



ENSURING NATIONAL SECURITY THROUGH FEDERAL SUPPORT OF DEFENSE SCIENCE AND TECHNOLOGY

AN AIAA INFORMATION PAPER

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INTRODUCTION

In the years since the end of the Cold War, general uncertainty in the need for a large defense budget, including public investment in Defense Science and Technology, has had a negative influence on budget planning. Without a major adversary it was difficult to predict the quantity and quality of a threat. There was talk of a terrorist threat, but it was vague and not quantifiable in numbers or quality. Since the DoD has typically based its planning on detailed threat analyses, justifying a large budget has been impossible. Since 9/11, however, the reality of the threat is clear, if not the quantity, quality, and war plan of the adversaries. It is a different kind of war, one which requires some new science and technology and a reprioritization of emphasis on prevention of, as well as reaction to, hostile activities. This speaks for more, not less, government funded defense research in science and technology development. The organizational steps taken in the executive branch to emphasize homeland defense are good, and we are told the struggle will be long and difficult. Therefore, we must maintain a strong defense S&T budget for both short- and long-term applications of new technology in the war on terrorism and homeland defense.

AIAA POSITION

The American Institute of Aeronautics and Astronautics (AIAA) is pleased to present its views on Department of Defense funding of Science and Technology activities. The AIAA is a society of some 35,000 aerospace professionals working in academia, government agencies, and industry. At least half of our members are directly involved in research, design, development, test, production, or operation of military aerospace systems in the public and private sectors of the defense industrial base. We are proud to serve in this capacity and to be a part of today's war on terrorism.

The AIAA strongly supports the view that government investment in science and engineering is proper and essential to enabling investments that open doors to private sector applications of technology which, in turn, creates products and jobs that advance the quality of life and prosperity of our citizens. In aeronautics and space, the principal agencies through which these investments are made are NASA and the DoD.

In general, most AIAA members also fully support a fiscally responsible government spending policy. It is important to differentiate between wealth-producing and non-wealth-producing spending by the federal government. History clearly tells us that investing in defense science and technology is in the wealth-producing category, especially in the aeronautics field. In our view this will remain true for the foreseeable future, and payoffs from space technology investments will continue to grow rapidly. The rate of payoff growth will depend, of course, on the size and quality of the continuing investments both by the government and by industry.

When we speak of defense Science and Technology (S&T) funding we are referring to the defense budget categories of 6.1 (Basic Research), 6.2 (Applied Research), and 6.3 (Advanced Technology Development). We do not include 6.4, EMD (Engineering

Manufacturing Development), which refers to development directly tied to weapons systems acquisition and is the major part of the DoD R&D spending.

Adequacy of the 2003 Defense S&T Budget Request

In 1994 and 1995 testimony to the Appropriations Committees of both houses of congress and again in 1997 testimony to the Senate Subcommittee on Acquisition and Technology, Committee on Armed Services, the AIAA expressed "grave" concern regarding reductions in defense S&T funding. From 1993 to 1999 the S&T investment fell \$2.25B or 22% in real terms (FY2002 dollars) to about 2.75% of the DoD budget (in 1993 it was 3.3%). Since 1999 there has been a much-needed rise averaging 9% per year such that S&T reached 3.1% of the total defense budget in 2002. However, the DoD request for 2003 contains an S&T *decrease* of 5.5% (\$0.56B in FY2002 dollars), to only 2.65% of the DoD budget, negating much of the recent increases and leaving the S&T investment \$0.6B less than the 1993 level (FY2002 dollars). This is despite an increase in the total DoD budget request of \$38.3B (FY2002 dollars) or 11.5% over 2002.

It is recognized that the 2003 request includes an increase in 6.4 funding of about \$4B (in FY2002 dollars) which is a real increase of about 11%. However, in our opinion this does not justify the reduction in S&T funds, especially in this time of adjustment in strategy and planning to emphasize homeland defense and the war against terrorism. We need to have a technology strategy and research plan that adjusts for the reality of this change in primary adversary/threat to the security of the United States and its citizens around the world. It is a far more complex problem than we have planned to face in the past. It is unreasonable to think that less S&T funding will be adequate when we have been through nine years of far less S&T funding than in the height of the cold war. One might even argue that we would have been better prepared for 9/11 if we had dedicated more S&T to the threat of terrorism over the last 10 years, but that would have been difficult under the reduced budgets of that period.

Examples of S&T investments with high payoff in full-scale weapon systems

There are far too many examples of extremely high payoff in fielded aircraft systems to enumerate them all; just a few examples are cited below:

Numerous S&T programs were initiated in the mid-to-late 70s studying stealth technologies applied to aircraft design culminating in an advanced development program called "Have Blue," which was a sub-scale prototype of the F-117, the first production stealth combat aircraft. This and related S&T investment has led to a current series of combat aircraft far superior in survivability to anything in the world. This translates to improved cost-effectiveness (fewer lost aircraft in combat) and far fewer combat casualties.

The recent successful conclusion of the advanced development program, "JAST," has provided a new generation low-cost, multi-role fighter suitable for three services in the U.S. and exportable to our allies. This program is expected to save billions due to the "economy of scale" provided by multi-role, multi-service, and multi-country applications of the technologies developed by the JAST program.

The long-running Integrated High Performance Turbine Engine Technology (IHPTET) program has led to order-of-magnitude improvements in jet engine durability and performance by nationally integrating new engine technology development and promoting its transfer into both commercial and military engines.

Computational Fluid Dynamics (CFD) and finite element structural analysis codes have combined to pay off in reducing the time and improving the accuracy of aircraft design and analysis potentially shortening the development time and cost of new production systems, both military and commercial.

The first production fly-by-wire (FBW) flight control system, fielded in the F-16, would not have happened in the 1970s if not for an advanced development flight demonstration of a FBW system flown on a modified F-4. Today, all new aircraft, both military and commercial, incorporate advanced digital FBW designs, first proven in the AFTI/F-16 technology demonstration program of the 1980s. Even some older airframe designs, such as the F-16C/D and the F/A-18E/F are now delivered with digital FBW systems.

The 1980s also produced a vectored nozzle advanced development program, the F-15 STOL/Maneuver Technology Demo, which contributed to the selection of vectored nozzles for the F-22, improving its cruise range, survivability, combat agility, maneuverability, and controllability.

These are examples of programs that cost in the neighborhood of hundreds of millions and sometimes much less, yet their payoff has been in the billions when operational costs and effectiveness are taken into account, and uncounted lives have been saved.

S&T, the source of superiority and national security

S&T investment is still the bedrock of America's military and economic superiority and, therefore, our national security. S&T investment in defense technologies is absolutely critical to making weapon systems effective and affordable in the future. In addition to purely defense contributions, S&T investment maintains America's technology leadership and contributes to important economic security goals. And it is a high-leverage catalyst for the creation and maintenance of high-quality jobs in the 21st century.

Last but not least, significant changes in the S&T plan are necessary in order to adjust to the obvious change in "sea state" that occurred on September 11, 2001. As the president has said, this is going to be a long struggle. It demands new creative thinking about who, what, and where the adversary is and will be in years to come. Clearly, creative research and technology development is required to effectively prosecute this fight now and in the future. **Reducing defense S&T funds is not the right budget answer for 2003.**

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