The FY 1997 DoD Acquisition and Technology Program

By

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Mr. Chairman, Members of the Subcommittee, and staff, thank you for the opportunity to appear before you today to discuss the Department of Defense Acquisition and Technology Program.

The United States has the best led, trained, and equipped military force in the world today. Since World War II, fielding technologically superior forces has been the cornerstone of our national military strategy. This advantage has allowed our forces to deter, and when deterrence failed, prevail over numerically large enemy forces. Our predecessors invested wisely in technology in the 1960s and 1970s. The result was an overwhelming, swift, decisive victory in Desert Storm and a continuing deterrence of our potential adversaries.

In today's post-Cold War world, our planning must cope with increased uncertainty. We are far less certain about who our future adversaries will be or what technology we will face. In today's global economy, everyone, including our potential adversaries, will gain increasing access to the same commercial technology base. The military advantage will go to the nation which has the best cycle time to capture technologies that are commercially available; incorporate them in weapon systems; and field new operational capabilities.

Mr. Chairman, the strategic focus of the defense acquisition and technology program is on *fielding superior operational capability* and *reducing weapon system life cycle costs*. We have maintained this focus since the Gulf War. As impressive as our military accomplishments were against Saddam Hussein, our forces are qualitatively superior today. We received an inkling of what combat will look like in the 21st century in our support of the NATO combat Operation DELIBERATE FORCE in Bosnia.

In DESERT STORM, only two percent of the weapons expended during the air war were precision guided munitions (PGMs). During the NATO combat Operation DELIBERATE FORCE in Bosnia, PGMs accounted for over 90 percent of the ordnance expended by U.S. forces. We have employed these weapons with great precision. The bomb damage assessment (BDA) photographs in Bosnia bear no resemblance to BDA photos of the past where the target, often undamaged, is surrounded by craters. The Bosnia BDA photos show one crater where the target used to be and virtually no collateral damage. We have moved to one target, two weapons, and are moving to a situation of one target, one weapon. This has been the *promise* for the past 20 years, now it is becoming a *reality*.

Mr. Chairman, I am pleased to report that these capabilities are being fielded at less cost to the American taxpayer. This would not have been possible without the help and support from the Members of this Subcommittee. Working together, the Congress and the Department of Defense have implemented sweeping acquisition reforms that are reducing the life cycle costs of our weapon systems. We now have examples of cost avoidance in the range of 15 to 50 percent. As these savings and cost avoidance opportunities are identified, they are applied

during the Department's budget process. The President's FY 1997 budget request includes the benefits of the Department's on-going program of acquisition reform.

TECHNOLOGY STRATEGY

One point that I made before the subcommittee last year, but one that always needs emphasizing, is that stable, sustained investments in the technology base, technology "on-ramps" and advanced concept technology demonstrations (ACTDs) are essential for military superiority. A long commitment to this strategy is required over years and decades to achieve significant results; it is not possible to wait until advanced technology is clearly needed in a system to begin investment; by then, it is too late.

Today's leading edge systems were made possible through decades of investment in fundamental science and exploratory development work. The technology base initiated in the 1960's and the technology "on-ramps" sustained in the 1970's gave us the stealth aircraft, precision guided munitions, and night vision systems that provided U.S. forces with a decisive combat edge during the 1991 Gulf War. As I pointed out last year, the Air Force's F-117 stealth fighter, so effective in Desert Storm, can be traced to a mathematical formulation for radar scattering from geometric shapes and the development of radar absorbing materials that date back to the early 1960's.

Technology Base: Basic Research

The Basic Research or 6.1 account within the RDT&E appropriation is the source of new knowledge and understanding that ultimately forms the foundation for future military capabilities. Over the 50 years since DoD founded its first basic research office, basic research has sometimes paid immediate dividends, with a transition of technology directly from the laboratory bench to defense systems in the field. For example, last year researchers applied high speed, experimental computational fluid dynamics (CFD) techniques to solve an operational problem encountered on the C-17 airlifter. During certain flight regimes, paratroops deploying on each side of the C-17 would "bump-and-tangle." CFD technology enabled engineers to quickly define the combination of C-17 flight parameters (airspeed and angle-of-attack) that allows paratroopers to safely and simultaneously exit from both sides of the aircraft.

In most cases though, the full benefits of the Department's investment in basic research do not become apparent until much later. It is only in hindsight that we are able to clearly discern the patterns of basic research that spawned revolutionary military capabilities over the past several decades—such as the capabilities provided by the Global Positioning System, ARPANET, night vision, high speed computer chips, lasers, and fiber optics.

The Department's investment in basic research is focused on science and engineering areas with the greatest long-term potential for defense application. Even though DoD's total 6.1 funding is less than ten percent of the Federal investment in basic research, the DoD provides almost two-thirds of total Federal support for basic research in electrical engineering, mechanical engineering, and materials science.

The importance of these DoD investments to national security can not be overstated, as evidenced by the promise of several recent scientific accomplishments. DoD-sponsored basic research has produced a way to make stable, high temperature silicon carbide fibers that can be used to make the parts for a new generation of high performance, low pollution aircraft engines. These engine parts will function at 2000 degrees without degradation—hundreds of degrees hotter than alternative materials. Our fertile nanoscience program has produced

experimental operating transistors with feature sizes of 30 billionths of a meter. Building on this success, we are beginning to control electronic properties on a scale of less than 10 billionths of a meter. Circuits using such dimensions will have up to 1000 times the number of electronic components of today's computer chips—a quantum leap in circuit technology.

The Department benefits greatly from investment in basic research at universities, industry, and in-house laboratories. Universities carry out about 60 percent of the total 6.1 program—basic research is a core competency of the universities, and university research pays additional dividends through the associated training of future scientists and engineers in disciplines important to national defense. Approximately one-quarter of the 6.1 program is performed by DoD and other Federal laboratories to focus on areas where extramural capability is unavailable, and about 15 percent is performed by industry and nonprofit institutions other than universities.

With respect to resources, the President's FY 1997 budget request maintains zero real growth in the 6.1 basic research account. This carefully considered request reflects the importance that the Department places on sustaining the long-term foundation for future military capabilities. I urge your support of the full request.

Exploratory Development

The Exploratory Development or 6.2 account within the RDT&E appropriation is the second component of the Department's technology base investment and is the mechanism for exploiting new knowledge and understanding for future military capabilities. We are vigorously exploiting ten technology areas: sensors and electronics; information systems and technology; weapons; advanced materials and materials processes; airborne platforms; nuclear, biological, and chemical (NBC) defense; human systems; ground vehicles and watercraft; medical and biomedical; and space platforms.

One illustrative example of the military payoffs associated with sustained investment in 6.2 exploratory development programs is the F119 engine that powers the F-22 fighter. This engine, by virtue of its ability to sustain supersonic flight without afterburning and its high thrust-to-weight ratio, dramatically increases the capability of the aircraft, as well as reducing the weight and cost penalties associated with stealth. There are many critical technologies that have made this engine possible: in the area of materials and processes alone, they include graphite polyimide fan components, hollow-bladed fans with an integral rotor, thermal barrier coatings for high-temperature parts, and various other processing techniques. All of these technology developments, and many more, date back to the Department's investment in 6.2 exploratory development programs in the 1970s and 1980s. Most of these programs were executed largely before the precise needs for the F119 or the F-22 were identified.

Technology Ramps

Superior weapon systems like the Army's "Big Five" heroes of DESERT STORM—Apache, Black Hawk, Patriot, Abrams and Bradley, the Air Force's F117 Stealth Fighter, and the Navy's Tomahawk cruise missiles are all products of well planned technology "on-ramps." It is clear that technology base investments, focused on specific technological objectives, must be made well in advance of specific system requirements. Nonetheless, as system requirements begin to emerge, it is also necessary to adjust science and technology (S&T) efforts, particularly in the 6.3 advanced development arena, to ensure that potential sources of technological risk are addressed. Technological risk is further reduced through technology insertion roadmaps leading to system level demonstration and validation and/or engineering and manufacturing development efforts.

An example that illustrates this point is the M829A1 kinetic energy projectile, used very effectively as a tank-killer in the Gulf war. As with many other developments, its technological origins can be traced to the 1960s, with fundamental efforts on energetic materials, mechanics of composite materials, and penetration mechanics. During the late 1970s and early 1980s, exploratory development efforts addressed the more application-oriented areas of propulsion technology, aluminum and composite materials, and target interactions. These efforts, while focused on specific technological objectives that would improve kinetic energy projectiles, were not focused on a specific requirement. In the mid-1980s, however, when the need for a new projectile began to emerge, 6.3 advanced development efforts were initiated to focus on the technological risk associated with the specific design aspects of the projectile: charge, sabot, and penetrator. These risk-reduction efforts enabled a short development program leading to an initial operational capability (IOC) in 1989.

The Joint Strike Fighter program is a technology "on-ramp" for providing the U.S. Navy with a first day of the war survivable aircraft, the U.S. Air Force with a 21st century replacement of its F-16 fleet, and the U.S. Marine Corps with an AV-8B replacement. Technology insertion roadmaps exist to reduce risk and take advantage of technological advances in a more-electric airframe, shared radio-frequency apertures and sensors, shared electro-optical apertures and sensors, advanced packaging and cooling techniques for integrated avionics, and many others.

A final example illustrating a technology "on-ramp" for a specific application is in the air-to-air missile technology arena. We have maintained a sustained annual technology base investment in core technologies relevant to air-to-air missiles: advanced processing, fuzing, propulsion, and the like. However, when a specific application is identified, such as the AIM 9X, exploratory and advanced development investments are made in technology areas specific to the application to reduce the technological risk. Accordingly, we are currently making investments in areas such as high angle-of-attack operation, airframe control, and infrared guidance, and integrated fuzing to reduce the risk associated with incorporation into the AIM-9X.

Advanced Concept Technology Demonstrations

In many cases, the technology associated with a new system or piece of equipment is mature and the technical risk is low, but the operational risk high. In order to gain acceptance in the field, the advanced technology must be married with a suitable employment doctrine. This is one thing that I think has not been given adequate emphasis in the past. We have traditionally underestimated the importance of developing the appropriate doctrine, the tactics for employment, the training, and the people who use technologically advanced systems.

Advanced Concept Technology Demonstrations (ACTDs) are designed to rapidly transfer technology from the developers to the users by focusing on *concept*—not *technology*—risk reduction. ACTDs are user-oriented and even user dominated. They are an integrated effort to assemble and *demonstrate* significant, new and improved military capability that is based upon mature advanced technologies. Each ACTD is based on actual military operations or demonstrations which are jointly developed and implemented with the operational users and material development communities as key participants.

In FY 1995, Congress and the Department of Defense initiated the first ten ACTDs. As originally conceived, ACTDs are relatively short-term efforts to assess the potential and develop the doctrine, concepts of operations, and tactics for new technologies prior to committing to formal acquisition. ACTDs are a critical precursor to formal acquisition. As

such they can support both our operational needs and our legitimate acquisition requirements and serve as a means to reduce both operational risk and acquisition cycle times.

ACTDs are specifically intended to be completed within two to four years. Of the ten initiated in FY 1995, several have already achieved their initial objectives and are completed or very near completion. All of these demonstrations have provided significant insight and added capability for operational forces. They have afforded the appropriate commanders with an opportunity to evaluate new technologies and assess the impact of this technology on their present and emerging military missions.

The most well known ACTD is the Predator Medium Altitude Unmanned Aerial Vehicle (UAV). Predator progressed from a concept to a three system operational capability in a period of less than thirty months. Each system consists of three air vehicles, the appropriate ground stations and communications support. Predator flew its first flight in July 1994 and deployed to the Bosnia theater in July 1995. On March 1 of this year Predator again deployed, as an ACTD, to European Command (EUCOM) to support Operation Joint Endeavor. On July 1, 1996, we are planning to complete the ACTD and transfer the Predator to the Air Force which will provide the UAV operational support to our Joint Task Force Commanders. Both the technical and operational lessons learned during the "real world" operational application of this ACTD are facilitating our acquisition of the Predator UAV.

In January 1996 we completed the Cruise Missile Phase I Mountain Top ACTD. This ACTD involved participation by the Navy, Army and Air Force and very successfully demonstrated the concept of cooperative engagement, supported by airborne sensors, of low flying cruise missiles. This is a critical step in assessing our future needs and the technology applications which will be needed to address the emerging cruise missile threat. The technical concept demonstrated during this ACTD provides us with the ability to significantly leverage our present surface and airborne weapons systems.

The Joint Countermine ACTD, still in execution, is a cornerstone of the Department's efforts to ensure that the countermine efforts in all of our military Services are coordinated and complementary. The ACTD addresses the issue of providing a joint task force commander with a seamless countermine capability which flows from the deep water, through the shallow water, surf zone, and up on to the land. As such, this ACTD involves significant participation by the Navy, Marine Corps, Army, and our Unified Commanders. This ACTD is addressing many technologies relevant to the countermine issues in Bosnia and we are continually assessing, in coordination with the Joint Staff, the maturity of these technologies for possible deployment in support of Operation JOINT ENDEAVOR.

The ACTDs initiated in FY 1995 and the nine started in FY 1996 leverage approximately one billion dollars in military service and DoD agency technology programs. To ensure the ACTDs address the warfighters' needs and requirements, they are coordinated closely with the Joint Staff through the Joint Requirement Oversight Council (JROC) and Joint Warfighting Capability Assessment (JWCA) groups. This coordination ensures that we focus our present and future ACTDs on legitimate present and emerging joint warfighting issues. The Joint Staff and JROC provides the critical link to the Unified Commanders-in-Chief (CINCs).

ACTDs are an effective, inexpensive means to evaluate the operational utility of mature technologies emerging from the DoD Science and Technology Program and from investment by other government agencies, industry or our allies. As indicated earlier, ACTDs are focused on the needs of the military user. They provide us with the ability to quickly respond to unanticipated needs and take advantage of technology advances before they proliferate or become obsolete.

Congress has provided the Department with a powerful tool which has been used in executing ACTDs. Section 845 of the National Defense Authorization Act for FY 1994 provided the Defense Advanced Research Projects Agency authority to conduct technology demonstrations and prototype projects of military systems using non-procurement contracts. Section 845 provides unparalleled flexibility in contracting. DARPA is successfully using this authority to conduct several projects including the high altitude endurance unmanned aerial vehicle program, Tier II Plus (Global Hawk), and the stealthy Tier III Minus (DarkStar). The Navy/DARPA program to apply commercial practices to the Arsenal Ship will also utilize this approach. With Section 845 authority, DARPA conducts experiments with the acquisition process and attempts to tailor the process for each project to achieve optimum results. DARPA has encouraged teaming, integrated product and process development, established performance goals rather then specifications, and introduced such innovations as having a single firm requirement, namely the price of production versions of the prototype.

S&T Strategic Planning Process

We have strengthened our requirements, technology assessment, technology development and demonstration processes with initiatives like Advanced Concept Technology Demonstrations and the Joint Warfighting S&T Plan. The Department has taken these steps to ensure the S&T program is militarily relevant and technically sound.

Working with the Joint Staff and Services, the Director of Defense Research and Engineering (DDR&E) has developed, and currently has in coordination, the Joint Warfighting S&T Plan. This plan supports the FY 1997 budget and is responsive to the Chairman of the Joint Chiefs of Staff (CJCS) vision for the future battlespace. It is directed towards exploiting the rapid pace of technology advances and gaining information superiority to enable enhanced dominant maneuver, precision engagement, full dimension protection and focused logistics operational concepts. The Department's future success in achieving this vision will in large measure depend upon supporting the technology roadmaps that are essential to achieving the joint warfighting capability objectives cited in the Joint Warfighting S&T Plan.

The Joint Warfighting S&T Plan complements the revised Defense Technology Area Plan and our first Basic Research Plan. Another innovation this year is that, in collaboration with the Services and Agencies, we have developed 300 Defense Technology Objectives and six Strategic Research Objectives to help focus and improve management of our S&T investment. These plans will be made available over the next several months to support industry and university decisions about how to invest their research funding.

MAJOR INITIATIVES

Dual Use Strategy

The Department's dual use strategy remains one key to ensuring our military forces will have affordable access to the world's best technology. Last year, I testified before this subcommittee that commercial industry surpassed the DoD in R&D spending back in 1965 and that the disparity between DoD and commercial sector investment in R&D has been growing wider ever since. Those trends have continued over the past year. The bottom line for the Department is that we have no choice but to move from separate industrial sectors for defense needs and commercial markets to an integrated national industrial base.

Leveraging the commercial sector, the essence of the dual use strategy, gives us a tremendous opportunity to field advanced weapons both more quickly and affordably. The Department's dual use strategy consists of three pillars:

- Invest in dual use technologies critical to military applications;
- Integrate military and commercial production;
- Insert commercial components into military systems.

The first pillar means leveraging the commercial sector's base of research and technology to foster militarily useful technology. The second involves leveraging the commercial sector's low cost production capabilities by manufacturing commercial and military items on the same production lines. The third pillar requires creating the incentives and management approaches inside the DoD necessary to facilitate using these dual use, "dual produced" items in military equipment.

Last year, I cited Multichip Modules (MCMs) as one example of the Department's investment in dual use technology. MCMs are semiconductor chips packaged together on a single substrate and integrated together into a single package or module. Because MCMs have application in a multitude of Defense systems, where they can offer increased performance and reliability in a smaller package, DoD jump-started this technology with early investments. Our aim at the outset was to improve the state of the art of the technology, and, more importantly, lower production costs so that MCMs became affordable for defense applications. The key to lower cost is larger production volume, and larger volume production comes from increased use of MCMs in commercial items.

I am pleased to report that the Department still expects to see a factor of ten decrease in costs as production volume increases. We are starting to see results from our investment. In 1990, the Defense Department was the only customer — there was practically no commercial market. Last year, I was able to tell you that commercial applications are using over half of total sales of MCMs. That trend is continuing. Several of the companies that originally depended solely on the Department's research and development investment, such as nCHIP and MicroModule Systems, are now profitably producing hundreds of thousands of modules for commercial computer workstations.

These MCM manufacturers have also successfully produced dozens of prototype modules for use in military systems, and can expect to receive volume production orders for future defense systems. Until they do, they are being sustained through orders for their commercial products. The U.S. manufacturing base for this important technology is robust but does not rely on DoD for its sole support. DoD gains access to the most advanced technology without paying to support the entire manufacturing base, and can take advantage of low-cost, volume production for its specialized needs.

Holographic data storage is another technology with both military and commercial applications. In this case, the advancement of the technology is being accomplished with investments from DoD and from industry. Holographic data storage forms the new frontier in storage technology. Information is stored in a volume instead of on the surface of a disk. This makes possible the storage of 10s of gigabits of digital data in a volume the size of a sugar cube. The data can be found and retrieved 10 to 100 times faster than current storage devices and accessed at random.

The Photorefractive Information Storage Materials (PRISM) and the Holographic Data Storage System Consortia (HDSS) bring together prominent researchers from the universities, the aerospace industry, the computer industry, the electronics and materials industry, as well

as a telecommunications provider and two small start-up companies. With equal funding contributions from industry and DARPA, these consortia carry out coordinated research and development programs on advanced holographic mass data storage technology leading to the development and demonstration of advanced storage platforms.

By leveraging each other's unique expertise, the consortia are able to perform an overall development task that none of the participants was willing or capable of carrying out on their own. More importantly, DoD does not have to bear the cost of this development task alone. Instead, government funding can stimulate and supplement this very important research and development effort. In return, DoD has the potential to gain storage devices of unequaled performance.

To date, the consortia have developed demonstration devices that store and retrieve vast amounts digital video and audio clips. As the military improves its data collection capabilities, the ability to store and access large amounts of data becomes paramount. The new data storage capability we expect from holographic data storage will have a major impact in such areas as intelligence, information warfare, target recognition, and command and control operations. Commercial applications abound as well, for efficient data retrieval from libraries and image repositories.

Dual Use Applications Program

The FY 1997 President's Budget contains $250 million to begin the Dual Use Applications Program (DUAP), a joint program conducted by the three military departments, DARPA, and DDR&E. The DUAP will introduce dual use R&D approaches into the military Services as a new norm by developing dual use technologies for the direct benefit of military users. Building on lessons from our past experience in this area, the DUAP will embed this new way of doing business throughout the military services by building a cadre of people who understand and accept it through real experience with it. The Service Acquisition Executives are committed to using DUAP to apply technology they need and leverage dual use R&D more effectively in their departments.

DUAP funds will create an opportunity for service program managers to fund new technology through a dual use approach. Research and Development projects will be solicited as government/industry partnerships, selected to meet Service needs, and managed by the Services using new authorities and methods. Each project will include, up front, a clear path for the technology to be used in a military system. As a joint program, the DUAP will be a unique forum for all the Services to simultaneously refine and share what they learn about dual use R&D while working on technologies of joint interest. Without shared, joint learning in the right environment, our progress in making dual use a new norm will be much, much slower. Think of the DUAP as the joint dual use battlelab.

Commercial Technology Insertion Program

The Commercial Technology Insertion Program, being initiated in FY 1997 at a level of $50 million, will accelerate the insertion of commercial technologies into defense systems by working with the Services to identify opportunities and to provide the funds necessary to overcome barriers to insertion. Funds will be used to qualify commercial technology for defense systems; to adapt commercial technologies to meet military needs; or to modify military systems to accept a commercial technology.

An ongoing success story, the insertion of Active Matrix Liquid Crystal Displays (AMLCDs) in weapon system cockpits, is being used as a model for the CTIP. This project is

being funded by Title III of the Defense Production Act and is providing funds to program offices to qualify and/or accelerate the purchase of AMLCDs into weapon systems. Seven AMLCD insertion efforts are underway. One of these efforts is the Army's AH-64D Longbow Apache helicopter which is in the middle of an upgrade program. The Apache Program Office wanted to incorporate AMLCDs into the Longbow but lacked the funds required to qualify them and was planning to use cathode ray tubes in their upgrade program. The insertion program is providing the funds required for qualification, allowing AMLCD technology to be incorporated into the Longbow with no schedule slippage and at a comparable acquisition cost. The results will be four new color displays per aircraft. These displays will be smaller, lighter in weight, and more reliable and capable than the previously planned equipment complement.

Project selection for the Commercial Technology Insertion Program is scheduled for April 1996, which will allow the Defense subcommittees to preview precisely where we propose to invest the FY 1997 funds. Selection will be based on the impact the technology will have on the defense system's life cycle costs and performance, the pervasive impact the technology will have on a range of defense systems and the commitment of the Service to provide downstream funding needed for the acquisition of the technology.

Small Business Innovation Research (SBIR) Program

This program is executed by the Services and Defense Agencies. Its objective is to involve small business in federal R&D, to increase the commercialization of technology developed by federal R&D, and to increase the use of commercial technology in defense systems. The program has been very successful and has resulted, for example, in development of innovative fuel cell technology to produce electricity and water and lightweight head mounted displays. Under the SBIR program, DoD will fund approximately $550 million in R&D projects at small technology companies in FY 1997—projects that serve a DoD need and have commercial potential.

Small Business Technology Transfer (STTR) Program

STTR is a three-year pilot program, initiated in 1993, under which DoD will fund $30 million in FY 1997 in cooperative R&D projects between a small technology company and a research institution (i.e., a university, federally-funded R&D center, or nonprofit research institution). The STTR program serves a different function than the one addressed by the SBIR program. It is a complementary program that enables a researcher at a research institution to spin-off a commercially promising, dual-use idea with a small technology company. Thus, whereas SBIR exploits the ideas in our small business sector, STTR taps into a vast new reservoir of dual-use ideas in our nation's research institutions.

Government-Industry-University Research Initiative

In the U.S. today, universities are the principal *performers* of long-term research. Industry has reduced the size of its in-house research laboratories, and its investment is oriented more towards near-term applied research, rather than long-term basic research. Yet, the DoD and other government agencies have mission-driven reasons to seek long-term research advantages in relevant technologies.

The Department must find a way to fund and execute long-term research and to leverage the strengths of government, industry, and the universities. This proposed new initiative calls for a three-way partnership between the government, industry, and universities. Funds would be provided by both the government and industry to university centers. Government would

ensure that research remained long-term in nature and mission-relevant. Industry would ensure that the research had promise for delivering commercially successful products.

This would provide a new mechanism to link universities (the long-term research performer) with industry (the short term product producer), doubling the level of industry investment in strategically directed research focus areas.

A test case is currently underway at the Defense Advanced Research Projects Agency in the area of advanced lithography. We anticipate industry matching funds will be forthcoming. This effort complements a National Science Foundation effort co-funded with industry.

NATO Cooperative R&D Program

In the post-Cold War world, the United States no longer faces a single galvanizing threat such as the former Soviet Union. Instead, there is increased likelihood of our forces being committed to limited regional military actions—coalition operations—in which allies are important partners. In this climate, the United States seeks armaments cooperation with its friends and allies for three reasons:

- The first reason is *political*: these programs help strengthen the connective tissue—the military and industrial relationships—that bind our nations in a strong security relationship;

- The second reason is *military*: there is a need to deploy forces with interoperable equipment and rationalized logistics in a coalition environment; and,

- The third is *economic*: our defense budgets and those of our allies are shrinking—what we cannot afford individually may be affordable with a common effort.

To promote new cooperative arrangements, the FY 1997 budget request contains funding for NATO cooperative R&D programs. These programs have fielded significant new capabilities for U.S. and allied forces. For example, a NATO R&D cooperative effort transitioned into the F-16 mid-life update, which resulted in increased U.S.-European F-16 interoperability and $2 billion in international co-development. In another case, a $17 million investment in a NATO cooperative R&D program led to the successful integration of a new fire-control radar into the AV-8 Harrier for the Marine Corps, and $900 million in foreign sales for U.S. industry.

We have restructured the NATO R&D program for FY 1997 to better meet the current challenges facing the U.S. and its allies and to improve the management of this important program. Resources for the international programs have been integrated into the defense planning and budgeting process of the military departments. Funds are now requested in four program elements, one for defense-wide applications or new starts, and a separate program element for efforts transitioned to each military department.

Selection decisions for new projects will be made with the coordination of the responsible Service Acquisition Executive. Two important new projects envisioned for FY 1997 are: (1) Combat Identification to reduce the likelihood of friendly fire casualties, and (2) International Command & Control Systems to enhance battlefield awareness. Both projects are directed towards improving the effectiveness of coalition operations with our allies. Finally, the CINCs are being consulted in the identification and approval of new cooperative projects.

Foreign Comparative Testing Program

The Foreign Comparative Testing (FCT) Program allows the Department of Defense to evaluate whether the defense equipment developed by our allies and other reliable foreign sources can satisfy DoD requirements or correct mission area shortcomings. In cases where U.S. requirements are met, the Department is able to avoid development costs to meet a validated requirement. For example, a $10.5 million FCT evaluation of the Israeli-developed HAVE NAP Missile, allowed the United States to save $165 million in development costs and six years in development schedule.

The FCT Program has been an unqualified success. Since its inception, the United States has procured over $3 billion worth of non-developmental items (NDI) through the FCT Program. By the end of FY 1995, 341 FCT projects and 77 procurements were completed. In the process, the United States avoided the costs of new start developmental programs, realized cost savings due to foreign competition, fielded equipment rapidly, and created international industrial teaming opportunities for U.S. industry.

RDT&E INFRASTRUCTURE

Defense Laboratories

The Department of Defense has been reducing its extensive RDT&E infrastructure, including the defense laboratories, through the Base Realignment and Closure (BRAC) process. Significant consolidations of defense laboratory functions have already been made by the Department as a result of the base closures and realignments made in 1988 and the three implementation years of 1991, 1993, and 1995 associated with the Base Realignment and Closure Law of 1990. More consolidation is necessary and planned over the Department's Future Years Defense Program (FYDP).

In May 1996, the Department will report on the development of a comprehensive plan for its laboratories and test and evaluation centers in the 21st century. This plan will take about 18 months to develop and will be fully implemented, as required by the FY 1996 Defense Authorization Act, by October 1, 2005. It will provide an affordable, balanced blueprint for structuring our RDT&E organizations and sizing our RDT&E infrastructure to respond to the needs of the warfighter in a dynamic technological environment. The Department's vision for the defense laboratories will be based on three pillars: (1) Reduction, (2) Restructuring (to include cross-servicing), and (3) Reinvestment (for infrastructure modernization). The five year plan will lay out the Department's on-going process to look for new opportunities to tailor our laboratories to tomorrow's mission challenges.

The plan will build upon the previous reductions achieved through the BRAC process. It will be fully responsive to the provisions of the FY 1996 Defense Authorization Bill, Section 277, as well as to the President's NSTC guidance, doing so in an integrated way and as an element of the overall vision. The plan will seek Congressional bi-partisan support for the DoD RDT&E Infrastructure Vision 21 through passage of new enabling legislation.

DARPA

The Defense Advanced Research Project Agency (DARPA) FY 1997 budget request is $2.178 billion. This is 17 percent below the FY 1996 request, in nominal terms, and represents almost a five percent decline in real dollars from the FY 1996 appropriated level. It is a real decline of about 20 percent from the FY 1994 budget. This is an appropriate level of funding for the Agency.

DARPA's strategic investment is guided by the needs of the military warfighters overlayed by a technological vision. The Unified Commanders, the Chairman and the Joint Staff must focus on their immediate needs. The technologist, however, should take those needs and match them with technological capabilities to derive a vision for the military 20 years in the future. DARPA's investments are guided by such visions in each of several militarily important areas. The Agency funds demonstrations of systems and component technologies and the underlying, long-term technology development necessary to make the visions a reality.

The objective is to provide the warfighter with the tools he needs to confront the uncertainties of the future battlefield and to dominate that battlefield. Among DARPA's top military priorities, areas where technology can make a difference to the warfighter, are: (1) biological warfare defense, (2) improved operations of small military units, and (3) battlefield dominance.

To expand a bit, biological warfare defense is unfortunately an area in which our nation is deficient. It is also an area that is easy for adversaries to exploit. DARPA plans a major effort to focus on those technological solutions that complement efforts ongoing elsewhere in the Department, particularly in the Army, concentrating on the high-risk end of advanced detectors, countermeasures, and improved treatment options.

The warfighters, particularly the Marine Corps with their Sea Dragon concept, and to a lesser extent the Army with Force XXI, are pursuing concepts of operations that are ahead of technology in the area of small unit operations. This operational concept can exploit the technological strengths of the US, by using technology to provide the superior situational awareness, covert communications, precise navigation, and efficient logistics support that will enable small, dispersed forces to operate cohesively against much larger forces. DARPA is working closely with the Services, especially the Marine Corps, in this effort. The FY 1997 budget request for DARPA includes $52.7 million for this effort.

In a separate thrust, DARPA has refocused its activities to assist the warfighter in achieving the battlefield dominance so necessary for current and future joint warfare. This includes technologies and systems leading to comprehensive battlefield awareness, which is the ability to know where everything is and what it is doing; and information integration, particularly near-real-time command, control, communications (C3), planning and replanning, to get data where it is needed and use it for real-time planning. This investment area includes ACTDs with direct warfighter participation and development programs in: data collection, exploitation, and dissemination; dynamic sensor management; C3 for the joint task force commander; air campaign planning and execution; and the communications infrastructure and shared data bases that support all of these tasks. These very significant efforts in support of the warfighters total $184.9 million and represent one of the major thrusts to exploit information technologies for military capabilities.

Also included in this battlefield dominance thrust is DARPA's continued investment in advanced distributed synthetic environments. These technologies are improving the military's ability to conduct realistic, cost-effective training of forces and joint task force commanders, allowing them to exercise their new battlefield dominance capabilities. We saw the fruits of this in Atlantic Resolve '94 and we are moving towards further demonstrations under Synthetic Theater of War 97.

One key part of the battlefield dominance equation is surveillance and data collection. DARPA and the Defense Airborne Reconnaissance Office (DARO) are working together on the High Altitude Endurance Unmanned Air Vehicle system, which consists of two complementary air vehicles. One, the Tier III Minus DarkStar, will soon fly for the first time.

The other, Tier II Plus (Global Hawk), will finalize its design this spring, and first flight is scheduled for December 1996. DARPA's budget request includes $14.7 million for Tier III Minus; additional Tier III Minus and Tier II Plus funding is included in the DARO FY 1997 request.

In the area of naval warfare, DARPA is refocusing its programs to concentrate on advanced submarine technologies and on technologies for the Navy's exciting new arsenal ship concept, with a request of $16.4 million for the latter. DARPA and the Navy will work together on this effort to provide a new paradigm for Navy shipbuilding and to achieve lower costs and greatly reduced manning levels.

DARPA has been active in the area of micro-electromechanical systems (MEMS) for 4 years, and plans to continue its investment in this area, requesting $54.8 million for FY 1997 efforts. MEMS holds exciting possibilities for revolutionizing a myriad of military systems ranging from miniature inertial measurement units for munitions and personal navigation, distributed unattended sensors, non-invasive biomedical sensors, and distributed aerodynamic control. The Department's investment in this technology will position the military to take advantage of new applications as they become known.

A second interesting enabling technology that warrants increased investment is the area of high energy-density power sources such as small highly efficient batteries, self-sustaining fuel cells, and mini-turbine engines. These technologies are particularly applicable to tomorrow's highly mobile, information-intense environment. In addition, the combination of mini-turbine engines and MEMS devices hold promise for a variety of futuristic, tiny systems, such as micro-unmanned air vehicles and human-portable cooling systems.

DARPA continues to support long-term funding in those critical technologies underpining the 20-year military visions. Information technologies are obviously key to many of the capabilities needed by the future warfighter, especially technologies for robust, massive, mobile information networks applicable to the military in the field, and technology to make information systems easier to use and more useful. In FY 1997 and future years, DARPA plans to expand its emphasis on the difficult problem of information survivability.

DoD-Sponsored R&D Centers

The Department has strengthened its management of Federally-Funded Research and Development Centers (FFRDCs) and University-Affiliated Research Centers (UARCs) to ensure the most effective and prudent use of the centers while providing measures to guard against abuse. The work content and the operations of each of these centers have been closely scrutinized over the past year. FFRDCs and UARCs are sized consistent with essential sponsor requirements, acquisition reform initiatives, and defense strategies and budgets.

We have strengthened our management controls, including managing the workload of our centers to the core concept; transitioning on-going work that is non-core out of the centers; and establishing consistent management fee guidelines. We have established new, stringent criteria for the performance of non-FFRDC work by the parent corporation of an FFRDC. And finally, we have established an "Independent Advisory Group" of highly respected people from outside the government to independently assess the adequacy of on-going DoD management actions.

In summary, the Department of Defense has responded to the legitimate concerns of the Congress. We have implemented needed management reforms and it is now time to restore the normal process for fiscal oversight of FFRDCs and UARCs. Accordingly, we are requesting

the four defense oversight committees to discontinue the practice—started a few years ago—of inserting special language in annual authorization and appropriation bills to limit DoD spending at FFRDCs. Such measures are no longer needed and they unnecessarily constrain DoD's ability to effectively and efficiently use FFRDCs for appropriate national security tasks.

Test & Evaluation Centers

The Department's Test and Evaluation (T&E) infrastructure contains some of the most technically advanced and complex facilities in the world and provides critical support to our weapons system development programs. Our major facilities are managed under a Department-wide Major Range and Test Facility Base (MRTFB) directive to satisfy the needs of all the military Services and defense agencies—not just the Service or component that operates the facilities. This structure provides a basis for minimizing unnecessary redundancy.

In FY 1997, the institutional funding for operating the MRTFB facilities amounts to about $1 billion or about 3 percent of the Department's RDT&E budget and about one and half percent of the total funding for DoD infrastructure. The military and civilian workforce at these facilities account for slightly more than one percent of the Department's military and civilian workforce. At some MRTFB centers, government personnel comprise only a small fraction of the workforce, but, on the average, they comprise a little less than 60 percent of the workforce at the RDT&E funded MRTFB activities. The remaining 43 percent of the workforce is composed of contractor personnel.

The funding and workforce for the Department's T&E centers have been on a downward slope since about 1987. This downsizing trend has lagged overall changes in the defense budget, but has been tracking with the needs of our major weapons development programs as they enter their test & evaluation phases. Some examples of our major consolidation actions include: the closure of Jefferson Proving Ground and consolidation of its workload to Yuma Proving Ground; relocation of the 4950th Test Wing at Wright-Patterson Air Force Base to the Air Force Flight Test Center; and the closing of the Navy's Turbine Engine test facilities at Trenton, New Jersey and consolidation of all aircraft engine altitude testing capability at the Arnold Engineering Development Center in Tennessee.

From 1990 to 1997, the Department of Defense has reduced the test center workforce by more than 9,000 people. While the marginal workload at the test centers has remained high, primarily due to the progression of major weapon system development efforts into their test & evaluation phase, the institutional (open-the-door) workforce and funding have declined significantly since 1990. From 1990 to 1997, the institutional workforce will decline 27 percent with an additional decline of 12 percent programmed by FY 2001. The workforce associated with user funded workload is expected to decline 20 percent from 1990 to 1997 and another eight percent by FY 2001.

ACQUISITION PROCESS IMPROVEMENTS

A big assumption in our defense planning is that we will get significant savings by overhauling our defense acquisition system. The idea here is to be more efficient in what we buy; how we buy it; and how we oversee that buying process. As I look at the defense acquisition system in detail, what I find is that the system is not broken—it fields equipment that is second to none in the world. But I believe that the system can and must operate much more efficiently.

Although the new federal acquisition streamlining regulations will help the Department use commercial procurement procedures, we know that the principal problems are not

statutory or regulatory. There is considerable freedom in our acquisition statutes and regulations. The issue is really cultural. We have become so risk averse that it seems like we end up spending billions to make sure we do not lose millions. We have set up a structure that discourages risk taking—it settles for very, very conservative performance at all levels. We are moving now to try to adjust that culture. To make a cultural change, we need the appropriate incentives to adjust the behavior of our acquisition work force.

On February 9, 1994, Secretary Perry provided the then House Armed Services Committee, and on February 24, 1994, both the Senate Armed Services and Governmental Affairs committees, his plan for acquisition reform within the Department of Defense entitled, "Acquisition Reform: A Mandate for Change." On March 15, 1994, Secretary Perry issued a policy memorandum implementing "A Mandate for Change" within the Department. Today, I am pleased to provide a status report on the progress we have made in implementing the reforms identified in "A Mandate for Change."

Implementation Of Legislative Reforms

One of the major efforts identified in the "Mandate for Change" was leveraging the recommendations of the Section 800 Panel. As a result of a true bi-partisan partnership, the Congress enacted two landmark pieces of legislation, the Federal Acquisition Streamlining Act of 1994 and the Federal Acquisition Reform Act of 1996. DoD, working with the Administrator of the Office of Federal Procurement Policy (OFPP) and other federal agencies, is in varying stages of implementing both pieces of legislation.

Federal Acquisition Streamlining Act (FASA)

FASA provided the Department with much needed relief in a number of key areas. First, it provided streamlining in the area of low dollar, relatively low risk procurements by setting the Simplified Acquisition Threshold, or SAT, at $100,000 and by exempting purchases at or below the SAT from 13 statutes. This legislation also provided us with flexibility in the purchase of commercial items, exempting them from the application of a number of statutes which prevented us in many cases from buying those items in the commercial marketplace.

Equally important was the relief FASA provided from the application of the Truth in Negotiations Act (TINA). FASA gave the Department the flexibility to obtain cost or pricing data where the risk associated with the procurement merits, while at the same time clearly setting forth the circumstances where cost or pricing data is not normally required. Last, and certainly not least, was the authority to implement five Pilot Programs.

The vast majority of FASA provisions were implemented prior to October 1, 1995. Between December 1994 and October 1995, the Department supported publication of 23 rules, which changed 1328 pages or 71 percent of the Federal Acquisition Regulation. This was accomplished using multi-functional teams drawn from throughout the federal government. As a result of the public comments received thus far, we are in the process of looking at a number of issues including: the reorganization of FAR Part 13; whether our new commercial rule in FAR Part 12 can be used for construction; and how to amend existing contracts to take advantage of FASA changes.

There are also a few difficult issues associated with the implementation FASA which we have not been able to resolve. Those issues are: (1) the rule on travel costs; (2) implementation of multiyear provisions; and (3) small disadvantaged business coverage. These issues have proved to be very difficult for a number of reasons. In the case of small disadvantaged business coverage, a major factor has been the impact of the Supreme Court's decision in

Adarand. The Department is working closely with the Administrator of the OFPP to resolve these outstanding issues.

Federal Acquisition Reform Act (FARA)

FARA provides the Department with very important statutory relief as well. The consolidation of the review of protests at the General Accounting Office was a major step in establishing a single standard of review for protests. Similarly, the decentralization of procurement authority for information technology provides the opportunity to purchase information technology in a way which is more efficient and more closely meets the Department's requirements. It also provides additional authority in the area of buying commercial products through use of Simplified Acquisition Procedures for commercial items purchases up to $5 million and through more clearly defining what constitutes a commercial item.

FARA implementation has just begun. One of the issues we are reviewing is how best to involve industry in the implementation process. During FASA implementation, industry participation and guidance on rules implementation was solicited through a series of public meetings. For the record, I would like to take this opportunity to thank the industry associations which participated with us in the FASA implementation effort. Industry has encouraged us, and we are exploring ways, to further improve the process in which the Department involves industry in the development of FARA implementation policy.

Streamlined Acquisition Oversight

We are beginning to achieve real success in implementing a bold, new, reengineered oversight and review process that will better serve our warfighters and conserve public funds. Our approach is to shift from "after-the-fact oversight" to "early-and-continuous insight." A new Overarching and Working-Level Integrated Product Team (OIPT-WIPT) process, the foundation of our newly revised DoD Instruction 5000.2, is focused on developing program strategies and plans that are affordable and executable.

This oversight process facilitates identifying and resolving issues in a more timely manner; keeping programs on track; and providing the warfighter what he needs, when he needs it, and at an affordable cost. While this process is relatively new, there are visible signs of success. For example, the cycle time for acquisition decision memorandums which averaged 23 days in 1994, was down to two days in 1995. More importantly, 18 of 26 scheduled Defense Acquisition Board (DAB) reviews in 1995 were not held— "paper-DABs" sufficed in these cases because all the major issues were resolved without the need for a formal DAB meeting.

Paperless Contracting

The Department has made great strides towards implementing a paperless contracting environment over the past year. Our approach included identifying the 240 contracting offices which execute 80 percent of the contract actions initiated by the Department annually. Over the past year, the Department has developed and begun implementing a plan to fully automate these high volume offices, and to date, over half of these offices have been fully automated. Our future plans include expanding a paperless automation environment to all facets of the acquisition process. The goal is to link the customer, the logistics systems, the procurement system, and the financial system in a seamless web.

Military Specifications Reform

We have effectively turned our procurement system on its head with respect to military specifications and standards. A program manager in the past had to get a waiver in order to use commercial and performance standards. Now the reverse is true. If a program manager wants to use military specifications, then he has to get a waiver in order to justify the extra cost entailed in military specifications.

As part of our effort to maximize utilization of both commercial products and practices, Secretary Perry issued guidance in June 1994 that changed the focus on the way in which we describe our requirements and reduced the number of occasions in which design-specific military specifications and standards are to be used. Our focus is to describe our requirements in terms of the performance needed, thus providing greater reliance on commercial and dual use technologies.

We have reviewed all of our 30,000 specifications and standards, eliminating 2600 of them to date. We are continuing to implement the decisions on these documents. It is important to note that our policy is not one of "zero tolerance." Military specifications will continue to be used in some cases, such as to define interfaces and ensure safety. In these cases, however, we still want to make sure that the documents are current and include current technology.

Single Process Initiative

The Single Process Initiative is one of our newest reform initiatives. It implements the "A Mandate for Change" guidance to adopt commercial practices where we can on existing contracts. This initiative addresses a very real problem. Currently in many of our contractor's facilities, there are different processes imposed to manufacture similar product lines. For example, a contractor has one manufacturing process for his commercial customers and a different one imposed by the Defense Department.

In just one factory, a defense contractor was forced to use eight different soldering specifications—five for the government and three for commercial clients purchasing similar types of products. This meant the workers had to be trained on all eight soldering and inspection techniques. It also meant that the contractor had to maintain eight different types of production documentation. This cost him more. In turn, he passed those costs on to us. That is fair, but it is expensive. It is expensive for the Department and the taxpayer.

With this initiative—starting on existing contracts—we will reduce the number of processes used. We are seeking to modify the contracts as a 'block', not simply contract by contract. For most contracts that we have in place, there will be bilateral cost avoidance—that is, the savings will be passed directly to the government; and, in the end, to the taxpayer. This occurs on cost-reimbursable contracts and cases where we have priced options that can be renegotiated. In the case of longer term fixed-price contracts, there is a possibility of what I would describe as *unilateral* cost avoidance—savings would be realized by the contractor but the contract's fixed-price structure has no mechanism to automatically pass along these savings to the government. In these unilateral cases, we would seek consideration and make adjustments to the contract prices.

This initiative is being implemented on a expedited basis. We will not spend months having detailed cost proposals prepared, audited and negotiated unless the initial review by an administrative contracting officer indicates that the possibility exists for substantial *unilateral* savings after the contractor transition costs and the government administration costs are

considered. We expect the number of these unilateral savings cases to be few. This initiative has been embraced by industry. The Defense Contract Management Command has received over two dozen concept papers and several hundred inquiries.

Defense Acquisition Pilot Programs

The Department has recently reported significant progress by the Defense Acquisition Pilot Programs (DAPPs) in implementing regulatory and statutory acquisition reform and in achieving significant cost and schedule benefits from 15 to 50 percent. The five programs, which were nominated as pilots by DoD in December 1994 and designated under the provisions of the Federal Acquisition Streamlining Act of 1994, are the Joint Direct Attack Munitions (JDAM), Fire Support Combined Arms Tactical Trainer (FSCATT), Joint Primary Aircraft Training Systems (JPATS), Commercial Derivative Engine (CDE) and the Non-Developmental Airlift Aircraft (NDAA).

The DoD Pilot Program Consulting Group (PPCG) was tasked to assist the DAPPs in evaluating the benefits of approved regulatory and statutory relief, through the development of focused metrics and appropriate baselines. In its 1995 report, the PPCG reported significant gains in efficiencies as a result of reductions in the use of military standards, contract data requirements, solicitation length and complexity, and source selection cycle time.

The JDAM program, for example, projects a 34 percent reduction in development time and a unit cost savings of over 50 percent with an associated total production cost avoidance of $2.9 billion. The JDAM program office attributes these dramatic savings to the commercial-style environment created by FASA. The JDAM program manager capitalized on the "commercial environment" to procure proven technology with reduced oversight (an average 85 percent reduction in in-plant oversight) and streamlined procurement documentation (29 data requirements and a two-page statement of work with only interface specifications and no military standards).

The Army's FSCATT program manager also reports significant cost and schedule benefits. Streamlined procurement efforts completely eliminated unique military standards, while reducing data requirements from 56 to seven. In-house source selection hours were slashed by 30 percent. Development time and costs were reduced by 33 and 34 percent respectively. In addition, the innovative use of commercial-style milestone billing on this program is expected to significantly reduce contract administration costs.

JPATS acquisition reform initiatives enabled a 50 percent reduction in military standards and a 60 percent reduction in contract data requirements. These efforts resulted in a reported 12 percent reduction in development time and a 50 percent savings in program office staffing.

McDonnell Douglas quickly responded to the NDAA competition (and DoD should-cost efforts) by aggressively attacking cost drivers, resulting in a 25 percent reduction in projected C-17 costs. The recent milestone decision to purchase 80 additional C-17s, in lieu of the NDAA, reflects the benefits of the commercial-style NDAA competition. In addition, a further $896 million savings is anticipated as a result of a proposed C-17 multiyear procurement.

ACQUISITION WORKFORCE

The Department's acquisition workforce peaked in FY 1989. In the six year period from June of 1989 to June 1995, the Department reduced the number of personnel employed in acquisition organizations by 30 percent, or 187,012 people. Our projections, using estimates contained in the President's FY 1997 Budget Request, indicate the Department will reduce the

number of personnel in these organizations another 67,173 by FY 2001. This carefully managed and controlled drawdown will yield an overall 40 percent personnel reduction in FY 2001 when compared to the FY 1989 level, and a 30 percent reduction over the FY 1980 level.

FY 1997 BUDGET REQUEST

We have made very tough choices because of the need to balance the federal budget and the resultant budget top line for defense. The President's FY 1997 budget request contains $34.7 billion for RDT&E and $38.9 billion for Procurement. FY 1997 represents a transition year as we continue a modest reduction of RDT&E towards more sustainable levels. We continue to emphasize Science and Technology funding to assure future warfighting superiority.

SUMMARY

Mr. Chairman, every weapon system in the U.S. inventory today required decades of direct investment in critical enabling technologies. These systems exist because of the technologies and concepts developed by teams of dedicated researchers at our universities, defense laboratories, test centers and industrial contractors. The DoD is committed to maintaining a legacy of technological supremacy at an affordable cost. The Department's FY 1997 budget submission contains a prudent and relevant mix of defense technology investments. This program is needed to produce a robust set of innovative technology options for tomorrow's weapon systems. It secures the Department's long-term modernization strategy; meets the national security needs of the nation; and preserves a legacy of technological superiority for U.S. forces in the 21st Century.