

# ESTABLISHING AND SUSTAINING ROBUST DOD SCIENCE AND TECHNOLOGY R&D FUNDING: An AIAA Information Paper

## ABSTRACT

The American Institute of Aeronautics and Astronautics (AIAA) – the world’s forum for aerospace leadership – sees a disquieting trend in terms of the lack of long term planning and funding for Aerospace and Defense (A&D) research and development funding. Innovation does not occur over night. In the A&D world, it can often take years for technology to mature beyond “blue sky” concepts to functional, deployable systems. As a result, it is critical that the programs born into this environment do not have their success undermined by a system whose funding can vary widely from year to year. Only by establishing and sustaining a robust level of funding for DoD science and technology research and development (R&D), can the impact of these fluctuations be reduced in the already volatile world of R&D.

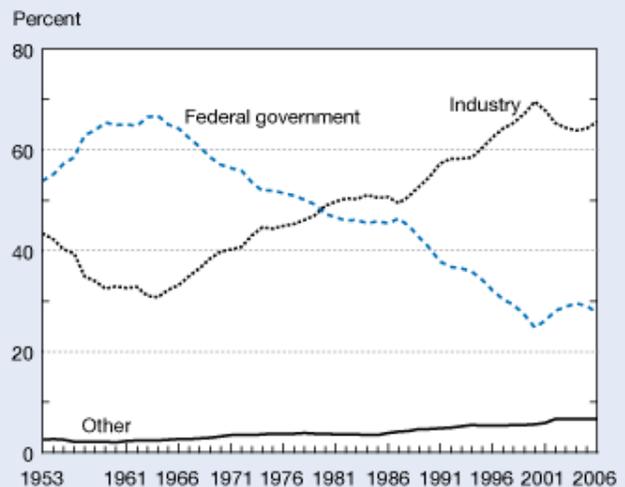
## ISSUE

Federal funding constitutes one of the largest, albeit declining, percentages of national R&D investments. In 2006, the federal government funded \$94 billion of R&D activity, or approximately 28% of all R&D funding in the United States. This percentage represents a decline from 2005 levels and continues a trend that has been occurring since the mid 1960’s (Fig. 1). Additionally, federal R&D funding as a percentage of Gross Domestic Product (GDP) has at best been steady, but typically varies from year to year (Fig. 2). The reality of declining federal funding amplifies the problems created by the inability of the federal government to maintain a sufficient and consistent funding level for R&D as reflected in a fixed and guaranteed percentage of GDP.

## BACKGROUND

In the case of both NASA and the DoD, money earmarked for R&D has been

Figure 4-3  
National R&D expenditures, by funding sector:  
1953–2006



SOURCE: National Science Foundation, Division of Science Resources Statistics, National Patterns of R&D Resources (annual series). See appendix table 4-5.

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Figure 1 – Historical R&D Trends

TABLE 14. International comparisons of research and development expenditures and research and development as percentage of gross domestic product in United States and selected other countries: 1981–2006

Year	United Kingdom								Russian Federation		Total OECD
	United States <sup>a</sup>	Japan <sup>b</sup>	Germany <sup>c</sup>	France	United Kingdom	Italy	Canada				
2001	2.76	3.12	2.46	2.20	1.83	1.09	2.09		1.18	2.27	
2002	2.66	3.17	2.49	2.23	1.82	1.13	2.04		1.25	2.24	
2003	2.66	3.20	2.52	2.17	1.78	1.11	2.03		1.28	2.24	
2004	2.59	3.17	2.49	2.15	1.71	1.10	2.05		1.15	2.21	
2005	2.62	3.32	2.48	2.13	1.76	1.09	2.01		1.07	2.25	
2006	2.62	3.39	2.53	2.11	1.78	NA	1.94		1.08	2.26	

OECD=Organisation for Economic Co-operation and Development; GDP=gross domestic product; NA=not available.

Figure 2 – Comparison of International R&D Investments (%GDP)

shifted to support programs that are overrun and behind schedule but have been deemed as vital to future department/agency roadmaps. According to a recent GAO report on DoD Acquisition of Major Weapons Systems, acquisition costs for the 95 major defense acquisition programs (MDAPs) have grown on average by 26% from their original estimates and experienced an average schedule delay of nearly two years. R&D funding is routinely a casualty when re-allocating financial resources to address overruns and schedule problems.

While the GAO report shows the tendency for current and future programs to be over budget and late in delivering, budget allocations and minimal funding for R&D point to the propensity to sacrifice R&D for the sake of in work programs. The implication of this leading to a vicious cycle is clear as the GAO report points to technology entering into system development and demonstration phase with only a minimal level of maturity. As R&D funds are shifted to support these production programs, it will result in future programs following the same pattern of entering with immature technology, forcing the same cycle to be repeated time and time again.

Currently aviation and aerospace activities make up as much as nine percent of America's GDP as well as represent the fastest growing source of technological exports. These advances were made in part by having a steady and robust level of R&D funding. As other countries continue to increase their R&D spending as a percent of their GDP, the US is in danger of losing its position as the technology leader in a variety of aerospace related fields. In some areas the US has already relinquished that position to countries in Europe and Asia that continue to grow their R&D budgets at a significantly higher rate than the United States.

## RECOMMENDATIONS

As a matter of urgency, Congress should immediately move to designate within the relevant departments/agency, a fixed and protected level of R&D funding. Only by providing a fixed and reliable level of funding will program managers be able to plan for multiyear programs based upon realistic schedules and costs. Protecting R&D funds will also address the issue of immature technology being pushed into production as a result of losing R&D funding. A major shift if DoD acquisition policy will need to accompany changes to sustained R&D funding.



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Additionally, Congress should immediately set a fixed and protected level for overall federal R&D funding equal to 3% of the yearly GDP with a minimum level of no less than the previous year's funding.. Protecting these funds will prevent the R&D coffers from being raided to address cost overruns in other programs. This, coupled with acquisition reform, will be a major factor in addressing general program overruns as well as providing for sustained and robust funding for science and technology R&D.

Further, it is recommended that Executive Order 13419, National Aeronautics Research and Development, be fully implemented to address the fundamental focus of aeronautics research as specified in Section 2, part b. As is allowed by the wording of E.O. 13419, a specific level of funding and providing a protected status to R&D funding should be considered as part of all R&D tasks included in future R&D plans submitted in accordance with Section 3.

Prompt action by the Congress to address both the funding and prioritization of R&D is critical to the sustainability of future R&D activities.