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REPORT TO CONGRESS

COMBINED ANNUAL REPORT TO CONGRESS ON STANDARDIZATION OF EQUIPMENT WITH NATO MEMBERS AND COOPERATIVE RESEARCH AND DEVELOPMENT PROJECTS WITH ALLIED COUNTRIES

DEPARTMENT OF DEFENSE

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DEPARTMENT OF DEFENSE

JUNE 1990

THE SECRETARY OF DEFENSE

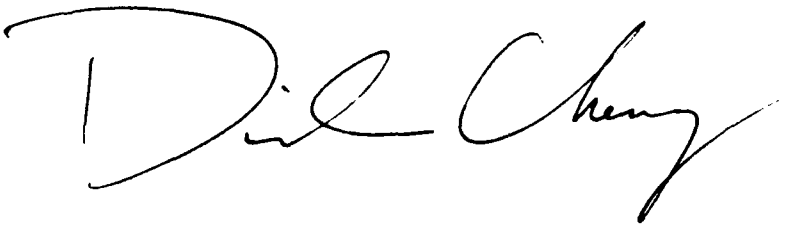
WASHINGTON, D.C. 20301

TO THE CONGRESS OF THE UNITED STATES

The Department of Defense, under the provisions of Title 10, United States Code, Section 2457, is required to report to the Congress annually on U.S. efforts to promote the standardization of equipment with North Atlantic Treaty Organization members. Increased standardization and interoperability of equipment, including weapons and communications systems, ammunition, and fuel, with our NATO allies has been a long-standing objective of U.S. policy. The enclosed report provides an assessment of our progress toward that goal. This year's report includes, for the first time, a section on cooperative research and development projects with allied countries. This requirement, established in Title 10, United States Code, Section 2350a, details the status, funding, and schedule of cooperative research programs now underway or proposed with both our NATO and major non-NATO allies.

The military advantages of standardized and interoperable equipment are universally acknowledged. Our successes in this area have underscored the validity of that policy. The benefits we derive have taken on increased importance in view of the dramatic events in Eastern Europe in recent months. As the level of our defense expenditures comes under increasing pressure in the future, we must redouble our efforts to stretch the defense dollar to the maximum extent possible. Arms cooperation clearly stands out as a way to enhance efficiency and serviceability, while conserving resources. The efforts and plans described in this report reflect the current FY 1991 budget and out-year projections.

While noteworthy progress has been achieved, we must not rest on past accomplishments. I believe we must continue to seek aggressively opportunities for cooperative ventures. I ask your support as we identify those programs with promising potential and then follow through on our commitments to bring these efforts to a successful conclusion.



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I. INTRODUCTION AND OVERVIEW

This report responds to the requirements of 10 United States Code Sections 2350a and 2457. It discusses current programs of the Department of Defense in the context of NATO equipment standardization and cooperative research and development programs. In addition, it discusses programs utilizing various methods for achieving standardization, including cooperation in defense research, development, testing, production, procurement and logistics during the acquisition life cycle. These cooperative undertakings in rationalization, standardization, and interoperability are "force multipliers" that can deliver both economic benefits--outright cost-savings and economies of scale--and military benefits of equipment commonality and interoperability. It should be noted that this report does not address standardization achievements in which the US does not participate, although there have been significant accomplishments of that nature in the Alliance.

This section discusses the political and economic factors affecting Department of Defense activities in NATO standardization and armaments cooperation.

Section II provides an assessment of DoD efforts to standardize equipment and evaluates progress and problems in several key areas.

Section III provides information on US programs that have been addressed by the Defense Acquisition Board (DAB) during 1989. The DAB reviews cooperative opportunities at every milestone, as required by DoD directives, and Section III summarizes the conclusions drawn in DAB reviews for major systems in 1989.

Section IV discusses the efforts within NATO to establish common requirements and to facilitate armaments cooperation. Section IV reports on general efforts, as well as on several specific projects, such as the NATO Conventional Armaments Planning System (CAPS), which have improved NATO's ability to establish common requirements.

Section V reports on US development programs that address NATO requirements. The Section focuses on those programs aiming to develop equipment that will meet an agreed, documented NATO requirement. Because there is a documented NATO requirement, much of the equipment being developed in these programs will probably be adopted by Allied forces.

Section VI reports on programs to introduce into US forces equipment that was originally developed in another NATO nation. Most of the items discussed are also in the inventory of one or more Allied nations and, to the extent that they are, standardization goals have been reached. Section VI also reports

on the Foreign Comparative Test Program, which has been strongly supported by Congress in the past several years.

Section VII reports on US systems that have been adopted for use in the forces of Allied nations.

Section VIII complies with 10 USC 2350a. It provides brief program descriptions, participating countries and aggregate funding for cooperative R & D programs (Nunn Amendment) with our NATO Allies which were undertaken with funds from the International Research and Development Account. In addition, it lists some of the codevelopment projects that the US is proposing to the Allies, and it reports on programs in which the US is cooperating with one or more Allied nations in producing military equipment.

THE NEED FOR COOPERATION

Stability in Europe during the 1990s will depend upon the continued vitality of the North Atlantic Treaty Organization. The NATO Alliance and each individual nation will find it necessary to continue modernization of conventional forces. Economic factors will make cooperative approaches to research, development and production of defense equipment essential--and political factors will make NATO the most appropriate forum for armaments cooperation. The economic imperative is clear and present in Europe today, where industrial cooperation is a sensible approach to acquiring increasingly expensive systems. With a declining defense budget, the US has the choice of engaging in cooperative programs with its NATO Allies or of accepting less defense.

As the 1990s unfold, we face several significant challenges to meeting those objectives. While the quantitative threat will almost certainly decrease, the qualitative threat shows every indication of increasing as new technologies are applied to weaponry. As a consequence, the qualitative factors will become even more critical as more efficient weapons will be needed to achieve smaller but higher quality forces. As a result, opportunities for cost savings from economies of scale will diminish at the same time equipment sophistication increases. Briefly, the Alliance must:

- Modernize NATO forces in a climate of increasingly constrained resources and a less immediate Soviet threat.
- Structure armaments programs in a way that demonstrates an equitable sharing of the roles, risks, and benefits.
- Develop constructive ways to coordinate

programs and structure cooperative efforts in terms of the need to strengthen the defense industrial base of the entire Alliance.

- o Consider carefully the advantages of specialization of efforts and forces within the Alliance so as to maximize the effect of national strengths and minimize the weaknesses

A strong Alliance demands that Alliance programs be well managed in the broadest economic sense. Yet, while economic factors such as shrinking defense budgets make cooperation more necessary, they are also potentially divisive and can affect adversely our ability to rationalize defense research, development and production in the Alliance. There is already a growing trend toward protectionism as limited defense budget resources are allocated in an environment that tends to encourage spending domestically on those defense budget components that contribute to improvements in a nation's technology base and to its industrial competitiveness. The same economic factors are present on both sides of the Atlantic, and they act on all members of the Alliance.

These factors make it all the more important that Alliance leaders continue to emphasize armaments cooperation. Public support for investment in defense programs, already weakened, will be further eroded if the Alliance continues wasteful duplication of effort in research, development, and production of military end items. Past uncoordinated defense equipment programs within NATO have led to the deployment of many types of main battle tanks, many types of fighter aircraft, and a plethora of anti-tank missiles and armored vehicles. Alliance officials have long agreed that elimination of this duplication of development effort, and realization of economies of scale in production, will yield increased output for our constrained defense dollars. The need to modernize conventional forces remains, and the additional defense we can obtain through improved armaments cooperation is essential to maintaining a strong deterrence.

CHANGING THREAT ENVIRONMENT: IMPLICATIONS FOR STANDARDIZATION

The de facto dissolution of the Warsaw Pact, as well as the "union" of East and Germany on the horizon, confronts NATO with a new reality. That reality includes a reduced threat, diminishing public support for defense expenditures, and a gradual shift in emphasis from a politico-military competition to an economic competition in which NATO-member countries are competing against each other for economic wealth and influence. In addition, the collapse of the communist regimes in Eastern Europe has laid bare all the latent fears, suspicions and animosities that have been

buried during the Cold War. The sudden collapse of communism in Europe will not be accompanied by a sudden disappearance of country-to-country animosities. On the contrary, this will only occur gradually. It is in this environment that the United States and NATO must approach the 1990s.

The changing threat environment and, in particular, arms reductions which may result from the Conventional Forces Europe (CFE) negotiations, hold significant potential for logistics standardization in NATO. Post-CFE redistribution of weapon systems and the destruction of older, less-capable weapon systems may result in fewer types of weapon systems in the Alliance. As a consequence, common logistics support could become more economically efficient than the unilateral support by several nations which occurs all too often today. The US and NATO have studies underway aimed at understanding and reacting effectively to the logistics implications of the CFE arms reductions.

ARMAMENTS COOPERATION IMPROVEMENT EFFORTS

Cooperation in research, development, production and procurement is becoming more institutionalized in the Department of Defense and in the Alliance as a whole as a consequence of several developments. DoD participates in activities of NATO organizations such as the Conference of National Armaments Directors (CNAD), the Senior NATO Logisticians Conference (SNLC), the NATO Standardization Group (NSG), the NATO Air Defense Committee (NADC) and the NATO Maintenance and Supply Agency (NAMSA). These activities and the other efforts discussed below have improved armaments cooperation in the Alliance.

Conventional Defense Improvement (CDI)

NATO's CDI effort encompasses a wide range of activities to correct serious deficiencies in NATO's conventional force posture. One of these activities aims to improve armaments cooperation and, in 1985, the Alliance began to implement a new armaments cooperation improvement strategy designed to make more cost-effective use of Alliance resources devoted to the development and production of defense equipment. The identification by the NATO military commanders of critical deficiencies that require special emphasis is central to this effort. The NATO commanders identified deficiencies in the following areas: air defense, ground forces, mobilization, reinforcement, sustainability, follow-on forces attack, electronic warfare, command and control, naval anti-submarine warfare, anti-air, and amphibious capabilities. Alliance Defense Ministers agreed that these critical-deficiency areas would be the focus of cooperative efforts.

Nunn Amendment

At the same time NATO began to implement the armaments

cooperation improvement strategy, the Nunn-Roth-Warner Amendment to the FY86 Defense Authorization Act provided the US military with the incentive necessary to actively seek out new cooperative programs with the Alliance members that would contribute to solving these critical deficiencies. The timing of this Amendment provided the synergism needed to initiate a substantial number of new projects. As of February 1990, a total of 34 bilateral and multilateral Memoranda of Understanding have been signed. They address a variety of projects and negotiations are underway to initiate additional projects.

The pursuit of cooperative research and development projects is an effective means of sharing the cost of modernizing our conventional defense capabilities while at the same time fielding standardized equipment that is so important to allied combat capability. It is noteworthy that, in the aggregate, the contributions of the Allies to "Nunn Amendment" projects already underway are over 70 percent of the costs, saving the United States substantial costs that would have been incurred had the United States pursued the same projects on a unilateral basis.

Science and Technology Cooperation

The technology edge that we enjoy over potential adversaries results from past investments in R&D. This investment, through the efforts of industry, universities, and in-house government laboratories, have resulted in significant advances in materials, optics, integrated circuits, software, computers, propulsion, sensors and other technologies. These efforts have come to fruition in part because of industries' independent R&D (IR&D) efforts and the Congress could further advance our successes in this area by enacting an R&D tax credit. Some examples of joint programs under DoD scientific and technology cooperation are the NATO Insensitive Munitions Information Center (NIMIC) with Canada, France, the Netherlands, Norway and the United Kingdom, the Advanced Short Take-Off/Vertical Landing (ASTOVL) Aircraft with the United Kingdom and the X-31 Enhanced Fighter Maneuverability (EFM) program with Germany.

In addition, DARPA has an International Programs Office in Europe to support cooperative R&D ventures with our NATO Allies. DARPA has an agreement with Germany for joint research in armor protection and an experimental reactive armor program with France. DARPA supported the NATO Distributed Wargaming exercise and continues to assist with new technologies applied to ACE-wide exercises. DARPA's work in distributed simulation networks is being shared with NATO countries aiming at a NATO-wide simulation backbone to offset large exercises.

SECTION I

CONVENTIONAL ARMAMENTS PLANNING SYSTEM (CAPS)

In 1987, in a further effort to improve NATO armaments cooperation, NATO Secretary General Lord Carrington proposed establishment of a NATO CAPS which would relate the armaments research, development and acquisition planning of the nations to the long term equipment- related requirements of the Major NATO Commanders (MNCs). NATO initiated a trial of CAPS in January 1988 and established the NATO Conventional Armaments Review Committee (NCARC), on which all NATO nations are represented, to conduct the trial.

The CAPS concept calls for a cyclic dialogue in which the Alliance keeps nations informed of its requirements and the nations keep the Alliance informed about how those needs will be met. CAPS has the potential to identify cooperative opportunities early enough in the process to permit harmonization of national plans, and it promises for the first time to focus armaments cooperation efforts on the agreed military priorities of the Alliance.

In 1989 the NCARC drafted the first Conventional Armaments Plan (CAP), which contains an analysis of the plans, programs, and activities of the NATO nations. The CAP includes recommendations for action.

Following completion of the two-year trial of CAPS, the North Atlantic Council (NAC), reinforced by Deputy Defense Ministers, approved full implementation of CAPS at a meeting on November 16, 1989.

The NCARC met in February 1990 to develop the procedures for conducting the 1990-1991 CAPS cycle. Agreement was reached to conduct preliminary exchange of Armaments Goals in May 1990 followed by national responses to the Armaments Planning Questionnaire (APQ) in August. CAPS is further discussed in Section IV of this report.

NATO STANDARDIZATION GROUP (NSG)

Recognition of the need to rationalize the many separate standardization activities of the Alliance also led in 1985 to the establishment of the NSG, a high level NATO committee which reports directly to the NAC. The NSG is developing a NATO Standardization Program (NSP) and, to assist in the management of that program, is developing a NATO Standardization Information Base (NSIB). The NSIB aims to integrate the NATO Registry system, all previous and future NATO documents, and information about NATO groups such as key personnel and agenda for group meetings. The NSIB will be a useful tool to determine gaps or overlaps in NATO standardization efforts and armaments development programs.

DOD GOALS

The DoD seeks to achieve improved warfighting capabilities as well as cost savings by cooperating with its Allies in the development, production and follow-on support of military equipment. DoD's objectives for such armaments cooperation activities include:

- DoD access to, use of, and protection of the best technology developed by our Allies, and comparable access to, use of, and protection of the best US technology, in order to avoid duplication of effort.

- Deployment and support of common--or at least interoperable--equipment with the Allies.

- Achievement of economies of scale by coordinated research, development, production and logistic support programs.

Notwithstanding recent setbacks, the DoD will strive toward the achievement of more effective and efficient cooperation and will undertake the following efforts to meet the challenges of the 1990's:

- Propose cooperative research and development projects to the Allies to address critical deficiencies and inviting the Allies to propose such projects to the US.

- Define and evaluate cooperative opportunities at each stage of an equipment acquisition program through the use of Cooperative Opportunities Documents.

- Acquire equipment already developed and fielded by our Allies, as an alternative to expensive US development programs, when the Allied equipment meets US requirements and a US program to meet our requirement is not already in development.

- Encourage our Allies to acquire equipment already developed and fielded by the US, as an alternative to their own expensive development programs, when the US equipment meets their requirements and they do not yet have a program already in development to meet those requirements.

SECTION I

THE EUROPEAN ARMAMENTS COMMUNITY

Recently, many Americans have become concerned about the loss of American industrial competitiveness in the world marketplace and, in the defense sector, an erosion of the defense industrial base. As a consequence, some question the premise in statute that urges a strengthened European armaments community: standardization of weapons and equipment within the Alliance, on the basis of "two-way street" cooperation in defense procurement, can only be successful if the European nations operate on a united and collective basis. Nevertheless, the Department considers the premise as still valid. However, the realization of European armaments collaboration objectives has changed the environment in which the United States must act.

Independent European Program Group (IEPG)

The Independent European Program Group (IEPG) was formed in the mid-1970s in an effort to improve armaments collaboration among the European members of the Alliance, and in 1989 it established a permanent Secretariat to help expand and intensify its activities.

The IEPG has made substantial progress in recent years, providing high-level political support and organizational structure to strengthen the contribution of the European member nations to Alliance armaments collaboration. Improved collaboration, along with substantial growth in the economic strength of the European Allies, is beginning to make the European defense industries very competent partners in cooperative programs and defense trade. The US has consistently encouraged those developments.

However, the development of stronger European defense industries must not become an obstacle to improved cooperation and should not become an excuse for the US, or any other nation, to pursue restrictive trade practices. Opportunities for industry-to-industry cooperation are increasing, and the recent trend toward more intensive collaboration between the defense industries of the North American and European Allies is in the best interest of every nation in the Alliance. That trend serves to bolster the defense industrial base of the Alliance. It also prevents waste from duplication of effort and mitigates political tensions created by narrowly focused, nationalistic competition.

The Department is closely following developments related to the European Economic Community plans to integrate its internal market. Of principal concern to the United States at this stage is a European Commission proposal to collect tariffs uniformly on defense goods imported from outside the EEC by EEC nations.

A TEAM EFFORT

All nations of the Alliance have conventional force modernization requirements. As forces are reorganized in response to arms control agreements, DoD expects to see significant issues arise concerning these modernization needs--issues involving political, economic, industrial and military factors. US leadership in the solution of these issues will be essential, and achieving our national objectives will require a farsighted, consistent, and persistent policy consensus within and among the Executive Branch, the Congress, and US industry. Such a consensus is being developed through mechanisms such as the Defense Science Board and the Defense Policy Advisory Committee on Trade. It is our hope that US leadership will lead to the initiation of programs which implement our national policy of improving NATO conventional capability while, at the same time, increasing the strength of the defense industrial base throughout the Alliance.

The basic structure for implementing our national policy of armaments cooperation and standardization within NATO is in place and working. But political will and determination to make real progress is essential in all Alliance countries if NATO is to achieve the full benefits of improved cooperation in armaments research, development, and production.

II. ASSESSMENTS AND EVALUATIONS

In accordance with 10 U.S. Code 2457(d)(1) this section provides an assessment and evaluation of the costs of failure to standardize equipment within NATO, a list of actions to be taken to standardize equipment, and a report on progress achieved.

The costs of failure to standardize, or at least make interoperable, the equipment employed by NATO nations is difficult to assess in quantitative terms, particularly when making assessments of military effectiveness. Previous studies undertaken in the area of ammunition standardization suggest that a very substantial penalty indeed is paid for not fielding interoperable ammunition. In fact, one study demonstrated that ammunition standardization made the critical difference between winning and losing in a European Central Region scenario.

Realization of the need for standardization and interoperability within NATO, furthered through many NATO military exercises, has manifested itself in standardization improvements over the years in such areas as training, doctrine, communication, fuels, refueling and rearming, and ammunition. More recently, the high cost of inefficient development and production of Alliance defense equipment, caused largely by duplication of effort, has become more detrimental as fiscal realities put increased pressure on increasingly scarce resources. As our limited resources fail to meet requirements for timely modernization of equipment, the US and NATO as a whole will have to make increasingly efficient use of available resources to maintain operational readiness and effectiveness. As a consequence, standardization is increasingly becoming a necessary step in achieving that goal.

The US approach to standardization has traditionally been to expect the other Allies to adopt our equipment and doctrine. To some extent that was an effective strategy as long as the US dominated the defense equipment market; the results are evident in the large numbers of US weapons systems being used by Allied forces (see Section VII). Unfortunately, that strategy has been failing for at least a decade, in spite of such spectacular successes as the NATO Airborne Early Warning program and the multi-national F-16 production program. The maturing of the European defense industry and the fading distinction between military and commercial technology have changed the defense marketplace, and with it the strategy that must be followed to achieve efficiency and improved military effectiveness.

In this context, there is a high premium on the success or failure of cooperation, and the US and NATO as a whole have reaped the benefits of a cooperative strategy. The following paragraphs describe the US approach in the context of the requirements of this report.

SECTION II

The overall approach to NATO conventional force improvement is now embodied in the NATO Conventional Defense Improvement (CDI) effort, first proposed to the NATO Defense Planning Committee by the Secretary of Defense as a way to assess deficiencies and address conventional force improvement needs. Improved armaments cooperation is a key element of CDI, and the US is focusing on the collective efforts of the Alliance in that area to assess equipment deficiencies and address conventional equipment needs.

The CDI effort, with its assessment of NATO's conventional posture, has yielded a set of critical deficiencies that now form the basis for evaluating our programs and setting our priorities for cooperative projects. Not all of these deficiencies are equipment-related and none can be corrected by the standardization of equipment and doctrine alone. However, where there is opportunity for cooperative action to correct a deficiency, there is also the opportunity to concurrently achieve standardization goals. As the largest member of the Alliance, the US is in a position to influence strongly both the definition of deficiencies and the proposals for corrective action. Yet, the need to achieve both economic efficiency and military effectiveness, in parallel, dictates a cooperative approach to both the identification of, and action to redress, critical deficiencies identified under the CDI effort. The projects listed in Section VIII of this report are therefore designed to address the requirements of the CDI effort.

The DoD is undertaking the following actions:

- Proposing cooperative research and development projects to the Allies to address critical deficiencies and inviting the Allies to propose such projects to the US. Since the advent of the Nunn Amendment funding of cooperative research and development projects in 1985, the number of NATO cooperative projects in which the US participates has grown dramatically. Section VIII of this Report contains details on those projects.

- Actively seeking opportunities to acquire equipment already developed and fielded by our Allies as an alternative to expensive development programs. The increased funding available for testing and evaluating foreign equipment--provided in large part through the initiative of the Nunn Amendment--has resulted in a dramatic increase in the number of foreign equipment evaluated. Early assessments of the effectiveness of this action indicate that it will result in a substantial increase in acquisition of Allied equipment, a consequent reduction in development expenditures, and further improvements in standardization and interoperability (see Section VI of this Report). To the extent that it

fosters reciprocity, the Allies will continue to acquire equipment from the US and achieve the same goals.

- Defining and evaluating cooperative opportunities at each stage of an equipment acquisition project. First required by a directive of the Secretary of Defense in 1985 and now required by law for major acquisition programs, this action has already resulted in the reorientation of several major programs. Major programs are discussed in Section III of this Report.

- Participating in efforts of the AC/315 NATO committee, the NATO Standardization Group (NSG), to develop and implement a NATO Standardization Information Base (NSIB) for the collection, correlation, and rapid retrieval of standardization actions undertaken in NATO, and to create a NATO bilingual terminology thesaurus which is essential for establishing and operating the NSIB effectively. When fully operational, the NSIB will substantially improve the capability of NATO program management groups to identify, examine, and assess the value of ongoing and planned NATO standardization efforts, as well as areas in which additional efforts should be initiated.

- Strengthening policy on the use of metric system measurement in an effort to increase compatibility with the other NATO nations. Most NATO nations use the metric system of measurement in describing defense materiel items. DoD Directive 4120.18, "DoD Metrification Program," states that new defense systems, in pre-Phase I status, shall use the metric system in all those elements which require new design, unless use of the metric system in selected projects is not in the best interests of the DoD. It also requires that, in order to improve interoperability and enhance inter-NATO support, the metric system shall be used for development of materiel for joint NATO use. Current DoD policy states that the metric system will be applied in US Army helicopters and the Strategic Defense Systems. An effort has been underway for several years to have essential metric specifications and standards available in 1990 to support these programs.

- Participating in the efforts of the joint working group from CNAD cadre groups AC/135 and AC/301 to develop common interface control standards and NATO Standard Stock Numbers for substitutable and/or interchangeable parts, assembled components, and equipment used by two or more NATO national armed forces. This effort is aimed at improving cross-forces logistic support capability.

- Participating in the AC/301 efforts to develop standardized methods and criteria for identifying and evaluating the economic benefits derived from NATO standardization projects.

MAJOR COMBAT ITEMS

For some time now, NATO member nations have, in the aggregate, provided more resources to defense than the Warsaw Pact nations. Yet, the Warsaw Pact has produced and deployed more major combat items of every type than the NATO nations. DoD, along with the Congress, has been particularly concerned over these imbalances with respect to tanks, armored personnel carriers, artillery pieces and rocket launchers, armed helicopters, and tactical combat aircraft. Both DoD and the Congress agree that a major factor in this discouraging performance by NATO is inadequate cooperation among the NATO countries in research, development, and production of military end-items of equipment and munitions.

Achieving substantial cooperation in major combat systems development is more difficult than in other areas because the stakes are inherently higher both in military and economic terms. Cooperation often entails forgoing independent national development projects in exchange for a smaller piece of a cooperative effort. Nations that can afford an independent capability to develop and produce major combat systems are not anxious to forfeit that capability through a cooperative program that encourages another nation to participate in all or part of the development. Unfortunately, if a nation chooses to develop a program independently, fewer and fewer items can be procured, as weapons systems unit costs continue to rise. Ultimately, this leads to unilateral structural disarmament. Nevertheless, there is some optimism for future cooperative efforts between the NATO member countries as defense budgets get leaner and multilateral industry consortia develop.

Cooperation in developing and producing a NATO standard main battle tank will probably not become a reality. However, there have been cooperative efforts among the NATO countries in defining requirements for the Future Main Battle Tank (FMBT) 2000. Progress has been made at the grouped subsystem and component level, including common chassis. The US, the UK, and France have signed an MOU on harmonizing requirements for Future Tank Main Armament Systems. The Federal Republic of Germany will also become a signatory upon verification of funding. Participating countries will demonstrate technologies for a cannon, an autoloader, fire control, and a family of ammunition. The US and West Germany have a cooperative program to demonstrate technology for an automated and interoperable Combat Vehicle Command and Control System. Other

efforts are focused on track interoperability and environmental systems.

There is little cooperation in developing and producing armored personnel carriers. Production runs of such vehicles, including infantry fighting vehicles, are still long enough to justify national programs, although international consolidation of programs and production would undoubtedly result in fielding of more assets in NATO for the same investment.

Artillery and rocket launcher standardization in NATO is considerably better than with most other weapons systems. A multilateral Memorandum of Understanding (MOU) on 155mm artillery has enabled the participating member countries to devote much effort to ensuring interoperability among the Allies. In addition, much work is being done in the field of 155mm ammunition standardization. The Multiple Launch Rocket System (MLRS), the new tactical field artillery system for the Army, has been adopted by many NATO Allies. MLRS launchers and rockets are now produced in Europe under a coproduction MOU with France, the United Kingdom, West Germany and Italy. A bilateral production MOU was also signed with Turkey. The Netherlands is procuring the MLRS through the Foreign Military Sales (FMS) program. A separate cooperative agreement exists for the MLRS Terminally-Guided Warhead (TGW). The TGW is a conventional, smart, anti-armor warhead carried by the MLRS rocket. TGW is a codevelopment program under an MOU with France, Germany and the UK that could prove to be an outstanding example of armaments cooperation.

Several armed helicopter development programs continue within NATO. The United States is developing the LH, France and Germany are cooperating in the development of an armed helicopter (PAH-2), and Italy, Spain, and the United Kingdom are cooperating in the LAH program. The US is in production with the AH-64, which was developed to meet requirements similar to those that underpin the European programs. There is clearly strong potential for cooperation in this field, and the US is making an effort to engage the allies in AH-64 acquisition and in LH development.

AIR DEFENSE INTEGRATION

One of NATO's most critical operational problems, now and in the foreseeable future, is the integration of NATO Air Defense Forces, both ground and air elements. NATO presently resorts to an indirect identification process that depends primarily on demanding air space control procedures. This process results in cumbersome and restrictive procedures, as well as weapon-identification zones and restrictions on beyond-visual-range (BVR) capabilities that fail to completely utilize a major potential NATO advantage over Warsaw Pact air forces. The critical link to the entire air

defense structure is the NATO Identification System (NIS) which would allow friendly aircraft greater freedom to operate over the battlefield.

Recently, the US, France, Germany and the UK achieved a major, long-sought goal in reaching agreement on a draft Standardization Agreement (STANAG) for a NIS Question and Answer Identification Friend or Foe (IFF) system that provides jam-resistant capability in a hostile environment. Nunn Amendment funding played a key role in this success by enabling the US to thoroughly evaluate designs proposed by West Germany and the United Kingdom. However, tactical command and control systems continue to suffer from an inability to network tactical systems because of separate national developments in areas such as tactical switching systems and tactical radios. This problem is critical when NATO commanders attempt to maintain combat coordination at the corps operations level involving differing nations.

The movement to achieve combat coordination at the corps operations level in NATO has taken a large step forward with the adoption by the NATO Tri-Service Group on Communications Electronic Equipment of STANAG 4175 on the Multi-functional Information Distribution System (MIDS). The STANAG is being considered for ratification by the NATO nations (the US ratified it in December 1986). This STANAG is the technical description for the MIDS Class 2 terminal being evaluated by France, Germany, Italy, Spain, and the United States for eventual production in NATO. The MOU governing the concept definition of the MIDS terminal has been signed by the five participating nations. A common data link language (LINK-16/TADIL-J), as defined by STANAG 5516, is required for US JTIDS and STANAG 4175 MIDS to be fully implemented in NATO. However, there continues to be delay in commitment to LINK-16 for use with the Joint Tactical Information Distribution System (JTIDS) on the NATO AWACS and air defense ground sites. The US JTIDS Class 2 is backward-compatible with existing NATO AWACS and air defense ground sites, but, in that mode, it is unable to take advantage of the full capabilities offered by JTIDS/TADIL-J. The US JTIDS/TADIL-J effort will provide secure digital data exchange between aircraft, ground command and control centers and ships equipped with JTIDS/MIDS LINK 16/TADIL-J capability.

In addition, NATO has previously ratified a STANAG for HAVE QUICK and a second edition covering HAVE QUICK II is currently in coordination. Many nations are already employing HAVE QUICK, and most nations will begin using HAVE QUICK II in the near future. These systems will provide an urgently needed, jam-resistant voice capability for the NATO tactical air forces.

AMMUNITION AND WEAPON SYSTEMS

NATO has made considerable progress in ammunition standardization during the past twenty years and there are several current programs contributing to further progress. However, widespread duplication of missiles and a worrisome trend toward a wider variety of weapon systems will lead to greater production, logistic support and training costs to the Alliance.

STANAG's are in place for small arms ammunition, and widespread NATO use of common weapons systems such as 155mm artillery, SIDEWINDER, SEA SPARROW, 76mm naval guns, PATRIOT and the MLRS advance standardization and interoperability. Current programs such as the four-nation program to develop TGW for MLRS will lead to further gains.

Two promising programs for ammunition standardization suffered setbacks in 1989. The US and the United Kingdom withdrew from the Modular Stand-off Weapon (MSOW) program, and it is not clear whether the remaining nations will be able to continue the program. The US is in the process of terminating its participation in the 155mm Autonomous Precision Guided Munition Project, which promises to provide the first autonomous guided projectile for the ubiquitous 155mm artillery weapon. The remaining nations have expressed their intent to continue without the US.

NAVAL SYSTEMS

Naval systems such as the 76mm Oto Melara gun, the P-3 Maritime Patrol/ASW system, the Standard Missile, and the SEASPARROW system are widely used in NATO. Nevertheless, there are probably more varieties of equipment and more potential for standardization in the naval arena than anywhere else. The US Navy has initiated a number of projects with our NATO Allies, each described elsewhere in the report, and has proposed several new development projects and equipment evaluation projects under the umbrella of the Nunn Amendment.

CHEMICAL DEFENSE EQUIPMENT

As the worldwide threat of exposure to chemical and biological (CB) warfare mounts, it is increasingly important that all US forces are properly protected on the battlefield. Ongoing research and development programs to provide improved CB defense equipment and training devices are progressing well. For example, because current chemical protective masks for aircrews are uncomfortable and restrictive, the US Air Force evaluated several masks developed by our Allies as candidates to replace the current mask. Although none was selected as a finalist, all were highly competitive in terms of capability and availability. Under the Foreign

Comparative Test Program, the US Army is evaluating mask filters obtained from several allied countries. The purpose of this program is to identify qualified foreign sources to broaden the US production base for protective mask filters and to enhance competition. This will lower the logistical burden of supplying US Army personnel with compatible gas mask canisters. In addition, the US Army has procured five German Spurpanzer FUCHS (Fox) nuclear, biological, and chemical (NBC) reconnaissance systems for evaluation. The advantages of standardizing NBC equipment include interoperability, common training, improved replacement and repair capability, and early improvement in combat effectiveness by filling a critical gap in the US defense.

FUELS

Following conversion from F-40 (JP-4) to F-34 (JP-8) as the standard aviation fuel for ground-based aircraft within NATO, efforts have been continuing towards further implementation of the "single fuel in the battlefield" through the use of F-34 for diesel-fueled ground vehicles/equipment in place of F-54 (Diesel Fuel, DF-2). NATO countries have been involved in engine testing and field trials to confirm the usability of JP-8 in all types of diesel fuel consuming materiel, with the planned conversion from F-54 to F-34 for ground materiel to occur on or about 1991-92. In this regard, the United States has been conducting a "JP-8 Demonstration Program" at Ft. Bliss, Texas, wherein all diesel-fueled vehicles and equipment have been exclusively using JP-8 since January 1989. This JP-8 demonstration is serving as a source of data for other NATO countries that are in the process of conducting smaller field trials aimed at the same objective, i.e., demonstrating full usability of JP-8 as an alternate fuel for F-54. The JP-8 Demonstration Program is also serving as a means to document the many advantages in converting to JP-8 as a combat/tactical fuel. In addition to the obvious logistical benefits, other advantages expected to accrue are improved low-temperature operability, reduced fuel-related engine/fuel system maintenance, longer engine-oil life, fewer replacements of oil filters, improved storage stability of fuel stocks, and reduced engine emissions.

III. PROCUREMENT ACTIONS FOR MAJOR WEAPONS SYSTEMS DURING 1989

In accordance with 10 U.S. Code Section 2457(d), this section reports on new major system decisions. Section 2457(d) requires that when the Secretary of Defense initiates procurement action on a new major system that is not standardized or interoperable with equipment of other members of NATO, he shall report that fact to Congress, along with a description of the system to be procured and the reasons for that choice.

The acquisition reforms undertaken by the DoD in response to recent legislation and the President's Blue Ribbon Commission on Defense Management have emphasized the need for increased cooperation with our Allies. DoD Directives on major system acquisition have been revised to redefine the early milestones (0 and I) and increase the rigor in the later milestones. In the course of regulatory streamlining, several acquisition-related regulations have been targeted for rescission. The Title 10 requirement for a Cooperative Opportunities Document for each program at every milestone has been implemented and will be the focus of increasing scrutiny.

Listed below are status reports on significant major weapon systems which were reviewed by the Defense Acquisition Board (DAB) for the 1989 period. DAB actions on these systems were undertaken as part of special program reviews, milestone I (demonstration and validation/DEMVAL phase) reviews, milestone II (full scale development/FSD) reviews, or milestone III (production/ deployment) reviews. Each of these decisions is in concert with 10 U.S. Code Section 2457. While all of the systems will not become standard within NATO and some will not be deployed in Europe, their development and subsequent deployment will be undertaken to provide the maximum standardization and interoperability within NATO. The DoD continues to seek cooperative opportunities for these programs.

MK-50 Torpedo. The MK-50 Torpedo Milestone III DAB review in March 1989 approved low-rate initial production (LRIP) with the understanding that the Navy is committed to achieving fully competitive procurement no later than FY94. The MK-50 Torpedo is intended for anti-submarine warfare (ASW), within the broad context of the sea control mission and with an eye towards defending friendly naval forces and shipping from submarine attack.

The MK-50 Torpedo is not standard within NATO, although it meets a NATO requirement for a more advanced ASW Torpedo. There are several lightweight torpedoes under development by individual members of the Alliance, including the United Kingdom's Stingray, France's Murene and Italy's A-290. Duplication of effort in meeting this requirement is an example of the difficulty the Alliance has had in cooperating on major systems.

TACIT RAINBOW. The US Air Force is developing an autonomous, loitering, lethal emitter attack weapon which is effective against threats in the 2-18 GHz range. Both air and ground launch variants of TACIT RAINBOW are being developed to meet Air Force and Army requirements.

Because of the sensitive nature of the technology embodied in TACIT RAINBOW, no attempt to collaborate with the NATO Allies was undertaken during its development. There is no equivalent development underway within NATO, although there are other efforts to develop unmanned aerial vehicles for emitter attack. In 1988 the CNAD established an ad hoc group on Unmanned Aerial Vehicles (UAVs) to further interoperability and standardization in this growing technological area.

In December 1989 the DAB directed the following actions:

Air-Launched Tacit Rainbow (ALTR) The Air Force was authorized to proceed with the ALTR second source technology transfer. Second-sourcing will be reevaluated at Milestone IIIA.

Ground-Launched Tacit Rainbow (GLTR). In 1989, the DAB held up approval of the GLTR Milestone II approval pending completion and DAB review of a revised Acquisition Strategy Report.

Advanced Anti-Tank Weapon System-Medium (AAWS-M). In 1989, the DAB approved entry into FSD. The AAWS-M is a US effort to develop an anti-tank weapon system. It has competition for NATO standardization from the Three-Government Anti-Tank Weapon System (TRIGAT), which is under development in a joint effort by France, Italy and West Germany. There is a definitive US and NATO requirement for an improved anti-tank system, and the AAWS-M will satisfy those requirements.

The AAWS-M will incorporate advanced guidance technology with an eye towards improving gunner survivability. In 1989, the AAWS-M selected fire-and-forget technology after having conducted a competition between laser-beam riding technology, fiber optic technology, and fire-and-forget focal plane array technology. The TRIGAT, on the other hand, will rely on wire guidance.

Advanced Interdiction Weapon System (AIWS). In 1989, the DAB authorized the DEM/VAL phase of the AIWS. The AIWS was originally to be replaced by the Modular Stand-off Weapons (MSOW) Program. MSOW was proposed as a NATO collaborative effort to develop a series of stand-off weapons to improve NATO's conventional warfighting capability. The seven countries originally participating in the preliminary phases of MSOW were Canada, West Germany, Italy, Spain, the U.K. the US, and France. France and Canada eventually withdrew from the program in 1988. The MSOW

program envisioned three variants, including a short range system against fixed targets, a long range system against fixed targets, and a short range system against mobile targets. The US and the UK terminated participation in the MSOW program in September 1989.

As a consequence, the AIWS will be upgraded to meet some of the MSOW requirements. The AIWS will include a flyable guide bomb tapped into the Global Positioning System (GPS) and using a submunitions dispenser. The Navy does not plan a powered system. The AIWS should be effective at 5-10 miles.

Long-Range Conventional Standoff Weapon (LRCSW). In April 1989, the Secretary of Defense signed the DAB decision memorandum which approved the concept definition phase leading to FY-91 Milestone I. LRCSW is a joint Air Force and Navy program for a long-range, precision guidance standoff weapon intended to defeat deep, high-leverage fixed targets as well as supporting Third World contingency operations. LRCSW will take advantage of emerging technologies such as advanced turbofan or propfan propulsion and near-zero CEP guidance, combined with munitions and vehicle airframe advances and provide the US with a highly survivable, standoff capability by the turn of the century. Currently, guidance and propulsion technology development are being pursued and the LRCSW concept definition work began in September 1989. Due to the complexity and sensitivity of the associated technologies, cooperative opportunities are limited for the time being.

Advanced Tactical Fighter (ATF). In 1989, the DAB approved a six-month extension in the DEM/VAL phase. The ATF is being developed by the US Air Force and Navy as the next generation air-superiority fighter. It is planned for introduction in the late-1990s to counter the emergence of large numbers of advanced Soviet and Third World fighter.

The ATF will incorporate reduced observability with respect to radio frequency, infrared and visual signatures. This capability largely negates the value of fighter fire-control radars and produces a first-look, first-shot and kill advantage over modern enemy fighters. From the outset, the program has tried to achieve a balance between affordability, performance, survivability, and reliability/maintainability.

The ATF will conform to NATO fuel, munitions and electrical interface STANAG's for aircraft cross-servicing. However, the aircraft itself will not be standardized within NATO.

M1A2 Tank. In 1989, the DAB authorized continuation of FSD of Block II modernization. However, large-scale production of the M1A2 Tank has since been cancelled, and requirements for a future main battle tank will be addressed in the Armored Systems

Modernization (ASM) program, formerly the Heavy Forces Modernization (HFM) program. In March 1990, the Army Systems Acquisition Review Council (ASARC) reviewed the ASM for presentation to the DAB. The ASM revolves around the fielding of several vehicles, with the Block 3 tank as its cornerstone, and the use of common chassis. The other vehicles are a Future Infantry Fighting Vehicle; a Combat Mobility Vehicle, similar to a military bulldozer; an Advanced Field Artillery System; an anti-armor vehicle capable of firing a kinetic energy missile; an ammunition resupply vehicle; and possibly an Armored Gun System for light forces. The chassis would be modified to accommodate the different vehicles each would support. Common components include engines, track, suspension, and electronics. Common designs will reduce program costs and risk arising from duplication. The cooperation initiatives for ASM will emphasize common chassis, components and subcomponents, rather than common systems because of the difficulty the Alliance has had in cooperating on major systems.

C-17. In 1989, the DAB approved several schedule slippages of the C-17. The C-17 is the first transport aircraft to be designed around mission requirements and inputs from the services that will use the C-17, as well as from the theater commanders. The Air Force contracted for the first two aircraft in 1988 and four additional aircraft in 1989. In total, the Active, Guard and Reserve forces plan to acquire 210 aircraft. Following a major aircraft review, the Secretary of Defense has proposed reducing the total C-17 buy to 120 aircraft.

The C-17 is not standardized within NATO because there is no NATO requirement. The U.S. needs the C-17 to provide high capacity intertheater/intratheater airlift to airfields of limited size, and to assist in attaining a 66 million ton-mile per day intertheater airlift capability which has not yet been met.

C-17 FSD (Milestone II) was approved in February 1985. Preliminary design reviews were completed in late 1985, and airframe/air vehicle critical design reviews began in 1988. The program was approved for LRIP (Milestone IIIA) in December 1988. Flight testing is scheduled to begin in June 1991. Additionally, the Secretary of the Air Force has designated the C-17 as a Defense Enterprise Program. Under this congressionally directed concept, C-17 program management is streamlined by reduction of the levels of supervision over the program director. The Air Force is planning multi-year procurement for the C-17 after the full-scale production decision (Milestone IIIB) process.

Joint Surveillance Target Attack Radar System (JSTARS). JSTARS is a joint Army/Air Force program to develop a system to detect, locate, track, and attack moving and stationary ground targets behind enemy lines. The Air Force is developing the airborne

system, a multi-mode, side-looking radar sensor on a used militarized Boeing 707 (E-8) aircraft. Grumman is the prime contractor for this portion of the program. The Army is developing the Ground Station Module (GSM), a mobile, sheltered ground data processing and display station. Motorola is the prime contractor for this portion of the program.

Following a DAB review of the Air Force portion of the program in April 1988, the following changes were approved: the planned force structure was increased from 10 to 22 aircraft; new Boeing 707 aircraft will be procured instead of used ones; a self-defense suite will be added to the program; and flight and mission simulators will be added to the program. In October 1989, the DAB approved the reversal of new to used 707s, slight cost increases, and an alignment of the IOC with the Army requirement (FY97). In December 1988, the DAB reviewed the Restructured GSM program and recommended a schedule change to align the GSM with the E-8 portion of the program; enhancements to provide the GSM nuclear, biological and chemical warfare capability; and enhancements to enable the GSM to simultaneously process data from multiple sensors.

JSTARS is a key element in the NATO Follow-on Forces Attack concept and is further discussed in Section VII of this Report. The Airborne Radar Demonstrator System (ARDS) to further JSTARS interoperability within NATO is being developed under a cooperative program discussed in Section VII of this Report. In 1988, the CNAD established an ad hoc group on Stand-Off Surveillance, Targeting and Attack Systems (SOSTAS) to further standardization and interoperability in that important mission area. Other related cooperative efforts currently underway are the Standoff Radar Program Studies (SORPROS) and Standoff Radar Interoperable Data Link (SIDL).

Advanced Medium Range Air-to-Air Missile (AMRAAM). In 1989, the DAB approved Lot 3 LRIP. AMRAAM Lot 2 full production was approved in May 1988 and acquisition of long lead items for Lot 3 was approved in September 1988. Lot 4 approval is anticipated in the Summer of 1990 (DAB Milestone IIIB). In total, the US has procured 1,480 AMRAAMs through FY89. A full-rate production decision will be made when certain criteria are met.

Under an agreement with France, West Germany, and the United Kingdom, the US undertook to develop the AMRAAM and the Europeans undertook to develop the companion Advanced Short Range Air-to-Air Missile (ASRAAM). AMRAAM is an all-weather, active-radar missile which permits multiple target attack, and launch and maneuver tactics. It is expected to be the de facto NATO standard medium range air-to-air missile since other NATO nations will employ AMRAAM, in addition to the signatories to the ASRAAM/AMRAAM agreement. West Germany is expected to acquire approximately 3,000

AMRAAM's for possible use on the European Fighter Aircraft (EFA); the United Kingdom is expected to acquire approximately 2,000 AMRAAMs for use on Sea Harrier's, Tornado's and possibly the EFA; all of the F-16 countries are expected to acquire the AMRAAM; Switzerland is expected to acquire the AMRAAM for the F-18; and Italy and Spain are probably going to acquire the AMRAAM for the EFA.

Mark XV Identification System. The Mark XV program recently and successfully completed a DoD-wide review which was initiated in January 1990 and completed in March 1990. The objective of the Mark XV program is to develop a secure, jam-resistant, NATO-interoperable aircraft identification system. The lack of such a fully implemented system creates the potential for significant fratricide amongst the air defense forces of the Alliance and, accordingly, NATO Defense Ministers designated aircraft identification in 1985 as one of ten key conventional defense deficiencies. A STANAG for the NATO Identification System (NIS) Question and Answer (IFF) subcomponent is in the ratification process. The Mark XV is designed to comply with this STANAG. An MOU was signed to coordinate development with France, the Federal Republic of Germany, Italy, and the United Kingdom, and a second MOU has been concluded with Italy which provides for industrial teaming. A Milestone II review of the program was held by the DAB in December 1988, with the resultant recommendation that the Mark XV proceed into FSD. An FSD contract for the Mark XV was awarded in February 1989.

T-45 Training System (T45TS). In December 1989, the DAB approved the Navy's re-baselined program and continued pilot rate production. This program calls for the procurement of 300 T-45A GOSHAWK training aircraft, 32 simulators, 49 computer-aided devices, and 4 training integration systems. The carrier-suitable GOSHAWK, a derivative of the HAWK trainer being produced by British Aerospace (BAe) for the Royal Air Force, will replace current US Navy intermediate and advanced jet training aircraft, which are nearing the end of their service life. McDonnell Douglas is the prime US contractor and has a workshare arrangement with BAe to produce the airframes. Other US and UK firms are involved in the manufacture of major systems. In a separate effort, conducted under the auspices of the FCT program, off-the-shelf digital cockpit display systems from three British manufacturers were evaluated for integration in the T-45A aircraft. The Smiths Industries head-up display (HUD) was judged the best and was selected as an integral part of a simulated gun system. The Smiths HUD introduces digital data into the cockpit and sets the stage for introduction of digital systems in a multifunction display in follow-on production aircraft. The Navy expects to procure 332 HUDs costing about $26M. The first 12 aircraft with associated ground equipment are scheduled to be operational by 1991.

IV. NATO EFFORTS TO ESTABLISH COMMON MILITARY REQUIREMENTS

As required in 10 U.S. Code Section 2457 (d)(5) and (6), this section describes actions taken by NATO to develop common Alliance requirements and to establish procedures and mechanisms to determine common military requirements.

ARMAMENTS PLANNING

Common requirements do not simply emerge from recognition of a common threat. NATO has struggled for many years with the question of how to harmonize technical requirements and schedules and how to overcome the industrial and political obstacles to cooperative development and production of defense equipment. As is evident from reporting in other sections of this report, significant progress is being made in this very difficult and complicated endeavor.

NATO's approach to the challenge of establishing common military requirements has heretofore entailed two efforts with limited interaction and, unfortunately, limited results. However, NATO has now successfully completed a two-year trial of a NATO CAPS to develop a better framework for harmonizing requirements and establishing cooperative projects.

Establishing Requirements. Force proposals and, in the general sense, military materiel requirements are regularly expressed by the Major NATO Commanders (MNCs). After consideration of their assigned missions and related operational concepts, the MNCs communicate materiel requirements in the form of Mission Need Documents (MNDs) to the NATO Military Committee (MC). The MC subsequently recommends to the Defense Planning Committee (DPC) and North Atlantic Council (NAC) that programs be initiated to deal with the approved MNDs. In a separate arena, under the CNAD, the MNDs are entered into the NATO Phased Armaments Programming System (PAPS) for consideration by nations for cooperative efforts.

The MC's endorsement of a MND generally means that all nations concur in the need for an answer to an agreed threat. That does not, however, establish common equipment requirements or common specifications. The entry of a MND into the PAPS helps frame the question, but does not ensure that a common solution will be pursued.

The Phased Armaments Programming System (PAPS). The creation of PAPS in 1980 established a formal mechanism to facilitate cooperation and to monitor progress in satisfying Alliance military materiel requirements. PAPS provides a regularized milestone approach to the weapons systems acquisition process, beginning with verification of requirements and feasibility phases and continuing with the full life cycle from engineering development through

equipment production to phase-out. Many of the experiences of the former US Defense Systems Acquisition Review Council (DSARC) process helped to shape the structure of the PAPS system, and in general PAPS provides a framework which readily integrates with the internal research, development and acquisition systems of each NATO member nation. Nevertheless, even though it provides a useful framework for considering projects, the PAPS has not proven to be a success in terms of actually fostering cooperative efforts.

THE CNAD AND ITS MAIN GROUPS

The CNAD is the senior NATO body charged with coordinating the Alliance's armaments activities. Under the CNAD are three Main Groups chartered to deal with land, sea, and air warfare equipment needs, as well as two Main Groups charged with addressing communications/electronic equipment and defense research matters. These groups each establish subordinate working groups and study groups to address individual matters under their cognizance. It is through such groups--and there are now over 200 such groups--that nations strive to harmonize the timeframes, technical requirements, and development programs for the economies and military benefits of standardization and interoperability.

NATO ARMY ARMAMENTS GROUP (AC/225) The NATO Army Armaments Group (NAAG) is subordinate to the CNAD from which it receives direction. The NAAG meets bi-annually and is responsible for directing the exchange of information on national land warfare equipment programs and related aspects with a view to identifying cooperative efforts, to include interoperability of components, concept and doctrine, and equipment standardization.

Significant accomplishments during 1989 include the reorganization of Panel VI (Surveillance, Target Acquisition, and Electronic Warfare), establishment of project groups for Short Range Air Defense Weapons and Target Area Meteorological Analysis, and the completion of pre-feasibility studies for a Future Main Battle Tank, Battlefield Management System, and the Lightweight Battlefield Helicopter. Considerable efforts have been expended to ensure that complete data is provided for the 1990 APQ.

NATO NAVAL ARMAMENTS GROUP (AC/141) The NATO Naval Armaments Group (NNAG) is subordinate to and a Main Group of the CNAD. NNAG is responsible for:

(1) Information exchange on national naval equipment programs.

(2) Identification of common concepts and doctrines.

(3) Promotion of equipment standardization and cooperation

in research, development and production.

1989 NNAG activity centered on Above Water Warfare (IEG/1); Undersea Warfare (IEG/2); Mines and Mine Countermeasures (IEG/3); Maritime Air (IEG/4); Tactical Control and Data Handling (IEG/5); and Ship Design (IEG/6). The NNAG also conducted work on Electronic Warfare (SWG/4); Advanced Naval Vehicles (SWG/6); and inter-ship and intra-ship Electromagnetic Interference (EMI) (SWG/10). The Group also continued efforts at collaborative development of Future Minesweeping Systems (PG/22); a Low-Cost ASW Weapon (PG/34); a Maritime UAV System for use on NATO ships (PG/35); and a Very Short Range Air Defense System (VSRAD) (PG/36). The NNAG devotes part of each meeting to a special theme topic, studying it in terms of alliance requirements, current work within NNAG subordinate groups, and appropriate national program briefs. Special theme topics for 1989 meetings were "Future Inner Layer Air Defense" and "Mine Countermeasures."

NATO AIR FORCE ARMAMENTS GROUP (AC/224) The NATO Air Force Armaments Group (NAFAG) is subordinate to and a Main Group of the CNAD. NAFAG is responsible for:

(1) Information exchange on national air force equipment programs.

(2) Identification of common concepts and doctrines.

(3) Promotion of equipment standardization and cooperation in research, development and production.

NAFAG activity in 1989 centered on aircraft/weapons interoperability (Air Group I); air weapons collaborative programs (Air Group II); participation in actual NATO electronic warfare trials (Air Group III); image recording systems interoperability in reconnaissance aircraft (Air Group IV); and analysis of the matrix on avionics mid-life updates(Air Group V). Also in 1989, the NAFAG instituted a topical meeting once a year in order to completely analyze a common NATO requirement. Last year's topic was "Effect of Opening the Night Window," and this year's topic is "Smart Aircraft-Smart Weapons." One direct result from last year's topical meeting is the NAFAG Mission Planning System Workshop.

TRI-SERVICE GROUP ON COMMUNICATIONS & ELECTRONIC EQUIPMENT (AC/302) The TSGCEE is subordinate to the CNAD. The TSGCEE meets bi-annually and is responsible for the exchange of information on national communications-electronic equipment programs with a view towards identifying cooperative development efforts, interoperability of components, concepts and doctrine, as well as standardization of equipment, interfaces and radio frequency waveforms. The main areas of TSGCEE activity are communications,

navigation, identification, data distribution, information collection and processing and geographic information. In 1989, TSGCEE activity centered on cooperative efforts in the following programs: NATO Identification System, the NAVSTAR GPS, the MIDS, the UHF Anti-Jam Voice, and the Battlefield Information, Collection and Exploitation System. Additionally, TSGCEE worked on STANAG's for secure voice and trunking and switching networks. Finally, work on ADP interfaces, digital mapping and network interoperability have resulted in good progress towards interoperability and standardization.

NATO GROUP ON ACQUISITION PRACTICES (AC/313) The NATO Group on Acquisition Practices (AC/313) is a Main Group of the CNAD. AC/313 identifies and evaluates acquisition practices that are impediments to effective armaments cooperation and develops guidance for dissemination to those who initiate or negotiate cooperative programs. In the past, AC/313 has promulgated guidance in areas such as (1) the structure and topics to be addressed in an MOU, (2) the contractual terms peculiar to various project phases, and (3) suggested management structures for government and industry program/project organizations.

NATO DEFENSE RESEARCH GROUP (DRG) The NATO DRG is a Main Group of the CNAD. Its purpose is to promote cooperative research ventures relating to emerging technologies or future technical concepts that might lead, in the long-term, to future equipment. The DRG consists of 8 technical panels with 44 associated research study groups, and 3 ad hoc groups with 4 associated research study groups. The DRG conducts various seminars, symposia, and workshops in addition to the numerous exchanges that occur during the technical meetings that generally take place biannually. Numerous professional papers and scientific and technical reports are published annually.

THE CONSOLIDATED NATIONAL DEFENSE EQUIPMENT SCHEDULE (CNDES) The NATO International Staff also publishes annually a CNDES that correlates the equipment replacement (development and procurement) plans of all NATO nations in each mission area. This document provides useful information but not the impetus for establishing cooperative projects. Moreover, the national project data in the CNDES tends to be related to programs that are already too far along in the process to be easily harmonized with another nation's project.

NATO LONG TERM PLANNING

The recognition of the need to identify common requirements earlier in the process has led to progress in several fields. The establishment of significantly longer term military requirements continues to receive attention in the NATO Long-Term Defense

Planning System. This system aims at analyses of mission areas in a timeframe beyond the current acquisition cycle. By postulating the threat environment and comparing the current capability to cope with that out-year threat, deficiencies are identified which can then be translated into requirements for conceptual and/or equipment development. As in any extended timeframe program, particularly one which seeks comprehensive solutions, progress is incremental. The Supreme Allied Commander Europe (SACEUR) has taken leadership responsibility for a major share of the initial effort and has begun a careful approach to meld future-oriented national tactical concepts with the requirements inherent in coalition warfare. Long Term Planning Guidelines for several mission areas have emerged from this effort and have been approved as the basis for structuring new armaments programs.

CONVENTIONAL DEFENSE IMPROVEMENT (CDI)

NATO developed a comprehensive framework for improvement of its conventional forces in 1985 with the CDI effort, a key element of which is improvement in armaments cooperation. As part of this effort the MNC's developed a Conceptual Military Framework (CMF) to provide a basis for long term armaments planning and to help set priorities for armaments efforts. At the same time, the CNAD developed an Armaments Cooperation Improvement Strategy--later approved by both Defense and Foreign Ministers in the DPC and the NAC--which had as its central feature a commitment to address the critical conventional deficiencies facing NATO through more efficient coordination of equipment programs.

THE OVERALL REVIEW OF CNAD ACTIVITIES AND PROJECTS (ORCAP). In 1986, in order to bring together the various elements of information that were becoming available, the CNAD approved a document titled the ORCAP. This document correlates Key Mission Components, critical deficiencies in conventional capabilities, MNC priorities, and CNAD equipment projects to provide National Armaments Directors an overview of requirements and current efforts. It also reports on the progress of cooperative activities undertaken by the nations under the auspices of the CNAD. It is a dynamic document, revised for and reviewed at each semi-annual meeting of the CNAD. The CNAD uses this document to focus attention and effort on cooperative activities that most directly contribute to the improvement of NATO's conventional forces.

The NATO CONVENTIONAL ARMAMENTS PLANNING SYSTEM (CAPS)

In 1987, NATO Secretary General Lord Carrington proposed establishment of a NATO CAPS to relate NATO force goals and long term planning guidelines to national armaments research, development and acquisition planning and to international armaments cooperation efforts. The concept calls for a continuous dialogue

in which the Alliance keeps nations informed of its requirements and the nations keep the Alliance informed about the degree to which those needs will be met. CAPS has the potential to identify cooperative opportunities early enough in the process to permit harmonization of national plans, and it promises to focus armaments cooperation efforts on the agreed priorities of the MNCs. The nations welcomed the Secretary General's initiative and initiated a trial of CAPS in 1988. The NCARC was established in 1988 to conduct the trial.

The emergence of longer term NATO requirements projections has paved the way for a much more effective and rigorous system for planning cooperative armaments programs. Progress made in Long Term Defense Planning and the advent of the CMF provide the basis for a CAPS that can tie together all of the other armaments cooperation activities of the Alliance in a commonly agreed framework for addressing the critical needs of NATO in an efficient and effective manner.

Following completion of the two-year trial of CAPS, the NAC, reinforced by Deputy Defense Ministers, approved full implementation of CAPS at a meeting in November 1989. The NCARC met in February 1990 to develop the procedures for conducting the 1990-1991 cycle. Agreement was reached to conduct preliminary exchange of Armaments Goals in May 1990 followed by national responses to the Armaments Planning Questionnaire (APQ) in August.

NATO STANDARDIZATION GROUP (AC/315)

Established in 1983 and beginning work in 1985, the NATO Standardization Group (NSG) was charged by the NAC to prepare a composite NATO Standardization Program (NSP) based upon inputs from NATO standardization tasking authorities. The NSP will be a compilation of the standardization activities of the various NATO bodies, with a view towards the elimination of gaps and overlaps in standardization activity. The NSG is working to develop a NATO Standardization Information Base (NSIB), a computer database which will integrate the NATO Registry System, all previous and future documents, and information about NATO groups, such as key personnel and agendas, and will be accessible by anyone in NATO Headquarters with a remote terminal or personal computer. While the NSG has concentrated on the development of the NSIB, it has developed a core NATO Thesaurus, which will assure the use of common terminology within the Information Base. The NSG is also conducting "manual" analyses of standardization activities in a number of topic areas, to include ammunition, wheeled vehicles, and software.

THE INFRASTRUCTURE PROGRAM

Funding to meet NATO military requirements derives from both national programs and NATO programs such as the NATO Infrastructure Program. The latter includes the categories of Airfields, Naval Bases, Petroleum, Oil and Lubricants (POL), Communications, Navigation Aids, Warning Installations, War Headquarters, Training Installations, Ammunition Storage, Forward Storage Sites, Surface-to-Air Missiles, Surface-to-Surface Missiles, and Reinforcement Support. Each year the Alliance funds, on a cost-shared basis, a large number of projects within these categories.

Through its deliberative processes and agreed criteria, the Infrastructure Program has had a very positive influence on the standardization of common-funded facilities and equipment in support of the military requirement. The program includes common user systems such as the air defense early warning and command and control network, an extensive POL pipeline and storage network, an integrated command, control, and communications network and static, alternate, and mobile war headquarters, as well as operational facilities for NATO forces. Five of six annual programs for which over $11 billion (based on current exchange rates) was committed in December of 1984 are now being implemented. Funding of $4.8B for the first two years of the next six year period (1991-1996) was agreed in December 1988. NATO will consider funding for the entire six years at the Spring 1990 meeting of Defense Ministers.

MILITARY AGENCY FOR STANDARDIZATION (MAS)

NATO standardization is the process of formulating, agreeing, implementing and updating standards for use within NATO. NATO operational standardization is one means by which Alliance nations may develop their collective capability to resist armed attack as required by Article 3 of the North Atlantic Treaty. Alliance operational standardization carries additional political value as an outward demonstration of cooperation and solidarity. The NATO operational standardization process encompasses a wide range of objectives, depending on the particular activity involved and the purpose of specific standards within that activity. Objectives for operational standards strive for the use of identical or compatible concepts, doctrines, procedures, practices or formats to enhance interoperability of Alliance forces. Normally, proposed operational standards are formulated by Service boards of experts under the authority of the NATO MAS.

The United States participates energetically in the activities of the MAS. The Army, Navy, and Air Force Boards of the MAS supervise the activities of forty-nine separate working parties. These working parties deal primarily with doctrine, tactics and

procedures. Agreed doctrine forms the basis for agreed user requirements for equipment and is, therefore, of fundamental importance to standardization of materiel. One doctrinal effort with rich potential for materiel standardization is the Army Board's initiative to develop logistics doctrine for NATO. Another US Army objective that has received sustained attention in the Army Board is an effort to evaluate procedural STANAGs by verifying their effectiveness in joint and combined exercises. The MAS working parties also seek agreement on materiel standardization. For example, the Air Board oversees the development of STANAGs that affect future aircraft design and enhance the ability of NATO nations to cross-service each other's aircraft. The validity of these agreements are checked by NATO's Aircraft Cross-Servicing Program.

ARMY The NATO MAS Army Board issued new NATO STANAG's. The US Army ratified a total of seventy STANAG's during fiscal year 1989. The majority of these actions dealt with ground equipment, though aviation and naval equipment as well as test procedures were addressed in some. Under the American-British-Canadian-Australian (ABCA) Standardization Program, of which three participants are NATO members and cross-fertilization is frequent, fifteen new Quadripartite Standardization Agreements (QSTAGs) relating to ground equipment were ratified by the US Army. Army ratification of fifteen new Air Standards under the Air Standardization Coordinating Committee, which has the same membership as ABCA, further supported international military standardization.

The more important standardization agreements ratified by the US for the MAS Army Board were:

a. STANAG 2897, which provides for standardized explosive ordnance disposal equipment requirements and equipment.

b. STANAG 2982, which provides for standardized essential field sanitary requirements.

c. STANAG 2026, which standardizes the format of the Travel Order to be used by NATO forces. The NATO Travel Order is used for both individual and collective movement.

d. STANAG 2034, which standardizes NATO land force procedures applicable to the request, issue, receipt, reimbursement, and documentation for supplies provided in international supply transactions in peace and war.

e. STANAG 2129, which standardizes the procedures to be used by NATO forces to enable allied land forces on the battlefield to identify each other as friendly.

f. STANAG 2147, which standardizes a basic system for target numbering to be used by NATO forces in fire support operations. The target numbering system is to identify, with alphanumeric characters, points or areas that are to be fired on or referenced. Such a system must uniquely identify each point or area, and must be interoperable with each nation's fire control automatic data processing equipment.

g. STANAG 2166, which standardizes the essential movement and transport documents used for the movement of materials by ship to and from NATO nations so that loading and discharge can be carried out efficiently.

h. STANAG 2754 and 2764, which designate the grades of fuel to be introduced into and delivered by the Central Europe Pipeline System (CEPS) and the North European Pipeline System (NEPS) and define the qualities of fuels entering the CEPS and at its outlets.

i. STANAG 2946, which provides standardized performance requirements and hardware interface to allow forward area refueling of member nations' rotary wing aircraft engaged in land operations.

The NATO MAS Army Board is continuing to address medical rationalization, standardization, and interoperability among the NATO countries through the efforts of the General Medical Working Party and the NBC Medical Working Party. A total of forty-seven medical STANAGs have been promulgated, forty for the General Medical Working Party and seven for the NBC Medical Working Party. The STANAGs cover issues such as vaccination of the NATO forces, chemical methods of insect and rodent control, procedures for disposition of allied patients by medical installations, emergency war surgery, minimum standards of water potability, the concept of medical support in an NBC environment, and medical effects of ionizing radiation.

The US Army is also continuing to address the entire standardization agreement process on a managerial basis, particularly with respect to the assessment of present and proposed agreements. The goal is to ensure that agreements are implementable and effective in enhancing standardization so that constrained available resources can be focused on the most potential areas. Under the program to evaluate international military STANAGs and QSTAGs, all agreements found to be of limited value or unworkable will be referred back to the appropriate international fora for revision or cancellation as appropriate. This process will be continued until all agreements have been evaluated.

The use by the Army of automation not only for data management but for coordination and communication is also receiving priority

emphasis. The Interoperability Decision Support System (IDSS) is a prototype system being developed for use by organizations involved in the interoperability and standards arena. It is presently in use in the US Army, Marine Corps, Air Force, the Joint Chiefs of Staff, and other government organizations. The user-friendly IDSS has features including a database capable of storing point-of-contact information, wiring diagrams of organizations, reports, documents, meeting calendars and agendas, glossaries, and much more. IDSS has an extensive information retrieval capability, an electronic document coordination feature, and the ability for a system administrator to control access to the net and to permit/deny input access to the data.

The American-British-Canadian-Australian (ABCA) program is adopting the IDSS software for use as their programs ADP support. The US Army has provided the Primary Standardization Office (PSO) with the necessary computer equipment to install IDSS. This will link remote locations within the ABCA arena to the PSO. The Air Standardization Coordinating Committee (ASCC) is also using the IDSS to conduct electronic business. The potential exists, therefore, to share databases and enhance programs by reducing duplication of effort.

In another area, that of International Test Operations Procedures (ITOPs), approximately 60 ITOPs have been published through working meetings with France, Germany, and the UK under a four-nation MOU on Mutual Acceptance of Test and Evaluation. The published ITOPs address automotive testing, large caliber weapons and ammunition, main battle tank fire control, radar, communications transmitters and receivers, and intrusion detection systems. New Working Groups of Experts have been established during the past few months to develop ITOPs for airdrop/air transport, missiles and rockets, live-fire testing, and nuclear protection. The Army is continuing to provide US representation through participation in international working groups and through the management and development of ITOPs and NATO STANAGs.

NAVY The NATO MAS Navy Board works to ensure maximum procedural and material standardization. Within the combined NATO naval arena, this effort has led to publication of a large number of Allied Publications (APs). The APs become a common document in all NATO navies, a standard shipboard reference refined through years of practical, at-sea, day-to-day use in NATO operations and exercises. APs range from ATP-1(C) Vol. II, the signalling book which allows navies to "talk" to each other despite the myriad of languages in NATO, to ATP-16(B), the at-sea replenishment book, to APP-2(C), the helicopter cross-deck operations book. Most naval APs are reviewed at least every two years and the US Navy has implemented over 90% of them.

The US Navy ratified a total of 24 new NATO STANAG's and amendments in 1989. The majority deal with standardization of doctrine, tactics, and procedures, although, six directly affect materiel standards. These are:

a. STANAG 1135, which standardizes the minimum requirements for naval fuels, lubricants, and associated products within NATO.

b. STANAG 1217 and 1235, which provide the requirements for day and night transfer station markers for underway refueling.

c. STANAG 1297, an agreement that provides for a NATO Common Rescue Seat for submarine escape an rescue operations.

d. STANAG 1319, provides for the minimum requirements for medical stores in submarine escape compartments.

e. STANAG 1357, standardizes the specifications for a F-44 (JP-5) House Coupling for the transfer of aviation fuel between NATO ships.

New opportunities for materiel standardization emerge from continuous at-sea interchanges. Among those opportunities now being investigated is a common coupling for the at-sea transfer of F-44 (JP-5) fuel. NATO navies are also pursuing agreements on a wide variety of procedural and equipment matters such as firefighting requirements during cross-deck helicopter operations, NATO helicopter in-flight refueling (HIFR) procedures, and identification of radiation hazard (RADHAZ)-safe helicopter-borne ordnance which can be accepted on NATO ships during an emergency.

AIR FORCE The NATO MAS Air Board issued six new STANAG's in 1989 including:

a. STANAG 3381, establishing NATO standard procedures for compensation of support in the form of supplies and services applicable to all nations when providing such support to one another, and a standard form for request, acknowledgment of receipt and return or invoice of support in the form of supplies and services applicable to all nations when providing such support of one another; and

b. STANAG 3979, established common characteristics for parachute extraction assemblies.

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The NATO MAS Air Board issued 134 revised editions or changes to existing NATO STANAG's, including the following which were ratified by the US:

a. STANAG 3499, which ensures minimum acceptable characteristics of charging connectors used in replenishment of aircraft liquid oxygen systems, thereby increasing the effectiveness of aircraft cross-servicing.

b. STANAG 3531, which standardizes the procedures to be followed when investigating and reporting military or military/civilian aircraft or missile accidents or incidents involving two or more nations. The fundamental objective of the safety investigation is the prevention of future accidents and incidents.

c. STANAG 3547, which ensures minimum acceptable characteristics for equipment employed for the cross-servicing of aircraft or air-launched missiles with liquid nitrogen.

d. STANAG 3109, which standardizes servicing markings on aircraft for cross-servicing and to give warnings, the neglect of which may cause damage to equipment or injury to personnel.

e. STANAG 3054, which defines the minimum acceptable characteristics of compressed air provided for the cross- servicing of aircraft, and specifies an agreed supply pressure and the essential characteristics of the supply hoses.

f. STANAG 3747, which provides guide specifications (Minimum Quality Standards) for aviation turbine fuels (F-34, F- 35, F-40, and F-44).

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT

The purpose of the Advisory Group for Aerospace Research and Development (AGARD) is to foster and improve the interchange of information relating to aerospace R&D among NATO countries. Nine permanent panels recommend effective ways for members to use R&D capabilities to benefit the NATO community, provide scientific and technical advice and assistance to the NATO Military Committee, and stimulate and improve defense cooperation and collaboration among members. Over 44 technical panel meetings were held in 1989. The panels organized numerous conferences, symposia, specialists' meetings, working groups, subcommittees, lecture series, and special and short courses. In 1989, 77 publications were prepared ranging from technical evaluation reports and advisory reports to graphs that pertain to a single, clearly defined subject and comprise material generally agreed to be of lasting interest.

AIR DEFENSE

In November 1980, NATO established the NATO Air Defense Committee (NADC) as its senior body on air defense matters, to harmonize military requirements of the nations and the NATO Military Authorities, and to identify the risks associate with the air defense mission. Responsible for both near-term and long-term planning, the NADC was tasked to take into consideration all pertinent political, economic, industrial, and technological factors which could impact on the development of an Alliance-wide integrated air defense network. Through three subordinate panels (Panel on Air Defense Philosophy (PADP), Panel on Air Defense Weapons (PADW), and Panel on Airspace Management and Control Systems), it has investigated numerous complex areas to include: the design of an integrated command and control system for total airspace management throughout NATO; methods of integrating both offensive and defensive counter-air operations; and design and development of the common NATO Identification System for the purpose of standardization and interoperability.

Under the direction of the NADC, a team of technical experts from NATO member countries was formed in 1982 to develop a design for a new NATO Air Command and Control System (ACCS). This effort represents a vast command and control initiative undertaken to provided a framework to integrate the many major strategic and tactical command, control, communications, and intelligence systems of the future. ACCS improvements will include infrastructure, national, and multinational funded projects in its architecture. Funds for ACCS implementation have been included in the NATO Infrastructure Budget beginning in 1992 and are expected to total approximately $26 billion during the fifteen year lifetime of the program.

As a result of US initiatives, NATO is closely examining its overall counter-air (offensive and defensive) capability through the efforts of the PADP. In addition, the PADW is working to determine the weapon systems required to counter the Warsaw Pact threat and examining how to integrate offensive counter-air considerations into NATO air defense concepts. Great challenges lie ahead in affordability, exploitable technology and cooperative development.

Recognizing the emerging threat of conventionally-armed tactical missiles (CTMs), the NADC, in 1987, created a Threat Assessment Working Group (TAWG) to develop an assessment of the threat posed by the Warsaw Pact deployment of such weapons. In 1988/89 the TAWG reviewed and revised their initial effort to include the results of the INF Treaty. Concurrently with this effort, the NADC created a Countermeasures Working Group to examine possible ways to counter the tactical missile threat being

developed. The final report of the joint effort by these two organizations was completed and forwarded to the DPC for review in late 1989.

Significant improvements have been made in NATO's air defense coverage through US bilateral initiatives to provide point air defense at several of our bases in Europe. Cooperative agreements have been signed with the United Kingdom, Turkey, The Netherlands, and Germany, and a separate agreement has been signed with Italy. The agreements with the United Kingdom and Turkey provided RAPIER air defense systems for US base defense in both countries and the agreements with The Netherlands and Germany provide PATRIOT air defense in both those nations. In addition, the agreement with Germany provides point air defense of several US main operating bases in Germany by US-procured ROLAND air defense systems which are manned, operated and maintained by German forces. These agreements have substantially improved NATO air defense effectiveness and furthered the NATO objectives of standardization and interoperability.

Several air defense modernization issues are currently before the NATO. One of these concerns a medium-range surface-to-air missile system (MSAM). The SACEUR Air Defense Ad Hoc Working Group has confirmed the need for a mix of densely packed surface-to-air missile systems. (SAMs), short range air defense systems (SHORAD), and fighters. It also has identified weaknesses in the current HAWK missile system. The PADW identified two approaches to resolve these HAWK deficiencies: upgrade and improve HAWK of develop an entirely new system. A Draft NATO Staff Target (DNST) that defines characteristics of a proposed MSAM has been developed but not yet approved, partly because the US Army is currently reassessing its own air defense requirements, while developing an Air Defense Modernization Plan, to see which option is both possible and cost-effective. During this reassessment, the Army is continuing to explore options for cooperation in the needed air defense mix both through NATO and other bilateral fora.

The exchange of data is critical to the interoperability of command and control systems. For automated data handling, the form and content of the data to be exchanged must be standardized. The development and management of the NATO STANAG's in this area are accomplished by the Allied Data Systems Interoperability Agency (ADSIA). Through this agency, the United States has introduced the tactical data link TADIL-A into NATO as LINK 11 for use by allied navies as well as the NATO Airborne Early Warning and Control System. ADSIA, with continued US participation, will ensure standardization between US TADIL-J (to be used by JTIDS) and NATO LINK 16 (to be used by MIDS employed elsewhere in NATO). The data link work program will now concentrate on the development of a message standard for the replacement of the obsolete LINK 1 (NADGE)

system in accordance with the requirements of the ACCS program. ADSIA is also responsible for the development of NATO Message Text Formats (MTF). During 1987, US MTF formatting rules and procedures were reconciled with their NATO equivalents. The US has submitted a number of its own MTF for acceptance with the NATO program and expects to expand this effort in 1990. A "Nunn Amendment" project to accelerate the production of MTF and necessary automated support products was begun by the US and three NATO nations in 1988. The US supports ADSIA with delegations, working group chairmen and significant staff.

NATO AIRBORNE EARLY WARNING (AEW) SYSTEM

Through the contributions and participation of 13 of the 16 NATO nations, the NATO Airborne Early Warning and Control (AEW&C) Force has become a reality. This multibillion dollar effort includes the joint purchase and ownership of 18 NE-3A aircraft, the upgrade of ground radar sites throughout Europe, and activation of a main Operating Base, three Forward Operating Bases (in Greece, Turkey and Italy), and a Forward Operating Location in Norway. The aircraft are being manned and supported by over 2,400 personnel from all of the participating nations. This force is being integrated into the overall NATO air defense program. This cooperative project represents the first major NATO full time operational force in the history of NATO and provides an AEW capability throughout NATO's area of interest. All E-3A's have been delivered and the NATO NE-3A component has attained Initial Operational Capability (IOC). The arrangement benefits the US in that over 60 percent of the investment is made by other participants, and this reduces the burden of US AEW requirements in Europe.

Separate programs of the United Kingdom and France promise to further contribute to NATO's overall AEW posture. The UK will acquire seven E-3D's with an option for one additional system, and France will acquire four E-3D's. Deliveries of the UK and French E-3's will be in 1991.

The opportunity also exists to establish joint US/NATO/UK/France arrangements for common modifications to E-3's in those instances where our requirements are common. In November 1986, the US and the NATO AEW&C Programme Management Organization (NAPMO) concluded an agreement for cooperative research and development of electronic support measures to both US E-3 and NATO NE-3A aircraft. Similar opportunities for joint E-3 upgrades exist between the US, the UK, and France.

SECTION IV

NATO MAINTENANCE AND SUPPLY AGENCY (NAMSA)

The NAMSA is the primary logistics support organization within NATO. NAMSA provides combined logistics support, during peacetime as well as wartime, for weapon systems and equipment held in common by NATO countries. The availability of combined logistics support encourages standardization and leads to more efficient use of Alliance resources and improved material readiness.

The rapidly evolving European environment presents NAMSA with many opportunities for expanding cooperative logistics support, leading to greater interoperability and further standardization within the NATO Alliance. The new NAMSA General Manager has indicated that he will aggressively pursue such opportunities.

Since 1985, the United States has increased emphasis on cooperative logistics support for US military forces, which resulted in our joining NAMSA-supported Weapon System Partnerships for the MLRS and the PATRIOT Missile System. Our NAMSA partners for MLRS are the France, Germany, Italy, the Netherlands and the United Kingdom; our partners for PATRIOT are the Netherlands and Germany. Provisions of the partnerships allow other NATO nations to join if they later deploy the weapon systems. In both partnerships, the United States and its European partners use NAMSA for maintenance and engineering services. The European partners also obtain extensive supply support from NAMSA for the MLRS and the PATRIOT.

ANTI-INFRARED SMOKE

A NATO Army Armaments Group (NAAG) Sub-Panel VI on anti-infrared smoke and munitions has been established to address applicable portions of a NATO Staff Target (NST) for armor protection, projectiles, mortars and large area screening. Canada, France, Germany, the Netherlands, Norway, the UK and the US are participants. The Sub-Panel is currently completing a handbook for the assessment of smokes, drafting STANAGs for the assessment of smoke, standardizing laboratory test methodology, and exploring the possibility of initiating a project to develop a multi-spectral large area smoke munition, generator, and armored fighting vehicle self-screening systems. A preliminary field test for the conduct of a smoke/obscurant countermeasures material evaluation test (SOCMET) will be conducted during the summer of 1990 in France and during the fall of 1990 in Canada. Full-scale SOCMET trials are scheduled for 1992-1993.

MULTI-SERVICE ELECTRONIC WARFARE SUPPORT GROUP (MEWSG)

NATO's Multi-Service Electronic Warfare Support Group (MEWSG) Program is a multi-phased international project modeled after the US Navy's Fleet Electronic Warfare Support Group (FEWSG) Program. It is establishing within NATO a dedicated electronic warfare (EW) organization equipped with a full range of EW assets for the training of NATO Forces. The emphasis of the MEWSG Program is now multi-service, and it aims to create a realistic hostile EW training environment for all NATO forces: maritime, air, and land. The US has been an active participant in MEWSG since 1977. The MEWSG project group also includes Belgium, Canada, Denmark, France, Germany, Italy, the Netherlands, Norway, and the United Kingdom. Significant equipment standardization exists today and is planned in the future between the two programs. The NATO MEWSG and Navy FEWSG programs are also planned to be the basis for follow-on cooperative development, test and evaluation, and coproduction efforts and for personnel and information exchange programs with NATO addressing common EW equipment, EW tactics, EW training, and EW doctrine requirements. Phase I of the MEWSG Program consisted of acquiring through NATO common infrastructure funds several shipborne van and airborne pod EW assets for electronic countermeasures (ECM) and threat simulation. Concurrently with Phase I a MEWSG operational staff has been established in the United Kingdom. Phase IIA, the procurement of three large fully-equipped EW aircraft, was authorized as a NATO infrastructure project in June 1986 with the US as the procurement agent. Planning is also underway for MEWSG Phase III, the procurement of three communications ECM vans to support land force exercises. Italy is the prospective host nation for the Phase III project.

YEAR 2000 TACTICAL ADP ARCHITECTURE

The Army is engaged in a study sponsored by SHAPE to ensure that the new tactical ADP systems to be introduced by the nations achieve a level of multinational interoperability that is militarily viable. To this end, the participating nations have developed an architectural concept that is based on the mutual adoption of common functional, i.e., international commercial (nonproprietary) standards that are supplemented, where necessary, by military enhancements or standards. The study is also addressing the possibility of codevelopment and reuse of software application programs as a way to reduce ADP system life cycle costs. A number of reports from this study effort have been approved by the national participants and submitted for acceptance by the remainder of the Alliance.

SECTION IV

STANDARD COMMUNICATION INTERFACE DEVICE

Using the NATO standard interface device based on STANAG 5040, six nations including the US have demonstrated interoperability between national common-user switching systems in tests and exercises conducted in Europe during the past three years. This success has led to commitments of national and NATO military commanders to expand the use of STANAG 5040 across the European theater. Since STANAG 5040 is one of the interoperability requirements of the Army Mobile Subscriber Equipment (MSE), Army units deploying to Europe with MSE will be able to achieve interoperability across the European battlefield. Although the implementation used in MSE is based on the existing TRI-TAC design and was successfully tested at Ft. Hood, Texas in 1988 as part of initial fielding, there are some notable differences. To ensure successful operation in Europe and to iron out any operational problems associated with interfacing MSE with the German counterpart (AUTOKO) prior to initial fielding of MSE in Europe this year, interoperability training was conducted at Grafenwoehr, Germany, from 30 January to 1 February 1990, under the direction of the U.S. Army Signal Center, as a part of REFORGER using 2d Armored Division assets.

DIGITAL NATO GATEWAY

With the transition to digital multichannel communications systems has come the need for interfaces that are more elegant and of higher capability than the STANAG 5040 approach. The implementation of a digital NATO gateway has been defined by a series of STANAGs, which have been ratified by many NATO member nations. The Army MSE at the corps and division level includes the capabilities discussed in STANAGs 4206-4212 and 4214 in addition to those in STANAG 5040. When interconnected to a NATO system of similar capabilities, user-to-user digital calls across the gateway will be possible, as will facsimile exchange between equipments built to the requirements of STANAG 5000, such as the AN/UXC-7 provided by the MSE system. In a departure from the STANAG 5040 approach, no separate device is needed. Interconnection is achieved via a direct cable between the MSE and NATO switch, in accordance with STANAG 4210, or via a "meet in the air" line of sight radio link, in accordance with STANAG 4212. The individual links are bulk encrypted. Under current plans, the implementation used for MSE will migrate to Army echelon above corps as well as Air Force TRI-TAC for fielding in the 1992 timeframe. Testing of the implementation with a similarly equipped NATO switch remains a concern due to non-availability of assets. Although both the UK and Germany intend to incorporate this gateway into their PTARMIGAN and AUTOKO systems, respectively, it will not be available until very late in the decade.

TACTICAL RADIO INTEROPERABILITY

The NATO nations have specified the requirements for electronic counter-countermeasures (ECCM) interoperability in tactical radios. The Military Operational Requirements (MORs) for High Frequency, Very High Frequency, and Ultra High Frequency ECCM interoperability were approved by the NATO Military Committee in January 1988 and forwarded to the CNAD for development of appropriate NATO STANAGs. These MORs provide the basis for future NATO STANAGs relating to ECCM combat net radio interoperability. This program demonstrates an increasing NATO commitment to base future standards on sound requirements stated by the eventual system users.

Despite the progress on this much needed initiative, the fielding of interoperable VHF ECCM radios is not foreseen in the near- or mid-term. New systems that are not interoperable are now being fielded. However, these systems are interoperable when ECCM is not used and a balanced re-transmission system permitting interoperation of selected nets is possible. When the Army fields the ECCM-capable Single Channel Ground and Airborne Radio System (SINCGARS) in the European theater in late 1991, it will not be interoperable in the ECCM mode with the German radios also being fielded. The US and German armies are now pursuing a three-phase approach aimed at achieving increasing levels of interoperability early in the next century. Similar efforts are also underway with the UK and Canada.

In the UHF ECCM band, NATO is well into fielding its Have Quick II system in aircraft and ground units. A second generation, anti-jam tactical UHF radio for NATO (SATURN) is under development and will ensure interoperable, survivable communications well into the 21st century.

BATTLEFIELD MANAGEMENT SYSTEM (BMS)

The NAAG has established a new Project Group (PG-25) to investigate an emerging concept, known as the BMS, for automating command and control at the brigade and lower echelons. The BMS is intended to provide for more efficient, survivable operations in the tactical battlefield, as well as improved interoperability among NATO forces. The first phase of work has involved vehicle electronics in tanks and other combat vehicles. PG-25 has completed and evaluated a pre-feasibility study for a systematic approach to vehicle electronics. Short-term efforts will be directed toward STANAG's and collaborative work. Future work includes studying requirements for arms elements at the brigade level and below.

SECTION IV

BATTLEFIELD DAMAGE ASSESSMENT AND REPAIR

The NATO Land Forces Battlefield Recovery and Repair Working Party (BRWP) made progress in 1989 by developing Allied Engineering Publications (AEPs) on battlefield recovery and repair. The US Army has designated the Army Materiel Systems Analysis Activity (AMSAA) as the US Representative to the NATO BRWP. AMSAA has forwarded AEP-13, the NATO Vehicle Battlefield Recovery Handbook, AEP-16, the NATO Vehicle Recovery Handbook, and AEP-17, the Battlefield Vehicle Recovery User Handbook, to the NATO allies for comment. AMSAA is continuing to participate in the BRWP to provide US Army direction and support.

JOINT AREA COMMUNICATION SYSTEM (JACS)

The NATO Military Committee approved the Mission Element Needs Statement for the JACS on 14 February 1988. The JACS is intended to provide an area, common-use communications system for NATO military commands to meet the agreed NATO doctrine stated in STANAG 5048 for Army corps. Issues relating to the user population to be served by JACS -- mobile user single channel radio access, number of nodes forming a JACS network, the COMSEC concept for JACS, and narrow band-wide band interoperability -- have been addressed in a draft concept paper. The current direction of the program will ensure continued interoperability between the JACS and the US TRI-TAC switches deployed in Europe and ensure interoperability with the Army's MSE. The concept and standards will make the Army's MSE a strong contender for use as the eventual JACS.

ALLIED AMMUNITION INTEROPERABILITY INITIATIVES

The United States participates in a NAMSA program for consolidated procurement of munitions for the NATO forces. The program takes advantage of economies of scale in munitions production as a result of combining national requirements. The US Army is the lead Service for DoD. In the NAMSA pilot program, the United States offered a portion of its M577 fuze requirement to be coupled with the buys of several other nations. A US firm won the competition and was awarded a contract on 4 August 1988 by the NAMSA. This procurement resulted in savings to the US over a US-only procurement from the same source. The program was completed with delivery of 355K fuzes in October of 1989. The US will participate in a consolidated procurement of M739A1 point detonation fuzes. The award for production of 381K will be made in May of 1990.

In addition, a US-German Ammunition Interoperability Handbook has been developed and distributed to key elements (including corps, brigades, and schools) of both armies. Similar initiatives are being pursued with other allied and friendly nations to

optimize interoperability in the critical area of ammunition. The capability of US supply systems to process German ammunition requests has been demonstrated. Revitalization of the NATO Land Forces Interchangeability Working Party and the development of a ammunition interoperability master plan are being considered.

Another important ammunition interoperability initiative with Alliance nations is the NATO Insensitive Munitions Information Center (NIMIC). Since April 1988, a Pilot NIMIC (PNIMIC) has operated at the Applied Physics Laboratory of Johns Hopkins, with the participation of Canada, France, The Netherlands, Norway, the United Kingdom, and the US acting as host nation. A PNIMIC MOU was signed by the participants and a NIMIC MOU is under negotiation between the original participants and other interested NATO nations. The participants are all members of NATO AC/310, a cadre group under the CNAD. AC/310 is chartered to address the safety and suitability for service of munitions and explosives in NATO, and it has identified a need to develop insensitive munitions. PNIMIC, and its eventual successor NIMIC provides a focal point for the exchange of national requirements and analysis of technical information to aid munition developers in developing or modifying munitions so as to reduce munitions vulnerability to unplanned stimuli in a combat environment.

COMMON USER ITEM LISTS

The Office of the Secretary of Defense has directed the US Army to establish an Allied Common User Item database with software programs to produce and maintain Common User Item Lists (CUILs) on US and Allied equipment. The interoperability database is a major goal the of NATO Group of National Directors on Codification (AC/135). The US Army has provided the NAMSA with cataloging data on the M113 and the M109A1/A2 to develop CUILs that can be utilized by the US and NATO allies.

ADP INTEROPERABILITY

The US-German ADP Logistics Systems Interoperability Sub-Working Group (SWG) is developing a systems interface between the German MKTZ system and the US Army Tactical Command and Control System (ATCCS). Germany has provided the Army with M109A1/A2 logistics data on diskettes to be configured for compatibility with US ADP systems. When completed, the final ADP product will allow US-German front line computers to provide interoperable logistics systems that will give both armies more valuable information on their weapon systems and supplies.

V. DOD RESEARCH AND DEVELOPMENT PROGRAMS SUPPORTING COMMON NATO REQUIREMENTS

In accordance with 10 U.S. Code Section 2457(d)(4), this section provides a report on the identity of each DoD research and development program that supports or conforms to NATO requirements and the common NATO requirements which these programs support or to which they conform.

This section identifies DoD research and development programs for weapon systems which respond to an Outline NATO Staff Target, a NATO Staff Target or NATO Staff Requirement.

US ARMY PROGRAMS SUPPORTING COMMON NATO REQUIREMENTS

Integrated Meteorological System (IMS). The purpose of this project is to develop a capability to obtain meteorological data and the necessary analysis model to depict weather conditions in the target/silent areas in support of all weather-sensitive military operations. The IMS covers data acquisition from denied or inaccessible areas such as over enemy-held or dominated territories and data-sparse regions. Target Area Meteorology refers to the availability of meteorological data behind enemy lines as required for deep interdiction and the combat area. In 1987 the Outline NATO Staff Target was approved and a Working Group of Experts (WGE) was formed to operate under the PAPS process.

The WGE completed its work in 1988 and recommended three potential solutions: a meteorological sensor package for RPV/UAVs, surface meteorological sensor packages, and a dropsonde for measuring meteorological data. Its recommendation that a project group be formed to determine the pre-feasibility of these recommended solutions and the development of analyses models for the target/silent area was acted upon and the group has met four times. A pre-feasibility study was initiated in January 1990 and is estimated to be completed in the summer of 1990. The US, France, the Netherlands, and the United Kingdom are full participants, while Canada and Germany are observers.

Wide Area Mine. The US Wide Area Mine (WAM) program addresses a requirement similar to the Area Defense Weapon System (ADWS) approved in an Outline NATO Staff Target (ONST) in April 1986. In October 1989, that ONST was reviewed and updated by the NATO Battlefield Engineering Panel and sent to the NAAG for establishment of a specialist team to assist in the formation of a Project Group. Initial drafts of a MOU and a work plan for ADWS are being staffed at the national levels. Germany, France, Canada, Italy, Norway, Belgium, and the United Kingdom continue to be the nations participating fully in this work. NATO countries have not accepted use of the WAM because they want a weapon with greater range. The US continues to be an observer of the work of this project group in order to obtain possible enhancements to the US

SECTION V

Army's wide area mine.

US NAVY PROGRAMS SUPPORTING COMMON NATO REQUIREMENTS

QUICKSTRIKE Mines. The US is developing the QUICKSTRIKE Mine MK 65 that has the potential for modification to permit submarine launch. As modified for submarine delivery, the MK 65 meets the US Force Goal for a NATO requirement for a NATO General Purpose Ground Mine (GPGM). The mine is capable of incorporating a programmable Target Detection Device (TDD) and will be deliverable by high-speed low-altitude aircraft. A non-programmable version of QUICKSTRIKE TDD is currently in production. The programmable version is now in full scale engineering development.

MK 60 CAPTOR Mine. CAPTOR is a moored, influence-activated anti-submarine mine that satisfies the US Force Goal for a NATO requirement for a deep water mine. Employing a modified MK 46 torpedo as the payload, the CAPTOR system is delivered by aircraft, surface ships and submarines.

Mine Detection and Classification Sonar (SQQ-32). The SQQ-32 mine detection and classification sonar will provide a significant advance in mine hunting sonar capability as compared to existing equipment used by NATO navies. As such the SQQ-32 is potentially applicable to NATO use. The SQQ-32 is in full scale engineering development. A Remote Underwater Mine Countermeasures (RUMIC) System to meet the full NATO requirement for an advanced mine countermeasures capability is in the exploratory development phase. The details of this device are being incorporated within NATO through US participation in NNAG, Project Group 26 (PG/26) on Remotely Controlled Mine Hunting System.

SH-60F. The US Navy is developing the SH-60F helicopter, a version of the SH-60 helicopter, with a dipping sonar. This helicopter meets the NATO Staff Target specifications for the NATO Frigate Helicopter (NFH). Several countries have expressed an interest in acquiring the SH-60F.

P-3 Patrol Aircraft Update IV. The Update IV program involves outfitting the P-3 Orion Maritime Patrol Aircraft with an advanced avionics suite that will address a number of NATO requirements in the areas of advanced processing capability for anti-submarine warfare, satellite data links, and airborne electronic warfare. Update IV includes addition of a distributed processor data bus architecture; reconfiguration of workstations; installation of a MIL-STD-1553 data bus; addition of electronic support measures; installation of the APS-137 radar; possible development of a new acoustic sensor; and potential for satellite communications capability, fiber optic data links, VHSIC, and artificial intelligence.

V-22 Osprey Advanced Vertical Lift Aircraft. The Department of the Navy is completing development of the V-22 Osprey, which meets NATO requirements for a shipboard maritime Vertical/Short Take-Off and Landing (VSTOL) aircraft capability. The Osprey is compatible with all US aviation capable ships employing medium lift helicopters. It incorporates several subsystems and components manufactured by our NATO Allies.

US AIR FORCE PROGRAMS SUPPORTING COMMON NATO REQUIREMENTS

Advanced Medium-Range Air-to-Air Missile (AMRAAM) and Advanced Short-Range Air-to-Air Missile (AMRAAM/ASRAAM). The AMRAAM is an all-weather, all-aspect missile with an active radar seeker that is designed to meet a NATO operational objective for air-to-air missiles for the 1990s and beyond (the NATO operational staff target was never formalized because the Family of Weapons agreement was signed by the US, France, Germany and the UK). AMRAAM will be compatible with the F-14, F-15, F-16 and F/A-18 aircraft, as well as the German F-4F and the UK's SEA HARRIER and TORNADO aircraft. Full scale development began in FY81, and the first production delivery to the US Air Force was made in September 1988. US Navy deliveries are scheduled for FY91. In conjunction with US AMRAAM development, the UK and Norway are developing the ASRAAM, a possible follow-on to our AIM-9. Part of the Family of Weapons MOU, the ASRAAM portion faces a serious milestone decision on whether to proceed, due to schedule delays, cost overruns and, most recently, German withdrawal from the program.

Joint Tactical Information Distribution System (JTIDS). JTIDS is an Air Force-led joint/NATO program to acquire a high capacity, secure, jam-resistant integrated communications, navigation and identification system which will provide voice and data for the exchange of air surveillance/control information among tactical command and control platforms and selected air defense fighters. The NATO E-3's and ground environment are currently equipped with Class 1 terminals using the Interim JTIDS Message Specification (IJMS). Class 1's are installed in US E-3's, in the TACS, and in a limited number of Army air defense artillery units. The Navy will start fielding the smaller, more capable, Class 2 terminals using the joint/NATO standard TADIL J/LINK 16 in the early 1990s. The Air Force and Army will begin to replace their Class 1 terminals with Class 2's during this timeframe. The United Kingdom will start fielding Class 2's in its air defense Tornados in 1990/91. NATO's JTIDS program, the MIDS, conforms to STANAGs 4175 and 5516. The United Kingdom and French E-3's will have the US Air Force E-3 Class 2 JTIDS baseline. The US leads a NATO cooperative effort to codevelop a low-volume MIDS terminal for space-constrained fighters and selected C2 platforms for the mid 1990s. The other participants are France, Germany, Italy, and Spain. This

program will be designated MIDS-LV. The US Navy has assumed lead service responsibilities.

Joint Tactical Fusion Program (JTFP). The JTFP addresses the NATO requirement for battlefield management which is contained in Outline NATO Staff Target AC/302(PG/7)D/6 of 1 September 1986 and Mission Need Document AC/302(PG/7)D/9 of 26 September 1986. The program is developing an automated system that will rapidly receive, correlate, store and disseminate enemy target data from a large number of sensors in near-real-time. The Army uses the All Source Analysis System (ASAS), and the Air Force system is the Enemy Situation Correlation Element (ENSCE); both systems are being developed using lessons learned in the development of the Limited Operational Capability Europe (LOCE) and the Limited Enemy Situation Correlation Element (LENSCE). The JTFP is employing both evolutionary concepts and pre-planned product improvement techniques in the development of the ASAS/ENSCE.

HAVE QUICK/HAVE QUICK II. The US-developed HAVE QUICK jam-resistant voice communication system provides a jam-resistance capability for tactical voice communications. This capability has been adopted in NATO through ratification of STANAG 4246 (edition 1). Under the HAVE QUICK II program, improvements to the HAVE QUICK system are being fielded to enhance its jam resistance and ease its operational usage. HAVE QUICK II is the first US ECM-resistant communication system to obtain NATO frequency support. STANAG 4246 (edition 2) has been ratified for HAVE QUICK II. The HAVE QUICK II system will provide a significant tactical jam-resistant voice capability well into the 1990s and fulfills the NATO Staff Requirement for ECM-Resistant and Secure Communications (MC 284, 30 August 1983).

NAVSTAR Global Positioning System (GPS). The NAVSTAR GPS is a space-based radio navigation system which will provide significant improvement over current radio navigation systems in coverage, accuracy, survivability and availability. GPS will also provide a common positioning grid for air, land and sea forces, including reconnaissance elements.

The NATO GPS Project, a cooperative venture among the US and nine other NATO nations, was established in April 1978. NATO GPS Project activities have included flight tests on aircraft of NATO allies, an ECM Vulnerability Study, ship and submarine trials and development and approval of a NATO standard interface control document. In 1983 a revised MOU was negotiated for continuing the cooperative development effort. In 1987, an addendum was signed, extending the MOU into the production phase and adding Spain as a tenth NATO participant. Engineers from the participating NATO nations are assigned to the GPS Program Office where they are supporting the development program. The firm, fixed-price, multi-

year contract for 28 GPS satellites, including R & D satellites, is on schedule. Launches began in 1989, and will lead to a planned 24-hour-per-day worldwide GPS capability in 1993.

Aircraft Flight Control Concepts. An MOU for research into advanced flight control systems was entered into between the US Air Force and the German government in 1979. Germany is investigating task-oriented handling quantities of various direct-force control modes in order to develop a technology database from which handling-qualities criteria can be defined for new control concepts. The US is conducting theoretical and experimental studies to support a continuous effort to revise and update the Military Flying Qualities Specification. Preliminary results, information on analytical tools developed during the program, and final results will be exchanged as part of the program.

VI. DoD PROGRAMS USING SYSTEMS OF ALLIES

Title 10, United States Code, Section 2457(d)(7) requires a description of each DoD program that supports the development or procurement of weapon systems or military equipment originally developed or procured by our NATO allies.

This section discusses Allied systems in use by the US Army, Navy and Air Force, as well as Allied systems being tested to determine whether they meet US requirements. This section also fulfills reporting requirements of the FY 1990 Defense Authorization Act (P.L. 101-189) concerning the Foreign Comparative Testing (FCT) Program.

ALLIED SYSTEMS IN USE BY THE US ARMY

Squad Automatic Weapon (SAW) The SAW is a light-weight (approximately 16 lbs.) one-man portable machine gun capable of delivering a large volume of effective fire. It provides increased range and volume of fire and better penetration than the M16A1 rifle. It fires an improved 5.56mm round which will satisfy a NATO STANAG prepared from the results of the NATO Small Arms Test. The SAW will replace the M16 rifles designated to be employed in the automatic mode in the rifle squad in all US Army infantry/US Marine Corps units, providing a significant increase in the squad's automatic fire capability. Following a competitive evaluation of four candidate weapons, the Belgian Fabrique Nationale (FN) MINIMI was chosen for a 12-15 month maturity phase leading to a type classification and procurement decision. Fielding in US units began in April 1984.

In 1985, the SAW program was interrupted to incorporate needed modifications into the weapon system. In September 1988, a five-year contract was awarded to FN Manufacturing Incorporated, Columbia, South Carolina, a US subsidiary of Fabrique Nationale, Herstal, Belgium for 30,106 weapons. Procurement: FY90, $11.6M; FY91, $12.5M.

M119, 105mm Howitzer The M119 is a non-developmental item (NDI) initially purchased from the United Kingdom (Royal Ordnance) with follow-on production at Rock Island and Watervliet Arsenals. The howitzer will replace the M101A1 and M102 howitzers in Light Infantry Divisions and Separate Brigades, and will be fielded to National Guard and Army Reserve units. Total production is 548 M119s, with 149 being purchased from Royal Ordnance and the remainder manufactured by the US arsenal system. The first year of procurement was FY87. Late initial deliveries by the UK contractor triggered a reduction in the FY90 funding from $24.6M to $4.0M. The contractor is now on schedule, with completion of initial fielding to the 7th Infantry in December 1989. Procurement resources currently budgeted are: FY90, $4.0M; FY91, $26.2M.

Bridge Erection Boat (BEB) The US Army has evaluated and adopted the UK Army Combat Support Boat to satisfy its requirement for a new bridge erection boat. The boat will also be used for river reconnaissance, ferrying, mining shorelines, moving supplies and supporting diving operations. The BEB, which is water-jet-powered and has a shallow draft, has been type classified. A September 1980 contract awarded to Fairey-Allday Marine Ltd. resulted in the procurement of 250 boats and associated support items for $39.4 million. A new four-year competitive procurement was awarded in September 1984 to American Development Corporation, North Charleston, South Carolina, for 440 boats and associated support items for $65.9 million. Current procurement projections have been substantially lowered due to reduced requirements.

120mm Mortar In March 1988, the US Army selected a type-Tampella 120mm mortar, currently produced by Soltam of Israel, to replace the 4.2-inch heavy mortar. Six NATO nations currently use 120mm mortars, with four NATO nations having the type-Tampella. The US 120mm is expected to have ammunition interoperability with five other NATO nations. Procurement: FY90, $10.9M; FY91, $12.3M.

European Telephone System (ETS) The ETS program replaces antiquated analog telephore switches with digital switches throughout Europe. The program has two phases. In Phase I, the US Army is the lead military department responsible for replacement, acquisition, installation, test and cutover of digital switches and network management for the Army, Navy, and Air Force. The switching systems are being installed at approximately 150 locations throughout Germany, Belgium, The Netherlands, and Italy. ETS Phase I is a bilateral agreement between the US and Germany and uses a German-manufactured Siemens KNS-4100 switch, except in Italy where an ITALTEL Office 5000 switch will be used. The Army is responsible for overseeing and monitoring acquisition and installation of Army switches in these countries and for modifying Phase I switches to provide command and control functions. In Phase II, the US Air Force has the lead for installation of digital switches in the United Kingdom, Spain, Greece and Turkey. Procurement: FY90, $8.9M; FY91, $2.4M.

Practice Ammunition A number of training rounds made by Allied suppliers has been type classified for competitive procurement. Procurement to date and planned is:

UK	.22 caliber tank training ammunition	330K	rounds	$ 0.1M
Germany	105mm tank training ammunition	36,000	rounds	$24.4M

Germany	5.56mm plastic training ammunition	3.96M	rounds	$ 1.383M
Germany	.50 cal plastic training ammunition	10.515M	rounds	$10.07M
Germany	4.2" mortar training round	168K	rounds	$ 2.0M
Norway	M72A3 Light Anti-tank Weapon	200,000	rockets	$35.7M

Chemical Agent Monitor (CAM) The US Army has evaluated the CAM, which was jointly developed by the United Kingdom and the United States. The CAM was type classified for the Army in December 1987. The US Government has a license agreement with the British manufacturer, Graseby Dynamics, Ltd., and their US licensee, Environmental Technology Group, Inc. (ETGI), which requires sole source procurement of CAM from Graseby and ETGI until 11,400 units have been purchased. CAM units are currently being fielded to US Army elements. Completion of the quantity requirement and full and open procurement is anticipated by FY92. CAM is being purchased by all US Services. An international evaluation program is underway with the UK to upgrade the CAM and simplify maintenance procedures. Program funding is: FY90, $12M; FY91, $20.2M.

9mm Pistol A multi-year firm fixed price contract was awarded to Beretta USA in April 1985 for 315,930 Italian-developed 9mm pistols designated as the M9. Under contract options, an additional 377,965 M9's are being acquired. Adoption of the M9 as a replacement for the caliber .45 pistol and several models of the caliber .38 pistol will provide for standardization of 9mm ammunition with our NATO allies. Procurement: FY90, none; FY91, $8.0M.

Mobile Subscriber Equipment (MSE) The MSE communication equipment being acquired by the US Army is based on a French design. Urgently needed to raise combat readiness, MSE is being fielded in Corps sets to both active and reserve component units to provide automatic, secure mobile radio telephone and data service for command and control in corps and divisions. Systems will be fielded to III Corps in FY89/90; US Army Europe in FY90/91; 18th Airborne Corps in FY92; and I Corps in FY93. MSE will be interoperable with communications equipment of our NATO Allies. The program funding is: FY90, $934M; FY91, $29M.

German NBC Contamination Marking Set This set is designed for marking areas contaminated with nuclear, biological and chemical (NBC) agents. It consists of a metal portable carrier containing NBC marking flags, writing implements, nylon ribbon and metal supporting stakes. The set has been adopted as an expendable stock fund item and procurement is continuing. A total buy of over

64,000 sets costing about $6.6M has been made. Currently, 7,000 sets costing $0.95M are on contract.

Potable Water Tank A lightweight British collapsible water tank was type classified to provide self-support capability in field operations. 5435 units were procured for $8.8M.

Kinetic Energy Recovery Rope (KERR) The KERR is a 64mm vehicle-mounted recovery rope designed and developed by Marlow Ropes Limited of the UK. The recovery rope began as an international cooperative program in 1979 and is now being used by US Army troops in the field. It is a special weave nylon rope designed to stretch and provide enough impulse to recover bogged down vehicles and tanks. FM 20-22 lists the recovery rope as an acceptable alternative vehicle recovery method. A total of 8,920 ropes were purchased for $9.8M.

120mm Tank Gun In January 1978 the US Army selected the German 120mm smooth-bore tank gun system for incorporation into the US M1 main battle tank. In February 1979 a license agreement with the German developer and Addendum 2 to the 1974 US/German MOU on tank harmonization were signed. The US 120mm Tank Gun Cooperative Development Program began in March 1979, involving technology transfer, fabrication and test of the cannon (tube and breech), the kinetic and chemical energy service rounds, two companion training rounds and the integration of the 120mm tank gun system into the M1A1 tank. During 1980, technology transfer continued and initial hardware was fabricated for converting two M1 tanks to M1A1 tanks. The first US-produced 120mm gun (tube and breech) was delivered from Watervliet Arsenal on schedule. The interface control dimensions for the 120mm systems have been agreed to in accordance with the International Configuration Management Agreement between the US and Germany, and a framework has been established for gun and ammunition interoperability tests. A Defense System Acquisition Review Council (DSARC) full scale production decision was made in December 1984. The first production delivery of the M1A1 tank with the German 120mm gun took place in late 1985 and delivery of the M1A1 to Europe began in 1986. Production of the 120mm tank gun and 120mm ammunition to support fielding of the M1A1 tank is continuing on schedule.

Armor Machine Gun The US Army has adopted the Belgian MAG-58 produced by Fabrique Nationale of Belgium. This armor machine gun, designated the M240, is a 7.62mm air-cooled, link belt-fed, light-weight, fully automatic general purpose machine gun that is electrically operated. It is replacing the current M219 machine gun on the M48 and M60 series tanks and is being incorporated into the M1 tank and the Bradley Fighting Vehicle. Various versions of the MAG-58 are already in the inventories of six other NATO countries: the UK, Belgium, The Netherlands, Greece, Luxembourg

and Portugal. The US procured 10,000 weapons from Fabrique Nationale in 1977-78 to retrofit existing vehicles and provide weapons for new production vehicles. The first weapons were deployed to Europe in May 1979. In September 1979, a five-year contract was awarded to Fabrique Nationale Manufacturing Incorporated, Columbia, South Carolina, a US subsidiary of the Belgian-based firm, for 16,417 weapons . This provided a domestic production base which is capable of producing 830 weapons per month. The M240 Armor Machine Gun was funded at $20.0 million in FY83, $11.5 million in FY84, $22.1 million in FY85, and $16 million in FY86. Total procurement: approximately 35,000 machine guns.

C2 NBC Protective Mask Canister The C2 NBC Protective Mask Canister is currently used in the US M40 Protective Mask as well as the mask issued to Canadian forces. Although originally developed by Canada, both US and Canadian companies are now under contract. Currently, there are 2.47 million canisters on contract at a cost of $19M.

ALLIED SYSTEMS IN USE BY THE US NAVY

T-45 Training System (T45TS, formerly VTXTS) This program calls for the procurement of 300 T-45A GOSHAWK training aircraft, 32 simulators, 49 computer-aided devices, and a training integration system. The carrier-suitable GOSHAWK, a derivative of the HAWK trainer being produced by British Aerospace (BAe) for the Royal Air Force, will replace current US Navy intermediate and advanced jet training aircraft, which are nearing the end of their service life. McDonnell Douglas is the prime US contractor and has a workshare arrangement with BAe to produce the airframes. Other US and UK firms are involved in the manufacture of major systems. In a separate effort, conducted under the auspices of the FCT program, off-the-shelf digital cockpit display systems from three British manufacturers were evaluated for integration in the T-45A aircraft. The Smiths Industries head-up display (HUD) was judged the best and was selected as an integral part of a simulated gun system. The Smiths HUD introduces digital data into the cockpit and sets the stage for introduction of digital systems in a multifunction display in follow-on production aircraft. The Navy expects to procure 332 HUD's costing about $26M. The first 12 aircraft with associated ground equipment are scheduled to be operational by 1991. RDT&E: FY88, $94.6M; FY89, $91.2M; FY90, $22.4M; FY91, $14.9M. Procurement: FY88, $368.1M; FY89, $414.0M; FY90, $96.3M.

PENGUIN Anti-Ship Missile The Norwegian-developed PENGUIN anti-ship missile is being adapted for employment with the Light Airborne Multi-Purpose System MK III (LAMPS III helicopter). Navy SH-60B helicopters will be capable of delivering the PENGUIN, which is a passive homing missile featuring inertial mid-course guidance

and infrared target detection and homing guidance. The PENGUIN, which in various models is employed by the Norwegian Navy and Air Force as well as by other NATO forces, will provide a new countermeasures resistant, helicopter launched, offensive anti-ship weapon capability for US Navy surface forces that complements the capability already attained with HARPOON. The PENGUIN Mk 2 Mod 7 program entered full scale engineering development in January 1986 as a result of a contract signed between the Royal Norwegian Navy and the United States Navy. A separate FWE project evaluated the PENGUIN Mk 2 Mod 5 seeker which will be installed in missiles procured by the Navy. Present plans call for Navy procurement of 193 PENGUIN missiles costing approximately $155M, commencing in 1990 if the RDT&E program is successfully completed. RDT&E: FY88, $16.5M; FY89, $8M; FY90, $5.8M.

Real Nite (Night Attack FLIR) Real Nite is a follow-on development test program involving a wide-field-of-view navigation forward-looking infrared (FLIR) sight and various other components developed by the UK manufacturer GEC Avionics. Real Nite significantly enhances the low-level night attack capability of tactical aircraft. Systems selected for procurement to date include CATS EYE Night Vision Goggles (366 sets, $21.7M), Common Module FLIR (263 units, $96M), Thermal Cuing Units (150 units, $6.8M) and Head Up Display (HUD) (113 units, $22.7M). Procurement of other equipment is probable.

Navy Aircrew Common Ejection Seat (NACES) The NACES program provides for testing and producing a single ejection seat for different types of Navy fighter and trainer aircraft. With selection criteria structured to encourage NATO industrial collaboration, one UK and two US companies responded to the initial (April 1984) Request for Quotations (RFQ). The UK firm, Martin Baker, was awarded the contract for development in FY85. The seat is in the final stages of development and will be employed in the T-45, F-14D, and F-18C/D. The first delivery is scheduled for July 1989. RDT&E: FY88, $13.6; FY89, $9.9M; FY90, $9.1M; FY91, $2.9M.

AN/SLQ-49 Inflatable Decoy The AN/SLQ-49 is a generic class of expendable decoys developed in the UK for surface ship protection against anti-ship missiles. The Navy used FCT funds to obtain test units for fleet evaluation and technology transfer to establish a manufacturing source within the US. The US Navy is expanding the current AN/SLQ-49 technology for an air-dropped variant. The US Navy AN/SLQ-49 program has been discussed in the NATO Electronic Warfare working group. AN/SLQ-49 testing, as a part of a NATO Standing Naval Force Atlantic (STANAVFORLANT) naval exercise, was completed in the spring of 1987 and US Navy Operational Evaluation was completed in June 1987. Contingency assets have been provided to deployed forces and there are plans to expend $1.5M annually for procurement of AN/SLQ-49S for various types of naval ships.

Versatile Exercise Mine Systems (VEMS) Designed and developed for the Royal Navy by British Aerospace, VEMS simulates the physical characteristics and actuation systems of all types of bottom mines. Its primary use is to assess the effectiveness of minesweeping and minehunting systems and the tactics employed. Evaluation of VEMS was conducted as an FCT project. Twenty five VEMS costing $5.2M were ordered, with the first production units delivered in May 1988.

LERICI Class Minehunters In November 1986, Intermarine S.P.A. of Sarzana, Italy, was awarded a Navy contract to design and oversee construction of an enlarged version of the Italian LERICI class minehunter. As designed for the US Navy, LERICI class ships will displace 823 tons. Hulls will be constructed entirely of fiberglass, engines will be built of non-magnetic materials, and machinery will be mounted on vibration dampers. The first US LERICI class ship will be built in a US shipyard by Intermarine-USA, a subsidiary of the Italian firm. Subsequent construction awards will be determined through competitive procurement, with a total of 17 units projected. FY89 procurement funding was $197.2M.

ICS-III Integrated Communication System ICS-III is a completely integrated system capable of transmitting and receiving large volumes of data, voice and message traffic in the HF, UHF and VHF bands. Designated AN/URC-109 by the US Navy, five systems costing $32M have been purchased for installation in Wasp (LHD-1) class ships. Using modular interfaces with multi-path connecting and computer assistance, ICS-III permits flexible control of shipboard communications and allows for reduced use of personnel and equipment through system wide sharing of assets. ICS-III is operational in the Royal and Dutch navies and a modified system was recently purchased by the French Navy.

ALLIED SYSTEMS IN USE BY THE US MARINE CORPS

AV-8B HARRIER The AV-8B is the replacement aircraft for the aging Marine Corps AV-8A/A-4M light attack force aircraft. This new V/STOL (Vertical/Short Takeoff and Landing) has better reliability/maintainability than the AV-8A, greater range/payload performance characteristics, and can operate without need for runways or extensive ground support equipment. The AV-8B was jointly developed by the US and the UK under a 1981 MOU for the development, production and support of the AV-8B and its UK counterpart, the GR MK5. Operational since 1985, the AV-8B is currently in joint production by British Aerospace, McDonnell Douglas, and Rolls Royce (Pegasus II engines). McDonnell Douglas is supplying 276 AV-8Bs for the Marine Corps and British Aerospace

is supplying 92 GR MK5s for the Royal Air Force. Spain has taken delivery of 12 AV-8Bs. Procurement: FY90, $557.8M; FY91, $534.8M).

ALLIED SYSTEMS IN USE BY THE US AIR FORCE (USAF)

EIFEL Program EIFEL is a German-developed data management and command and control system which automates selected tactical offensive air command and control functions. The present version, EIFEL I, is being operated at over 20 locations in the UK and central Europe, including four NATO Central Region Allied Tactical Operations Centers (ATOCs), among which is the US-operated ATOC at Sembach, Germany.

A joint US/German study, completed in 1982, resulted in a program plan for the joint development of the EIFEL Follow-On (EFO) program. The EFO program will host EIFEL I on new hardware (the current system will not be supported by its manufacturer after 1989) with new software. EFO will standardize EIFEL software, expand the capabilities of the system, and make software maintenance much easier. An MOU was signed in June 1986 by the DoD and German Ministry of Defense representatives to participate in the cooperative development of EFO, and a joint Program Office has been established. A cost-sharing MOU has been negotiated with the nations that operate the ATOC at Maastricht (Belgium, the Netherlands, and the UK) so that they will share the development expenses.

Wide-angle Head-Up Display (HUD) Unit for the F-16 The USAF is installing Marconi-built (UK) wide-angle conventional head-up display units in its F-16 C/D aircraft. Deliveries began in 1984. Total quantities to be purchased will be approximately 1,200, with deliveries running through 1995. The Turkish Air Force will also use the wide-angle conventional head-up display units in its program to acquire 160 F-16C's. In addition, the USAF will install Marconi wide-angle raster HUD's in its 450 LANTIRN-equipped F-16s. The total cost for these raster HUD's will be approximately $98 million.

HB-876 Aerial Mine The USAF intends to procure approximately 67,500 units of this British-made mine at a cost of $6.8M. Deliveries of an additional 1680 inert units are expected during FY90-92 for full scale development. All FSD units were funded in FY89 at a cost of approximately $3.0M.

Lightweight Decontamination System (LDS) The US Army, the USAF, and the US Marine Corps are procuring the Sanator LDS, a Norwegian decontamination system which produces hot water or steam to remove chemical agents from equipment, vehicles and aircraft. It also has a shower capability and the entire system is man-portable. In

FY82-FY88 the Air Force procured 1800 units, the US Army procured 1400 units, and the Marine Corps procured 350 units through a licensed US firm. The Air Force is planning to spend $9.0M in FY89-FY91 to upgrade its units with improved controls for better fuel/water economy and safer operation. The Army and Marine Corps plan competitive procurement of the improved model in FY89-FY94.

Rapid Runway Repair System During 1984-1986 the USAF Engineering Center, Tyndall AFB, FL, Eglin AFB, FL and engineers in an exercise situation in Germany, evaluated a rapid runway repair system comprised of items from two German and one Dutch firm. This system, consisting of a concrete cutting saw, a leveling beam, and pre-cast reinforced concrete slabs, was successfully evaluated. 55 sets costing $6.5M were bought.

Munitions Ejection Release Unit The units used on the German TORNADO aircraft were test flown on USAF F-4s. Ejection characteristics were evaluated, vibration measured, and ease of maintenance and handling was assessed. As a result of the successful test program, 4170 units for the F-15 C, D and E will be procured during FYs 85-94 at a cost of $59.0M.

FOREIGN COMPARATIVE TESTING (FCT) PROGRAM

The FCT program, formerly the Foreign Weapons Evaluation (FWE) and NATO Comparative Test (NCT) Programs, supports US national policy of encouraging international armaments cooperation and the procurement of non-developmental items (NDI) to help reduce costs under Title 10 U.S. Code, Section 2325, DFAR Supplement Part 10, and DoD Directive 5000.37.

Previously, only NATO Comparative Test (NCT) Program projects were required to be reported to Congress. The 1990 Defense Authorization Act (P.L. 101-189), which combined the NCT and FWE Programs, requires the inclusion of all FCT projects in the DoD Annual Report required by section 2457(d) of Title 10, United States Code.

The FCT program involves the test and evaluation of NATO and non-NATO Allies' weapon systems and equipment with a view toward meeting valid existing US DoD Component requirements or mission area shortcomings, while reducing duplication in research and development, enhancing standardization and interoperability, improving cooperative support, and promoting competition and international technology exchange. The program is administered by the Deputy Director, Defense Research and Engineering (Test and Evaluation), DDDR&E(T&E).

SECTION VI

In excess of 200 test and evaluation projects have been conducted since 1980 with thirty-three resulting in US procurement actions. During FY89, forty-five FCT projects were in the process of evaluation and thirty-one projects had completed evaluation. Approximately fifteen new FCT projects will be selected to begin evaluation in FY90.

ALLIED EQUIPMENT UNDER FCT EVALUATION BY THE US ARMY

The following Allied systems and equipment were under evaluation by the US Army during FY89. FY89 project funding is indicated in parentheses.

JAPANESE ARMOR AUXILIARY POWER UNIT (APU) ENGINES

Two M1 Tank APU designs (Yanmar and Honda) are under evaluation in the European Theater to determine their ability to meet low cost "silent watch" requirements (operating tank combat and environmental systems without the main engine running). A reliable APU will reduce fuel consumption and engine wear (none).

CANADIAN CL-227 REMOTELY PILOTED VEHICLE (RPV)

A CANADAIR rotary wing, pilotless air vehicle system is under evaluation to determine feasibility for air reconnaissance and surveillance missions. It is capable of autonomous, pre-programmed or operator controlled flight and it is outfitted for various sensor payloads ($413K).

BRITISH COMMUNICATIONS AURAL PROTECTIVE SYSTEM (CAPS)

CAPS, an aural protective headset for personnel in combat vehicles to reduce noise and allow the wearer to hear and talk over the intercom, is manufactured by RACAL Acoustics. It is under evaluation, along with a similar headset manufactured by GENTEX of the US, for possible type classification ($129K).

AUSTRALIAN FREQUENCY MANAGEMENT FACILITY

A Plessey system, which assigns operating frequencies to HF and VHF radios in a tactical network to minimize interference and maximize propagation, is under evaluation to determine if any of its sub-routines, techniques or prediction models are superior to those now being used by the Army (none).

MULTINATIONAL GAS MASK CANISTERS

Various C2-type gas mask canisters are under evaluation to measure interchangeability, breathing resistance and protection, and to qualify foreign sources to compete for a small portion of yearly procurement of C2-equivalent canisters (none).

FRENCH HELICOPTER OBSTACLE AVOIDANCE SYSTEM

A Thomson-CSF in-flight detection system for wires and other obstacles is under evaluation, for use on Army helicopters, to determine if it meets Army requirements for an advanced wire strike avoidance system ($1.805M).

SWISS AND AUSTRIAN 155mm HOWITZER AUTOLOADERS

Semi-automatic loaders (SALs), manufactured by K&W and Sondertechnik, are under evaluation to determine if one can fully satisfy Army requirements for incorporation into the M109 Howitzer Improvement Program (HIP). The SALs employ an inertial ramming concept to load projectiles into a 155mm cannon chamber. Successful application can reduce crew labor burden, provide burst rate-of-fire and increase both cyclic and sustained rates-of-fire ($2.911M).

DUTCH AND BELGIAN IMAGE INTENSIFICATION NIGHT VISION SIGHTS

Seven night vision devices, including two second generation individual weapon sights, a driver's universal passive periscope, a set of holographic goggles, two types of weapon sights for small arms and an 18mm two-stage passive binocular, are being compared to similar systems in the US inventory. The foreign systems are manufactured by Philips USFA, Oldelft and OIP Optics (none).

GERMAN IMPROVED RIBBON FLOAT BRIDGE

An improved Ribbon Float Bridge, developed by Krupp and MAN, is under evaluation to determine if it will meet the Army requirement for bridging capable of supporting Military Load Class (MLC) 70 loads in river currents found in the European Theater ($6.0M).

BRITISH AND ISRAELI MANPACK HF COMMUNICATIONS SYSTEM

Two lightweight, man-portable HF radio systems (MEL and TADIRAN) are under evaluation, in conjunction with the Image Transmission System, (see Israeli Image Transmission System below) to determine which best meets Army Special Forces requirements ($46K).

ISRAELI IMAGE TRANSMISSION SYSTEM

This TADIRAN system, which converts digitalized video input signals for encryption and transmittal over combat net radio, is under evaluation to determine if it meets Army requirements ($26K).

FRENCH, BRITISH, GERMAN NBC LIGHTWEIGHT PROTECTIVE GARMENT

Compact and lightweight garments, designed to protect soldiers from liquid and vapor NBC agent hazards, are under evaluation for possible type classification (none).

SECTION VI

RAVEN REMOTELY PILOTED VEHICLE (RPV)

RAVEN, manufactured by Flight Refuelling Ltd., is under evaluation to determine if it satisfies Army requirements for UAV maneuvering. Raven is an unmanned aerial vehicle (UAV) intended to carry day and night sensors to provide real-time battlefield intelligence ($2.185M).

SWEDISH SURVIVABLE TIRE SYSTEM

The Swedish system, manufactured by Trelleborg, is a low-profile tubeless tire with special rim and metallic run-flat devices. It is under evaluation against an Army requirement for a survivable tire system for the High Mobility Multipurpose Wheeled Vehicle ($245K).

BRITISH, AUSTRALIAN REVERSE OSMOSIS WATER PURIFICATION SYSTEMS

Two small-capacity water purification units are under evaluation to determine if they meet Army requirements for use by small, independent task forces operating in isolated areas. The UK's MEMTEC filter is a single unit requiring external electrical power, and the Australian Stella-Meta filter consists of four sections with a self-contained diesel power supply ($93K).

FRENCH, GERMAN, BRITISH TANK DIESELS

Three advanced design 1500 HP diesel engines, manufactured by Unidiesel, MTU-883 and Rolls-Royce Perkins, are under evaluation as a possible replacement for gas turbine engines in future M1-series tank improvement programs. Subsequent to the start of this evaluation, MTU has teamed with General Motors in the US for possible future MTU-883 sales (none).

GERMAN 35MM TANK PRECISION GUNNERY INBORE DEVICE (TPGID)

A gun barrel insert system, manufactured by Mauser-Werke Oberndorf, which allows tank crews to train on full-scale gunnery ranges with subcaliber ammunition, is under evaluation for possible use as a standard, lower cost, training item for the Army's Main Battle Tank ($844K).

FCT EVALUATIONS COMPLETED BY THE ARMY IN FY89

The following Allied systems and equipment completed evaluation by the Army in FY89. FY89 project funding and project disposition are indicated in parentheses.

BRITISH RAM AIR PARACHUTE SYSTEM (RAPS)

The GQ360 Advanced Tactical Parachute System, developed by GQ Parachutes to provide more accurate directional control for steering to a designated landing site, was evaluated for type classification for use by Army Special Forces. Awaiting final test report ($287K).

FRENCH LECLERC MAIN BATTLE TANK AUTOLOADER

The LeCLERC tank main gun autoloader, developed by Creusot-Loire for the French Government, was evaluated to assess its potential application to US XM91 autoloader development and to verify its technical characteristics. Project was terminated due to uncertainties surrounding Army requirements for future tank R&D programs (none).

GERMAN ELTRO MINE DETECTION SYSTEM

The ELTRO pulse radar mine detection sensor was evaluated for possible incorporation into the Army Minefield Reconnaissance and Detection System (MIRADOR). ELTRO did not meet Army sensor requirements for the MIRADOR system (none).

GERMAN NBC RECONNAISSANCE VEHICLE

The TPz1 Fuchs NBC Reconnaissance Vehicle, in service with the German Armed Forces to survey, sample, identify and mark NBC-contaminated areas, was evaluated to provide a safety release to the Army's Chemical School for the development of NBC reconnaissance doctrine. Testing is complete ($1.425M) and a Congressionally-directed NBC Reconnaissance System competition is complete. In March 1990, the Army announced the selection of the Fuchs vehicle/system. Eight of the systems will be procured in FY90.

CANADIAN ROCKET-POWERED TARGET

The ROBOT-X, manufactured by Boeing of Canada and advertised as a low-cost, over-the-horizon, rocket-boosted, composite material target, designed to exercise point defense missile systems, was evaluated to determine if it could meet Army requirements for a pre-programmed target to replace expensive target vehicles now in use. Awaiting final test report ($210K).

BRITISH TANK TRACK TENSION DEVICE

A hydraulic device, manufactured by Vickers Defense Systems, which allows tank track tension to be adjusted from within the tank for varying terrain conditions, was evaluated in the M1A1 tank to confirm claimed cost savings, increased track life and suitability for installation in new production tanks. Awaiting final report ($51K).

SWEDISH RANGER ANTI-ARMOR WEAPON SYSTEM (RAAWS)

The CARL GUSTAF, a new lightweight shoulder-fired anti-tank weapon manufactured by FFV Ordnance, is being procured for US Army Ranger units as an interim replacement for the current M67 90MM recoilless rifle ($429K).

SECTION VI

NEW START FCT PROJECTS UNDERGOING US ARMY EVALUATION IN FY90

The following Allied systems and equipment were selected to begin evaluation by the Army in FY 1990 under the FCT Program.

BRITISH IMPROVED CHEMICAL AGENT MONITOR (I-CAM)

The I-CAM is a hand-held device for monitoring nerve and blister agent contamination on personnel, supplies and equipment. It is intended as an improvement over the British CAM (Chemical Agent Monitor), having an improved-design detection section and enhanced circuitry which shows promise of increased reliability. The I-CAM will be evaluated for type-classification and fielding by Army units currently employing the CAM, which was evaluated under the FWE/NCT Program in FY 84/85 and subsequently adopted by the Army, Air Force and Navy. The US military will benefit from the I-CAM's reduced logistics and maintenance burden, as well as a potential reduction in future production costs, if the system receives a favorable evaluation (FY89 $1.071M).

GERMAN LEGUAN VEHICLE-LAUNCHED BRIDGE

The LEGUAN Bridge System, developed by Krupp Industrietechnik and MAN, is designed to support Military Load Class (MLC) 70 traffic over gaps up to 24 meters. The system will be adapted to a modified Abrams Tank chassis and evaluated to determine if it meets the Army requirement for a heavy assault bridge to support armored and mechanized infantry forces ($1.95M).

FRENCH LONG WAVELENGTH INFRARED (IR) SCANNED FOCAL PLANE ARRAYS

Focal plane arrays, developed by Societe Francaise de Detecteurs Infrarouge, are part of a family of long wavelength infrared, time-delay-and-integration arrays, integrated into a digitally-processed imaging system. They will be evaluated as a potential lower-cost source for the Army's second generation standard focal plane array production requirements (FY89 $475K).

ALLIED EQUIPMENT UNDER FCT EVALUATION BY THE US NAVY AND THE US MARINE CORPS

The following systems and equipment were under evaluation by the US Navy and US Marine Corps during FY89. FY89 funding is indicated in parentheses.

NORWEGIAN, FRENCH 2.75-INCH PENETRATING WARHEAD

Two 2.75-inch rocket warheads are undergoing comparative evaluation with US M151/M440 ammunition to determine their potential to satisfy USN/USMC requirements for improved rocket systems. The Norwegian system, developed by Raufoss, is a forged steel body with delayed fuzing for use against ships. The French system, developed by Thomson Brandt Armaments of France is a multi-warhead, fin-stabilized subprojectile system for use against light

armor, equipment and vehicles (none).

CANADIAN 2.75-INCH ROCKET MOTOR

A CRV-7 rocket motor is under evaluation to assess its suitability for both 2.75 and 5.0-inch unguided, aircraft-delivered advanced rocket systems for future fixed-wing and helicopter aircraft. The system, developed by Bristol Aerospace, has a cast composite propellent grain, a molded nozzle with integral flutes and a bayonet-type igniter (none).

FRENCH 2.75-INCH INSENSITIVE ROCKET MOTOR CASE

The composite material rocket motor case was developed by Societie Europeenne de Propulsion for use on an air-launched, solid propellant rocket motor, and it is manufactured by directly applying an overwrap onto an extruded composite propellent grain. It is under evaluation to assess the suitability, cost and production rate of the overwrap manufacturing technology ($60K).

ITALIAN 76MM GUN AMMUNITION

76MM gun ammunition is under evaluation to determine if it provides a significant increase in effectiveness compared to 76MM projectiles currently in use. The Italian ammunition is manufactured by SNIA,BPD and it contains preformed fragments of tungsten alloy, fitted around the projectile body and held in position by a steel liner ($400K).

BRITISH ACTION INFORMATION ORGANIZATION SYSTEM

The Plessey Action Information Organization System (AIOS) is under evaluation for suitability as a tactical display on board the Navy's new AVENGER-class Mine Countermeasures (MCM) ships. AIOS provides a display for tactical command, control and navigation for minehunting, mine neutralization, mission planning and minesweeping. ($689K).

BRITISH AIR-LAUNCHED MARITIME DECOY

An expendable air-launched maritime decoy is under evaluation to verify the deployment scheme, operation in salt water, air worthiness, radar cross section characteristics, and suitability for launching from helicopters and S-3/P-3 aircraft. It was developed by Irvin Industries as a rapid response offboard decoy, and it is composed of a self-inflating RF corner reflector (none).

SWEDISH BOL CHAFF DISPENSER

An electro-mechanical chaff dispenser, modified for installation in the LAU-7A Sidewinder missile aircraft launch rail, is under evaluation to determine if it can satisfy Navy requirements for increased self-protection capability for tactical aircraft. It was developed by Philips Elecktronik ($290K).

SECTION VI

BELGIAN, ISRAELI BULLET TRAP RIFLE GRENADE

Bullet Trap Rifle Grenades, part of a family of muzzle-launched Ordnance and designed to be shoulder-fired from the M16A2 rifle and M4 carbine using regular ball or tracer ammunition, are under evaluation to provide a basic configuration of muzzle-launched combat ordnance for individual USMC riflemen. The manufacturers are MECAR of Belgium and Israel's Military Industries (none).

BRITISH CORROSION CONTROL

A Vickers Shipbuilding/AISH & Co. Impressed Current Cathodic Protection (ICCP) system is under evaluation for possible application to the corrosion protection performance specification of the Navy SSN 21 SEAWOLF-class submarine. The ICCP consists of reference electrodes, improved-design hull penetrators and anodes positioned throughout a ship's hull to measure electromagnetic forces (none).

GERMAN, FRENCH EHF TRAVELING WAVE TUBES

Two travelling wave tube (TWT) designs by Siemens (coupled-cavity TWT) and Thomson CSF (helix TWT) are under evaluation as possible qualified second sources of TWT components for the Navy EHF SATCOM Program (NESP) ($605K).

ITALIAN ELECTRO-OPTICAL GUN FIRE CONTROL SYSTEMS

Phase II of an ongoing multinational demonstration involves two Electro-Optical Gun Fire Control Systems (EOGFCS) manufactured by Selenia (NA-18 and NA-30). Each system contains a thermal imager, TV camera and laser rangefinder, which are intended to provide three-dimensional tracking during emission control and radar jamming conditions, as well as a day/night capability for navigation and covert observation ($2.626M).

BRITISH H-3 HELICOPTER GEARBOX DIAGNOSTICS

The Health and Usage Monitor System (HUMS) is under evaluation to determine if it meets Navy requirements for in-flight vibration monitoring. The Westland Helicopter system provides in-flight monitoring of gear degradation in helicopter main, intermediate and tail rotor gearboxes (none).

BRITISH HP PURE AIR GENERATOR

The Dowty Fuel Systems High Pressure Pure Air Generator (HiPPAG) is under evaluation as a more cost-effective, lower maintenance replacement for the nitrogen receivers currently in use. HiPPAG is intended as a continuously recharging pure air system with application in the LAU-7A series Sidewinder (AIM-9) missile launcher ($360K).

BRITISH MAGNETIC SELF-RANGING SYSTEM

A self-contained, ship-transportable ranging system, for the measurement of ship magnetic signatures and calibration of ship degaussing systems in areas remote from permanent facilities, is under evaluation for sensitivity, accuracy and to determine limitations and capability for enhancement. It was developed by Thorn EMI ($170K).

GERMAN MTU-883 DIESEL ENGINE

Motoren und Turbinen Union (MTU)-designed 12-cylinder 883-series diesel engines are under evaluation to determine whether the advanced design is suitable as a power plant for the Marine Corps Advanced Assault Amphibian Vehicle (AAAV) ($60K).

AUSTRALIAN PARACEL TRANSPORTABLE RECOMPRESSION CHAMBER (PTRCS)

A portable two-man hyperbaric recompression chamber, manufactured by International Innovations and intended to provide emergency pressurized treatment and transportation for divers suffering from pressure-related ailments, is under evaluation to determine if it meets Navy explosive ordnance disposal and underwater construction team requirements. The PTRCS can be accommodated in small aircraft, road vehicles or on small boats ($513K).

SWEDISH AND GERMAN WATERJET PROPULSION SYSTEM

A waterjet ship propulsion system, consisting of a diesel engine manufactured by Motoren und Turbinen-Union (MTU), a gearbox by Zahnradfabrik Friedrichshafen (ZF) and a waterjet pump manufactured by KaMeWa, is under evaluation for possible application to US surface effects ships ($2.119M).

FCT EVALUATIONS COMPLETED BY THE USN/USMC IN FY89

The following Allied systems and equipment completed evaluation by the Navy and Marine Corps during FY89. FY89 project funding and project disposition indicated in parentheses.

NORWEGIAN 25MM MULTIPURPOSE AMMUNITION

Raufoss M84/2 multipurpose ammunition, which utilizes a pyrotechnically-fuzed explosive in a hardened steel projectile, was evaluated to determine whether it meets USMC performance objectives as a potential replacement for M792 HEI-T ammunition currently used in the AV-8B, LAV-25 and LAV-AD ($230K).

BELGIAN COIL CHAFF DECOY

An off-board deception device was evaluated to determine if it meets Navy criteria for ship-launched offboard decoys, and if it has the potential to replace procurement of US-produced chaff. COIL Systems is the Belgian developer (none).

SECTION VI

CANADIAN ACTIVE SHAFT GROUNDING

An adaptive electronic feedback circuit system, which functions to significantly reduce ship propeller shaft-related electromagnetic fields, was evaluated to verify the system's performance in reducing the vulnerability of naval vessels to mines. The system, developed by Davis Engineering, exceeded technical performance requirements and is under consideration by the Navy for back-fitting and forward-fitting to naval combatants (none).

BRITISH AIR DEFENSE SITUATION DISPLAY

An air defense display system, part of the UK Air Defense Ground Environment System (UKADGE) and which can interface with various sources of track data, was evaluated to determine the system's capability to interface with the NATO Air Defense Geographic Display and the Ocean Surveillance Information System (OSIS). The evaluation was a success and the Navy is considering plans to acquire three additional systems. Thorne EMI developed the display system (none).

BRITISH ANTI-SHIP MISSILE TOWED DECOY

A ship-towed decoy which utilizes a radar reflector to simulate the target, was evaluated to determine if it satisfies Navy requirements for ship-launched offboard electromagnetic decoys. The Navy is in the process of defining mutual requirements with the United Kingdom to establish a cooperative R & D program. Awaiting final report on the Marconi Defense Systems ship-towed decoy ($250K).

BRITISH CORMORANT LIGHTWEIGHT SONAR

The CORMORANT lightweight, low frequency, passive/active dipping sonar, manufactured by Plessey Marine, was evaluated to determine if it met required performance capabilities as a candidate for Navy SH-2F/G helicopters. The CORMORANT was found to be technically qualified in its development phase as tested and is a candidate for the Airborne Low Frequency Sonar (ALFS) under competitive Navy procurement (none).

CANADIAN E-2C MULTIFUNCTION DISPLAY

The Marconi developed CMA-882 Avionics Management System, a high resolution, flat panel display utilizing integrated digital bus technology, was evaluated to determine if it met command, control and display requirements of the Navy E-2C Hawkeye AEW aircraft. The CMA-882 met or exceeded all requirements and is suitable for the E-2C aircraft. The Navy plans to procure two units for each E-2C aircraft it procures (none).

BRITISH, CANADIAN FLEXTENSIONAL TRANSDUCERS

Active sonar transducers for low frequency operation, developed by British Aerospace and Sparton, were evaluated to determine whether the flextensional designs have performance advantages over US designs. Both designs met required performance criteria and both companies are expected to participate in an upcoming RFP for additional units for the Navy's improved AN/SQQ-89 sonar transmitter array. Awaiting final report ($178K).

BRITISH H-3 COMPOSITE ROTOR BLADES

Westland Helicopter's main rotor and tail rotor blades, made of composite glass fiber/epoxy resin materials were evaluated to determine if composite blades are superior to existing aluminum alloy blades. Awaiting final report (none).

SWEDISH HELLFIRE WARHEAD

The AB Bofors Sea Hellfire, a blast/fragmentation anti-ship warhead integrated with the US Hellfire (AGM-114B) semi-active laser-guided missile, was evaluated to qualify the warhead/missile for Navy special warfare craft combat operations use. Awaiting final report ($415K).

BRITISH INDUCTIVELY COUPLED INITIATOR

An ML Aviation, inductive coupling process for shielding electrical connections, which has potential application to the ignition process for impulse cartridges, was evaluated in MK23 impulse cartridges to determine if the shielding eliminates inadvertent cartridge ignition in an electromagnetic interference (EMI) environment. The inductive coupled initiator met or exceeded all requirements. Navy procurement will be dependent on availability of future funding. Awaiting final report (none).

GERMAN,ITALIAN MINE MECHANISMS

Three mine pressure mechanisms, developed by Dornier and MISAR, were evaluated for possible application to the requirements of US mine warfare programs. Not acquired (none).

BRITISH, ITALIAN MINOR CALIBER GUNS

A German MAUSER Model F 30MM cannon, mounted in both a British DES30F and an Italian BREDA 30MM gun mount were comparatively evaluated to determine the best qualified to meet Navy requirements for small caliber guns aboard various surface ships. Neither mount, configured with the MAUSER Model F cannon, was found to be suitable for US Navy use. Project terminated (none).

BRITISH MK 48 HOSEPIPE

Torpedo wire guidance communication systems, consisting of high tensile strength-reinforced flexible hose, were evaluated to determine if improvements in US capabilities to launch wire-guided subsurface weapons could be achieved. Preliminary results indicate

the HOSEPIPE met or exceeded the Navy requirement and the Navy anticipates procurement. Standard Telephone & Cable and Marconi Underwater Systems, Ltd., developed the MK48 Hosepipe. Awaiting final report ($490K).

VERTICAL LAUNCH SEASPARROWM (GMVLS MK 48)

An unmanned system with missile motor exhaust controls and capable of launching NATO SEASPARROW missiles from vertically-mounted canisters, was evaluated to determine the system's ability to meet requirements of the Navy Advanced Short Range AAW Combat System. The technical evaluation concluded that the GMVLS MK 48, developed by the NATO Consortium and Raytheon, was a viable replacement for the present NATO SEASPARROW MK 29 launcher. A Navy decision on procurement is pending ($290K).

MULTINATIONAL SPECIAL WARFARE EQUIPMENT

Various Allied equipment was evaluated to determine if it met combat requirements of Navy Special Operations Forces. The equipment failed to meet requirements (none).

BRITISH MODULAR STORES MANAGEMENT SYSTEM (MSMS)

A GEC Avionics advanced aircraft armament control system, intended to fulfill the SMS requirements of US and NATO aircraft, was evaluated for performance using current and future weapons in various aircraft and configurations. The MSMS was found to be suitable for updating older analog aircraft. However, the Navy does not plan to acquire the MSMS for current tactical aircraft (none).

BRITISH NATO IDENTIFICATION SYSTEM RADAR MODE INTERROGATOR

Two Identification Friend or Foe (IFF) radar mode (RM), waveform interrogators, developed by Cossor and Plessey, were evaluated as a possible alternative to two US interrogators under development for application to the US tri-service MK XV IFF system program. Although the UK RM equipment was not acquired, Cossor was selected to develop and supply the beacon portions of the MK XV FSED transponder (none).

ISRAELI OPHER SEEKER

A guidance and control kit, developed by Elbit Computers to convert MK 83 general purpose bombs into low cost, launch-and-leave precision guided weapons, was evaluated to determine the feasibility of applying the technology to the Navy AIWS. Awaiting final report ($447K).

BRITISH OSBORNE II ACOUSTIC MINESWEEPER

An improved OSBORNE programmable, acoustic surface minesweeping device was evaluated for possible application to the Navy AVENGER-class Mine Countermeasures (MCM) ship. The system is in service with the UK Royal Navy and it is manufactured by British

Aerospace. Awaiting final Report (100K).

BRITISH SEA PETREL TARGET

An unguided ballistic rocket, manufactured by BAJ, Ltd. and in service with the UK Royal Navy, was evaluated to determine if it was suitable as an open-ocean training target which simulates the characteristics of anti-ship missiles. The SEA PETREL was found to be operationally unsuitable and the project was terminated by the Navy Warfare Sponsor ($1694K).

BRITISH SIREN OFFBOARD ECM

A Marconi Defense Systems rocket-propelled electronic warfare decoy, which is mortar-launched and employs a parachute to control the rate of descent, was evaluated to determine if it meets Navy requirements for ship-launched offboard decoys. The Navy is in the process of defining mutual requirements to establish a cooperative R & D program with the United Kingdom. Awaiting final report ($399K).

BRITISH WIRE SWEEP MONITORING EQUIPMENT (WSME)

BAJ and Vickers equipment for measuring the strain on towed minesweeping gear was evaluated to determine any advantages in maintaining a flat sweep profile in comparison with conventional US minesweeping control techniques. During Phase I testing, it was concluded that the WSME offered minimal performance improvement for the increased cost of fleet introduction. As a result, testing was terminated by the Navy (none).

BRITISH, CANADIAN ASW ACOUSTIC PROCESSOR

Two airborne acoustic processing systems (Canadian UYS-503, manufactured by Computing Devices and British AQS-902G, manufactured by GEC Avionics) were evaluated for potential application to the Navy's SH-2F helicopter upgrade program. Both systems were found to be technically qualified and the Canadian system was competitively procured by the Navy (none).

NEW START FCT PROJECTS UNDERGOING USN/USMC EVALUATION IN FY90

The following Allied systems and equipments were selected to begin evaluation by the Navy and Marine Corps in FY 1990 under the FCT Program.

BRITISH AERIAL TARGET VECTOR SCORING SYSTEM

The Advanced Radar Missile Scorer, a vector scoring system developed by Cambridge Consultants, which is utilized for the evaluation of air-to-air weapon requirements, will be evaluated for its capability to provide non-cooperative vector scorer information during Navy missile performance test scenarios.

SECTION VI

BRITISH BARRICADE DECOY SYSTEM

An ML Wallops Defense Systems lightweight automated Anti-Ship Missile Defense (ASMD) system for small, weight-sensitive surface ships, will be evaluated as a possible replacement for the heavy, manual MK 34 decoy launcher presently in use.

GERMAN DIVER SONAR

An ELAC manufactured, hand-held diver sonar, with all sensors, electronics, controls, display and rechargeable battery housed in one common unit, will be evaluated.

SWEDISH AIRCRAFT DRY AIR DEHUMIDIFICATION SYSTEM

A Dessicant Wheel Dehumidification System, developed by Munters, will be evaluated to determine if daily dehumidification of operational aircraft will increase system reliability, aircraft readiness, mean time between failure, and decrease maintenance/support costs sufficiently to justify acquisition.

DUTCH GOALKEEPER CLOSE-IN WEAPON SYSTEM (CIWS)

The Signaal manufactured GOALKEEPER CIWS, which employs a General Electric 4200 shot-per-minute, 30MM Gatling gun with a search-while-track, dual-frequency track radar and below-deck electronics and magazine, will be evaluated to provide valuable information to both Navies. Procurement is not envisioned.

FRENCH NUCLEAR MAGNETIC RESONANCE GRADIOMETER

A nuclear magnetic resonance gradiometer developed by Crouzet, will be evaluated to demonstrate its capabilities to satisfy Navy requirements for improved ship detection by mines, as well as its applicability as a nonacoustical buried mine detection system.

ISRAELI GIDEON HELMET-MOUNTED DISPLAY

An electro-optic, helmet-mounted display device will be evaluated for possible incorporation into the Marine Corps AH-1W Cobra Attack Helicopter. The Gideon, developed by Elbit, attaches to a pilot's night vision goggles (NVG) and displays control, performance and position symbology combined with the external view seen through the NVG.

BRITISH INMOS TRANSPUTER MICROPROCESSOR

INMOS, a fifth generation Very Large Scale Integration microprocessor and capable of increased data processing speeds, will be evaluated to determine if its application in a parallel processing environment will improve the speed of data processing in the Undersea Surveillance System. INMOS was developed by INMOS Corporation.

SWEDISH SPRAY FORMED ALLOY 625 PIPING

The Osprey Spray Forming Process for the direct conversion of liquid metal into shaped preforms was developed by Sandvik, and it will be evaluated to determine if it has application to SSN-21 class submarine piping systems.

BRITISH PX180R TURNING TARGET SYSTEM

BDL Systems PX180R, a lightweight, portable, self-powered infantry turning target system, will be evaluated for suitability as a training device for the Marine Corps.

ALLIED EQUIPMENT UNDER FCT EVALUATION BY THE US AIR FORCE

The following Allied systems and equipment were under evaluation by the USAF during FY89. FY89 funding is indicated in parentheses.

AUSTRALIAN BDU-33 PRACTICE BOMB

An Australian Ordnance Factory practice bomb, intended to simulate the high drag ballistics of a MK 82 bomb, is under evaluation to determine if it meets USAF requirements for a high drag practice training device ($241K).

FRENCH DIELECTRIC MEASUREMENT EQUIPMENT (DME)

Aerospatiale's DME, intended to measure critical radar cross-section properties of selected materials over a broad range of frequencies at ambient and elevated temperatures, is under evaluation for application to materials utilized in USAF reentry vehicles ($1.485M).

BRITISH HIGH SPATIAL BANDWIDTH FLIR

A high performance FLIR developed by GEC Sensors is under evaluation to provide a baseline for assessing potential improvements in automatic target recognition. GEC intended it to provide digital output, and presents it as physically compact, DC restored, countermeasure hardened, and with a high mean time between failure (none).

FRENCH HOT GAS VALVE NOZZLE

A composite-material hot gas valve manufactured by Societe Europeenne de Propulsion (SEP) is being evaluated to ascertain its advertised performance advantages over refractory metals employed in US-developed hot gas valves. The SEP system may have potential application in chamber bleed, thrust vector control systems utilized in high performance solid propellent rocket motors. ($871K).

SECTION VI

GERMAN INSENSITIVE HIGH EXPLOSIVE

Spherical Nitroquanidine (SNQ), developed by Fraunhofer Institute fur Treib-und Explosivstoffe (ICT), is being evaluated for possible applications in MK 82 (500 lb, general purpose) bombs (none).

FRENCH RUNWAY CRATERING SUBMUNITION (SAMANTA)

A kinetic energy, air-delivered, delayed-fuze penetrator, is being evaluated to determine its effectiveness in penetrating and destroying runways. It was developed by MATRA to crater and heave target airfields, independent of surface thickness ($958K).

BRITISH SPRITE REMOTELY PILOTED VEHICLE (RPV)

M.L. Wallop Defense Systems' SPRITE, a remotely-controlled air vehicle, is under USAF evaluation to determine: its capabilities to rapidly locate unexploded ordnance in and around runways in support of Air Force Base Recovery After Attack operations; to provide battlefield intelligence to Army and Marine Corps ground and air maneuver commanders; and to operate from small USN craft (none).

BRITISH WATCHMAN AIR SURVEILLANCE RADAR

A tactical air surveillance "S" band radar, developed by Plessey Radar Company, is under evaluation to determine its suitability to fulfill USAF air traffic control requirements in deployed locations (none).

FCT EVALUATIONS COMPLETED BY THE AIR FORCE IN FY89

The following Allied systems and equipment completed evaluation by the USAF under the FCT Program in FY89. FY89 project funding is indicated in parentheses.

BRITISH CELLULAR LOGIC IMAGE PROCESSOR (CLIP)

A high-speed, parallel computer, developed by Stonefield-Omicron Electronics for image analysis, was evaluated for possible application to USAF requirements for real-time, multi-sensor target detection systems. The project was terminated and a report is awaited on completed testing ($14K).

MULTINATIONAL CHEMICAL DEFENSE EQUIPMENT

A variety of Allied chemical defense equipment (fabrics, flight suits, gloves, protective masks, detectors, warning systems and shelters) were evaluated against USAF requirements. Awaiting final test reports (none).

GERMAN, ISRAELI, JAPANESE MILLIMETER WAVE COMMUNICATIONS

Three millimeter wave communications radio systems of varying frequency bands, manufactured by Siemens, TADIRAN and Nippon Electric, were evaluated for potential use by the USAF as tactical and fixed communications systems between C3 facilities. Awaiting final test report ($117K).

BRITISH NIGHT ATTACK UPGRADE EQUIPMENT

Two GEC Avionics systems, (SPARTAN Terrain Reference Navigation System and LOCUS Laser Obstacle and Clearance Unmasking System) were evaluated to determine if they meet USAF requirements for low level attack during night and marginal weather. Awaiting final test report (none).

GERMAN AND JAPANESE ICBM ACTIVE DECOY COMPONENTS

Miniaturized, lightweight, nuclear-hardened radar receiver components, manufactured by Siemens and Fujitsu, were evaluated for potential application in penetration aid decoys and jammers for strategic ballistic missile reentry vehicles. Awaiting final report (none).

NEW START FCT PROJECTS UNDERGOING US AIR FORCE EVALUATION IN FY90

The following Allied systems were selected to begin evaluation by the USAF in FY 1990 under the FCT program.

BRITISH MULTI-FUNCTION BOMB FUZE (MFBF)

An electronic, programmable bomb fuzing system will be evaluated in comparison with the performance of two fuze systems currently in use by the USAF. The MFBF, currently in production by Thorne EMI Electronics, is intended to provide a single fuzing system replacement for the current range of operational fuzing modes including airburst, impact and delayed detonation ($1.480M).

FRENCH SPOT DIGITAL SATELLITE IMAGERY

Evaluation of the SPOT Digital Satellite Imagery to assess whether the imagery meets USAF mission planning requirements, is manageable with regards to storage space and speed of recall, and will increase real world mission success rates for an operational theater ($4.6M).

VII. WEAPONS SYSTEMS OR EQUIPMENT ORIGINALLY DEVELOPED OR PROCURED BY U.S. AND BEING FURTHER DEVELOPED OR PROCURED BY NATO ALLIES

As required in 10 U.S. Code Section 2457(d) (8), this section provides descriptions of weapon systems or equipment originally developed or procured by the US that are being or have been further developed or procured by other NATO allies.

U.S. ARMY SYSTEMS USED BY NATO ALLIES

UH-1 The UH-1 is a low silhouette, single rotor helicopter powered by a gas turbine engine. It is used for transportation of personnel, equipment, and supplies; command and control; and medical evacuation. Several UH-1 models have been produced, most recently, the UH-1H and UH-1V. The UH-1V is a UH-1H converted to a medical evacuation aircraft by the installation of a radar altimeter, distance measuring equipment and a rescue hoist. Italy, Germany, Greece, Norway, Spain, Turkey and Canada have the Huey helicopter.

Chinook Helicopter The CH-47D Chinook is a twin-engine, tandem-rotor, medium-lift transport helicopter used for equipment and personnel transport, aircraft recovery, medical evacuation and cargo movement. The CH-47D can transport 33 soldiers in full combat gear and has a lift capability of 15,000 pounds. It is the prime transport for the Army's M198 towed 155mm howitzer. Greece, Italy, Canada, the United Kingdom and Spain have the Chinook.

HAWK HAWK is a mobile, all-weather, day and night air-defense guided missile system of medium range and altitude capabilities. It includes ground support equipment for target acquisition, engagement and HAWK missile fire control. HAWK was initially fielded in 1960, and system capability has been maintained through a series of product improvements. Modification efforts have focused on increasing firepower, improving reliability and maintainability, and reducing manpower requirements. HAWK has been acquired by Belgium, France, Germany, Greece, Italy, the Netherlands and Spain from the US or through the NATO HAWK Procurement and Logistics Organization. Denmark and Norway are leasing HAWK from the US. Norway has developed a variant of the HAWK, the Norwegian Adapted HAWK (NOAH). NATO nations are now considering alternatives to HAWK modification, including development of a new medium surface-to-air missile system.

AN/TSQ-73 MISSILE MINDER The AN/TSQ-73 MISSILE MINDER is part of the fire direction center of the Improved HAWK battalion. It has been acquired by France and Italy through the NATO HAWK Procurement and Logistics Organization.

SECTION VII

TOW Anti-Tank Missile The tube-launched, optically-tracked, wire-guided TOW was developed to counter numerically superior Warsaw Pact armor forces. TOW is now fielded in four versions: Basic, I-TOW, TOW 2 and TOW 2A. A fifth version, TOW 2B, is in FSD. Thirty-nine nations worldwide employ the TOW system, including all NATO nations with the exception of Belgium, France, and Iceland. Belgium will field a TOW airborne system in 1991.

TOW Airborne Systems Five NATO countries have fielded (or will field) versions of the helicopter-launched TOW. The UK and the US use the M-65 airborne system. The UK version is produced locally and uses a roof sight on the LYNX helicopter in lieu of the US chin sight. Italy, Denmark, and Belgium have procured an airborne system called the HELITOW, which is a joint development of Emerson Electric Company of the US and SAAB-Scania of Sweden. Italy will use the Agusta 129, Belgium the Agusta 109, and Denmark the Aerospatiale Ecureuil. Sweden has mounted the HELITOW on the MBB B105.

Forward-Looking Infrared (FLIR) The FLIR module is used in the thermal imaging systems for anti-tank rounds (TOW, DRAGON), tanks (M60A3, M1), advanced attack helicopters, and other systems. These modules are being acquired by or produced under license by Germany, Italy, The Netherlands, Denmark, Norway, and the UK.

M109A2/3 SP Howitzer The M109-series, self-propelled, 155mm howitzer is currently in the NATO inventories of Belgium, Denmark, Germany, Greece, Italy, The Netherlands, Norway, Portugal, Canada, Spain, and the UK as well as the US. Germany, Norway and Italy have developed unique configurations which incorporate specialized features. The M109G is the German version, the M109A3G is the Norwegian version and the M109L is the Italian version. It is of some concern to the US that, since the termination of the European SP-70 program, several NATO nations are now pursuing independent solutions to fulfill their howitzer requirements.

STINGER The STINGER missile system is a shoulder-fired air-defense missile that will be produced by a consortium of Germany, Greece, the Netherlands and Turkey. Germany, as the lead nation, has ordered long lead items and STINGER test equipment. The program entered the production phase in 1989, and missile deliveries are projected to commence in 1992.

PATRIOT The PATRIOT is an air-defense system consisting of a radar set, an engagement control station, a power plant, and eight remotely located launchers. Each launcher contains four ready-to-fire missiles sealed in canisters that serve the dual purpose of shipping containers and launch tubes. Under a 1984 US-German agreement to improve NATO air-defense in central Europe, the US will provide fourteen fire units to Germany, and Germany

will acquire fourteen PATRIOT fire units as well as man and maintain twelve US-owned fire units located in Germany. The Netherlands is also acquiring four PATRIOT fire units and has an interest in an additional four units. Under a US/Italian agreement, Italy will acquire PATRIOT ground equipment for twenty fire units.

Field Artillery Ammunition Support Vehicle (FAASV) The Government of Spain procured a limited quantity of FAASV's under a direct sale. Greece has procured the FAASV in its Command Post Vehicle variant, and Canada has shown interest in purchasing the FAASV.

M114A1, Medium, Towed, 155mm Howitzer The M114A1 is in the inventories of most NATO nations. The Netherlands, Canada, Norway, and Denmark are currently in the process of modifying the M114 to a 39-caliber configuration using a Bofors cannon (known as the M114/139 or M139). Other nations with the M114 in their inventories are likely to convert to a 39-caliber configuration.

M110-series, 8-inch, Self-Propelled Howitzer The 8-inch howitzer, M110-series, is in the inventories of Germany, Turkey, Italy, Greece, Belgium, The Netherlands, and the United Kingdom.

M198, Medium, Towed, 155mm Howitzer Turkey has acquired the M198 howitzer under the Foreign Military Sales (FMS) program.

M113 Armored Personnel Carrier (APC) More than a dozen derivative vehicles make up the M113 family and nearly 30,000 vehicles are in use today in some forty nations. In NATO, eleven nations have M113 vehicles in their forces.

UH-60 Blackhawk Helicopter The UH-60 Blackhawk utility helicopter is used by Turkey, with variants of the UH-60A, the S-70A series, used by the Royal Australian Navy. Additionally, Great Britain has the WS-70 variation of the Blackhawk. Other countries using the UH-60 Blackhawk or variants are Colombia, the Philippines, Saudi Arabia, Jordan (S-70A), and China (S-70C).

M-47 and M-48 Tanks The M-47 and the M-48 are medium armored, full-tracked main battle tanks. Germany, Greece, and Turkey still operate these tanks. Both tanks were originally armed with 90mm cannons. However, many of the M-48's in Germany and Turkey are being fitted with a 105mm cannon. Turkey has purchased 105mm conversion kits from the United States and Germany.

Lance The Lance is a surface-to-surface missile system capable of delivering both nuclear and non-nuclear warheads. The UK and Germany have the Lance, and, along with the Netherlands, Belgium and Italy, they have procured Lance assets from the US under the FMS program. A mix of both nuclear and non-nuclear Lance assets

exist in some NATO countries.

Dragon ATGM The DRAGON is a one-man portable, medium-range anti-tank missile system that was fielded in 1972 for use against mobile and stationary targets. It has a range of 1,000 meters and an 11.2-second flight time. The Netherlands has the Dragon missile system in its inventory.

US NAVY SYSTEMS USED BY NATO ALLIES

Sea King The Sea King has been the Navy standard ASW and multi-purpose helicopter since it was first introduced in 1966. ASW equipment includes active and passive sonobuoys and a lightweight sonar. The SH-3 is currently operational in Belgium, Germany, the UK, and Canada. The SH-3 is now being replaced by the SH-60F.

Harpoon Missile The HARPOON is an all-weather, medium range, stand-off/over-the-horizon missile that is designed for surface and air launch. It provides a high degree of single-round effectiveness against surface ship targets. Among NATO countries, HARPOON has been acquired by Canada, Denmark, the Federal Republic of Germany, Greece, The Netherlands, Portugal, Spain, Turkey, and the United Kingdom.

Torpedo MK-46 The MK-46 Torpedo is a lightweight antisubmarine weapon that can be launched from fixed-wing and rotary aircraft, as well as ships, and is the *de facto* NATO standard weapon in this category. The MK-46 MOD 1 and MOD 2 versions are in the inventories of Canada, France, Greece, Federal Republic of Germany, Italy, Spain, and the United Kingdom. The UK has almost completely phased out MK-46 torpedoes from its inventories and is replacing the assets with the lightweight, British-developed Marconi Stingray torpedo. France and Italy are also both developing separate, indigenous lightweight torpedoes. The MK-46 MOD 5 is an upgraded torpedo that feature improved acoustic performance and countermeasures resistance. Canada, The Netherlands, and Turkey have taken deliveries of MOD 5 torpedoes. Greece, Portugal, and Spain have MOD 5 torpedoes on order. US Navy procurement of the MK-46 has ceased. Procurement is continuing for Foreign Military Sales (FMS) customers. The US Navy will support the MK-46 through the 2012.

Torpedo MK 48 MOD 4 The MK 48 MOD 4 torpedo is a heavyweight, submarine-launched, conventional, dual-purpose, antisubmarine/antisurface warfare weapon. It meets a NATO requirement for an advanced heavyweight torpedo capability and has been procured by NATO allies Canada and The Netherlands, as well as by Australia. Turkey has also expressed interest in acquiring the MK-48. The UK declined to procure the MK-48, opting instead for the British-developed Tigerfish torpedo.

SPARROW Missile (RIM/AIM-7M) The SPARROW missile is a joint US Navy/Air Force program to acquire an improved medium-range, all-weather surface-to-air (RIM) and air-to-air (AIM) weapon. The RIM-7M missile is used in the NATO SEASPARROW missile system and is being acquired by the NATO SEASPARROW consortium that includes Belgium, Canada, Denmark, the Federal Republic of Germany, Greece, The Netherlands, Norway, Portugal, and Turkey. Canada is modifying its missiles for use in the MK-41 VLS. The AIM-7 missile has been acquired by Canada, as well as by Israel, Egypt, and Australia. Switzerland is planning to acquire the AIM-7M for interim use on F/A-18 aircraft (see below), pending acquisition of the Advanced Medium Range Air-to-Air Missile (AMRAAM) in the mid-1990s.

Vertical Launch System (VLS) MK-41 The MK-41 is a shock-resistant, armored vertical launching system that fits under the main deck of a ship and permits rapid launch of guided missiles from arrays of storage "cells." The launch process involves ignition of a rocket motor within the hull of a ship, and venting of exhaust gases upwards through a plenum chamber into the atmosphere. The MK-41 VLS eliminates the problems of weapon handing and movement associated with the rail-launched systems, and increases the quantity of weapons that can be stored in a given volume inside a ship. Canada has acquired the MK-41 VLS, and the Federal Republic of Germany is in the process of acquiring this system.

Light Airborne Multi-Purpose System (LAMPS/MK-III) SH-60B The SH-60B LAMPS/MK-III combines a helicopter with ship sensors, signal processing and weapon systems. The SH-60B carries sonobuoys to detect underwater targets. This system meets NATO Staff Target Specifications of weight and load capability for the NATO Frigate of the 1990s. Spain has acquired six LAMPS MK-III for its FFG-7 class frigates.

Tactical Towed Array (TACTAS) AN/SQR-18 and -19) The AN/SQR-18 and -19 TACTAS systems were developed to support the US Navy sea control mission by providing improved passive detection, classification and tracking capability. The Netherlands and Italy have acquired the AN/SQR-18; Canada and Spain have acquired the AN/SQR-19.

STANDARD Missile 1 (SM-1) The SM-1 is an all-weather, supersonic, surface-to-air missile with a secondary surface-to-surface capability. It is operational in cruisers, destroyers, and frigates. There are two variants, Medium-Range (MR) and Extended-Range (ER). The SM-1 MR variant, and the supporting TARTAR weapons system, have been acquired by France, the Federal Republic of Germany, Italy, The Netherlands, and Spain. The SM-1 ER variant, and the supporting TERRIER weapons system, has been purchased by Italy. SM-1 production was terminated in 1987. The US Navy will

support the SM-1 through the 2000. All future STANDARD missile acquisition by NATO allies will have to come either from US Navy SM-1 inventories via Foreign Military Sales (FMS) with replacement-in-kind, or from upgrading weapon suites to STANDARD Missile 2 (SM-2, see below).

STANDARD Missile 2 (SM-2) The SM-2 is an improved version of the SM-1 that provides cruisers and selected guided missile destroyers with an area defense capability against aircraft and missiles. It is compatible with phased array radars such as AEGIS. The SM-2 improvements include all-digital guidance and a more lethal warhead, as well as a "dual-thrust" rocket motor that allows the missile to be launched from the MK-41 VLS and that provides increased speed and longer range. The SM-2 Blocks II and III have been acquired by Canada for use with a TARTAR fire control system. Other NATO countries are actively pursuing shipboard weapons programs that could incorporate SM-2.

High-Speed Anti-Radiation Missile (HARM) The HARM is a US Navy/Air Force weapon system designed to suppress and/or destroy land- and sea-based radars associated with hostile air defense systems. It has a broad frequency coverage in a single seeker head, coupled with an airframe capable of high speed and long range. HARM provides a significant improvement over earlier generation SHRIKE and STANDARD ARM weapons. The HARM has been sold via FMS channels to the Federal Republic of Germany and Spain.

F/A-18 HORNET Strike-Fighter Aircraft The F/A-18 HORNET strike-fighter is a highly automated, twin-engine jet aircraft that is capable of performing dual fighter and attack air missions. It has replaced the F-4 and most A-7s in Navy/Marine Corps fighter and attack squadrons. The HORNET aircraft has strong growth potential, including improved reconnaissance and night attack capability. Its aircraft carrier suitability makes it an ideal platform for austere environments, including short or damaged runways fitted with arresting gear. The F/A-18 has been acquired by Canada (designated CF-18) via commercial purchase from the US manufacturer. Spain has acquired the F/A-18 (designated EF-18) via FMS from the US Navy. The Federal Republic of Germany is in the process of integrating the AN/APG-65 radar of the F/A-18 into FRG F-4 aircraft. France considered acquiring F/A-18s as interim replacements to its obsolescent, carrier-based F-8 aircraft, but opted instead for an F-8 upgrade pending development of the Dassault Rafale. Outside NATO, Australia has acquired F/A-18s via FMS and coproduction. Also, Kuwait has committed to procure the F/A-18. Switzerland has selected the F/A-18 as its new air defense fighter, and is in the process of deciding whether or not to accept an FMS case from the US Navy. South Korea has also selected the F/A-18 as its future air defense aircraft, and an FMS/coproduction program is in preparation.

P-3 ORION Patrol Aircraft The P-3 ORION is a land-based, four-engine, turboprop maritime patrol aircraft with the primary mission of antisubmarine warfare (ASW). It is capable of carrying a large variety of conventional ordnance for accurate delivery in a low air-threat environment. Among NATO allies, the P-3 is in service with Canada (designated CP-140 Aurora), The Netherlands, Norway, Portugal, and Spain. The follow-on system to the P-3, the Long Range Air ASW-Capable Aircraft (LRAACA), is being evaluated by Canada, the Federal Republic of Germany, and Italy.

Super Rapid-Blooming Offboard Chaff (SRBOC) SRBOC is a shipboard defensive system intended for use against antiship missiles by presenting a false target to incoming missile seeker heads. Belgium, Canada, the Federal Republic of Germany, The Netherlands, Portugal, and Spain have acquired SRBOC.

OLIVER HAZARD PERRY Class Frigates (FFG 7) Spain is building four ships based on the design of the US Navy FFG-7 class ships.

SIDEWINDER Missile (AIM-9L and -9M) The SIDEWINDER is a short-range, heat-seeking air-to-air missile that has been continuously improved since its development at NWC China Lake, California in the 1950s. The AIM-9L has been sold through FMS channels as well as produced and widely sold by a consortium led by the Federal Republic of Germany and including Italy, Norway, and the United Kingdom. Other NATO/European countries that have acquired AIM-9L are Belgium, Canada, Denmark, Greece, The Netherlands, Spain, Sweden, Switzerland, and Turkey. The AIM-9M has been acquired by Belgium, Canada, The Netherlands, and the United Kingdom.

PHALANX Close-In Weapon System (CIWS) The PHALANX CIWS is a ship-mounted anti-air gun system consisting of a six-barrel 20mm Gatling gun, search and track radars and a high-speed digital computer. PHALANX is designed to maximize accuracy of its extremely dense, depleted uranium or tungsten ordnance against incoming hostile targets by eliminating intersystem alignment errors. CIWS is essentially self-contained in a rugged, integrated modular structure which facilitates extremely short reaction time for search, track and engagement of targets. This system is the last line of defense of a ship against airborne threats. Among NATO allies, the PHALANX CIWS has been acquired by Canada, Greece, Portugal, Turkey, and the United Kingdom.

DDG-2 Guided Missile Destroyer Since 1960, the US has commissioned 23 DDG-2's, of which three were sold to Germany and three were sold to Australia. The DDG-2's primary mission is Anti-Air Warfare, but it is a multi-purpose ship. Although the US is decommissioning the DDG-2, the various systems, missiles, guns and search sensors on board will continue to support standardization with our NATO Allies.

SECTION VII

US AIR FORCE SYSTEMS USED BY THE NATO ALLIES

The following USAF programs continue to show potential for procurement by NATO allies. Some are already being procured by the Allies and have been discussed in more detail in preceding sections of this report.

C-130 Hercules. Still in production almost 40 years after Tactical Air Command issued its original design specification, basic and specialized versions of the C-130 Hercules continue to perform diverse roles worldwide, although it is primarily used for airlift support. Nearly every NATO Air Force operates the C-130, and with ongoing updates and modifications, these aircraft will perform well into the next century. Portugal, Italy, Greece, Denmark, Canada, Spain, the United Kingdom, France, Belgium, and Turkey have C-130's.

F-4 Phantom II. Although the F-4 continues to be replaced by the F-15 and F-16 in active USAF units, hundreds are still operational in US and allied Air Forces. Designed in the mid-1950s, the F-4 has moved to a predominantly air-to-ground role, although it retains residual air-to-air capability. Continuous updating, including recent navigation and weapons delivery-system modifications, has maintained the effectiveness of the F-4. The United Kingdom, the Germany, Turkey, Greece and Spain have F-4's.

F-5. In 1954, Northrop decided to develop a low-cost lightweight supersonic fighter, at a period when fighter aircraft were becoming increasingly heavy and expensive. The highly successful F-5 was eventually acquired by seventeen foreign air forces, and it is still assigned to fighter ground attack duties in six NATO air forces. Greece, Turkey, Canada, the Netherlands, Norway and Spain still fly the F-5. Spain's F-5's are being upgraded with laser rangers and improved avionics.

F-104 Starfighter. Greece and Turkey have maintained large inventories of F-104's by acquiring surplus aircraft from other NATO Air Forces. In addition, 160 Italian Air Force F-104's have been undergoing a major weapons system update since 1982. Italy's F-104's will receive lookdown/shootdown radar, advanced ECM capability, an improved IFF and altitude reporting system, an improved electrical system, an armament computer and a new automatic pitch control computer.

A-7 Corsair II. Sixty land-based A-7H Corsair II's were delivered to Greece in 1975-77 for tactical support of maritime operations. Forty-three A-7P's were delivered to Portugal in the early 1980s, primarily for a ground attack role. Portugal's A-7's are refurbished USN A-7A's.

Harrier AV-8A/B. Spain and Italy have the Harrier AV-8A/B. This system is identical to the UK version of the Harrier, but it was produced by the US.

C-135FR Tanker. Like the KC-135 Stratotankers of the Strategic Air Command, the eleven C-135FR's of the French Air Force have had their lower wing skin renewed to make possible another 25,000 flying hours. In addition, they were re-engined with CFM56 Turbofans in April 1988. All C-135FR's are equipped for both flying-boom and probe-and-drogue refuelling, which enables them to service all types of combat aircraft flown by the French Air Force.

F-16 Multinational Fighter Program. The European Participating Governments (EPG) consortium to produce the F-16 was formed in 1975 by Belgium, Denmark, The Netherlands and Norway. To date, the consortium has produced approximately 475 aircraft. Production is currently scheduled to continue through 1992 with an expected total of 517 aircraft. Discussion continues with the consortium towards an MOU on the F-16 Mid-life Update Program. Greece recently purchased 40 F-16C/D's and Turkey has contracted for 160 F-16C/D aircraft with deliveries lasting through 1994. In total, 14 countries are buying the F-16 through FMS.

NATO Airborne Early Warning and Control (AEW&C) Program. Thirteen NATO nations are participating in the NATO AEW&C Program. NATO has acquired 18 NE-3A aircraft through the joint-ownership program. In addition, 37 modified Air-Defense Ground Environment sites have been accepted, thus providing the capability to integrate the NE-3A air picture with ground radar data. The UK and France have also decided to acquire E-3's, and deliveries will begin in 1991.

NAVSTAR Global Positioning System (GPS). While ten NATO nations are active participants in the NATO GPS Program, only Norway, Germany and Canada have procured user equipment. Several other nations are planning to procure equipment and are participating in the operational test program. Testing of user equipment is being performed by Canada, Denmark, Germany, the Netherlands, Norway, and the UK.

Joint Tactical Information Distribution System (JTIDS). This system was adopted as the ECM-resistant communications system for the NATO AEW&C Program. Standardization and interoperability efforts are continuing under the aegis of the NATO MIDS Project Group.

AGM-65 MAVERICK. The MAVERICK missile is a self-guided, rocket-propelled, air-to-surface missile designed to destroy small, hard tactical targets in the close-air support, interdiction, defense suppression and counter-air operations of tactical air

forces. Several allied countries, including Germany, Greece, Portugal and Turkey have purchased TV Maverick (AGM-65A/B) through FMS cases. An MOU is also in existence for coproduction of the AGM-65D with Italy leading a NATO consortium.

The development of this missile began in 1968 and has resulted in a "family" of terminal guidance seekers mated to a common center/aft section. The television (TV) version provides a daylight launch-and-leave capability. Production missiles delivered include the AGM-65A (TV) and the AGM-65B (TV-scene magnification) MAVERICK. The AGM-65D Imaging Infrared (IR) MAVERICK provides a day/night under-adverse-weather weapon system while retaining the launch-and-leave capability of the basic TV MAVERICK. AGM-65D production was initiated in September 1982. The AGM-65F and G missiles use the imaging infrared seeker with a 300 lb blast/fragmentation warhead; the F model is designed for Navy use against ship targets, while the G model is for USAF use against selected land targets as well as ship targets.

HAVE QUICK and HAVE QUICK II. This UHF jam-resistant voice communications system has been adopted as the NATO standard and licensed to several non-NATO allies. STANAGs for HAVE QUICK and HAVE QUICK II have been ratified, HAVE QUICK has been widely fielded, and several nations have begun fielding HAVE QUICK II hardware. The US HAVE QUICK contractor, Magnavox, has established a consortium of companies within NATO that is producing HAVE QUICK equipment under license.

Electronic Countermeasure Pods. Electronic countermeasure pods are externally mounted jammers carried by most USAF fighter aircraft such as the F-16, F-111, F-4, A-10, and the A-7, as well as numerous aircraft of our Allies. Fielded inventory includes the ALQ-119 and ALQ-131 Block I, the ALQ-131 Block II and ALQ-184 pods. They provide defensive jamming against air-defense network threats.

VIII. COOPERATIVE RESEARCH AND DEVELOPMENT PROGRAMS (NUNN AMENDMENT)

This section responds to the statutory requirement that the Under Secretary of Defense for Acquisition submit to the Speaker of the House of Representatives and Committees on Armed Services and Appropriations of the Senate, a report on the ongoing and proposed international research and development (R&D) projects. The information in this section pertains only to those funds appropriated for "NATO Cooperative Research and Development".

NATO Cooperative Research and Development Funding

	FY86	FY87	FY88	FY89	FY90	FY91
ARMY	10.4	28.6	12.7	74.2	37.1	28.1
NAVY	5.2	20.2	43.2	5.2	46.4	26.7
AIR FORCE	19.6	36.3	15.9	18.0	17.5	21.0
AGENCIES	19.4	36.9	53.2	34.4	17.1	19.7
TOTAL:	**54.6**	**122.0**	**125.0**	**131.8**	**118.1**	**95.5**

The fiscal requirement for FY91 depends on the successful negotiation of MOUs in which agreed funding levels are established by individual participants. The requirement breakdown is as follows:

- Ongoing programs initiated with prior year funds 30.7
- Proposed projects with FY90/91 funds allocated 64.8
- **TOTAL REQUIREMENT** (Administration fund request) **95.5**

The following Section contains three categories. The first consists of all Nunn funded ongoing cooperative research and development programs. This includes both ongoing projects that have no further impact on Nunn funding and those for which additional funding is required. Category two includes proposed projects that are well along and could have FY 90/91 funds allocated for them. Allocation of funding depends on timing, allied participation and extent of work. As indicated above, specific funding levels are not confirmed until the negotiation process has matured to the point of MOU signature. The final category consists of other proposed projects that are under consideration for future interest.

MAJOR ONGOING COOPERATIVE PROGRAMS

AIR FORCE:	FY 90	FY 91
Advanced Avionics Architecture (includes Advance Video Process)	1.3	0.0
Ducted Rocket (with Germany)	0.0	0.0
F-16 Derivative	0.0	0.0
J-Stars (SIDL, SOPROS) SOSTAS	0.0	0.0
NATO Identification System	0.0	0.0
MIDS (Transferred to Navy, effective 16 Jan 90)		
ARMY:		
All Agent Bio/Chemical Detector	7.6	8.1
APGM (cancelled by Congress FY90)		
ARDS	0.0	0.0
CVC2	0.0	0.0
E-O Countermeasures Systems	0.0	0.0
Hawk Mobility Enhancement	1.5	0.0
Laser Standoff Chemical Detector	2.8	0.0
Patriot Multi-Mode Seeker	0.0	0.0
ADA JPO:		
Ada Programming Support Environment	6.0	6.2
DARPA:		
Armor/Anti Armor (Reactive Armor)	0.0	2.5
ASTOVL	0.0	0.0
Enhanced Fighter Maneuverability	0.0	0.0
Non-Acoustic ASW	0.0	0.0
DCA:		
C3 Interoperability (NPIS, NDLA)	0.9	3.9
Post 2000 Tactical Area Communication	3.2	0.0
DIA:		
BICES (ATTG, TADMS)	0.0	0.0
DMA:		
International Map/Chart Data Base	3.0	0.0
NAVY:		
MIDS	9.0	0.0
MPA-90	3.0	4.5
NATO AntiAir Warfare System	0.0	0.0
RIM 116A - Rolling Airframe Missile	4.0	1.0
RPV/MOSP	1.5	4.5
Surface Ship Torpedo Defense	0.0	0.0
TOTAL OF MAJOR ONGOING COOPERATIVE PROGRAMS	**43.8**	**30.7**

AIR FORCE:

PROJECT TITLE: Advanced Avionics Architecture (includes Advance Video Processing)

ALLIES: GE, FR, UK

DESCRIPTION: Encompasses 3 Bi-Lateral projects. Development of 32 and 16-bit processing modules, high speed data bus modules, a video processing module and system couplers.

PROJECT STATUS: FR-US project on schedule.

AGREEMENTS: MOU signed with France 24 Sep 88. GE and UK MOU are in staffing.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	6.9	0.0	1.3	1.3	0.0

PROJECT TITLE: Ducted Rocket Program

ALLIES: FR, GE

DESCRIPTION: Exploratory and/or prefeasibility development of an engine to demonstrate the next generation of ducted rocket technology for medium range air-to-air missiles.

PROJECT STATUS: Development is under way.

AGREEMENTS: MOA signed with GE 14 April 1989, and MOA with FR in staffing.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	0.8	1.4	0.0	0.0

SECTION VIII

PROJECT TITLE: F-16 Derivative

ALLIES: BE, DA, NL, NO

DESCRIPTION: Program objective is to do preliminary design of an aircraft to complement the ATF, meet the mid-1990s threat, and meet the EPGs need for a follow-on fighter. It will also continue to encourage NATO cooperation and interoperability through the existing structure developed under the F-16 MOU.

PROJECT STATUS: Phase I ongoing - study effort.

AGREEMENTS: MOU (Steering Committee Am #44) signed 26 May 1988.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	12.5	0.0	0.0	0.0

PROJECT TITLE: JSTARS (Joint Surveillance Target Attack Radar System) Interoperability - SORPROS and SIDL

ALLIES: NATO, FR, IT, UK

DESCRIPTION: (1) SORPROS - Stand Off Radar Program Studies - goal is to assess the impact of stand off radars in a modern battlefield environment through increased European participation in such cooperative studies. (2) SIDL - SOSTAS Interoperable Data Link - goal is to produce a system specification for a common data link in accordance with the Joint NATO Staff Target.

PROJECT STATUS: Both studies ongoing.

AGREEMENTS: SORPROS MOU signed 15 Dec 88, and SIDL MOU signed 23 March 89.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	2.5	2.0	0.0	0.0	0.0

PROJECT TITLE: NIS - NATO Identification System

ALLIES: Info Exchange = BE, CA, FR, GE, IT, SP, GR, DA
Coop Develop = FR, GE, IT, UK, US

DESCRIPTION: Development of an agreed NATO-wide design standard for the next generation IFF system.

PROJECT STATUS: USAF is reviewing Mark XV in detail, NIS requirement still exists.

AGREEMENTS: Information Exchange MOU signed 16 Jan 87 and Cooperative Development MOU signed 23 Oct 87.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	11.1	1.5	0.0	0.0	0.0	0.0

ARMY:

PROJECT TITLE: All Agent Biological/Chemical Detector

ALLIES: CA, UK

DESCRIPTION: A small lightweight, automatic detector to sample, detect and classify chemical and biological hazards in the air and on surfaces. Represents first field biological agent detection capability within NATO.

PROJECT STATUS: The limiting technology to be demonstrated is feasibility of sensors to respond to threat chemical and biological agents. UK is developing the Ion Mobility Spectrometry. Canada is developing the Aerosol Module for Air Sampling. US is developing the main frame chassis module and the biodetection module.

AGREEMENTS: CB defense MOU APR 80 is in place. Annex 3 now in OSD.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	0.0	0.0	7.6	8.1

SECTION VIII

PROJECT TITLE: ARDS - Airborne Radar Demonstration System

ALLIES: FR, UK

DESCRIPTION: Program to demonstrate interoperability of UK Astor airborne component and FR Orchidee system with US Army ground station component of JSTARS.

PROJECT STATUS: Hardware and Software interfaces for the participating systems have been installed and tested. Demonstrations will be conducted through 1991.

AGREEMENTS: MOU signed 1 August 1986.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	9.9	7.8	0.0	0.0	0.0	0.0

PROJECT TITLE: CVC2 - Combat Vehicle Command and Control

ALLIES: GE

DESCRIPTION: Technology development to provide embedded C2 and cockpit automation for ground combat vehicles under the (BMS) umbrella concept for M1A1 and Leopard 2. Focus on combat vehicles at battalion level. Compliments current C3I program. Provides capability for reporting locations/situations assessment, coordinating attack maneuvers, targeting, etc.

PROJECT STATUS: SIMNET-D experiments showed marked improvements in combat effectiveness. Company level experiments in process. Contract to integrate into M1A2 underway.

AGREEMENTS: MOU 12 September 1988. MOU Appendix (GE) to M1/LEOP 2 Harmonization agreement DEC 74. DEA 86-FR-1342. France and UK have an interest. Negotiating MOU modification for UK to join CVC2 program

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	6.6	5.3	12.4	0.0	0.0

PROJECT TITLE: Electro-Optic Countermeasure Systems

ALLIES: GE

DESCRIPTION: An initial side-by-side demonstration of U.S. and UK systems, and technical data exchange to explore feasibility of incorporating some of the UK design features to increase the capability of U.S. systems. (Cameo, Blue Jay, Stingray, Coronet Prince).

PROGRAM STATUS: Previous information exchange under IEP ties in with the Navy laser based-EO/IR detect systems and with Stingray, Cameo Blue Jay and Coronet Prince.

AGREEMENTS: MOU 23 June 1988.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	10.5	1.8	8.3	0.0	0.0

PROJECT TITLE: Hawk Mobility Enhancement (HME)

ALLIES: NL

DESCRIPTION: Replacement for the Hawk loader/transporter and modification to the Hawk launcher system. Developing a new manipulator for transferring missiles to the launcher and increased transport capabilities.

PROGRAM STATUS: Plan is for NL to develop loader/transporter and US to develop launcher. Contract awarded September 1989. TDP to be completed 3/90. A separate contract is planned to allow for the independent orientation and alignment of each Hawk major end item

AGREEMENTS: MOU 19 June 1987.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.4	3.1	3.0	1.5	0.0

SECTION VIII

PROJECT TITLE: Laser Standoff Chemical Detector

ALLIES: FR

DESCRIPTION: A small, lightweight chemical contamination sensor for NBC reconnaissance vehicles (ground/air) 3-5KM range, able to quickly map terrain, showing type, location and concentration of contaminant.

PROJECT STATUS: FR is increasing laser power and improving their current vapor algorithm. US is emphasizing the aerosol and surface algorithm development.

AGREEMENTS: MOU 28 September 1988.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	2.0	1.5	4.5	2.8	0.0

PROJECT TITLE: Multi-Mode Seeker Demonstration

ALLIES: GE

DESCRIPTION: The development of an advanced missile to counter tactical ballistic missiles (TBMs), by integrating advanced G&C, warhead, fuze, and C3I into the existing patriot missile system. Also called Multi-Mode Seeker portion of Extended Air Defense.

PROGRAM STATUS: Contract awarded to Raytheon 7/89. Initiating design work to incorporate an active Seeker into the Patriot Missile. GE contractor has delivered millimeter wave transmitter to be used in seeker development.

AGREEMENTS: MOU signed 17 May 1989.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	0.0	45.0	0.0	0.0

ADA JPO:

PROJECT TITLE: Ada Programming Support Environment

ALLIES: BE, CA, DA, FR, GE, IT, NL, NO, SP, UK

DESCRIPTION: Uses the common Ada Programming support environment interface set on the foundation for APSE that will support transportability of data, and the reduction of soft ıre lifecycle costs.

PROGRAM STATUS: Completion of the critical review. Viable changes in the second architecture and additional allied support.

AGREEMENTS: MOU November 26, 1986 with first two countries (becomes effective with each country as that country signs the MOU).

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	1.9	7.5	3.3	3.4	6.0	6.2

DARPA:

PROJECT TITLE: Armor/Anti-Armor (Reactive Armor)

ALLIES: UK, FR, GE

DESCRIPTION: This is compilation of 3 separate projects: 1) Advanced Armor Protection Systems, 2) Reactive Armor, 3) Tandem Warheads Armor/Anti-Armor Chemical Energy Warheads.

PROJECT STATUS: 3 projects underway.

AGREEMENTS: MOU signed 16 February 1986 with FR.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	10.8	13.0	0.0	2.5

SECTION VIII

PROJECT TITLE: ASTOVL - Advanced Short Takeoff - Vertical Landing Aircraft

ALLIES: UK

DESCRIPTION: Technology demonstration of short take off and landing aircraft. Development of hot gas ingestion, propulsion lift generation, and thrust deflector nozzle technology.

PROGRAM STATUS: Active project involving DARPA, Air Force, Navy and NASA relating to engines and different configurations. Project on-going for 3 years.

AGREEMENTS: MOU signed 23 January 1986.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	7.0	7.5	0.0	0.0	0.0	0.0

PROJECT TITLE: Enhanced Fighter Maneuverability Demonstrator X31

ALLIES: GE

DESCRIPTION: To build a technology demonstrator for advanced fighter maneuver technology. To increase fighter aircraft agility and improve close in exchange ratios.

PROGRAM STATUS: 1st aircraft is 80% complete. 2nd aircraft is 50% complete. First flight in spring of 1990.

AGREEMENTS: MOU signed 16 May 1986.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	10.5	21.7	7.0	0.0	0.0	0.0

PROJECT TITLE: Non-Acoustic ASW

ALLIES: UK, GE, NO

DESCRIPTION: To conduct research into electro-magnetic and optical sensors to detect submarines or their signatures in the ocean with emphasis on Radar and Lasers.

PROGRAM STATUS: Many equipment analysis near completion. Further tests underway. Will run thru FY91.

AGREEMENT: MOU signed 21 June 1988 Norway. MOU signed 5 May 1989 with UK.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	18.0	10.0	0.0	0.0

DCA:

PROJECT TITLE: C3 Interoperability (NPIS)

ALLIES: FR, GE, NL, NO, SP, UK

DESCRIPTION: This program will create NATO procedural and technical interface standards for data systems and their supporting communication systems (E.G., MIDS, JTIDS, BICES).

PROJECT STATUS: Project management group convened first meeting in March 1989 to develop/finalize TOR and reporting requirements.

AGREEMENTS: MOU signed 30 December 1988.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	0.0	3.5	0.9	3.9

SECTION VIII

PROJECT TITLE: Post 2000 Tactical Area Communications

ALLIES: CA, FR, IT, UK, GE, NL, NO, SP

DESCRIPTION: A tactical communications system designed to common standards to meet the requirement for the Land combat zone-post 2000.

PROGRAM STATUS: MOU has been signed by nine nations including U.S.

AGREEMENTS: MOU signed 6 July 1988 (effective date). MOU signed 18 September 1988 (last signature). SOI 14 April 1987.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	1.3	0.0	3.2	0.0

DIA:

PROJECT TITLE: BICES - Battlefield Information Collection and Exploitation System/TADMs

ALLIES: PO, SP, UK

DESCRIPTION: Provides NATO and US operating commanders with common, current, and dynamic pictures of enemy dispositions. Combines communication and intelligence systems (an umbrella of systems) for integration into ACE ACCIS. Connected to NMOS and ACCS.

PROJECT STATUS: Technical evaluations to define methods and tool for specifying large C3 systems and continued developing of a survivable testbed.

AGREEMENTS: MOU signed 18 July 1988.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	5.3	0.0	0.0	0.0

DMA:

PROJECT TITLE: Digital Chart of the World International Map and Chart Database

ALLIES: AS, CA, UK

DESCRIPTION: Establish standards that will ensure interoperability of shared digital spatial information among allies, develops uniform data base applications software using these standards, and produces an interoperable digital mapping, charting and geodesy product. Needed by our fighting forces of the 1990s.

PROGRAM STATUS: Initial project review held 11/89. First prototype Data Set sent for evaluation 12/89.

AGREEMENTS: MOU with CA 13 July 1985 and Amend 1 signed, 1 February 1989. MOU with UK 13 July 1985 and Annex Q signed 23 February 1989. MOU with AS in final negotiations.

FUNDING:	FY86	FY87	FY88	FY89	FY90	FY91+
	0.0	0.0	6.5	3.5	3.0	0.0

NAVY:

PROJECT TITLE: MIDS - Multi-Functional Information Distribution Systems

ALLIES: IT, FR, GE, SP

DESCRIPTION: Smaller, lighter, lower cost terminal, functionally equivalent to the JTIDS class 2 terminals.

PROGRAM STATUS: Completed project definition phase (Oct. 88) - assessment of cost/benefit/technology risk to expedite entry to full scale engineering development. Congress specifically funded in FY89. 90 study underway to prepare for phase II MOU.

AGREEMENTS: MOU phase I December 1986 (CA, DA, SP, UK, US), 14 July 1987 (IT). MOU phase II expected FY90. SOI February 1987.

FUNDING:	FY86	FY87	FY88	FY89	FY90	FY91+
	8.5	5.0	0.0	14.3	9.0	0.0

SECTION VIII

PROJECT TITLE: Maritime Patrol Aircraft 90

ALLIES: GE

DESCRIPTION: Two-pronged effort to counter the Soviet submarine threat of the 1990's and beyond. Project includes updated avionics package and a new MPA airframe. Avionics portion is titled update IV and aircraft portion is titled LRAACA. Replace P-3.

PROJECT STATUS: General harmonization MOU signed. Avionics entered FSED July 1987 (Boeing). Airframe entered FSED January 1989 (Lockheed). Development phase MOU has Authority to Conclude, but is not signed.

AGREEMENTS: DEA 82-G-4231. General Harmonization MOU signed 5 April 1989. FSD MOU in negotiations.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	1.0	0.0	3.0	4.5

PROJECT TITLE: NATO AAW - Anti-Air Warfare System

ALLIES: CA, NL, SP

DESCRIPTION: Joint effort by the NATO nations in NFR-90 to develop an AAW suite to meet the expected air threat of 1995 and later. Deployable on frigate-sized ships and larger. Development of a local area missile system and multifunction radar.

PROJECT STATUS: Contracts awarded May 1988. Program office established in Washington D.C. with US officer as PM. RAN submitted for phase II (D&V) September 1988. MOU package submitted to OSD November 1989. UK/GE announce withdrawal Nov/Dec 1989. Will restructure because of withdrawal.

AGREEMENTS: Concept exploration phase MOU signed 19 October 1987. Demonstration and validation phase MOU has been negotiated and RAC is being submitted.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	3.6	10.6	9.0	0.0	0.0	0.0

PROJECT TITLE: RIM-116A - Rolling Airframe Missile (RAM)

ALLIES: GE

DESCRIPTION: High firepower, lightweight, self-defense missile system which will improve shipboard capability to engage and destroy anti-ship missiles. 5 inch diameter missile uses a dual mode passive radio frequency/IR guidance system.

PROJECT STATUS: RAM is in FSED under three power MOU, March 1979. DA is observer on RAM steering committee. NUNN project is to provide IR all the way capabilities.

AGREEMENTS: MOU signed 3 Aug 1987. Phase 1 feasibility pre-design MOU signed 16 August 1989.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	0.0	2.6	0.0	4.0	1.0

PROJECT TITLE: MOSP for RPV Multi-Mission Optronic Stabilized Payload

ALLIES: IS

DESCRIPTION: Develop an enhancement of the Israeli pioneer RPV which features TV and forward looking infrared (FLIR) payloads for use in laser designation, radio relay, and signet.

PROGRAM STATUS: Change in DoD RPV requirements eliminated the vehicle that MOSP was designed for. MOSP is in development in Israel. Lack of suitable RPV to carry payload is causing US to reevaluate program. Discussions with Israel concerning this issue are in-process.

AGREEMENTS: SOI December 1986. MOU signed June 7, 1988.

FUNDING:	**FY86**	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
	0.0	1.1	2.7	0.0	1.5	4.5

SECTION VIII

PROJECT TITLE: SSTD - Surface Ship Torpedo Defense

ALLIES: UK

DESCRIPTION: Program involves development of new acoustic sensors and countermeasures to detect, track, and divert incoming torpedoes.

PROGRAM STATUS: Project is on-going with a projected IOC of FY96+. Negotiations scheduled began 3/90 to address FSD cost shares.

AGREEMENTS: SOI July 1986. MOU signed 26 October 1988. FSD scheduled for July/August 1990 start.

FUNDING:

FY86	**FY87**	**FY88**	**FY89**	**FY90**	**FY91+**
0.0	2.0	11.4	4.6	0.0	0.0

HIGH PRIORITY PROPOSED PROJECTS SCHEDULED FOR FY90/91 FUNDS:

AIR FORCE:

Aircraft Shelter Upgrade
Cooperative Communication Network
OTH Radar
Senior Guardian
Super Cockpit Interface

ARMY:

Electro-Thermal Gun Technology
Future Tank Main Armament
MSAM

DEFENSE:

EM Gun Vehicle Integration

NAVY:

AV-8 Radar
Coastal Harbor Defense
E-2C Display Hardware
Fiber-Optic Sensor Array
Closed Loop Degaussing System
Magnetic Anomaly Detector Sonobouy
Mass Memory Module
NATO Mechanical Mine Sweeper
Radar Upgrade for Fighter Aircraft

	FY90	FY91
TOTAL OF HIGH PRIORITY PROPOSED PROGRAMS	74.3	64.8
TOTAL OF MAJOR ONGOING COOPERATIVE PROGRAMS	43.8	30.7
GRAND TOTAL	118.1	95.5

SECTION VIII

AIR FORCE:

PROJECT TITLE: Aircraft Shelter Upgrade Program

ALLIES: NO

DESCRIPTION: Develop practical upgrades to existing tactical shelters in Europe and PAC theaters, to test new design concepts for use in construction of future aircraft shelters, and to reduce vulnerability.

PROGRAM STATUS: On hold until MOU is signed.

AGREEMENTS: Awaiting Norwegian signature.

PROJECT TITLE: Cooperative Communication Network

ALLIES: AS

DESCRIPTION: Provides real systems with which global, distributed processing operating systems can be exercised, evaluated and further developed. Packet switched facilities to be used for R&D of each countries requirements.

PROGRAM STATUS: On hold awaiting Project Arrangement signature.

AGREEMENTS: Project Arrangement awaiting Australian signature.

PROJECT TITLE: OTHR - Over the Horizon Radar

ALLIES: AS

DESCRIPTION: Evaluate the sources of and characteristics of residual clutter in OTH Radars, associated limits on target track establishment performance, and the potential mitigation techniques applicable to current and future OTH Radars.

PROGRAM STATUS: Awaiting MOU signature.

AGREEMENTS: MOU in OSD for staffing.

PROJECT TITLE: Senior Guardian

ALLIES: GE

DESCRIPTION: R&D in the field of data link command and control (Classified Program).

PROGRAM STATUS: GE foreign military sales program progressing, and technical discussions have occurred on cooperative portion.

AGREEMENTS: Authority to Negotiate received from OSD. Awaiting GE response and negotiation.

ARMY:

PROJECT TITLE: Electro-Thermal Gun Technology

ALLIES: GE

DESCRIPTION: Provides improved weapon performance. Technology consist of gun, powder supply and munitions developed for future systems. Modify tank armament to accommodate hi performance ET.

PROGRAM STATUS: Technology discussions underway.

AGREEMENTS: MOU in OSD. May combine with Hypervelocity Projectile.

PROJECT TITLE: Future Tank Main Armament (LW 120mm)

ALLIES: UK, GE, FR

DESCRIPTION: Hardware development for new main armament system for tanks to yield a minimum interchangeable ammunition. Some components under consideration are communications, gun, autoloader, and fire control. Phase I will be the execution on a self reliant basis of work packages which will reduce the overall expenditure and risk of each participant.

PROGRAM STATUS: Some US preliminary work is underway.

AGREEMENTS: SOI 25 September 1988. MOU negotiation completed. UK and FR signature expected May 90 followed by GE.

SECTION VIII

PROJECT TITLE: MSAM - Medium Surface to Air Missile

ALLIES: GE

DESCRIPTION: Program initiated in 1986 for international consideration to develop Surface to Air Missile.

PROGRAM STATUS: Funds were reinstated by Congress in FY 90.

AGREEMENTS: Cocperative Program will be initiated to reduce technical risk and to further define and evaluate the most promising candidate.

DEFENSE:

PROJECT TITLE: Electro-Magnetic Gun for Armored Vehicles

ALLIES: UK

DESCRIPTION: A turbine-driven generator is built into the turret of an Armored vehicle to drive an EM Gun in the 10-12 mj range.

PROGRAM STATUS: New U.S. project. MOU on EM Gun in place for SDI could be modified for tactical applications. Builds on UK turbine generator design.

AGREEMENTS: MOU signed 12 October 1989.

NAVY:

PROJECT TITLE: AV-8 Radar

ALLIES: IT, SP

DESCRIPTION: Integration of APG-65 into AV-8B Harrier to provide USMC and allies with air-to-air capabilities.

PROGRAM STATUS: Considerable interest from Spain.

AGREEMENTS: MOU has been negotiated with Spain and Italy. RAC is in Navy staffing.

PROJECT TITLE: Coastal Harbor Defense

ALLIES: KS

DESCRIPTION: Project will provide acoustic and magnetic environmental measurements of 7 ROK harbors and approaches leading to development of a harbor/coastal defense system.

PROGRAM STATUS: A TOR exists for shallow water barrier system 098R/65353895. DEA-4517 with ROK will cover preliminary work. Will result in hardware and designs. Congress deleted funds in FY90 program.

AGREEMENTS: DEA 72-K-4501, and DEA 84-K-4517. SOI signed May 1988. MOU in draft. Authority to negotiate signed 1/8/90. Negotiations are complete.

PROJECT TITLE: E-2C Software Enhanced Display System

ALLIES: EG

DESCRIPTION: Enhanced main display unit in the E-2C aircraft. Increases tracking ability from 250 to 1600. Includes design, coding, integration and test of Egyptian computer program.

PROGRAM STATUS: Egypt will develop E2C tactical software to capitalize on capability of enhanced main display hardware. MOU is in negotiation phase.

AGREEMENTS: SOI signed. MOU is in staffing as of April 1990.

PROJECT TITLE: Fiber-Optic Sensor Array

ALLIES: NO

DESCRIPTION: Develop a Fiber-Optic Magnetic Sensor Array for surveillance systems. This project is for anti-submarine warfare application.

PROGRAM STATUS: MOU is in draft. FSED with CA signed January 1983. Engineering development will be completed in FY91. Full-scale production planned in FY92.

AGREEMENTS: DEA 73-N-5207. SOI signed February 1988. System definition and test plan phase MOU has been negotiated. RAC has been forwarded to OSD.

SECTION VIII

PROJECT TITLE: Closed Loop Legaussing System

ALLIES: FR

DESCRIPTION: Develop Mine Countermeasures Ship. Development of a Closed Loop Degaussing system that will automatically reduce static magnetic field sensors, degaussing electrical controller hardware, and control algorithms/software.

PROGRAM STATUS: SOI signed February 1988. RAC is in staffing. Estimated that development will be completed in six years with an IOC in eight years.

AGREEMENTS: DEA 64-FR-5620. SOI signed February 1988. System definition and test plan phase MOU negotiations are complete. RAC has been forwarded to OSD.

PROJECT TITLE: MAD Sonobuoy

ALLIES: FR

DESCRIPTION: Three phased development effort to provide a Non-Acoustic expendable Sonobuoy using a Nuclear Magnetic Resonance (NMR) Sensor. Will supplement detection, localization and classification capabilities for passive and active acoustics.

PROGRAM STATUS: French DCNO and USN Op-098 signed SOI December 1987. RAC package is in staffing. DEA will act as conduit of information flow until MOU is in place.

AGREEMENTS: DEA 76-F-5644. MOU in draft. SOI December 1987. MOU negotiations are complete. RAC has been forwarded to OSD.

PROJECT TITLE: Mass Memory Module

ALLIES: CA

DESCRIPTION: Project to define, design, and develop a replacement for rotating magnetic drums used for bulk memory storage of operational computer programs for ASW missions on S-3 and CP-140 aircraft. Initial platforms are S-3 and CP-140.

PROGRAM STATUS: MOU is in staffing as of March 1989. Two year development program is anticipated. The program will be integrated with a project agreement under the CA/US defense development sharing program.

AGREEMENTS: SOI December 1987. Project Agreement is in negotiations.

PROJECT TITLE: NATO Mechanical Mine Sweeper

ALLIES: FR, IT, SP, TN

DESCRIPTION: A surface mine countermeasure mechanical minesweeper that will be the prime candidate as the single ship deep phase II.

PROGRAM STATUS: Five nations indicated interest. Feasibility study underway.

AGREEMENTS: MOU is in negotiations.

PROJECT TITLE: Radar Upgrade for Fighter Aircraft

ALLIES: AS, CA

DESCRIPTION: Updating three parts of APG-65 radar: Receiver-Exciter, Radar Data Processor, Radar Signal Processor. Memory, throughput, and speed will all be improved giving radar growth potential in ECCM capability.

PROGRAM STATUS: CA recently signed bilateral MOU with US to initiate APG-65 radar upgrade effort. AS dropped out of the initial MOU negotiations, but recently indicated an interest in joining the program.

AGREEMENTS: MOU signed 30 March 1990. MOU contains provisions for accession of other nations.

PROPOSED PROJECTS FOR FUTURE INTEREST:

AIR FORCE:

Alaskan C2 Military Automated Network
EHF Satellite Communication System
Imagery/Information Reformatter System
Space Based Radar

ARMY:

Alternate Multi-Mode Seeker
CONDOR - Covert Night/Day Operation in Rotercraft

DEFENSE:

Autonomous Minehunting Vehicle
Joint Project for Information Fusion
Multifrequency Radar

NAVY:

Anti-Ship Missile Countermeasures
Automatic Ship Classification
Combined Interoperability Program (CIP)
Communications Systems Network
Continuous Composite Propellant Processing
Interface Control for Modular Installation
Low Frequency Active Sonar
Night Attack Avionics
Tactical Command for OTH Radar

AIR FORCE:

PROJECT TITLE: Alaskan Command and Control Military Automated Network

ALLIES: CA

DESCRIPTION: Information systems development incorporating data gathering, message processing and situational displays.

PROGRAM STATUS: MOU in work and technical discussions with CA ongoing.

AGREEMENTS: MOU being drafted by ACC.

PROJECT TITLE: EHF Satellite Communication System

ALLIES: CA

DESCRIPTION: US and CA have requirements for wide-band, secure, survivable communications. Technology base research requirement for antenna development, thin film superconductivity microwave ic's, modulator receiver development, anti-jam techniques, and laser communications.

PROGRAM STATUS: Technical discussions ongoing.

AGREEMENTS: MOU in staffing.

PROJECT TITLE: Imagery/Information Reformatter

ALLIES: FR

DESCRIPTION: Develop, test, evaluate, and produce an advanced development model NATO I2R to allow interoperability among NATO imagery reconnaissance systems.

PROGRAM STATUS: UK was initially interested, but has now withdrawn. Technical discussions with FR are scheduled for 21-22 February 1990.

AGREEMENTS: Draft MOU is in OSD staffing.

PROJECT TITLE: Space Based Radar

ALLIES: CA

DESCRIPTION: Define a system and demonstrate critical technologies needed to satisfy Canadian and US requirements.

PROGRAM STATUS: FY90 funding was deleted by Congress. The program is being restructured for possible submittal as a new project. Separate on-going SBR technology programs are occurring with some bilateral technical discussions.

AGREEMENTS: MOU awaiting program resolution.

ARMY:

PROJECT TITLE: Alternate Multi-Mode Seeker

ALLIES: GE

DESCRIPTION: Will address the implementation of an active seeker into the Patriot missile to improve system performance against the projected threat. It refines and finalizes the design of a multimode seeker prepared under a previous contract.

PROGRAM STATUS: In Army staffing.

AGREEMENTS: Draft MOU is in staffing.

PROJECT TITLE: CONDOR - Covert Night/Day Operation in Rotercraft

ALLIES: UK

DESCRIPTION: Integration of sensor (Image Intensification and Forward-Looking Infra-Red) and pilotage information into a wide field of view, color, helmet mounted display, plus laser eye protection with virtual cockpit display.

PROGRAM STATUS: SOI likely. UK is extremely interested in program.

AGREEMENTS: No MOU exists for this effort.

SECTION VIII

PROJECT TITLE: Communications Systems Network

ALLIES: CA, FR, NL, and UK

DESCRIPTION: To develop advanced networking technologies and to test and evaluate results in a full-scale feasibility demonstration leading to NATO C3 systems.

PROGRAM STATUS: Technical discussions. Likelihood of follow-on is high.

AGREEMENTS: Technical discussions. MOU is in draft.

PROJECT TITLE: Continuous Composite Propellant Processing

ALLIES: FR

DESCRIPTION: Adaptations on French techniques to develop a capability to continuously process composite propellants to meet this need. The system will be safer and less expensive than current processes.

PROGRAM STATUS: Technical discussions underway to coordinate expected tasks.

AGREEMENTS: DEA 84-F-5660 in effect. MOU in draft.

PROJECT TITLE: Interface Control for Modular Installation

ALLIES: GE, UK, CA, DK, JA

DESCRIPTION: Development of standard modular subsystems interface definition documentation in future allied amphibious ships. Promotes further development of the modular concept for ship warfare and HM&E subsystems.

PROGRAM STATUS: No MOU exists. DEAs exist with GE, UK, CA, and DA that could be used for data exchange. Several US systems are modular designs. Discussions held with JA, GE, UK, CA. Project has been slipped 1 year awaiting funding and OSD approval.

AGREEMENTS: DEA 66-G-4201,, and DEA 72-D-5003. IEP ABC-33. No MOU. SOI signed with Denmark 9/88.

NAVY:

PROJECT TITLE: Anti-Ship Missile Countermeasures

ALLIES: UK

DESCRIPTION: Develop, test, and evaluate countermeasures against potentially hostile anti-ship missiles. Joint development of waveforms, algorithms, and generic tactics.

PROGRAM STATUS: Threat simulation and vulnerability assessment will be completed within six months of MOU signature.

AGREEMENTS: The RAN is awaiting ASN(RE&S) signature.

PROJECT TITLE: Automatic Ship Classification

ALLIES: GE

DESCRIPTION: Development of an airborne system to provide real-time automatic classification of ship targets using radar information. Reduces operator workload and increases timeliness in classifying targets over a large area.

PROGRAM STATUS: Currently in exploratory development. MOU in technical discussion stage. Advanced development start 1990-1991.

AGREEMENTS: MOU in draft.

PROJECT TITLE: Combined Interoperability Program (CIP)

ALLIES: JA, KS, AS

DESCRIPTION: Improves communications between key Pacific allies by implementing US C3 standards. Project consists of developing C3 architectures, procedures, and standards needed for implementation.

PROGRAM STATUS: Discussions of standards under way.

AGREEMENTS: MOU in draft.

PROJECT TITLE: Low Frequency Active Sonar

ALLIES: UK, possibly FR

DESCRIPTION: Develop a shallow-water, long range, prototype equipment for surface ships by adding a low frequency active adjunct to towed arrays. US provides high power active source, electronic driver and test instruments. UK provide array, receiver and ship.

PROGRAM STATUS: USN has moved this program out 2 years and will submit as a new start in FY90.

AGREEMENTS: IEP-B-85.

PROJECT TITLE: Night Attack Avionics (Morning After)

ALLIES: NL, TU, UK

DESCRIPTION: Development of an integrated night combat system with subsystem laboratory/flight testing-advanced sensor fusion, common flat panel displays, night vision helmet, hardening of FLIRs and image intensifiers against LP lasers.

PROGRAM STATUS: US has kept abreast of foreign systems, via FWE and NATO coop test (Cheap Night, Quick Night, and Real Night). RAN is in staffing at ASN (RE&S) as of March 1989. Canada has withdrawn support.

AGREEMENTS: SOI signed with NL, CA, and TU October 1987. SOI signed with UK in July 1988. CA has withdrawn support. MOU under negotiations.

PROJECT TITLE: Tactical Command for Over the Horizon Radar

ALLIES: AU

DESCRIPTION: Project will use Over the Horizon Radars to relay tactical information to other platforms. Specific investigation areas will be to determine information types to be relayed, connectivity with other sites, and relay methodology.

PROGRAM STATUS: Propose to amend IEP if project is approved. Project will utilize Air Force general MOU as basis for project. Navy will develop annex which covers work for tactical communications.

AGREEMENTS: IEP AA-10. MOU is in negotiations.