

Media Backgrounder on:

The Final Report of the Commission
on the Future of the United States
Aerospace Industry



ANYONE ANYTHING ANYWHERE ANYTIME



November 18, 2002



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Anyone, Anything, Anywhere, Anytime
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America needs a national aerospace vision to keep alive the flames of imagination and innovation that have been a hallmark stretching from the pale sands of Kitty Hawk to the red dust clouds of Mars. The vision the Commission used to guide its efforts is:

"Anyone, Anything, Anywhere, Anytime."

As a result of its extensive fact-finding, research, hearings, interviews, and written testimony from experts throughout the world, the Commission has issued nine recommendations that begin the process of reestablishing the aerospace and aviation industry sector on firm footing.

Here is a backgrounder of those recommendations.

Full details are available in the Commission's complete *Final Report*.

AEROSPACE IN FOCUS

- Aerospace contributed 9 percent to the nation's gross domestic product and 11.2 million U.S. jobs in 2000.
- The U.S. air transportation system carried 666 million passengers and nearly 24 billion tons of air cargo all over the world in 2000.
- The United States exported \$58.5 billion in aerospace products in 2001, the largest net export segment of all U.S. industry.
- The airline industry is handling more than three times as many passengers in 2002 as it did in 1978, and the FAA expects a billion annual air travelers in 10 years.
- U.S. aerospace sales are estimated at \$144 billion in 2002.
- The global satellite imagery sector of aerospace has more than tripled in size since 1988 and is projected to reach nearly half a billion dollars in sales by 2005.
- Federal and company investment in research and development was \$10.3 billion in 2000.



Vision: Anyone, Anything, Anywhere, Anytime

Recommendation #1: The integral role aerospace plays in our economy, our security, our mobility, and our values makes global leadership in aviation and space a national imperative. Given the real and evolving challenges that confront our nation, government must commit to increased and sustained investment and must facilitate private investment in our national aerospace sector. The Commission therefore recommends that the United States boldly pioneer new frontiers in aerospace technology, commerce, and exploration.

Photo above: Plasma propulsion will help reduce transit times through the solar system.

Now is the time for the aerospace sector – government, industry, labor, and academia – to come together to address the critical issues facing the aerospace sector, remove bureaucratic and other impediments to progress, and embrace our vision for aerospace in the 21st century.

Background

The 20th century was America's century. Our nation thrived on previously unimagined advances in ground, air, and space transportation, rapidly becoming the world leader in nearly every economic sector driven by the progress of science and technology.

One hundred years ago, the slogan "Anyone, Anything, Anywhere, Anytime" would have meant leaving home when transportation permitted and then allowing a week or two to travel between widely separated American cities. Today, New York to London is a day trip. A package of any size shipped today arrives tomorrow morning anywhere in the country.

What could "Anyone, Anything, Anywhere, Anytime" mean a century from now? A sub-orbital day trip between Japan and the United States? A lunar vacation? A Martian hiking expedition? Whatever our future holds, the aerospace sector will take us there, providing our nation and the world with the ability to move people, goods, services, and ideas whenever they are needed and wherever they are wanted.

We need a bold vision for air transportation that creates a new, highly automated "Interstate Skyway System." The system needs to be safe, secure, and efficient and accommodate the large volume and variety of civil and military aerospace vehicles the nation will require in coming years.

We also need an audacious vision of space exploration that recognizes the solar system as our backyard, the Milky Way galaxy as our neighborhood, and the universe as our hometown. We should do this not simply because it's fun, or thrilling, or challenging, or enlightening...but because it represents a critical investment in our economic strength and ultimately in our capacity to defend ourselves.

It's America's choice.

FACTS IN FOCUS

To achieve our vision for aerospace, the Commission concludes that:

- The nation needs a national aerospace policy.
- There needs to be a government-wide framework that implements the policy.
- The administration and Congress need to remove prohibitive legal and regulatory barriers that impede the sector's growth and continually seek to level international playing fields.
- Global U.S. aerospace leadership can only be achieved through investments in our future, including our industrial base, workforce, long-term research, and national infrastructure.



Air Transportation: Exploit Aviation's Mobility Advantage

Recommendation #2: The Commission recommends transformation of the U.S. air transportation system as a national priority. The transformation requires:

- Rapid deployment of a new, highly automated Air Traffic Management (ATM) system beyond the FAA's Operational Evolution Plan so robust that it will efficiently, safely, and securely accommodate an evolving variety and growing number of aerospace vehicles and civil and military operations.
- Accelerated introduction of new aerospace systems by shifting from product to process certification and providing implementation support.
- Streamlined new airport and runway development.

Objective

Delivering people and goods quickly and affordably – when and where needed.

Background

Our air transportation system is severely limited in its ability to accommodate America's growing need for mobility. The basic system architecture, operational rules, and certification processes developed decades ago don't allow today's technologies to be fully utilized and don't allow needed innovations to be rapidly implemented. There are barriers to advancing air mobility.

Photo above: Future air traffic control concepts can be explored through computer simulation.

As a first step, the administration should immediately create a multi-agency task force with the leadership to develop an integrated plan to transform our air transportation system.

First, the U.S. air traffic management infrastructure is not scalable and is vulnerable. Air transportation's inherent speed advantage is being limited by air traffic infrastructure and operating concepts.

Second, revamped certification processes, procedural regulations, and airborne equipment innovation is needed. The bulk of certification and procedural regulations and processes were developed in an era whose time has passed and haven't kept pace with new technologies. Furthermore, aircraft operators must equip with compatible hardware and systems in order for a modernized air traffic network to succeed.

Third, new runway and airport development takes too long. Meeting the nation's demand for air transportation and fully exploiting its benefits will require a ground infrastructure that accommodates significant traffic increases. Many of the nation's major airports are operating at capacity limits during large portions of the day.

In addition, the economic downturn and the substantial added security burden since 9/11 have seriously disrupted the economic health of the airline industry. Well-intentioned security policies have resulted in billions in post-9/11 costs and lost revenue and account for a large majority of the projected \$9 billion in airline industry losses in 2002.

General aviation also has been acutely affected, manufacturers and suppliers are suffering significant losses in aircraft and equipment sales, and the overall impact is rippling through the rest of the U.S. economy.

And, as the forced contraction of the industry continues, small and midsize communities are being disconnected from the national air transportation system that is vital to their economies.

The U.S. government must assume the full cost and responsibility for assuring the protection of our aviation system against terrorist attack. At the same time it must adopt rational security measures that facilitate public access to the air transportation system, and thereby encourage air travel.

FACTS IN FOCUS

- Having been forced to borrow on a massive scale to fund continuing operations, the nine largest U.S. airlines now carry more than \$100 billion in debt but have a total market capitalization of only about \$15 billion.
- Although U.S. air passenger traffic has increased 40 percent since 1991, only seven new airport runways and a single new major airport were built in that time.
- Without infrastructure improvements, the combined economic cost of air traffic management system delays over the period 2000 to 2012 will total an estimated \$170 billion.
- For air trips less than 500 miles, doorstep to destination travel time is now between 35 and 80 miles per hour.



Space: Its Special Significance

Recommendation #3: The Commission recommends that the United States create a space imperative. The Department of Defense, NASA, and industry must partner in innovative aerospace technologies, especially in the areas of propulsion and power. These innovations will enhance our national security, provide major spin-offs to our economy, accelerate the exploration of the near and distant universe with both human and robotic missions, and open up new opportunities for public space travel and commercial space endeavors in the 21st century.

Objective

The challenge we face on the space frontier is to build from dreams and concepts the political will to move forward to new technologies and destinations. For almost 20 years we have been satisfied to limit our dreams, rely upon proven technologies, and invest little in building public or political support for space initiatives. But the potential to do great things has never been clearer.

Background

The Commission believes the nation would benefit from a joint effort by NASA and DoD to reduce significantly the cost and time required to access space. Such an effort would build on the capabilities of both organizations and provide the “critical mass” of funding needed to create the necessary breakthroughs in propulsion.

Investment in the development of more advanced propulsion systems will lead to faster transit times, improve operational flexibility, and reduce the radiation impact for long-duration, human exploration missions. Once the time to explore many parts of the solar system has been reduced to reasonable numbers, the political imperative to do what is now possible will be acted on.

Photo above: Mining the moon for ore and isotopes might make sound commercial business opportunities in the future.

The United States will have to be a space-faring nation in order to be the global leader in the 21st century – our freedom, mobility, and quality of life will depend on it.

A significant limiting factor in the performance of most spacecraft, including the International Space Station, is the amount of power that can be generated from solar energy. Increasing available power could expand opportunities in military, civil, and commercial space applications. Once there is sufficient power in orbit to do real things, investment will be more likely.

New technologies open up opportunities for a next generation of satellites and launch systems for military operations, homeland defense, global protection, and air transportation management.

The Commission believes the nation needs a joint civil and military initiative to develop a core space infrastructure that will address emerging national needs.

Our national space infrastructure is aging. For example, the Vehicle Assembly Building at Kennedy Space Center has a 35-year-old roof that requires frequent patching and other failures that have resulted from hurricanes and high winds. Replacement cost of infrastructure is \$3.9 billion at Kennedy Space Center and \$3.0 billion at Cape Canaveral Air Force Station. Clearly a new operations and management structure is desirable for these facilities.

The civil and commercial aerospace sectors will look to space more in the future to develop new products and services and create new markets as they have for telecommunications and commercial remote sensing. The U.S. commercial space industry continues to lose access to markets as demand decreases and international competition increases. Government regulations and incentives are necessary to bolster this important market until there is a turn-around in demand.

The Commission believes that the search for knowledge will not only answer fundamental questions but also will inspire our children and provide a source of future products and services. This will require that the U.S. government sustain its long-standing commitment to science and space and continue to focus on international cooperative efforts.

FACTS IN FOCUS

- Japan, China, Russia, India, and France, to name a few, see space as a strategic and economic frontier that should be pursued aggressively. So should we.
- Arianespace captured 50 percent of the commercial world market in 2001. The United States and Russia each had 19 percent.
- A heavylift Expendable Launch Vehicle costs \$10,000 per pound to orbit. The use of new revolutionary Reusable Launch Vehicles that will significantly reduce cost is well within our grasp in this decade.
- Nuclear energy could produce a high-temperature plasma that would potentially reduce transit time for a manned mission to Mars from as much as eight months to about three.



National Security: Defend America and Project Power

Recommendation #4: The Commission recommends that the nation adopt a policy that invigorates and sustains the U.S. aerospace industrial base. This policy must include:

- Procurement policies that include prototyping, spiral development, and other techniques that allow the continuous exercise of design and production skills.
- Stable funding for core capabilities without which the best and brightest won't enter the defense industry.
- Removing barriers to international sales of defense products.
- Removing barriers to defense procurement of commercial products and services.
- Propagating defense technology into the civil sector, particularly in communication, navigation, and surveillance.
- Sustaining critical technologies that aren't likely to be sustained by the commercial sector, e.g., space launch and solid rocket boosters.

Objective

A healthy aerospace industry is central to maintaining a safe and secure world. It provides the ability to:

- Rapidly, safely, and securely send and receive information,
- Move troops, equipment, and supplies to anywhere on the globe or into space at anytime, and
- Prosecute effects-based warfare.

The federal government must maintain and enhance critical national infrastructure, including design capabilities, solid rocket boosters, radiation hardening, space launch facilities, critical RDT&E infrastructure, the Global Positioning System, and frequency spectrum.

Background

The effectiveness of American defense is a crucial determinant of world peace, prosperity, and stability. In the 21st century enabling technologies for vital military capabilities will come from the commercial sector as well as the defense sector. Today's military capabilities are at risk due to a threatened industrial base, workforce concerns, and the need to protect critical infrastructure.

The Defense Department should task the Defense Science Board to develop a national policy that will invigorate and sustain the U.S. aerospace industrial base. The policy should address issues such as mergers and acquisitions, procurement and budgeting policies, research and investment, technology transition, international sales, and workforce development.

The United States must continually develop new experimental systems in order to sustain the critical skills to conceive, develop, manufacture, and maintain advanced systems and provide expanded capability to warfighters.

The federal government and industry must partner to enhance the operational readiness and capability of new and legacy military aerospace systems. The government should fund research and technology development programs to reduce total ownership costs and environmental impacts and create a structured, timely, and adequately funded technology insertion process and reform procurement practices accordingly.

FACTS IN FOCUS

- Loss of corporate knowledge is costly. At the end of WW II, a typical military aircraft development manager had worked on 15 development programs. By the end of the 1990s, the number had fallen to one.
- Many aerospace systems, like the B-52, are on the path to an operational life of 50-to-75 years, though their intended design life was only 20-to-30 years. These aging systems face inadequate spares support, increased maintenance costs, and, in some cases, flight safety threats.
- The success of the Predator unmanned aerial vehicle program shows the military value of moving leap-ahead demonstrators into the hands of warfighters at a very early stage of development.
- DoD's annual science and technology funding must be sufficient and stable to create and demonstrate the innovative technologies needed to address future national security threats.

Photo above: Defense acquisition policies should encourage greater use of commercial standards.



Government must ensure that the nation has a healthy aerospace industry that not only meets our security and economic needs but also can compete successfully in the international marketplace.

Government: Prioritize and Promote Aerospace

Recommendation #5: The Commission recommends that the federal government establish a national aerospace policy and promote aerospace by creating a government-wide management structure. This would include a White House policy coordinating council, an aerospace management office in the Office of Management and Budget, and a joint committee in Congress. The Commission further recommends the use of an annual aerospace sectoral budget to establish presidential aerospace initiatives, assure coordinated funding for such initiatives, and replace vertical decision-making with horizontally determined decisions in both authorizations and appropriations.

Objective

In the rapidly changing global economy, government leadership must be increasingly flexible, responsive, and oriented toward decision-making at macro levels. It must prioritize and promote aerospace within the government and in its interactions with the industry in order to realize the fullest potential of aerospace to the nation.

Background

The development and implementation of federal aerospace policy is currently spread across multiple government agencies with oversight by numerous congressional committees. The government isn't organized to define national aerospace priorities, develop federal aerospace sector plans and budgets, manage programs that cross multiple departments and agencies, or foster a healthy aerospace sector in a global economy.

The federal government is organized vertically while national aerospace challenges are becoming more horizontal in nature.

Photo above: Government should provide leadership and aerospace policy that prepares the nation for the future.

Without integration national aerospace policy occurs either by default or piecemeal. The Commission believes that the U.S. government can only ensure U.S. aerospace leadership by leading itself. To do this, the executive and legislative branches need to be reoriented to better address national aerospace issues.

Maintaining a national aerospace policy should be a function assigned jointly to the National Security Council and the National Economic Council. They should establish an Aerospace Policy Coordinating Council to develop and implement an integrated national aerospace policy. OMB should create a Bureau of Aerospace Management that would translate the national policy into annual planning and budget guidance.

Federal departments and many agencies should establish offices of aerospace development to promote aerospace activities and align aerospace with their missions. A prudent response from Congress would be to organize a Joint Committee on Aerospace.

Government processes tend to be complex, lengthy, and inefficient. As a result, aerospace products and services developed and used by the government are more costly for the taxpayers and take longer to acquire. Also, aerospace products and services developed by industry for sale in the commercial marketplace take longer and cost more because of extensive government barriers resulting in lost market share and diminished profitability.

Government, industry, labor, and academia must work together as partners to transform the way they do business, allowing the nation to capitalize on the best ideas available and apply them rapidly to new aerospace products, processes, and services.

FACTS IN FOCUS

- Between FY 1993 and FY 2001, federal procurement spending dropped 35 percent on air systems, 50 percent on missile systems, and 46 percent on space systems in absolute dollars.
- Defense, Transportation, and NASA are the major federal departments and agencies involved in aerospace – but they're not alone. Others with significant involvement include the State, Commerce, Agriculture, Energy, Labor, and Justice departments and the General Services Administration.
- More than two million workers are directly employed in the nation's civilian and commercial aerospace and aviation industry. They earned an average wage of \$47,700 annually or 35 percent more than the U.S. average.
- Issues that impact government's role in promoting aerospace include a national aerospace consensus, the government organizational structure, key government processes, and private-public partnerships.



Global Markets: Open and Fair

RECOMMENDATION #6: The Commission recommends that U.S. and multilateral regulations and policies be reformed to enable the movement of products and capital across international borders on a fully competitive basis and establish a level playing field for U.S. industry in the global marketplace. The U.S. export control regulations must be substantially overhauled, evolving from current restrictions on technologies through the review of transactions to controls on key capabilities enforced through process controls. The U.S. government should neutralize foreign government market intervention in areas such as subsidies, tax policy, export financing, and standards either through strengthening multilateral disciplines or providing similar support for U.S. industry as necessary.

Objective

A globally competitive U.S. aerospace industry.

Background

Open global markets are critical to the continued economic health of U.S. aerospace companies and to U.S. national security. The 2001 U.S. aerospace trade surplus was nearly \$32 billion, the

The U.S. government must take immediate action to neutralize distortions and enable fair and open competition.

largest surplus of any U.S. manufacturing sector. However, the U.S. industry share of the global market has declined in key sectors over the last 20 years. We are on the brink of ceding our position as the top producer of large commercial aircraft and are losing market share in civil helicopters and aircraft engines. Much of this decline is a direct result of foreign government intervention and protectionist policies.

In order to remain global leaders, U.S. companies must remain at the forefront of technology innovation. They also must have access to global customers, suppliers, and partners.

The defense industrial base is falling farther and farther behind the commercial marketplace because it has to cope with excessive regulation. The current export control regime provides too little security and is choking American companies and preventing effective technology collaboration with others. U.S. export controls must be completely overhauled, and defense procurement policies must more effectively balance international collaboration and maintain U.S. industrial capacity in critical technologies and capabilities.

Although we are ahead of other countries in investment in military technology and capability, we are on the edge of dropping out of the race in the civil sector. Instead of continuing to invest, our government has increasingly pulled back from the civil aerospace market and left it up to U.S. companies to compete against competitors subsidized by their governments.

FACTS IN FOCUS

- European companies present the most formidable competition to U.S. companies. Yet, European companies are also our most important trading partners.
- The Chinese government has identified aerospace as one its leading high-technology industries for the 21st century centered around a core government policy goal of self-reliance in the aerospace and defense sectors.
- More than 180 individual export control licenses have been needed for export sales of C-130J military transport aircraft to the UK Royal Air Force to support British companies involved in the production of the aircraft. It's difficult to see how this process protects national security inasmuch as the UK is a vital U.S. ally.
- The success or failure of our future efforts in space exploration is linked to our ability to work effectively with partners on projects such as the International Space Station and planetary defense.



Business: A New Model for the Aerospace Sector

Recommendation #7: The Commission recommends a new business model designed to promote a healthy and growing U.S. aerospace industry. This model is driven by increased and sustained government investment and the adoption of innovative government and industry policies that stimulate the flow of capital into new and established public and private companies.

Objective

A strong and healthy U.S. aerospace industry that is attractive to investors.

Background

The U.S. government budgeting and procurement system is extraordinarily complex and inefficient. Unpredictable and unstable government budgeting and funding create a cycle that contributes to the diminished return on the government's investment in national security capabilities and serves as an impediment to long-term industry excellence.

A stable long-term investment budget is critical to the modernization and transformation goals of U.S. armed forces. The Commission advocates increasing the government's financial flexibility to make funding adjustments among and within programs.

In a call to revise program management policies, the Commission believes the use of multi-year contracting for both procurement and R&D programs will improve program stability and performance as well as produce needed cost savings.

Photo above: The United States has lost more than 600,000 scientific and aerospace jobs in the past 13 years.

To be globally preeminent, our aerospace industry must be able to attract vitally needed capital at a reasonable cost. Without a significant change in the business model, the future of the aerospace industry, so critical to our national economic and homeland security, is uncertain and at risk.

The U.S. aerospace industry extends through a network of purchasers, subcontractors, suppliers, and partners – sometimes referred to as the supply chain. Each of the participants is intrinsically tied to the factors affecting the industry. Encouraging a climate that is attractive to new entrants, while stable enough for current players, will promote competition and innovation, add to efficiencies, and lower costs.

Certain U.S. tax and trade laws and regulations that affect a variety of industries weigh particularly heavily on defense and aerospace in competition with domestic commercial entities as well as in international markets.

Government and industry should work together to develop and implement training and exchange programs that would educate and expose their respective workforces to each other's challenges and responsibilities.

Government must develop and implement a policy regarding international cooperation in defense and aerospace that recognizes the global industrial base. The Commission urges a review of the policy regarding domestic and international business combinations.

FACTS IN FOCUS

- Today, even with the largest defense budget in history and the longest bear market since WW II, aerospace comprises 1.8 percent of the S&P 500 – well below the sector's comparative value before the Reagan buildup.
- During the last "bust" cycle that impacted the aerospace industry in the 1990s, more than 50 companies consolidated into today's "Big 5" – Boeing, General Dynamics, Lockheed Martin, Northrop Grumman, and Raytheon.
- Many of the aerospace defense systems in use today are a result of the Reagan buildup of the 1980s when defense spending was as much as eight percent of GDP. Today's defense spending is about three percent of GDP.
- The Commission finds that one cause of the current financial condition of the airline industry is over-taxation – approximately 40 percent of a \$100 airline ticket goes to pay government-imposed fees.



Workforce: Launch the Future

Recommendation #8: The Commission recommends that the nation immediately reverse the decline in and promote the growth of a scientifically and technologically trained U.S. aerospace workforce. In addition, the nation must address the failure of the math, science, and technology education of Americans. The breakdown of America's intellectual and industrial capacity is a threat to national security and our capability to continue as a world leader. Congress and the administration must therefore:

- Create an interagency task force that develops a national strategy on the aerospace workforce to attract public attention to the importance and opportunities within the aerospace industry.
- Establish lifelong learning and individualized instruction as key elements of educational reform.
- Make long-term investments in education and training with major emphasis in math and science so that the aerospace industry has access to a scientifically and technologically trained workforce.

Objective

A well-educated, scientifically literate, and globally competitive aerospace workforce.

Photo above: In aerospace, people are an organization's key asset.

Our policymakers need to acknowledge that the nation's apathy toward developing a scientifically and technologically trained workforce is the equivalent of intellectual and industrial disarmament and is a direct threat to our nation's ability to survive.

Background

There is a major workforce crisis in the aerospace industry. Our nation has lost more than 600,000 scientific and technical aerospace jobs in the past 13 years. These losses began as a result of reduced defense spending following the end of the Cold War. But subsequent contraction of the industry through mergers and acquisitions and the events of 9/11 have made the situation worse.

Due to these actions and events, many of the workers who have lost their jobs are unlikely to ever return to the industry. These losses, coupled with pending retirements over the next 10 years, represent a devastating loss of skill, experience, and intellectual capital to the industry. Few new young employees are in the "pipeline" to replace the aging aerospace workforce.

The aerospace industry has historically been cyclical and strongly driven by defense spending. Global competition, especially in commercial aviation, has risen rapidly since 1989, most notably from Europe, and is likely to grow.

The aerospace industry must have access to a scientifically and technologically trained workforce. In the long term, the Commission stresses that that action must be taken to improve mathematics and science education from K-12 through PhD.

It is likely that people entering the workforce now will hold five or more jobs in their lifetime, and the education system must be prepared to deliver training and education to meet these changing skill requirements and labor market needs.

FACTS IN FOCUS

- NASA has three times as many technicians over the age of 60 as under the age of 30.
- In a survey of some 500 U.S. aerospace engineers, managers, production workers, and technical specialists, 80 percent of the respondents said they would not recommend aerospace careers to their children.
- A 1995 international math and science education study found that U.S. students scored above the international average in 4th grade, slightly above it in 8th grade, but near the bottom in 12th grade.
- Because of retirements, attrition, job changes, and other reasons, U.S. school districts will need to hire 240,000 middle school and high school math and science teachers between now and 2010.



Research: Enable Breakthrough Aerospace Capabilities

Recommendation #9: The Commission recommends that the federal government significantly increase its investment in basic aerospace research, which enhances U.S. national security, enables breakthrough capabilities, and fosters an efficient, secure, and safe aerospace transportation system. The U.S. aerospace industry should take a leading role in applying research to product development.

Objective

U.S. preeminence in aerospace research and innovation.

Background

In the past, aerospace led the technology revolution because of large public investment in research directed at national security imperatives and goals. Today, we have no integrated national aerospace consensus to guide policies and programs. This has resulted in unfocused government and industry investments spread over a range of research programs and aging infrastructure.

The lack of sufficient, sustained public funding for research, development, test, and evaluation infrastructure limits the nation's ability to address critical national challenges and to foster breakthrough aerospace capabilities that could enable a new era in aerospace leadership for America.

Photo above: Long-term research and innovation in technologies, such as propulsion, are the fuel for the future strength of U.S. aerospace.

The U.S. aerospace industry must take the lead in transitioning research into products and services. Government must assist by providing insight into long-term research programs. Both industry and government need to create an environment that will accelerate the transition of research into application.

To provide focus for aerospace investments on developing breakthrough capabilities, the Commission suggests the government achieve, as a national priority, the following goals by 2010:

Air Transportation

- Demonstrate an automated and integrated air transportation capability that would triple capacity by 2025.
- Reduce aviation noise and emissions by 90 percent.
- Reduce the aviation fatal accident rate by 90 percent.
- Reduce transit time between any two points on Earth by half.

Space

- Reduce cost and time to access space by half.
- Reduce transit time between two points in space by half.
- Demonstrate the capability to monitor and surveil continuously Earth, its atmosphere, and space for a wide range of military, intelligence, civil, and commercial applications.

Time to Market

- Reduce the transition time from technology demonstration to operational capability from years and decades to weeks and months.

FACTS IN FOCUS

- "But it is not really necessary to look too far into the future; we see enough already to be certain that it will be magnificent. Only let us hurry and open up the roads."
— Wilbur Wright 1908
- Clearly, during the next 100 years, advances in propulsion will be the critical enabling technology to revolutionary aerospace capabilities.
- Hydrogen may be the next breakthrough energy source for aircraft, producing no combustion emissions and increasing safety margins.
- Micro-technology helped develop scientific instruments that make it possible for the first time to image, manipulate, and probe objects that can be more than 1,000 times smaller than the microcircuits of the most advanced computers.



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