United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Government Activities and Transportation, Committee on Government Operations, House of Representatives

For Release on Delivery
Expected at
9:30 a.m., EST
Wednesday,
March 18, 1992

NASA AERONAUTICS

Efforts to Preserve U.S. Leadership in the Aeronautics Industry Are Limited

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Madam Chairman and Members of the Subcommittee:

I appreciate the opportunity to testify before you on the National Aeronautics and Space Administration's (NASA) efforts to preserve U.S. leadership in the aeronautics industry--an industry vital to this nation's economic and military well-being. First, I will comment on the competitive position of the U.S. aeronautics industry and NASA's relationship to it. My testimony will then focus on NASA's funding of its aeronautics program, and research and technology demonstration activities that are associated with the commercial aeronautics industry.

OVERVIEW

Since its beginning in 1915, NASA's predecessor, the National Advisory Committee for Aeronautics, was the focal point for government support of aeronautics technology. Then when NASA was established in 1958, its charter charged it with preserving the role of the United States as a leader in aeronautics science and technology. This responsibility is especially important because the aeronautics industry is a major contributor to commerce, transportation, and the national defense. In 1991, aeronautics products provided a $29 billion positive contribution to the U.S. trade balance, and the industry employed an estimated 657,500 U.S. workers. The aeronautics industry is also considered a "technology driver" that leads to "spin-offs" of advanced technology products useful in other parts of the economy.

The aeronautics industry is diverse, ranging from large airframe manufacturers down to numerous producers of smaller avionics and engine products. Although the U.S. aeronautics industry has experienced strong sales and remains a leading competitor in the growing global export market, the industry has been losing some of its market share. The U.S. aeronautics industry's sales (expressed in constant 1992 dollars) increased from about $36 billion in 1973 to an estimated $77 billion in 1992. Export sales of U.S. commercial transportation aircraft still exceed those of other countries. U.S. commercial aircraft are generally considered superior in performance and reliability. However, foreign companies, most notably Airbus Industrie consortium in Europe, continue to press for a greater share of a growing aeronautics world market. A major airframe manufacturer forecasts that the market for jet transport aircraft alone will be worth almost $2.0 trillion through the year 2030. The majority of this amount, between about $1.6 to $1.8 trillion, is expected to come from the sale of aircraft that fly below the speed of sound. The remainder of the total jet transport market is expected to be comprised of high-speed civil transport aircraft that fly above the speed of sound. These aircraft are forecast to be available at the earliest by the year 2005.

The U.S. share of aeronautical global exports declined from 65 to 52 percent between 1974 and 1987, the most recent year for which comparative data is available.[1] At the same time, the comparable European share rose from 25 to almost 39 percent. This news is disconcerting because the Congressional Research Service (CRS) recently suggested that aircraft production has a significant impact on the economy. The CRS indicated that for every additional dollar of aircraft shipments, output of the economy increases by 2.3 dollars, and every $1 billion (in 1977 dollars) of new U.S. aircraft shipments is estimated to create nearly 35,000 jobs. Finally, just as increases in demand and output could stimulate economic activity, a decrease in demand would have the same, but negative effects on output and employment.

NASA is responsible for helping the United States maintain its aeronautical leadership position. In fiscal year 1992, NASA budgeted about $1 billion for its aeronautics program.[2] This figure represents a limited amount of NASA's total budget. In fact, in the last 20 years the amount of aeronautics funding has declined in relation to the agency's overall budget. Within the aeronautics budget, NASA has emphasized fundamental research which is more useful for long-term competitiveness. The agency has focused only a small part of its research on the area with the largest near-term sales potential, the large jet transports that operate below the speed of sound.[3] Moreover, NASA has not adequately supported the U.S. industry's aircraft wind tunnel test needs. Such tests can also benefit competitiveness in the near term.

NASA'S LIMITED AERONAUTICS BUDGET

NASA's aeronautics funding has been limited relative to the agency's overall budget. The makeup of NASA's aeronautics budget over the past 20 years shows that the agency has placed greater importance on space programs than aeronautical ones. Furthermore, NASA has experienced substantial budget growth during that timespan, yet little of this increase has gone to aeronautics.

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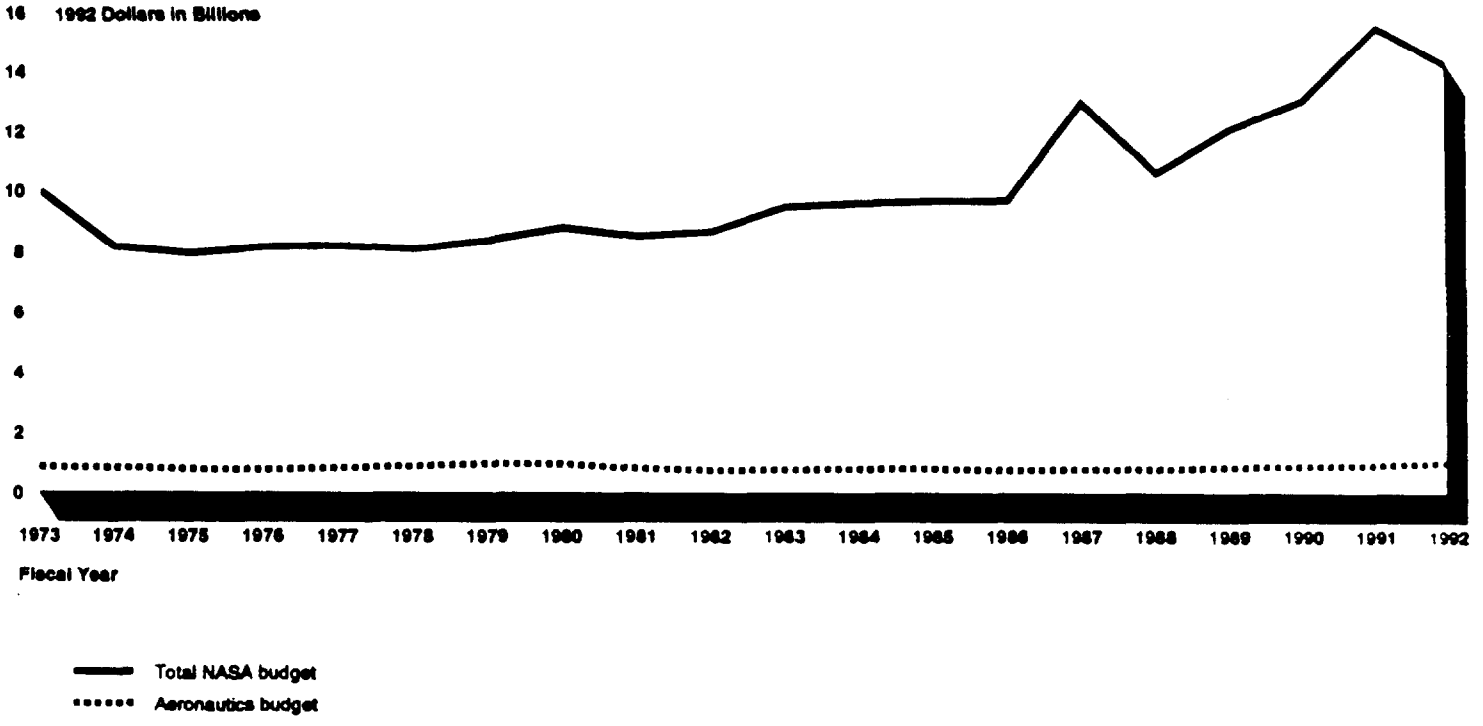
[1]Includes both civil and military aeronautical exports.

[2]This $1 billion was divided between three budget accounts as follows: $574 million for Research and Development, $386 million for Research and Program Management, and $42 million for Construction of Facilities.

[3]For purposes of this testimony, we define "near-term" as within the next 10 years.

NASA's total budget consists basically of aeronautics and space funding. To illustrate, as shown in figure 1, for fiscal years 1973 through 1992, NASA's aeronautics budget in 1992 dollars increased about 19 percent from about $840 million to $1.0 billion per year, as NASA's overall budget increased about 43 percent from $10.0 billion to $14.3 billion.

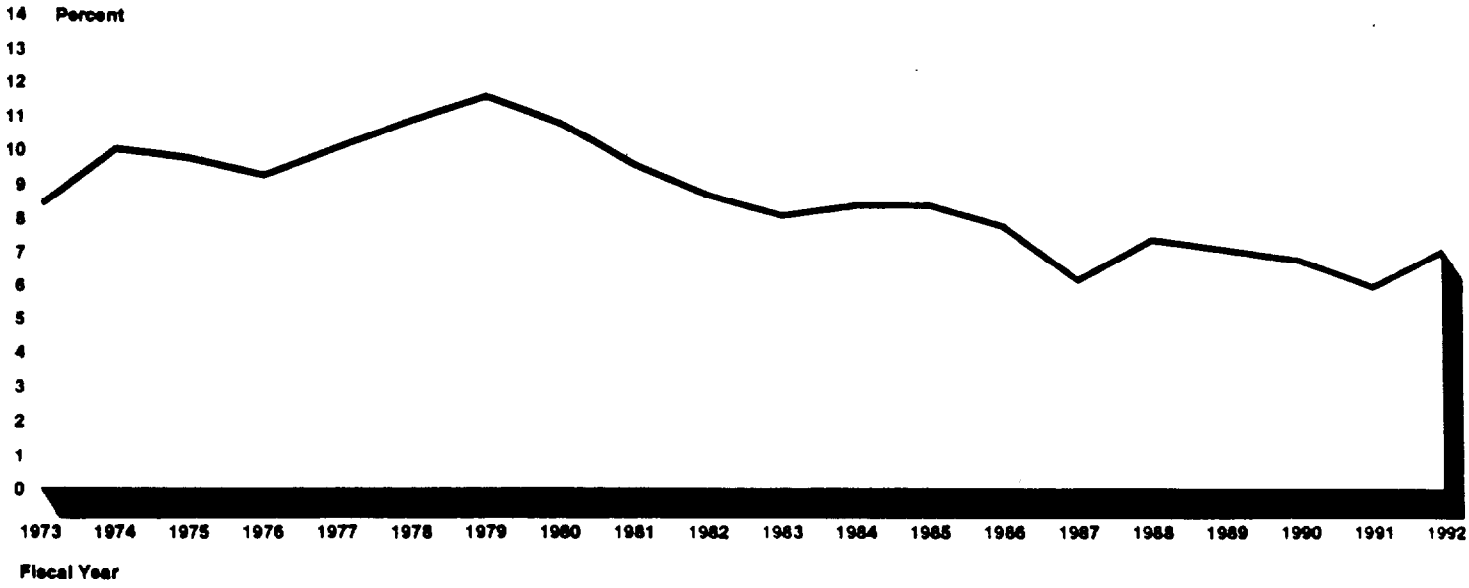
Figure 1: NASA's Budget History (FY 1973-92)



Source: GAO analysis of NASA data.

Figure 2 shows that the aeronautics portion of NASA's total budget declined from 8.4 to 7.0 percent for fiscal years 1973 through 1992.

Figure 2: Aeronautics Portion of NASA's Total Budget (FY 1973-92)



Source: GAO analysis of NASA data.

NASA's support for the U.S. aeronautics industry can be viewed as even more limited than the previous figures suggest. What NASA considers "aeronautics funding" includes three broad categories: subsonic, supersonic, and hypersonic. "Subsonic" is a range of speed below the speed of sound in air (761.5 mph at sea level), "supersonic" is a range of speed between about one and five times that speed, and "hypersonic" is a range of speed that is greater than five times that speed. The hypersonic research component may be more appropriately grouped with the space program because its major goal is to develop aircraft that can fly into space. Moreover, some of NASA's aeronautics test facilities are used to support space activities--space shuttle vehicle testing, for example. If the costs of the hypersonic component and the space shuttle testing facilities were borne by the space program, aeronautics funding would make up an even smaller portion of NASA's budget.

NASA'S AERONAUTICAL RESEARCH AND DEVELOPMENT ACTIVITIES

A 1982 White House aeronautics study states that U.S. government support of NASA's aeronautical programs is the best means for ensuring that adequate national investments are made in aeronautics.[4] Industry officials told us that although NASA's subsonic research budgets have been limited, the agency's research activities have been of great value and the staff conducting this research has been highly qualified. For example, NASA's research on wing design and energy efficient engines led to significant improvements in aircraft. According to industry officials, NASA's research can help U.S. companies stay at the cutting edge in the design of new commercial aircraft. However, the industry officials desire more help from NASA.

NASA has followed administration policy that emphasizes the agency's role in long-term aeronautics research. As illustrated in figure 3, since the early 1980s the majority of the agency's aeronautics research and development funds has been devoted to fundamental research, while its systems technology funding has generally declined. The last four years, however, show an increase in systems technology funding with a majority of the funding increase attributable to supersonic, high-performance computing, and advanced composite material research.

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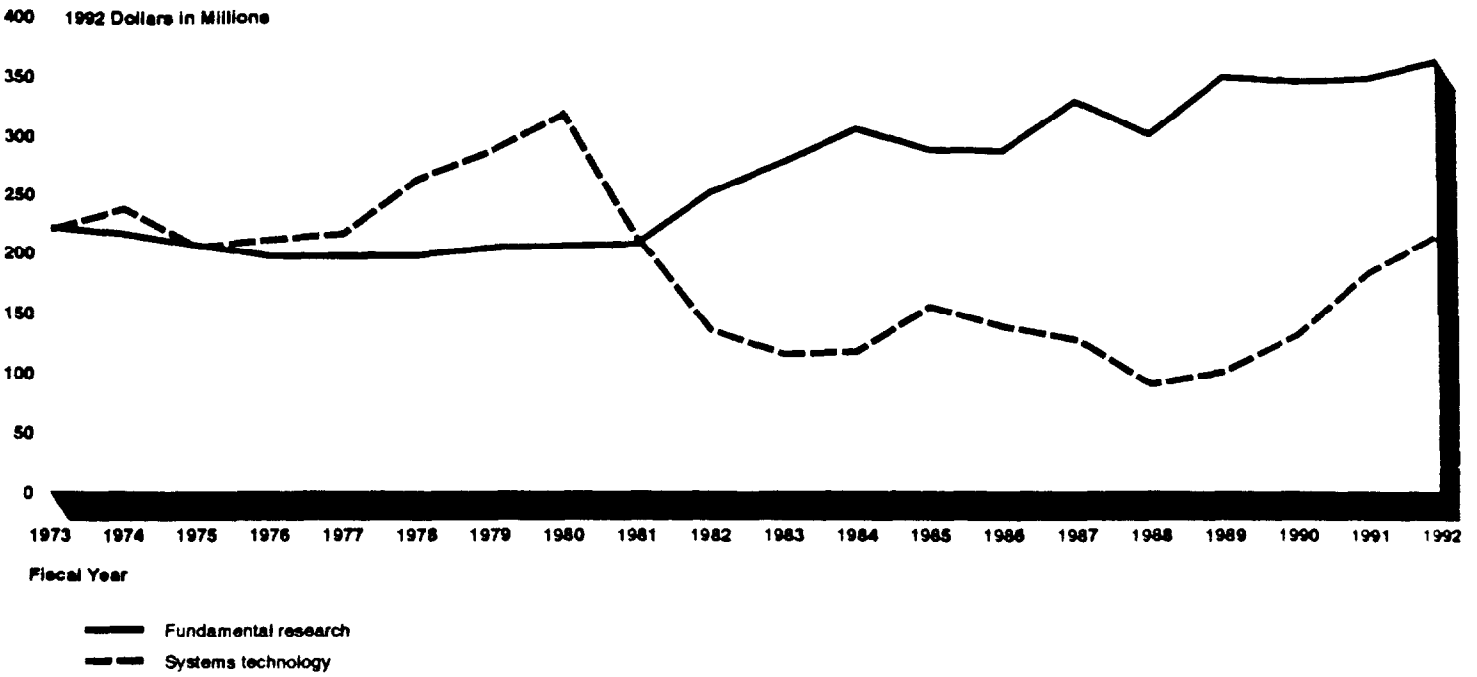
[4]Aeronautical Research and Technology Policy, Volume I: Summary Report, Executive Office of the President, Office of Science and Technology Policy, November 1982.

Figure 3: NASA's Aeronautics Research and Development Funding (FY 1973-92)



Source: GAO analysis of NASA data.

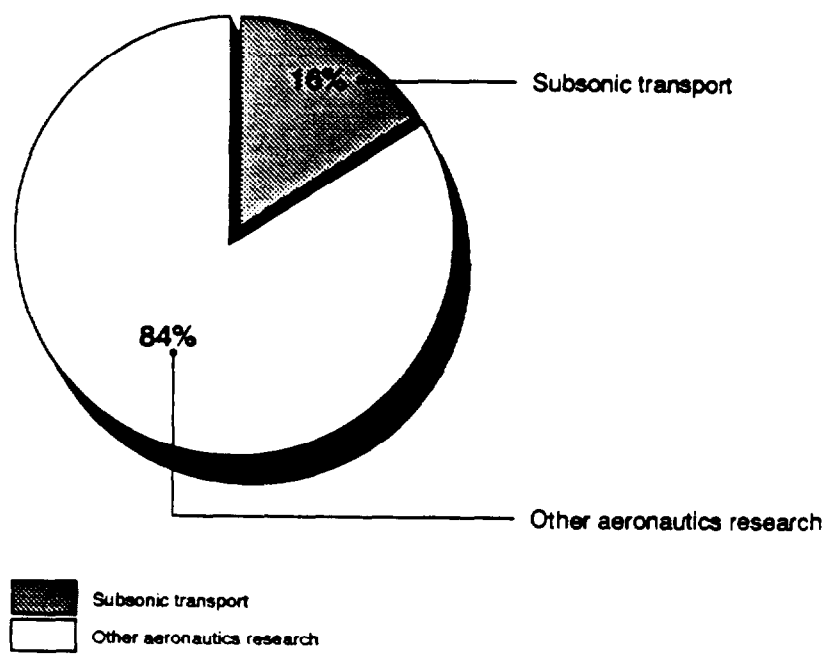
In fiscal year 1992, NASA allocated $361 million (about 63 percent) of its aeronautics research and development funding to fundamental research and $213 million (about 37 percent) to systems technology. "Fundamental research" provides the foundation for the continuing advancement of aeronautics technology and, therefore, is less likely to be applied immediately by the aircraft industry. On the other hand, the systems technology budget provides for technology and, sometimes, validation demonstrations useful for a technology's application by industry in the near term.

Aeronautical technology demonstrations can facilitate technology transfer by reducing the industry's economic and technical risks of applying new technology. Industry representatives told us that they do not think NASA has adequately funded such demonstrations. Since the early 1980s, the administration has limited the amount of NASA's aeronautical technology demonstrations because it believes that, in general, industry, rather than the government, should pay for them.

Subsonic Research Is Most Beneficial to Near-Term Industry Competitiveness

If we look at the near term, we find that the subsonic component of NASA's work is more likely to enhance U.S. industrial competitiveness. Subsonic transport aircraft sales will continue to dominate the growing world market for commercial transport aircraft beyond the year 2000. Yet, as shown in figure 4, NASA's research funding for subsonic transport aircraft was only 16 percent (about $93.5 million) of the total aeronautics research and development budget in fiscal year 1992.

Figure 4: NASA's Subsonic Transport Research and Development Funding (FY 1992)



Source: GAO analysis of NASA data.

NASA aeronautics officials had planned to do more in the subsonic area. For example, NASA requested $371 million for its fiscal year 1983 aeronautics research budget. However, the Office of Management and Budget (OMB) cut 19 projects valued at about $139 million from the budget, including several that were expected to

significantly improve the efficiency of subsonic aircraft. The OMB stated that funding technology development and demonstration projects with relatively near-term commercial applications would represent an "inappropriate federal subsidy." Some parts of the projects denied in 1983 were later included in other fundamental research projects conducted by the agency.

Since 1983, NASA's aeronautics directorate has repeatedly attempted to augment its subsonic systems technology effort. It designed a program aimed at developing and evaluating key subsonic transport technologies that it deemed "crucial to the superiority and international competitiveness of the U.S. transport industry." These technologies focus on revitalizing aging aircraft and developing flight controls and engine power management systems that use new electro-mechanical controls and fiber-optic data transmission technologies, for example. In fiscal year 1990, NASA aeronautics officials proposed a 5-year, $642 million program to accomplish those objectives. To date, only about $17 million survived the budget review process at NASA headquarters and OMB. Furthermore, total program cost has been reduced to $120 million, and the estimated program completion date has slipped to 1998.

Another industry concern is NASA's inability to support the wind tunnel test requirements of major U.S. aircraft companies when they are developing new subsonic commercial aircraft concepts. The Unitary Wind Tunnel Plan Act of 1949, as amended, provided for NASA to operate and staff selected wind tunnel facilities and make them available to industry for aircraft and missile development tests. According to Boeing and McDonnell Douglas officials, the two key tunnels for their developmental testing are the 12-foot and the 11-foot tunnels at NASA's Ames Research Center. About 5 years ago, the 12-foot tunnel developed cracks and became a potential safety hazard, so it was shut down and is currently undergoing reconstruction at a projected cost of about $101 million.[5] The tunnel will not be back on line until about 1995. As a result, both Boeing and McDonnell Douglas have been forced to use tunnels in England and France, respectively. These tests are essential to the design of the companies next generation of aircraft, the Boeing 777 and the McDonnell Douglas MD-12, for example.

U.S. industry officials told us that maintaining the confidentiality of the data generated in these overseas test facilities was in question. They are very concerned about the possibility that important wind tunnel data could be copied and

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[5]This project is part of a larger NASA facilities revitalization program to restore and modernize key facilities crucial to maintaining U.S. competitiveness in aeronautical research and development. In 1992, NASA estimates a total of about $340 million for fiscal years 1989 through 1995 for this effort.

supplied to the Airbus consortium. If so, Airbus could learn how their U.S. competitors' technology compares with their own and how a technology advancement was achieved. Nevertheless, the U.S. companies continue to use these wind tunnels to finalize their designs, because they have no other alternative.

The other tunnel, the 11-foot tunnel at Ames, is in need of rehabilitation, and lacks various data and productivity capabilities. It is scheduled to be shut down in 1995 for a refurbishment that will take about 2 years. The loss of this tunnel will force U.S. companies to conduct additional tests overseas.

The European wind tunnels are considered by industry officials to be superior now and in the future, even allowing for the result of the 12- and 11-foot tunnels' refurbishment. NASA's wind tunnel refurbishment plan has only received enough funds to correct some of the highest priority deficiencies, and additional funding would be required if NASA is to increase its tunnel productivity to equal that which currently exists in Europe. Meanwhile, newer, state-of-the-art wind tunnels are being planned in Europe over the next few years.

European Governments' Subsidy of Industry's Use of Wind Tunnels

Boeing and McDonnell Douglas note one apparent difference between U.S and European policy when it comes to supporting the domestic aeronautics industry. When U.S. companies use NASA wind tunnels to develop proprietary designs, they must pay NASA fees to cover the cost of such use. The fee for using NASA's 11-foot tunnel at Ames was increased 2 years ago from $2,400 to $3,600 per hour. According to NASA officials, the fees that U.S. companies pay to use the tunnels in Europe may be up to 40 percent higher than the NASA fees. These fees amount to millions of dollars per year. However, Boeing and McDonnell Douglas officials believe that Airbus pays no fees for use of the same British and French tunnels because tunnel use is considered part of the governments' support of Airbus. Industry officials point to the wind tunnel situation as an example of the so-called unlevel playing field that confronts the U.S. aeronautics industry in its endeavor to compete in the world market. We will soon initiate work that could provide information on the extent to which this issue is a problem.

This concludes my remarks, Madam Chairman. I would be happy to answer any questions.

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