Goldwater on Defense

(Sen. Barry Goldwater (R.-Ariz.), long a proponent of airpower, recently spoke to the Wings Club of New York City on the changing character of aerospace as it applies to strategic, tactical and economic aspects of the present world environment. Although his remarks were made prior to the outbreak of hostilities in the Middle East, much of what he said was given fresh emphasis by events there and elsewhere. A portion of his talk is printed below. Additional excerpts will be published in a subsequent issue of AVIATION WEEK & SPACE TECHNOLOGY—Ed.)

. . . The B-52, like George Blanda, is still a proven and effective weapon. But both Blanda and the B-52 have been around a lot of years and they don't have much left. . . .

The sobering realities are that we have not designed and fielded new air-superiority fighters in the last 15 years, and we have not added any advanced strategic bombers in the last 22 years. To complete this tragedy, in 1971 Congress killed the development of the American supersonic transport.

My point, at least to me, is clear. Our world leadership in both military and commercial aviation is in dangerous jeopardy. . . .

We urgently need the B-1, the F-14, the F-15, and the A-10, and a supersonic transport, and the other components of an effective aerial capability. This is no time to de-emphasize. We can't afford further neglect of aviation development in the United States. . . .

Since the days of the World War 2, massive bombing of Germany and Japan, and later the establishment of the Strategic Air Command, this nation's security has depended upon the strength and dedication of our airmen. That faith and reliance has met the test many times: in Korea; throughout the Berlin Airlift; and during the Cuban Crisis. . . .

Most importantly, airpower has been the principal deterrent to worldwide nuclear war. But the unfortunate paradox of that magnificent achievement is that airpower's success has been so effective that many people have gradually lost their appreciation of the urgency and need for continuing effective defense.

Strategic nuclear war has not occurred, but that threat has not diminished. Just because our deterrent forces have been successful doesn't mean they can be reduced. . . .

Why do we need the B-1, the F-14, the F-15? Because, while we have been relying on airplanes designed well over a decade ago, the Soviet Union has been passing us in aircraft design, development, and production and performance.

In the last 10 years they have developed 12 new fighter prototypes, at least three of which are now operational: the MiG-25 Foxbat, the MiG-23 Flogger, and the Su-11 Flagon. The Foxbat is a deadly fighter with a service ceiling in excess of 80,000 ft. It is operational and production is continuing.

If you are inclined to laugh off China, they made 250 Mig-25s two years ago. I don't know how many they made last year.

To challenge the Foxbat for air superiority, our best current operational fighter is the F-4, a Mach 2.2 machine at 40,000 ft., introduced in 1957, which can't touch the MiG-25. Air superiority is absolutely essential for success in military operations by any service. . . .

In the strategic bomber realm, the Soviets have built a new swing-wing giant called the Backfire, which flys at Mach 2 and has left us way behind in this aircraft category.

The development of this long-range aircraft reinforces the contention that the manned bomber is an integral part of the U. S. defense system. We know what bombers can do. We learned that in World War 2 and we saw the B-52s finally reaffirm the knowledge over North Vietnam last year.

Missiles are essential, but they are not battle-tested weapons and they are irrevocable. The manned bomber can do very much more than a missile. A bomber can be launched on an alert; it can be recalled; it can be used in less-than-all-out war.

On the other hand, when you launch an ICBM, that baby's gone, the decision is irreversible.

It is essential that we get the B-1 into the Air Force inventory as soon as possible to replace the B-52, which was designed in the late 1940s and built in the 1950s and early 1960s. The B-1 will be a superb aircraft, capable of matching the Soviet Backfire. Compared to the B-52, the B-1 will use half as much runway, fly faster, carry two and one-half times more payload, have greater range and require less fuel consumption. But the problem is that the Backfire is either operational now or sure to be by 1974, while even if we can get the needed funds to continue development of the B-1, the new bomber won't be operational until about 1980. . . .

Meanwhile, we have been reducing the size of our air arm. In Fiscal Year 1950, we had 22,818 fixed-wing aircraft; today we have approximately 14,000. We had over 1,200 strategic bombers in 1964; there are less than 450 now. The Air Force had a budgeted buy of only 168 aircraft last year, compared to 778 in 1964.

Moreover, the Soviets are equipping their satellites and client nations with significant numbers of modern aircraft. Algeria, Egypt, Iraq, Sudan, and Syria together possessed 1,188 combat aircraft as of last year, mostly Soviet types. . . . Egypt alone had 568 combat airplanes, led by 220 MiG-21s.

The power balance implications are enormous.

In case you are getting the impression that I am talking strictly of military matters, I would remind you of the economic impact foreign aircraft development portends. Economic wellbeing and the national defense are inseparable, especially in a modern world dominated by rapid technological advance. Nevertheless, some of my fellow members of the Congress oppose the sale of modern U. S. aircraft to friendly nations—at the risk of those nations seeking aircraft from other countries whose aeronautical industries are becoming serious competitors of the United States. Even the U. S. Marines are flying British-designed-and-built aircraft.

While the proposed American SST was being talked to death, the busy Soviets were building the Tu-144, a supersonic transport capable of flying at twice the speed of sound, 65,000 ft. high, and with a range of over 4,500 mi. This machine will soon be in airline service.

With the British-French Concorde and Soviet supersonic transports already flying, we may see the day—and I hope we don't—when American commercial airlines buy supersonic transports abroad—at $40 million or more per aircraft. Consider the resultant impact on our already strained balance of trade.

Airbus A 300: 90% quieter than competitors.

By 1980 short-haul air traffic will have increased by 100%. This would be very bad news for people living near airports if it meant a 100% increase in the number of aircraft. Fortunately such an increase is not practicable: airports are saturated already. So the need is for *larger aircraft*.

Consequently there will be no significant increase in the number of aircraft flying. The really great news is that all the new, large-capacity jets will be quieter than current aircraft, and that the A 300 will be the quietest of them all.

3 reasons why the A 300 is so much quieter

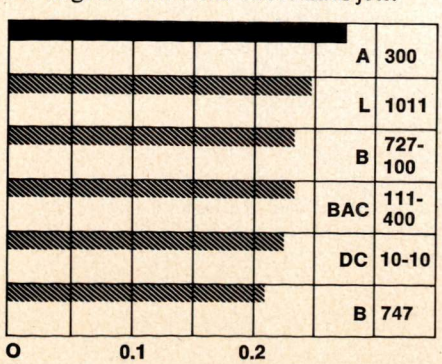
1. The A 300 has only 2 fan jets instead of 3.
2. The A 300 has a very high thrust-weight ratio so it takes off quicker and climbs steeper.
3. The A 300's General Electric CF6-50 engines are in themselves very quiet.

2 engines instead of 3

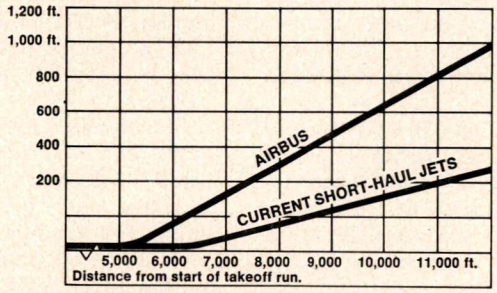
Being the only large-capacity aircraft specifically designed for short-haul routes, the A 300 has 2 engines, instead of 3. This obviously contributes to a lower noise level.

The highest thrust-weight ratio

The A 300 has a higher thrust-weight ratio than any of its competitors, as much as 30% higher than other short-haul jets.



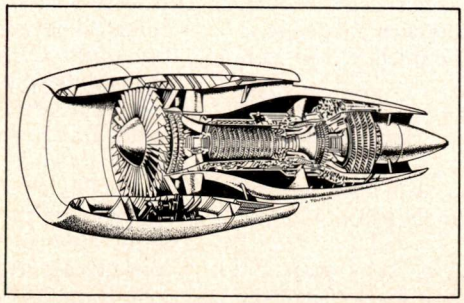
As a result, the A 300 accelerates quickly to takeoff speed and can climb away very steeply. By the time it reaches a point 9,000 feet beyond the start of the takeoff run, the A 300 is as much as 450 feet higher than today's jets.



This alone accounts for a considerable reduction in the noise level below the flight path.

Quiet engines

The A 300 is equipped with 2 General Electric CF6 engines of very advanced design. These engines have a high bypass ratio, reducing exhaust velocity and consequently exhaust noise.



Interior diagram of the CF6 General Electric turbo-reactor—the quietest ever.

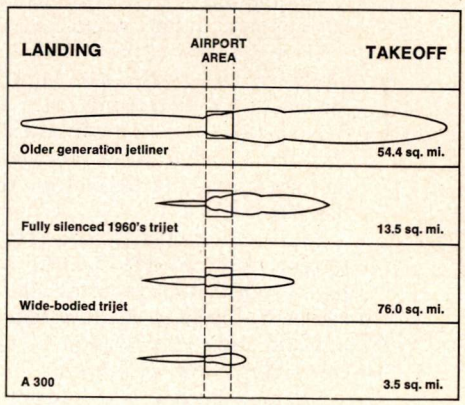
No inlet vanes

The elimination of inlet guide vanes considerably reduces fan noise. *Long bypass ducts* reduce noise coming from the rear of the fan. And for this reason those on the A 300 are longer than they need be for purely aerodynamic and structural reasons.

Sound absorbent material

Among a wide range of materials used in the engine nacelles to absorb noise, two of the most important are fiber glass fabrics impregnated with epoxy resin and aluminium honeycomb.

Comparative noise footprints
(90 EPNdB)



With the A 300 significant noise is almost entirely contained within the airport boundaries.

Who is Airbus Industrie?

The A 300 is a joint enterprise by five of Europe's foremost aircraft constructors: Aerospatiale in France, Deutsche Airbus MBB VFW/FOK in Germany, Hawker-Siddeley in Great Britain, Fokker VFW in the Netherlands and CASA in Spain.

The combined experience of the A 300's constructors is spectacular: between them they have produced the Caravelle, the Trident, the Fokker Friendship, the Concorde, as well as numerous military and smaller aircraft.

Airbus A 300

From Airbus Industrie

Available early 1974.

PSAC file
Military

DOD Warns Congress on Soviet Gains

By Donald C. Winston

Washington—Decade of intensive Soviet investment in military research and development has given that country a clear advantage over the U.S. in air defense, certain classes of strategic missiles and naval surface weaponry, Congress is being warned by Defense Dept. witnesses testifying on the Nixon Administration's $83.4-billion Fiscal 1973 defense budget.

Defense Dept. is concentrating its forces in an attempt to minimize congressional cuts on the $8.55 billion budgeted for research, development, test and evaluation. Congress is expected to reduce the overall budget to a flat $80 billion by the time a money bill is presented for President Nixon's signature next summer. Defense Secretary Melvin R. Laird would like to see no more than one-tenth of the reduction allocated to research, leaving that category with at least $8.2 billion for the fiscal year.

Nixon Administration is requesting a net increase of $760 million over Fiscal 1972 for research, development, test and evaluation. The increases, by program area, total more than $1 billion but are offset by planned decreases of $170 million in anti-submarine warfare, $64 million in Safeguard and Minuteman missile programs and $9 million in miscellaneous programs.

Program areas slated for increases and the amounts of the planned boosts are:

- Strategic sea-based offense, basically the undersea long-range missile system (ULMS), $413 million.
- Strategic bombers and penetration aids, primarily the North American Rockwell B-1 and the subsonic cruise armed decoy (SCAD), $111 million.
- Basic research and exploratory development, $97 million. This is in the form of an across-the-board 6% increase in an area described as "the fundamental source of our continued technological superiority."
- Air logistics and mobility, including the Army utility tactical transport aircraft system (UTTAS), the heavy lift helicopter and short-takeoff-and-landing (STOL) aircraft, $81 million.
- Field army air defense, including the SAM-D missile and troop-carried anti-aircraft weapons, $73 million.
- Ocean surveillance, $65 million.
- Strategic and tactical warning, command, control and communications, $51 million.
- Close air support, $46 million.
- Fleet offensive systems, including the Harpoon missile, $34 million.
- Operational test and evaluation, $32 million.

John S. Foster, Jr., Defense Dept. director of research and engineering, has been presenting the bulk of the arguments to congressional armed services and appropriations committees, but he has been joined by other witnesses in emphasizing the scope of the Soviet threat to the U.S.

Admiral Elmo R. Zumwalt, chief of Naval Operations, told the Senate Armed Services Committee last week that within the next 13 years the U.S. will be forced to import half its petroleum requirement, or approximately 12 million barrels daily. This would require approximately 1,000 tankers of average 70,000-ton capacity fully committed to such delivery.

"The potential for coercion of the U.S., with or without allies, inherent in this situation is ominous when one considers the measures the Soviets are taking to improve their navy," he declared.

Adm. Zumwalt told the committee that during 1971 the Soviets added several missile ships to their inventory and accelerated production of Yankee class ballistic missile submarines, producing a total of 15 new nuclear submarines of all types. Yankee class submarines are the rough equivalent of the U.S. Polaris A3 submarine.

He told the committee that several new generations of anti-ship missiles have been identified (AW&ST Feb. 21, p. 61), that new surface-to-air missiles have been mounted on Soviet ships and that a long-range sea-launched ballistic missile has been tested.

Russia's chief naval weakness is absence of sea-based tactical air, Adm. Zumwalt testified, but this has been offset partially by the Soviet policy of obtaining access to foreign ports and airfields, a process demonstrated dramatically in the Middle East and currently under way in South Asia in the wake of the India-Pakistan war.

Foster said that recent Soviet gains mean that the U.S. "can no longer feel assured that it has unquestioned technical superiority over the Soviet Union." Foster said that the chief priorities should be on re-attainment of bomber survival and penetrability and on ability to deploy U.S. forces, via sea power, to areas of vital interest to the country.

In listing areas of comparative Soviet superiority (see box) Defense Dept. offi-

U.S., USSR Weapons Capabilities Compared

Deployed Soviet weapon systems were evaluated in comparison with U.S. capability by the Defense Dept. in recent testimony before Congress on the Fiscal 1973 budget, with these findings.

Soviet Union has technological superiority in:

- Anti-ballistic missile systems.
- Fractional-orbit bombardment systems (FOBS).
- Strategic air-defense interceptors.
- All aspects of civil and industrial strategic defense and recuperative planning.
- Tactical anti-shipping missiles.
- Surface attack ships (without carriers).
- Anti-aircraft artillery systems.
- Some armored combat vehicles.
- Medium- and high-altitude surface-to-air missile defenses.
- Surface-to-surface tactical missiles.
- Heavy lift helicopters.

Approximate technological parity exists in:

- Tanks and anti-tank weapons.
- Satellite tracking systems.
- Satellite navigation systems.
- Small arms.

U.S. has technological lead in:

- Intercontinental ballistic missile guidance and penetration aids.
- Strategic bombers.
- Strategic submarines and submarine-launched ballistic missiles.
- Attack submarines.
- Anti-submarine warfare sensors and patrol aircraft.
- Satellite communication systems.
- Airborne warning and control systems.
- Airborne surveillance sensors.
- Defense-suppression weapons and systems.
- Deep-strike tactical aircraft.
- Aircraft carriers.
- Guided ordnance.
- Air-to-air superiority weapons.
- Man-portable air defense systems.
- Close-support helicopters, aircraft and aerial weapons.
- Long-range logistic transports.
- Artillery munitions.

Evader Vehicle

Washington—U.S. will develop an intercontinental ballistic missile re-entry vehicle that maneuvers to evade an anti-ballistic missile interceptor. Re-entry vehicle would be coupled with exo-atmospheric penetration aids.

Decision to develop the vehicle was based on likelihood that the Soviets would make substantial advances in anti-ballistic missile terminal defense. U.S. scientists have made studies on options open to the Russians for improvement of the SA-2 and SA-5 surface-to-air missile systems to make them capable of defending against ballistic missiles and concluded that the maneuverable re-entry vehicle would be warranted.

cials did not mention recent Russian experiments in satellite intercept (AW&ST Dec. 13, 1971, p. 20). The USSR has yet to deploy such a system but is believed to be developing the capability. Satellite-intercept is considered a first-strike, rather than a defensive, system.

Foster is telling Congress that technological superiority for the U.S. has greater implications than merely development of superior weapon systems. "As long as we retain technological superiority, we can make meaningful measurements of relative strength without fear of surprise," he pointed out. "We can estimate their progress because we've already been there."

On the other hand, a Soviet lead in any specific area would automatically deprive the U.S. of the capability to evaluate relative strength. "In due course we should lose confidence in the realism of our deterrence," he said.

"In those areas where we acknowledge technological parity or inferiority, we cannot have high confidence in our estimates of Soviet capability, nor can we predict with confidence what their next step forward will be."

Foster testified that Russia made "a fundamental decision" several years ago to overtake the U.S. in military and scientific areas, and has since invested heavily to do just that. "The Soviets are convinced that they have already assumed leadership in some technological areas . . . they believe they will dominate world science in the 21st century."

Military manifestations of this movement during the past 10 years include:

- Development of the world's fastest interceptor, the MiG-23, the largest strategic missile, the SS-9 and the largest helicopter, the Mil V-12.
- Introduction of more than 50 new ships of all classes, armed with newly-developed naval missiles and guns.
- Production of new armored vehicles, artillery, anti-tank weapons and a new tank for the army.

"The Soviets firmly believe that a strong national RDT&E program can provide the mechanism for their becoming the world's dominant economic, political and military power," Foster said. "It could be very unfortunate for the U.S. if inadequate support were given to the military RDT&E by which we maintain our slim and dwindling technological lead."

In other testimony Adm. Thomas H. Moorer, chairman of the Joint Chiefs of Staff, told congressional committees of Defense Dept. concern over Soviet naval exercises involving coordinated attacks utilizing aircraft, surface ships and submarines in conjunction with cruise missiles. Exercise target was a simulated carrier task force.

Adm. Moorer said the Russians are developing several new anti-submarine warfare techniques "which could significantly improve their ASW capability in those waters in which our submarines are now required to operate." He said this was the chief impetus for U.S. development of ULMS, and that as a result of Soviet developments this country has advanced its initial operational capability for ULMS from Fiscal 1981 to 1979.

Also, a shorter-range ULMS-1 missile is being developed for installation in present Poseidon submarines, providing possible earlier deployment. Missile tubes of the new ULMS submarines will be able to accommodate either ULMS-1 or ULMS-2 longer-range missiles.

Problems Facing ATS Program Force 6-month Delay in Launch

Management, planning and production problems have beset the Applications Technology Satellites F and G program, forcing a minimum six-months delay in the mid-1973 launch schedule.

The National Aeronautics and Space Administration said the program has encountered only "normal" technical design difficulties, which have been resolved. But, the space agency added, ". . . the solutions were not accompanied by timely initiation of critical parts procurements with the result that parts deliveries are late and fabrication of some subsystems is delayed."

A review board headed by Charles Mathews, director of NASA's new Office of Applications, is examining "schedule and efforts" of the program's prime contractor, Fairchild Industries, and principal subcontractors—Philco-Ford Corp., Honeywell and IBM. But the space agency says it may be several weeks before a solution to the problems is found.

NASA said the program's problems could be solved with "no expected increase in funding." Runout costs for the two satellites are $180-215 million.

Skeptical aerospace sources say, however, that the program difficulties cannot be resolved without some financial juggling. "It will end up robbing Peter to pay Paul," one source said. "And in this case, Paul is ATS-G."

While NASA emphasized management, planning and production as major elements of the program difficulties, some sources indicate that incremental funding also is a contributing factor. Said one source, "If Fairchild had had another $6 million this fiscal year, the situation would not have occurred."

Philco-Ford, subcontractor for the transponder that will feed data to the satellite antenna for transmission to earth stations, is one of the subcontractors having delivery problems.

Original value of the Philco-Ford contract was $9.7 million, but has subsequently risen to $11 million with amendments. The firm said the program is under study, but declined comment.

Mathews and members of his board were at the Philco-Ford facility in Palo Alto, Calif., last week to look into the delay in deliveries of the crucial communications equipment.

Fairchild was awarded the contract to build the spacecraft in 1970 after a protest was raised over the initial selection of General Electric as prime contractor. The contract now has, according to NASA, a face value of about $63 million.

At the NASA Goddard Space Flight Center, the ATS project manager, Harry Gerwin, was replaced by John Thole, who had been managing the Orbiting Solar Observatory project at Goddard.

A spokesman for Fairchild said: "The ATS program is in good shape. Design uncertainties have been shaken out. We are well into the manufacture and test of final flight hardware."

Grumman Loss

Grumman Corp. audited results for 1971 show a net loss of $17,989,580, based on a pre-tax write-down reported earlier of $65 million on the Navy F-14A Tomcat fighter program.

Total revenues for the company were $800.7 million. In 1970, Grumman reported a net profit of $20.3 million on total sales of $995.4 million.

The 1971 loss includes not only the write-down of F-14 inventories to reflect the contract price the Navy will pay for the first batch of aircraft, but also the net effect of price adjustments caused by the crash of the first aircraft and resulting realignment of test schedules and other contract changes.

General Theme of Chapter 4: Driven by a dynamic international political-military situation, by changing national goals and priorities, and by a rapidly changing technology, the military capabilities required to preserve our security in the late 1970's and early 1980's will be different from those needed for the 1960's. Requirement cannot be specified with certainty, but science and technology can and must provide adequate options to cover the capabilities actually needed. Providing the needed options, and the subsequent capabilities, will not be easy; our success in doing so will be determined in large part by our ability to deal with a variety of difficult policy problems. We have established policies to deal with these problems; their implementation assumes a continuous, energetic, creative R&D program devoted to the support of national security. Such a program requires and merits the whole-hearted support of the Congress and the American people.

I. The Changing Situation

In the section Ia we would present a general assessment of where we stand with respect to needed military capabilities and where we must go. This would involve a discussion of the changing threats to national security, the national security goals established by the President to deal with these threats, and the broad needs for force capabilities which these imply. This discussion should lead to the

general policy conclusion that we need to: a) maintain a currently satisfactory strategic deterrence in the face of a rapidly increasing Soviet strategic threat (which might be moderated by SALT); b) maintain the present tactical nuclear deterrent in Europe and continue to provide a nuclear shield in the Far East; c) in cooperation with our allies, enhance our capability to deter conventional war in Europe and in the Far East, as well as our capability to fight conventional wars should deterrence fail; d) improve the capabilities of our less developed allies to provide for their own security without the use of US manpower. Our ability to achieve the capabilities implied in these policies depends strongly on our ability to respond to changes in technology, or to use science and technology effectively.

The next sub-section would discuss major technical changes which have influenced or are influencing our ability to achieve the goals cited above: With respect to strategic deterrence the discussion could include brief consideration or mention of: a) increased accuracy, mobility, and MIRVs for ballistic missiles; b) improved hardening for land-based missiles; c) ABM; d) improved submarine capabilities and bomber dispersal. With respect to tactical nuclear capabilities, we might discuss opportunities for improved accuracy, and the consequent lowering of yield and collateral destruction; we might also mention the NICS system in NATO, which would assure improved command and control. With respect to improved conventional capabilities, technical trends

could be illustrated by discussing micro electronics, terminal homing, electronic warfare, stand-off attack capability, and the use of sensors. With respect to support to less developed allies, we could refer to different equipment needs arising from different physical and environmental factors, needs for simplicity in equipment design, and the general technical support required for the implementation of this aspect of the Nixon Doctrine. The purpose of these discussions would be to show that science and technology are changing the nature of the military problems we face and to support in a general way the need for a continuing large scale national security R&D program.

II. What are some of the principal problems we foresee in continuing to provide technical support to national security, and what policies have been developed to handle them?

a. Maintaining an appropriate balance between cost, risk, and performance in defense equipment.

b. Chosing an appropriate expenditure level of defense R&D?

c. Establishing appropriate priorities within the overall defense R&D program.

d. Maintaining adequate basic research in areas relevant to defense.

e. Providing appropriate technical support for arms control discussions and possible treaty commitments.

f. Preserving and enhancing the national technical base which supports national security.

III. Overall Summary and Conclusions

In this section we would present our summary judgments on the prospects for the future and indicate the broad R&D policy directions which the Nation should take in order to provide the capabilities which we need.

1. Ground Warfare Panel

2. Membership

J. Baldeschwieler, Chairman
J. Baldwin
R. Beaudet
S. Colby
M. Gustavson
K. Jordan
P. Kruse
B. Leonard
E. Mueller
J. Sternberg replacement nominees: Augustine, Carpenter, Fowler, Nance, Roush*

3. Terms of Reference

The Panel made an abortive effort about a year ago to bring itself to generate terms of reference. The technical considerations of the Panel were always more pressing than the need to generate the terms of reference, so that this is still an open matter.

4. Status of Work

The Panel is currently inactive as some of its members are participating in the NATO ad hoc panels. It is anticipated that the Panel will become active again either in March or April.

5. Accomplishments

The more substantial work of the Panel, either by volume or impact, is the following:

Review of Army TACFIRE Program (June 4, 1970)
MBT-70 (July 25, 1970)
Letter on Terminal Homing (September 30, 1970)
Letters to Army on Scatterable Mines (September 16, 1970)

If more detail is required on these it is readily available.

*Dr. Heffner has these names and the matter will be discussed among him, Dr. Baldeschwieler, et al, when convenient.

6. Other Remarks

It is my opinion, and I believe that Dr. Baldeschwieler shares it at least to some degree, that the GWP is ready for some "new directions." What those new directions are needs to be arrived at by consultation. One possibility is a widening of what has been the Panel's accepted definition of ground warfare, to include air interdiction and close air support. This might conflict with other Panel activity so that a coherent consideration of the problem is required.

1. Strategic Military Panel

2. Membership

Panel membership was discontinued by Dr. DuBridge in August 1970. Presently we are engaged in the administrative process of clearing prospective new members. The list of candidates is:

V. Fitch, Princeton (Chairman)
C. Bean, GE Research
S. Buchsbaum, Sandia
N. Crist, Princeton and JASON
A. Donovan, Aerospace
S. Drell, Stanford
J. Hopfield, Princeton
E. Irons, Yale
R. LeLevier, Rand and JASON
J. Sandweiss, Yale
G. Tape, Associated Universities, Inc.
H. Weiss, Lincoln Labs

3. Terms of Reference

This Panel has been active since before 1960 and although I have not made a diligent search (i.e., back to the archives), I have never seen terms of reference.

4. Status of Work

Under the circumstances of Item 2, there is no ongoing SMP work. A subset of the prospective panel members (Fitch, Buchsbaum, Drell, LeLevier) plan to accompany Dr. David to SAC in early March.

5. Accomplishments

The more substantial work of the Panel, either by volume or impact, is the following:

Integrated Hard Point Defense (March 13, 1970)
Defense Support Program (May 19, 1970)
Strategic Air Defense of Continental U.S. (August 3, 1970)

If more detail is required on these it is readily available.

6. Other Remarks

There is agreement between Dr. David and the SMP prospective Chairman, Dr. Fitch, that one of the main interests of the Panel when it becomes operative will be command and control communications, especially with respect to effectiveness, vulnerability, survivability, in exercising the SIOP. Other interests will be CONUS A/D, the new strategic manned aircraft (B-1 or other) and the SIOP itself.

THE SHAPE OF FUTURE US MILITARY FORCES

Richard L. Garwin

P/A

July 4, 1972

INTRODUCTION

Public discussion over the shape and size of future US military forces calls forth all of the trappings of debate and controversy. Advocates of strong military forces or of larger military budgets (or both) are accused of militarism, while advocates of smaller budgets and even those who propose to phase out an obsolete military system without budget reductions are often accused of selling out their country, wanting to be second best, or worse. More recently, any informed position on military matters leads to the appelation militarist; but we do have military forces and a Defense Department, and the country must decide what it wants to do with them and how best to do it. In this matter, of course, both the Administration and the Congress have a continuing responsibility.

The advance of technology, together with changing relative costs, both permit and impel a new look at the military functions and possible ways to accomplish them. Examples abound of greatly different means of approach. For instance, the United States naval surface force is built around some 16 attack carriers, and its primary tactical offensive and defensive weapon is the manned aircraft. On the other hand, the Soviet naval force is built around the cruise missile, which can be launched from land-based naval air, from large and small ships, and from submarines. Similarly, the US land-based strategic offensive force has only 54 Titan 2 missiles to 1000 Minuteman ICBMs, while the Soviet strategic offensive force has a much larger component of heavy missiles (more than 500 SS-7, SS-8, and SS-9 missiles).

Even should we discern a more advantageous shape for our armed forces, it is necessary to take into account our present position and to chart a careful course from what we have to what we should have. At some point in such a transition, however, one should stop putting funds into the modernization and expansion of obsolete systems, and expend them instead on the new shape of the military forces.

To some extent, our concept of military missions is conditioned by our sense of the possible. I make no claim that the following discussion is unique, or that the proposals are original or the best possible, but I do think that these alternatives deserve a detailed comparison with our present forces and their projection, in order to indicate how much improvement in capability for a similar budget, or reduction in cost for a similar capability, is possible.

The discussion is necessarily condensed, even cryptic, since it is essential to suggest new means to accomplish almost all of the fundamental missions. I judge that work already accomplished by the Department of Defense and by the Armed Services has already established the feasibility and the utility of these alternative programs, although recognition of this fact is far from universal.

STRATEGIC FORCES

The initial SALT agreements concluded in May 1972 endorse officially the utility and necessity of the posture of mutual deterrence between the US and the Soviet Union. Most importantly, the agreements forbid the establishment of a nationwide defense against ballistic missiles and limit severely the effectiveness of any local ABM which might be deployed around the national capital or to protect certain of the ICBM force. The impact of such an agreement on the nature of future strategic forces is an important subject which cannot be treated exhaustively in this paper. Clearly, though, offensive programs which were formerly directed toward the penetration of an expanding and strengthening ABM system will no longer constitute the best expenditure of ongoing effort in the strategic field. Furthermore, the size of the strategic offensive force (and its distribution among land-based missiles, bombers, and some submarine-based missiles) should be looked at on a continuing basis. Replacement of the force as it wears out should not be done prematurely, and the example of the B-52, which has had its life extended by relatively inexpensive wing-strengthening programs and by even less expensive gust-alleviation measures, suggests that a detailed study is in order on the maintenance costs and life of ICBMs and Poseidon boats and missiles.

In view of the SALT Treaty and Executive Agreement, an only partially MIRVed Minuteman force, together with the Poseidon conversion of the Polaris fleet will constitute an adequate deterrent. I personally believe there are far better uses for money within the Defense Department than its expenditure for full-scale development or construction of the B-1 bomber or the Trident submarine. An extended range version of the Poseidon missile (the Poseidon C-4, as the Trident-1 missile is designated) might be pursued on a low-cost timescale.

STRATEGIC AIR DEFENSE

Clearly it makes no sense at all to maintain an expensive strategic air defense against a Soviet bomber force whose destructive capability is a very small fraction of the Soviet missile force against which we shall have no defense at all. Air defense of the United States will have a different purpose and presumably a different form from that which was hoped to survive a coordinated attack by Soviet missiles and aircraft delivering

thousands of nuclear weapons. The new kind of air defense could provide much better performance against intruders in peacetime and even against a relatively few nuclear-weapon-carrying aircraft in wartime than can our present high-cost system. It can emphasize improved radar and interceptors rather than redundancy and invulnerability.

On the other hand, although such an air defense system should be able to detect enemy aircraft down to ground level, and must therefore have radars elevated into the air, it is not necessary to use the AWACS ("Airborne Warning and Control System) aircraft. AWACS is more than an elevated radar -- it is an airborne control system as well, untargetable by ICBM's because it is in motion. A modest but effective air defense should rely instead on an airborne radar, whose electrical signals are relayed without human intervention directly to one of a few control centers on the ground. This relay can be done via communication satellite or to a number of ground antennas of modest cost. Furthermore, an approach of lower cost and greater effectiveness than AWACS is probably to use a helicopter-lifted radar, in which a light-weight radar van or pod is lifted by an efficient cargo helicopter and maintained at an altitude of 15,000 feet or so. More specifically-oriented development could result in a helicopter to support such a radar at 40,000 foot altitude, thus giving it a line-of-sight to ground level exceeding 200 miles. Helicopter-lifted radars, held stationary with respect to the ground, have far less difficulty seeing moving aircraft than do AWACS-type radars which are themselves in motion at jet aircraft speeds.

While advanced unmanned ground-launched missiles guided by the elevated radars would probably be the interceptor system of choice in a large strategic defense, and a relatively small number of such long range, supersonic missiles would be useful in the limited air defense system, the maintenance of national sovereignty over US air space in peacetime should involve primarily manned aircraft.

MAINTENANCE OF SEA LINES OF COMMUNICATION

The United States has strong trade ties with the rest of the world. It is worth substantial cost to the United States to protect these sea lanes against possible disruption. There are, of course, political threats to our sea lines of communication, and these must be countered in the political arena, where a strong and effective military capability may be an asset.

The physical threat to the sea lanes should be put in perspective, distinguishing between the nature and the numbers of forces required. Thus, while some small nation could conceivably undertake to harass and disrupt US shipping wherever it could be found, such a clear violation of international law and custom could be countered by attack on the country concerned. Large

forces for maintenance of sea lines of communications are required for the foreseeable future only against the Soviet Union and its allies, where the threats to our ocean shipping are air-launched cruise missiles, surface-launched cruise missiles, submarine-launched cruise missiles, and torpedoes. Protection of merchant shipping, and especially protection of the defending forces, does not appear to be possible in a full-scale nuclear war at sea. The maintenance of sea lines of communication is discussed in some detail in a recent paper.[1] In brief, that paper concludes, in a somewhat different context, that effective defense of merchant shipping in the event of a large-scale war can be achieved by

1. emphasizing the utility of helicopter ASW, with the helicopter used as a truck in deploying active sonars by a leapfrogging tactic along the route, with ASW analysis and processing done in the base ship,

2. self-defense measures aboard merchantmen, such as standard homing torpedoes which would be fired in a random direction if the merchantman were hit by a torpedo, and which would pose a substantial threat to the survivability of the attacking submarine,

3. advanced mine fields which in time of war would exact substantial attrition from submarines attempting repeatedly to move from their ports to the shipping lanes,

4. adequate surveillance and defense against cruise missiles, as well as a general capability in air and ocean surface surveillance to threaten and destroy the launchers of anti-shipping cruise missiles.

Comparing our present naval forces with those advocated above for the defense of merchant shipping, we see little application in this role for fast and maneuverable destroyers, nuclear attack submarines (SSNs), attack carriers, or even for antisubmarine carriers. The ASW carrier, of undoubted substantial local effectiveness, provides excessive defense for a single merchant ship, and we do not have and would not have ASW carriers in sufficient numbers to do the shipping protection job. Furthermore, there is serious question as to survivability of the ASW carrier in the face of a threat against which it would otherwise be desirable to deploy an ASW carrier.

On the other hand, a small fleet of SSNs provides a capability for observation and for attack on a small number of enemy warships and is of considerable value in that role.

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1. R. L. Garwin, "Antisubmarine Warfare and National Security," Scientific American (July 1972), pp 14-25.

ATTACK OF GROUND TARGETS

In the course of theater operations, it is often desired to destroy the other side's military airbases, command headquarters, military logistics, and to attack forces in the field, including emplaced guns, tanks, troops, etc. Close to an established front line, such attack can be carried out by artillery, which is itself susceptible of considerable improvement in effectiveness. In a conflict without front lines, much damage can be inflicted against stationary targets by the use of hand-emplaced explosives, and against moving targets by hand-emplaced mines.

Experience shows a considerable desire to attack ground targets well beyond the range of artillery, a function which is now carried out by tactical aviation, either land-based air force or carrier-based navy.

The preponderance of attack has always been against fixed targets. Maps are obtained, photo-reconnaissance missions flown (using either manned aircraft or drones), targets identified on the photo materials which provide better resolution and a longer time to identify such targets than does direct visual reconnaissance, strikes planned, and aircraft sent against these targets. The attack pilot must then acquire the target, visually in good weather, with night vision equipment at night, and via radar in certain aircraft-target combinations. A navigation grid would allow those same targets to be struck blindly by navigation, and with accuracies considerably better than those obtained in gravity bombing of targets in the tactical theater. The accuracies, however, are not so good as can be obtained with homing bombs such as WALLEYE or the laser-guided bomb. Against defined targets, the high accuracy of these latter provide far less probabilty of peripheral damage to surrounding habitation, personnel, and structures for a given degree of target assurance.

However, optimum attack of targets on a bombing range bears little relation to the best system for attacking ground targets during wartime. The presence of strong air defenses, supplied to both Egypt and to North Vietnam by the Soviet Union, changes the relative cost of different modes of attack. A few fighter bombers may have to be accompanied by many more than their number of supporting aircraft whose purpose is to defend against fighters, to jam ground based radars or to provide some rescue capability. Thus, 4000 pounds of bombs which may cost $4000 might require not one but four aircraft for delivery, at a cost of about $100,000 plus attrition. At a 0.5 per cent attrition rate per sortie, and with an aircraft cost of $4 million, the cost of the aircraft may add another $100,000 to the cost of the mission. Furthermore, the continuing drain of pilots and aircraft requires typically an aircraft in training for every aircraft deployed. Thus $4000 in ordnance may only be the most visible part of a $300,000 expenditure which very probably does

not destroy the target. The fighter bomber force adequate for destruction of targets at a rate of one sortie per aircraft per day and an attrition of 0.2 per cent per sortie would disappear in a month if fully exercised at an attrition rate of 3 per cent per sortie.

The fighter-bomber survivability can be improved and its effectiveness enhanced by wide adoption of the technique of bombing by navigation, relying on LORAN C at present and eventually on the more accurate positioning signals available from a future navigation satellite system. By such techniques, the aircraft can be given greater flexibility for survival, their exposure time to defenses can be reduced, and the accuracy of weapons delivery enhanced.

Still an alternative means of attacking ground targets is by the use of missiles. A cruise missile of 500-mile range, launched from ship or from the ground, could weigh 3000 pounds for a 1000 pound warhead of conventional high explosive. It could have an expendable Turbojet engine delivering 600 pounds of thrust for one hour and would have a high subsonic speed. A missile designed for wide use would put most of the expensive portions of the guidance system back at a direction center. Such a missile might be obtained for costs which break down as follows:

Engine	$ 3,000
Airframe	$ 2,000
Warhead	$ 2,000
Auto pilot and Actuators	$ 3,000
Guidance and Communications	$10,000

Many dozens of such missiles could be flown simultaneously by a single central computer, which could command evasive maneuvers continuously so as to reduce the vulnerability of such vehicles to anti-aircraft fire or to attack by defending fighters. The position of the vehicle could be known to the computer by means of signals received at the vehicle from navigation satellites or LORAN systems and transmitted back to the computer via an airborne monitor which would handle all missiles in flight simultaneously. These missiles could be guided all the way to their point of impact and would therefore have an accuracy better than that which can be obtained in dropping gravity bombs with the help of a navigation system. It seems possible for a total missile cost of $25,000 to include also a terminal homing capability to give such missiles the accuracy of the TV-guided WALLEYE.

In comparison of relative effectiveness of forces, such a missile wins out over aircraft-delivered gravity bombs. It

competes with WALLEYE in low defense environments, but it is substantially superior in heavily defended areas. To the defense planner at the national level, such a capability is much more robust against uncertainty of developments on the other side, and it requires substantially less in support costs and in personnel than does attack with manned aircraft. As will be seen, the use of such missiles has impact far beyond its direct substitution for fighter bombers.

For attack on moving targets, such missiles can be used to deliver mines in the path of the vehicles. They can also be directed by real-time command to strike such moving targets which have been identified by radar surveillance. To discuss this aspect further would require too much detail for the scope of this paper.

CLOSE AIR SUPPORT

Support of troops in combat is obtained from artillery or by aircraft-delivered munitions. Although specialized aircraft are under development for this role, the problem is primarily that of delivering munitions at a specified point, and this can be accomplished by navigational techniques. For use near the battlefield, many alternative navigational methods are immediately available, ranging from LORAN C to various microwave navigation schemes. Not only can the aircraft position itself for weapons release, but weapons can be guided directly to their target. One aspect of specialization of a close support aircraft is low cost, but one must make every effort to see that it does not have a concomitant low effectiveness. In any case, specialized close-support aircraft are in competition with high-flying aircraft dropping laser-guided bombs which are guided to their targets by a laser held by a ground or air observer, with the use of gravity bombs dropped by navigation, with the use of bombs guided to their targets by navigation, and with the use of short-range battle field missiles guided to their targets in any of these ways.

SURVEILLANCE AND RECONNAISANCE

The need for surveillance ranges from the desire of a commander of a besieged camp to perceive the current location of enemy trenches to the desire to obtain a fine-scale map of an entire country. Much more attention could be paid to low-cost techniques such as balloons or drone helicopters or aircraft to provide a platform on which to mount a TV camera or a film camera. Observation at night can be done with long-wave infrared techniques, and radar seems very well suited to the detection of moving targets on the ground or in the air. More attention to continuity of ground vehicle surveillance using helicopter-lifted moving-target-indicator-radar, as described under AIR DEFENSE above, can provide assurance against surprise and also a better allocation of forces.

AIR SUPERIORITY

This term is usually used in the context of tactical theater warfare, meaning that the side with air superiority can use the skies safely, whereas the other side cannot. It is more and more expensive to obtain air superiority, the farther one goes from one's own base. The preferred means of obtaining air superiority is to destroy the airfields of the other side and his aircraft on the ground. I have noted a means of doing this by use of the missiles described under "ATTACK OF GROUND TARGETS" above. The purpose of air superiority over enemy territory is to obtain safe passage for one's own bombers and reconnaisance aircraft. If there are no manned bombers, air superiority is an unnecessary and perhaps too expensive luxury. Air superiority over one's own territory contributes to the survival of one's airbases, command headquarters, and deployed forces. However, this same function can be performed by a combination of hardening, dispersal of valuable targets, and defense by the use of guns and surface-to-air missiles. In fact, the most valuable and vulnerable targets for enemy air attack are usually one's own airfields and air vehicles. While the need for fighter bombers and fighters and the existence of these valuable and vulnerable targets is thus somewhat circular, there is an undoubted need for cargo aircraft and personnel carriers which must be defended not only against air attack, but also against mortar fire directed toward their landing and sheltering areas, and against sabotage. A force oriented toward such a limited definition of air superiority might be of quite different form and size than our present goals. In particular, air superiority might receive a significant contribution from the use of a modern remote-piloted vehicle (RPV) analogous to the old supersonic BOMARC which served so long in the US air defense forces. Such vehicles can be launched from the ground, from cargo aircraft, or from fighters, and can be given undoubted maneuvering superiority and survivability against enemy manned aircraft, while retaining and enhancing the senses and the intelligence of the remote pilot.

ANTI-TANK WARFARE

Tanks have a useful function in protecting some fraction of the troops against fragments and small arms fire. The existence of tanks provoked the development of anti-tank weapons, some mounted on other tanks, some on field pieces, and some of them hand-held rocket-propelled and in recent years guided. Tanks are also vulnerable to mines emplaced by hand, by artillery, or by aircraft. The race between tank and anti-tank weapon is an old one, and claims of supremacy for one side or the other have been heard many times. It seems now to me that the technological advance in electronics and the recent greatly diminished cost for a given function would allow a proliferation of effective and controllable anti-tank weapons spelling the end of the large and expensive tank.

GENERAL COMMENTS

It is very difficult to evaluate general-purpose forces in terms of specific military functions, just because these force elements do have capabilities for several such functions. Undeniably, small numbers of advanced vehicles, such as YF-12 airplanes, attack carriers, etc., have some value. However, when adequate forces cannot be procured because of budgetary limitations, we have the worst of both worlds -- a large defense budget and inadequate military capability.

In the discussion above, we have reviewed some feasible near-term technological alternatives to current means of accomplishing certain fundamental military functions. This brief review leads to the conclusion that we need no large forces of

-- fighter bombers

-- attack submarines

-- aircraft carriers

-- AWACS

-- tanks

-- fast destroyers

-- advanced tactical fighter aircraft

-- B-1 bombers

-- Trident submarines

We need to establish the route of transition from our present forces to much more effective forces, at significantly lower cost, whose performance is more reliable in the face of achievable enemy options. Our present forces result from a long tradition of organization and behavior. In the numbers which are planned to exist, they are incapable of serving the country's military needs; and they are too expensive in unit cost and in capital investment to produce in the numbers which might be needed.

In this brief note I have described alternatives to the present force structure. A sequel to this paper should consider more fully the relative merits of our present "high investment-low attrition" forces in comparison with a posture of "low investment-high attrition" forces like those described above, which seem to offer a much more desirable military capability and one which can be maintained and continually

modernized at lower cost.

Although the strategy of transition to more effective military forces cannot be laid out in all detail in this paper, I advocate major commitments to the most effective management and development techniques known in order to:

-- deploy a world-wide, highly accurate defense navigation satellite system

-- develop the low-cost, high precision, ground and ship launched interdiction missile

-- develop and procure advanced, lightweight, radar equipment, to be operated while supported from a helicopter for the purpose of air defense and theatre monitoring

-- develop more efficient helicopter-deployed sonars, together with the tactics of leapfrog deployment of these sonars, with processing in the base ship

-- develop low cost and effective mines

-- develop a remote-piloted vehicle against enemy aircraft

-- commit to wide deployment and corresponding tactics for a hand-held, controllable, anti-tank capability

-- recognize the wide utility even now of a common navigation grid for the provision of close support, interdiction, and reconnaissance, as contrasted with present visual means.

It seems to me that the main commitment of development and investment should be in these directions, while economies should be made in investment and maintenance of present forces, recognizing the probability that they will be displaced in the near future with more effective and less vulnerable capabilities.