VOL. 20, NO. 8/APRIL 14, 1977

EVALUATING the STATUS of DEFENSE TECHNOLOGY

COMMANDERS DIGEST

THE FUTURE OF DEFENSE TECHNOLOGY

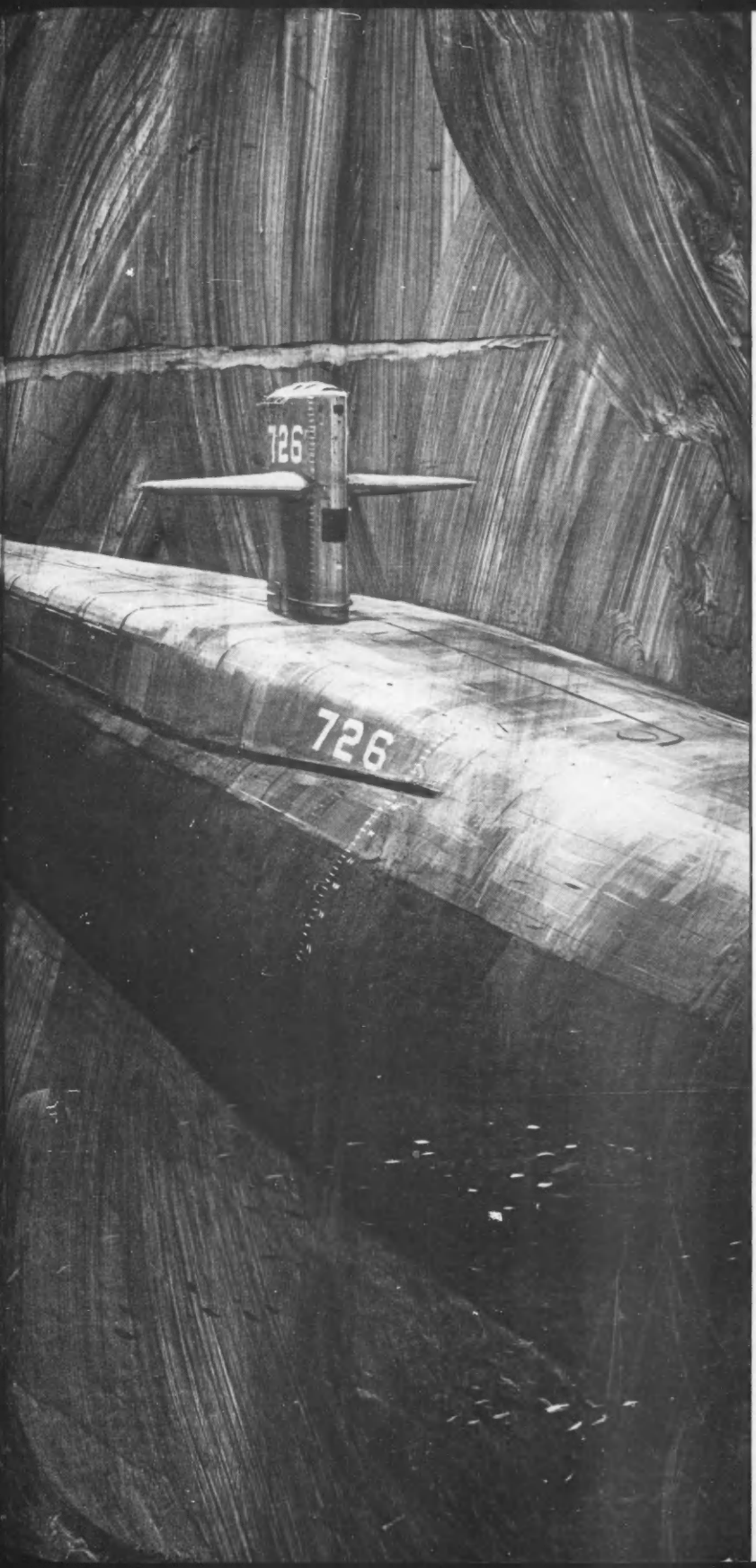
During the last several years the Department of Defense has studied extensively the scope and quality of military research and development in the Soviet Union and has compared it with the U.S. effort. From this DoD has derived a feeling for elative trends and relative strengths and weaknesses and what these might have in the future.

In the overall assessment last year—which described many numerical indicators and analyses of the quality of the products emerging from Soviet research and development (R&D) in the strategic, general purpose forces, and space areas—it was concluded that:

- Today the U. S. has a technological lead in most areas crucial to our security but that lead is eroding and in some areas is already gone, and
- Without appropriate action on our part, the Soviets could achieve, on balance, a position of clearly perceived military superiority in terms of the combination of quantity and quality of their deployed military weapons at some point during the 1980s.

It was suggested that the "appropriate action," which would prevent this sober assessment from becoming a prediction of future reality, should be a strong national commitment to retain U. S. technological leadership backed by a multi-year investment having continuity and real annual growth of at least six to 10 per cent in R&D and procurement.

Nothing during the last year has changed this basic technology balance assessment. The Soviet Union's determined drive toward supremacy in deployed military technology has not abated. It continues on a broad front. There have also been some surprises: for example, the deployment of the powerful new Hind D attack helicopter; further demonstration of anti-satellite capability; and the profuse armament aboard the Kiev, including long-range, supersonic, tactical cruise missiles.



The Stinger shoulder-fired missile system (cover), the Patriot (SAM-D) high-to-medium altitude air defense system (far left), and the TRIDENT missile continue to be included in R&D programs.

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

Soviet production technology is becoming increasingly sophisticated; the Soviet Union is steadily gaining the ability to manage the production of large-scale complex systems. This means that, instead

DEFENSE NEWS BRIEFS

Functions Merge

Communications, Command, Control, and Intelligence functions merged at the Pentagon on March 31, 1977.

The new designation is Assistant Secretary of Defense (Communications, Command, Control and Intelligence).

★★★★

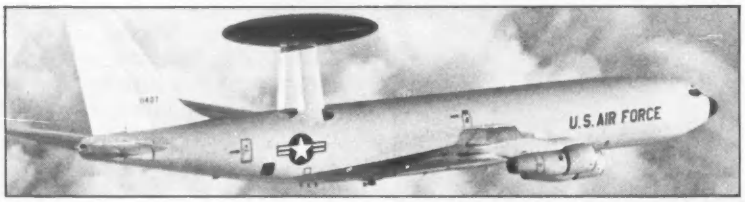
Armed Forces Strength

Total numerical strength of the Armed Forces on Feb. 28, 1977, based on preliminary reports released in late March are as follows:

	Feb. 28, 1977 preliminary	Jan. 31, 1977	Feb. 28, 1976
Total DoD	2,077,619	2,076,662	2,093,480
Army	779,097	778,839	772,890
Navy	528,820	528,700	528,244
Marine Corps	189,048	188,938	193,873
Air Force	580,654	580,185	598,473

★★★★

Air Wing Gets First E-3A



The first production E-3A Airborne Warning and Control System (AWACS) aircraft was turned over to its operational wing March 24 during ceremonies at Tinker Air Force Base, Oklahoma.

AWACS is a complete radar station and command control center aboard a Boeing 707, distinguished in appearance by its 30 foot diameter, six foot thick radar dome atop the aircraft.

★★★★

Care Rates Overseas Hiked For Civilians

Overseas outpatient medical and dental care rates at military treatment facilities to civilian employees of the United States and their dependents increased on April 1 when the outpatient rate for these individuals went up from one dollar to $20 per visit.

★★★★

F-18 Named "Hornet"

"Hornet" is the name selected for the F-18 Strike Fighter Aircraft now under development for the Navy and Marines.

Reference is to the wasp family member "that strikes rapidly and produces a sharp sting." Hornet also is an old and often-used name for Navy ships of the line."

of needing to offset just a quantitative advantage with quality, the United States is increasingly facing "quantity *and* quality"—and this, in turn, places a still greater premium on the quality of output from this Nation's technological efforts.

The United States has a strong advantage in having a large and competitive high-technology civil sector upon which to draw. There also is an advantage in certain critical technologies such as microelectronics, computers, and materials. The Department of Defense must vigorously exploit these technologies and continue to build on its advantage in the future. The Soviets understand this and are seeking to acquire Western products and production technologies in these areas.

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

In general purpose forces the Soviets have undergone and are continuing a massive expansion and technological transformation in all mission areas:

- Although the United States maintains decided performance advantages in *tactical air forces*, an area in which a clear margin of superiority must be maintained, the Soviets are rapidly acquiring a new generation of offensively oriented aircraft (large range-pay load) and deploying them in large quantities.
- In the maritime balance the situation is not as clear although, on balance, the United States still probably is in the lead. The Soviets are developing formidable attack submarine technology, a variety of offensive strike cruise missiles,

global command and control involving use of satellites, and a worldwide land-based naval aviation arm in the Backfire—all of which lead to the ability to interdict the sea lanes so vital to the Western world.

- It is in the area of land warfare systems which most immediately and urgently concern DoD. The Soviets have mounted a modernization program of unprecedented magnitude. In many cases they are widely deploying technology now for which DoD will not have roughly comparable counterparts until the early-to-mid-1980s. For example:
- Mobile air defense—sophisticated, dense;
- Attack/assault helicopters—very impressive, new aerial platform for advanced weaponry and tactics;
- Infantry combat vehicles—superb new systems, amphibious, armored, heavily armed;
- Self-propelled artillery—long range, high firing rate;
- Tanks—new T-72 in large quantities;
- Mobile multiple rocket launchers—enormous firepower; United States has no comparable weapon;
- Anti-tank weapons—long stand-off, precision guidance;
- Electronic warfare—organic part of doctrine;
- Mine-laying—a Soviet specialty;
- Chemical warfare—clear Soviet lead;
- Support vehicles/equipment—extensive, complete; and
- Sophisticated command & control—an area of Soviet concentration.

Their new capabilities aggregate to a revolutionary change in land warfare. They are clearly designed for the surprise and rapid movement associated with a massive breakthrough blitzkrieg strategy involving high mobility, unprecedented massed armor and firepower and new kinds of tactics. And always—along with this striking technological progress—is the issue of deployment in huge quantity.

Finally, in assessing an overall technology balance, the United States must always be sensitive to the unknown but real possibility of technological surprise. DoD is competing with a closed society. The United States lays out in the open and debates its plans, thinking, and accomplishments; the Soviets do not. And, in this highly complex and technologically dependent society, DoD may be particularly susceptible to numerous possibilities for technological surprise which could have disastrous economic or security consequences.

This overall assessment portrays a magnitude of commitment and momentum on the part of the Soviet Union which inevitably will carry long into the future. The net technology balance is clearly on the side of the United States today, but it is deteriorating. The Soviet Union has the expressed determination and has mounted an effort with the inexorable goal to erode further and erase that lead. These trends must be dealt with realistically and prudently—and now.

This assessment forms the background for U. S. programs of research and development and modernization investment.

U.S. DEFENSE RDT&E—STATUS AND PERSPECTIVES

The following three objectives have been strongly and explicitly emphasized in formulating and managing the Defense research, development, test and evaluation (RDT&E) program over the last several years:

- Maximize the output of research and development in terms of completed system developments which can be produced and fielded to provide the needed near-term modernization of our Armed Forces.
- Strengthen the management of systems development and acquisition.
- Strengthen and broaden the base of technology to insure innovative new options and major new technological directions for our long-range security.

It is believed that very significant progress has been made in all three areas. The FY 1978 program will build directly on this base.

In the end, the measure of a successful research and development program is superior and affordable weapon systems in the hands of the Armed Forces. The Defense Department has concentrated on completing existing programs and successfully transitioning them to production even at the expense of postponing some important new developments.

The program has been extraordinarily productive in terms of this objective. 1975 and 1976 were banner years in reaching critical milestones. **Table 1** shows a representative list of major systems which have been introduced into production or are reaching that point. It represents part of the "return-on-investment" in Defense R&D.

All of this illustrates that, in fact, DoD is in the midst of a broadly based modernization program which is reaching fruition. The need for this program is evident when one examines the military hardware in the field today and looks at the vintage of its basic design and its physical age. Examples are shown in **Table 2**. Although Defense has continued to upgrade these equipments over many years (such as the M-60 tank, the F-4 fighter, the B-52, helicopters, air defense, etc.), many of them have been operated for 10 to 20 years. They are being replaced by the new capabilities which are the output of the RDT&E process and which must compete with the massively deployed new generation of Soviet equipment.

On the whole, the United States modernization will not be felt until the early-to-mid-1980s. The lead times are long. It is urgent to press forward to achieve the modernization goals.

In order to achieve the high output, the Department of Defense has purposefully been very selective in the number of programs allowed to enter the expensive full-scale engineering development phase.

Overall there are a large number of important new systems maturing toward production. In general, the productivity is high as measured against the rigid standards of performance and cost which DoD has set for itself and which are necessary for a secure posture in the 1980s.

The Defense Department emphasis on more rigorous management is paying off. Last year it was reported that the annual cost growth rate for all programs (about 50) in the Selected Acquisition Reports, adjusted for escalation and quantity, dropped from 6.4 per cent in December 1972 to 4 per cent in 1975. This has since been further improved to 3 per cent. These results are often masked by inflation. But the progress is real and steady. DoD has a long way to go—but it is learning how to do a better job.

Defense's goal is to better anticipate and manage the problems inherent in the development of systems operating on the forward edge of technology and, when problems occur, to treat them openly and effectively in a way that inspires confidence from Congress and the public.

The following are stressed:

• Competitive Prototyping—Competitive hardware demonstration rather than paper competition has an enormous pay-off which is worth many times the investment in terms of better products and lower cost. We have seen this over and over again (examples: F-16/F-18 lightweight fighters, XM-1 tank, UTTAS, F-16 radar, Cruise Missile Guidance, AAH, AMST).

• Design-to-Cost—Becoming a way of life, it has paid off. Sixty-nine major defense systems are now located at various stages in the DTC program.

• Better Program Management—This is the most important of all. The Defense Systems Management College has been expanded and program management has been established as a career path in the Services.

• Independent Cost Estimating—DoD is developing this discipline in the Services and it is leading to more realistic prediction of program costs at their inception.

• Rigorous Management Review—The Defense Systems Acquisition Review Council (DSARC) process has been improved continually and is reflected now in similar reviews in the Services.

• Mission Areas Needs—The Defense Department is emphasiz-

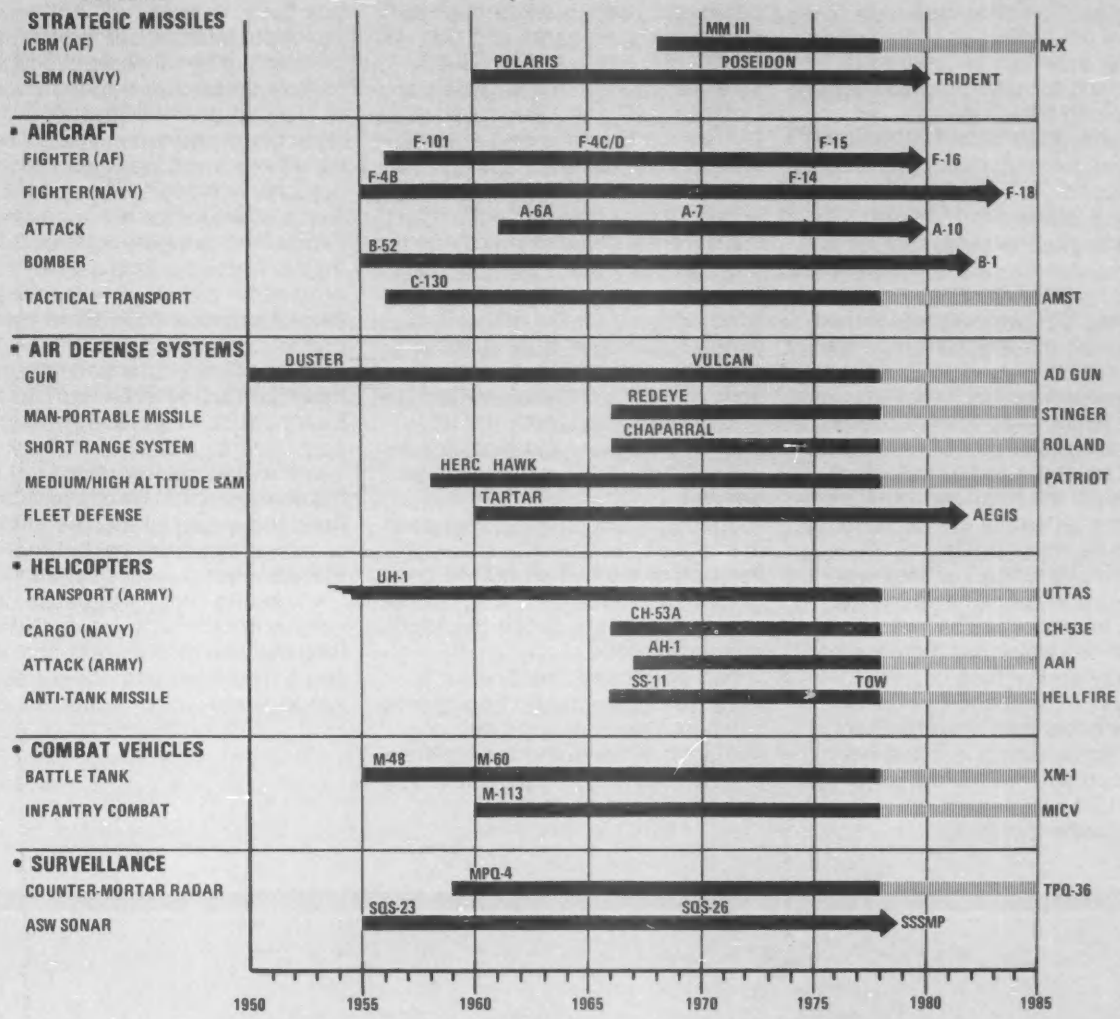
TABLE I

Programs in Final Stages of Development or Early Production (FY 1978)

UTTAS Transport Helicopter
Harpoon Anti-Ship Missile
AWACS
AIM-9L Sidewinder Air-to-Air Missile
AIM-7F Sparrow Air-to-Air Missile
F-16 Air Combat Fighter
SM-2 Standard Missile
Stinger Air Defense Missile
Phalanx Ship Defense
B-1 Bomber
TRIDENT I Strategic Missile
TRIDENT Submarine
Laser Maverick Air-to-Ground Missile
MICV Infantry Combat Vehicle
TACFIRE Artillery Control System
EF-111A EW Aircraft
CH-53E Cargo Helicopter
Fleet SATCOM Communications Satellite
A-6E TRAM
FLIR on A-7E
GBU-15 Glide Bomb
AN/TSQ-73 Air Defense System
XM-198 Howitzer
AN/TPQ-36 and AN/TPQ-37 Mortar and Artillery Locating Radars
JTIDS Secure Data Link Terminals for AWACS
ALQ-131 Jammer
Captor Mine
PHM Hydrofoil
Low-Cost EW Suite for Ships
Artillery Delivered Mines
Advanced WILD WEASEL Aircraft

TABLE 2 – MODERNIZATION

INITIAL OPERATIONAL CAPABILITY DATES



ing stronger program concept formulation and justification before a program is initiated. This is critical to better use and management of defense resources.

• Emphasis on Life-Cycle Costing—Objective here is to reduce escalating operation and maintenance costs. Defense is beginning to make progress,but still has a long way to go.

• Better Contracting—Better incentives for performance are being developed. A "Four-Step Process" is being initiated to help eliminate technological leveling, buy-ins and de facto auctioneering of programs which have led to large overruns in the past. DoD now allows interest on capital investments which will reduce costs.

• Emphasis on Software Management—Software accounts increasingly for cost and schedule overruns and constitutes a large fraction of the total cost of modern systems. Attempts are being made to reduce these costs.

• Manufacturing Technology—Extensive investments in manufacturing technologies have been introduced which will increase productivity and reduce costs.

• System Test and Evaluation—Independent and more realistic operational testing is being emphasized early in the development cycle to discover problems. The result is better products.

At times it seems progress is slow, but these and other similar management actions are having a significant effect. Furthermore, in research and development, firm and exacting management not only decreases costs but improves the quality of the research and the quality of the resulting products. This emphasis on management in Defense R&D and systems acquisition should be expanded and continued in the future.

Defense's long-range security and insurance against technological surprise depend directly on the creation of a broad, dynamic, and innovative base of technology on which to build for the future. A strong research and development program must always provide options for policy decision makers. This is DoD's hedge for the future against surprise—and increasingly in the future, this flexibility will be needed.

Special attention has been given to this area because the support for this part of the overall RDT&E program had eroded by almost 50 per cent in real terms during the 1960s and early 1970s.

Two years ago, the Director of Defense Research and Engineering outlined a general approach or strategy for managing the Defense RDT&E effort. In it, the overall program was divided into two parts:

• Group One: Creation and Demonstration of Options.

• Group Two: Full-Scale System Development.

Group One includes the technology base, demonstration of new concepts, competitive prototyping, pursuit of alternative solutions to military problems—i.e., the creation of a broad base of advanced technology and technological options from which decision makers select only those few programs which should enter the expensive Group Two category. In Group Two, the concepts are fully developed for production and deployment in the field. A rigorous DSARC review controls this process and the number of programs transitioning from Group One to Group Two has been reduced significantly over the past several years.

Within this framework the following actions were taken to rebuild the quality of the Group One or technology base part of the RDT&E effort:

• Funding Policy—Because of the serious erosion in support, Defense R&D outlined to Congress two years ago a multi-year plan for correcting this situation which requested a 10

WHAT THEY ARE SAYING . . .

"As a technologist, I have been told that our C³ problems are not technical. . .they are organizational and doctrinal. I suspect that there is some truth to that statement, but I also suspect that the organizational issue is only the first layer of problem with which we must deal."

—George H. Heilmeier, *Director, Defense Advanced Research Projects Agency, in a speech to the Air University Airpower Symposium, Maxwell AFB, Alabama, March 30, 1977.*

per cent annual real growth rate in research and a five per cent annual real growth in exploratory development. The total amount needed for the technology base program for FY 1978 is $1,880 million.

• DARPA—The Defense Advanced Research Projects Agency is regarded as the "corporate research laboratory" of DoD. DARPA is used to concentrate on a number of specific high-risk but potentially very high-payoff directions which can have a major or revolutionary impact on Defense capabilities. Examples are high energy lasers in space, revolutionary advances in submarine detection, new forms of digital communications and command and control, ceramic turbines, artificial intelligence, new types of lightweight fighting vehicles.

• DoD In-House Laboratories—To improve the quality of the in-house laboratories, DoD is moving toward block-funding and increasing the accountable responsibility of their leadership for the quality of the technology base work. At the same time, Defense is proceeding toward an objective of restoring the ratio of in-house to contract R&D to the lower and better balanced ratios which existed in the early 1960s. The Department of Defense is proceeding with consolidations, where reasonable, to reduce the overall size of the in-house establishment.

• Industrial Independent Research and Development (IR&D)—IR&D is absolutely central to the quality of Defense RDT&E and weapons acquisition, and its "independence" must be maintained. It is the heart of a competitive and competent industrial base: it results in lowering the cost of acquisition and it is a uniquely efficient source for new technology and the innovative new options of Group One. It is well managed, and it pays for itself many times over.

• DoD-University Relations—The traditionally strong and mutually supportive relationship between DoD and the university community has greatly attenuated over the years. Starting with World War II it was the well-spring for the surge in technical strength in terms of both critical research and people. This relationship must be rebuilt; DoD is encouraging greater support of university research and participation by young university faculty and students in DoD laboratory activities. This trend is vital; it will be expanded.

Promising Technological Directions

With Defense's prime focus on achieving a secure posture in the 1980s and, therefore, with most of the resources devoted to the maturing programs of today, it must be kept in mind the directions which could afford radically new capabilities or, alternatively, could present us with technological surprise. Here are a few:

• The greatest force effectiveness leverage for the future lies in integrating in real time the functions of surveillance, target acquisition and command and control of forces. Building on concepts

"Workloads imposed on DLA are based on the demands of the Military Services and other agencies which we support. We do not control these demands nor the workloads they generate. We do, however, share jointly with the Services responsibility for materiel readiness of our Armed Forces."

—Lt. Gen. W.W. Vaughan, Army, *Director, Defense Logistics Agency (DLA) before the Defense Subcommittee of the Senate Committee on Appropriations, March 22, 1977.*

"I seldom miss an opportunity to emphasize the fact that every major weapon system in our military arsenal has its effectiveness predicated on the products and services of the Defense Mapping Agency; DMA products—accurate, current, and provided in a timely manner—are essential for every type of military operation conceivable."

—VADM Shannon D. Cramer Jr., *Director, Defense Mapping Agency (DMA), before the Defense Subcommittee of the Senate Appropriations Committee, March 22, 1977.*

such as Airborn Warning and Control System (AWACS), NAVSTAR, packet communications, and battlefield fusion of intelligence, force multiplier factors of three and upwards can be achieved. We must rely on such force multiplier technology to compensate for "quantity and quality" on the Soviet side.

- Cruise missiles—already changing military thinking—are in their infancy and offer revolutionary potential. Future characteristics such as "zero CEP" accuracy at large standoff ranges and supersonic dash, at relatively low cost, will fundamentally change land, sea, and air warfare.
- High energy lasers.
- New forms of undersea submarine detection.
- New capabilities in space, including satellites used for targeting, missile guidance and surveillance.
- Applications of the Space Shuttle.
- Aircraft with low observables to make them virtually undetectable and with Vertical/Short Take Off and Landing (V/STOL) capabilities.
- New forms of defense against ballistic missiles.

All of these and others will dominate future thinking and future DoD programs. A vigorous technology base must be created now.

NATO Standardization

There is increasing recognition of the importance of achieving efficiencies and improved effectiveness through standard and interoperable systems in NATO.

The U. S. should take the lead in bringing this about through a policy of international cooperation with its allies which will encompass joint industrial programs, licensing both ways, and co-production.

Defense has been pursuing this goal vigorously. A great deal of progress has been made despite the complexities of national interests, international economic factors, and industrial pressure groups here and abroad. But there still is a long way to go. The Culver-Nunn legislation has been very supportive of this effort.

The F-16 is a successful adoption of NATO standardization on a U. S. product. The U. S. adoption of the German/French Roland is an example of an excellent system which fills a high priority need for the United States and achieves a high degree of standardization and interoperability in NATO.

Other recent examples include adoption of common consumable logistic items on the XM-1 tank, adoption of our AIM 9-L missile, cooperative programs on air-to-surface ordnance, ship defense missile, secure communications, ammunition, field radios, Harrier V/STOL, and others. NATO AWACS, which would provide a powerful and cohesive capability for the Alliance, may yet become a reality.

TABLE 3

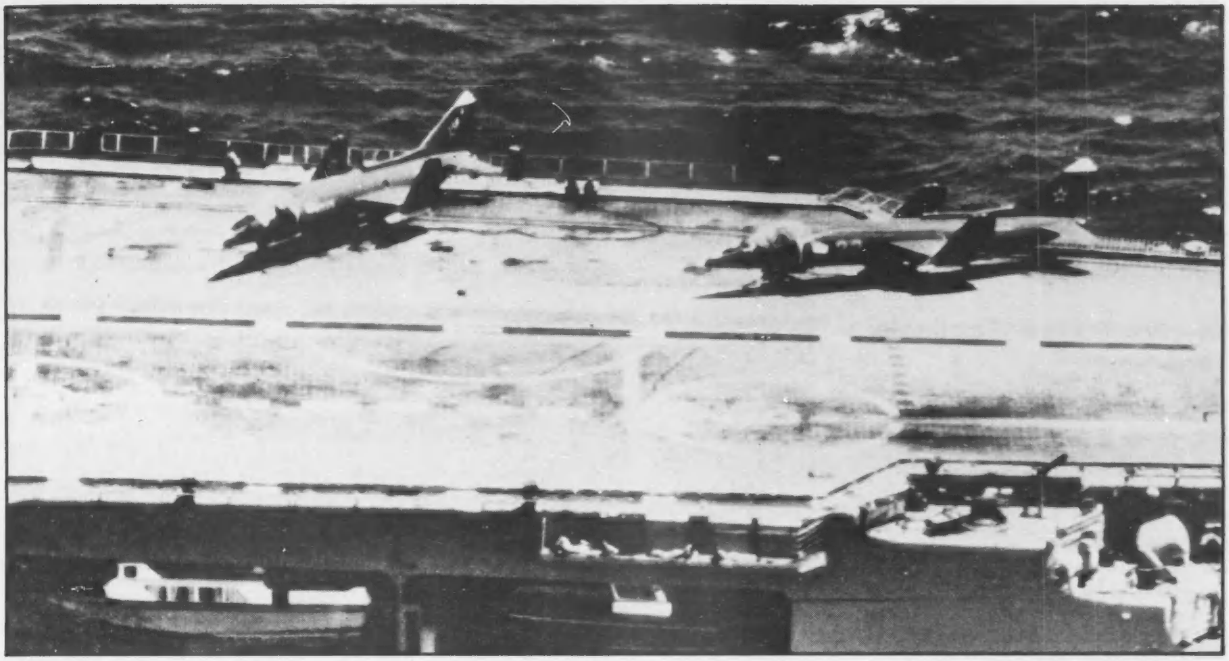
Representative List of Joint Service Programs (FY 1978) (Total Number Approximately 60)

NAVSTAR Global Positioning System	AF, N, A
AN/TTC-39 TRITAC Switch	A, N, AF, MC
AIM-9L, AIM-7F Air-to-Air Missiles	N, AF, MC
Harm	N, AF
Imaging Seeker	AF, N
Rembass	A, AF, MC
Microwave Landing System	A, N, MC
Base Security	AF, A, MC
EO Guided Bomb	AF, N
GAMO Ground Amphibious Military Operations	A, N, AF, MC
JTIDS Secure Communications	AF, A, N
Gator Mine	AF, A, N
F-16/F-18 Electronic Countermeasures	N, AF
BRAZO Anti-Radiation Air-to-Air Missile	AF, N
Beyond Visual Range Air-to-Air Missile	AF, N
Position Location Reporting System	A, MC
Tomahawk and ALCM Cruise Missiles	N, AF

Technology Transfer

The subject of technology transfer is controversial. On one hand, the free enterprise system of the United States allows and encourages the export of products and technology, and this is of economic importance to the Nation. On the other hand, much of this technology is the lifeblood of future security, both military and economic. Moreover, the Soviets are clearly seeking to narrow critical areas of deficiency (e.g., microelectronics, materials, computers, instrumentations, production technology, etc.) by importation of Western technology.

The Defense Science Board (DSB), at the request of the Director of Defense Research and Engineering, has studied this issue and made recommendations on how to improve the controls. The Board proposes that DoD concentrate less on the myriad of individual controls



Two Soviet YAK–36 Vertical/Short Take Off and Landing (V/STOL) fighters on the deck of a Soviet aircraft carrier.

on products per se and concentrate more on control of development, production and process control technologies and on control over the more "revolutionary" technologies which are emerging (versus "evolutionary" technologies).

Stronger and more effective treatment of technology transfer is required and DoD is taking steps to implement the DSB recommendations. New guidelines are badly needed. Changes in the bureaucracy of munitions and export control may be needed. The United States cannot afford to deplete the reservoir of technology vital to national interests and leadership faster than that reservoir can be refilled.

Joint Service Programs

The time is long past when Defense can have the luxury (and waste) of individual Service developments for every "requirement". In addition to fiscal realities, the complexities of modern systems and requirements for intimately integrated and interdependent tactics between Services dictate that requirements and systems developments be approached on a truly joint-Service basis.

Joint-Service programs with a designated lead Service as a preferred alternative to total centralization of management in DoD has been stressed. The progress is encouraging, there are now some 60 or more joint development programs and another 15 or so Joint Operational Test and Evaluation programs. Progress is sometimes difficult, but the results justify the efforts.

Some outstanding examples are the NAVSTAR Global Positioning System, internal countermeasures

for the F-16/F-18 fighters, GATOR mine, and AIMVAL/ACEVAL air combat test. The new Beyond Visual Range air-to-air radar missile is another example, as well as the Cruise Missile Program.

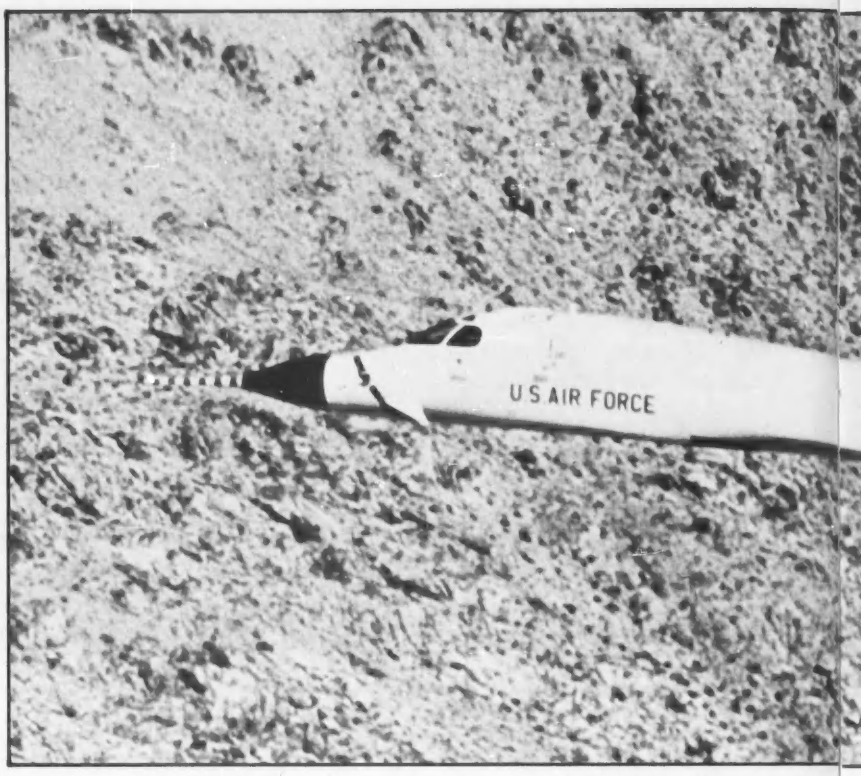
Joint programs will be increasingly important in the future. They save money. They provide common and well-integrated military capability among the Services.

FY 1978 RDT&E Highlights

The needed overall level of $12 billion for FY 1978 represents a continuation of the general program and major areas of emphasis described previously. Simply stated, there are many programs either in full scale development or transitioning to production to which we are giving top priority at necessarily great cost. Very few programs will be allowed to enter the expensive full-scale development phase and a number of promising areas are being held back so that DoD can concentrate on those of the highest priority for the near-term modernization of U.S. forces.

At the heart of Defense's strategic programs is the need to improve and modernize its forces in the face of asymmetries in favor of the Soviet Union which are incipiently forming both in terms of offensive countermilitary capabilities and damage-limiting defensive capabilities. U.S. programs must neutralize any such possibilities at the outset, keep nuclear conflict unthinkable, grant no unfavorable asymmetry, maximize deterrence—and, therefore, stability—in the United States' relationship with the Soviet Union.

A total of $2.3 billion is needed for strategic R&D programs, which



continues essentially constant funding since FY 1973. This is modest in view of a Soviet momentum in the strategic area which continues at a high level.

With this investment DoD proposes to feature the following:

- Continue development of the B-1 bomber.
- Continue TRIDENT I (C-4 missile) for beginning deployment in 1979. Planning will begin for a longer range TRIDENT II.
- Minuteman III improvements will continue. M-X will continue in advanced development. Primary emphasis will be devoted to multiple AIM point survivability. The missile is being designed to carry a large number of improved accuracy warheads. Thus, it will maximize the retaliatory capability of a residual force after taking a first strike and will discourage Soviet first strike counterforce ambitions.
- Cruise missile development will proceed as powerful and inherently stabilizing complementary dimensions to U.S. strategic forces. The air-launched ALCM and variants of Tomahawk for submarine and surface launch will use common guidance, propulsion and warheads. Flight tests on both ALCM and Tomahawk have been outstandingly successful and the guidance more accurate than predicted last year. Cruise missiles, both nuclear and non-nuclear, are perhaps the most significant weapon development of the decade. Defense is consolidating management under a Joint Air Force/Navy program office.

The Defense Department plans to continue development of the B-1 bomber.

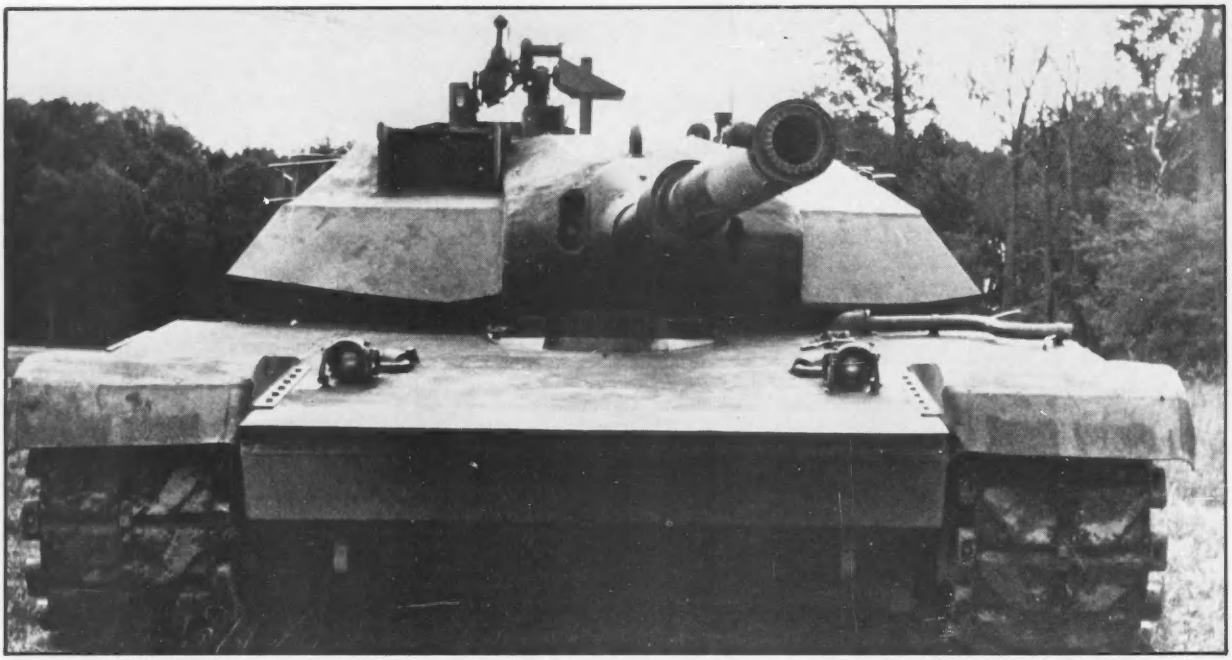
• DoD is exploring new techniques for improving accuracy with submarine launched missiles (FBM Accuracy program), and new concepts in re-entry vehicles systems (ABRES) and for maintaining the security of fleet ballistic missile submarines (SSBN Security Program).

• Ballistic missile defense has been reduced to a minimum sized program for hedging against future uncertainties and from which DoD could respond in a reasonable time of several years if required. The program will explore a broad range of future defensive applications including possibility of revolutionary technologies.

• In space, the question of satellite survivability is paramount in view of recent Soviet activities and will receive intense attention, along with an expanded effort on space surveillance.

• Finally, central to the U.S. strategic posture is the effectiveness of its command, control, warning and surveillance systems.

DoD proposes to invest $4.3 billion in FY 1978 in programs which provide for the modernization of the general purpose forces to keep pace with Soviet expansion and technological transformation discussed above. This emphasis continues the trend of the last several years. It reflects the premium which must be placed and is being placed on deterring non-nuclear conflict and keeping the nuclear threshold as high as possible in a period of dramatic improvements in Soviet capabilities.



The XM-1 Tank (Chrysler Corporation prototype in this photo) is an example of competitive hardware demonstration which has an enormous pay-off and is worth many times the investment in terms of better products and lower cost.

COMMANDERS DIGEST

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The program focuses on deficiencies in two potential areas of confrontation: Central Europe and the sea lines of communication. It has been structured to reverse the adverse trends in land warfare systems, to maintain the maritime balance and to retain the United States clear margin of superiority in tactical air forces. To do this, DoD is again giving priority to those programs which will provide urgently needed new capabilities in the hands of U.S. forces in the near term. A few examples of key programs and DoD's objectives follow.

Land Combat

The relentless growth in Soviet tactical forces capability and the threat it presents to the non-nuclear defense of NATO have already been noted. The land combat weapons acquisition program is aimed specifically at countering these newly developing weapons and the tactics and doctrine which accompany them. R&D in land combat features:

• Air Defense—The carefully planned development of a family of air defense weapon systems to counter the Warsaw Pact's increasing saturation air attack capability will continue. Major programs include the European developed Roland all-weather missile system (similar to Soviet SA-8 system deployed since the mid-1970s), the Patriot (SAM-D) high-to-medium altitude air defense system and the Stinger shoulder-fired missile system, all of which continue in engineering development. The proposed air defense gun program is a new effort leading to an armored gun system for the protection of mobile armored forces.

Mobility/Firepower—Efforts in this area have been aimed principally at increasing the firepower available to the ground commanders. The XM-1 will have superior mobility, a

new turbine engine, and increased survivability and firepower. The M-198 towed howitzer, now in production, will be supplemented in the future with the General Support Rocket System (GSRS), a new program. The GSRS will provide a very high rate of fire to help counter the Blitzkrieg or surge tactic. The Advanced Attack Helicopter (AAH) and Hellfire missile system have moved into engineering development and, when deployed together, will improve our anti-armor capability significantly. The TOW missile is being placed under armor on the MICV and M113 vehicles to reduce the vulnerability of DoD's anti-armor forces to Soviet artillery. The Copperhead cannon launched guided projectile program continues in engineering development and will provide a creditable anti-armor capability utilizing standard field artillery assets. Electronic warfare will continue to be emphasized.

- Target Location—Delivering firepower effectively is dependent on our ability to locate targets beyond the visual line of sight. Efforts to improve this capability center on the TPQ-36/37 counter mortar and counter battery radar systems, the SOTAS heliborne sensor for locating moving targets, and the REMBASS system for locating and classifying ground targets. Remotely piloted vehicles continue in advanced development and DoD has initiated an interim scout helicopter capability in consonance with the fielding of the AAH.
- Tactical Mobility—Programs to enhance battlefield mobility include the UTTAS utility helicopter, now transitioning to production; the MICV infantry combat vehicle, in the final stages of engineering development; and improving the lift capacity of the CH-35E cargo helicopter.

Tactical Air Forces

DoD will continue a major tactical air forces modernization program to retain essential superiority in the face of an already formidable and growing threat. Key programs include:

- New, affordable, high-performance aircraft/avionics such as the F-15 and A-10 continuing in production; the F-16 nearing production, having achieved all major development objectives and continuing a successful NATO standardization program; and the F-18 carrier-based fighter in engineering development.
- Having modernized the aircraft platforms, DoD will now emphasize improvement of air-delivered ordnance for these platforms. Imaging Infrared Maverick, approved for engineering development, and the GBU-15 modular glide bomb are among several programs which will provide enhanced support for the ground forces in the European combat environment.
- Air-to-air missile developments include improving the AIM-7F with a monopulse radar guidance system, if this proves to be cost effective; the beyond visual range (BVR) program for a next generation air-to-air radar guided missile; and the AIM-VAL tests to help define the next generation of infrared missile to replace the AIM-9L.
- The Air Force EF-111A Manned Support Jammer System and the Navy's Tactical Airborne Signal Exploitation System (TASES) are the major systems in a broad and important program of airborne electronic warfare for both offensive and defensive purposes.
- Defense continues laying the technology groundwork for the next generation of V/STOL aircraft. An improved version of the deployed Marine Corps AV-8 Harrier is under development. Future applications of V/STOL technology will be important to the Air Force as well.

Naval Forces

Major Naval issues which remain include anti-submarine warfare, ship defense in the face of an increasing cruise missile threat and naval command and control.

In the area of anti-submarine warfare, progress continues toward a significantly improved capability to counter the steadily growing Soviet submarine threat. The Lamps MK III Helicopter, Surveillance Towed Array Sensor System (SURTASS), SQS-26 Surface Ship Sonar, improvements to the Sound Surveillance System (SOSUS) and the Captor mine are important elements of the overall ASW R&D program.

Needed improvements in the fleet's ability to deal with Soviet anti-ship missiles and naval aircraft depend on the successful development and deployment of a number of shipboard defensive systems. These include the AEGIS system and its Standard Missile II for the high to medium altitude threat; the Shipboard Intermediate Range Combat System (SIRCS) for defense against high speed, low altitude targets, such as Soviet cruise missiles; and improvements to the Phalanx close-in system.

Fleet offensive capabilities will be enhanced in the near term by the addition of the Harpoon, which is transitioning to production; and, in the longer term, by the longer range Tomahawk cruise missile.

Naval command, control and communications efforts include developing communications satellites to support global operations (FLTSATCOM) and advanced satellites to improve our over-the-horizon targeting capabilities.

Conclusion

The United States now leads in the technology competition, but this qualitative lead is diminishing and the Soviet quantitative advantage remains or grows.

DoD's program is focused on bringing to maturity a large number of systems now in full-scale development and thereby upgrading its deployed capabilities in the late 1970s and early 1980s. It will be a time of high investment for the Defense Department. However, there is no cheap way to insure continued national security.

As a result of funding constraints and emphasis on near-term modernization, relatively few new programs have been allowed to proceed into full-scale development. Should this continue, it is possible that the creation of options for the future which have had major payoffs in recent years will dry up. Many more prototype hardware demonstrations than DoD has been able to fit into the program, in spite of their spectacular payoff, should be started. This must be an area of renewed investment in the future.

In basic technology Defense must gain renewed momentum in innovation. The sight of the economic benefits which inevitably flow from a vigorous program of defense research and development at the forefront of technology should not be lost.

A strong program of Defense R&D is a powerful guarantor for the future.

WHO'S NEWS IN DEFENSE

Appointments

John C. Stetson, President of A.B. Dick Co., was nominated by President Carter on March 21 to be Secretary of the Air Force.

Mrs. Wine

Mrs. Jill Wine Volner, former Assistant Watergate Special Prosecutor, took the oath of office as General Counsel of the Army on March 29, 1977. Born in Chicago May 5, 1943, she received her B.S. degree (Journalism) from the University of Illinois in 1964, her J.D. degree from Columbia University Law School in 1968 and an Honorary Doctor at Laws from Hood College in 1975.

RADM Kenneth M. Carr, Military Assistant to the Deputy Secretary of Defense, has been reassigned to Commander, Submarine Force, Atlantic Fleet, and nominated for promotion to vice admiral.

Lt. Gen. Lawrence F. Snowden, has been named Chief of Staff, Headquarters, U.S. Marine Corps.

General Snowden, a native of Charlottesville, Va., moves from Deputy Chief of Staff for Plans and Policies to his new job.

Honors

Technical Sergeant Herman J. Kokojan, USAF, *Airman Magazine* photo-journalist, has been named 1976 Military Photographer of the Year by the National Press Photographers Association and the University of Missouri.

This was the second consecutive year Kokojan has won the award.

Promotions

Gen. Roberts

Lt. Gen. John W. Roberts, Commander of the Air Training Command at Randolph Air Force Base, Texas, has been nominated by President Carter for promotion to the rank of general.

The general is a native of Mankato, Minn., and entered the military as an aviation cadet in 1943.

Maj. Gen. Andrew W. O'Donnell, U.S. Marine Corps, has been approved by President Carter for promotion to the rank of lieutenant general and for assignment as Deputy Chief of Staff for Plans and Policies, Headquarters, U.S. Marine Corps.

General O'Donnell, a native of Westchester County, New York, has been serving as Director, Plans Division, Headquarters, U.S. Marine Corps.

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