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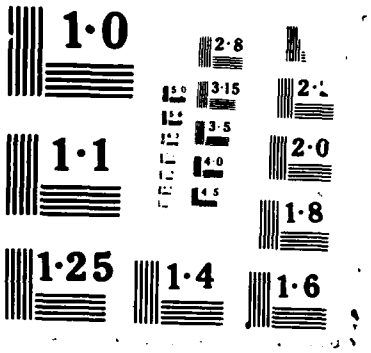
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DEPARTMENT OF DEFENSE

STATEMENT ON

DEFENSE AGENCY RESEARCH AND DEVELOPMENT

BY

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DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

TO

THE SUBCOMMITTEE ON DEFENSE

OF THE

COMMITTEE ON APPROPRIATIONS

UNITED STATES HOUSE OF REPRESENTATIVES

100TH CONGRESS, SECOND SESSION

MARCH 22, 1988

Good morning, Mr. Chairman, members of the Subcomittee. I am Robert C. Duncan, the Director of Defense Research and Engineering. Although I've worked with members of this subcommittee before in my previous position as Director of the Defense Advanced Research Projects Agency (DARPA), this is my first opportunity to appear before you as Director of Defense Research and Engineering (DDR&E). Because of that, I'd like to begin my remarks with an overview of the DDR&E organization and follow that with a discussion of the research and development (R&D) programs that the Subcommittee requested I cover. I will conclude my remarks with a summary of our FY 1989 RDT&E budget.

Organization

On organizational issues, you know that in 1986 the Packard Commission recommended (and Congress responded with implementing legislation) the creation of the position of the Director of Defense Research and Engineering within the new Office of the Under Secretary of Defense for Acquisition. The DDR&E is to be the principal advisor and assistant to the Secretary of Defense and the Under Secretary for Acquisition on matters involving R&D. In December of last year, the Senate confirmed my nomination to be DDR&E. I report to Dr. Robert Costello, the Under Secretary of Defense for Acquisiton. Organizationally, I am responsible for strategic and theater nuclear forces, tactical warfare programs, international programs and

technology, research and advanced technology, and development test and evaluation. In addition, Dr. Costello has also delegated to DDR&E oversight responsibilities for the Defense Advanced Research Projects Agency and the Defense Nuclear Agency.

The Research, Development, Test and Evaluation (RDT&E) Request

Under the fine leadership of Secretary Carlucci and Deputy Secretary Taft, I believe we have done a careful and thorough job in the process of accommodating the cut required by the "budget summit." That process has yielded an amended RDT&E budget of $38.2 billion, or essentially no real growth over FY 1988 levels. Secretary Carlucci has spoken of the increased risks inherent in lowering the level of resources we devote to defense when there is no corresponding reduction in the level of our responsibilities around the world. This relationship between smaller budgets, undiminished responsibilities, and greater risks is easy to understand if one thinks about the consequences of deactivating a tactical air wing or cutting military personnel end strengths, for example. I believe, however, that the risk becomes less clear, and therefore easier to ignore, when we talk about the consequences of deferring these R&D investments in our future. Often, the more basic the research is (as in our 6.1, 6.2, and 6.3A budget categories), the longer the time to anticipated potential payoff.

As I indicated earlier, the programs covered today are those requested by the Subcommittee. For the most part they are RDT&E elements carried in the Office of the Secretary accounts and typically have joint or tri-Service implications.

Balanced Technology Initiative

The Balanced Technology Initiative (BTI) was established as an important new element of the DoD Science and Technology Program in FY 1987 to provide additional support for the development of "promising new technologies that could substantially advance our conventional defense capabilities." A detailed and substantive BTI program plan was developed by my office and described in a comprehensive report to Congress. The program was structured to "make a difference" in the conduct of conventional defense missions.

The BTI program includes work in five categories. Work in the Smart Weapons Technology category is intended to promote the advancement of technologies critical to the development of next-generation, autonomous, fire-and-forget munitions having improved target acquisition, identification, and hit capabilities. Work in the RSTA/BMC3 Technology category, a category merging two widely used acronyms (RSTA - for Reconnaissance, Surveillance, and Target Acquisition; and BMC3 - for Battle Management, Communications, Command, and Control), develops enabling technologies for obtaining, processing,

transmitting, and using information essential to the effective development and utilization of conventional defense resources. Detailed information regarding enemy positions, and rapid communications of that information to friendly forces, facilitates the effective use of smart weapons in conventional conflicts.

Projects included in the Armor/Anti-Armor Technology category are intended to be complementary and supplementary to ongoing work in the cooperative DARPA/Army/Marine Corps program. Activities include important work in the areas of advanced guns and projectiles, new weapons concepts, mine/countermine technology, and high performance materials and modeling. Work in the High Power Microwaves (HPM) category is intended to develop a comprehensive understanding of the effects of HPM on tactical weapons systems to help assure the survivability of US and Allied assets and to place vulnerable enemy systems at risk. The fifth program category, Special Technology Opportunities, includes work on enhanced blast munitions, superconducting ceramic materials, and advanced guidance for cruise missiles.

The great majority of BTI projects are being carried out by the Services and the Defense Advanced Research Projects Agency (DARPA). The BTI program will be managed as a special interest activity under my direction. Funding for the program has been included in the revised FY 1989 budget request.

Air Defense Initiative

The Soviets have demonstrated an increasing capability to strike important targets in North America using manned bombers, air-launched cruise missiles, and submarine-launched cruise missiles. This threat may be significantly enhanced by the introduction of low-observable technology in the late 1990s. To counter this threat, we are significantly expanding the Air Defense Initiative (ADI) program in this year's budget. The program will accelerate the development of surveillance technologies, including the detection of quiet, cruise-missile-capable submarines, and expand our efforts in selected C3I and engagement technologies. This effort is extremely important in several contexts. First and foremost, we must maintain our tactical warning, attack assessment, and air sovereignty capabilities against the evolving low-observable threat. Tactical warning is fundamental to our ability to deter attack and maintain strategic stability. The requirement for enhanced air defenses could become even more critical if we negotiate a sharp reduction in strategic offensive ballistic missiles. Finally, should a decision be made to begin full-scale development of strategic ballistic missile defenses, the ADI program will provide the requisite technologies for a possible complementary decision regarding air defense.

I must emphasize that maintaining our capabilities against an advanced threat will be difficult. We don't know the answer

today. However, we do know the broad technology issues we need to explore and the capabilities we must improve. Thus, ADI is vital to maintaining even our basic tactical warning and attack assessment capabilities and is the only program working to solve the problem of North American air defense against an increasingly advanced (and low observable) threat.

University Research

DoD derives dual dividends from university research. First, university researchers generate new knowledge in technical fields that underpin defense systems. Second, the Department relies upon university research programs to train future scientists and engineers. Increased technical knowhow and new talent are key to our long-term military and economic competitiveness.

Universities will perform approximately $700 million in Technology Base activities in FY 1989. Within this amount, approximately $95 million has been requested for the University Research Initiative (URI). URI focuses on an interdisciplinary approach to research, complementing single-investigator university efforts in the research program. The multidisciplinary approach can accelerate research progress in areas that are particularly appropriate for team efforts. It can also speed transition of research results to practical application in defense systems or in commercial spinoffs.

SEMATECH

The Defense Science Board (DSB) concluded that defense systems will become highly dependent upon foreign sources for semiconductors if immediate action is not taken to reverse this unfavorable trend. Further, they warned that US technology leadership in this area is rapidly eroding, with serious implications for the nation's economy and the Defense Department. The DSB recommended that action be taken to retain a domestic strategic production base and to maintain a position of strength in the technologies of device and circuit design, fabrication, materials refinement and preparation, and production equipment.

This program will focus on developing world-class manufacturing technology in a cooperative, cost-shared effort with a consortium of semiconductor manufacturers known as SEMATECH. SEMATECH's goal is to regain world semiconductor manufacturing leadership upon which we can draw to build technically superior weapons and other military equipment. We are currently in the process of making a grant to SEMATECH, in accordance with Congressional guidelines, to develop the manufacturing technologies important to national economic and security interests in this important area.

Software Engineering

Most modern military systems are dependent upon computers and software to accomplish their missions. Many military systems achieve their superiority as a result of having advanced computing elements embedded in them. Computer software provides the means by which computers execute complex computing tasks. The Consolidated DoD Software program seeks to improve reliability and cost effectiveness of the software for warfighting systems. The initiative has three components - the Ada standard programming language; the Software Technology for Adaptable, Reliable Systems (STARS) program; and the DoD Software Engineering Institute. The consolidation of these three programs into one element, as recommended by the Defense Science Board, is included in the FY 1989 request.

The Ada program was established to develop and introduce into military systems a standard computer programming language that not only satisfied difficult technical requirements but also permitted proper financial management of software procurement for embedded computers. The program is implementing comprehensive standardization, control and support to ensure its smooth, swift and widespread introduction into US and NATO defense systems.

The STARS program seeks to achieve improvements in software quality/reliability and reduce software costs. Future weapons

systems will rely on large quantities of software for their successful operation. STARS will demonstrate an order of magnitude productivity improvement by using software engineering principles made possible by Ada. Our goal is to bring a high degree of automation to the software development and maintenance process, and make possible widespread reuse of already coded and tested software. The combination of software automation and reuse should reduce labor costs, maximize the productivity of scarce software professionals, improve reliability and permit second-sourcing of software procurement when appropriate.

The DoD Software Engineering Institute is working to accelerate the transition of software technology from the laboratory into DoD systems. It will help transition technology more quickly by evaluating new tools and techniques, upgrading them for large systems, and demonstrating their usability in military situations. It will also provide software engineering assistance to developers in the Services and Defense Agencies. The Institute will continue to play an important role in the development and use of DoD software.

Microwave and Millimeter Wave Monolithic Integrated Circuits (MIMIC)

The MIMIC program is oriented toward major improvements for analog functions of microwave and millimeter wave devices and in

sensor electronic systems including radar, electronic warfare, communications and smart weapons. These circuits will be built from gallium arsenide (GaAs) because of improvements possible in performance at higher frequencies and increases of radiation hardness. The monolithic format improves reliability and will lead to significant reductions in cost. A one-year study phase began in January 1987, and contracts for the initial hardware/ software developments will begin in FY 1988. The MIMIC program complements present DARPA efforts in digital GaAs circuitry and will provide advanced capabilities in analog circuitry, "the eyes and ears" of military electronic equipment, at affordable costs.

NATO Research and Development

Driven by resource limitations and a commitment to a strong conventional defense, the United States and its Allies have pursued armaments cooperation as an effective means of improving our defensive posture. In order to increase the affordability of research, development, production, and logistics programs, we are steadily increasing investment in those acquisition efforts where development costs and resources are shared with our Allies. As a result, it is projected that US investment in cooperative programs will increase significantly with both NATO and non-NATO Allies. This will better enable us to field strong conventional forces.

Congressional funding for cooperative research, development and testing efforts with NATO and major non-NATO Allies has been an incentive for increased armaments cooperation. Since enactment of the NATO Cooperative Research and Development program in 1985, we and our Allies have greatly expanded armaments cooperation. International agreements have been reached and research and development programs initiated for at least a dozen cooperative projects, with many more in negotiation. Each of these projects involves the United States and one or more other nations sharing the costs to redress a deficiency in our alliance conventional defense posture.

Joint Remotely Piloted Vehicles (RPVs) Program

One of the major initiatives for improved management being instituted is the Non-lethal Unmanned Aerial Vehicle (UAV) program. As you know, Congress consolidated, under OSD management, various Service and Defense Agency UAV efforts and provided $50 million in RDT&E and $45 million in Procurement funds for this purpose in FY 1988. Specifically, OSD has been charged with establishing funding and program priorities, establishing requirements necessary for single programs to meet joint Service needs, and eliminating unwarranted duplication. We have reviewed the Packard Commission proposals and hope to include some of its recommendations into the management structure for UAVs, specifically seeking to use rapid prototyping processes in order to expedite the fielding of new

capabilities for conventional forces. Of the funds appropriated for UAVs, the Department has completed actions to execute a fixed-price contract option to procure four Pioneer systems. The Congressionally-directed RPV Master Plan, detailing the Secretary's decision as to which UAV activities should be pursued, is being drafted. This UAV Master Plan should be provided to the Congress by mid-April. We appreciate the vote of confidence given OSD by the Congress and the provision of the requisite funds and management tools to effectively pursue the UAV consolidation.

Budget Summary

As you know, Secretary Carlucci gave guidance and established priorities for the crafting of this amended budget. His overall guidance was the choice of a smaller force fully ready as opposed to a larger, but unready force. His priorities were people, readiness, and efficient acquisition. The "efficient acquisition" priority is the one most responsible for shaping the major changes to the RDT&E budget.

Our original request in the FY 1988/89 biennial RDT&E budget was for $44 billion in FY 1989. As a result of the recent amendment process, we have reduced that request by about $6 billion to $38 billion. For your information, funding for programs discussed in this statement is summarized in the

attached table. We believe the amended budget provides a reasonable balance between resources needed to protect us today and resources required to ensure our future. We will manage the investment wisely and continue to provide effective stewardship of the resources applied to this essential and important element of the national defense posture.

Table 1
Selected Program Amounts
Research, Development, Test and Evaluation
(Dollars in Millions)

	FY 1988	FY 1989
Balanced Technology Initiative	$200	$238
Air Defense Initiative	49	214
University Research Initiative	85	95
Microwave and Millimeter Wave Monolithic Integrated Circuits	45	67
Software Engineering	25	37
Joint Remotely Piloted Vehicles	50	35
NATO Research and Development	148	201
SEMATECH	100	45
LANDSAT	10	0

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