47/-48 med tks; 500 M-113/-577, 70 Fiat 6614 APC; 2,000 105mm, 155mm, and 203mm towed, 76 M-109 155mm, 12 M-107 175mm, 16 M-110 203mm SP guns/how; 5,300 81mm and 107mm mor; *Honest John* SSM; 80 M-18 76mm, 100 M-36 90mm SP ATK guns; *LAW* RL; 57mm, 75mm, 106mm RCL; *TOW* ATGW; 66 *Vulcan* 20mm, 40 40mm AA guns; 80 *HAWK*, 45 *Nike Hercules* SAM; 14 O-2A ac; 20 UH-1B, 44 OH-6A, 5 KH-4, 25 Hughes *Defender* hel with *TOW*.

(On order: 100 Fiat 6614 APC; 37 M-109 155mm SP how; *TOW* ATGW; 48 Hughes 500D, 56 OH-6A hel.)

RESERVES: 1,100,000; 8 inf divs (cadre).

Navy: 48,000 (incl 23,000 Marines).

10 ex-US destroyers: 5 *Gearing* with 1 hel, 2 *Sumner*, 3 *Fletcher*.

7 ex-US frigates: 1 *Rudderow*, 6 *Lawrence* *Crossley*.

6 ex-US corvettes: 3 *Auk*, 3 *PCE-827*.

8 FAC(M) with *Standard* SSM: 7 PSMM Mk 5, 1 ex-US *Asheville*.

5 CPIC FAC(P) <.

10 large patrol craft: 2 100-ft, 8 ex-US *Cape* <.

28 coastal patrol craft <: 13 *Sewart* (9 65-ft, 4 40-ft), 15 *Schoolboy*.

8 MSC-268/-294 coastal minesweepers, 1 minesweeping boat <.

21 ex-US landing ships (8 LST, 12 LSM, 1 LCU).

8 *Alouette* III hel.

(On order: 4 frigates, 120 *Harpoon* SSM.)

Bases: Chinhae, Incheon, Pusan, Cheju, Mokpo, Mukho, Pohang.

Coastguard: 25 small craft, 9 Hughes 500D hel.

RESERVES: 25,000.

MARINES: 23,000.

1 div.

2 bdes.

LVTP-7 APC.

RESERVES: 60,000.

Air Force: 32,600; 362 combat aircraft.

16 FB sqns: 4 with 60 F-4D/E, 10 with 220 F-5A/B/E/F, 2 with 50 F-86F.

1 recce sqn with 12 RF-5A.

1 ASW sqn with 20 S-2F.

1 SAR hel sqn with 6 UH-19, 5 UH-1D, 2 Bell 212.

Tpts incl 12 C-46, 10 C-54, 10 C-123, 2 HS-748, *Aero Commander*.

Trainers incl 20 T-28D, 30 T-33A, 20 T-41D, 30 F-5B, 3 F-5F.

Hel incl 5 UH-1D, 6 UH-1N, 50 Hughes 500MD.

AAM: *Sidewinder*, *Sparrow*.

(On order: 36 F-16, 36 F-5E, 32 F-5F fighters; 24 OV-10G COIN; 6 C-130H tpts; 6 CH-47C, 27 UH-1H hel; AIM-9L *Super Sidewinder* AAM; *Maverick* ASM.)

RESERVES: 55,000.

Para-Military Forces: A local defence militia, 2,800,000 Homeland Defence Reserve Force.

LAOS

Population: 3,400,000.

Military service: conscription.

Total armed forces: 55,700.

Estimated GNP 1978: \$260 m.

Defence expenditure 1979: 15.15 bn kip (\$37.9 m).

\$1 = 400 kip Pot Poi (1979).

Army (Lao People's Liberation Army): 46,000.

(The Royal Lao Army has been disbanded; some men may have been absorbed into the Liberation Army.)

1 armd bn.

64 inf bns.

4 arty, 4 AA arty bns.

11 inf coys (provincial).

M-24, PT-76 lt tks; BTR-40, M-113 APC; 75mm, 105mm, 155mm how; 81mm, 82mm, 4.2-in. mor; 107mm RCL; 37mm AA guns; 4 U-17A lt ac.

Navy: 1,700.

32 river patrol craft } many in reserve.

16 landing craft/tpts < }

Air Force: 8,000; 34 combat aircraft. (Most aircraft inherited from the Royal Lao Air Force; degree of serviceability unknown.)

1 sqn with 10 MiG-21.

20 T-28A/D COIN ac.

4 AC-47 gunships.

Tpts incl 1 Yak-40, 10 C-47, 9 C-123, 6 An-24, 3 An-26, 1 *Aero Commander*, 1 DHC-2.

Trainers: 6 T-41D.

Hel: 10 UH-34, 10 Mi-8.

AAM: AA-2 *Atoll*.

MALAYSIA

Population: 13,600,000.

Military service: voluntary.

Total armed forces: 66,000.

Estimated GNP 1978: \$US 14.9 bn.

Defence expenditure 1980: \$M 2.96 bn (\$US 1.47 bn.)

\$1 = \$M 2.02 (1980), \$M 2.36 (1978).

Army: 54,000.

3 div HQ.

12 inf bdes, consisting of 34 inf bns, 3 recce, 4 arty, 1 APC regts, 2 AA arty btys, 1 special service unit, 5 engr, 5 sigs regts and administrative units.

140 Panhard M-3 armd, 60 *Ferret* scout cars; AT-105, V-100, 200 V-150 *Commando*, *Shorland*, M-3 APC; 12 5.5-in guns, 92 105mm how; 81mm mor; 120mm RCL; SS-11 ATGW; 35 40mm AA guns.

RESERVES: About 26,000.

Navy: 6,000.

2 frigates (1 ASW with *Seacat*).

8 FAC(M): 4 *Spica* with *Exocet* SSM, *Blowpipe* SAM; 4 *Perdana* with *Exocet*.

6 *Jerong* FAC(G).

22 large patrol craft: 4 *Kedah*, 4 *Sabah*, 14 *Kris*.

5 ex-Br *Ton* coastal minesweepers.

3 ex-US 511-1152 LST.

Bases: Johore Straits, Labuan, Lumut Perak.

RESERVES: 1,000.

Air Force: 6,000; 31 combat aircraft.

2 FGA sqns with 12 F-5E, 2 F-5B.

2 COIN/trg sqns with 15 CL-41G *Tebuan*.

1 MR sqn with 2 C-130H.

3 tpt, 1 liaison sqns with 6 C-130H, 3 *Heron*, 2

HS-125, 2 F-28, 15 DHC-4A, 12 Cessna 402B, 2 *Dove*.

5 hel sqns with 37 S-61A4, 22 *Alouette* III, 9 Bell 47G, 4 UH-1H.

1 trg sqn with 15 *Bulldog* 102.

AAM: *Sidewinder*.

(On order: 88 A-4, 4 F-5F fighters, 1 C-130H tpt, 1 C-130H MR ac, 100 BO-105 hel, *Super Sidewinder* AAM.)

Para-Military Forces: 14,800 Police Field Force;

21 bns (incl 2 Aboriginal), 200 V-150 *Commando* APC, 40 patrol boats. People's Volunteer Corps, over 200,000.

MONGOLIA

Population: 1,700,000.

Military service: 2 years.

Total armed forces: 28,100.

Estimated GNP 1974: \$2.8 bn.

Defence expenditure 1980: 426.1 m tugrik (\$127 m).

\$1 = 3.37 tugrik (1980), 4.00 tugrik (1974).

Army: 25,000.

2 inf bdes.

1 construction bde.

30 T-34, 100 T-54/-55 med tks; 40 BTR-60, 50 BTR-152 APC; 76mm, 100mm, 130mm, 152mm guns/how; 10 SU-100 SP guns; *Snapper* ATGW; 37mm, 57mm AA guns.

RESERVES: 30,000.

Air Force: 3,100 (1,000 conscripts), excluding expatriate personnel; 12 combat aircraft.

1 fighter sqn with 12 MiG-21.

Tpts: 20 An-2, 6 Il-14, 4 An-24.

Hel: 10 Mi-4.

Trainers: Yak-11/-18.

1 SAM bn with SA-2.

Para-Military Forces: Some 10,000 frontier guards and security police.

NEPAL

Population: 14,000,000.

Military service: voluntary.

Total armed forces: 22,000.

Estimated GNP 1979: \$1.76 bn.

Defence expenditure 1980: 228 m rupees (\$19 m).

\$1 = 12.00 rupees (1980).

Army: 22,000.

5 inf bdes (1 Palace Guard).

1 arty regt.

1 engr regt.

1 sigs regt.

1 para bn.

1 air sqn (1 comms flt, 1 Army flt).

AMX-13 lt tks; 4 3.7-in pack how; 4 4.2-in, 18.120mm mor; 2 40mm AA guns; 2 *Skyvan*, 1

HS-748, 1 *Turbo-Porter* tpts; 5 *Alouette* III, 1 *Puma* hel.

DEPLOYMENT: *Lebanon* (UNIFIL): 1 bn (599).

Para-Military Forces: 12,000 Police Force.



New Zealand's Air Force flies the US-built A-4 in fighter-bomber and trainer roles.

NEW ZEALAND

Population: 3,151,000.
 Military service: voluntary, supplemented by Territorial service of 12 weeks for the Army.
 Total armed forces: 12,640.
 Estimated GNP 1979: \$US 17.14 bn.
 Defence expenditure 1979: \$NZ 344.1 m (\$US 358.4 m).
 \$1 = \$NZ 0.95 (1979).

Army: 5,666.
 2 inf bns.
 1 arty bty.
 5 M-41 lt tks; 9 *Ferret* scout cars; 66 M-113 APC; 17 5.5-in. guns; 41 105mm how; 23 106mm RCL.

DEPLOYMENT: *Singapore:* 1 inf bn with log support.

RESERVES: 1,854 Regular, 5,903 Territorial. 2 bde gps: 1 Regular, 6 Territorial inf bns, 1 fd arty regt (3 btys), 1 armd sqn, 1 sas, 2 fd engr, 2 sigs sqns on mobilization.

Navy: 2,755.
 4 frigates: 2 *Leander* (with *Wasp* hel, *Seacat* SAM), 2 Type 12 (1 with *Seacat*).
 4 *Lake*-class large patrol craft.

Base: Auckland.

RESERVES: 1,607 Regular, 431 Territorial.

Air Force: 4,219; 34 combat aircraft.
 1 FB sqn with 10 A-4K, 3 TA-4K *Skyhawk*.
 1 FB/trg sqn with 16 BAC-167.
 1 MR sqn with 5 P-3B *Orion*.
 2 med tpt sqns with 5 C-130H, 6 *Andover*.
 1 tpt hel sqn with 6 *Sioux*, 3 *Wasp*, 11 UH-1D/H.
 1 comms sqn with 4 *Andover*, 3 *Devon*.
 Trainers: 3 F-27, 14 *Airtrainer*, 4 *Airtourer* ac, 3 *Sioux* hel.

DEPLOYMENT: *Singapore:* 1 spt unit (3 UH-1 hel).

RESERVES: 916 Regular, 164 Territorial.

PAKISTAN

Population: 82,700,000.
 Military service: voluntary.
 Total armed forces: 438,600.
 Estimated GNP 1978: \$18.5 bn.
 Defence expenditure 1979: 11.68 bn rupees (\$1.18 bn).

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\$1 = 9.9 rupees (1978, 1979).

Army: 408,000 (incl 29,000 *Azad Kashmir* troops).
 6 Corps HQ.
 2 armd divs.
 16 inf divs.
 4 indep armd bdes.
 4 indep inf bdes.
 6 arty bdes.
 2 AA arty bdes.
 6 armd recce regts.
 6 SAM sqns with *Crotale*.
 1 Special Services Group.
 5 army aviation sqns.
 M-4, 250 M-47/-48, 50 T-54/-55, 700 T-59 med, 15 PT-76, Type 60, 50 M-24 lt tks; 550 M-113, K-63 APC; about 1,000 75mm pack, 25-pdr, 100mm, 105mm, 130mm, and 155mm towed, 12 M-7 105mm sp guns/how; 270 107mm, 120mm mor; 57mm, 100mm towed, 8 M-36 90mm SP ATK guns; 75mm, 106mm RCL; *Cobra* ATGW; ZU-2-14 23mm, 30mm, 37mm, 60 40mm, 57mm, 15 90mm, 3.7-in AA guns; 6 *Crotale* SAM; 40 O-1E, 30 *Saab Supporter* 11 ac; 12 Mi-8, 35 *Puma*, 30 *Alouette* III, 12 UH-1, 15 Bell 47G hel.
 (On order: TAM med tks; M-113 APC; TOW ATGW.)

RESERVES: 500,000.

Navy: 13,000.
 6 submarines: 2 *Agosta*, 4 *Daphne*.
 5 SX-404 midget submarines.
 1 ex-Br *Dido* cruiser (cadet trg ship).
 6 destroyers: 2 ex-US *Gearing*, 4 ex-Br (1 *Battle*, 1 CH, 2 CR).
 1 ex-Br Type 16 frigate.
 3 large patrol craft: 1 *Town*, 2 ex-Ch *Hai Nan*.
 12 ex-Ch *Shanghai-II* FAC(G).
 4 ex-Ch *Hu Chwan* hydrofoil FAC(T)<.
 7 ex-US *Adjuvant* and 268-class coastal mine-sweepers.
 1 ASW/MR sqn with 3 *Atlantic*, 2 HU-16B.
 3 *Alouette* III, 6 *Sea King* ASW/SAR hel.
 ASM: AM-39.
 (On order: 40 ASROC ASW msls.)

Base: Karachi.

RESERVES: 5,000.

Air Force: 17,600; 256 combat aircraft.
 1 lt bbr sqn with 11 B-57B (*Canberra*).
 12 FGA sqns: 4 with 17 *Mirage* IIIEP, 38 *Mirage* SPA/DP; 5 with 140 MiG-19/F-6; 3 with 40 F-86F/*Sabre* 6.
 1 recce sqn with 10 *Mirage* IIIIRP.
 2 tpt sqns with 14 C-130B/E, 1 L-100, 1 *Falcon* 20, 1 F-27, 1 *Super King Air*, 1 *Banzan*.
 Hel: 10 HH-34B, 4 *Super Frelon*, 14 *Alouette* III, 1 *Puma*, 12 Bell 47G.
 Trainers incl 5 MiG-15UTI, 24 MiG-17/F-4, 5 *Mirage* IIIIDP, 23 *Saab Supporter*, 20 T-33A, 50 T-37C.
 AAM: *Sidewinder*, R-530, R-550 *Magic*.
 (On order: 32 *Mirage* 5, 18 *Mirage* III FGA; 25 *Supporter* trg ac.)

RESERVES: 8,000.

Para-Military Forces: 109,000: 22,000 National Guard, 65,000 Frontier Corps, 15,000 Pakistan Rangers, 2,000 Coastguard, 5,100 Frontier Constabulary.

PAPUA NEW GUINEA

Population: 3,200,000.
 Military service: voluntary.
 Total armed forces: 3,692. (All services form part of the Army.)
 Estimated GNP 1979: \$1.9 bn kina.
 Defence expenditure 1979: 19.8 n kina (\$28.2 m).

\$1 = 0.702 kina (1979, 1980).

Army: 3,200.
 2 inf bns.
 1 engr bn.
 Log units.

Navy: 410.
 5 *Attack*-class large patrol craft.
 2 310-ton landing craft.

Bases: Port Moresby, Manus Island.

Air Force: 82.
 3 C-47, 3 *Nomad* tpts.

PHILIPPINES

Population: 49,000,000.
 Military service: selective.
 Total armed forces: 112,800.
 Estimated GNP 1979: \$29.06 bn.
 Defence expenditure 1979: 5.65 bn pesos (\$764.3 m).
 \$1 = 7.39 pesos (1979).

Army: 70,000.
 4 lt inf divs.
 1 indep inf bde (being mechanized).
 1 Special Services bde.
 2 engr bdes.
 1 lt armd regt.
 4 arty regts.
 28 *Scorpion*, 7 M-41 lt tks; 60 M-113, 20 V-150 *Commando* APC; 120 105mm, 6 155mm how; 81mm, 40 107mm mor; 75mm, 106mm RCL; *HAWK* SAM.
 (On order: 95 105mm how.)

RESERVES: 96,000, 6 divs.

Navy: 26,000 (7,000 Marines and naval engrs).
 2 ex-US frigates.
 10 ex-US corvettes: 2 *Auk*, 8 PCE-827.
 11 large patrol craft: 6 135-ton, 5 PGM-39/-71.
 44 coastal patrol craft<.
 2 ex-US 218-class coastal minesweepers.
 35 ex-US landing ships (23 LST, 4 LSM, 8 spt), 61 LCM, 3 LCU.
 1 SAR sqn with 9 *Islander* ac, 3 BO-105 hel.
 2 marine bdes (each 3 bns) with LVTP-5/-7 APC, 105mm how.
 (On order: 6 PSMM FAC(M), 12 LST.)

Base: Sangley Point.

RESERVES: 12,000.

Air Force: 16,800; 89 combat aircraft.
 3 FB sqns with 16 F-5A, 24 F-8H (+ 10 F-8H in reserve).
 1 fighter/trg sqn with 17 T-34A.
 3 COIN sqns with 16 SF-260WP, 16 T-28D.
 1 SAR sqn with 8 HU-16 ac; 5 UH-19, 3 SH-34G, 12 UH-1H, H-13, Hughes 300 hel.
 1 hel sqn with 35 UH-1H.
 6 tpt sqns with 4 C-130H, 4 L-100-20, 1 Boeing 707, 1 BAC-111, 18 C-47, 9 F-27, 4 YS-11, 15 C-123K, 12 *Nomad*.
 1 liaison sqn with O-1E, Cessna 180, 6 U-17A/B, Cessna 310K, 18 DHC-2.
 3 trg sqns with 10 T/RT-33A, 12 T-41D, 30 SF-260MP, 3 F-5B.
 Other hel incl 12 UH-1D, 8 FH-1100, 2 H-34, 2 S-62A.
 AAM: *Sidewinder*.
 On order: 11 F-5E fighters, 3 F-27 MR, *Super Pinto* trg ac, 9 BO-105, 18 Hughes 500D hel.)

RESERVES: 16,000.

Para-Military Forces: 78,500: 43,500 Philippine Constabulary (1 bde, 12 bns), 35,000 Local Self-Defence Force.

SINGAPORE

Population: 2,400,000.
Military service: 24-36 months.
Total armed forces: 42,000.
Estimated GNP 1978: \$US 8.1 bn.
Defence expenditure 1980: \$S 126 bn (\$US 574 m).
\$US 1 = \$S 2.196 (198), \$S 2.31 (1978).

Army: 35,000.
1 div HQ.
1 armd bde (1 recce, 1 tk, 2 APC bns).
3 inf bdes (each 3 inf bns).
1 arty bde.
6 arty bns.
1 cdo bn.
6 engr bns.
3 sigs bns.
350 AMX-13 lt tks; 500 M-113, 250 V-200 *Commando* APC; 60 155mm how; 50 120mm mor; 90 106mm RCL.
(On order: 120 AMX-13 lt tks.)

RESERVES: 50,000; 16 inf, 4 arty, 1 engr, 1 sigs bns.

Navy: 3,000.
6 TNC-45 FAC(M) with *Gabriel* SSM.
6 Vosper FAC(G); 3 Type A, 3 Type B.
2 large patrol craft (trg ships).
2 ex-US *Redwing* coastal minesweepers.
5 ex-US 511-1152 LST (3 in reserve), 6 landing craft.
(On order: 2 TNC-45 FAC(M).)

Base: Singapore.

Air Force: 4,000; 125 combat aircraft.
2 FGA/recce sqns with 35 *Hunter* (16 FGA-74, 8 FR-74, 11 T-75).
2 FGA sqns with 32 A-4S, 5 TA-4S.
1 AD sqn with 18 F-5E, 3 F-5F.
1 COIN/trg sqn with 20 BAC-167, 5 *Jet Provost*, 7 SF-260W.
1 tpt/SAR sqn with 6 C-130B/H, 6 *Skyvan*.
1 hel sqn with 25 UH-1B/H, 3 AB-212.
2 trg sqns with 8 SF-260MS, 12 T-33A.
2 SAM sqns: 1 with 28 *Bloodhound* 2, 1 with 10 *Rapier*.
(On order: 6 F-5E fighters, 5 SF-260W COIN/trg.)

Para-Military Forces: 7,500 police/marine police; Gurkha guard units; some 30,000 Home Guard.

SRI LANKA (CEYLON)

Population: 14,471,000.
Military service: voluntary.
Total armed forces: 14,940.
Estimated GNP 1978: \$2.8 bn.
Defence expenditure 1979: 411 m rupees (\$26.5 m).
\$1 = 15.5 rupees (1979), 14.7 rupees (1978).

Army: 10,000.
1 inf bde (4 bns).
1 recce regt.
1 arty regt.
1 engr regt.
1 sigs bn.
18 *Saladin* armd, 35 *Ferret* scout cars; 10 BTR-152 APC; 76mm, 85mm guns.

RESERVES: 10,000; 11 bns, incl supporting services and a Pioneer Corps.

Navy: 2,740.
6 FAC(G): 5 ex-Ch *Shanghai*-II, 1 ex-Sov *Mol*.
17 coastal patrol craft (4 on order).

Bases: Trincomalee, Karainager, Colombo, Tangale, Kalpitiya.

RESERVES: 1,100 Naval Volunteer Force.

Air Force: 2,200; 6 combat aircraft.
1 FGA sqn with 3 MiG-17F, 1 MiG-15UTI, 2 *Jet Provost* Mk 51.
1 tpt sqn with 1 CV-440, 2 DC-3, 2 *Riley*, 1 *Heron*, 3 *Cessna* 337.
1 hel sqn with 6 AB-206, 2 Bell 47G, 2 SA-365.
Trainers incl 4 *Cessna* 150, 6 *Chipmunk*, 3 *Dove*.

RESERVES: 900; 3 sqns Air Force Regt, 1 sqn Airfield Construction Regt.

Para-Military Forces: 14,500 Police Force, 4,500 Volunteer Force.

THAILAND

Population: 47,800,000.
Military service: 2 years.
Total armed forces: 230,800.
Estimated GNP 1978: \$21.9 bn.
Defence expenditure 1980: 22.4 bn baht (\$1.09 m).
\$1 = 20.5 baht (1980), 20.35 baht (1978).

Army: 155,500.
1 cav div.
7 inf divs (4 with 1 tk bn).
1 indep regimental combat team.
1 AB, 3 special forces bns.
1 SAM bn with 40 *HAWK*.
4 recce coys.
5 aviation coys and some flts.
34 M-48A5 med, 170 M-41, 74 *Scorpion* lt tks; 32 *Shorland* Mk 3 recce; 250 M-113, 40 LVTP-7, 20 V-150 *Commando*, 20 *Saracen* APC; 371 105mm, 80 155mm how; 81mm mor; *LAW* RL; 57mm, 177 106mm RCL; *TOW*, *Dragon* ATGW; 80 40mm AA guns, incl M-42 SP; 89 O-1 lt ac; 90 UH-1B/D, 4 CH-47, 24 OH-13, 16 FH-1100, 3 Bell 206, 2 Bell 212, 2 Bell 214B, 6 OH-23F, 28 KH-4 hel.
(On order: 116 M-48A5, 16 M-60A3 med, 70 *Scorpion* lt tks; 40 M-113, 164 V-150 APC; 34 M-114 155mm how; *TOW* ATGW; 24 M-163A1 20mm *Vulcan* SP AA.)

RESERVES: 500,000.

Navy: 32,200, incl 14,000 Marines.
4 frigates: 1 with *Seacat* SAM, 2 PF-103, 1 ex-US *Cannon*.
6 FAC(M): 3 50-metre with *Exocet* SSM, 3 45-metre with *Gabriel* SSM.
26 large patrol craft: 14 ex-US (10 PGM-71, 4 *Cape*), 7 *Liulom*, 1 *Klongyai*, 4 T-91.
24 coastal patrol craft.
2 *Bangrachan* coastal minelayers.
1 MCM spt ship, 4 ex-US *Bluebird* coastal minesweepers, 10 minesweeping boats.
5 511-1152 LST, 3 LSM, 1 *LSIL*-351, 10 LCU, 26 LCM (all ex-US), *LCA*.
3 trg ships: 2 ex-Br (1 *Algerine*, 1 *Flower*), 1 *Maeklong*.
1 MR sqn with 10 S-2F MR, 2 HU-16B, 2 CL-215 SAR ac.
8 Bell 212 ASW, 4 UH-1H hel.
1 Marine div: 2 inf, 1 special force, 1 arty regts.
(On order: 3 450-ton FAC(G).)

Bases: Bangkok, Sattahip, Songkla, Paknam, Phangnga.

Air Force: 43,100; 164 combat aircraft.
3 FGA sqns with 14 F-5A/B, 12 F-5E, 4 F-5F.
7 COIN sqns with 45 T-28D, 31 OV-10C, 16 A-37B, 31 AU-23A *Peacemaker*.
1 recce sqn with 4 T-33, 3 RT-33A, 4 RF-5A.
1 utility sqn with 35 O-1 lt ac.
3 tpt sqns: 1 with 15 C-47; 2 with 30 C-123B, 2 HS-748, 1 *Merlin* IVA VIP, 1 *Islander*, 3 *Skyvan*, 10 *Turbo-Porter*.
2 hel sqns with 40 CH-34C, 18 S-58T, 49 UH-1H, 13 UH-19.
Trainers incl 10 *Chipmunk*, 16 T-33, 20 T-37B, 4 T-41D, 12 SF-260MT, 15 CT-4.

AAM: *Sidewinder*.
4 bns of airfield defence troops.
(On order: 6 OV-10C COIN, 3 C-130H, 4 CASA C-212, 3 *Merlin* IVA tpts, 18 S-58T, 4 CH-47A, 14 UH-1H hel.)

Para-Military Forces: 37,000 Volunteer Defence Corps, 1,700 Marine Police, 500 Police Aviation, 1,500 Border Police, 3,800 Special Action force; 20 V-150 *Commando* APC, 16 lt ac, 27 hel.

VIETNAM

Population: 60,000,000.
Military service: 2 years minimum.
Total armed forces: 1,029,000.
Estimated GNP 1979: \$8.5 bn.

Army: 1,000,000.
1 armd div.
38 inf divs. (Inf divs, normally totalling 8-10,000 men, include 1 tk bn, 3 inf, 1 arty regts and spt elements.)
2 fd, 1 AA arty divs.
5 engr, 3 construction divs.
1 transport div.
5 indep fd, 4 indep AA arty bdes.
4 indep engr bdes.
5 indep armd regts.
25 SAM regts (10 with 180 SA-2, 10 with 180 SA-3, 5 with 45 SA-6).
1,500 T-34/85, T-54, T-55, T-62 and Type 59, 400 M-47 and M-48 med, 450 PT-76 and Type 60, Types 62/63, 150 M-41 lt tks; BRDM, M-8, M-20 armd cars; 1,500 BTR-40/50/60/152, Type 56, K-63, 800 M-113, V-100 *Commando* APC; 300 76mm, 85mm, 100mm, and 105mm, 800 122mm, 200 130mm, 100 152mm (all ex-Sov), 800 ex-US M-101/102 105mm and M-114 155mm guns/how; 90 SU-76, SU-100, ISU-122, 200 M-108 105mm, M-109 155mm, M-107 175mm and M-110 203mm SP guns/how; 82mm, 100mm, 107mm, 120mm, 160mm mor; 107mm, 122mm, 140mm RL; *Sagger* ATGW; 4,000 23mm, 37mm, 57mm, 85mm, 100mm, and 130mm towed, ZSU-23-4, ZSU-57-2 SP AA guns; SA-2/3/6/7/9 SAM.

DEPLOYMENT: 40,000 (3 inf divs and spt tps) in Laos (numbers fluctuate), 180-200,000 in Kampuchea.

Navy: 4,000.
3 frigates: 2 ex-Sov *Petya*, 1 ex-US *Barneget*.
2 ex-US *Admirable* corvettes.
10 FAC(M) with *Styx* SSM: 8 ex-Sov *Osa*, 2 *Komar*.
21 large patrol craft: 3 ex-Sov SO-1, 18 ex-US PGM-59/71.
12 FAC(T): 6 ex-Sov P-4, 6 ex-Ch P-6.
22 ex-Ch FAC(G): 8 *Shanghai*, 14 *Swatow*.
About 80 coastal patrol craft.
28 MCM craft.
3 501-1152 LST, 11 LSM, 18 LCU (all ex-US).
Some 360 river patrol, gun, troop carrier, and spt craft.
10 Mi-4 SAR hel.

Air Force: 25,000; 485 combat aircraft.
1 lt bbr sqn with 10 Il-28.
20 FGA sqns with 90 MiG-17F-4, 60 MiG-19F-6, 60 Su-7/20, 25 F-5A, 60 A-37B.
12 interceptor sqns with 60 MiG-21bis, 120 MiG-21F/PP.
Tpts incl 35 An-2 and Li-2, An-12, 9 An-24, 12 Il-14, 4 Il-18, C-130.
Hel incl 20 Mi-4, 10 Mi-6, 60 Mi-8, 20 CH-47, 100 UH-1.
About 60 trainers incl Yak-11/18, MiG-15UTI/21U.
AAM: AA-2 *Atoll*.

Para-Military Forces: 70,000 Frontier, Coast Security, and People's Armed Security Forces; Armed Militia of about 1,500,000.

Latin America

CONTINENTAL TREATIES AND AGREEMENTS

The Act of Chapultepec. Signed by Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, the US, Uruguay, and Venezuela in March and April 1945. This Act declared that if any aggression across boundaries established by treaty occurred, or was threatened, the signatories would consult and agree upon measures up to and including armed force to prevent or repel such aggression.

The Inter-American Treaty of Reciprocal Assistance (Treaty of Rio). Signed in September 1947 by all parties to the Act of Chapultepec except Ecuador and Nicaragua, this Treaty expanded that Act, constrained signatories to the peaceful settlement of disputes among themselves, and provided for collective self-defence should any member party be subject to external attack. Since coming into force on 3 December 1948, it has been invoked some 12 times. Cuba withdrew in March 1960.

The Charter of the Organization of American States. Dated April 1948, this embraced declarations based upon the Treaty of Rio. The members of the OAS—the signatories to the Act of Chapultepec plus Barbados, El Salvador, Grenada, Jamaica, and Trinidad and Tobago—are bound to peaceful settlement of internal disputes and to collective action in the event of external attack upon one or more signatory states. Amendments (Rio, 1965; Bogotá, 1966) reiterated the goal of peaceful settlement of disputes. In 1965–6 an Inter-American Peace Force was formed for service in the Dominican Republic. Subsequent attempts to create a permanent Force have failed, but an Inter-American Defence Board has been formed to co-ordinate planning. Declarations condemning Communism in the Western Hemisphere, signed in Bogotá by 17 nations in 1948 (Brazil, Chile, the Dominican Republic, and the US abstaining), were reiterated at Caracas (1954, 1973), San José (1960), Punta del Este (1962), and Washington (1972). In 1962 the Foreign Ministers and, later, the Council excluded Cuba and forced the withdrawal of Soviet missiles from that country. In 1964 Cuba was indicted for subversion in Venezuela. In 1975 the OAS agreed to normalize relations with Cuba.

A Treaty for the Prohibition of Nuclear Weapons in Latin America (The Tlatelolco Treaty). This was signed in February 1967 by 25 Latin American countries, 23 of



which have ratified it (Argentina has not; Brazil has, but has reserved her position on peaceful nuclear explosions); the Treaty is not in force for Chile. Britain and the Netherlands have ratified it for the territories within the Treaty area for which they are internationally responsible. Britain, France, the Netherlands, and the US have signed Protocol I (which commits states outside the region to accept, for their territories within it, the Treaty restrictions regarding the emplacement or storage of nuclear weapons); Britain, China, France, the USSR, and the US have signed Protocol II (an undertaking not to use or threaten to use nuclear weapons against the parties to the Treaty). The contracting parties have set up an Agency to ensure compliance with the Treaty.

OTHER AGREEMENTS

The 1903 treaty with the Republic of Panama, granting the United States virtual sovereign rights over the Canal Zone in perpetuity, was renegotiated. The 1977 treaties which resulted came into force in October 1979. About 40% of the former Canal Zone will remain under US control until 31 December 1999. Panama received 11 of 14 US bases. Defence of the Canal will be the joint responsibility of both nations, with Panama assuming an

increasing role until the final take-over.

In July 1965 El Salvador, Guatemala, Honduras, and Nicaragua agreed to form a military bloc, with a Defence Council, to co-ordinate measures against possible Communist aggression.

The United States has a bilateral agreement with Cuba for jurisdiction and control over Guantánamo Bay. This was confirmed in 1934. In 1960 the US stated that it could be modified or abrogated only by agreement between the parties and that she had no intention of giving such agreement.

ARGENTINA

Population: 27,000,000.

Military service: Army and Air Force 1 year, Navy 14 months.

Total armed forces: 139,500 (92,000 conscripts).

Estimated GNP 1978: \$45 bn.

Defence expenditure 1979: 3,713 bn pesos (\$2.8 bn). (Rapid inflation makes defence expenditure and GNP figures in local currency and dollar terms unreliable.)

\$1 = 1,317 pesos (1979), 795.8 pesos (1978). (Year average exchange rates.)

Army: 85,000 (65,000 conscripts).

4 army corps.

2 armd bdes (6 armd car regts).

6 inf bdes (1 mech, 4 mot, 1 jungle).

3 mountain bdes.

1 airmobile bde.

1 indep armd car regt.

6 AD bns.

1 aviation bn.

100 M-4 *Sherman*, 100 *TAM* med, 120 *AMX-13* lt tks; 250 M-113, 60 *Mowag*, 300 *AMX-VCTP*, 75 M-3 APC; 200 105mm and 155mm towed, 20 M-7 105mm SP guns; 105mm pack, 90 M-114 155mm towed, 24 Mk F3, 6 M-109 155mm SP how; 81mm, 120mm mor; 50 *Kuerassier* 105mm SP ATK guns; 75mm, 90mm, 105mm RCL; SS-11/-12, *Bantam*, *Cobra*, *Mamba* ATGW; 30mm, 35mm, 40mm, 90mm AA guns; *Tigercat* SAM; 5 *Turbo-Commander* 690A, 3 *Turbo-Porter*, 2 *DHC-6*, 3 G-222, 4 *Merlin* IIIA, 4 *Queen Air*, 1 *Sabreliner*, 5 *Cessna* 207, 15 *Cessna* 182, 1 *Citation*, 20 U-17A/B ac; 9 A-109, 7 Bell 206, 4 FH-1100, 18 UH-1H, 4 Bell 47G, 2 Bell 212, 6 SA-315 *Lama* hel.

(On order: 120 *TAM* med tks; 120 *Kuerassier* SP ATK guns; 12 SA-330 *Puma*, 12 *Lama* hel.)

RESERVES: 250,000: 200,000 National Guard, 50,000 Territorial Guard.

Navy: 35,000 (17,000 conscripts), incl Naval Air Force and Marines.

4 submarines: 2 Type 209, 2 ex-US *Guppy*.

1 ex-Br *Colossus* aircraft carrier (capacity 14 A-4, 6 S-2 ac, 4 S-61 hel).

1 ex-US *Brooklyn* cruiser with *Seacat* SAM, 2 hel.

8 destroyers: 1 Type 42 with *Sea Dart* SAM, 1 *Lynx* hel; 7 ex-US (3 *Sumner*, 1 *Gearing*; 3 *Fletcher* with *Exocet* SSM).

2 ex-Fr A-69 corvettes with *Exocet* SSM.

7 patrol ships: 2 ex-US *Cherokee*, 2 *King* (1 trg), 3 ex-US *Sotoyomo*.

2 large patrol craft.

4 *Dabur* FAC(P).

2 TNC-45 FAC(G).

2 ex-US *Higgins* FAC(T)<.

6 ex-Br *Ton* coastal minesweeper/hunters.

1 LSD, 2 LST, 27 ex-US landing craft<.

(On order: 6 submarines, 1 Type 42 destroyer, 4 *Meko* 360 frigates, 1 A-69, 2 *Meko* 140 corvettes.)

Bases: Puerto Belgrano, Mar del Plata, Buenos Aires, Ushuaia.

NAVAL AIR FORCE: 3,000; 23 combat aircraft.

1 FB sqn with 11 A-4Q.

1 MR sqn with 9 S-2A/E, 3 SP-2H.

Tpts incl 3 *Electra*, 1 HS-125, 3 I-28.

Other ac incl 8 *King Air*, 4 *Queen Air*, 3 *Turbo-Porter*.

Hel incl 5 S-61D/NR, 9 *Alouette* A-103(III), 2 WG-13 (*Lynx*), 3 *Puma*.

Trainers incl 7 EMB-326GB, 15 T-34C, 12 T-6/-28, 2 C-45.

(On order: 14 *Super Etendard* fighters, 8 WG-13 (*Lynx*) hel.)

MARINES: 10,000.

5 inf bns.

1 cdo bn.

1 amph bn.

1 fd arty bn.

1 AD bn.

2 security bns.

1 sigs bn.

6 indep inf coys.

22 LVTP-7, 15 LARC-5, 6 *Mowag* APC; 105mm,

155mm how; 81mm, 106mm mor; 75mm,

105mm RCL; *Bantam* ATGW; 30mm AA guns;

10 *Tigercat* SAM.

Air Force: 19,500 (10,000 conscripts); 236 combat aircraft.

1 bbr sqn with 9 *Canberra* B-62, 2 T-64.

4 FB sqns with 60 A-4P *Skyhawk*.

1 FB sqn with 18 F-86F.

6 FGA sqns: 2 with 21 *Nesher*, 1 with 17 *Mirage* 5, 3 with 48 MS-760A *Paris* II.

1 interceptor sqn with 22 *Mirage* IIIEA, 2 IIIDA.

2 COIN sqns with 37 IA-58 *Pucará*.

1 assault hel sqn with 14 *Hughes* 500M, 8 UH-1H.

1 SAR sqn with 12 *Lama*, 2 S-58T, 2 S-61NR hel.

5 tpt sqns with 1 *Boeing* 707-320B, 7 C-130E/H, 2 KC-130, 1 *Sabreliner*, 2 *Learjet* 35A, 3 G-222,

13 C-47, 10 F-27, 6 F-28, 5 *DHC-6*, 22 IA-50 *Guaraní* II, 2 *Merlin* IVA.

1 Antarctic sqn with 2 *DHC-2*, 3 *DHC-3*, 1 LC-47 ac, 1 S-61R hel.

1 comms sqn with 4 *Commander*, 14 *Shrike* *Commander*, *Paris*, T-34, IA-35 *Huanquero*.

Hel incl 4 UH-1D, 3 UH-19, 3 Bell 47G.

Trainers incl 35 T-34C, 12 *Paris*, 37 *Cessna* 182.

AAM: R-530. ASM: AS-11/-12.

(On order: 8 *Mirage* 5 fighters; 20 IA-58 *Pucará* COIN; 16 *Turbo-Commander* tpts; 2 KC-130 tankers; 3 CH-47C, 8 Bell 212, 9 *Puma* hel.)

Para-Military Forces: 42,000. Gendarmerie: 11,000; Shorland armd cars, M-113 APC, 20 lt ac, 10 hel under Army command, mainly for frontier duties. Argentine Naval Prefecture (coastguard): 9,000; 2 patrol ships, 25 large patrol craft, 30 patrol vessels, 5 aircraft, 6 hel. Federal Police: 22,000; APC, 4 hel.

BOLIVIA

Population: 5,285,000.

Military service: 12 months selective.

The United States has bilateral military sales arrangements at varying levels with most countries of the region. The Soviet Union has no known formal defence agreements with any of the states in the area, although she has supplied military equipment to Cuba and Peru. Austria, Belgium, Britain, Canada, France, West Germany, Israel, Italy, the Netherlands, Portugal, Switzerland, and Taiwan have also sold arms in the region. Argentina and Brazil are designing and manufacturing for export their own military equipment; Chile is assembling *Mirage* 50 aircraft under licence.

Total armed forces: 23,800.

Estimated GNP 1979: \$4.7 bn.

Defence expenditure 1979: 2.95 bn pesos (\$118 m).

\$1 = 25.0 pesos (1980), 20.2 pesos (1979).

Army: 18,000.

2 corps, 5 div HQ.

4 cav regts (horsed).

1 mech regt (3 bns).

1 mot regt (3 bns).

13 inf regts (incl 1 Presidential Guard), each with 1 mounted, 1 mot inf bns.

3 arty regts.

2 ranger bns.

1 para bn.

6 engr bns.

EE-9 *Cascavel* armd cars; 18 M-113, 10 V-100

Commando, 20 *Mowag*, EE-11 *Urutu* APC; 6

75mm guns; 25 M-116 75mm pack, 25 M-101

105mm how; 18 *Kuerassier* 105mm SP ATK guns.

Navy: 1,800.

1 transport.

22 lake and river patrol craft (21<).

Bases: Tiquina, Loma Suarez, Puerto Horquilla.

Air Force: 4,000; 41 combat aircraft.

1 fighter/trg sqn with 13 T-33A/N.

2 COIN sqns with 18 EMB-326GB (*Xavante*), 10 AT-6G.

Tpts incl 1 DC-6B, 1 *Electra*, 2 C-54, 1 L-100-30,

1 C-130H, 1 *Sabreliner*, 2 *Learjet*, 5 *Arava*, 4 CV-440, 7 C-47, 1 *Super King Air*, 5 F-27.

1 hel sqn with 5 UH-1H; 7 SA-315B *Lama* SAR.

Liaison ac incl 11 *Cessna* 185, 2 *Cessna* 206C, 2 *Turbo-Centurion*, 1 *Turbo-Porter*, 1 *Cessna*

402, 1 *Cessna* 421.

Trainers incl 20 T-6G, 6 T-41D, 12 T-23 *Uirapuru*, 6 SF-260M, 10 PC-7 *Turbo-Trainer*.

1 airbase defence inf regt.

(On order: 4F-27 tpt ac, 11 PC-7 *Turbo-Trainer*.)

BRAZIL

Population: 126,000,000.

Military service: 1 year.

Total armed forces: 272,550 (113,000 conscripts).

Estimated GNP 1978: \$201 bn.

Defence expenditure 1979: 47.3 bn cruzeiros

(\$2.09 bn).

\$1 = 22.65 cruzeiros (1979), 16.9 cruzeiros (1978).

Army: 182,750 (110,000 conscripts).

4 army, 2 indep comd HQ.

8 divs: each up to 6 armd, 4 mech or mot inf bdes.

2 indep inf bdes.

1 indep para bde.

5 lt 'jungle' inf bns.

60 M-4, some M-47 med, 250 M-3A1, 250 M-41 lt

tks; 120 EE-9 *Cascavel*, M-8 armd cars; EE-11

Urutu, M-59, 600 M-113 APC; 500 M-116 75mm pack, 375 105mm, 90 M-114 155mm towed, 50

M-7, 100 M-108 105mm SP how; 81mm mor;

3.5-in RL, 108mm MRL; 106mm RCL; *Cobra* ATGW; 30 35mm, 30 40mm, 50 90mm AA guns; 4 *Roland* SAM; 40 L-42 *Regente*, O-1E lt ac; 10 AB-206A hel.
(On order: 80 X-1A2 med tks.)

RESERVES: 60,000 first line; 500,000 second line.

Navy: 47,000, incl 13,500 Naval Air Force, Marines and Auxiliary Corps, 3,000 conscripts.

8 submarines: 3 *Oberon*, 5 ex-US *Guppy* II/III. 1 ex-Br *Colossus* aircraft carrier (capacity 20 ac, incl 7 S-2A ASW ac, 4 *Sea King* hel).

12 destroyers: 5 ex-US *Fletcher* (1 with *Seacat* SAM), 5 ex-US *Sumner* (1 with *Seacat*), 2 ex-US *Gearing* with ASROC.

6 *Niteroi* frigates: 2 with *Seacat* SAM, *Ikara*, 1 *Lynx* hel; 4 with *Exocet* SSM.

10 *Imperial Marinheiro* patrol vessels.
6 river patrol ships: 2 *Pedro Teixeira*, 3 *Roraima*, 1 monitor.

6 *Piratini* large patrol craft.
6 *Schütze* coastal minesweepers.
10 river patrol craft< (6 *Anchova*).
2 ex-US LST.
4 LCU.

Bases: Rio de Janeiro, Aratu, Belem, Natal, Ladario.

NAVAL AIR FORCE: no combat aircraft.
1 ASW sqn with 5 SH-3D *Sea King* hel.
1 utility sqn with 5 *Whirlwind*, 7 *Wasp*, 6 AS-350M *Ecureuil*, 18 AB-206B, 9 *Lynx* hel.
1 trg sqn with 10 Hughes 269/300 hel.

MARINES: 12,000.
1 div (bde) with 3 inf, 1 amph assault, 1 arty, 1 engr bns. LVTP-7 APC.

Air Force: 42,800; 173 combat aircraft.
1 interceptor sqn with 14 *Mirage* IIIIEBR, 3 DBR.

2 FGA sqns with 33 F-5E, 5 F-5B.
8 COIN/recce sqns with 70 AT-26 *Xavante*, 19 T-25 ac, 11 UH-1D, 4 Bell 206, 4 OH-6A hel.

1 ASW sqn with 8 S-2E, 9 S-2A (7 in carrier).
1 MR sqn with 12 EMB-111M.
4 SAR sqns with 7 HU-16B *Albatross*, 3 RC-130E, 7 PBV-5A ac, 5 SH-1D, 2 Bell 47G hel.

12 lpt sqns with 2 Boeing 737, 9 C-130E/H, 2 KC-130H, 13 HS-125, 1 *Viscount*, 12 HS-748, 20 DHC-5, 96 EMB-110 *Bandeirante* (78 C-95, 6 R-95, 4 EC-95, 9 C-95A), 5 EMB-121 *Xingu*, 10 C-47 ac, 6 AB-206, 6 SA-330 *Puma* hel.

3 liaison sqns with L-42, T-25, O-1E, 10 EMB-810C (*Seneca* II) ac, 30 UH-1D/H hel.
Trainers incl 62 T-23 *Uirapuru*, 130 T-25 *Universal*, 10 T-33, 82 AT-26.

AAM: R-530.
(On order: 20 EMB-110 (C-95A) tpts, 20 AT-26 trg ac.)

Para-Military Forces: Some 185,000 Public Security Forces; state militias in addition.

CHILE

Population: 11,200,000.
Military service: 1 year (Army and Navy only).
Total armed forces: 88,000 (21,600 conscripts).
Estimated GDP 1978: \$15 bn.

Defence expenditure 1979: 25.6 bn pesos (\$726 m). (Rapid inflation makes defence expenditure and GNP figures in local currency and dollar terms unreliable.)

\$1 = 35.25 pesos (1979), 30.14 pesos (1978).

Army: 53,000 (20,000 conscripts).
6 div HQ.
7 cav regts (3 armd, 3 horsed, 1 hel-borne).

21 inf regts (incl 9 mot, 3 mountain).
6 arty groups (incl AA dets).

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70 M-4 med, 10 M-3, 60 M-41, 47 AMX-13 lt tks; 30 EE-9 *Cascavel* armd cars; 300 M-113, EE-11 *Urutu* APC; 105mm guns, 36 M-56 105mm pack how; Mk F3 155mm sp how; 81mm, 120mm mor; 106mm RCL; *Milan* ATGW; 20mm, 40mm AA guns; 6 CASA C-212 tpts, 4 *Navajo*, 4 O-1 ac; 7 *Puma*, 10 *Lama*, 3 UH-1H, 2 AB-206 hel.

RESERVES: 160,000.

Navy: 24,000 (1,600 conscripts), incl Naval Air and Marines.
3 submarines: 2 *Oberon*, 1 ex-US *Balao*.

3 cruisers: 1 ex-Swed *Gota Lejon*; 2 ex-US *Brooklyn* with 1 hel.
6 destroyers: 2 *Almirante* with *Exocet* SSM, *Seacat* SAM; 2 ex-US *Sumner* with 1 hel; 2 ex-US *Fletcher*.

5 frigates: 2 *Leander* with *Exocet* SSM, *Seacat* SAM, 1 hel; 3 ex-US *Lawrence*.
3 ex-US corvettes: 2 *Sotoyomo*, 1 *Cherokee*.

4 Lürssen-type FAC(T).
3 large patrol craft (1 ex-US PC-1638).
12 river patrol craft< (10 *Anchova*).
3 511-1152 LST, 1 LCM, 2 LCU, 6 LCPV.

Bases: Talcahuano, Valparaiso, Puerto Montt, Punta Arenas, Puerto Williams.

NAVAL AIR FORCE: 500; 12 combat aircraft.
1 ASW/SAR sqn with 6 EMB-111, 2 PBV-5A, 4 SP-2E, 5 Beech D-18S, 1 *Navajo*, 1 F-27 ac, 4 UH-19, 2 UH-1D hel.

Tpts incl 4 C-47, 6 EMB-110C *Bandeirante*, 4 CASA C-212, 4 *Metro*.
Hel incl 4 AB-206, 3 UH-19, 2 UH-1D, 6 BO-105, 12 *Alouette* III.

Trainers: 4 PC-7 *Turbo-Trainer*.

MARINES: 5,000.
1 bde.
Coast-defence units.
5 dets (1 at bn strength).

Air Force: 11,000; 84 combat aircraft.
2 FB sqns with 16 *Hunter* F-71, 18 F-5E/F.
1 fighter/trg sqn with 8 T-33A.

2 COIN sqns with 34 A-37B.
1 ASW/SAR sqn with 8 HU-16B *Albatross*.
Tpts incl 2 C-130H, 6 DC-6B, 8 C-47.

2 utility sqns with 17 DHC-6, 1 *King Air*, 3 *Twin Bonanza*, 10 Cessna 180.
Hel incl 6 S-55T, 13 UH-1H, 3 UH-12E, 1 *Puma*, *Alouette* III.

Trainers incl 30 T-34A, 25 T-37B, 8 T-41, 10 *Vampire* T-22/-25, 4 *Hunter* T-77, 9 Beech 99, 10 T-25 *Universal*.

AAM: *Sidewinder*, *Shafir*. ASM: AS-11/-12.
1 AA arty regt.
(On order: 16 *Mirage* 50 fighters, 20 T-25 trg ac.)

Para-Military Forces: 27,000 *Carabineros*, with 15 *Mowag* MR-8 APC, 25 lt ac.

COLOMBIA

Population: 26,520,000.
Military service: 2 years.
Total armed forces: 65,800.
Estimated GDP 1978: \$14.5 bn.

Defence expenditure 1979: 9.01 bn pesos (\$215 m).
\$1 = 41.87 pesos (1970), 38.1 pesos (1978).

Army: 53,000 (26,500 conscripts).
10 inf bdes ('Regional Bdes') (6 mech cav, 6 arty gps, 26 inf, 6 engr bns).
1 trg bde, incl Presidential Guard.

1 ranger bn.
1 AB bn.
1 AA arty bn.

M-4A3 med, M-3A1 lt tks; White M-3, M-8, M-20 armd cars; 48 M-101 105mm how; mor; 40mm AA guns.

RESERVES: 500,000.

Navy: 9,000, incl 2,800 Marines.
2 Type 209 submarines.
2 SX-506 midget submarines.
3 destroyers: 2 *Holland*, 1 ex-US *Sumner*.
5 ex-US frigates: 1 APD, 1 *Courtney*, 3 *Cherokee*.
4 gunboats: 3 *Arauca*, 1 *Barranquilla*.
10 coastal patrol craft<.
1 ex-US 511-1152 LST.
2 marine bns.

Bases: Cartagena, Buenaventura.

Air Force: 3,800, 18 combat aircraft.
1 fighter/recce sqn with 14 *Mirage* 5COA, 4 5COR/D.

Tpts incl 2 C-130B, 5 C-54, 19 C-47, 2 HS-748, 3 *Arava*, 1 F-28, 10 DHC-2, 3 Piper PA-23.

Hel incl 13 AH-1A, 6 UH-1B, 1 UH-1N, 20 OH-6A, 8 OH-13, 6 TH-55.
Trainers incl 10 T-37C, 1 AT-37, 27 T-41D, 3 RT-33, 26 T-33A, 30 T-34B.

AAM: R-530.
Para-Military Forces: 50,000 National Police Force.

CUBA

Population: 9,900,000.
Military service: 3 years.
Total armed forces: 206,000.
Estimated GNP 1978: \$12.5 bn.
Estimated defence expenditure 1980: 811 m pesos (\$1.1 bn).
\$1 = 0.72 pesos (1980), 0.76 pesos (1978).

Army: 180,000.
3 armd bdes.
15 inf divs (bdes), (some mech).
Some indep bns.

Over 600 tks, incl 60 IS-2 hy, T-34/-54/-55, 50 T-62 med, PT-76 lt; BRDM-1 armd cars; BMP MICV, 400 BTR-40/-60/-152 APC; M-116 75mm pack, 122mm, 130mm, 152mm guns/how; 100 SU-100 sp guns; 45 *FROG*-4 SSM; 57mm, 76mm, 85mm ATK guns; 57mm RCL; *Snapper*, *Sagger* ATGW; ZU-23, 37mm, 57mm, 85mm, 100mm towed, ZSU-23-4 sp AA guns; SA-7 SAM.

DEPLOYMENT: *Angola*: 19,000; *Ethiopia*: 16,500.

RESERVES: 90,000.

Navy: 10,000.
3 ex-Sov submarines: 2 F-, 1 W-class.
14 ex-Sov large patrol craft: 10 SO-1, 4 *Kronshadt*.

27 ex-Sov FAC(M) with *Styx* SSM: 6 *Osa*-I, 5 *Osa*-II, 16 *Komar*<.

26 ex-Sov FAC(T): 2 *Turya*, 12 P-6<, 12 P-4<.
12 ex-Sov *Zhuk* FAC(P)<.

12 coastal patrol craft.
3 minesweepers: 2 ex-Sov *Yevgenya*, 1 ex-Pol K-8.

7 T-4 LCM.
Some 50 *Samlet* coast-defence SSM.

Bases: Cienfuegos, Havana, Mariel, Punta Balenatos, Canasi.

Air Force: 16,000, incl Air Defence Forces; 168 combat aircraft.
3 FB sqns: 2 with 30 MiG-17, 1 with 10 MiG-23.

8 interceptor sqns: 3 with 48 MiG-21F, 2 with 30 MiG-21MF, 2 with 40 MiG-19, 1 with 10 MiG-23.

1 trg sqn with 15 MiG-15UTI.
Tpts incl 10 Il-14, 12 An-2, 4 An-24, 20 An-26.
Hel incl 5 Mi-1, 24 Mi-4, 20 Mi-8, Mi-24.
Trainers incl 2 MiG-23U, 20 Zlin 326.

AAM: AA-2 Atoll.
24 SAM bns with 144 SA-2/3, SA-6.

Para-Military Forces: 15,000 State Security troops; 3,000 border guards; 100,000 People's Militia.

DOMINICAN REPUBLIC

Population: 5,620,000.
Military service: voluntary.
Total armed forces: 19,000.
Estimated GNP 1977: \$4.3 bn.
Defence expenditure 1979: 91 m pesos (\$91 m).
\$1 = 1 peso (1977, 1979).

Army: 11,000.
3 inf bdes (one has 1 armd recce sqn).
1 arty regt (3 bns).
1 mixed armd bn.
1 inf bn (horsed).
1 Presidential Guard bn.
1 engr bn.
20 AMX-13 lt tks; AML armd cars; M-3 APC; 20 M-101 105mm how; 20 40mm AA guns.

Navy: 4,500.
3 frigates: 2 ex-US *Tacoma* (in reserve), 1 ex-*Can River*.
5 ex-US corvettes: 2 *Admirable* ex-mine-sweepers, 3 *Cohoes*.
5 large patrol craft (3 ex-US *Argo*, 1 ex-US PGM-71).
8 coastal patrol craft<.
2 LCU.
1 cdo bn.

Bases: Santo Domingo, Bani.

Air Force: 3,500; 36 combat aircraft.
1 fighter sqn with 10 *Vampire* F-1/FB-50.
1 fighter/trg sqn with 20 F-51D *Mustang*.
1 COIN/trg sqn with 6 T-28D.
SAR ac: 2 PBV-5A *Catalina*.
1 tpt sqn with 6 C-46, 6 C-47, 3 DHC-2.
Hel incl 3 *Alouette* II/III, 2 H-19, 2 UH-12E, 7 OH-6A, 1 SA-365 *Dauphin* 2.
Trainers incl 4 Cessna 172, T-6, 4 T-41.
1 para, 1 AA bns.

Para-Military Forces: 10,000 Gendarmerie.

ECUADOR

Population: 7,900,000.
Military service: 2 years, selective.
Total armed forces: 38,800.
Estimated GNP 1978: \$7.0 bn.
Defence expenditure 1979: 4.39 bn sucres (\$163 m).
\$1 = 26.9 sucres (1979), 24.9 sucres (1978).

Army: 30,000.
6 nominal divs (each of 1 armd, 2 inf bdes; 3 with 1 recce sqn).
1 regt of 3 horsed cav gps (bns of 2-3 coys).
1 para bn.
3 arty bns.
1 AA arty bn.
2 engr bns.
1 Presidential Guard sqn.
10 indep inf coys (cadre bns).
40 M-3, 80 AMX-13 lt tks; 27 AML-60/-90 armd cars; 20 M-113, AMX-VCI APC; 18 105mm guns; 6 Mk F3 155mm SP how; 10 40mm AA guns; 1 *Skyvan*, 6 *Arava*, 3 *Turbo-Porter* tpts, 7 lt ac, 2 hel.
(On order: VAB APC; 28 M-167 20mm towed, 44 M-163 *Vulcan* 20mm SP AA guns; 18 M-730 *Chaparral* SAM.)

Navy: 4,000, incl 700 marines.

2 Type 209 submarines.
1 ex-US *Gearing* destroyer.
1 ex-US *Lawrence* frigate.
1 ex-US PCE-827 corvette.
3 Lürssen-type FAC(M) with *Exocet* SSM.
2 *Manta* FAC(M) with *Gabriel* SSM.
2 ex-US PGM-71 large, 5 coastal patrol craft<.
1 511-1152 LST, 2 LSM (all ex-US).
2 *Arava*, 2 T-37, 1 T-41, 1 Cessna 320, 1 Cessna 177 ac, 2 *Alouette* III hel.
2 marine bns, one on garrison duties.
(On order: 6 corvettes, *Exocet* SSM.)

Bases: Guayaquil, San Lorenzo, Galápagos Islands.

Air Force: 4,800; 50 combat aircraft.
1 lt bbr sqn with 5 *Canberra* B-6.
1 FB sqn with 10 *Jaguar* S, 2 *Jaguar* B.
1 interceptor sqn with 4 *Mirage* F-1J.
1 recce sqn with 6 *Meteor* FR-9.
1 COIN sqn with 10 A-37B.
1 COIN/trg sqn with 12 BAC-167 *Strikemaster*.
MR ac: 1 PBV-5A *Catalina*.
Tpts incl 4 *Electra*, 2 C-130H, 4 DC-6B, 3 *Learjet*, 5 HS-748, 12 C-47, 6 C-45, 2 DHC-5D, 3 DHC-6.
Hel incl 1 *Puma*, 5 *Alouette* III, 4 *Lama*, 3 Bell 47G.
Trainers incl 23 T-34C, 12 SF-260, 24 Cessna 150A.
AAM: R-550 *Magic*.
(On order: 12 *Mirage* F-1J interceptors, 2 *Mirage* F-1J trainers, 1 *Super King Air* tpt.)

Para-Military Forces: 5,800.

GUATEMALA

Population: 6,950,000.
Military service: voluntary.
Total armed forces: 14,900.
Estimated GNP 1978: \$6.6 bn.
Defence expenditure 1980: 76.8 m quetzal (\$76.8 m).
\$1 = 1.1 quetzal (1980), 1.0 quetzal (1978).

Army: 14,000.
4 bde HQ.
1 Presidential Guard bde.
9 inf bns.
1 para bn.
1 engr bn.
1 armd car coy.
9 arty btys.
Some M-3 *Stuart* lt tks; 15 M-8 armd cars; 6 M-3A1, 10 M-113, 10 RBY-1, 7 *Commando* APC; 12 75mm, 12 105mm how; 81mm, 12 4.2-in mor.

Navy: 450 incl 200 marines.
14 coastal patrol craft<.
1 LCM.

Air Force: 450; 10 combat aircraft.
1 FGA sqn with 10 A-37B.
1 tpt sqn with 1 DC-6, 10 C-47, 8 *Arava*.
1 comms/trg sqn with 5 Cessna 172, 2 Cessna U-206C ac, 8 Bell UH-1D hel.
Trainers incl 2 T-33A, 7 PC-7 *Turbo-Trainer*.
(On order: 5 PC-7.)

Para-Military Forces: 3,000.

HONDURAS

Population: 3,700,000.
Military service: voluntary.
Total armed forces: 11,300.
Estimated GNP 1978: \$1.66 bn.
Defence expenditure 1979: 62.8 m lempiras (\$31.4 m).
\$1 = 2 lempiras (1978, 1979).

Army: 10,000.
1 Presidential Guard bde (2 bns).
6 inf bns.
2 arty bns.
1 engr, 1 sigs bn.
12 M-116 75mm pack, 12 M-101 105mm how; 81mm, 120mm mor; 57mm RCL.
(On order: *Scorpion* lt tks.)

Navy: 100.
5 *Swift* patrol craft: 1 105-ft fast, 4 65-ft coastal<.
(On order: 1 105-ft patrol craft.)

Base: Puerto Cortes.

Air Force: 1,200, 24 combat aircraft.
1 FB sqn with 12 *Super Mystère* B2, 6 F-86F *Sabres*.
1 COIN sqn with 6 A-37B.
Tpts incl 1 C-54, C-45, 1 C-47, 3 *Arava*, 1 *Westwind*, 4 Cessna 180/185.
Trainers incl 6 T-6, 24 T-28F, 5 T-41A, 3 RT-33A.
Hel: 1 *Alouette* III, 2 UH-19D.

Para-Military Forces: 3,000.

MEXICO

Population: 71,500,000.
Military service: voluntary, with part-time conscript militia.
Total armed forces: 107,000 regular, 250,000 part-time conscripts.
Estimated GNP 1978: \$91 bn.
Defence expenditure 1979: 11.82 bn pesos (\$518 m).
\$1 = 22.8 pesos (1979), 22.7 pesos (1978).

Army: 83,000 regular, 250,000 conscripts.
1 mech bde gp (Presidential Guard) (3 bns).
2 inf bde gps (each of 2 inf, 1 armd recce, 1 arty bns).
1 para bde (2 bns).
Zonal Garrisons incl:
23 indep cav regts, 65 indep inf bns, 3 arty regts.
AA, engr, and support units.
M-3, M-5 lt tks; 100 M-3A1, M-8 armd cars
HWK-11 APC; M-116 75mm pack, 105mm towed, M-8 75mm, M-7 105mm SP how.

Navy: 20,000, incl Naval Air Force and Marines.
2 ex-US *Fletcher* destroyers.
5 frigates: 1 ex-US *Edsall* (trg ship), 4 ex-US *Lawrence/Crossley*.
37 ex-US corvettes: 18 *Auk*, 16 *Admirable* ex-minesweepers, 3 *Abnaki* ex-tugs.
22 *Azteca* large patrol craft.
6 coastal, 9 river patrol boats<.
2 ex-US 511-1152 LST.
(On order: 9 *Azteca* large patrol craft.)

Bases: Gulf: Vera Cruz, Tampico, Ciudad del Carmen, Isla Mujeres. Pacific: Acapulco, Puerto Cortes, Guaymas, Manzanillo.

NAVAL AIR FORCE: 350; 13 combat aircraft.
MR ac: 13 HU-16 *Albatross*.
Other ac incl 1 *Learjet* 24D, 4 C-45, 2 FH-227, 1 *Baron*, 3 *Bonanza*, 4 Cessna 150.
Hel: 4 *Alouette* II, 3 Bell 47, 5 Hughes 269A.
(On order: 10 SA-315B *Lama* hel.)

MARINES: 2,000.
3 bn HQ.
19 security coys.

Air Force: 4,000; some 70 combat aircraft.
1 COIN sqn with 14 AT-33A.
5 COIN/trg sqns with 20 AT-6G, 45 AT-28D.
1 SAR sqn with 18 LAsA-60 ac, 9 *Alouette* III, 1 Hiller 12E hel.
4 tpt sqns with 2 Boeing 727, 1 DC-7, C-118, 5 C-54, 1 *Electra*, 1 *Jetstar*, 1 BAC-111, 20 C-47,

3 *Skyvan*, 12 *Islander*, 10 *Arava*, Aero Commander.
Hel incl 5 Bell 206B, 3 Bell 212, 10 Bell 205, 3 *Puma*.
Trainers incl 20 T-6, 30 T-28, 4 T-34, 20 Beech F33-19, 20 *Musketeer*, 4 PC-7 Turbo-Trainer.
1 para bn.
(On order: 8 PC-7 Turbo-Trainer.)

PARAGUAY

Population: 3,300,000.
Military service: 18 months.
Total armed forces: 16,000.
Estimated GNP 1978: \$2.14 bn.
Defence expenditure 1978: 5.19 bn guaranies (\$41 m).
\$1 = 126 guaranies (1978).

Army: 12,500.
1 cav div (bde) (2 mech cav regts, 1 inf bn, 1 arty bty).
6 inf divs (bdes) (bn gps).
2 indep horsed cav regts.
1 arty regt.
2 indep inf bns.
1 Presidential Guard bn.
5 engr bns.
1 sigs bn.
13 M-4 med, 12 M-3A1 lt tks; M-8 (mod) armd cars; M-3 (mod) APC; 75mm, 48 M-101 105mm how; 2 Bell 47, 3 UH-12E hel.

Navy: 2,500 (500 Marines and Naval Air).
2 *Humaita* river defence vessels.
3 corvettes (ex-Arg *Bouchard* minesweepers).
9 patrol craft: 1 large, 8 coastal <.
1 ex-US LSM, 2 ex-US LCU.
1 marine regt (bn).
1 C-47, 4 Cessna U-206, 2 Cessna 150 ac, 2 Bell 47G hel.

Bases: Asunción/Puerto Sajonia, Bahía Negra.

Air Force: 1,000 some 25 combat aircraft.
FGA sqn with 6 A-37B.
COIN/trg sqn with 22 AT-6G *Texan*.
Tpts incl 5 DC-6B, 2 C-54, 3 CV-240, 10 C-47, 1 DHC-6, 1 *Dove*, 1 DHC-3.
Hel: 14 Bell UH-13A.
Trainers incl 8 Fokker S-11, 8 T-23 *Uirapuru*, 1 MS-760, 5 Cessna 185.
1 para regt (bn).
On order: 12 EMB-326 *Xavante* COIN, 10 EMB-110 tpts.)

Para-Military Forces: 4,000 security forces.

PERU

Population: 17,400,000.
Military service: 2 years, selective.
Total armed forces: 95,500 (49,000 conscripts).
Estimated GNP 1978: \$12.4 bn.
Defence expenditure 1979: 96.7 bn soles (\$366 m). (Rapid inflation makes defence expenditure and GNP figures in local currency and dollar terms unreliable.)
\$1 = 264.45 soles (1980), 130 soles (1978).

Army: 75,000 (51,000 conscripts).
2 armd divs (bdes).
1 Presidential Guard cav div: 2 horsed regts, each of 3 bns.
2 inf and mech divs (bdes), each of 3 bns.
1 AB div (para-cdo bde).
1 jungle div (bde).
10 arty bns.
4 engr bns.
3 armd recce sqns.
250 T-54/-55, 60 M-4 med, 110 AMX-13 lt tks; M-8 armd, 50 M-3A1 scout cars; 200 M-113, 40

V-150 *Chaimite*, UR-416, Mowag APC; 90 105mm, 122mm, 130mm, 4 M-114 155mm how; 120mm mor; 28 40mm, 76mm towed, ZSU-23-4 SP AA guns; SA-3 SAM; 5 U-10B, 5 Cessna 185 lt ac; 42 Mi-8 (35 in store), 4 *Alouette* III, 5 *Lama* hel.
(On order: 200 T-55 tks; 122mm, 130mm guns; SA-3/-7 SAM; 2 *Nomad* lt tpt ac.)

Navy: 10,500, incl Naval Air, 1,000 Marines.
8 submarines: 2 Type 209, 6 ex-US (2 *Guppy* I, 4 *Abtao*).
3 cruisers: 2 ex-Neth *De Ruyter* (1 with *Exocet* SSM, 3 hel), 1 ex-Br *Ceylon*.
7 destroyers: 2 ex-Br *Daring* with *Exocet* SSM, 2 ex-US *Fletcher*, 3 ex-Neth *Holland*.
2 *Lupo* frigates with *Otomat* SSM, *Aspide* SAM, 1 hel.
5 river gunboats, 3 river patrol craft <.
2 ex-US LST, 2 ex-US LSM.
9 S-2E *Tracker* ASW, 6 C-47, 2 F-27MPA MR, 1 *Aztec* tpt ac.
Hel: 6 AB-212 ASW, 10 Bell 206, 6 UH-1D/H, 2 *Alouette* III, 2 Bell 47G.
Trainers: 6 T-34.
2 Marine bns.
(On order: 4 Type 209 submarines, 2 *Lupo* frigates, 6 PR-72P FAC(M) with *Exocet* SSM, 6 lake patrol craft.)

Bases: Callao, San Lorenzo, Talara, Iquitos.

Air Force: 10,000; 112 combat aircraft.
2 lt bbr sqns with 32 *Canberra* B-2/B(I)-8/B(I)-56.
4 strike/interceptor sqns: 2 with 24 *Mirage* 5P, 2 with 23 Su-22.
2 COIN sqns with 24 A-37B.
1 OCU with 2 *Canberra* T-4, 2 *Hunter* T-67, 1 *Mirage* 5DP, 4 Su-22UTI.
Tpts incl 2 L-100-20, 4 C-130E, 5 DC-6, 4 C-54, 2 *Learjet*, 16 An-26, 2 F-27, 4 F-28, 6 DHC-6, 15 DHC-5, 18 *Queen Air*, 3 *King Air*, 2 Beech 99, 12 *Turbo-Porter*, 5 Cessna 185.
Hel incl 12 *Alouette* III, 6 UH-1D, 20 Bell 47G, 17 Bell 212, 6 Mi-6, 5 Mi-8.
Trainers incl 15 T-6, 6 T-34, 8 T-33A, 19 T-41, 26 T-37B/C, 4 Cessna 150.
ASM: AS-30.
(On order: 16 Su-22 fighters.)

Para-Military Forces: 25,000 *Guardia Civil*.

URUGUAY

Population: 3,300,000.
Military service: voluntary.
Total armed forces: 30,000.
Estimated GNP 1978: \$3.7 bn.
Defence expenditure 1977: 304 bn pesos (\$72 m).
\$1 = 5.41 pesos (1978), 4.22 pesos (1977).

Army: 22,000.
4 div HQ (regional).
4 mech bde (2 cav regts).
4 inf bdes, each with 3 bns.
1 ceremonial inf bn.
4 arty bns.
1 AA bn.
5 engr bns.
17 M-24, 18 M-3A1 lt tks; 10 M-3A1 scout cars; 15 M-113 APC; 25 M-101 105mm how.
(On order: FN-4-RM-62 armd cars.)

Navy: 5,000, incl naval air, naval infantry, coast-guard.
3 ex-US frigates: 1 *Dealey*, 2 *Cannon*.
2 corvettes: 1 *Auk*, 1 *Aggressive* (ex-US minesweepers).
1 *Adjuvant* large, 6 coastal patrol craft <.
2 ex-US LCM.
3 S-2A MR ac, 3 SNB-5 (C-45) tpts, 1 T-34B, 7 SNJ-4/6, 4 T-6, 2 *Super Cub* trainers, 2 SH-34J hel.
1 naval inf bn.

(On order: 3 *Vigilante* patrol craft.)

Base: Montevideo.

Air Force: 3,000; some 20 combat aircraft.
1 fighter/trg sqn with 5 AT-33A.
1 COIN sqn with 8 A-37B.
1 recce/trg sqn with 10 T-6G, 8 U-17A.
Tpts incl 5 C-45, 12 C-47, 2 F-27, 2 FH-227, 7 *Queen Air*, 6 EMB-110B/C.
Hel incl 6 UH-1B/H, 2 H-23F.
Liaison ac: 3 Cessna 182A/D, 2 *Super Cub*.
Trainers incl 9 T-28B, 6 T-41D, 26 T-34B.

Para-Military Forces: 2,200.

VENEZUELA

Population: 15,400,000.
Military service: 2 years, selective.
Total armed forces: 40,500.
Estimated GNP 1978: \$39.3 bn.
Defence expenditure 1980: 3.45 bn bolivares (\$804 m).
\$1 = 4.29 bolivares (1978, 1980).

Army: 27,000.
1 armd bde (2 med, 1 lt tk bns).
1 cav bn horsed.
2 mech bns.
11 inf bns.
3 ranger bns.
7 arty gps.
5 AA arty and engr bns.
142 AMX-30 med, 40 AMX-13 lt tks; 12 M-8 armd cars; AMX-VCI, 20 UR-416 APC; 75mm pack, 135 M-101 105mm towed, 20 AMX 155mm SP how; 81mm, 120mm mor; 35 M-18 76mm SP ATK guns; 106mm RCL; SS-11 ATGW; 40mm AA guns; 2 *Merlin*, 1 *King Air*, 1 *Islander*, 2 *Arava* tpt ac; 20 *Alouette* III, 3 UH-1D/H, 2 UH-19, Bell 47G, 2 Bell 205A, 6 Bell 206B hel.

Navy: 9,000, incl 4,000 Marines.
4 submarines: 2 Type 209, 2 ex-US *Guppy* II.
4 destroyers: 2 *Aragua* (1 with *Seacat* SAM), 2 ex-US *Sumner*.
5 frigates: 1 *Lupo* (with *Otomat* SSM, *Aspide* SAM, 1 hel), 4 *Almirante Clemente*.
3 *Vosper Thornycroft* FAC(M) with *Otomat* SSM.
3 *Vosper Thornycroft* FAC(G).
21 *Rio Orinoco* coastal patrol craft <.
1 LST, 4 LSM, 1 tpt, 12 LCVP (all ex-US).
6 S-2E *Tracker* ASW, 4 HU-16 SAR, 3 C-47, 1 HS-748, 1 *King Air* tpts, 2 Bell 47J hel.
3 marine bns.
(On order: 2 Type-209 submarines, 5 *Lupo* frigates, 6 AB-212 ASW hel.)

Bases: Caracas, Puerto Cabello, La Guaira, Puerto de Hierro.

Air Force: 4,500; 99 combat aircraft.
1 lt bbr sqn with 29 *Canberra* (18 B-2, 7 B(I)-8, 2 PR-3, 2 T-4; 23 refurbished).
3 fighter sqns: 1 with 14 CF-5A, 4 CF-5B; 1 with 16 *Mirage* (10 IIIEV, 4 5V, 2 5DV); 1 with 20 F-86K.
1 COIN sqn with 16 OV-10E.
2 tpt sqns with 6 C-130H, 1 Boeing 737, 1 DC-9, 20 C-47, 12 C-123B, 2 HS-748, 1 Cessna *Citation*.
Hel incl 13 *Alouette* III, 20 UH-1D/H, 1 UH-1N, 10 UH-19, 2 Bell 212.
Trainers incl 12 *Jet Provost*, 23 T-2 *Buckeye*, 25 T-34 *Mentor*, 2 Beech 95, 9 *Queen Air*, 12 Cessna 182.
AAM: R-530.
1 para bn.
(On order: 8 A-109 hel.)

Para-Military Forces: 15,000 National Guard.

The Bendix F-15 Avionics Intermediate Shop



2 June, 1980 Nellis AFB...mobile buildings are ready for AIS...



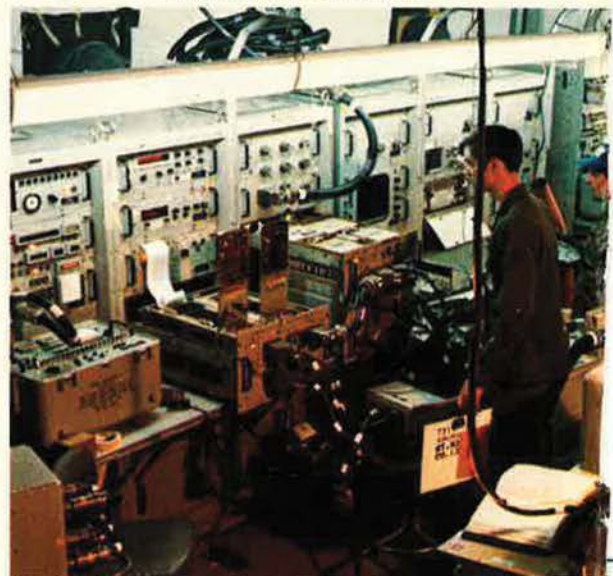
Ready to produce a controlled environment...



AIS brought into building...



Unloading C141B...



4 June, 1980 All units working... testing underway.

Has test capabilities... Will travel!

It's Operation Red Flag 80-4. The objective: to test the rapid deployment of aircraft, including the F-15 Eagle. For the first time, this test included the deployment of the F-15 Avionics Intermediate Shop. The requirements: load the AIS onto 4 C-141B Starlifters at Holloman AFB...transport to Nellis AFB...off-load and set up in mobile buildings...have operational A.S.A.P.

The Test Systems Division of Bendix designed and built the AIS to test all of the "black boxes"... the line replace-

able units that make up the avionics system of the F-15. But, to be a working part of the Rapid Deployment Force, the AIS has to be able to go where it's needed. That means rugged construction, mobility, ease of setting up...in addition to highly precise test capabilities.

The Red Flag operation proved that the Bendix F-15 AIS does all the jobs. Within 2 days after being unloaded from the C-141B's, it was operational at Nellis!

The F-15 AIS is an outstanding illustration of the Bendix approach to creating test systems. More than testing expertise and experience, Bendix brings innovative thinking to every challenge.

We do it every time... we can do it for you.

The Bendix Corporation
Test Systems Division
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201-288-2000,
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We speak total testing



The East - West Theatre Balance in Europe

Any assessment of the military balance between NATO and the Warsaw Pact—a balance which tends to change fairly slowly—involves comparison of the strengths of both men and equipment, consideration of qualitative characteristics, of factors such as geographical advantages, deployment, training and logistic support, and of differences in doctrine and philosophy. It must be set within the context of the strategic nuclear balance, of military forces world wide and, in particular, of the relative naval strengths of the two sides.

Certain elements in the equation hardly change at all. Warsaw Pact equipment is standardized, whereas that of NATO is not and is therefore subject to limitations on interoperability and thus flexibility. NATO has certain strengths, such as the striking power of its tactical air forces, but there is little depth in the NATO central sector, which presents problems in its defence. The Warsaw Pact can reinforce quite rapidly any of its European Fronts, whereas NATO lacks flexibility. On the other hand, the Warsaw Pact has its own vulnerabilities, and there must be doubts about the reliability of some of its members and the value of their forces. It must be borne in mind that Soviet tactical concepts call for an offensive defence, while NATO forces are primarily intended to deter an attack by creating a reasonable Soviet doubt about the possibility of the speedy success of a conventional offensive and the nuclear consequences that might follow. Should deterrence fail, NATO plans to conduct a stubborn forward defence incorporating a degree of mobility and to respond flexibly to aggression by retaining the ability to counter violence at whatever level it is introduced.

LAND AND AIR FORCES

Although divisions on both sides are often of different size and have different organizations and men-to-equipment ratios, it is sometimes useful to compare numbers of divisions. It must be emphasized, however, that quite substantial numbers of combat manpower on both sides are not held on divisional establishments.

When making a divisional comparison, it is most useful to compare the divisions available in two geographical re-

Table I: Ground Forces Available Without Mobilization^a (div equivalents)^b

	Northern and Central Europe ^c			Southern Europe ^d		
	NATO	Warsaw	(of which	NATO	Warsaw	(of which
		Pact	USSR)		Pact	USSR)
Armd	10	23	13	5½	6	2
Mech/inf/other	13	23	13	37½	15	2
AB	4			½		
TOTALS	27	46	26	44	21	4

^a Includes: NATO ready forces, Soviet divisions in Eastern Europe, and non-Soviet Pact divisions in Category 1 (see note on p. 73).

^b Divisions, brigades and similar formations aggregated on the basis of three brigades to a division.

^c NATO figures are for ARCENT and ARNORTH combined. Since neither of the commanders of these forces can be assured of the support of ground forces in Portugal or Britain, these are not included. By the same criterion, French forces are also not included, although three divisions are currently deployed in Germany. Forces in Berlin are also excluded. Warsaw Pact forces include all Category 1 divisions of East Germany (2 tk, 4 mech), Czechoslovakia (3 tk, 3 mech) and Poland (5 tk, 3 mech), and Soviet divisions deployed in those countries in peacetime.

^d NATO forces include Italian, Greek and Turkish land forces and, on the Warsaw Pact side, the Category 1 land forces of Bulgaria (1 tk, 5 mech), Hungary (1 tk, 3 mech), and Romania (2 tk, 5 mech), together with 4 Category 1 Soviet divisions (2 tk, 2 mech) stationed in Hungary.

gions: first, Northern and Central Europe (taken together); and, second, Southern Europe. For obvious reasons, it is not easy to distinguish between Warsaw Pact forces intended for deployment on what NATO terms the front of Allied Forces Northern Europe and those intended for the front of the Central Region. On the other hand, geography and politics impose a distinct degree of separation in forces opposing each other on the Southern Flank. There are three areas of NATO deployment in the Southern Region—Eastern Turkey, Greek and Turkish Thrace, and North-East Italy—and it would be difficult, if not impossible, for forces in any of these areas to be moved to another. Table I has therefore been divided into two parts with NATO listed as a whole (because US ground forces do not constitute the major part of the total) and the Warsaw Pact divided into two—Soviet forces deployed in Eastern Europe in peace and non-Soviet Pact forces of Category 1.

REINFORCEMENTS

Judgment on the rate at which reserve forces can be mobilized, moved to the theatre and put into action is far from easy and involves many complex factors and qualifying assumptions. Some general points can be made:

- Warning time is only useful if there is the political will to mobilize. It depends crucially upon how early an attacker's preparations can be detected. This in turn will de-

pend upon whether the attack is based upon reinforced forces or upon those in place.

- The success or failure of an unreinforced attack will depend upon the defender's ability to move active forces rapidly from barracks into defensive positions.

- Reinforcement varies greatly from country to country. It should be rapid for Central European states. It should be quite rapid for the Soviet Union, although her East-West transport systems have their limitations. Reinforcement by air is clearly feasible to overcome bottle-necks in land transport. The US faces great difficulties over reinforcement, although measures are being taken to improve her response, including more prepositioning of stocks in Europe and better military air transport utilization rates together with use of civil assets.

- Any Western reinforcement by sea will become much more uncertain if it has to take place after the outbreak of hostilities. Air reinforcement will then also be contested. Transit facilities are likely to come under attack. By contrast, it may be less easy for the West to interfere with Soviet reinforcement; although here, too, there are some vulnerabilities.

Table II: Warsaw Pact Reinforcing Formations Available (div equivalents^a)

	Category 1			Category 2			Category 3		
	Armd	Mech/inf/other	AB	Armd	Mech/inf/other	AB	Armd	Mech/inf/other	AB
USSR*	1	1	8	5	10	—	19	48	—
Bulgaria	—	—	—	—	2	—	—	1	—
Czechoslovakia	—	—	—	—	—	—	2	2	—
Hungary	—	—	—	—	1	—	—	1	—
Poland	—	—	—	—	3	1	—	3	—
Romania	—	—	—	—	2	—	—	2	—
GRAND TOTAL:	1	1	8	5	18	2	21½	57	—

GRAND TOTAL: 113½

* Based in Western and Central Military Districts (excluding Leningrad, 2 divs in Transcaucasus MD). Forces in Afghanistan are believed to have come from divisions east of the Caspian, although the possibility that one or more of the reported 5 motor rifle divisions and one airborne division may have been deployed from Western Military Districts cannot be ignored.

- Many Warsaw Pact divisions are not at a high state of readiness, especially those listed as Category 3 (see note on p. 73). The USSR's size and her relative lack of good internal communications will make concentration of reserve manpower rather difficult and may preclude altogether the switching of divisions from the Eastern USSR at short notice.

- Some Western reinforcement does not involve the raising of complete formations but rather is intended to fill out the establishments of formations already deployed forward in peace.

Table III: Western Reinforcing Formations Available (div equivalents^a)

	Active				Reserve ^b			
	Armd	Mech	Marines	Other	Armd	Mech	Marines	Other
US*	2½	4½	2½	5	3	3	1½	8½
Belgium	—	—	—	—	—	—	—	—
Britain	—	—	—	1½	—	—	—	—
Canada	—	—	—	—	—	—	—	—
France	5	—	1	6	—	—	—	—
W. Germany	—	—	—	—	—	—	—	2
Netherlands	—	—	—	—	—	—	—	—
Norway	—	—	—	—	—	—	—	—
GRAND TOTAL:	7½	4½	3½	13	3½	4	2	14½

GRAND TOTAL: 52½

* Including light divisions (infantry and airborne) and armoured cavalry regiments.

^b Some countries, particularly Britain, Canada, the Netherlands and France have plans to mobilize battalion-sized units in some numbers in addition to the formations shown here. France also has formations earmarked for territorial defence.

might be that the Warsaw Pact is intrinsically capable of a much faster build-up of formations in the first two or three weeks, particularly if local surprise is achieved, having a large pool of reserves on which to draw and the formations to absorb them; that NATO can only attempt to match such a build-up if it has, and takes advantage of, sufficient warning time; and that the subsequent rate of build-up of formations also favours the Warsaw Pact substantially. Only if the crisis develops slowly enough to permit full reinforcement could the West eventually reach a better position. Apart from having greater economic resources, Alliance countries, including France, maintain rather more men under arms than the Warsaw Pact. For Army/Marines the figures are: NATO 2,860,000; Warsaw Pact 2,612,000. And the Soviet Union has a large number of her divisions and mer on the Chinese border. Clearly, Soviet plans will put a premium on exploiting a fast build-up of forces, and NATO plans depend on having adequate standing forces to meet any attack and on augmenting them in good time.

EQUIPMENT

In a comparison of equipment one point stands out: the Warsaw Pact is armed almost completely with Soviet or Soviet-designed material and enjoys the flexibility, simplicity of training, and economy that standardization brings. NATO forces have a wide variety of everything from weapons systems to vehicles, with consequent duplication of supply systems and some difficulties of interoperability they do, however, have some qualitatively superior weapons. As to numbers of weapons, there are some notable disparities, of which that in tanks is perhaps the most significant. The relative strengths are shown in Table IV. Tanks in French formations are not included in the table. If the three divisions stationed in Germany are taken into account, 450 tanks should be added to the NATO total; if the three divisions in eastern France are also counted, a further 750 should be added.

It will be seen that in Northern and Central Europe NATO has only a third as many operational tanks as the Warsaw Pact, though NATO tanks are generally superior (not perhaps, to the T-72 now being issued to the Soviet forces). This numerical weakness in tanks (and in other armoured fighting vehicles, where the Soviet forces are notably

Table IV: Main Battle Tank Comparison

	Northern and Central Europe			Southern Europe		
	NATO	Warsaw Pact	(of which USSR)	NATO	Warsaw Pact	(of which USSR)
Main battle tanks in operational service*	7,000	19,500	12,500	4,000	6,700	2,500

* These are tanks with formations or earmarked for the use of dual-based or immediate reinforcing formations (some 600). They do not include those in reserve or small stocks held to replace tanks damaged or destroyed. In this latter category NATO has perhaps 2,500 tanks in Central Europe. There are tanks in reserve in the Warsaw Pact area, but the figures are difficult to establish. The total Pact tank holdings are, however, materially higher than the formation totals shown in the table and are presumed to be held in stockpiles or in independent units.

well-equipped both in numbers and quality) reflect NATO's essentially defensive role and has in the past been offset to some extent by a superiority in heavy anti-tank weapons, a field in which new air- and ground-launched missiles rapidly coming into service could increasingly give more strength to the defence. NATO is indeed introducing large numbers of such weapons, but so is the Pact.

The Warsaw Pact has also built up a marked advantage in conventional artillery in Northern and Central Europe counting field, medium and heavy guns, mortars and rocke

Tables II and III summarize the present position.

A fair summary of the initial reinforcement position

launchers with formations, NATO has only some 2,700 against a Warsaw Pact total of over 10,000. In Southern Europe the position is more nearly equal, NATO having 3,500 against some 4,000 in the Warsaw Pact, though about one-third of the NATO total is in Italy.

LOGISTICS

NATO has an inflexible logistic system, based almost entirely on national supply lines with little central co-ordination. It cannot now use French territory and has many lines of communication running north to south near the area of forward deployment. Certain NATO countries are, furthermore, short of supplies for sustained combat, but non-Soviet Warsaw Pact countries may well be no better off. The Soviet logistic system has been greatly augmented in recent years, however, with the organization being improved and formations being given more support. The former NATO superiority in forward-area logistics has probably now gone, though there is some inherent advantage in operating on home territory.

AIR POWER

If NATO ground formations are to be able to exploit the nobility they possess by day as well as by night, they must have a greater degree of air cover over the battlefield than they now have. Such cover is provided by a combination of rapid warning and communications systems, fighter aircraft and air defence weapons both for defence of key areas or in the hands of forward troops. In numbers of aircraft NATO is inferior, but it has a higher proportion of multi-purpose aircraft of good performance over their full mission profiles, especially in range, payload and all-weather capability; although some inability to perform night and all-weather operations exists, considerable power can be deployed in the ground-attack role in particular. Both sides are modernizing their inventories. (The latest versions of the MiG-23/27 *Flogger*, Su-17/-20 *Fitter* and Su-19/-24

different roles; long range and payload have in the past had lower priority for the Warsaw Pact, while NATO has maintained a long-range deep-strike tactical aircraft capability. (The Soviet Union has chosen to build tactical missiles and an MRBM force which could, under certain circumstances, perform analogous missions—though not in a conventional phase of any battle.) The introduction of more advanced, longer-range Soviet aircraft now presents a much greater air defence problem for NATO, whose strike aircraft have to meet the increased air defence capability that Soviet forces have built up. The Soviet Union has always placed heavy emphasis on air defence, evident not only from the large number of interceptor aircraft in the table, but from the strength of her deployment of high-quality surface-to-air missiles and air defence artillery both in the Soviet Union and with units in the field. These defences would pose severe problems for NATO strike aircraft, drawing off much effort into defence suppression. NATO territory and forces are much less well provided with air defence, but heavy expenditure is now going into new systems of many sorts, both low- and high-level missiles and artillery and into electronic warfare equipment for aircraft.

The Warsaw Pact enjoys the advantage of interior lines of communication, which makes for ease of command and control and logistics. It has in the past had a relatively high capability to operate from dispersed natural airfields serviced by mobile systems, but the introduction of new high-performance fighters will reduce this. It does, however, have more airfields with protective shelters and the great advantage of standard ground support equipment which stems from having only Soviet-designed aircraft. These factors make for greater flexibility than NATO has, with its wide variety of aircraft and support equipment. NATO suffers from having too few airfields, which are thus liable to be crowded, and the shelter programme is still incomplete. It probably still has superiority in sophistication of electronic equipment but this technological edge is being eroded as the newer Soviet aircraft are brought in. The capability of NATO air crews (which in general have much higher training standards and fly more hours) and the versatility of its aircraft gives considerable all-weather operational strength. The introduction of AWACS and *Nimrod* AEW aircraft will give NATO an airborne control system that offers significant advantage. Since squadrons can be moved quickly, the NATO numerical inferiority shown above could be redressed if enough airfields were available. While the total tactical aircraft inventories of the two sides are not dissimilar in size, the Soviet Union keeps about a third of her force on the Chinese front.

Table V: Tactical Aircraft

Tactical Aircraft in Operational Service	Northern and Central Europe*			Southern Europe*		
	NATO	Warsaw Pact	(of which USSR)	NATO	Warsaw Pact	(of which USSR)
Fighter/ground-attack	1,602	1,350	930	612	325	70
Interceptors	386	2,050	1,000	202	1,000	400
Reconnaissance	263	550	300	106	200	125

* The area covered here is slightly wider than the one described in note c to Table I. Many aircraft have a long range capability and in any case can be redeployed very quickly. Accordingly, the figures here include the appropriate British and American aircraft in Britain, American aircraft in Spain and Soviet aircraft in the western USSR. They do not, however, include the American dual-based squadrons, which would add about 100 fighter-type aircraft to the NATO totals, nor French squadrons with perhaps another 400 fighters. Carrier-borne aircraft of the US Navy are excluded, but so are the medium bombers in the Soviet Air Force, which could operate in a tactical role, and also several hundred heavily armed helicopters which pose a considerable threat to ground forces. Overcrowding of forward airfields could prove a limiting factor in the amount of air power NATO can deploy.

Fencer are reported to have substantially improved range, payload, avionics and ECM capabilities.) The Soviet Union is producing multi-role fighters to replace the large numbers of aircraft at present used only in an air defence role, thus giving increased ground-attack capacity. Increasing numbers of fighters specifically designed for deep strike and interdiction are available. NATO is also bringing into service new fighter aircraft of many types, and the United States maintains F-15, A-10, and F-111 squadrons in Europe. US aircraft in particular can now be assumed to have available very advanced air-delivered weapons, such as laser-guided and other precision-guided munitions.

The air forces of the two sides have tended to have rather

CHANGES OVER TIME

The comparisons above begin to look rather different from those of a few years ago. The effect of small and slow changes can be marked, and the balance can alter. In 1962 the American land, sea, and air forces in Europe totalled 434,000; now the figure is around 300,000. There were 26 Soviet divisions in Eastern Europe in 1967; now there are 30 (down one from last year), and they are larger in size (despite the increase of some 25 divisions on the Chinese front over the same period). The numerical pattern over the years so far has been a gradual shift in favour of the East, with NATO relying on offsetting this by a qualitative superiority in its weapons which is now being eroded as

new Soviet equipment is introduced. While NATO has been modernizing its forces, the Warsaw Pact has been modernizing faster and expanding as well. In some areas (for example, SAM, certain armoured vehicles, and artillery) Soviet weapons are now superior, while in other fields (such as tactical aircraft) the gap in quality is being closed. The advent of new weapons systems, particularly precision-guided munitions and new anti-tank and air defence missiles, may again cut into the Warsaw Pact's advantage in tank and aircraft numbers, but in general the pattern is one of a military balance moving steadily against the West. As a result of this perception of a shifting balance, NATO set in train in 1977 a major review of defence policy.

It is still too early to say whether this Long Term Defence Programme (LTDP), which was presented to NATO heads of State in Washington in May 1978, will in fact produce the greater readiness and savings through co-operation that are called for, but the objectives were relatively limited in scope, could be attained in practice for the small increases in budgetary outlays to which most Alliance members had committed themselves up to 1980, and should serve to redress the worst of the imbalances. The ten 'task forces' addressed the following subjects:

1. Short-term readiness, including rapid outloading of ammunition and chemical protection.
2. Rapid reinforcement by US, UK, and Canadian Strategic Reserves, including the use of civil air and sea lifts and the addition of three sets of divisional equipment for US reinforcements (POMCUS) in Europe.
3. Increased reserves and improved mobilization techniques.
4. Co-operative measures (including, especially, command control and communications) at sea and national naval force increases particularly in ASW, mine-warfare, and defence against air and surface attack.
5. Air defence integration and qualitative improvement.
6. Command Control and Communications (C³).
7. Electronic warfare improvement on land, at sea, and in the air.
8. Consumer Logistics, including an improvement in war reserve stocks and greater alliance co-ordination of logistic support.
9. Rationalization of the research, development, and production of armaments in the direction of standardization and interoperability.
10. Theatre nuclear modernization.

Broadly speaking these are either in response to a specific and increasing Warsaw Pact threat—short-warning attack, increasing weight of air attack or interdiction of sea routes—or because of an awareness that NATO has for many years either been wasting a proportion of the resources allotted by the members of the Alliance to the common defence or, through failures in co-ordination, not using what there is available in the most efficient way. While some of this wastage is clearly endemic in an alliance of sovereign nations of widely different size, economic strength, and geographical disposition, it should be possible to make a more efficient use of resources. It is unlikely that LTDP can rectify all the problems or immediately eliminate any of them, but the plan, if followed through, will increase readiness and efficiency. The Task Force looking into theatre nuclear modernization resulted in the decision of December 1979 to procure and deploy 464 US cruise

missiles and 108 US *Pershing 2* MRBM in Europe. Plans exist for the cruise missiles to be deployed as follows: UK 160; Italy 108; FRG 96; Netherlands 48; Belgium 48. All the *Pershing 2* missiles will be in the FRG. Deployment should start in 1983 and be completed by 1988. The political will to improve and to modernize in general may be difficult to sustain in the face of domestic and economic difficulties besetting the alliance.

Nevertheless, in terms of the arithmetic of the East-West balance, strong and well-equipped reserve forces capable of rapid mobilization and movement into battle positions could do much to offset imbalances. US plans to increase the number of divisional stockpiles in Europe, together with an extensive overhaul of air transport resources, should give US forces in Europe the capability of moving five divisions in ten days (together with sixty tactical air squadrons) as against a current figure of only one division in that time and forty squadrons.

SUMMARY

It will be clear from the foregoing analysis that a balance between NATO and the Warsaw Pact based on comparison of manpower, combat units, or equipment is an extraordinarily complex one, acutely difficult to analyse. In the first place, the Pact has superiority by some measures and NATO by others, and there is no fully satisfactory way to compare these asymmetrical advantages. Secondly, qualitative factors that cannot be reduced to numbers (such as training, morale, leadership, tactical initiative, and geographical positions) could prove dominant in warfare. However three observations can be made by way of a summary:

First, the overall balance is still such as to make military aggression appear unattractive. NATO defences are of such a size and quality that any attempt to breach them would require a major attack. The consequences for an attacker would be incalculable, and the risks, including that of nuclear escalation, must impose caution. Nor can the theatre be seen in isolation: the central strategic balance and the maritime forces (not least because they are concerned to keep open sea lanes for reinforcements and supplies, and because of their obvious role in the North and in the Mediterranean) play a vital part in the equation as well.

Second, NATO has emphasized quality, particularly in equipment and training, to offset numbers, but this is now being matched. New technology has strengthened the defence, but it is increasingly expensive. If defence budgets in the West are maintained no higher than their present level and manpower costs continue to rise, the Warsaw Pact may be able to buy more of the new systems than NATO. Soviet spending has been increasing steadily, in real terms, for many years. Furthermore, technology cannot be counted on to offset numerical advantages entirely.

Third, while effective deterrence can be said to exist, there are some disturbing trends. The Warsaw Pact, in making a gesture of unilaterally reducing conventional forces, clearly expects some NATO reciprocation. NATO, already perceiving Warsaw Pact conventional superiority, was initially unimpressed. Conscious also of the growing Soviet long-range theatre nuclear capability, NATO is attempting to counter by introducing new theatre nuclear systems. It remains to be seen whether arms-control negotiations can be started to limit the numbers of these theatre nuclear weapons.

The Balance of Theatre Nuclear Forces in Europe

Much interest continues to be expressed in the balance of theatre nuclear forces (TNF) in Europe. We therefore give a Table setting out for each side the inventory of systems available, the number of warheads assumed to be available (based on assumptions about utilization, payload, and serviceability) and an assessment of the proportion of these warheads that might be expected to arrive on target in a retaliatory second strike. We have deliberately excluded battlefield systems from the analysis, *i.e.*, those with ranges under 160 km (100 statute miles). The method used is primarily numerical and multiplicative, and the numbers derived may imply a degree of precision which is unwarranted—and indeed is greater than the intended, given the rather broad judgments made.

Calculations leading to a quantitative assessment of the number of nuclear systems available to NATO and the Warsaw Pact are very sensitive to whatever assumptions are made about how nuclear weapon systems are allocated (as between strategic and theatre tasks) and how they are targeted (as between counter-maritime and counter-land mission). In this analysis all systems whose *primary* assigned missions are against maritime targets are excluded. One of the most sensitive targeting variables is the number of bombs or stand-off missiles carried by an aircraft (force landing). Authorities are very unlikely to assign several targets to a single aircraft on one mission (at least where air defences are likely to be encountered), and therefore *maximum* bomb-load is not always a useful figure. Only where a true stand-off ASM capability is available—as is the case with the Tu-22M *Backfire*—can any aircraft be expected to attack more than two targets in one sortie. Clearly this is a matter of operational judgment, and the force-loadings could be increased substantially above those in the tables if one takes account of what the aircraft available *could* carry.

Greater difficulty arises over 'strategic' systems—*i.e.*, those which are already considered to form part of SALT totals and are sometimes called 'central' systems. This assessment includes—as a separate category—American SALT-counted *Poseidon* warheads known to be allocated to SACEUR for planning purposes. On the other hand, it excludes all Soviet 'central' systems, despite the fact that

some earlier Soviet ICBM (specifically a number of SS-11 missiles in IRBM fields) were probably allocated not to the continental USA but to European targets, and that SS-17 and SS-18 ICBM could be targeted on Europe. The reasons for this exclusion are twofold; first, there seems little reason for the USSR to divert strategic systems to the theatre role now that she has introduced large numbers of SS-20 IRBM which appear to be perfectly capable of performing the theatre mission; and, second, there is no way to be sure of the aim points of Soviet ICBM or to make allowances for retargeting. Generally, therefore, it seems appropriate to



Test-firing of the US Army's medium-range Pershing missile, nuclear armed and first deployed in 1962.

exclude strategic (i.e., SALT-counted) systems, except where we are confident that they have been given a theatre mission—though it must be stressed that many long-range systems on both sides *could* be used against theatre targets. It may also be true that the SLBM aboard Soviet *Yankee*-class SSBN (also SALT-counted) could be targeted against the European land-mass while the boats are on transit to their firing stations off the US coasts; but, again, there is no way of substantiating such claims.

French systems are included on the NATO side, on the grounds that, although not assigned to NATO, they are 'Western' assets, and the Soviet Union would have to calculate that French forces would be used in a general conflict in Europe. However, there would necessarily be some loss of effectiveness, due to the exclusion of French forces from NATO target planning and the consequent danger of overlap in this area.

A further question is to determine the point of mobilization at which the balance is calculated. This assumes that there has been some prior warning to allow both sides to decrease the vulnerability of nuclear systems by some dispersal. Clearly, both sides would be able to bring additional forces to bear over time, or to switch resources to the European theatre, and this could substantially affect the figure assessed here for both utilization and inventory. However, this introduces a dynamic element which would not only complicate the picture but would also be very sensitive to assumptions made about priorities. A figure for serviceability is included and a calculation made to give an approximate figure for the number of warheads available.

But numbers alone cannot adequately portray the balance. This assessment moves beyond crude assessments of numbers and looks at the *value* of the available systems on each side, combining qualitative judgments in a multiplicative way. Survivability, reliability, and the ability to penetrate defences are each assessed (out of a highest possible score of 1.0) and the number of available warheads for each system is then multiplied by each of three factors of quality. It should be noted that some asymmetry of air defences has been taken into account, on the grounds that NATO depends upon a rather narrow belt of such defences, whereas the Warsaw Pact deploys a dense defence in considerable depth.

The Table gives a count for the *number of arriving warheads* for each system. Consideration was again given to including as factors age, accuracy, and flexibility, but it is concluded that they cannot easily be incorporated into this kind of mathematical model. However, age is to some extent taken into account in judgments about the other degrading factors—older systems score less well in reliability and usually (at least in the case of aircraft) in penetration. This study does not take account of the value of being able rapidly to retarget a system, nor of that of accuracy. In general, given the variety of systems and yields available to both sides, accuracy probably matters little: each has systems appropriate for area targets and for point targets.

Finally there is the question of range. The inclusion of all systems with more than 160 km range indicates a rough separation of the immediate battlefield from the larger theatre. A further distinction is sometimes made between short- and long-range theatre nuclear systems, with 1,000 km (540 nautical miles) as the dividing line. Ranges are given for the systems included here, but they are not used to assess the overall utility of the systems. One can divide

the balance into appropriate range bands, but it is misleading to concentrate on narrow comparisons. Each side has a particular doctrinal preference and will tend to procure a mix of weapon systems appropriate to its own doctrine, so there is no reason why either side would automatically wish its inventory to balance the other's in every category. Only if one side manifestly lacks the capability to do what it sets out to do will it need to procure new systems.

This form of analysis implies a focus not on first-strike capability but on retaliatory capability for deterrence through assured second-strike. In the context of other scenarios the balance would look different; clearly, relative survivability, for example, is not relevant if the sides are assessed for their first-strike potential only. Also, the analysis gives a *static* count, since it takes account of neither reloads nor the progressive attrition of either systems or defences over time. Nor is it possible to consider the effectiveness of the inventories in scenarios of repeated limited exchanges, where command control communications and intelligence (C³I), the flexibility of systems, accuracy, and targeting doctrine would play a large part in determining the outcome of conflict. Nevertheless, it is of considerable political and military importance to be able to make a judgment about the balance and utility of the TNF available to both sides in the context of a second strike under conditions of very limited warning, and this is what the assessment in this table seeks to do.

CONCLUSIONS

Comparison of the two halves of the Table shows that, if *Poseidon* is excluded from the calculations, the Warsaw Pact relies more heavily on the missile element of its theatre nuclear system (66% of arriving warheads) than NATO (55%); but if *Poseidon* is included, the NATO percentage rises to 78%. It is also significant that the Warsaw Pact's aircraft appear to be better able to survive and penetrate to their targets than NATO's, as shown by the judgment that 29% of Pact air-delivered weapons are expected to survive and arrive at their targets, against 23% for NATO. This reflects the facts that Soviet aircraft are generally newer than NATO's and that Soviet air defences are somewhat denser.

Without the inclusion of *Poseidon* on the NATO side, the Warsaw Pact overall advantage in *arriving warheads* is about 3.1:1; with *Poseidon*, the advantage falls to about 1.5:1. The trend to which we first pointed last year has become more pronounced. The new method of analysis used and the new information which has become available confirm the conclusion that the Warsaw Pact has an advantage which will become more pronounced in the next few years, as Soviet programmes continue. Not until NATO begins to deploy new long-range systems in about 1983-4 can any substantial increase in its capability be expected.

If it were considered appropriate—for arms-control purposes only—to separate systems with ranges of over 1,000 km from those of shorter range, the total of NATO longer-range systems *on the basis of warheads available* is 322, without *Poseidon* (as being SALT-counted), against 1,094 for the Warsaw Pact. It is clearly inappropriate, in the context of arms control, to carry the comparison through to include an assessment of qualitative factors, and so to reach a conclusion as to the number of warheads arriving on target. ■

Long- and Medium-range Nuclear Systems for the European Theatre

Category and type	Range/ combat radius ^a	First deployment ^b	Inventory ^c	Factors			Warheads available (approx.) ^d	Indices			Arriving warheads (approx.) ^e	Operating countries and notes
				Warheads per system	Utilization ^f	Serviceability		Survivability ^g	Reliability ^h	Penetration ⁱ		
WARSAW PACT												
(USSR unless noted)												
IRBM	(nm/km)											
SS-20	2,700/5,000	1977 ¹	160	3	0.66 ^l	0.9	285	0.9	0.8	1.0	205	MIRV (? 1 reload per system)
SS-5 <i>Skean</i>	2,200/4,100	1961	60	1	0.9 ^m	0.75	40	0.6	0.7	1.0	17	
MRBM												
SS-4 <i>Sandal</i>	1,000/1,900	1959	380	1	1.0	0.7	280	0.5	0.65	1.0	91	
SRBM												
SS-12 <i>Scaleboard</i>	490/900	1969	650	1	0.75	0.8	390	0.7	0.75	1.0	205	
<i>Scud B</i>	160/300	1965										
<i>Scud B</i>	160/300	1965										
SLBM												
SS-N-5 <i>Serb</i>	600/1,120	1964	60	1	1.0 ^l	0.45 ^m	27	0.8	0.6	1.0	13	On 13 G-II, 7 H-II subs
SS-N-4 <i>Sark</i>	200/480	1961	9	1	1.0 ^l	0.45 ^m	4	0.7	0.6	1.0	2	On 3 G-I subs
Ballistic missile sub-totals			1,337			1,040			540 (52% of available warheads)			
Aircraft												
	(km)											
Tu-22M/-26 <i>Backfire</i>	4,025	1974	75	4 ^{no}	0.4	0.8	96	0.7	0.85	0.7	40	
Tu-16 <i>Badger</i>	2,800	1955	318	2 ^o	0.4	0.7	178	0.7	0.75	0.5	47	
Tu-22 <i>Blinder</i>	3,100	1962	125	2 ^o	0.4	0.7	70	0.7	0.8	0.55	22	
Su-24 (Su-19) <i>Fencer</i>	1,600	1974	370	2	0.2	0.8	118	0.55	0.8	0.65	34	
MiG-23/-27	720	1971	1,300	1	0.2	0.8	208	0.6	0.8	0.65	65	
<i>Flogger B/D</i>												
Su-17 <i>Fitter C/D</i>	600	1974	640	1	0.2	0.8	102	0.55	0.8	0.65	29	
Su-7 <i>Fitter A</i>	600	1959	165	1	0.2	0.7	23	0.5	0.7	0.5	4	
MiG-21 <i>Fishbed L/N</i>	400	1970	1,000	1	0.2	0.8	160	0.5	0.8	0.6	38	
Air-delivered weapon sub-totals			3,993			955			279 (29% of available weapons)			
Warsaw Pact totals			5,330			1,995			819			
NATO												
IRBM	(nm/km)											
SSBS S-2/-3	1,600/3,000	1971/80	18	1	1.0	0.9	16	0.6	0.8	1.0	8	France. 9 S-3 in place
SRBM												
<i>Pershing 1A</i>	390/720	1962	180	1	1.0	0.9	162	0.7	0.8	1.0	91	US, FRG
SLBM												
<i>Polaris A3</i>	2,500/4,600	1967	64	1 ^p	1.0	0.45 ^m	28	0.9	0.8	1.0	20	Britain. MRV; MARV (<i>Chevaline</i>) entering service
MSBS M-20	1,600/3,000	1977	80	1	1.0	0.45 ^m	36	0.9	0.8	1.0	26	France
Ballistic missile sub-totals			342			242			145 (60% of available warheads)			
Land-based aircraft												
	(km)											
<i>Vulcan B-2</i>	2,800	1960	57	2	1.0	0.7	79	0.6	0.8	0.5	19	Britain. Incl octu ac
F-111E/F	1,900	1967	156 ^o	2	0.5	0.8	125	0.6	0.8	0.75	45	US ac in Europe
Mirage IVA	1,600	1964	33	1	1.0	0.7	23	0.6	0.8	0.5	6	France
<i>Buccaneer</i>	950	1962	60	2	0.5	0.7	42	0.6	0.8	0.5	10	Britain. Some ac are grounded
F-104	800	1958	318	1	0.3	0.7	67	0.4	0.8	0.3	6	Belgium, FRG, Greece, Italy, Netherlands, Turkey
F-4	750	1962	40	1	0.3	0.8	10	0.4	0.8	0.55	2	Turkey
F-4	750	1962	324	1	0.3	0.8	78	0.4	0.8	0.55	14	US Europe-/dual-based ac
<i>Jaguar</i>	720	1974	80 ^r	1	0.5	0.8	32	0.4	0.8	0.6	6	Britain, France
<i>Mirage IIIE</i>	600	1964	30	1	0.5	0.8	12	0.4	0.8	0.45	2	France
Carrier-based aircraft	(nm/km)											
A-6E	540/1,000	1963	20 ^r	2	0.5	0.8	16	0.5	0.8	0.6	4	US
A-7E	480/900	1966	40 ^r	2	0.5	0.8	32	0.5	0.8	0.4	6	US
<i>Super Etendard</i>	300/560	1980	12 ^r	2	0.5	0.8	10	0.5	0.8	0.5	2	French
Air-delivered weapon sub-totals			1,170			526			122 (23.2% of available weapons)			
NATO totals (excluding <i>Poseldon</i>)			1,512			768			267			
US Central SLBM												
<i>Poseldon C-3</i>	2,400/4,500	1971					400 ⁿ	0.9	0.8	1.0	288	
NATO totals (including <i>Poseldon</i>)						1,168			555			

^a Range given (in nautical miles and kilometres) for missiles. For aircraft, average combat radius in kilometres is given, assuming high-level transit, low-level penetration of air defences and average payload, unrefuelled.

^b Production runs will continue for up to 10 years from first in-service date.

^c Total nuclear-capable systems available.

^d Approx. percentage thought likely to be allocated to nuclear role. For USSR, assumes about 25% generally deployed in East (except where noted) and some 50% of bbs and some 25% of FGA ac retained in nuclear role.

^e Given by: Inventory × Warheads × Utilization × Serviceability.

^f Survivability is a function of weapon system characteristics, tactics and location in relation to attacking force.

^g Estimated likelihood of system functioning as planned after launch.

^h Dependent on effectiveness of defence against specific system and ECM fit. For NATO, assumes Moscow ABM defences not targeted or after ABM suppression.

ⁱ Given by: Warheads available × Survivability × Reliability × Penetration.

Assumes 33% in W. USSR, 33% in 'swing-zone' threatening NATO and Far East.

ⁿ Assumes almost all SS-5s in Western USSR.

^o All assumed in Western Sea Areas (primarily Baltic). H-II SSBN SALT-counted.

^p Takes account of approximate submarine refit time and missile serviceability.

^q Some authorities give 3 as average warhead loading.

^r ASM could be carried instead of free-fall bombs, and this would improve the penetration figure substantially.

^s MRV counts as one regardless of dispersal pattern (warheads not separately targetable).

^t F-111E/F could be reinforced by F-111D (not SALT-counted and might be assumed available to reinforce Europe), but these are not available on day-to-day alert. FB-111A not assumed available for theatre use.

^u Only 80 nuclear-capable aircraft in Anglo-French inventory of 219. Half of these assumed retained for nuclear role.

^v Assumes 2 carriers in US 6th Fleet (Mediterranean); temporary redeployment not allowed for. Half strike inventory retained for nuclear role against land targets.

^w Assumes one out of two French carriers in range. Converting from *Etendard IVM*.

^x Figure assumed to be available to SACEUR for NATO targeting. SALT-counted systems.

THE MILITARY BALANCE 1980/81

Tables of Comparative Strengths

1. Nuclear Delivery Vehicles: Comparative Strengths and Characteristics (A) United States and Soviet Union

(1) Missiles and Artillery

Category* and type	United States					Category* and type†	Soviet Union				
	Number Deployed (7/80)	First deployment	Max. range* (nm/km)	Throw-weight (000 lb)†	Warheads, max. yield* and notes		Number deployed (7/80)	First deployment	Max. range* (nm/km)	Throw-weight (000 lb)†	Warheads, max. yield* and notes
Land-based ICBM <i>Titan II</i> <i>Minuteman II</i> <i>Minuteman III</i>	54 450 550	1962 1966 1970	(nm/km) 8,100/15,000 6,100/11,300 7,000/13,000	7.5 1-1.5 1.5-2	1 x 9 MT, General Electric Mk 6. 1 x 1-2 MT, Avco Type 11B/C. 3 x 170-200 KT (MIRV), GE Mk 12.	Land-based ICBM <i>SS-9 Starg</i> <i>SS-11 Sego</i> <i>SS-13 Savage</i> <i>SS-17</i> <i>SS-18</i> <i>SS-19 Mod 1</i> <i>Mod 2</i>	— 1965 1966 1968 1975 1975 1975 1975 { 1975 n.a. }	(nm/km) 6,500/12,000 5,700/10,500 5,400/10,000 5,400/10,000 { 5,700/10,500 5,000/9,300 5,700/10,500 6,000/11,000 5,500/10,200 }	12-15 1.5-2 1 6 n.a. n.a. 7	Mod 1: 1 x 18 MT. Mod 2: 1 x 25 MT. Mod 3: experimental rocs. Mod 4: 3 x 4-5 MT (MIRV). Believed withdrawn. Mod 1: 1 x 1-2 MT. Mod 3 (has replaced some Mod 1): 3 x 100-300 KT (MIRV). 1 x 1 MT. Mod 1: 4 x 900 KT (MIRV). Mod 2: 1 x 5 MT operational. SS-17 has replaced some SS-11, using modified SS-11 silos. Mod 1: 1 x 18-25 MT. Mod 2: 8 x 2 MT (MIRV). Mod 3: 1 warhead, CEP about 600ft. { 6 x 350 KT (MIRV), in modified 1 x 5 MT. (tested). } SS-11 silos.	
I/IRBM						I/IRBM <i>SS-4 Scudal</i> <i>SS-5 Skean</i> <i>SS-20</i>	380 60 160	1959 1961 1977	1,000/1,900 2,200/4,100 2,700/5,000	n.a. n.a. 1.2	1 x 1 MT. Now being withdrawn. 1 x 1 MT. 3 x 150 KT (MIRV). Tested to longer ranges with 4 lower-yield warheads.
SRBM (tactical) <i>Perishing</i> <i>Lance</i>	108* 36*	1962 1972	(km) 160-720 70-110	n.a. n.a.	Dual-capable, 1 x high KT range. Conventional warheads under development. Dual-capable, 1 x low KT range; Conventional warheads under development.	SRBM (tactical) <i>SS-1b Scud A</i> <i>SS-1c Scud B</i> <i>FROG 7</i> <i>SS-12 Scaleboard</i> <i>SS-21</i> <i>SS-22</i> <i>SS-23</i>	1,300	{ 1957 1965 1965 1969 1978 1979 1979-80 }	(km) 150 160-300 16-70 490-900 65-120 540-1,000 190-350	n.a. n.a. n.a. n.a. n.a. n.a. n.a.	1 x KT range. Being replaced by SS-22. 1 x KT range. Being replaced by SS-21. 1 x MT range. Being replaced by SS-23. n.a. n.a. n.a.
GLCM						GLCM <i>SS-N-3 Shaddock</i>	(100)	1962	(nm/km) 240/450	n.a.	1 x KT range. (Naval version. Land-based data may differ.)
Sea-launched SLBM <i>Polaris A3</i> <i>Poseidon C3</i> <i>Trident C4</i>	160 448 48	1964 1971 1980	(nm/km) 2,500/4,600 2,500/4,600 4,000/7,400	1 2 3+	3 x 200 KT (MIRV) Lockheed Mk 2. 10 x 50 KT (MIRV) or 14 x MV over reduced range. 8 x 100 KT (MIRV)	Sea-launched SLBM <i>SS-N-4 Sark</i> <i>SS-N-5 Serb</i> <i>SS-N-6 Sawfly</i> <i>Mod 1, 2</i> <i>Mod 3</i> <i>SS-N-8</i> <i>SS-NX-17</i> <i>SS-N-18</i> <i>SLCM</i> <i>SS-N-3 Shaddock</i> <i>SS-N-7 Siren</i> <i>SS-N-9</i> <i>SS-N-12</i>	(9) 60 469 302 12 160 342 120 118 48	1961 1964 1969 1972 1977 1978 1962 1968 1968/9 1979	200/480 600/1,120 { 1,300/2,400 1,600/3,000 4,300/8,000 2,700/5,000 }	n.a. n.a. 1.5 1.5 3 5 n.a. n.a. n.a. n.a. { 550/1,000 2,000/3,700 }	1 x 1-2 MT (withdrawn, not yet reported scrapped). 1 x 1-2 MT. { 1 x 1-2 MT tested. 2 x 3 x KT range (MIRV). 1 x 1-2 MT. 1 x MT; also tested with MIRV. May be solid-fuel successor to SS-N-6. 3 x 1-2 MT (MIRV). Solid-fuel successor to SS-N-8. 1 x KT range. May be being replaced by longer-range SS-N-12. n.a. n.a. n.a. 2 warheads.
Air-launched ALCM <i>Hound Dog</i> <i>ALBM SRAM</i>	(400) 1,250	1961 1972	(km) 965 55-160	n.a. n.a.	1 x KT range. Carried on B-52. Service status unclear. 1 x KT range. Carried on B-52 (20), FB-111A (6).	Air-launched ALCM <i>AS-3 Kangaroo</i> <i>AS-4 Kitchen</i> <i>AS-6 Kingfish</i>	n.a. (800) n.a.	1961 1962 1977	(km) 600 700 250	n.a. n.a. n.a.	1 x MT range. 1 x KT range. 1 x KT range.
Artillery M-109 203mm SP how M-109 155mm SP	215 300	1962 1964	(km) 29 14	— —	Dual-capable, 1 x KT range. Dual-capable, 1 x 2 KT.	Artillery S-23 180mm towed gun	n.a.	1950/55	30	—	Dual-capable, 1 x KT range.

(H) Aircraft*

Category* and type	United States				Soviet Union						
	Number deployed (7/80)	First deployment	Max. range [†]	Max. speed (Mach)	Weapons load (000 lb)	Category* and type [†]	Number deployed (7/80)	First deployment	Max. range [†]	Max. speed (Mach)	Weapons load (000 lb)
Bombers			(nm/km)						(nm/km)		
<i>Long-range</i>						<i>Long-range</i>					
B-52D	75 [†]	1956	5,300/9,900	0.95	60	Tu-95 Bear	113	1956	6,900/12,800	0.78	40
B-52G	151 [†]	1959	6,500/12,000	0.95	70	Mya-4 Bison	41*	1956	6,000/11,200	0.87	20
B-52H	90 [†]	1962	8,600/16,000	0.95	70						
<i>Medium-range</i>						<i>Medium-range*</i>					
FB-111A	65	1969	2,540/4,700	2.5	37.5	Tu-16 Badger	56 [†]	1955	3,500/6,500	0.8	20
						Tu-22 Blinder	165 [†]	1962	1,200/2,250	1.5	12
						Tu-22M-26 Backfire*	145 [†]	1974	4,350/8,000	2.5	17.5
Strike aircraft			(km)			Strike aircraft			(km)		
<i>Land-based (incl short range bombers)</i>						<i>Land-based</i>					
F-4C/D/E	204*	1962	2,250	2.4	16	Su-7 Fitter A	165	1959	1,400	1.7	5.5
F-111A/E	156*	1967	4,700	2.2/2.5	28	MiG-21 Fishbed J/K/L/N	1,000	1970	1,100	2.2	2
						MiG-27 Flogger D	400	1971	1,800	1.7	7.5
						Su-17/20 Fitter C/D	640	1974	1,800	1.6	11
						Su-19/24 Fencer	370	1974	1,600	2.3	8
<i>Carrier-based</i>			(nm/km)								
F-4J/N	144*	1962	1,200/2,250	2.2	16						
A-6E	110*	1963	1,700/3,200	0.9	18						
A-7E	(100)*	1966	1,500/2,800	0.9	20						

(iii) Historical Changes in Launcher Strength (incl trg ac but not reserves)

	United States											Soviet Union										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
ICBM	1,054	1,054	1,054	1,054	1,054	1,054	1,054	1,054	1,054	1,054	1,054	1,513	1,527	1,527	1,575	1,618	1,527	1,477	1,350	1,400	1,398	1,398
SLBM	656	656	656	656	656	656	656	656	656	656	656	304	448	500	628	720	784	845	909	1,028	1,028	1,028
Long-range bombers	400	360	390	397	397	397	387	373	366	365	338	140	140	140	140	140	135	135	135	135	156	156

(B) Other NATO and Warsaw Pact Countries

(i) Missiles and Artillery

Category* and type*	NATO (excluding USA)					Warsaw Pact (excluding USSR)					
	Number deployed (7/80)	First deployment	Max. range [†]	Warheads and max. yield [†]	Countries equipped	Category and type*	Number deployed (7/80)	First deployment	Max. range [†]	Warheads and max. yield [†]	Countries equipped
Land-based			(nm/km)			Land based			(km)		
<i>IRBM</i>						<i>SSBM</i>					
SSBS S-2/-3	18	1971/1980	1,600/3,000	1 x 150 kt	France	SS-1b Scud A	(163)	1957	130	Dual-capable, 1 x kt range	All* Not now in frontline service.
<i>SRBM</i>						SS-1c Scud B	(163)	1965	270	Dual-capable, 1 x kt range	All*
Honest John	(91)	1953	40	Dual-capable, 1 x kt range	Frg, Greece, Netherlands, Turkey,*	KV-3 Scud C	(208)	mid-70s	450	n.a.	n.a.*
Parshing	72	1962	720	1 x kt range	Frg,*	FROG-3/-7	(208)	1957-65	40-60	Dual-capable, 1 x kt range.	All* FROG-3 obsolescent.
Pluton	30	1974	120	1 x 15-25 kt	France						
Lance	(54)	1976	110	1 x kt range	Belgium, Britain, Frg, Italy, Netherlands.						
Sea-launched			(nm/km)			Sea-launched					
<i>SLBM</i>											
Polaris A3	64	1967	2,500/4,600	3 x 200 kt (MRV)	Britain (being fitted with Chevaline warhead).						
MSBS M-20	80	1977	1,600/3,000	1 x MR	France						
Artillery			(km)			Artillery					
M-110 203mm sp how	n.a.	1962	16	Dual-capable, 1 x kt range	Belgium, Britain, Denmark, Frg, Greece, Italy, Netherlands, Turkey,*						
M-109 155mm sp how	n.a.	1964	16	Dual-capable, 1 x 2 kt range.	Belgium, Britain, Canada, Denmark, Frg, Greece, Italy, Netherlands, Norway, Turkey.**						

(ii) Aircraft

Category* and type*	NATO (excluding USA)					Warsaw Pact (excluding USSR)							
	Number deployed (7/80)	First deployment	Max. range [†]	Max. Speed (Mach)	Weapons load (000 lb)	Countries equipped	Category and Type [†]	Number deployed (7/80)	First deployment	Max. range [†] (km)	Max. Speed (Mach)	Weapons load (000 lb)	Countries equipped
Bombers			(nm/km)				Bombers						
<i>Medium-range</i>							<i>Strike aircraft</i>						
Vulcan B2	48	1960	3,500/6,400	0.95	21	Britain	<i>Land-based*</i>						
							Su-7 Fitter A	115	1959	1,400	1.7	5.5	Czechoslovakia, Poland.*
Strike aircraft			(km)				Su-20 Fitter C	35	1974	1,800	1.6	4.0	Poland.*
<i>Land-based*</i>													
F-104	318	1958	2,400	2.2	4	Belgium, Frg, Greece, Italy, Netherlands, Norway, Turkey.							
F-4	180	1962	2,200	2.4	16	Frg, Greece, Turkey.							
Buccaneer	60	1962	3,700	0.95	12	Britain.							
Mirage IVA	33	1964	3,200	2.2	16	France.							
Mirage IIIE	30	1964	2,400	1.8	19	France.							
Jaguar	80	1974	1,600	1.4	10	Britain, France.							
<i>Carrier-based</i>			(nm/km)										
Super Etendard	36	1980	800/1,500	1.0	16	France.							

* ICBM = range of over 3,500nm/6,400km; IRBM = 1,300nm/2,400km-3,500nm/6,400km; SRBM = 430nm/800km-1,300nm/2,400km; SSBM = under 430nm/800km.
[†] Ranges given in nautical miles and/or km (instead of statute miles, as in previous editions of *The Military Balance*). Use of maximum payload may reduce operational range by up to 25% of figures shown.
[‡] Throw-weight is the weight of post-boost vehicle (warheads, guidance systems, penetration aids) deliverable over a given range. At maximum range, throw-weight will be less than shown.
[§] Warhead yields vary greatly; figures given are estimated maxima. kt range = under 1 mt; MR range = over 1 mt. Yield figures for dual-capable weapons (which can deliver

conventional or nuclear warheads) refer to nuclear warheads only.
[¶] Figures for systems in Europe only.
^{**} Names of Soviet missiles and aircraft (e.g. *Scuds*, *Bears*) are of NATO origin. Numerical designations of Soviet missiles that not aircraft are of US origin.
^{††} All the types listed are dual-capable, but some in the strike categories are not presently configured for the nuclear role.
^{†††} Long-range = over 5,200nm/9,000km; medium-range = 3,000nm/5,600km-5,200nm/9,000km; short-range = aircraft primarily designed for bombing missions.
^{††††} Theoretical maximum range at optimum altitude and speed. Higher speeds, lower altitudes and full weapons

loads reduce range, especially with strike ac; for instance an A-6, at operational height and speed and with typical weapons load, has a combat radius of some 800nm/1,500km, compared with a maximum ferry range of 2,500nm/4,700km.
^{†††††} Excluding ac in storage or reserve.
^{††††††} Excluding some 35 configured as tankers.
^{†††††††} Including Naval Air Force bombers (some 280 Tu-16, 40 Tu-22, 70 Tu-22M/26).
^{††††††††} Listed as a medium-range bomber on the basis of reported range characteristics.
^{†††††††††} All NATO missiles of American origin, except SSBS, Pluton and MSBS (French). All Warsaw Pact vehicles of Soviet origin.

* Nuclear warheads held in American custody. No nuclear warheads held on Danish or Norwegian soil.
[†] In few cases is the M-109 likely to have a nuclear role.
[‡] Nuclear warheads held in Soviet custody.
[§] All ac listed are dual-capable, but many would be more likely to carry conventional than nuclear weapons. Certain other strike aircraft may also be capable of carrying tactical nuclear weapons.
[¶] *Vulcan* and *Invictor* of British origin; F-104 and F-4 American; *Mirage*, *Jaguar*, *Anglo-French*. All Warsaw Pact aircraft of Soviet origin.
^{**} It is uncertain how many are nuclear-capable.

2. Indices of NATO Defence Expenditure, Current and Constant Prices^a
(in local currency, 1970 = 100)

Country	1960	1974	1975	1976	1977	1978	1979 (provisional)	% Growth ^b	
								1960-70	1970-8
Belgium	53.9	153.0	186.5	217.8	239.3	264.8	290.7	6.4	12.9
	<i>72.5</i>	<i>115.4</i>	<i>124.7</i>	<i>133.4</i>	<i>136.4</i>	<i>144.9</i>	<i>152.3</i>	3.3	4.8
Britain	67.7	172.1	211.3	250.9	279.1	306.5	365.3	4.0	15.0
	<i>100.6</i>	<i>115.9</i>	<i>114.6</i>	<i>116.8</i>	<i>112.1</i>	<i>113.7</i>	<i>123.8</i>	0	1.7
Canada	80.3	138.9	151.7	174.1	200.1	223.0	229.6	2.2	10.6
	<i>105.3</i>	<i>108.0</i>	<i>106.6</i>	<i>113.6</i>	<i>121.1</i>	<i>123.9</i>	<i>116.8</i>	-0.5	2.7
Denmark	40.4	161.0	191.3	206.0	230.1	258.8	309.0	9.5	12.6
	<i>71.4</i>	<i>113.2</i>	<i>122.9</i>	<i>121.3</i>	<i>122.1</i>	<i>124.7</i>	<i>135.9</i>	3.4	2.8
France	57.7	147.4	171.3	195.6	225.1	255.3	288.4	5.6	12.4
	<i>85.7</i>	<i>108.1</i>	<i>112.5</i>	<i>117.2</i>	<i>123.7</i>	<i>128.4</i>	<i>132.8</i>	1.6	3.2
Germany	53.7	157.9	166.5	172.4	178.0	188.7	198.9	6.4	8.3
	<i>70.2</i>	<i>124.2</i>	<i>123.6</i>	<i>122.4</i>	<i>121.7</i>	<i>125.8</i>	<i>126.9</i>	3.6	2.9
Greece	36.0	169.8	309.1	291.9 ^c	346.1 ^c	392.7 ^c	n.a.	10.8	18.7
	<i>44.2</i>	<i>108.1</i>	<i>172.6</i>	<i>144.1^c</i>	<i>152.1^c</i>	<i>163.3^c</i>	n.a.	8.5	5.5
Italy	45.5	182.6	198.7	231.0	290.2	324.4	368.5	8.2	15.9
	<i>67.0</i>	<i>124.8</i>	<i>116.7</i>	<i>115.8</i>	<i>124.1</i>	<i>127.5</i>	<i>126.2</i>	4.1	3.1
Luxembourg	63.2	170.7	201.0	236.3	247.4	278.8	296.9	4.7	13.7
	<i>81.5</i>	<i>133.5</i>	<i>141.8</i>	<i>131.9</i>	<i>148.9</i>	<i>162.8</i>	<i>165.8</i>	2.1	6.3
Netherlands	43.5	161.9	182.6	197.0	233.4	236.1	253.4	8.7	11.3
	<i>65.6</i>	<i>117.9</i>	<i>120.7</i>	<i>119.7</i>	<i>133.2</i>	<i>129.5</i>	<i>133.4</i>	4.3	3.3
Norway	38.1	142.0	171.0	192.2	213.9	243.5	262.7	10.1	11.8
	<i>59.2</i>	<i>106.0</i>	<i>115.0</i>	<i>117.8</i>	<i>120.1</i>	<i>126.6</i>	<i>130.3</i>	5.4	3.0
Portugal	24.1	200.3	158.0	150.3	176.1	208.3	287.3	15.3	9.6
	<i>37.3</i>	<i>114.4</i>	<i>78.6</i>	<i>61.5</i>	<i>58.2</i>	<i>60.9</i>	<i>68.6</i>	10.4	-4.3
Turkey	38.6	253.8	271.4 ^c	427.3 ^c	681.4 ^c	811.6 ^c	n.a.	10.0	29.9
	<i>68.4</i>	<i>147.0</i>	<i>131.9^c</i>	<i>177.3^c</i>	<i>222.0^c</i>	<i>182.3^c</i>	n.a.	3.9	7.9
United States	58.3	110.3	116.8	116.9	129.6	135.0	141.0	5.5	3.8
	<i>76.5</i>	<i>86.9</i>	<i>84.3</i>	<i>79.7</i>	<i>83.0</i>	<i>80.4</i>	<i>81.5</i>	2.7	-2.2

^a Constant price series defence expenditures (in italics) are deflated by consumer price indices. These reflect general (not defence sector) rates of inflation.

^b Average annual compound growth rates.

^c Based on national, not NATO, definitions of defence expenditure.

3. Average Strength of Military Formations (in thousands)

	Division					Brigade				Squadron
	Armoured		Mechanized		Airborne	Armoured		Mechanized		Fighter aircraft
	Men	Tanks	Men	Tanks	Men	Men	Tanks	Men	Tanks	
United States	18,900	324	18,500	216	16,500	4,500	108	4,800	54	18-24
Soviet Union	11,000	335 ^a	14,000	266 ^a	7,000	1,300 ^b	95 ^b	2,300 ^b	40 ^b	12-15
China	9,200	270	12,700 ^c	30 ^c	9,000	1,200 ^b	90 ^b	2,000	—	9-10
Britain ^d	8,500	148	—	—	—	—	—	—	—	8-15
Germany	17,000	300	17,500	250	8-9,000	4,500 ^e	110	5,000 ^e	54	15-21
India	15,000	200	17,500 ^c	—	—	6,000	150	4,500	—	12-20
Israel	—	—	—	—	—	3,500	80-100	3,500	36-40	15-20
Egypt	11,000	300	12,000	190	—	3,500	96	3,500	36	10-12

^a These tank strengths are for Soviet divisions in Eastern Europe; other Soviet divisions have fewer.

^b Strength of a regiment, which is the equivalent formation in the Soviet and Chinese command structures. (The term 'regiment' is, however, often employed, particularly in West European countries, to describe a battalion-size unit, and it is so used in *The Military Balance*.)

^c Infantry division.

^d Britain has eliminated the brigade. Armoured division strength will rise to 11,500 on mobilization. New infantry formations of about brigade size, known as Field Forces, have been formed; their establishments vary according to role.

^e Manpower levels currently under review.

4. Comparisons of Defence Expenditure and Military Manpower 1975-80

Country	\$ million			\$ per head			% of government spending ^a			% of GNP ^b		Numbers in armed forces (000)			Est. Para-reservists ^c military (000)	
	1975	1979	1980	1975	1979	1980	1975	1979	1980	1975	1979	1975	1979	1980	1980	1980
Warsaw Pact^c																
Bulgaria	457	720	1,140	52	81	128	6.0	6.0	6.0	2.7	2.1	152.0	150.0	149.0	240.0	189.0
Czechoslovakia	1,706	2,415	3,520	116	159	229	7.3	7.1	7.6	3.8	2.8	200.0	194.0	195.0	350.0	133.5
Germany, East	2,550	4,762	4,790	148	285	285	7.9	8.8	7.5	5.5	6.3	143.0	159.0	162.0	305.0	571.5
Hungary	506	900	1,080	48	84	101	3.5	3.6	3.8	2.4	2.1	105.0	104.0	93.0	143.0	75.0
Poland	2,011	3,496	4,670	59	99	131	7.0	6.1	6.0	3.1	2.4	293.0	317.5	317.5	605.0	445.0
Romania	707	1,259	1,470	33	57	66	3.7	3.5	4.0	1.7	1.4	171.0	180.5	184.5	502.0	737.0
Soviet Union	124,000	n.a.	n.a.	490	n.a.	n.a.	n.a.	n.a.	n.a.	11-13%		3,575.0	3,658.0	3,568.0	5,000.0	460.0
NATO^c																
Belgium	1,971	3,636	3,735	200	363	378	10.0	9.2	n.a.	3.0	3.3	87.0	86.8	87.9	115.5	16.3
Britain	11,118	17,572	24,448	198	314	437	10.8	10.3	10.7	4.9	4.9	345.0	322.9	329.2	265.5	—
Canada ^d	2,965	3,751	4,240	130	157	177	11.9	8.6	n.a.	2.2	1.7	77.0	80.0	78.6	29.8	—
Denmark	939	1,559	1,404	185	303	274	7.3	7.4	6.4	2.2	2.0	34.0	34.7	35.1	154.5	—
France	13,984	18,776	20,220	264	349	374	20.2	17.5	n.a.	3.9	3.9	502.0	509.3	494.7	342.0	85.5
Germany ^e	16,142	24,391	25,120	259	396	410	24.4	22.3	22.2	3.7	3.3	495.0	495.0	495.0	750.0	—
Greece	1,435	n.a.	1,770	159	n.a.	236	25.5	n.a.	19.8	6.9	n.a.	161.2	184.6	181.5	290.0	126.0
Italy	4,700	7,089	6,580	84	124	n.a.	9.7	8.2	n.a.	2.6	2.4	421.0	365.0	366.0	738.0	201.0
Luxembourg	22	42	49	65	116	134	3.0	2.9	3.3	1.1	1.0	0.6	0.7	0.7	—	1.0
Netherlands	2,978	4,767	5,239	218	338	374	11.0	9.1	7.3	3.6	3.4	112.5	114.8	115.0	171.0	8.1
Norway	929	1,421	1,570	232	347	383	8.2	9.3	n.a.	3.1	3.1	35.0	39.0	37.0	247.0	—
Portugal ^f	1,088	587	699	124	60	71	35.2	10.4	n.a.	6.0	4.0	217.0	60.5	59.5	—	36.3
Turkey ^g	2,200	2,591	n.a.	55	58	n.a.	26.6	15.6	n.a.	9.0	n.a.	453.0	566.0	567.0	425.0	120.0
United States	88,983	114,503	142,700	417	520	644	23.8	21.5	23.3	5.9	5.2	2,130.0	2,022.0	2,050.0	817.9	n.a.
Other European																
Austria	410	857	915	54	114	122	3.7	4.1	4.1	1.0	1.3	38.0	38.0	50.3	870.0	11.3
Eire	128	205	285	41	63	86	4.3	3.1	3.3	1.6	1.6	12.1	13.9	14.8	18.6	—
Finland	388	524	656	83	110	142	5.0	4.8	5.4	1.4	1.4	36.3	39.9	39.9	700.0	4.0
Spain	1,701	4,819	n.a.	46	90	129	14.5	n.a.	n.a.	1.8	2.9	302.5	251.0	342.0	1,085.0	104.0
Sweden	2,483	3,328	3,588	303	400	432	10.5	8.4	7.7	3.4	3.3	69.8	65.9	66.1	656.5	—
Switzerland	1,047	1,842	1,832	160	292	290	19.3	18.8	18.9	1.8	1.9	18.5	18.5	18.5	621.5	—
Yugoslavia	1,705	2,807	3,634	80	127	164	49.9	52.8	56.9	5.6	n.a.	230.0	259.0	264.0	500.0	1,016.0
Middle East																
Algeria	285	605	705	17	32	36	4.7	6.3	5.3	2.2	1.9	63.0	88.8	101.0	100.0	10.0
Egypt	6,103	2,168	n.a.	163	54	n.a.	42.0	n.a.	n.a.	50.4	13.2	322.5	395.0	367.0	535.0	49.0
Iran	8,800	3,974	4,200	263	101	110	24.9	11.4	12.3	17.4	n.a.	250.0	n.a.	240.0	400.0	75.0
Iraq	1,064	2,328	n.a.	107	183	n.a.	43.7	30.1	n.a.	7.9	10.9	135.0	222.0	242.5	250.0	79.8
Israel	3,552	4,932	5,200	1,045	1,291	1,333	50.1	30.6	32.0	35.9	31.1	156.0	165.6	169.6	460.0	9.5
Jordan	155	380	n.a.	57	125	n.a.	22.0	22.2	n.a.	12.2	n.a.	80.2	67.2	67.2	30.0	10.0
Libya	205	n.a.	n.a.	85	n.a.	n.a.	13.7	n.a.	n.a.	1.7	n.a.	32.0	42.0	53.0	—	—
Morocco	224	917	676	13	47	34	4.5	16.8	20.7	2.8	6.0	61.0	98.0	116.5	—	30.0
Saudi Arabia	6,771	14,184	20,704	1,153	1,404	2,518	20.0	29.9	28.1	18.0	15.0	47.0	44.5	47.0	—	26.5
Sudan	120	n.a.	n.a.	7	n.a.	n.a.	15.1	n.a.	n.a.	n.a.	n.a.	48.6	62.9	68.0	—	3.5
Syria	706	2,036	4,040	96	243	459	25.3	35.6	54.9	15.1	22.1	177.5	227.5	247.5	102.5	515.5
Africa																
Ethiopia	84	526	385	3	18	17	19.4	25.0	n.a.	2.9	n.a.	44.8	221.6	229.5	20.0	169.0
Nigeria	1,736	1,750	1,702	28	25	22	11.8	11.8	n.a.	7.1	n.a.	208.0	193.0	156.0	2.0	—
South Africa	1,332	2,118	2,556	53	76	89	18.5	16.1	n.a.	5.3	3.9	50.5	63.3	86.1	155.0	165.0
Zimbabwe	102	708	444	16	10	6	12.3	41.0	22.0	3.0	n.a.	5.7	21.5	13.5	—	42.5
Asia																
Australia	2,492	2,956	3,900	184	206	272	8.6	n.a.	9.7	3.2	2.8	69.1	70.3	71.0	27.4	—
China	n.a.	46,000	56,941	n.a.	46	56	n.a.	18.0	n.a.	n.a.	9.0	3,250.0	4,360.0	4,450.0	—	9,000+
China (Taiwan)	1,007	n.a.	n.a.	61	n.a.	n.a.	n.a.	n.a.	n.a.	6.9	n.a.	494.0	539.0	438.2	1,160.0	100.0
India	2,660	3,724	4,406	4	6	7	21.1	26.9	n.a.	3.0	3.9	956.0	1,096.0	1,104.0	240.0	300.0
Indonesia	1,108	1,467	2,070	9	10	14	16.7	13.3	12.3	3.8	3.4	266.0	239.0	241.8	—	112.0
Japan	4,620	10,083	8,960	42	87	75	6.6	5.4	4.7	0.9	0.9	236.0	241.0	241.0	39.6	—
Korea, North	878	1,231	1,300	54	70	74	n.a.	n.a.	n.a.	n.a.	11.2	467.0	672.0	678.0	300.0	38.0
Korea, South	943	3,219	3,460	28	85	91	29.2	34.4	36.0	5.1	5.5	625.0	619.0	600.6	1,240.0	2,800.0
Malaysia	335	n.a.	1,465	31	n.a.	108	17.3	n.a.	14.3	4.0	n.a.	61.0	64.5	66.0	27.0	214.8
New Zealand	243	362	n.a.	79	13	n.a.	4.3	n.a.	n.a.	1.8	2.1	12.7	12.7	12.6	109.0	—
Pakistan	725	1,050	n.a.	10	13	n.a.	12.3	n.a.	n.a.	7.2	n.a.	392.0	429.0	438.6	513.0	109.0
Philippines	407	793	962	10	17	20	19.3	16.0	13.0	2.6	n.a.	67.0	103.0	112.8	124.0	78.5
Singapore	344	n.a.	574	152	n.a.	239	18.1	n.a.	n.a.	5.3	n.a.	30.0	36.0	42.0	50.0	37.5
Thailand	542	940	1,092	13	20	23	25.7	20.7	20.5	3.7	4.3	204.0	216.0	230.8	500.0	44.0
Latin America																
Argentina	1,031	1,819	n.a.	41	105	n.a.	9.7	n.a.	n.a.	0.9	n.a.	133.5	132.9	139.5	250.0	42.0
Brazil	1,283	2,088	n.a.	12	18	n.a.	9.3	8.9	n.a.	1.3	n.a.	245.5	281.0	272.6	560.0	185.0
Colombia	106	215	n.a.	4	8	n.a.	n.a.	7.8	n.a.	0.8	n.a.	64.3	67.5	65.8	500.0	50.0
Cuba	n.a.	1,168	1,126	n.a.	118	114	n.a.	8.9	n.a.	n.a.	n.a.	117.0	189.0	206.0	90.0	118.0
Mexico	536	519	n.a.	10	7	n.a.	2.4	1.1	n.a.	0.7	n.a.	82.5	100.0	107.0	250.0	—
Peru	383	430	n.a.	24	25	n.a.	15.3	n.a.	n.a.	3.1	n.a.	56.0	92.0	95.5	—	25.0
Venezuela	494	706	804	41	52	53	5.4	6.5	n.a.	1.7	n.a.	44.0	41.5	40.5	—	15.0

* Incl. aid to W. Berlin 19,540 30,544 31,946 313 496 526 29.2 27.9 28.2 4.4 4.1

^a This series is designed to show national trends only; differences in the scope of the government sector invalidate international comparisons.

^b Based on local currency. GNP estimated where official figures unavailable.

^c The difficulty of calculating suitable exchange rates makes conversion to dollars imprecise.

^d Defence expenditures are based on the NATO definition. Figures from 1979 are provisional.

^e Expenditure and GNP figures estimated from nationally-defined data.

^f Reservists with recent training.

AIRMAN'S BOOKSHELF

Lively Narrative

Battle of Britain, by Len Deighton. Coward, McCann & Geoghegan, New York, N. Y., 1980. 224 pages, with photographs, art, and index. \$19.95.

Len Deighton has already established himself as one of the top authors today on the subject of airpower in World War II. His nonfictional *Fighter* and *Blitzkrieg* have revealed a style and insight that clearly indicate his mastery of the subject.

Battle of Britain is airpower history as well, but Deighton departs somewhat from his standard approach by skillful integration of photographs, artwork, graphics, and narrative into a composite whole much greater than its parts.

Interviews with survivors, excerpts from diaries, press clippings, and a constant movement back and forth from the British to the German view of the same event make this a fast-paced and thrillingly "live" narrative of a brief but significant period in British history.

The author has assembled an astonishing array of rare and unusual photographs. Where no photos were available, or where a photo would not have been adequate, Deighton has provided some truly excellent and thoroughly accurate original artwork that greatly enhances the overall impact. Cutaway diagrams are used to illustrate construction techniques for aircraft of both sides, armament, powerplants, etc. There is a striking similarity in some of this artwork to that of the *Profile* aircraft series, long familiar to those with serious interest in historical aircraft and their markings.

While the photos and artwork will attract attention, the text is even better. In a concise and understandable style, Deighton reviews the background that made the Battle of Britain so important and, perhaps, inevitable. The people, events, aircraft, weapons—all are covered in sufficient detail to reveal the strengths and weaknesses of the participants.

Yet, this is not just history revisited. The *raison d'être* for aircraft like the F-16, F-111, A-7, F-15, etc., can be traced to lessons learned the hard way during the Battle of Britain. And, in spite of modern missiles, nuclear warheads, laser weapons, and a host of other modern developments, the basic lesson hasn't changed all that much—control of the air is an absolute necessity in war.

Perhaps it would be helpful if present-day opponents of the B-1, the AV-8B, the stretched F-111, the F-18, and other advanced weapon systems could be given a copy of this excellent book.

Battle of Britain is a significant addition to the wealth of literature available on the period. Its large format and lavish use of color make it a beautiful as well as educational work.

—Reviewed by Maj. N. Kent Goldsmith, USAF (Ret.), aerospace industry executive.

The War to End All Wars

No Man's Land: 1918, The Last Year of the Great War, by John Toland. Doubleday & Co., New York, N. Y., 1980. 651 pages with index, maps, and photographs. \$17.95.

The last year of World War I, "the war to end all wars," was a time of movement and dynamic action that contrasted sharply with the preceding four years. Opening in March 1918 with the first of four German offensives under the famous General Ludendorff, the period ended in inglorious defeat for Germany and its allies. In the interim, monarchies fell, American soldiers, marines, and airmen experienced war in and above the trenches of Europe, and the seeds of World War II were sown.

John Toland, noted author of previous works on Adolf Hitler, the Battle of the Bulge, and the last 100 days of the Third Reich, has used a myriad of different sources, including interviews with participants and documentary collections throughout the

US and Europe to unearth a wealth of details on significant events in 1918. Unlike his other books, however, this volume does not fare well.

No Man's Land opens with the German preparation for Operation Michael, the first Ludendorff offensive to kick off in late March. Following a seemingly endless bombardment, the German infantry advance appeared to mark the beginning of victory. If Toland intended his narrative of individual unit actions up and down the line to relay the confusion of battle, he has succeeded.

Toland intersperses his description of the trench warfare with cameo glimpses of major personalities, including Kaiser Wilhelm, British General Haig, Prime Ministers Lloyd George and Clemenceau, and French General Foch. Among the Americans are Pershing, Wilson, Patton, MacArthur, and Marshall. Unfortunately, the space devoted to each often sheds little light on the individual's true personality. The result is a vast amount of trivia.

Midway in the book, the author devotes a major section to affairs inside Russia. A fair coverage of the Allied intervention is presented, along with a scant look at the civil war between the Reds and the Whites. However, significant events outside Europe and Russia, such as those in Palestine, are summarily dismissed.

Mr. Toland misses his real opportunity to produce a notable history with his treatment of the experiences of the men fighting in "no-man's land." Despite numerous personal accounts, the reader is somehow left with the impression that the war really wasn't too ghastly or destructive. The photographs tell another story. Accounts of American actions at the Meuse-Argonne, Belleau Wood, and the St.-Mihiel salient provide a much more satisfactory appreciation for the horror and despair of the battlefield.

Those interested in airpower history will find this book disappointing. The only air actions of note are the death of Richthofen and a single day's flying activities of Rickenbacker.

No Man's Land does not stand up to the test of good history or Toland's previous works. The much-needed appreciation for the nature of combat and politics behind the First World War remains to be written.

—Reviewed by Capt. Don Rightmyer, Office of Air Force History.

New Books in Brief

Americans at War, by W. J. Koenig. This large-size, profusely illustrated book is a comprehensive history and study of more than two centuries of Americans at war. Koenig traces the history of the nation's wars, and analyzes the purposes of the men and women who fought them and the effect of those wars on the national character. The comprehensive text is enlivened by hundreds of color and black and white photos, maps, and drawings. Index, bibliography. G. P. Putnam's Sons, New York, N. Y., 1980. 352 pages. \$28.95.

The Campaign for North Africa, by Jack Coggins. The year 1942 witnessed the first major Allied thrust at the Axis: Operation Torch, which signaled the opening of the campaign for North Africa. Hanging in the balance were control of Mediterranean shipping lanes and the strategic oil fields of the Middle East. Here author Coggins recounts the story of Operation Torch and the subsequent North African campaign, which served as a "rehearsal" for the landings in Sicily, Italy, and Normandy. Includes many drawings and maps by the author (who served as an artist correspondent with the US Army during WW II). Appendices, bibliography, index. Doubleday & Co., Inc., Garden City, N. Y., 1980. 208 pages. \$15.

Canada's Flying Heritage, by Frank H. Ellis. This book is a paper reprint (having been out of print for some time) of Ellis's 1954 publication. *Canada's Flying Heritage* is a comprehensive history of the early days of Canadian aviation, from barnstorming, to the war, to the first bush pilots. Ellis, one of the "Early Birds" of Canadian aviation, has left an unsurpassed account not only of flying history, but also of those "forgotten flyers who flew by guess and by God or with calculating caution—for the sheer love of flying—in the early days." Photos, appendices, index. University of Toronto Press, Toronto, Canada, 1980. 398 pages. \$15.

NATO, Turkey, and the Southern

Flank: A Mideastern Perspective, by Lt. Gen. Ihsan Gürkan (Ret.). Recent events in the Mideast give added urgency to General Gürkan's analysis of the strategic situation on NATO's southern flank and his prescriptions for redressing the deterioration over the past decade of allied defenses there. His incisive arguments for the strategic importance of Turkey to the West deserve scrutiny from the other allied nations and all those interested in that volatile corner of the globe. National Strategy Information Center, Inc., 111 E. 58th St., New York, N. Y. 10022, 1980. (Distributed by Transaction Books.) 67 pages. \$3.95.

The Persian Gulf States: A General Survey, edited by Alvin J. Cottrell, et al. As the title indicates, this work is a broad overview of the Persian Gulf region. The various authors cover the history of the area, economics and urban development, religion, languages, literature, art, and society. ~~The book is scholarly and well-researched~~, but is written for the average reader, and is highly recommended for those searching for an encyclopedic reference work on this important strategic area of the globe. Photos, tables, index. The Johns Hopkins Univ. Press, Baltimore, Md. 21218, 1980. 695 pages. \$37.50.

Presidents and Prime Ministers, edited by Richard Rose and Ezra N. Suleiman. This collection of essays analyzing the political processes underlying the formal governmental structures of eight Western nations argues that, although there are great similarities between other Western democracies and the US, the US is experiencing a decline in central executive leadership not being felt by the others. The authors attribute this decline to two factors: the weakening of the authority of political parties and the institutionalization of public distrust. In the final chapter, Editor Rose suggests lessons from the European examples that may be applicable to American problems. American Enterprise Institute for Public Policy Research, Washington, D. C., 1980. 347 pages. \$8.25.

Remember the Future—The Apollo Legacy, edited by Stan Kent. A publication of the American Astronautical Society, this book is a free-wheeling compilation of speeches and papers presented at a July 1979 meeting in San Francisco commemorating the tenth anniversary of the landing of Apollo-11 on the moon. Ranging in content from technical presentations on advanced chemical rocket engine

concepts to a look into the future by science-fiction author Poul Anderson, the book argues persuasively for a renewed commitment to exploration and exploitation of space. Order from Univelt, Inc., P. O. Box 28130, San Diego, Calif. 92128, 1980. 207 pages. Hard cover \$25; soft cover \$15.

Saga of the Superfortress, by Steve Birdsall. The formation of the Twentieth Air Force, equipped with the new, truly "global" B-29 Superfortress, heralded the first large-scale use of strategic airpower against Japan. In this large, well-illustrated book, author Birdsall tells the story of the B-29 and the men who built and flew it, and traces its valiant history of combat. Photos, appendices, bibliography. Doubleday & Co., Inc., Garden City, N. Y., 1980. 345 pages. \$19.95.

Strategic Defense in Soviet Strategy, by Michael J. Deane. This book is an analysis of one side of the "complementary components" of Soviet strategic offensive/defensive capabilities. Whereas the US subscribes largely to a doctrine of mutual vulnerability (to produce a condition of mutual deterrence), the author argues that the USSR rejects this doctrine, and defines strategic defense/civil defense as "an integral component of Soviet war fighting and war survival capabilities. . . . [M]utual destruction is not an acceptable strategy or defense policy for rational leaders." Deane concludes that "it would seem imperative for [the US] to abandon at once its unilateral determination to treat effective defense against nuclear attack as an obstacle to stability and peace." Index. Available from Director of Publications, Advanced International Studies Institute, East-West Towers, Suite 1122, 4330 East-West Highway, Washington, D. C. 20014, 1980. 119 pages. \$7.95.

United States Naval Fighters of World War II in Action, by Michael O'Leary. This large-format book should prove a delight to any former Navy or Marine fighter jock who flew these planes in World War II. The book is divided into six sections, each dealing with a specific type of fighter. Along with the hundreds of excellent photographs and drawings is the story of these planes and their role in the war, and of the brave (and sometimes exceedingly colorful) men who flew them. Bibliography, index. Blandford Press Ltd., Dorset, UK, 1980. 159 pages. \$17.95.

—Reviewed by Hugh Winkler, Associate Editor.

PERSPECTIVE

Comment & Opinion

By TSgt. Kenneth V. Benesh, USAFR

The Professional Military Servant

During the early hours of May 1, 1898, Admiral Patricio Montojo y Parason and his Spanish Asiatic Squadron faced the guns of the American Asiatic Squadron commanded by Commodore George Dewey. Montojo's naval forces were outclassed by a ratio of two or three to one. His land-based guns were mostly relic muzzle-loaders, and some of the fortifications dated from early in the seventeenth century. Nevertheless, in spite of the depressing circumstances, Admiral Montojo was determined to fight, and the Spanish suffered a crushing defeat in the resulting Battle of Manila Bay.

It would be interesting to begin an in-depth comparison of Spain's defense policy during the nineteenth century and our present government's defense policy, but I don't think it would teach us anything that we don't already know. In reviewing the events at Manila Bay, among things that impressed me the most were the attitudes and actions of the officers and men of the Spanish squadron, for they admirably illustrate the role of the professional serviceman as a "professional military servant." I intend to comment on this role as it applies to the men and women of the US Air Force.

As Gen. R. H. Ellis, Commander in Chief of SAC, has noted, there is a proper sense in which "all of us in uniform" are "professional military servants of the nation." I realize that in today's society with its emphasis on "self"—self-actualization, self-awareness, self-fulfillment, etc.—the idea of being a professional servant probably would not appeal to many, in uniform or out, but the concepts of "servant" and "service" are really quite far-reaching.

When a person accepts a commission or enlists in the Air Force, or in any branch of the military, he commits himself to support and defend the Constitution of the United States. Now, the Constitution is something far more than a 200-year-old document; the concepts and ideals that it

embodies cannot be translated into terms of a "fair day's wage for a fair day's work."

One definition of a servant, according to Webster's *New World Dictionary*, is "a person ardently devoted to another [person] or to a cause, creed, etc." (Emphasis added.) This is precisely what the professional airman ought to be.

Most officers and airmen may consider themselves to be "devoted" or "patriotic," but how many of us, when facing the problems that frustrate us the most, find ourselves saying, "if . . . then . . ." rendering a conditional service that can often become divorced from responsibility? An extreme example would be policemen and firemen who strike, forsaking their responsibility to the people whose lives and property they're sworn to protect.

How many of us, on the other hand, seriously consider the quality of our service and attempt to keep in proper perspective the responsibility inherent in our roles as military servants? A rather remarkable example of this is the personal sacrifice made by a German soldier during World War II. Pvt. Joseph Shultz refused to take part in the wanton execution of innocent civilians. Apparently recognizing that his responsibility as a soldier consisted of something more than the mere following of orders, he chose instead to join the civilians; without even the benefit of a court-martial, he was shot along with them.

Possibly the most important thing to keep in mind, if we are to behave as professional military servants, is that it is neither necessary nor desirable to respond to the causes of frustration and discontent in kind. For example: the manner in which the federal government, or the Air Force when representing the government, treats the serviceman reflects favorably or unfavorably on the government only. The manner in which the serviceman responds reflects creditably or discreditably on *him*.

Referring back to the beginning of this essay, Admiral Montojo had no illusions about his chances at Manila

Bay. He, his peers, and his predecessors had, for decades, pleaded for a modern navy and shore defenses, but the Spanish government couldn't, or wouldn't, put up the money. Admiral Montojo could have, in the minds of many people today, surrendered in good conscience without a fight. But he, his officers, and men were aware of the unique responsibility they had as military servants of their country.

Speaking personally, I am concerned about the quality of military life; in spite of some GAO findings, I think that benefits are eroding. Besides, I consider it naïve to attempt a comparison of the military serviceman with his "civilian counterpart." Attempts to establish some scale of "equivalency" or "parity" cannot help being somewhat arbitrary and speculative. If Congress fails in its responsibility to me, a military servant, by unjust compensation, that does *not* absolve me of my responsibility to serve.

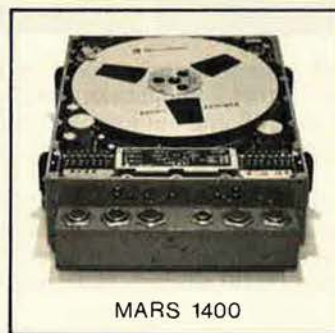
The professional military servant must honestly evaluate his present circumstances and motives—especially the motives. Financially and otherwise, tangibly or intangibly, he is not that bad off. I've no doubt that the majority of us in uniform would welcome a higher income, increased benefits, rapid advancement, job satisfaction, etc. But in seeking these goals, at what point will we cease to be professional military servants?

Sergeant Benesh, a Reservist assigned to Hq. ARPC/JAR as a Legal Service Specialist, is now attached to the Norton AFB Legal Office for training, and is beginning work on a Ph.D. in Intellectual History under a fellowship at Claremont Graduate School, Claremont, Calif. A graduate of the Fifteenth Air Force NCO Leadership School and the AFLC NCO Academy, he has a BA degree from the University of Albuquerque and an MA in International Relations from Webster College, St. Louis, Mo. He served twelve years on active duty and considers himself a professional NCO.



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DECEMBER 1980



Artist's impression of Northrop F-5G export fighter

NORTHROP

NORTHROP CORPORATION AIRCRAFT GROUP: Address: 3901 West Broadway, Hawthorne, California 90250, USA

NORTHROP F-5G

In 1974, Northrop began studies intended to lead to the design and development of an international fighter aircraft that, at a future date, would supersede the F-5E Tiger II in service. Selection of a suitable power plant proved a slow process, and no fewer than 25 engines had been evaluated by March 1979. At that time the decision was taken to utilise a single 71.17 kN (16,000 lb st) General Electric F404-GE-400 turbofan in place of the two 22.24 kN (5,000 lb st) General Electric J85-GE-21A turbojets which power the current F-5E/-5F Tiger II. While the F404 engine is heavier than the two that it will replace, weight saving in other areas is expected to limit the increase in aircraft empty weight to some

17% greater than that of the F-5E, and thus the additional 60% of engine thrust will offer significant performance improvements. Studies have also shown that fuel and maintenance costs for the F-5G will be lower than those of any other new generation supersonic fighter.

Although the detail design had not been completely finalised in the late Summer of 1980, most of the analytical work and about 90% of the wind tunnel testing had been completed, making possible some estimates of specification and performance for this fighter, which has been allocated the designation F-5G. A decision to proceed with the construction and development of four pre-production aircraft was made in January 1980, and the first of these is scheduled to fly in late 1982, with the first flight of a production example planned for mid-1983.

By comparison with the F-5E, this new aircraft is expected to demonstrate considerable performance

improvements in terms of acceleration and speed. For example, it is calculated that at 9,145 m (30,000 ft) a clean aircraft will take 30 seconds to accelerate from Mach 0.9 to Mach 1.2, 80 seconds from Mach 0.9 to Mach 1.6, and a time of only 2.3 minutes from brake release at sea level to climb to an altitude of 12,190 m (40,000 ft). Maximum level speed at optimum altitude will be about Mach 2.0. Manoeuvrability is also expected to show considerable improvement, as the heavier engine, increased thrust, and aerodynamic refinements should provide the F-5G with a better rate of turn throughout the entire flight envelope.

The description of the F-5E in the 1980-81 *Jane's* applies also to the F-5G, except as noted below:

WINGS: As for F-5E, except that the tapered leading-edge extensions, between the inboard leading-edge and fuselage, are to be lengthened and modified as a result of engine inlet duct redesign. This changed leading-edge shape has been



Cutaway emphasises the use made of every cubic inch of the F-5G's minimal space

found to increase the maximum lift coefficient of the wings. Strengthening of the structure by increasing the skin thickness of inboard sections will permit a manoeuvre load factor of 9g.

FUSELAGE: Basically as for F-5E, but nose flattened slightly to enhance stability at high angles of attack. Area-ruling in the mid-fuselage section will be reduced because of the higher thrust available. An 0.13 m (5 in) fuselage plug aft of the cockpit will permit rearrangement of the internal fuel cells and avionics, improving maintenance access. The rear fuselage will be narrower because of the power plant change; but in order to retain the longitudinal stability characteristics of earlier F-5s, step fairings are to be added beneath the rear fuselage. A single variable-geometry exhaust nozzle will replace the twin nozzles of the former power plant. Weight-saving graphite composite skins are to be incorporated in the rear fuselage.

TAIL UNIT: As for F-5E, except for changed mounting of fin, and aerodynamic improvement of the drag chute fairing. Weight-saving graphite composite skins are to be introduced on the tail surfaces.

LANDING GEAR: As for F-5E, except for new wheels and brakes to cater for the higher gross weight.

POWER PLANT: One 71.17 kN (16,000 lb st) General Electric F404-GE-400 turbofan engine installed in the aft fuselage. Fuel system generally as for F-5E, but rearranged to supply single engine: internal fuel capacity 2,014 kg (4,440 lb).

ENGINE INTAKES: Generally as for F-5E, but extended forward, enlarged slightly, and sited further from the fuselage to clear the thicker boundary layer airflow generated at higher

airspeeds. Provisions for inlet enlargement to cater for growth versions of the F404 turbofan.

SYSTEMS: Generally as for F-5E, but dual fly-wire longitudinal control system instead of the hydraulic/mechanical system of the F-5E, and an increased-capacity environmental control system.

DIMENSIONS, EXTERNAL:

Wing span over missiles 8.13 m (26 ft 8 in)
Length overall (incl nose-probe)

14.78 m (48 ft 6 in)
Height overall 4.52 m (14 ft 10 in)

AREA:

Wings, gross 17.3 m² (186 sq ft)

WEIGHTS (estimated):

Weight empty 5,089 kg (11,220 lb)
T-O weight, clean 7,761 kg (17,110 lb)
Max T-O weight 11,857 kg (26,140 lb)

PERFORMANCE (estimated):

Max level speed at optimum altitude Mach 2.0

Max rate of climb at S/L 15,330 m (50,300 ft)/min

Service ceiling 16,760 m (55,000 ft)

T-O run, clean 445 m (1,450 ft)

T-O run, maximum 1,115 m (3,650 ft)

Combat radius with max internal fuel and two 1,041 litre (275 US gallon) external tanks, two Sidewinder missiles, seven Mk 82 bombs, 5 min combat at S/L military power, 20 min fuel reserves at S/L, hi-lo-hi mission

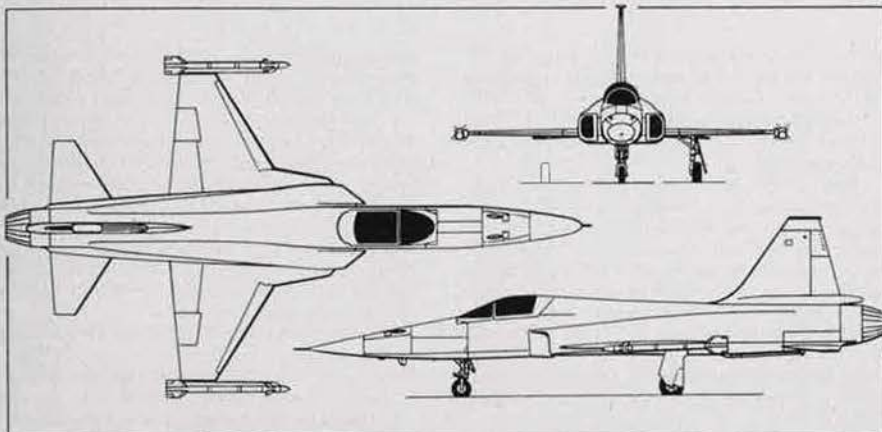
360 nm (666 km; 414 miles)

Combat radius with max internal fuel and three 1,041 litre (275 US gallon) external tanks, two Sidewinder missiles, 1 h 17 min on patrol, 20 min fuel reserves at S/L, combat air patrol mission

300 nm (555 km; 345 miles)

Ferry range with max internal and external fuel

1,490 nm (2,760 km; 1,715 miles)



Northrop F-5G single-seat tactical fighter (General Electric F404-GE-400 turbofan engine) (Pilot Press)

AERMACCHI

AERONAUTICA MACCHI SpA: Head Office: Corso Vittorio Emanuele 15, 20122 Milan, Italy

AERMACCHI M.B. 339K VELTRO 2 (GREYHOUND)

The Veltro 2, which perpetuates the name of the Macchi M.C. 205V fighter of the second World War, is a single-seat development of the M.B. 339A, optimised for the roles of light close air support and operational training. It is based on experience gained in the production and operation of the M.B. 326K. The M.B. 339K prototype (I-BITE) made its first public appearance at the Farnborough International Air Show in the United Kingdom in August/September 1980.

The airframe and power plant of the M.B. 339A are retained, except for a new forward fuselage with redesigned single-seat cockpit and a small change in fin and rudder areas; the other major changes concern the avionics and equipment relevant to the different roles performed by the Veltro 2. The following description applies to the basic M.B. 339K; operational capability can, at customer's option, be extended by the adoption of such additional features as a head-up display, cockpit TV display, ECM, and other improved avionics.

TYPE: Single-seat ground attack aircraft and operational trainer.

AIRFRAME: Structural design criteria based on MIL-A-8860 series of specifications; +8/-4g limit load factor in 'clean' configuration. In the ground attack role, service life requirement is 5,000 flying hours with 10,000 landings. Entire structure is specially treated to prevent corrosion.

WINGS: Cantilever low/mid-wing monoplane. Wing section NACA 64A-114 (mod) at centreline, NACA 64A-212 (mod) at tip. Leading-edge swept back 11° 18'. Sweepback at quarter-chord 8° 29'. All-metal stressed-skin structure, with single main spar and auxiliary rear spar, built in two portions and bolted to fuselage. Skin stiffened by spanwise stringers, closely-spaced ribs, and false ribs. Wingtip tanks permanently attached. Single fence on each wing at approx two-thirds span. Servo-powered ailerons, with manual backup, embody aerodynamic balance provisions, and are statically balanced along their entire span. Electrically-actuated trim, operated via artificial feel system. Hydraulically actuated single-slotted flaps, operated by push/pull rods.

FUSELAGE: All-metal semi-monocoque structure, built in two main portions: forward (nose to engine mounting bulkhead), and rear (engine bulkhead to tailcone). Forward portion built of C-section frames, four C-section spars, longitudinal L-section stringers, and skin panels. Rear section manufactured entirely from aluminium alloy except for firewall and most of tailcone, which are of stainless steel; four-bolt attachment to forward fuselage to facilitate access to engine. Hydraulically actuated, electrically controlled airbrake under centre of fuselage.

TAIL UNIT: Cantilever all-metal structure, of similar construction to wings. Slightly sweptback vertical surfaces. Rudder and elevators are statically balanced, each having an electrically actuated dual-purpose balance and trim tab. Two auxiliary fins under rear fuselage.

LANDING GEAR: Hydraulically-retractable tricycle type, with oleo-pneumatic shock-absorbers; suitable for operation under extremely adverse conditions. Nosewheel retracts forward, main units outward into wings. Steerable nosewheel, fitted with shimmy damper. Low-pressure tubeless tyres on main wheels, size 545 x 175-10 (14 ply rating); nosewheel has tubeless tyre, size 380 x 150-4 (6 ply rating). Emergency extension system. Hydraulic disc brakes with anti-skid control system.

POWER PLANT: One Rolls-Royce Viper Mk 632-43 turbojet engine, rated at 17.8 kN (4,000 lb st). Engine built in Italy under Rolls-Royce licence, with final assembly by Piaggio. Fuel in one fuselage tank, consisting of three rubber cells with a total capacity of 1,030 litres (226.5 Imp gallons), and two integral wingtip tanks. Standard tip-tanks

have a combined capacity of 630 litres (138.5 Imp gallons); this can be increased to 1,000 litres (220 Imp gallons) by the use of tip-tanks with a constant circular section. Total usable internal fuel capacity 1,660 litres (365 Imp gallons) standard, 2,030 litres (446.5 Imp gallons) with circular-section tip-tanks. Single-point pressure refuelling receptacle in port side of fuselage, aft of wing trailing-edge. Gravity refuelling points on top of fuselage and each tip-tank. Provision for two drop-tanks, each of 325 litres (71.5 Imp gallons), on centre underwing stations. Anti-icing system, for engine air intake lips and ducts, is optional.

ACCOMMODATION: Pilot only, on Martin-Baker IT10F zero-zero ejection seat in pressurised cockpit. Rearview mirror standard. One-piece moulded transparent jettisonable canopy, opening sideways to starboard.

SYSTEMS: Hydraulic system, pressure 176 bars (2,600 lb/sq in), for actuation of flaps, aileron servos, airbrake, landing gear, wheel brakes, and nosewheel steering. Backup system for wheel brakes and emergency extension of landing gear. Main electrical DC power from one 28V 9kW engine-driven starter/generator and a 28V 6kW secondary generator. Two 24V 22Ah nickel-cadmium batteries for engine starting. Fixed-frequency 115/26V AC power from two 600VA single-phase static inverters. External power receptacle. Pressurised cockpit, with max differential of 0.24 bars (3.5 lb/sq in). Bootstrap-type air-conditioning system, which also pro-

vides air for windscreen and canopy demisting. Low-pressure demand-type oxygen system, operating at 28 bars (400 lb/sq in).

and the outer two for up to 340 kg (750 lb) each. Provisions are made, on the two inner stations, for the installation of two Maccchi gun pods, each containing either a 30 mm DEFA cannon with 120 rds, or a 12.7 mm AN/M-3 machine-gun with 350 rds. Other typical loads can include two Matra 550 or AIM-9 Sidewinder air-to-air missiles on the two outer stations; four 1,000 lb or six 750 lb bombs; up to six SUU-11A/A 7.62 mm Minigun pods with 1,500 rds/pod; six Matra 155 launchers, each for eighteen 68 mm rockets; six Matra F-2 practice launchers, each for six 68 mm rockets; six LAU-68/A or LAU-32/G launchers, each for seven 2.75 in rockets; six Aerea AL-25-50 or AL-18-50 launchers, each with twenty-five or eighteen 50 mm rockets respectively; six Aerea AL-12-80 launchers, each with twelve 81 mm rockets; four LAU-10/A launchers, each with four 5 in Zuni rockets; six Aerea BRD bomb/rocket dispensers; six Aermacchi 11B29-003 bomb/flare dispensers; two 325 litre (71.5 Imp gallon) drop-tanks; or a photographic pod with four 70 mm Vinten cameras. Saab-Scania RGS 2 gunsight, with gyro lead computer; gunsight can be equipped with a fully-automatic Teledyne TSC 116-2 gun camera. Provision for towing type A-6B (1.83 x 9.14 m; 6 x 30 ft) aerial banner target.

DIMENSIONS, EXTERNAL:

Wing span over tip-tanks:
standard tanks 10,858 m (35 ft 7½ in)
circular-section tanks 11,045 m (36 ft 2¾ in)

Time to 9,145 m (30,000 ft) from brake release 9 min 9 s
Service ceiling 13,565 m (44,500 ft)
T-O run 575 m (1,886 ft)
Landing run 410 m (1,345 ft)
Combat radius with two 30 mm cannon (125 rds/gun) and four 500 lb Mk 82 bombs (total military load 1,088 kg; 2,400 lb):
lo-lo-lo, incl 2½ min over target 203 nm (376 km; 234 miles)
hi-lo-hi, out at 9,145 m (30,000 ft), back at 12,190 m (40,000 ft), 2½ min over target 350 nm (648 km; 403 miles)
Mission radius with two 30 mm cannon (125 rds/gun), two Matra 550 air-to-air missiles, four-camera photo-reconnaissance pod and two 325 litre (71.5 Imp gallon) drop-tanks:
hi-lo-hi, out at 9,145 m (30,000 ft), back at 10,670 m (35,000 ft), 5 min photographic run at 61 m (200 ft) 455 nm (843 km; 524 miles)

IAI

ISRAEL AIRCRAFT INDUSTRIES LTD: Head Office: Ben Gurion Int'l Airport, Lydda, Israel

IAI KFIR-C2 (LION CUB)

A prototype of the Kfir was flown in 1973, before the outbreak of the October 'Yom Kippur' war, and brief details were made public officially for the first time on 14 April 1975, when two of the new aircraft were displayed at Ben Gurion Airport.



Aermacchi's new M.B.339K Veltro 2 ground attack/trainer
(Brian M. Service)



The Kfir-C2's canard foreplanes are shown clearly in this air-to-air shot

vides air for windscreen and canopy demisting. Low-pressure demand-type oxygen system, operating at 28 bars (400 lb/sq in).

AVIONICS AND EQUIPMENT: Typical avionics installation includes Collins AN/ARC-159(V) UHF (or Perkin-Elmer SRT-194B VHF) primary com transceiver; Collins 618M-3A or equivalent ARINC 566A VHF/AM (or Collins AN/ARC-186(V) VHF/AM and FM) secondary com transceiver; Collins IA-210 interphone; Collins AN/ARN-118(V)1 Tacan (or Collins 860E-5 or equivalent ARINC 568 DME) nav system; Fiar/Bendix AN/AP-100(V)IFF; Collins 51RV-4B or equivalent ARINC 547A-4 VOR/ILS, including localiser and glideslope receivers; Collins MKI-3 marker beacon receiver; Collins DF-206 or equivalent ARINC 570 ADF; Marconi Avionics AD-620C computerised radio and dead reckoning area navigation system. Standard instrumentation includes Astronatics ARU-2B/A attitude director indicator; AQU-6/A horizontal situation indicator and flight director system; Sperry P-140 attitude and heading reference system; and Microtecnica AG-5 standby attitude indicator. Retractable landing light beneath port wing; taxiing light on nosewheel leg.

ARMAMENT AND OPERATIONAL EQUIPMENT: Two 30 mm DEFA cannon, with 125 rds/gun, mounted internally in lower forward fuselage, with external fairings. Firing rate 1,200 rds/min. Up to 1,815 kg (4,000 lb) of external stores can be carried on six underwing hardpoints, the inner four of which are stressed for loads of up to 454 kg (1,000 lb) each

Wing aspect ratio 5.26
Length overall 10.972 m (36 ft 0 in)
Height overall 3.90 m (12 ft 9½ in)
Tailplane span 4.164 m (13 ft 8 in)
Wheel track 2.483 m (8 ft 1¾ in)
Wheelbase 4.369 m (14 ft 4 in)

AREAS:
Wings, gross 19.30 m² (207.74 sq ft)
Ailerons (total) 1.328 m² (14.29 sq ft)
Trailing-edge flaps (total) 2.552 m² (27.47 sq ft)
Airbrake 0.520 m² (5.60 sq ft)
Fin 2.210 m² (23.79 sq ft)
Rudder, incl tab 0.680 m² (7.32 sq ft)
Tailplane 3.380 m² (36.38 sq ft)
Elevators (total, incl tabs) 0.979 m² (10.54 sq ft)

WEIGHTS:
Weight empty, equipped 3,174 kg (6,997 lb)
Unusable fuel and oil 14 kg (31 lb)
Fuel load (internal, usable, with circular-section tip-tanks) 1,582 kg (3,487 lb)
T-O weight 'clean', incl ammunition for internal guns 4,978 kg (10,974 lb)
Max T-O weight with external stores 6,150 kg (13,558 lb)
Landing weight with 10% fuel reserves 3,554 kg (7,835 lb)

PERFORMANCE:
Max level speed at S/L 480 knots (889 km/h; 553 mph)
Landing speed 89 knots (165 km/h; 102 mph) IAS

The Kfir utilises a basic airframe similar to that of the Dassault Mirage 5, the main changes being a shorter but larger-diameter rear fuselage, to accommodate the J79 engine; an enlarged and flattened undersurface to the forward portion of the fuselage; introduction of four small fuselage air scoops, plus a larger dorsal air scoop in place of the triangular dorsal fin, to provide cooling air for the afterburner; and a strengthened landing gear, with longer-stroke oleos. Several internal changes have also been made, including a redesigned cockpit layout, addition of a considerable amount of Israeli-built avionics equipment, and revised internal fuel tankage compared with the Mirage 5. Intended for both air defence and ground attack roles, the Kfir retains the standard Mirage fixed armament of two 30 mm DEFA cannon, and can carry a variety of external weapons including the Rafael Shafrir 2 air-to-air and Luz-1 air-to-surface missiles. Two squadrons of the Israeli Air Force were equipped with the initial Kfir-C1 version.

On 20 July 1976, at the Israeli Air Force base at Hatzetim, in the Negev, the first public demonstration took place of a modified version known as the Kfir-C2, which by that time was already in Israeli Air Force service, having entered production in 1974. The Kfir-C2 has a number of changes from the original C1, the most significant of which is the addition of non-retractable, sweptback canard surfaces just aft of the engine air intakes; a small strake on each side of the extreme nose; and an extended wing leading-edge, created by increasing the chord on approximately the outer 40% of each half-span.

The canard surfaces can be detached for missions not requiring high manoeuvrability.

The Kfir-C2 is the principal production version, both for the Israeli Air Force and for export. The modifications, reportedly being retrofitted also to existing Kfir-C1s, were designed to improve dog-fighting manoeuvrability at the lower end of the speed range and to enhance take-off and landing performance. It is claimed that, in particular, they give a better sustained turning performance, with improved lateral, longitudinal and directional control; contribute to a very low gust response at all operational altitudes, especially at very low level; offer improved handling qualities at all angles of attack, high *g* loadings, and low speeds; reduce take-off and landing distances, and landing speeds; and permit a more stable (and, if required, a steeper) approach, with a flatter angle of approach and touchdown. Later versions of the C2 have Elta EL/M-2001B nose radar in an extended nose, increasing the overall length by 0.80 m (2 ft 7½ in).

A two-seat trainer version is reported to be under development. Overall dimensions, power plant, and performance are expected to be similar to those of the single-seat version.

Approximately 200 Kfir-C1s and C-2s are believed to have been built by the Autumn of 1980, at an approximate current rate of two to three C2s per month. Since Israeli government approval was given for export sales of the C2, it has been possible for more accurate details of the aircraft to be released, and these are incorporated in the description which follows.

TYPE: Single-seat interceptor, long-range patrol fighter and ground attack aircraft.

WINGS: Cantilever low-wing monoplane of delta planform, with conical camber. Thickness/chord ratio 4.5% to 3.5%. Anhedral 1°. Incidence 1°. Sweepback on leading-edges 60° 35'. All-metal torsion-box structure, with stressed skin of machined panels with integral stiffeners. Two-section elevons on each trailing-edge, with smaller elevator/trim flap inboard of inner elevon, and artificial feel system. Elevons powered by hydraulic jacks; trim flaps are servo-assisted. Small hinged plate-type airbrake above and below each wing, near leading-edge; Extended chord on outer leading-edges. Small leading-edge fence on some aircraft, at approx one-third span.

CANARDS: Detachable sweptback canard surface above and forward of each wing, near top lip of engine air intake.

FUSELAGE: All-metal semi-monocoque structure, 'waisted' in accordance with area rule. Cross-section of forward fuselage has a wider and flatter undersurface than that of Mirage 5. Nosecone built of locally-developed composite materials, with a small horizontal strake or 'body fence' on each side near the tip. UHF antenna under front of fuselage, forward of nosewheel door. Enlarged-diameter rear fuselage, compared with Mirage 5, with approx 0.61 m (2 ft) shorter tailpipe. Ventral fairing under rear fuselage.

TAIL UNIT: Cantilever all-metal fin; rudder has artificial feel system and is powered by hydraulic jack, with servo-assisted trim. UHF antenna in tip of fin. Triangular-section dorsal air scoop forward of fin, to provide cold air for afterburner cooling. No horizontal tail surfaces.

LANDING GEAR: Retractable tricycle type, with single SHL wheel and oleo-pneumatic shock-absorber on each unit. Electrically operated hydraulic actuation, nose unit retracting rearward, main units inward. Longer-stroke oleos than on Mirage 5, and all units strengthened to permit higher operating weights. Low-pressure tubeless tyres on all units. Main-gear leg fairings shorter than on Mirage; inner portion of each main-leg door is integral with fuselage-mounted wheel door. Steerable nosewheel, with anti-shimmy damper. SHL hydraulic disc brakes and anti-skid units. Braking parachute in bullet fairing below rudder.

POWER PLANT: One General Electric J79-J1E turbojet engine (modified GE-17), with variable-area nozzle, rated at 52.89 kN (11,890 lb st) dry and 79.44 kN (17,860 lb st) with afterburning. Air intakes enlarged, compared with Mirage 5, to



Sidewinder missile on a Kfir-C2 at its operational base 'somewhere in Israel'

allow for higher mass flow. Adjustable half-cone centrebody in each air intake, operated automatically by air data computer, with manual backup. Internal fuel in five fuselage tanks (two 485 litre; 106.5 Imp gallon, one 465 litre; 102 Imp gallon, one 365 litre; 80 Imp gallon, and a 63 litre; 14 Imp gallon inverted flight accumulator tank), and four integral wing tanks (two 140 litre; 31 Imp gallon in leading-edges and two 550 litre; 121 Imp gallon main tanks). Total internal capacity 3,243 litres (713 Imp gallons). There is a refuelling point on top of the fuselage, above the forward upper tank. In addition, the centreline and two inboard underwing points are 'wet', and can be occupied by combinations of 500 litre (110 Imp gallon), and supersonic 1,300 litre (286 Imp gallon) Type 1301 or 1302 drop-tanks, up to a max external fuel capacity of 3,900 litres (858 Imp gallons).

ACCOMMODATION: Pilot only, on Martin-Baker IL10P zero-zero ejection seat, under rearward-hinged upward-opening Plexiglas canopy. Cockpit pressurised, heated and air-conditioned. A two-seat version is under development.

SYSTEMS: Environmental control system (ECS), using engine bleed air, for cooling and air-conditioning of cockpit and avionics compartments, and pressurisation of hydraulic and fuel systems; subsystem supplies compressed air to pressurise oxygen seal, cockpit, pilot's *g* suit, and CSD oil accumulators. Manual control of ECS available if automatic system fails. Two independent hydraulic systems, probably of 207 bars (3,000 lb/sq in) pressure. No. 1 system actuates flying control surfaces and landing gear; No. 2 actuates flying controls, airbrakes, landing gear, wheel brakes and utilities. Fully redundant primary electrical system, with two 15kVA (115V 400 Hz) alternators, each supplying 115V three-phase AC power at 400Hz and each driven by a CSD (constant-speed drive) unit; and a 750VA Oram static inverter, connected for split-bus non-synchronised operation. DC system includes two Elta 28V 200A transformer-rectifiers and a 24V 40Ah nickel-cadmium battery. External AC and DC power receptacles. Oxygen system for pilot. Engine fire warning system.

AVIONICS AND EQUIPMENT: Twin landing lights on nosewheel leg; anti-collision light in fin leading-edge. Two Elta AN/ARC-51 UHF com transceivers. Instrumentation and displays include Israel Electro-optics head-up display (HUD) and automatic gunsight, ADF, airspeed and Mach number indicator, angle of attack transmitter and indicator, MBT radar altimeter, accelerometer indicator, HSI, attitude director indicator, rate of climb indicator, standby artificial horizon, cabin altitude indicator, autopilot, and Tamam two-axis gyro and standby compasses. MBT twin-computer automatic flight control system, incorporating ASW-41 control augmentation and ASW-42 stability augmentation systems. Elbit S-8600 multi-mode navigation (Singer-Kearfott

licence) and Rafael Mahat weapon delivery system, or IAI WDNS-141 weapon delivery and navigation system, in nose and cockpit. This closed-loop nav/attack system incorporates HUD, central digital computer, Elta inertial measuring unit (IMU), computer terminal, Elta EL/M-2001B or EL/M-2021 X-band air-to-air and air-to-surface pulse-Doppler target acquisition and tracking radar, Tamam air data computer, IFF/SIF, and fire control. Air-to-air fire control system incorporates onboard override and correction systems, to reduce alignment time for directed missile launch and snapshooting at targets of opportunity. The HUD displays 'hot point' for cannon firing, missile launch area, and auxiliary flight data. Gyroscopic gunsight mode is available in the event of computer malfunction. In air-to-ground mode, weapon control computer carries out required calculations for selected attack mode, flight data, and type of store. It then displays weapon release and flight instruction data on the HUD. In manual air-to-ground mode, the HUD's computing unit performs a limited set of computations to display the bombs' trajectory perpendicular to the ground surface for every aircraft position. Bombing control is then activated manually by the 'pickle' button on the control column, or is processed by the bombing programmer.

ARMAMENT: Fixed armament of one IAI-built 30 mm DEFA 552 cannon in underside of each engine air intake (140 rds/gun). Guns have stall-free firing throughout the flight envelope. Seven hardpoints (three under fuselage and two under each wing) for up to 4,295 kg (9,468 lb) of external stores. Centreline station is stressed for loads of up to 1,587 kg (3,500 lb), fuselage outer stations for up to 1,088 kg (2,400 lb) each, inboard wing stations up to 1,542 kg (3,400 lb) each, and outer wing stations 208.5 kg (460 lb) each. Inboard underwing stations can carry triple ejector racks. For interception duties, one Rafael Shafrir 2 or AIM-9 Sidewinder infra-red homing air-to-air missile can be carried on each of the outboard underwing stations. For ground attack, typical external loads can include a single M-118 3,000 lb bomb, two Mk 84 2,000 lb bombs, seven Mk 83 980 lb bombs, eight M-117 820 lb bombs, eleven Mk 82 500 lb bombs, six 500 lb 'concrete dibber' bombs, eight CBU-24 or CBU-49 cluster bombs, a Rafael Luz-1 or similar air-to-surface missile such as Shrike, Maverick or Hobos, eight 300 litre (66 Imp gallon) napalm containers, two LAU-32/A (outer wings) or four LAU-3/A or LAU-10/A rocket launchers (inboard wing stations), five SUU-25C/A flare pods, or ECM pods. Drop-tanks (see 'Power Plant' paragraph) can be carried on the centreline and inboard wing stations.

DIMENSIONS, EXTERNAL:

Wing span	8.22 m (26 ft 11½ in)
Wing chord at root	8.04 m (26 ft 4½ in)

Wing aspect ratio	1.94
Canard span	3.73 m (12 ft 3 in)
Length overall, incl nose probe	15.65 m (51 ft 4 1/4 in)
Height overall	4.55 m (14 ft 11 1/4 in)
Wheel track	3.20 m (10 ft 6 in)
Wheelbase	4.87 m (15 ft 11 3/4 in)
AREAS:	
Wings, gross	34.8 m ² (374.6 sq ft)
Canards (total)	1.66 m ² (17.87 sq ft)
WEIGHTS AND LOADINGS:	
Weight empty (interceptor, estimated)	7,285 kg (16,060 lb)
Max internal fuel	2,572 kg (5,670 lb)
Max external fuel	3,075 kg (6,780 lb)
Typical combat weight:	
interceptor, 50% internal fuel, two Shafrir missiles	9,390 kg (20,700 lb)
interceptor, two 500 litre drop-tanks, two Shafrir missiles	11,603 kg (25,580 lb)
combat air patrol, three 1,300 litre drop-tanks, two Shafrir missiles	14,270 kg (31,460 lb)
ground attack, two 1,300 litre drop-tanks, seven 500 lb bombs, two Shafrir missiles	14,670 kg (32,340 lb)
Max combat T-O weight	14,700 kg (32,408 lb)
Wing loading at 9,390 kg (20,700 lb) AUW	270 kg/m ² (55.3 lb/sq ft)
Thrust/weight ratio at 9,390 kg (20,700 lb) AUW	0.86

PERFORMANCE:	
Max speed above 11,000 m (36,100 ft)	over Mach 2.3
Max sustained level speed at height, clean	Mach 2.0 (1,317 knots; 2,440 km/h; 1,516 mph)
Max level speed at S/L, clean	750 knots (1,389 km/h; 863 mph)
Max speed for brake chute deployment	210 knots (389 km/h; 242 mph)
Max rate of climb at S/L	14,000 m (45,950 ft)/min
Time to 15,250 m (50,000 ft), full internal fuel, 2 Shafrir missiles	5 min 10 s
Height attainable in zoom climb	22,860 m (75,000 ft)
Stabilised ceiling (combat configuration)	17,680 m (58,000 ft)
T-O run at max T-O weight	1,450 m (4,750 ft)
Landing from 15 m (50 ft) at 11,566 kg (25,500 lb) landing weight	1,555 m (5,100 ft)
Landing run at 11,566 kg (25,500 lb) landing weight	1,280 m (4,200 ft)
Combat radius, 20 min fuel reserves:	
interceptor, two 500 litre drop-tanks, two Shafrir missiles, incl 2 min combat	187 nm (346 km; 215 miles)
combat air patrol, three 1,300 litre drop-tanks, two Shafrir missiles, incl 1 h patrol	377 nm (699 km; 434 miles)
ground attack, hi-lo-hi, seven 500 lb bombs, two Shafrir missiles, two 1,300 litre drop-tanks, incl 5 min attack	415 nm (768 km; 477 miles)
g limit	+7

WAR

WAR AIRCRAFT REPLICAS; Address: 348 South Eighth Street, Santa Paula, California 93060, USA

WAR AIRCRAFT REPLICAS P-47D-25 THUNDERBOLT

Nobody old enough to have caught his first sight of a Republic P-47D Thunderbolt during the years of the second World War is ever likely to forget the impressive bulk of the mighty 'Jug'. The accompanying illustration of Gil Hallquist's P-47D, registered N25GH, will strike pangs of nostalgia—but does not the pilot's head look bigger than it used to appear in those wartime Thunderbolts?

The answer is that Mr Hallquist's aeroplane is a half-scale homebuilt, constructed over a four-year period, at a cost of nearly \$8,000, from plans marketed by War Aircraft Replicas. Other amateurs have built and flown half-scale Focke-Wulf 190s, F4U Corsairs, even Zero and Sea Fury replicas, all based on the common-design wooden fuselage box

and spar structure devised by WAR, but this is the first, and still only, half-scale P-47D.

Gil Hallquist deviated from the WAR plans in making the fuselage 10 cm (4 in) deeper, adding a retractable tailwheel, employing a hydraulic retraction system, and utilising a larger engine than normal, an 80 kW (108 hp) Avco Lycoming O-235-C2C. Construction is of foam/epoxy/glassfibre throughout, and the aircraft is stressed for 6 1/2g. It first flew in February 1980, and had logged 48 hours by the time it appeared at this year's EAA Fly-in at Oshkosh, Wisconsin, in August.

DIMENSIONS, EXTERNAL:

Wing span	6.20 m (20 ft 4 in)
Wing chord at root	1.17 m (3 ft 10 in)
Length overall	5.33 m (17 ft 6 in)

WEIGHTS:

Weight empty	395 kg (872 lb)
Max T-O weight	578 kg (1,275 lb)

PERFORMANCE (at max T-O weight):

Max level speed	170 knots (314 km/h; 195 mph)
Normal cruising speed	139 knots (257 km/h; 160 mph)
Landing speed	70 knots (129 km/h; 80 mph)
Rate of climb at S/L	268 m (880 ft)/min
Service ceiling	3,800 m (12,500 ft)
T-O and landing run	approx 305 m (1,000 ft)
Range with max fuel	500 nm (925 km; 575 miles)

km/h; 14 mph) higher than that of the fixed-gear version, and improved rates of climb.

A wide variety of mission configurations is to be offered, including standard and VIP passenger transport, troop and paratroop transport, palletised cargo transport, multi-engined crew trainer, target tug, glider tug, photogrammetric survey, maritime surveillance, flight calibration, ECM, and agricultural aircraft. Further details can be found in the 'Accommodation' and 'Avionics and Equipment' paragraphs which follow.

TYPE: Twin-engined passenger, cargo, ambulance and general utility transport.

WINGS: Cantilever high-wing monoplane. Wing section NASA GAW-1, with thickness/chord ratio of 17%. Dihedral 2°. Incidence (constant) 1° 30'. All-metal riveted light alloy structure, with stressed skin. Centre-section has main spar and two auxiliary spars; outboard of engines, wings have two spars. All-metal ailerons and all-metal electrically-operated double-slotted trailing-edge flaps. Trim tab in starboard aileron. Small stub-wings at cabin floor level serve as mountings for main landing gear units.

FUSELAGE: All-metal semi-monocoque structure, with stressed skin.

TAIL UNIT: Cantilever all-metal stressed-skin structure, with sweptback fin and rudder. Small dorsal and ventral fins. Non-swept horizontal



Half-scale P-47D Thunderbolt built by Gil Hallquist from War Aircraft Replicas plans (Howard Levy)

SIAI-MARCHETTI

SIAI-MARCHETTI SOCIETÀ PER AZIONI; Head Office: Via Indipendenza 2, 21018 Sesto Calende (Varese), Italy

SIAI-MARCHETTI SF.600 CANGURO (KANGAROO)

The F.600 prototype of the Canguro (I-CANG) was designed by Ing Stelio Frati and built by General Avia at Pioltello, Milan. Powered by two 261 kW (350 hp) Avco Lycoming piston engines, it flew for the first time on 30 December 1978.

Flight testing by SIAI-Marchetti began in 1979, as a result of which the wing and tailplane spans were increased slightly, and RAI certification was expected before the end of 1980. Meanwhile, in March 1980 SIAI-Marchetti, which will produce the aircraft under the designation SF.600, released details of intended production versions.

The basic SF.600 will be available with non-retractable landing gear, with a choice of Allison 250 turboprop or Avco Lycoming TIO-540 piston engines. Versions with retractable landing gear (SF.600T), and with swing-tail rear-loading capability, are also to be offered. The retractable-gear version has a cruising speed about 12 knots (22

surfaces. Trim tabs in rudder and each elevator.

LANDING GEAR: Non-retractable tricycle type standard, with oleo-pneumatic shock-absorber on each unit. Twin-wheel main units; single-wheel steerable nose unit. All five wheels and tyres same size, 7.00-6, tyre pressure 2.48 bars (36 lb/sq in). Retractable-gear version also available, with main units retracting into modified stub-wing fairings.

POWER PLANT: Two 313 kW (420 shp) Allison 250B-17C turboprop engines, each driving a Hartzell three-blade constant-speed fully-feathering and reversible-pitch propeller. Alternatively, may be powered by two 261 kW (350 hp) Avco Lycoming TIO-540-J flat-six piston engines. Fuel in four 275 litre (60.5 Imp gallon) wing tanks, giving total capacity of 1,100 litres (242 Imp gallons). External tanks, with total capacity of 600 litres (132 Imp gallons), available for turboprop version. Provision for auxiliary fuel tanks to be carried inside cabin. Oil capacity 11.4 litres (2.5 Imp gallons).

ACCOMMODATION: Pilot and co-pilot or passenger on flight deck. Cabin accommodates up to nine passengers or 12 paratroops, or four stretcher patients and two medical attendants, or equivalent.



SIAI-Marchetti SF.600 Canguru in its piston-engined form

lent cargo. Standard passenger layout comprises six single seats and a three-person rear bench seat, all facing forward. VIP layout has two forward-facing and two aft-facing seats forward, with folding tables between; central toilet and refreshment area; and two aft-facing seats, one folding table and three-person (forward-facing) bench seat at rear. Troop/paratroop layout has 12 inward-facing seats (five port, seven starboard). Forward-opening crew door at front on port side; wider door, of sliding type, at rear on port side for cargo loading. Swing-tail rear-loading version, opening sideways to starboard, also available.

SYSTEM: Electrical system for flap actuation and other services.

AVIONICS AND EQUIPMENT: Four external pylon attachments, one under each outer wing and two under fuselage, for auxiliary fuel tanks or other stores. Max load per pylon 300 kg (661 lb); max total external load 900 kg (1,984 lb). Palletised cargo version, equipped with two rows of floor rollers and floor-mounted tiedowns/quick-release hooks, can accommodate three 1.30 x 1.15 x 1.07 m (51 x 45½ x 42 in), two 2.20 x 1.15 x 1.07 m (86½ x 45½ x 42 in) pallets, or a single 4.50 x 1.15 x 1.07 m (177 x 45½ x 42 in) pallet. Electrically-powered (100A 28V DC) target-towing installation available (weight 83 kg; 183 lb), with 4.50 m (14 ft 9 in) sleeve target, 2,000 m (6,560 ft) cable, and optional miss-distance indication system. Cable-operated under-tail hook available, for towing one or more gliders. Photogrammetric version, carrying up to three operators, has one or two automatic cameras (Wild, Zeiss or similar) in cabin, plus twin gyros (MC-103-332D-11A or similar), Doppler radar, autopilot (AP-106 or equivalent), and radio altimeter (AL-101, AHV-6 or equivalent). Maritime surveillance version, currently under development, will be available in two forms. Fully-equipped version will have Bendix RDR-1400 search/navigation radar in nose, side/down-looking surveillance radar in forward underfuselage pod, one panoramic and one forward-looking oblique camera in pod under centre of fuselage, FLIR or low light level TV camera in underfuselage or underwing pod, Omega/VLF navigation system, compass system, periscopic sextant, observers' bubble windows in crew door and rear fuselage, searchlight, and pylon-mounted weapons, survival packs or life rafts. Simplified maritime version would have nose radar, underbelly camera pod and bubble windows only. ECM version, carrying two operators, would have a wide range of electronic or signal intelligence (elint or sigint) installations, radar warning receiver, and pylon-mounted chaff or cartridge dispensers. Agricultural version fitted with detachable 91 kg (200 lb) underbelly tank installation (tank volume 0.96 m³; 34 cu ft) for low

or ultra-low volume spraying, complete with spraybars. This version fitted also with bubble windows, additional lower windows in crew door, and wire cutters on windscreen and nosewheel unit.

DIMENSIONS, EXTERNAL:

Wing span	15.00 m (49 ft 2½ in)
Wing chord (constant)	1.60 m (5 ft 3 in)
Wing area, gross	24.00 m ² (258.3 sq ft)
Wing aspect ratio	9.4
Length overall	12.15 m (39 ft 10½ in)
Height overall	4.60 m (15 ft 1 in)
Tailplane span	6.16 m (20 ft 2½ in)
Wheel track	2.40 m (7 ft 10½ in)
Wheelbase	4.88 m (16 ft 0 in)
Propeller diameter	2.03 m (6 ft 8 in)
Crew door (fwd, port): Height	1.14 m (3 ft 9 in)
Width	0.86 m (2 ft 10 in)
Height to sill	0.90 m (2 ft 11½ in)
Cargo door (rear, port): Height	1.13 m (3 ft 8½ in)
Width	1.49 m (4 ft 10½ in)
Height to sill	0.90 m (2 ft 11½ in)

DIMENSIONS, INTERNAL:

Cabin, excl flight deck:	
Length	5.05 m (16 ft 6¾ in)
Width	1.23 m (4 ft 0½ in)
Max height	1.27 m (4 ft 2 in)
Floor area	5.57 m ² (60 sq ft)
Volume	7.80 m ³ (275.5 cu ft)

WEIGHTS AND LOADING (A: Allison 250 engines;

B: TIO-540 engines):	
Weight empty, equipped:	
A (fixed gear)	1,850 kg (4,078 lb)
B	1,950 kg (4,299 lb)
Operating weight empty:	
A (fixed gear)	1,947 kg (4,292 lb)
B	2,090 kg (4,607 lb)

Max payload:	
A	1,200 kg (2,645 lb)
B	1,000 kg (2,205 lb)
Max external load: A, B	900 kg (1,984 lb)
Max T-O weight:	
A (fixed gear)	3,300 kg (7,275 lb)
A (retractable gear)	3,400 kg (7,495 lb)
B	3,200 kg (7,054 lb)
Max overload T-O weight with external fuel:	
A	3,700 kg (8,157 lb)
Max cargo floor loading: A, B	400 kg/m ² (82 lb/sq ft)

PERFORMANCE (estimated, at max T-O weight except where indicated. A: Allison 250 engines and, except where indicated, fixed landing gear; B: TIO-540 engines):

Max cruising speed at 3,050 m (10,000 ft):	
A	178 knots (330 km/h; 205 mph)
B	176 knots (326 km/h; 203 mph)
Cruising speed (75% power) at 3,050 m (10,000 ft):	
A, B	159 knots (295 km/h; 183 mph)
Stalling speed, flaps down:	
A	59 knots (110 km/h; 68 mph)
B	58 knots (108 km/h; 67 mph)
Max rate of climb at S/L:	
A (fixed gear)	396 m (1,300 ft)/min
A (retractable gear)	550 m (1,804 ft)/min
B	381 m (1,250 ft)/min
Rate of climb at S/L, one engine out:	
A (fixed gear)	91 m (300 ft)/min
A (retractable gear)	130 m (426 ft)/min
B	85 m (280 ft)/min
Service ceiling:	
A	6,700 m (21,980 ft)
B	7,100 m (23,300 ft)
Service ceiling, one engine out:	
A	2,400 m (7,875 ft)
B	3,200 m (10,500 ft)
T-O run:	
A	220 m (722 ft)
B	240 m (788 ft)
T-O to 15 m (50 ft):	
A	350 m (1,148 ft)
B	395 m (1,296 ft)
Landing from 15 m (50 ft):	
A	320 m (1,050 ft)
A with propeller reversal	250 m (820 ft)
B	340 m (1,115 ft)
Landing run:	
A	210 m (689 ft)
A with propeller reversal	130 m (427 ft)
B	200 m (656 ft)
Typical range, 45 min reserves:	
A with 625 kg (1,378 lb) payload, at max T-O weight (standard fuel)	860 nm (1,595 km; 990 miles)
A with 625 kg (1,378 lb) payload, at max overload T-O weight (incl external fuel)	1,080 nm (2,000 km; 1,245 miles)
B with 250 kg (550 lb) payload	1,315 nm (2,435 km; 1,515 miles)
Range with max internal and external fuel:	
B	1,350 nm (2,500 km; 1,555 miles)
g limits (Normal category):	
A, B	+3.8: -1.52



F-15 Strike Eagle taking off from the McDonnell Douglas plant at St Louis, on the first leg of its flight to the Farnborough Air Show in England

MCDONNELL DOUGLAS

MCDONNELL DOUGLAS CORPORATION:
Head Office and Works: Box 516, St Louis,
Missouri 63166, USA

MCDONNELL DOUGLAS F-15 STRIKE EAGLE

McDonnell Douglas has developed as a company-funded project an all-weather interdiction version of the F-15, identified as the F-15 Strike Eagle. Demonstrated publicly each day at the 1980 Farnborough International Air Show, it is structurally similar to the F-15 Eagle, as described in the 1979-80 *Jane's*, but incorporates a synthetic aperture radar (SAR) configuration of the lightweight APG-63 pulse-Doppler radar which was developed by Hughes Aircraft Company for the standard F-15. SAR represents an advance in digital electronics which uses programmable signal processors with high-density storage elements in the radar. The SAR modification of the APG-63 provides a significant breakthrough in ground target resolution, making it possible for small targets to be 'seen' in any weather, or by night, from ranges of approximately 17 nm (32 km; 20 miles). It was intended to install the new Hughes SAR in the Strike Eagle airframe in early October, and it was anticipated that by December 1980 it would be possible for the radar to demonstrate a resolution of 3.05 m (10 ft) from a range of 8.5 nm (16 km; 10 miles).

When fully developed, Strike Eagle is expected to be able to carry out night and all-weather attacks against ground targets from stand-off ranges, and it is planned to demonstrate this capability by May 1981, at which time blind weapon delivery techniques will be simulated. It is hoped that within two months of that demonstration it will be possible to integrate SAR imagery with the FLIR (forward-looking infra-red) system of the Pave Tack targeting pods, leading to the first launching trials of live weapons, and the completion of all company-funded testing in late 1981. In the two-seat F-15 Strike Eagle, the aft seating position is equipped for a specialist officer to handle both the SAR and the Pave Tack systems. He is provided with four displays, two of which will be used for navigation to the target area: of the two that remain, one is dedicated to weapon selection, while the other monitors enemy tracking systems. Approach to the target area would be made at low level, followed by a brief-duration 'look-see' at a height of approximately 760 m (2,500 ft) to enable the radar officer to locate a specific target. After some 10 to 20 seconds the low level track would be resumed, with the on-board computer then provided with details of azimuth and range, and the FLIR system being used for pin-point designation of the target.

The F-15 Strike Eagle retains the air superiority capability of the basic F-15, but will be suitable also for deployment in close air support and interdiction roles. Three 30 mm gun pods can be carried on underfuselage and underwing racks, or up to 10,885 kg (24,000 lb) of other stores. These can include air-to-ground weapons such as HARM (High-speed Anti-Radiation Missile), Harpoon anti-ship missile, Mk 20 Rockeye bombs in an MER-200 dispenser which allows their delivery at supersonic speed, Mk 82 (500 lb) and Mk 84 (2,000 lb) bombs, Maverick television-guided missiles, and Pave



Single-seat Orao, first product of Romanian/Yugoslav co-operation in aircraft design

Tack infra-red tracking and laser-spot designation pods. Strike Eagle is able to carry also two low-drag conformal fuel tanks, known as FAST (Fuel And Sensor Tactical) Packs, to provide increased range. These can themselves be used to mount two AIM-7F Advanced Sparrow missiles, or 1,995 kg (4,400 lb) of air-to-ground weapons on each tank, or Pave Tack pods, or similar more advanced systems now under consideration.

SOKO/CNIAR

Participants:
SOKO, Mostar, Yugoslavia

Central National al Industriei Aeronautice
Române, Bucharest, Romania

This year, for the first time since the aircraft was flown six years ago, official data have been released to *Jane's* on the Orao/IAR-93 close-support aircraft/interceptor developed jointly by the Yugoslav and Romanian aircraft industries.

SOKO/CNIAR ORAO (EAGLE)/IAR-93

This twin-jet ground attack fighter is under development to meet a joint requirement of the air forces of Romania and Yugoslavia. In the latter country it is known as the Orao (Eagle); its Romanian designation is IAR-93. The joint programme is known as 'Yurom' (from Yugoslavia-Romania).

The Orao/IAR-93 was designed jointly by Yugoslav engineers from the Vazduhoplovno Tehnicki Institut in Zarkovo, near Belgrade, and by Romanian engineers from the Institutul de Mecanica Fluidelor si Constructii Aeronautice in Bucharest. Manufacture of single-seat prototypes began simultaneously in the two countries, and a first flight in each country was made on 31 October 1974. On 15 April 1975 the Yugoslav prototype, bearing serial number 25001, was demonstrated publicly during the Victory Day parade at Batajnica military airfield near Belgrade. A tandem two-seat dual-control prototype was then built and flown in each country, after which Yugoslavia and Romania each com-

pleted a number of pre-production aircraft. A formation of three IAR-93s was flown publicly on 23 August 1979, during the Liberation Day celebrations in Bucharest.

More than 33 factories in Yugoslavia are involved in the Orao manufacturing programme, led by SOKO, which has prime responsibility for final assembly and flight testing. In Romania, CNIAR is co-ordinating the factories involved and is responsible for deliveries of completed aircraft to the Ministry of National Defence. IAR-93 flight testing is undertaken at Craiova in Romania.

It is anticipated that 200 or more of these aircraft will be built for each country, including a proportion of two-seat dual-control operational trainers. The initial production batch is estimated to be nearly 40, including two-seaters; one unconfirmed report has suggested that the Yugoslav Air Force has already ordered 150 single-seaters and 50 two-seaters.

TYPE: Single-seat close support aircraft and interceptor.

WINGS: Cantilever shoulder-wing monoplane, of low aspect ratio. Anhedral 3° 30' from roots. Sweepback approx 43° on leading-edges. Leading-edge slats. Two small boundary layer fences on upper surface of each wing. Wide-chord semi-Fowler-type trailing-edge flaps. Trim tab in starboard aileron. Ailerons controlled by Dowty servo-actuators with autostabiliser system.

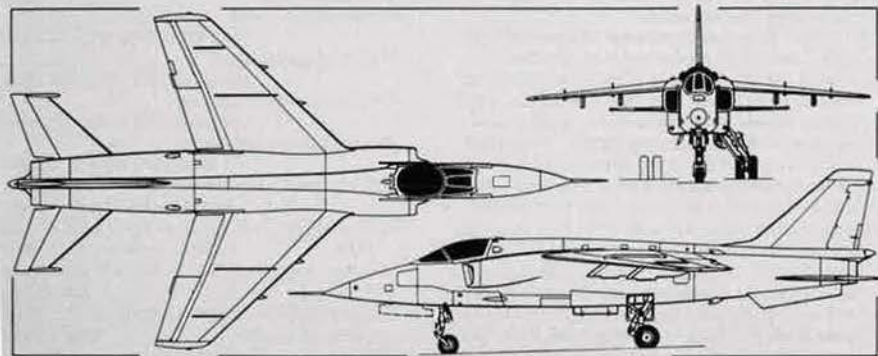
FUSELAGE: All-metal semi-monocoque structure. Door-type perforated airbrake under each side of fuselage, forward of main-wheel bays. Dorsal spine fairing houses systems circuits and flight control rods. 'Pen-nib' fairing above exhaust nozzles. Rear fuselage detachable to facilitate access to engines. Space provision in nose for ranging radar.

TAIL UNIT: Cantilever metal structure, with sweepback on all surfaces. Low-set all-moving tailplane. Small dorsal fin. Tailplane and rudder controlled by Dowty servo-actuators with autostabiliser system. Auxiliary ventral fin on each side beneath rear fuselage.

LANDING GEAR: Retractable tricycle type, with single-wheel steerable nose unit and twin-wheel main units. Manufactured by PPT factories (for Yugoslav aircraft) and CNIAR factories (Romanian aircraft). All units have two-stage oleopneumatic shock-absorbers. Hydraulic actuation, all units retracting forward into fuselage. Braking parachute in bullet fairing at base of rudder.

POWER PLANT: Two 17.8 kN (4,000 lb st) Rolls-Royce Viper Mk 632-41 non-afterburning turbojet engines, mounted side by side in rear fuselage, with lateral air intakes. Internal fuel capacity approx 3,200 litres (704 Imp gallons). Production aircraft will be fitted with Rolls-Royce-developed afterburners, increasing power of each engine to approx 22.3 kN (5,008 lb st); afterburners will be produced under licence in Yugoslavia and Romania.

ACCOMMODATION: Pilot only, on ejection seat be-



SOKO/CNIAR Orao/IAR-93 single-seat close support aircraft and interceptor (Pilot Press)

neath rear-hinged, upward-opening canopy; or crew of two in tandem under elongated canopy in operational training version. Dual controls in training version.

SYSTEMS AND EQUIPMENT: Autostabiliser system for control surface servo-actuators. Standard equipment varies according to operator and mission/performance requirements. Landing lights under nose, forward of nosewheel bay, and on nosewheel leg. Ram-air scoop aft of cockpit on each side; additional air scoops on top of fuselage, aft of canopy and at front of dorsal fin, and below rear fuselage.

ARMAMENT: Two 23 mm cannon in lower front fuselage, aft of nosewheel bay; one underfuselage and four underwing stations for external stores. Max external load approx 2,500 kg (5,510 lb).

DIMENSIONS, EXTERNAL:

Wing span 9.63 m (31 ft 7 1/4 in)
 Wing area, gross 26.00 m² (279.86 sq ft)
 Wing aspect ratio 3.57
 Length overall: incl probe 14.88 m (48 ft 9 7/8 in)
 excl probe 13.99 m (45 ft 10 3/4 in)
 Height overall 4.45 m (14 ft 7 1/4 in)
 Wheel track (c/l of shock-struts) 2.50 m (8 ft 2 1/2 in)
 Wheelbase 5.35 m (17 ft 6 3/4 in)

WEIGHTS AND LOADINGS (A: prototypes; B: production version):

Weight empty, equipped:
 A 6,100 kg (13,448 lb)
 B 5,700 kg (12,566 lb)

Internal fuel load:
 A 2,600 kg (5,732 lb)
 B 2,700 kg (5,952 lb)

T-O weight 'clean':
 A 8,880 kg (19,577 lb)
 B 8,600 kg (18,959 lb)

Max T-O weight with external stores:
 A, B 10,500 kg (23,148 lb)

Wing loading:
 A at T-O weight 'clean' 341 kg/m² (69.8 lb/sq ft)
 B at T-O weight 'clean' 330 kg/m² (67.6 lb/sq ft)
 A and B at max T-O weight 404 kg/m² (82.7 lb/sq ft)

Power loading:
 A at T-O weight 'clean' 250 kg/kN (2.45 lb/lb st)
 A at max T-O weight 295 kg/kN (2.89 lb/lb st)
 B at T-O weight 'clean' 192 kg/kN (1.88 lb/lb st)
 B at max T-O weight 235 kg/kN (2.30 lb/lb st)

PERFORMANCE (A: without afterburning; B: production version with afterburning):

Max level speed at low level:
 A 556 knots (1,030 km/h; 640 mph)
 B 610 knots (1,130 km/h; 702 mph)

Max level speed at high altitude:
 A 529 knots (980 km/h; 609 mph)
 B 577 knots (1,070 km/h; 665 mph)

Landing speed:
 A, B 130 knots (240 km/h; 149 mph)

Max rate of climb at S/L at 'clean' T-O weight:
 A 2,310 m (7,578 ft)/min
 B 4,536 m (14,882 ft)/min

Time to 12,000 m (39,370 ft): A 10 min 15 s
 Time to 13,000 m (42,650 ft): B 5 min 30 s

Service ceiling:
 A 12,000 m (39,370 ft)
 B 13,000 m (42,650 ft)

T-O run:
 A at 8,500 kg (18,740 lb) AUW 925 m (3,035 ft)
 B at max T-O weight 1,000 m (3,280 ft)

Landing run:
 A at 8,500 kg (18,740 lb) AUW 900 m (2,953 ft)
 B at max T-O weight 1,100 m (3,609 ft)

Combat radius (A and B) with 2,000 kg (4,410 lb) external stores:
 lo-lo-lo 162 nm (300 km; 186 miles)
 hi-lo-hi 194 nm (360 km; 224 miles)
 g limit: A, B +7.0

NDN

NDN AIRCRAFT LTD: Goodwood Aerodrome, nr Chichester, Sussex, UK

NDN 6 FIELDMASTER

NDN Aircraft has under development a new agricultural aircraft, designated NDN 6 Fieldmaster, which is being financed jointly by the company and the UK National Research Development Corporation. Representing an entirely new approach to the design of agricultural aircraft, it features a titanium chemical hopper which is an integral part of the fuselage structure, its outer surface contoured to serve as the skin of that fuselage section. The power plant is mounted on to the forward structure of this hopper, the aft fuselage is attached to its rear, and the wings are built directly on to each side of the hopper's base. The cockpit, which is incorporated in the aft fuselage section, is protected by a strong roll-over structure, and is large enough to accommodate a second seat in tandem. Removable dual controls are standard, to simplify flight training and check-out procedures. The wing carries full-span auxiliary aerofoil trailing-edge flaps. These embody a liquid spray dispersal system that discharges directly into the downwash of the flaps, ensuring that the spray droplets achieve the best possible crop penetration. Roll control is provided by dual narrow-chord ailerons mounted towards the wingtips and forward of the flaps.

Construction of the prototype has begun, and the first flight of this aircraft is planned for mid-1981. TYPE: Two-seat large-capacity agricultural aircraft.

WINGS: Braced low-wing monoplane, with an overwing streamline-section bracing strut each side. Conventional all-metal structure with full

ACCOMMODATION: Standard accommodation for pilot and trainee/passenger on fully-adjustable tandem seats in an enclosed cockpit, which has a strong roll-over protective structure. Dual controls standard; those for the pupil can be removed easily when not required. Crew safety helmets with headsets optional. Baggage space in fuselage. Birdproof laminated glass windscreen standard; two-speed windscreen wiper and windscreen washer installation optional. Accommodation ventilated; air-conditioning/heating system optional. Wirecutters forward of windscreen, and cable deflecting wire from top of windscreen to forward tip of fin.

SYSTEMS: Electrical system includes 24V 300A starter/generator. Hydraulic system for actuation of brakes. Central warning system standard, including engine fire warning.

AVIONICS AND EQUIPMENT: Intercom system standard. Optional avionics available to customer requirements. Standard equipment includes an external power socket. Optional equipment includes blind-flying instrumentation complete with vacuum system; airframe and engine hour meter; instrument lighting, navigation lights, fin and wingtip strobe lights; two forward-looking and/or two retractable sideways-looking work lights, each 600,000 candlepower; automatic flagman installation; fire bombing dump door; adaptors to convert standard 40-nozzle to 80-nozzle spray system; Transland gate box, high volume spreader, quick-disconnect flange kit, and side loading system; and Micronair 8-unit installation, with flow meter and rpm indicator.



Model of NDN 6 Fieldmaster agricultural aircraft. Production version will have a single nosewheel

corrosion proofing. Electrically-actuated full-span auxiliary aerofoil trailing-edge flaps, which incorporate plumbing for 20 standard spray nozzles on each wing. Two narrow-chord ailerons on each wing, adjacent to wingtip and forward of trailing-edge flaps.

FUSELAGE: Forward fuselage comprises structural titanium hopper with capacity of 1,996 kg (4,400 lb) dry, or 2,642 litres (581 Imp gallons) liquid chemicals, and incorporating large access door, vent system, inspection windows, and light. Aft fuselage, attached to the rear of this hopper, is of semi-monocoque light alloy construction, fully corrosion proofed, and with easy access for cleaning and maintenance.

TAIL UNIT: Braced conventional structure of light alloy. Trim tab in rudder and port elevator.

LANDING GEAR: Non-retractable tricycle type, manufactured by AP Precision Hydraulics, with a single wheel on each unit. Nosewheel has alternative steerable or castoring facility. Main units of levered suspension type. Tubed tyres of 74 cm (29 in) diameter on main wheels. Hydraulic disc brakes. Landing gear incorporates wire cutters.

POWER PLANT: One 559 kW (750 shp) Pratt & Whitney Aircraft of Canada PT6A-34AG turbo-prop engine, driving a Hartzell three-blade fully-feathering reversible-pitch metal propeller with spinner. Fuel system comprises two integral tanks in each wing, and has total capacity of 946 litres (208 Imp gallons). Engine air intake has a Centrisep filtration system.

DIMENSIONS, EXTERNAL:

Wing span 15.32 m (50 ft 3 in)
 Length overall 11.02 m (36 ft 2 in)
 Height overall 3.48 m (11 ft 5 in)
 Wheel track 5.08 m (16 ft 8 in)
 Wheelbase 3.35 m (11 ft 0 in)
 Propeller diameter 2.69 m (8 ft 10 in)

AREA:

Wings, gross 31.40 m² (338 sq ft)

WEIGHTS (estimated):

Weight empty, equipped 1,588 kg (3,500 lb)
 Max T-O weight 3,856 kg (8,500 lb)

PERFORMANCE (estimated, at max T-O weight, except as indicated):

Never-exceed speed 191 knots (354 km/h; 220 mph)
 Max level speed, clean 163 knots (303 km/h; 188 mph)
 Cruising speed, 75% power 149 knots (275 km/h; 171 mph)
 Design manoeuvring speed 135 knots (249 km/h; 155 mph)
 Stalling speed, flaps down 59 knots (109 km/h; 68 mph)
 Stalling speed, flaps down at 2,268 kg (5,000 lb) AUW 45 knots (84 km/h; 52 mph)
 Max rate of climb at S/L 366 m (1,200 ft)/min
 T-O run 177 m (580 ft)
 Landing run with propeller reversal, at normal operating weight 85 m (280 ft)
 Range with max fuel, no reserves 1,020 nm (1,889 km; 1,174 miles)

Now that the election rhetoric is behind us,
does the nation have the fortitude, determination,
and will to face up to . . .

The Sad Facts About Our Military Posture

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

NOW that the seemingly interminable campaign is over and we know the results, it is time to do some real thinking about the fix we are in. The facts have lately been obscured in a hot-air haze. Whether or not the All-Volunteer Force has an excessive number of mental incompetents, whether or not it is or is not combat ready and where we stand in the strategic arms contest are all valid questions for discussion. However, they evade the main issue. That, it seems to me, at any rate, is whether or not this country has any real will to face the decade ahead of us.

Rhetoric aside, the all-volunteer concept is a failure. It cannot be reckoned anything but a failure, no matter how happy we make the volunteers, unless our national objectives remain modest ones and, in no case, contemplate any real confrontation with the Soviets. Certainly we could have a better volunteer force than we have now. It is high time we do the things, such as increased pay and improved conditions of servitude, to make it better.

Nevertheless, in the long run, a standing military with nothing behind it cannot be the answer. If our present military resembles, here and there, more of an armed WPA than it does the Coldstream Guards, that is something that money—and a few enlightened and objective policies—can remedy. But even if the election has not turned the politicians' minds to other matters, and if all sorts of new benefits now start flowing the military's way, the volunteer force is, in itself, a defeatist approach to national defense.

Attrition, that euphemism for combat losses, would quickly decimate the regular units in any shooting war. Even in peacetime, protracted duty in places like the Indian Ocean shows up the fallacy of a national defense policy based on tightly stretched Regular forces. You just cannot keep sending the same people back time after time. Not, that is, if you wish to keep them in the service.

This all-volunteer idea is, perhaps, not only our most lingering but our most pernicious heritage of the Vietnam era. Other casualties, like ROTC and even the defense budget, are in the rehabilitation ward; but the concept of national service is very ill, if not moribund. It is sad, because a main source of career soldiers, sailors, and airmen in the days of the draft came from people who entered the service more or less involuntarily. They became interested in staying on only after they found out what military life was all about. That most important source has now dried up.

After what has gone on these past few months, it is going to be difficult to get the sad facts about our military posture out on the table. The Chief of Staff of the Army, Gen. E. C. Meyer, spoke awhile back of his "hollow army." It is an interesting phrase and one that deserves a thorough explanation. Unhappily, with the emergence of national defense as a key, if little understood, political issue, our senior military leaders' complaints about the state of readiness have become muted or distorted.

There are some disquieting omens that even the recently revived interest in the defense budget may turn out to have been a casualty of November 4. The services were being put on notice during the last weeks of October to brace themselves for some cuts. It is hard to see how any further reductions could be made in procurement. The aircraft lines are already producing at a slow

and needlessly more expensive trickle, and base closings never offered any immediate savings. Therefore, readiness must be the sacrificial goat the budget trimmers had in mind during those days just before the election as they whacked at the 1982 budget.

All in all, the prospect ahead of us is a discouraging one, given the dangers that face us and our evident unwillingness to prepare ourselves for those dangers. The election campaign has not been an encouraging time for people who have any real understanding of our military situation. The inflated achievements claimed by the politicians on one side, including those of our heretofore apolitical Secretary of Defense, have managed to make preparedness just another political football.

The charges by the politicians on the other side have never quite gotten to the point. No one, it seems, wants to identify himself with the fact that national defense in this decade—at a time when we can no longer rely on allies or oceans to give us time to get ready—is a national responsibility. A responsibility, moreover, that will require some sort of national service and a budget that pays the high cost of readiness, no matter what.

Finally, this business of military preparedness must somehow be handed back to the military professionals. Surely civilian control, a fine democratic concept of the founding fathers, was never intended to encroach so pervasively and perversely on the military structure. Civilian control in the policy sense works; when it is distorted into micromanagement of programs, it is a recipe for disaster. ■

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"Partners in Aerospace Power"

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THE BULLETIN BOARD

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

Extra Housing Funds Finally Arrive

Supplemental housing allowances for members living off base in high-cost Stateside areas have been studied, examined, proposed, and rejected within the Pentagon for at least two decades. Proponents of the supplements argued that similar allowances have long been paid people serving overseas. Why should CONUS people suffer? AFA has long championed such a benefit.

But the heavy cost of such proposals always got in the way until the variable housing allowance (VHA) came along. The money finally appeared in October 31, 1980, paychecks.

And while the VHA formula doesn't pay all the extra expenses of housing off base, it can only be described as generous. The estimated first-year cost DoD-wide is close to the \$600 million mark, perhaps a record outlay for a brand-new benefit.

Whereas in some earlier studies a VHA, or something like it, was only visualized for the few "high-cost" areas, the new program covers about ninety-eight percent of the more than 600,000 members drawing BAQ. In

other words, virtually all areas are now high cost.

People in Alaska and Hawaii don't get the VHA; they receive an overseas station allowance.

The VHA payment formula involves five "rank groups" and 347 housing areas. The payment range is extremely wide. For example, an E-8 at Chanute AFB, Ill., drawing the "with dependent" rate, gets a monthly VHA of \$29.79, in addition to his BAQ of \$297.90. O-6s in such ultra-high-cost areas as Washington, D. C., and Los Angeles receive a VHA of \$234.30 on top of their \$468.60 BAQ, for a total of \$702.90 in monthly housing money.

VHA is also paid to Reserve Forces members on active duty for training and to members overseas whose dependents remain in the States.

The new benefit raises some questions about the reaction of personnel who live in government quarters and thus don't qualify for BAQ or VHA. Might these quarters decline in popularity to the point that commanders couldn't fill them? Won't bachelor airmen and single company grade officers step up the pressure for "optional residency"?

These bachelors are normally tied

to base quarters, surrendering their BAQ whether they like it or not, though the Air Force is pushing a bill that would let E-7s and above and company graders live off base and collect their BAQ plus the new VHA. The measure, which has passed the House, is one of several additional benefit-type bills Congress was expected to take up in late November or early this month.

The others would: (1) continue current rental prices for on-base trailer spaces, thus defusing the "fair-market" rental issue; (2) equalize TDY policies for officer and enlisted members; (3) establish a new special pay of \$50 a month or permit certain R&R options for EM in CONUS-overseas imbalance skills who extend overseas tours; (4) set up a cost-sharing dental-care program for active-duty dependents; and (5) reduce various CHAMPUS costs. Most of the above items are policy positions AFA is strongly pushing (see the AFA Policy Paper "Defense Manpower Issues," p. 75, November '80 AIR FORCE Magazine).

VA Hails Outreach Effort

The Veterans Administration has called the fourteen-month-old "Operation Outreach" program, which helps troubled Vietnam veterans adjust to civilian life, a big success. The project, established in October 1979, involves VA counseling teams working out of store-front Vet Centers across the country—the counselors in effect "reach out" for local veterans who need help.

More than 3,000 vets a month are visiting the new Centers, the agency reports. Some of them are suffering from posttraumatic stress, whose symptoms include depression, uncontrolled anger and flashbacks, and nightmares of combat. Others have personal or family problems or need a job, or want a better one. Still others just have neglected to take advantage of VA-sponsored training and other benefits.

The four-member counseling teams, recruited for their counseling skills and training, were given special



During a recent visit to the nation's capital, the famed Marine Corps ace of World War II, Greg "Pappy" Boyington, was given a tour of AFA Headquarters. Colonel Boyington is shown here with (from left) AFA Chairman Dan Callahan; Mrs. Boyington, and, at right, AFA National President Vic Kregel. (Details on Boyington's visit, p. 31.)

training by VA instructors and independent experts. They report numerous success stories of how, following counseling and rap sessions, their clients are getting turned around, holding on to jobs, and otherwise adjusting to civilian life.

Some Vet Center team members visit veterans in jail. Other veterans who refuse to come to the Centers are met and counseled at parks, parking lots, restaurants, bars, and other places.

In a somewhat related action, the VA is opening contractor-operated halfway houses for the worst cases among the growing number of veterans who are alcoholics or on drugs. The facilities will provide residential care for veterans who have completed inpatient treatment at VA hospitals.

Last year, alcoholism accounted for more than 100,000 of the 1.2 million total admissions to VA hospitals, up from 94,400 the year before, and second to cardiovascular patients. Inpatient admissions for drug-dependent vets increased from 15,000 to more than 22,000.

Halfway houses treatment will focus on vets who are "chronically disconnected from society, without family, often without fixed addresses, and often lacking competitive skills for today's limited job market," VA said.

Thirteen halfway houses have already signed contracts and eighty are expected to be signed this year. An estimated 1,500 veterans will be cared for. In addition, VA is opening similar treatment facilities at several of its hospitals.

VA treats alcoholics for a short time in hospitals and follows with group and family therapy and vocational training during outpatient visits. It also stresses a close link with Alcoholics Anonymous.

Operation Outreach is operating on a \$9.9 million budget this fiscal year. Critics say this is just half of what Congress recommended.

SRB Program Big Business

The Air Force's Selective Reenlistment Bonus program has taken on king-size proportions as the service's retention drive gains momentum. No sooner did USAF get the authority, effective October 1, 1980, for an SRB (Zone C) for reenlistments between ten to fourteen years of service, than it designated fifty-seven Zone C skills.

SRB skills for members with less service (Zones A and B) have also been increased dramatically, with heavy emphasis on maintenance and other readiness fields. USAF's total

SRB budget has risen from \$30.5 million in FY '79 to \$84.9 million this year.

The accompanying chart summarizes the skills and budget increase:

FY	Zone A	Zone B	Zone C	Budget (million)
'79	56	28	0	\$30.5
'80	65	32	0	\$41.0
'81	89	65	57	\$84.9

Officials also pointed out that the number of members drawing Zone A bonus money will increase from about 4,000 to around 10,000 this year. Some 5,000 will draw Zone B money, up from 1,000, and about 2,000 airmen will get in on the new Zone C funds this year.

The SRB maximum payment was recently raised from \$12,000 to \$16,000 (\$15,000 to \$20,000 for Navy nuclear specialists). Some Zone C recipients with high "SRB multiples" and several years of obligated service will draw that sum or come near to doing so.

More typical, however, is an SRB of \$4,000 to \$6,000.

GI Bill Extension Delayed

Extension of the GI Bill beyond its present December 31, 1989, termination date has been delayed at least until next year. As reported in the October "Bulletin Board," the Senate approved a generous extension for-

mula that, according to Senate Veterans Committee Chairman Alan Cranston (D-Calif.), "would have removed the incentive for experienced and well-qualified military personnel

to leave the service to use their GI bill benefits."

But the House Veterans Committee refused to consider the change this year. It did make a commitment that it would consider the Senate's extension in the context of efforts next year to design an All-Volunteer Force GI Bill.

The Air Force, of course, was unhappy with the outcome. While the extension of the 1989 cutoff is generally seen as benefiting retention, something the lawmakers profess to be concerned about, there is some known resistance to the idea.

Meanwhile, GI Bill recipients are receiving a ten percent increase in benefits, in two steps. Half of the increase was effective October 1 and the other half is effective January 1. Almost 1,000,000 Vietnam-era veterans and eligible dependents and survivors will share in the raises.

The same legislation, according to House Veterans Committee Chair-



VA Administrator Max Cleland, here opening the Vet Center in Des Moines, Iowa, described the program as embodying a "no frills, low-key approach" to helping Vietnam-era veterans. (See item.)

man Ray Roberts (D-Tex.), will improve the VA's debt collection efforts. "The VA has admitted the existence of well over \$400 million in outstanding education overpayments and loans," Representative Roberts said. He declared that "our planned improvements will recover and save \$180 million for the federal government in FY '81 alone."

Commissary Systems Won't Merge

A two and one-half year study within the Pentagon, backed by AFA, has concluded that a consolidated commissary system isn't needed. So the four separate operations, one for each service, will continue as before. Critics have charged that money could be saved and efficiencies realized by a merger.

Instead, a joint-service executive board is being established to provide "broad policy guidance on commissary operations." This action, according to the Defense Department, "will strengthen the services' commissary systems."

Army Maj. Gen. Dean Tice, who serves as Deputy Assistant Secretary of Defense for Military Personnel Policy, will head the new board.

PCS Funds Gap Broad as Ever

The various new benefits recently approved did little to ease the dismal PCS entitlements situation. Com-

THE BULLETIN BOARD

pared to a government civilian, the military member at transfer time is treated as an unwanted orphan.

The civil servant gets a government-paid house-hunting trip, per diem, temporary quarters, and real estate expenses. The service member gets none of these, not even toll fees.

Hq. USAF some months ago developed a dramatic scenario spotlighting the differences. It compared an Air Force E-7 with a DoD GS-9; they are considered "equivalent" in rank. Both were assumed to have a wife and two children and both were moving from Washington, D. C., to San Francisco. The script assumed that both sold their "\$50,000 townhouses" in Washington and bought \$60,000 homes in San Francisco. It then compared their PCS entitlements. The E-7's came to \$968.55; the GS-9 got \$12,145.19. Yes, \$12,145.19!

How can this be? Well, the GS-9's entitlements included nearly \$1,000 for nine and one-half days travel per diem; more than \$1,100 for a six-day house-hunting trip to and from San Francisco (including air fare for him and his wife); more than \$1,300 for

twenty days in temporary quarters; and \$8,000 for "real-estate expenses" (brokers' selling fees, closing costs, etc.). The GS-9 also collected \$425 in mileage, \$200 in miscellaneous expenses, and \$10 in road tolls.

And the E-7 family? They received \$720.45 in travel mileage and \$248.10 in dislocation allowance. Total: \$968.55.

Since the old scenario appeared, the heavily publicized package of new benefits, including the 11.7 percent pay raise and the military travel mileage boost, became law. One might expect the vast PCS compensation gap to close somewhat as a result.

Not so. In fact, the gap has widened. Remember, the old scenario found the GS-9 outdrawing the E-7 by a huge \$12,145.19 to \$968.55—a difference of \$11,176.64.

But in updating the figures, Hq. USAF entitlement experts found that the GS-9's per diem and temporary quarters rates had shot up again, bringing his total entitlement for the Washington-San Francisco move to \$13,292.88.

And the E-7? His auto mileage increased to \$1,021.68 and his dislocation allowance (because of the pay raise) rose to \$277.20. But he still receives none of the big goodies the GS-9 enjoys, leaving him with just \$1,298.08. The difference in the draw is now \$11,993.80!

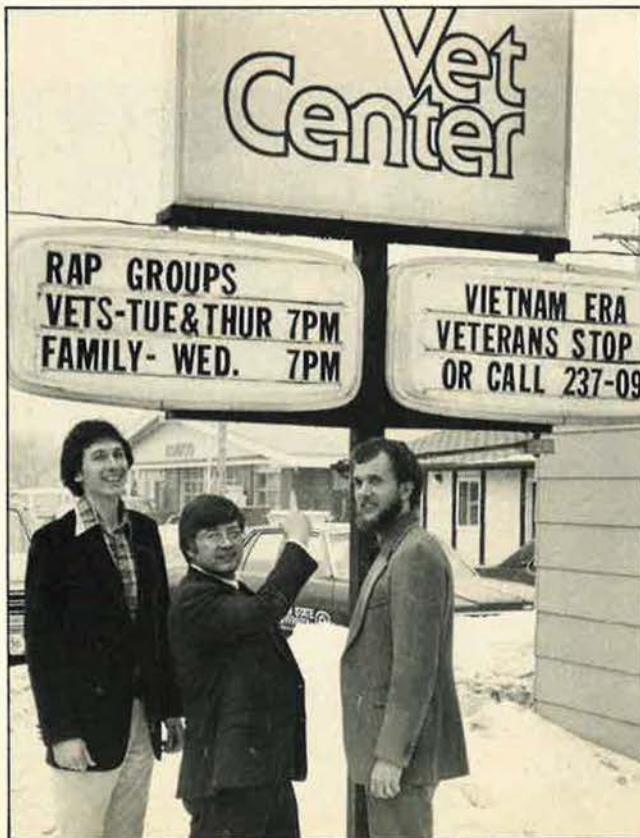
Survivor Benefits Improved

Changes to the Survivor Benefits Plan, about which AFA has testified before Congress, became effective this month. They include establishing the same civilian employee survivor annuity program formula for determining CPI-generated premium increases. This will result in lower premiums for military participants when future CPI raises are made to retired pay and therefore to SBP premiums.

The SBP alterations, effective this month, also include the following: (1) Retains the current 100 percent Social Security offset but ensures that no SBP annuity is reduced by more than forty percent when the beneficiary reaches age sixty-two, and (2) eliminates the Social Security offset for Reserve component members if the service performed is for periods of less than thirty days.

Several additional steps to sweeten SBP were cut out of the measure by the Senate Armed Services Committee. However, House leaders, fearful that time was running out for the Ninety-sixth Congress, decided to accept the watered-down package. Still, lawmakers like Rep. Charles E.

The Fargo, N. D., Vet Center, one of nearly 100 throughout the country, boasts evening hours in its outreach program for Vietnam-era veterans. The Center's team leader, James McLean, points out the time for evening meetings. He is flanked by assistants Gary Sorenson, left, and Dennis Lyon. (See item, pp. 148-149.)



Bennett (D-Fla.) called the final version "a significant improvement over present law."

SBP improvements eliminated by the Senate included steps to end the offset for widows with one dependent, provide a 270-day open enrollment period, and provide an annuity to widows whose husbands died in retirement before 1972.

Asked for its position on the SBP changes, Air Force said it "supports current efforts to improve the plan and believes that further major improvements concerning the cost of the plan and Social Security offset are essential. Air Force members are advised to consider all aspects of SBP along with insurance programs before deciding to join SBP," Hq. USAF said.

POW League Needs Funds

The National League of Families of American Prisoners and Missing in Southeast Asia needs funds desperately, according to its treasurer, Mrs. Brendan Foley. She reports that the League is caught in an inflation crunch and that contributions have slumped badly. The League's general operating fund is less than \$15,000. Unless contributions increase dramatically, "we will have to close down," Mrs. Foley commented. Tax-deductible donations should be sent to the League at 1608 K St. N. W., Washington, D. C. 20006.

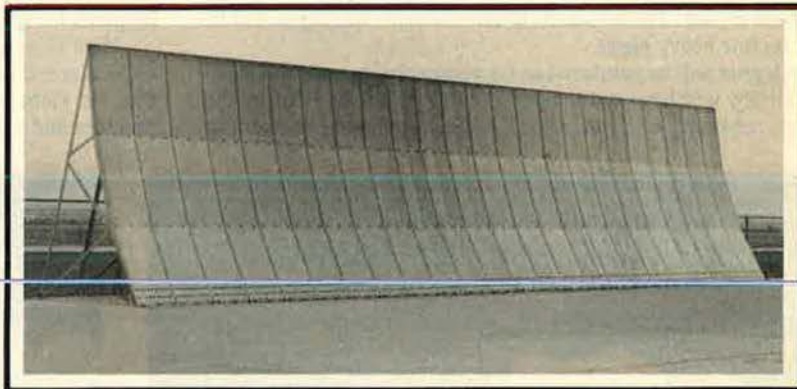
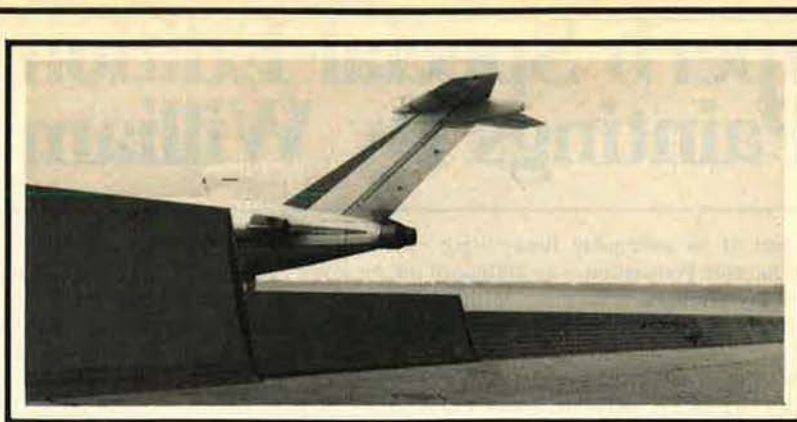
Short Bursts

Headquarters has been beating the drums for **nonrated lieutenant colonels to volunteer for commander, deputy commander, and some other base executive posts** at remote sites, mostly in Alaska, Korea, and Turkey. The "tight rated manning and declining rated supplement" triggered the call. The voluntary tours, which probably will enhance a person's record, last just a year.

Speaking of Turkey, assignments there are "getting better," according to the Manpower and Personnel Center. Recreational facilities at **USAF bases in Turkey are being improved** and a "Turkey Initiatives Working Group" has been formed at the Center to figure out other ways to change the image of duty in that distant land.

The Office of the Secretary of the Air Force furnishes the following reminder of **what to do when the National Anthem is played:**

Indoors—At public or military events, in uniform or civilian clothes, you stand at attention. Face the flag (if visible) or the music, but don't salute unless bearing arms.



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A recent letter from AFA Headquarters to chapters suggests that they promote the sale of the **Bob Hope Record Collection fund drive**. The Bob Hope Village at the Enlisted Men's Widows Home Foundation in Fort Walton Beach, Fla., will benefit.

Four sites are testing a **before-**

and-after school youth plan for children ages six through twelve. The one-year experiment is linked to the growing number of single parents, working wives, and joint military couples who don't get off work right after normal school hours. The bases involved are Lackland, Luke, Langley, and Duluth Airport. Child-care programs are now offered at 123 bases, preschools at 101. The Air Force says that the regular programs, which provide care for kids six weeks through ten years of age, handle more

Superb Special-Edition Prints of Two Paintings By William J. Reynolds

As part of its continuing fund-raising efforts, the Aerospace Education Foundation—an affiliate of the Air Force Association—has arranged with artist William Reynolds to produce special-edition prints of his two most recent oil paintings, shown below.

The print "Last Aerial Combat of World War II" (B-32) measures 21¾" by 26½", including border and legend. The print "Approaching the Initial Point" (B-17) measures 21¾" by 24", including border and legend. These special, limited-edition lithographs will be struck on fine heavy paper.

Each print will be numbered and accompanied by a Certificate of Authenticity, will have a description of the action depicted by the painting, and will have the artist's authenticating signature. The

finished prints are being offered at a price of \$75 each, postpaid, to the first 500 individuals to reserve their copies. They will make excellent Christmas gifts.

The artist drew heavily on his experience as a World War II fighter pilot and on his other flying experiences for the accuracy in detail and situation.

To preserve the exclusivity of each print, when the 500 lithographs are sold, no more copies will be struck from the plates prepared for these special editions.

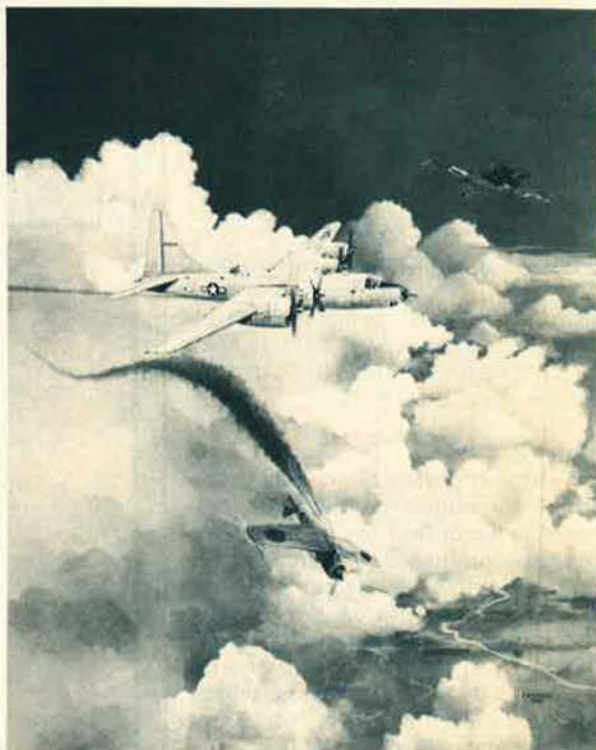
Here is an excellent way to add unique works of art to your collection and support the Foundation at the same time. Remember that the value of your lithographs is assured by individual print numbers and the artist's authenticating signature.



Approaching the Initial Point

The B-17 crewman with the best seat in the house during World War II was the bombardier. His station was the "greenhouse," the unprotected Plexiglas nose of the aircraft. The bombardier's station gave him an unparalleled opportunity to watch incoming enemy fighters. That's the situation shown in this fine Bill Reynolds painting "Approaching the Initial Point." The Initial Point (IP) was the place where the bomb run to the target began. After the IP, the fighters usually left the area because of the volume of antiaircraft fire from the ground. It was the bombardier's job to keep the aircraft on a constant course and heading so he could synchronize his Norden bombsight on the target. Since the bomber's nose area was a prime target for incoming enemy fighters, bombardiers needed not only technical skills but also a special measure of courage and dedication.

The oil painting was specially commissioned for the 9th Biennial Reunion of the Bombardiers Alumni Association held in Washington, D. C., in August 1980.



Last Aerial Combat of World War II

This is believed to be the last aerial combat of World War II, fought on August 18, 1945. A pair of B-32 Dominator aircraft were flying a photo-reconnaissance mission over Tokyo when they were attacked by an estimated fourteen Japanese fighters—Zekes and Tojos. The B-32 shown in the painting had its number three engine shot out. One of its two photographers was killed, and the other photographer and the top-turret gunner were wounded. The B-32s fought their way clear and returned to base in Okinawa. The Dominator, originally intended as a backup to the B-29 Superfortress, was one of the less well-known aircraft of the war. Of the 1,706 ordered, only 118 were built, and only 15 saw action. The flurry of combat over Japan on August 18, 1945, earned the B-32 a footnote in the history of US aerial combat.

This painting appeared on the cover of the September 1980 issue of this magazine.

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The **Defense Property Disposal Service** returned to the US Treasury a whopping \$121 million last fiscal year, the highest amount since FY '75. DPDS is the government agency charged with the worldwide sale of excess and surplus government material, which it screens for use by other government departments down to county level before disposal.

Brookings Institute's Senior Fellow Col. Martin Binkin, USAF (Ret.), will conduct an **eighteen-month study on racial imbalance in the armed forces**. The probe was made possible by a \$50,000 grant from the Edna McConnell Clark Foundation, with assistance from the Ford Foundation and the Defense Department. Colonel Binkin will examine such questions as what will be the effect of heavy black enlistments on the American military establishment?

Considerably more "fruit salad" will make an appearance soon on

the relatively uncluttered shirts and blouses of young Air Force members. This is assured by **the recent approval of one new medal and three new ribbons**. One of the latter will be awarded for completion of initial training, another for completion of an overseas tour. Seven policy changes, which ease curbs on award of decorations, have also been approved. Authorities want to see the almost ribbonless junior people much more a part of the decorations picture.

Senior Staff Changes

PROMOTIONS: To be Major General: James Taylor, Jr.

RETIREMENTS: M/G John W. Hepfer.

CHANGES: M/G Ernest A. Bedke, from IG, Hq. TAC, Langley AFB, Va., to DCS/Ops. & Intel., Hq. PACAF, Hickam AFB, Hawaii. . . B/G Robert C. Karns, from Cmdt., Air Command and Staff College, Air University, ATC, Maxwell AFB, Ala., to Deputy for Strategic Missiles, Space and Electronics Program, AFALD, AFLC, Wright-Patterson AFB, Ohio, replacing retired B/G James R. McCarthy. . . M/G Forrest S. McCartney, from Vice Cmdr., Ballistic Missile Office, AFSC, Norton AFB, Calif., to Cmdr.,

Ballistic Missile Office, AFSC, Norton AFB, Calif., replacing retiring M/G John W. Hepfer. ■

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ALABAMA (Auburn, Birmingham, Huntsville, Mobile, Montgomery, Selma): **Frank M. Lugo**, 5 S. Springbank Rd., Mobile, Ala. 36608 (phone 205-344-9234).

ALASKA (Anchorage, Fairbanks): **Frank X. Chapados**, 1426 Well St., Fairbanks, Alaska 99701 (phone 907-452-1286).

ARIZONA (Phoenix, Tucson): **John P. Byrne**, 9318 Country Club Dr., Sun City, Ariz. 85351 (phone 602-974-7177).

ARKANSAS (Blytheville, Fayetteville, Fort Smith, Little Rock): **Arthur R. Brannen**, 605 N. Hospital Dr., Jacksonville, Ark. 72076 (phone 501-982-2585).

CALIFORNIA (Apple Valley, Edwards, Fairfield, Fresno, Hawthorne, Hermosa Beach, Long Beach, Los Angeles, Merced, Monterey, Novato, Orange County, Palo Alto, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Mateo, Santa Barbara, Santa Monica, Vandenberg AFB): **Richard C. Doom**, P. O. Box 2027, Canyon Country, Calif. 91351 (phone 213-887-2923).

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WEST VIRGINIA (Huntington): **James Hazelrigg**, Rt. 3, Box 32, Barboursville, W. Va. 25504 (phone 304-522-3616).

WISCONSIN (Madison, Milwaukee): **Kenneth Kuenn**, 3239 N. 81st St., Milwaukee, Wis. 53222 (phone 414-747-5300).

WYOMING (Cheyenne): **Lynn A. Wallace**, 409 Saddle Dr., Cheyenne, Wyo. 82001 (phone 307-771-6988).

AIR FORCE MAGAZINE PROUDLY PRESENTS THE

Keith Ferris Military Aviation Calendar for 1981

Following the success of its 1980 calendar, and the pleasure it has given to thousands of purchasers, AIR FORCE Magazine has again commissioned aviation artist Keith Ferris to produce twelve original paintings for the 1981 calendar.

These twelve new Ferris paintings have been executed exclusively for this purpose. Each painting depicts a noteworthy event in military aviation. They span military aviation history, both in time and geography, and depict a variety of air forces and aircraft missions.

Aircraft depicted in the 1981 calendar are: T-37 jet trainer; P-51 Mustang fighter; Russian MiG-21 fighter; Japanese "Betty" bomber; C-123 Provider transport; B-57 Canberra bomber; German Ju-87 Stuka dive bomber; FF-1 US Navy fighter; Sopwith Camel carrier launch; F-106 Delta Dart interceptor; Tornado multirole combat aircraft; B-10 bomber.

Keith Ferris, son of an Air Force officer, grew up around airplanes, and has been painting them for more than twenty-six years. He is an AFA member, belonging to the Union-Morris (New Jersey) Chapter. Ferris's aviation paintings are renowned for their technical accuracy and depiction of events as seen through the eyes of a pilot.

The descriptive commentary accompanying each painting is written by Jeffrey L.

The Keith Ferris Calendar

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Paintings, such as "Solo Student Over the Numbers" shown above, measure 12" x 9" and are suitable for framing.

Ethell, expert aviation writer, and also the son of an Air Force officer. Ethell's research not only contributes to the veracity of Ferris's paintings; it enhances the enjoyment and appreciation of the events painted.

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The 1980 calendars — the first offered by AIR FORCE Magazine — are already collectors' items; the 1981 calendars are certain to continue the tradition. They make a perfect gift for aviation enthusiasts everywhere.

Order your calendar now. Orders received after December 1, 1980 cannot be guaranteed for delivery by Christmas.

Quantity discounts are available on request.

AFA NEWS

Chapter and State Photo Gallery

By Vic Powell, AFA AFFAIRS EDITOR



Mike Nisos, center, Managing Director of AFA's affiliate, the Aerospace Education Foundation, was recently presented the DSM/YOF trophy by the Barons, an organization supporting aerospace education. The trophy, plaque, and mug are awarded annually to individuals who have made outstanding contributions to aerospace education. At left is Noel Bullock, Regional Director for Aerospace Education (Rocky Mountain Region) of the Civil Air Patrol, and founder of AFA's Blue Barons Chapter. At right is Karl Benkesser, President of the Blue Barons Chapter. DSM/YOF means: "Distinguished Staffel Member/Ye Olde Fokker."



Cutting a birthday cake in honor of the Air Force's 33d anniversary was part of a recent formal ball at Hickam AFB, Hawaii. At left is SMSgt. John Norris, of Clark AB, R. P., one of the Air Force's Twelve Outstanding Airmen of the Year; Lt. Gen. James D. Hughes, center, Commander in Chief of Pacific Air Forces; and Bill Taylor, right, President of the Honolulu Chapter of AFA. The program was a joint effort by Hickam Officers' and Enlisted Wives' Clubs, the Honolulu Chapter of AFA, and the US Air Force in Hawaii.



The annual golf tournament of the Tacoma, Wash., Chapter was held recently at McChord AFB. Included among the 100 players were (left to right) Robert E. Ainslie, Golf Committee Chairman; Brig. Gen. Alfred Miller, Commander of the 25th Air Division; Al Rexius, past President of the Tacoma Chapter; Robert Campbell, President of the Tacoma Chapter; Maj. Gen. Kenneth Powell, USAF (Ret.); and Jack Gamble, President of Washington State AFA.



Three AFA Chapters in Southern California joined together recently with the California Angels baseball team to sponsor a benefit baseball game at Anaheim Stadium to support the Air Force Enlisted Men's Widows and Dependents Home Foundation. Over \$500 was raised for the Foundation. Participating in the first-ball ceremony at the Angels vs. Toronto game are the Presidents of the three Chapters (left to right): Doug Gibson, Long Beach Chapter; Dolly Foster, General James H. Doolittle Chapter; and Dave Graham, General Curtis E. LeMay Chapter.

CALENDAR OF EVENTS

AFA National Board of Directors Meeting,
 Holiday Inn, Melbourne Beach, Fla., February 21, 1981 . . .
Chicago O'Hare Chapter Symposium,
 O'Hare Ramada Inn, Des Plaines, Ill., March 14, 1981 . . .
Iron Gate Chapter's 17th National Air Force Salute,
 Sheraton Center, New York, N. Y., March 28, 1981.



Hugh Enyart, left, newly-elected President of AFA's Scott Memorial Chapter, Belleville, Ill., recently presented an AFA gift membership to US Sen. Charles Percy (R-Ill.). Senator Percy is a member of the Foreign Relations Committee and the Government Affairs Committee.



Lt. Gen. William R. Nelson, Commander of TAC's Twelfth Air Force, center, was the guest speaker at the recent Indiana State AFA convention held at Grissom AFB, Ind. New state officers were elected during the August convention and include (from left): Roy P. Whitton, Secretary and outgoing President; Dr. Richard Ortman, Vice President; General Nelson; John P. Kelly, Treasurer; and Donald E. Bradford, state President.



AFA's Dallas, Tex., Chapter presented its first "Community Partner" certificate to Ronald L. Gilham, of Beneficial Management Corp., left, during a recent Chapter meeting. Also attending the meeting were Eileen Bradley, second from left, a 1980 graduate of the Irving High School AFJROTC unit sponsored by the Chapter, and Phillip A. Hawkins, second from right, Dallas Chapter President. Maj. Gen. Richard Bodycombe, AFRES Commander, right, was the featured speaker at the meeting.



Forty AFJROTC cadets were honored recently for meritorious unit activity during the first joint meeting of the General Curtis E. LeMay Chapter and the Orange County, Calif., Navy League. David Graham, LeMay Chapter President, second from right, presented citations to AFJROTC units from Mater Dei High School, Santa Ana, Calif., and El Dorado High School, Placentia, Calif. Apollo-11 Astronaut Edwin E. Aldrin, second from left, was the special guest of honor at the program. At left is Cadet Lt. Col. Mike Muttart, Squadron Commander at El Dorado High School. At right is Lt. Col. Sam Tussey, USAF (Ret.), Aerospace Education Instructor at El Dorado High School. More than 150 guests attended the AFA/Navy League program held aboard the yacht Nesco 1 in Newport Harbor, Calif.

AFA NEWS PHOTO GALLERY

A check donated jointly by AFA, the Air Force Sergeants Association, and the Noncommissioned Academy Graduates Association was presented recently to Maj. Gen. William Maxson, Commander of the Lowry Technical Training Center, Lowry AFB, Colo., by Colorado State AFA President Steve Brantley. The donation will be used by the Center to help purchase state flags to be displayed on special occasions. Those present at the presentation were (from left): Jack Ingles, President of AFA's Silver and Gold Chapter; Colorado State AFA Treasurer Ed Wittbrodt; General Maxson; Maj. Gen. George C. Lynch, Commander of the Air Force Accounting and Finance Center; Brantley; and Col. John Giles, base commander.



AFA's Langley Chapter, Hampton, Va., recently presented Capt. John J. Catton a plaque designating him as the 1st Tactical Fighter Wing Junior Officer of the Quarter. Captain Catton is an F-15 pilot with the 27th Tactical Fighter Squadron at Langley AFB. F. C. McCrane, left, representing the Chapter, also presented Catton dinner certificates and tickets to sporting events courtesy of the Langley Chapter. Lt. Col. George A. Devorshak, Captain Catton's Squadron Commander, right, looks on at the presentation.

Kansas State AFA held its first annual convention this year. It was conducted jointly with the Kansas Retired Officers Association at Fort Riley, Kan. AFA Board Chairman Dan Callahan, a native of Kansas, was the featured speaker at the convention. Those attending the gathering included (left to right): Dan Callahan; Ed Fry, Adjutant General for the State of Kansas; Cletus Pottebaum, President of Kansas State AFA; Earl Clark, AFA National Secretary; Don Kuhn, outgoing Vice President for the Midwest Region; and Stuart Popp, President of Missouri State AFA.





AFA National President Victor R. Kregel met with two of SAC's 2d Bomb Wing aircraft commanders during a recent tour of Barksdale AFB, La. Kregel toured the Eighth Air Force's command post and received briefings on the Soviet threat and on SAC's military posture. At left is Capt. Jack Ramsaur, 71st Air Refueling Squadron. Capt. David Weber, 62d Bomb Squadron, is at right.



Brig. Gen. Russell Mohney, Vice Commander of the San Antonio Air Logistics Center, recently presented an AFA award for special service to David C. Stoltz, production management specialist in the Resources Management Division of Maintenance. Mr. Stoltz is an active member of AFA's San Antonio Chapter, contributing to the success of eight major public events hosted by the Chapter during his term as facilities and program chairman. He has served fifteen years at Kelly AFB, Tex., in the Directorate of Maintenance.



The publisher and editor in chief of the Daily Republic newspaper in Fairchild, Calif., Don Hancock, received the General Robert F. Travis Chapter's Community Service award in recent ceremonies. Assisting in the presentation is Maj. Gen. Robert F. Coverdale, Commander, Twenty-second Air Force, MAC, left. At right is Maj. Gen. Sidney S. Novaresi, Commander, Fourth Air Force, AFRES. Mr. Hancock is a member of the Travis Chapter. (Photo by Connie Hermann.)

Shown is Master Navigator tie.



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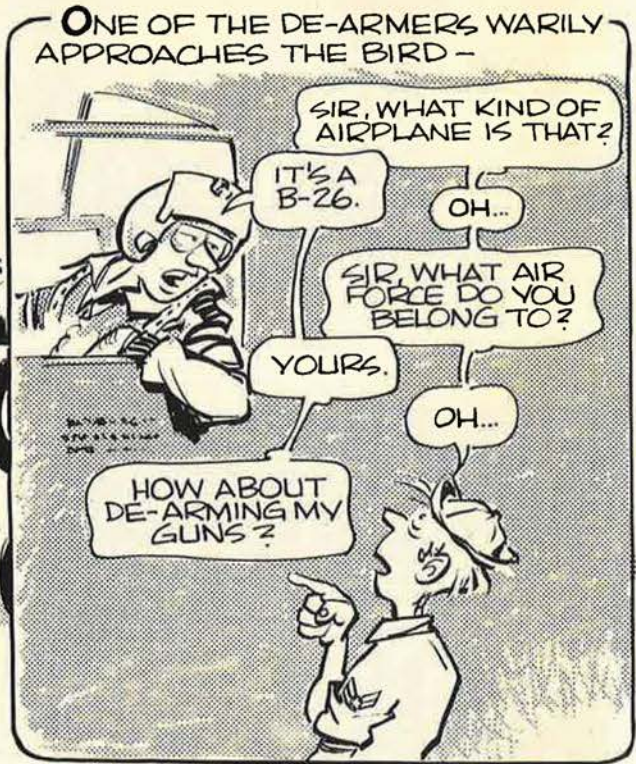
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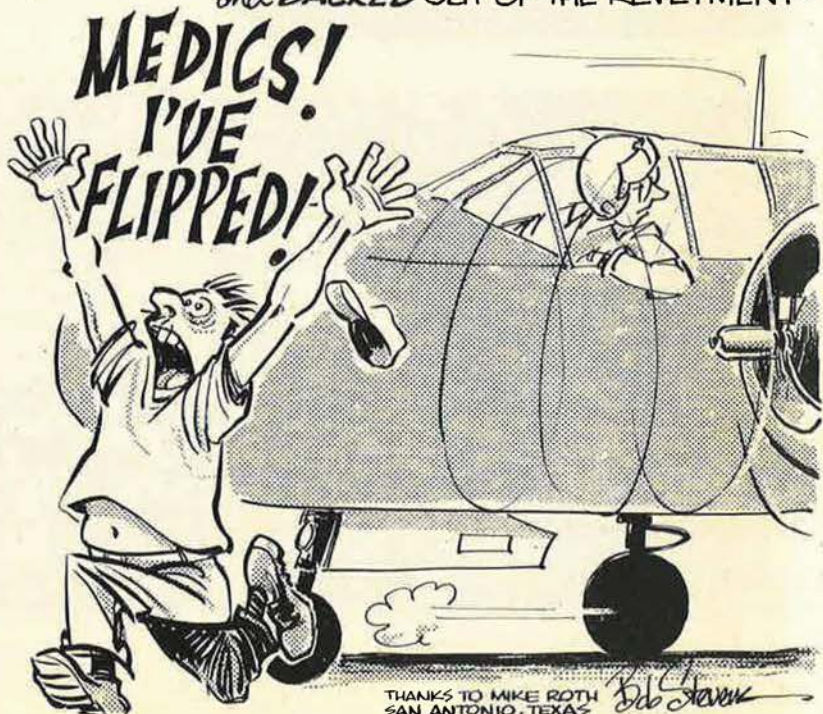
Bob Stevens'

"There I was..."

SOUTHEAST ASIA'S NIGHTMARE OFTEN GAVE PARTICIPANTS A FEELING OF BEING CAUGHT IN A TIME WARP. CONSIDER THE CREW THAT MET AN INTRUDER-TYPE B-26 (ORIGINALLY THE DOUGLAS A-26, circa 1944) WHICH DIVERTED TO THEIR F-4 BASE ONE NIGHT ...



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Aerial photo



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and laser-spot designator pods. In total, over 24,000 pounds of external ordnance can be carried on the F-15 weapons stations.

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