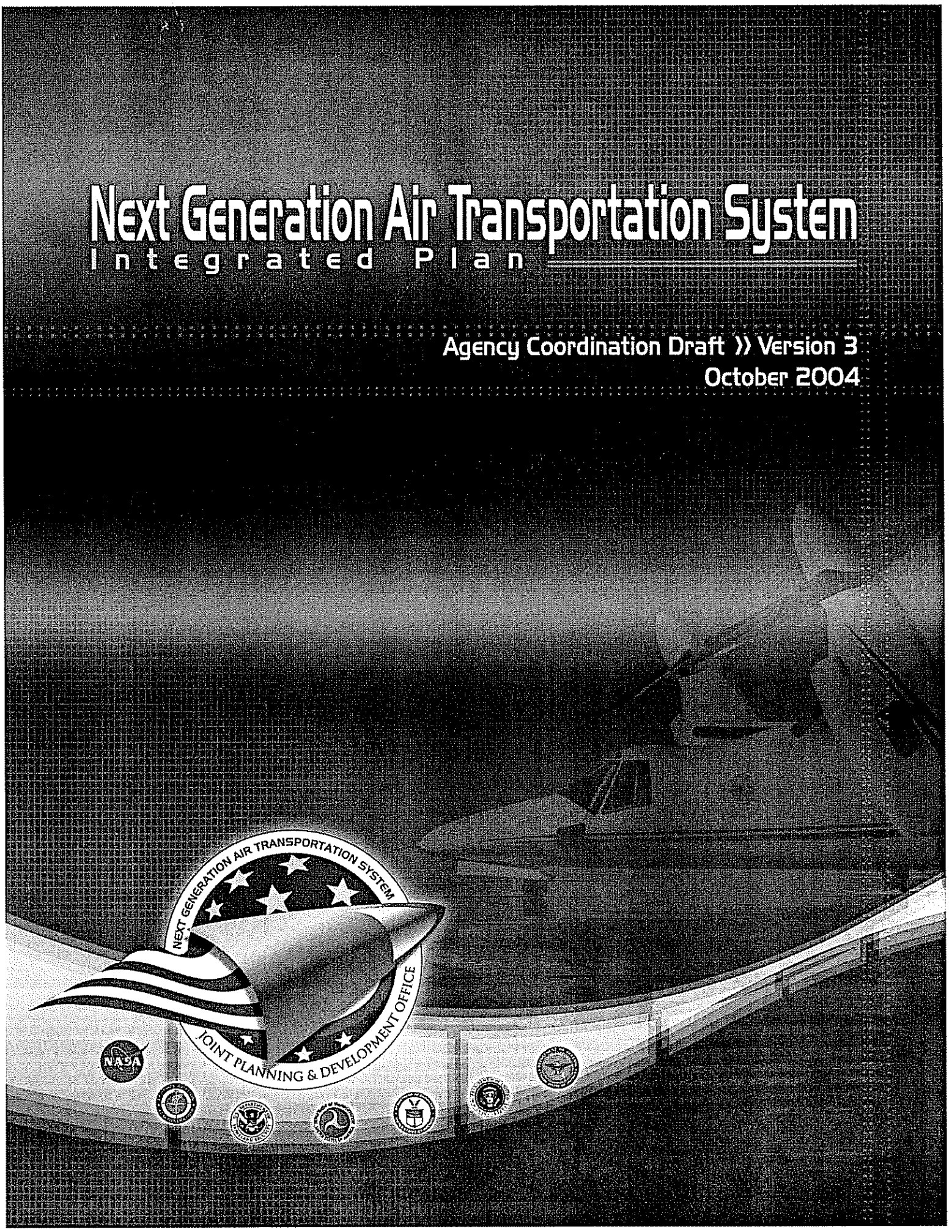
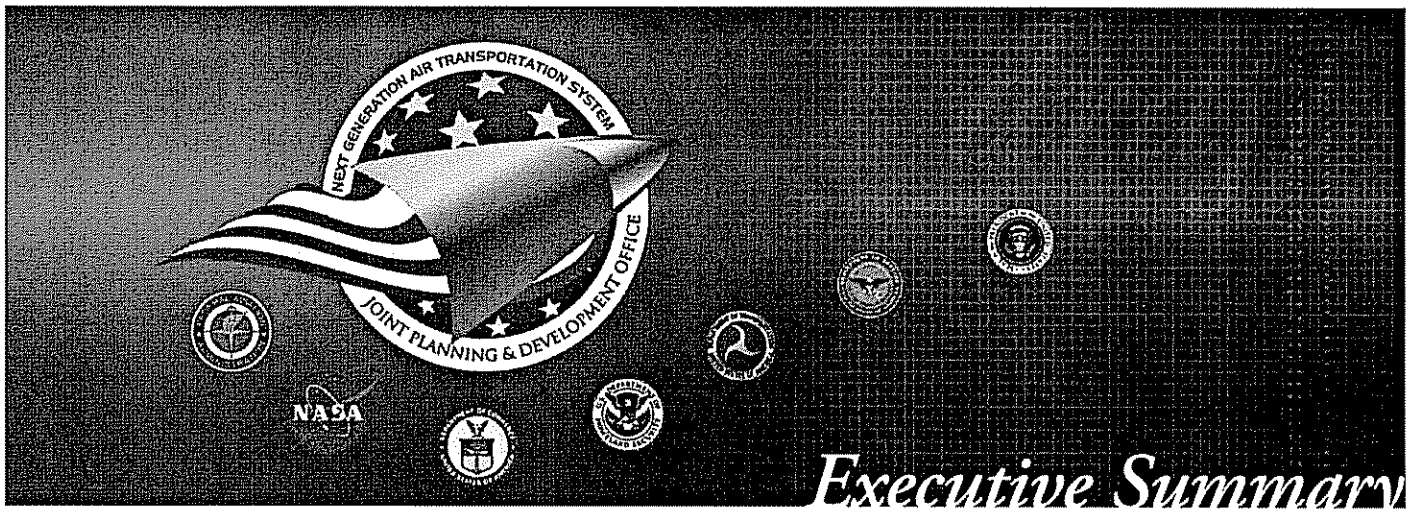
Next Generation Air Transportation System

Integrated Plan

Agency Coordination Draft ›› Version 3

October 2004





Executive Summary

The United States has been at the forefront of aviation since the day the Wright Flyer made its historic 12-second flight. Since then, Americans have become the most mobile society on Earth. Imagine though, what would happen to our economy and quality of life if we could no longer depend on air transportation for overnight delivery or we could no longer depend on arriving when we need to arrive?

The U.S. air transportation system as we know it is in peril. The demand for air transportation is outpacing our ability to increase capacity in our airports. Operating and maintenance costs of the air traffic system are outpacing revenues and conventional air carriers are in serious financial jeopardy. The terrible events of September 11, 2001 radically altered our country and they exposed a new impediment to the future of the air transportation industry. New security requirements are significantly impacting costs and the ability to efficiently move people and cargo. In addition, the growth in air transportation has provoked new community concerns over aircraft noise, pollution and congestion that affect our ability to respond adequately or rapidly enough to our changing world.

Now imagine an alternative world where a traveler or shipper determines departure and arrival times – instead of being confined to a predetermined schedule. Imagine a hasslefree travel experience where safety and security measures, ticketing, and baggage checks are all transparent as the traveler or package moves easily through the airport and on and off aircraft. Think of the possibilities if owning a recreational plane, micro-jet, or a share of a jet capable of flying in nearly all weather conditions was affordable to more Americans. Imagine improved individual and community quality of life in a world free of aircraft noise and emissions pollution, even as significant increases in air transportation occur. And, in a post-September 11-world, imagine the benefits of civil and military operations seamlessly integrated sharing necessary travel information with all users of the system worldwide. Consider the opportunity that would arise in communities that have more choices in how to connect with the larger air transportation system and expanded direct global access. Imagine the results of such a transformed air transportation system on the U.S. and global economy. Such a world is within our reach.

The 108th Congress and the President took the critical first step toward transforming our air transportation system by passing and signing into law Vision 100 – Century of Aviation Reauthorization Act. This Act established a charter to transform our current system into the Next Generation Air Transportation System by the year 2025. Imbedded in the legislation is a unique coalition of Government agencies that will lead this historic effort. Congress has tasked the agencies to be accountable to each other by forming a Senior Policy Committee composed of their respective leaders. This structure will gain the commitments and contributions of talent and resources required for the effort.

Members of the Senior Policy Committee:
Secretary of Transportation, Chair
Administrator of the Federal Aviation Administration (FAA)
Administrator of the National Aeronautics and Space Administration (NASA)
Secretary of Defense
Secretary of Homeland Security
Secretary of Commerce
Director of the Office of Science and Technology Policy

Sparked by this leadership these agencies have defined eight strategies for transformation, each individually significant yet interdependent on the other seven. The eight strategies are the first steps toward a

roadmap to provide a credible and stable path forward. As the term implies, this roadmap can guide our efforts to arrive at our destination if the paths and connections are clearly identified. With this roadmap, both public and private sectors can develop long-term investment plans and activities that result in the Next Generation Air Transportation System.

Since local governments and the private sector are the majority owners and investors of the air transportation infrastructure and its operations, their active participation is essential. Using one of industry's best practices, the integrated product team (IPT), each of the eight transformation strategies will be researched, developed, implemented and maintained through its own IPT. The power of the IPT model centers on the involvement of all parties touched by a process. In this way each strategy team will be lead by an agency with the charge to integrate across the interests of Federal, State and Local governments, quasi-government research institutions, universities, and most importantly, the manufacturers, service industries and customers of the air transportation system. Recognizing that the United States has the most creative, innovative and successful industrial base in the world, Government is striving to create a model where industry can excel.

Achieving the vision of a transformed air transportation system requires us to open our minds to new possibilities, embrace new approaches and create new ways to work together. To secure America's place as a global leader in aviation's second century, we need an air transportation system that supports a strong commercial capability, facilitates private-sector expansion and creates jobs. For that purpose our strategies are:

Developing the airport infrastructure to meet future demand, empowering local communities and regions to create alternative concepts of how airports will be used and managed in the future.

Establishing an effective security system without limiting mobility or civil liberties, embedding security measures throughout the air transportation system – from curb to curb. Creating a transparent set of security layers will deliver security without creating undue delays, limiting access or adding excessive costs and time.

Creating a responsive air traffic system, by devising alternative concepts of airspace and airport operations to serve present and future aircraft. As new vehicle classes and business models emerge, such as remotely operated vehicles and spaceports, the safe and efficient operation of all vehicles in the National Airspace System will be critical to creating new markets in aviation and beyond.

Providing each traveler and operator in the system with the specific situational awareness they need to reach their decisions through the creation of a combined information network. All users of the system will have access to the air transportation system data they require for their operations.

Managing safety through a comprehensive and proactive approach that can integrate major changes, such as new technologies or procedures. This will be done in a timely manner and without compromise to aviation's current superior safety record.

Introducing new operational concepts and technologies to minimize noise and emissions impacts on the environment and eliminate ground contaminants at airports. This effort includes exploration of solutions for the problem of depleting fuel supplies. These actions will result in reduced environmental impact and sustains aviation growth.

Reducing weather impacts on air travel through a system-wide capability for enhanced weather observations and forecasts, integrating them with the tools used by air system operators. This capability will substantially improve airspace capacity and efficiency while enhancing safety.

Harmonizing equipage and operations globally by developing and employing uniform standards, procedures, and air and space transportation policies worldwide, enhancing safety and efficiency on a global scale.

There has never been a transformation effort similar to this one, with as many stakeholders and as broad in scope. This is why we must act now to transform our air transportation system and assure that this second century of aviation is one of promise and prosperity and continued leadership for America.

This document, "An Integrated Plan for the Next Generation Air Transportation System" is our roadmap for change and our hope for a vibrant future.

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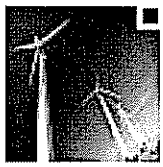
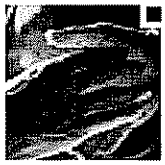
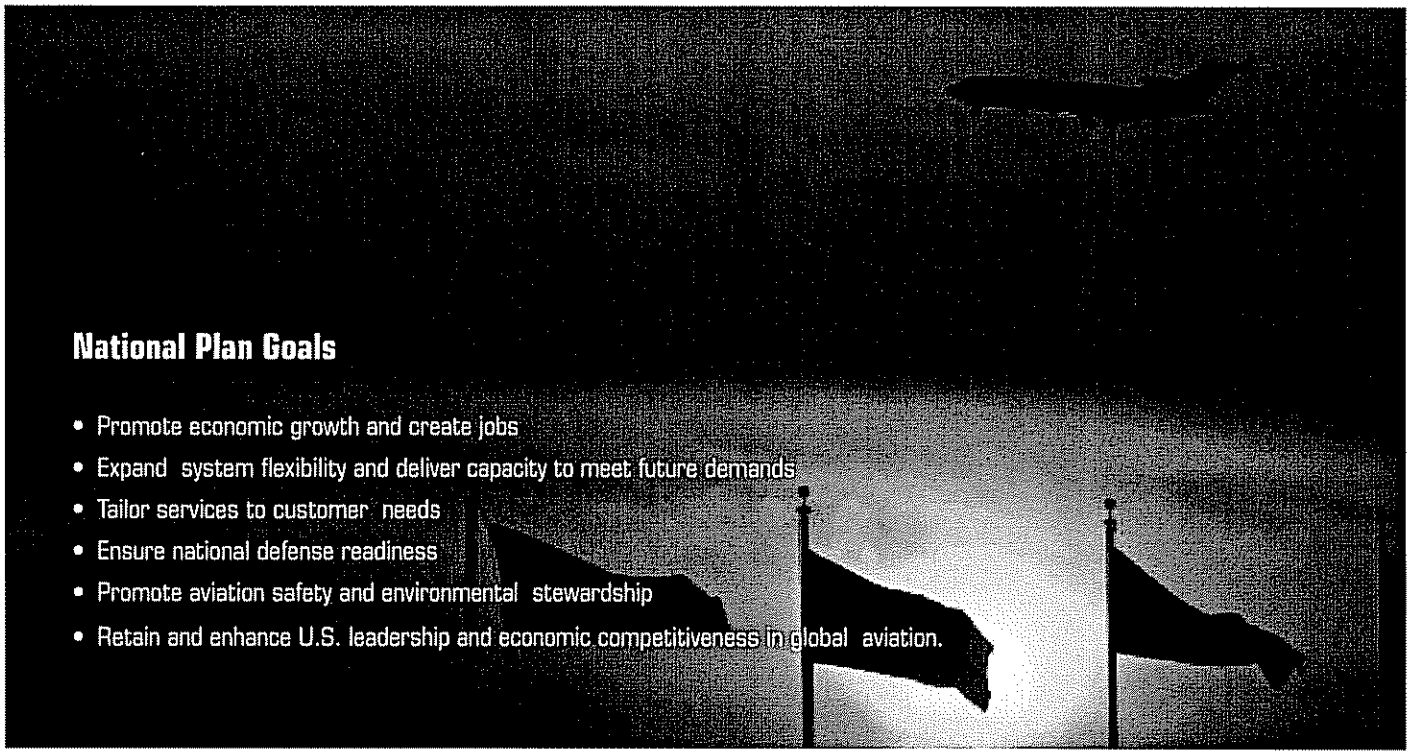






Chapter 1: Change Is Needed

In less than a century, aviation went from spectacle to spectacular. Today, Americans rely on aviation not just for transportation, but for recreation as well. Its growth has been fueled by the ability of aviation to offer a very safe, affordable, fast, predictable movement of goods and people. Millions of Americans fly every day for business, vacation, and to visit family and friends. Thanks to the speed and predictability of air transportation, we have become accustomed to year-round access to all varieties of food, flowers, and other products. Business depends on just-in-time air shipments for production efficiency, and to keep inventory costs low. Without the unique benefits of air transportation, our quality of life would be dramatically reduced.

The United States aviation system must transform itself and be more responsive to the tremendous social, economic, political, and technological changes that are evolving worldwide. We are entering a critical epoch in air transportation, in which we must either find better proactive ways to work together or suffer the consequences of reacting to the forces of change. The consequence of a do-nothing approach to this public policy problem is staggering — lost revenues could approach $100 billion annually due to people and products not reaching their destinations within times periods we expect today.

The existing air transportation system has evolved incrementally in response to accidents, new vehicles, facility changes, and market opportunities. Now, the air transportation industry has entered an era with new security concerns, new business models, and the new age of rapid technology development. Driven by an increasing pace of change, the old evolving approach is insufficient for system modernization. In terms of improving the system over the next 25 years, it is clear that business as usual cannot succeed.[1]

Three factors threaten the ability of aviation to grow and continue to serve the Nation:

Factors 1.1 Security

We must continue to squarely and aggressively face terrorism. Following 9-11, the Government acted swiftly and firmly to protect us from aviation terrorism. Additional steps were taken to strengthen all parts of aviation security, and our military was called upon to perform a new and difficult job of domestic air patrol. Americans understand and support the new security requirements. However, such actions cost more than $4 billion per year, and employ tens of thousands of our Nation's security personnel at a time when many other threats are also in need of attention. The flying public has also spent its precious time to support improved security throughout the airports. We need to find ways to secure aviation, without detracting from the affordability, speed, and predictable advantages we desire in air transportation. Key factors in this problem include the projected growth of 120 million additional international passengers that will have to clear customs and security, tripling of the cargo and passengers; and introduction of new types

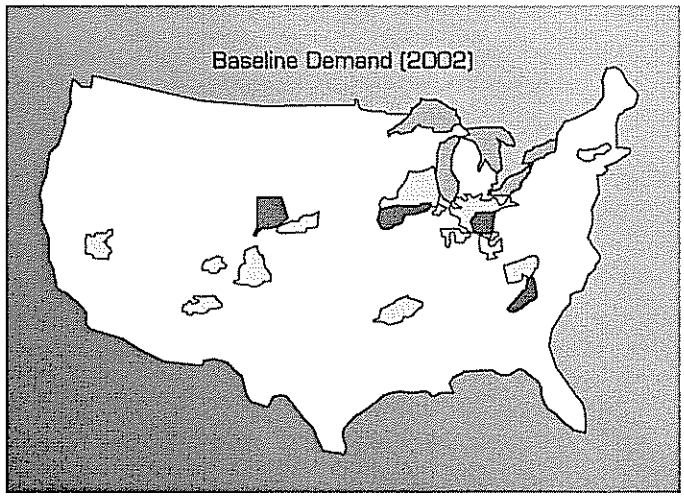
1 *National Research Council, "Securing the Future of U.S. Transportation," 2003.*

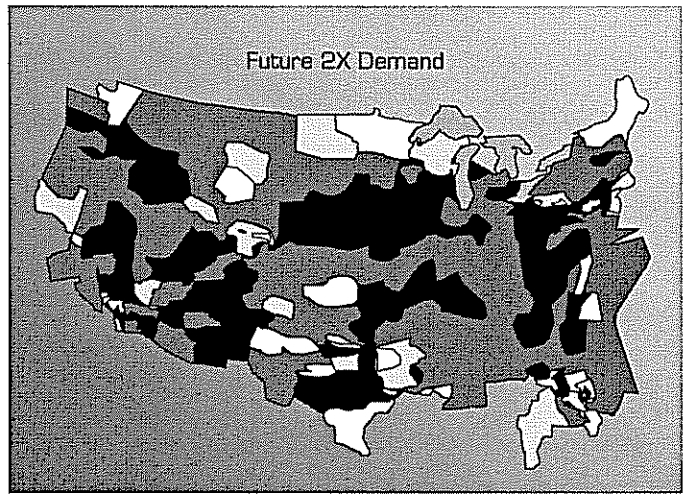
of vehicles and potential threats. Aviation security will require coordination of missions for national defense, homeland security, drug and law enforcement, and air traffic management. Gaps must be closed immediately to confront an ever-widening range of threats. Efficiencies must be found to enable the anticipated growth in air commerce.

Factors 1.2 Gridlock

Transformation must begin now to prepare for future growth[2]. Paradoxically, aviation's own success will erode the unique speed, predictable, and affordable benefits of air travel if the system does not expand and adapt to keep pace with the market demands. Historically growth in air transportation has always outpaced the growth of the Nation's gross domestic product. Growth in aviation was possible because significant investments were made to expand the airport system throughout the United States, as well as our ability to incorporate productivity enhancing technologies into the system. Today, many airports are barely keeping pace with demand while others employ schedule limiting systems to manage today's growth. We have already forecasted that present plans alone will leave increased congestion at more airports in 2020 than occurred during in the summer of 2000. In the year 2000, millions of Americans were stranded in airports with delays of more than an hour, and in rare cases up to 6 hours or more.

Imagine losing our current same-day travel to anywhere in the United States or abroad. With the annual growth in total system passenger miles expected to exceed 1 billion by 2015 and triple present levels by 2025, such a scenario is possible. Air cargo is expected to also grow three-fold over this same time period. Even after accounting for aggressive plans for improvements, the Federal Aviation Administration (FAA) predicts that at least 18 and possibly over 40 major airports will be congested in the 2020 time frame.[3] It is not only the numbers of flights, but also the extent of the new growth that poses a problem. Over the next 20 years, approximately 20 more airports will grow to more than half a million departures and arrivals a year—the size of Detroit operations. These growth centers will criss-cross the United States with significantly more air traffic than the present system can handle. The following chart shows that even at twice the present level of flights,





Sector Color Loading index:

- Yellow: 80 - 125% of sector capacity
- Red: 125 - 200% of sector capacity
- Black: > 200% of sector capacity

Signifacnt stress on airspace resources even at two-fold increase in demand.

2 PL 108-176 Sec 4 (8)

3 Federal Aviation Administration, Future Airport Capacity Task – Final Report, June 2004

most of the system will be saturated with air traffic above present acceptable levels, shown as red or black.

Finally the growth in air transportation has expanded community interests adding more objectives and priorities. This affects our ability to respond adequately or rapidly enough to our changing world. This could deprive communities of the opportunity for direct access to the global market place. Worse, many communities may even be unable to sustain satisfactory, affordable service.

Sustainability of the 540 commercial service publicly owned airports is already of concern. [Reconnecting America, Dec. 2002]

Factors 1.3 Global Competitiveness

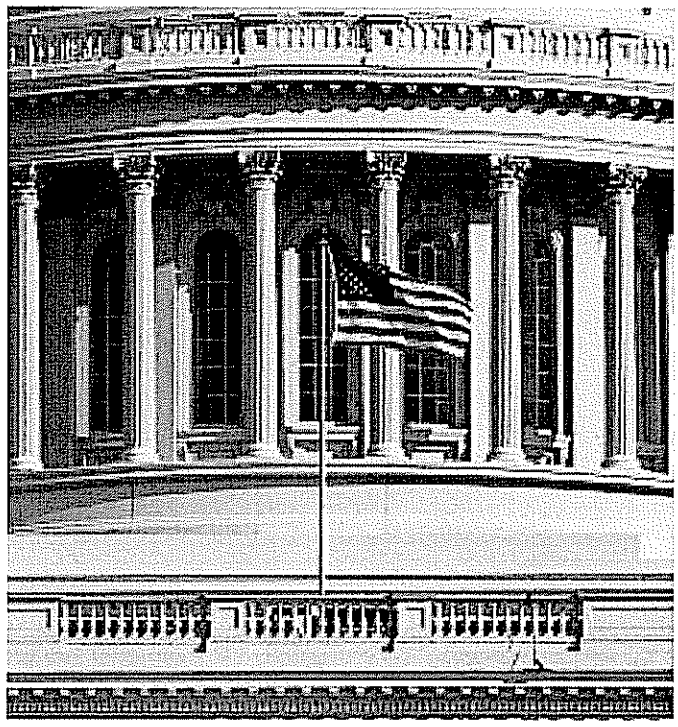
The United States has been a dominant force in aviation since its very inception 100 years ago. That dominance has helped support our economic health through developing a highly skilled workforce; encouraging technical innovations; and producing aviation products used around the globe. When the European Community created its future aviation vision, its title was: "European Aeronautics: A Vision for 2020-Meeting Society's Needs and Winning Global Leadership." In that document, they said that the vision would be fulfilled when the "European aeronautics industry leads in global markets in aircraft, engines and equipment."

Unless we act and invest now, we will lose our competitiveness in aviation. Loss of competitiveness in this area would mean a loss in high-paying jobs and a weakening of our economic strength through the shift in balance of trade. We can not afford to be a second tier aviation supplier in the second century of aviation.

A partnership between the Federal and State governments, industry and all interested parties and stakeholders must begin immediately. [Aerospace States Association Resolution Feb. 2004]

At stake is significant economic loss for the nation, along with a dramatic reduction in the quality of life we have come to expect thanks to air transportation. Failure to address these problems is estimated to cost consumers up to $20 billion a year in air travel by 2025.[4] However, the losses are much greater than just lost travel. Civil aviation products and services generate a significant surplus for U.S. trade accounts and contribute significantlyto the $100 billion a year in tourism from abroad. Air transportation has spawned a highly technical workforce. Aviation technologies, products, and services underpin the advanced capabilities of our national defense and homeland security.[5]

Congress, Commissions, State authorities, andothers have all recognized that Government and industry need to take a different approach to the business of aviation. If the United States is going to be ready for the changes thatare to come in the next two decades, we need an Integrated National Plan—one that combines and leverages the knowledge and resources of all Government agencies that have an interest in American aviation, along with the creativityof the private sector. The current challenges facing the Air Transportation System require a transformation driven by proactive Government-industry planning, and collaborative execution to achieve a common vision.



4 Cavolowsky, John, and Lee Olsen. Socio-Economic Demand Forecast Study, NASA and FAA, January 2004.
5 PL 108-176 Sec 4 (1-4)

Chapter 2: A National Vision for Air Transportation in 2025

Transforming the system to meet the needs of the 21st century will ensure U.S. leadership in the global economy. However, major changes must occur to make this happen.

A transformed Air Transportation System that provides services tailored to individual customer needs allows all communities to participate in the global economy, and seamlessly integrates civil and military operations.

Flight procedures will be tailored to aircraft and aircrew performance. Increased automation combined with new procedures will have fewer ties to geographical airspace differences. The combination of automation and procedures will overcome the complex issues associated with allowing all operators continued access in a mixed environment of commercial, military, and general aviation aircraft with differing levels of capability. The result of these changes will allow closer spacing of aircraft, which in turn will increase capacity. International standardization of the procedures, and technology developed under an integrated safety management approach, will create an equivalent level of safety across the globe.

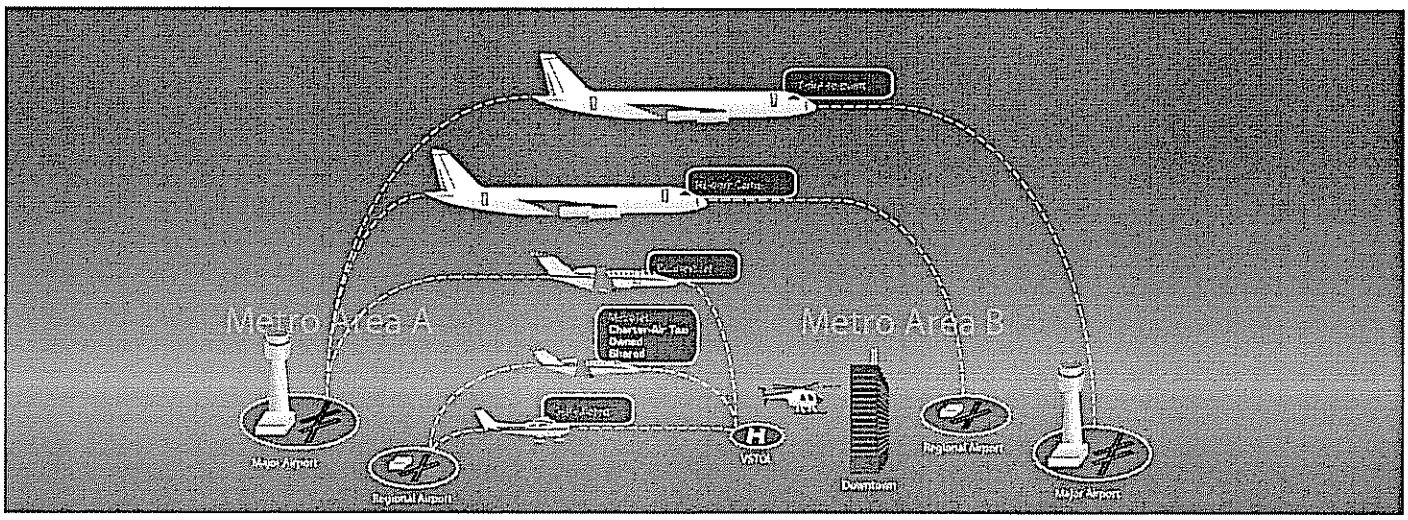
Ultimately these transformations will spur new business models. The entire concept of the airline schedule will be redefined as the boundaries between traditional carriers and on-demand service providers begin to merge. This proliferation of options will effectively enable customers to choose air transportation services tailored to their needs. For example, customers will have the means to shorten their curb-to-curb travel time. The options also provide more communities direct access to global air transportation services enabling business and leisure connectivity worldwide.

To meet future demands, travelers and shippers need to be able to access information regarding their options using advanced information technology. While traveling, information technology will notify passengers of itinerary changes or travel conditions and present comparable alternatives. Thus, the predictability of air travel will increase. We cannot eliminate delays, but we can give the traveler and the shipper the best information available to make decisions on the spot.

Leveraging new technologies and new operational procedures, the Next Generation Air Transportation System will adapt to unanticipated changes in traveler and shipper needs. To do this, we need greater use of automation for routine tasks that will alter the traditional roles of pilots, controllers, security specialists, flow managers, dispatchers, and military commanders. Greater focus on strategic management will create better use of resources, improve efficiency, and enhance response to unforeseen issues. Human performance and efficiency enhancements will enable the same number of decision-makers to accommodate a larger number of operations. Automation aids will use intelligent agents and other computer-decision support techniques to augment the role of decision-makers.

Access to operational information will create a common operating picture for civil, law enforcement, military, security, and commercial users. Security will mitigate threats to the Air Transportation System through an integrated, multi-layered approach that will combine prevention, detection, and response. Integrating the security in to routine activities (e.g. returning rental cars) will also reduce the "hastle-factor" for the traveler.

Integrated capabilities will deliver homeland defense benefits by improving the Federal Government's ability to share information among organizations responsible for protecting our country from attack. At the same time, flight restrictions will be reduced because of the availability of improved tracking and surveillance technologies. Reliance on combat air patrols and interceptors will be reduced, and our ability to prepare for military conflict will be enhanced.



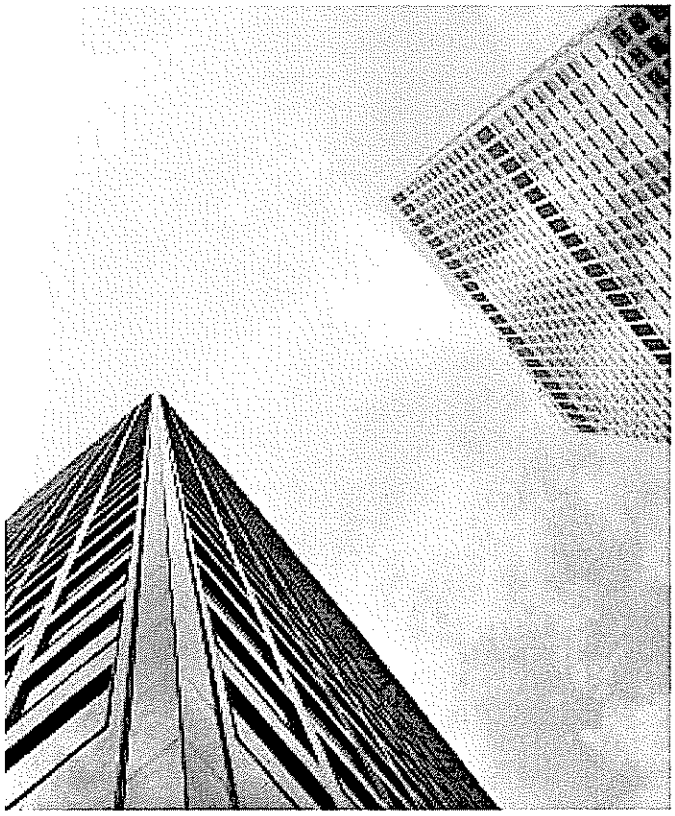
Chapter 3: System Goals and Performance Characteristics

To achieve a vision, we need to define the system goals and performance characteristics that will serve as its foundation. Accordingly, we aim to:

- **Retain U.S. leadership in global aviation**
- **Expand capacity**
- **Ensure safety**
- **Protect the environment**
- **Ensure our national defense**
- **Secure the Nation.**

3.1 Future Environment and Demand

The growth of aviation tomorrow will be driven by market forces and the operating environment. The ability to serve the demand depends on changes in technology, society and geo-political environment. Projections of future conditions rely in part on historical and emerging trends, global and regional economic studies and forecasts, results of modeling and simulation, and analyses of expected technological advances. The air transportation system must be prepared to address a range of possibilities for demand and priorities of the desired characteristics.



Potential influences on the future environment include a significant increase in the traveler and shipper demand for services, affordability of energy sources, a public that is increasingly concerned with the environment, and accelerating economic growth both domestically and internationally. Additionally, changes in travel patterns, the greater ease of international travel, and the onset of commercial space travel may have profound effects on overall planning efforts. Even near-term influences such as increasing use of unconventional vehicles such as commercial space travel and launch vehicles and unmanned air vehicles (UAV) will need careful consideration throughout the planning process.

Many indications show a much more diverse marketplace with the need for a broader range of air transportation services. In addition to the demand for air transportation services in the future, other national priorities and societal concerns will influence the transformation to the Next Generation Air Transportation System. These influences include continued pressure on air transportation operators and air-traffic service providers to reduce cost, and the emergence of new physical, biological, radiological, and chemical threats to aviation.

The demands that will be placed upon the future national air transportation system are likely to include the following:

- **Routine use of un-piloted air vehicles by military, civil, and potentially even commercial users**
- **Increased on-demand air taxi services leveraging the capabilities of new classes of low-cost aircraft, including microjets**
- **Continued growth in point-to-point service provided by the airlines**
- **Increased use of secondary and reliever airports to accommodate traveler/shipper needs to avoid congestion**
- **Increased passenger travel, reflecting growth in the economy, and reduced ticket prices**
- **Increased shipping of air cargo continuing to outpace passenger growth**
- **Continued demand for commercial space launches.**

3.2 Retain U.S. Leadership in Global Aviation

To retain leadership worldwide, the United States must develop a next generation air transportation system that brings continued vitality to our domestic air transportation and related industries. Working with global partners, the United States will continue to maintain and operate an air transportation system that sets standards for the world in safety, efficiency, and capacity.

Air transportation fuels the global economy by delivering goods and facilitating the movement of people for business and personal purposes. Already a third of U.S. exports are shipped by air.[6] Air transportation will expand with global commerce. The number of international air travelers will triple by 2025.[7][8][9] The expansion will include direct access to a wider range of foreign destinations and global markets through agreements such as Open Skies.

Continued expansion depends in part on productivity gains and cost savings. Costs associated with system improvements will not put undue burdens on military, commercial, and private aircraft owners.

The aviation-manufacturing sector plays a crucial role in the U.S. economy, and it will remain a critical element of the industrial base for our national defense. The vitality of this sector will be stimulated by the introduction of innovations into the marketplace. The value of U.S. aviation manufacturers will strengthen as industry develops innovative products to capture new markets.

Specialty services tailored to individual customer needs, such as on-demand air taxis, will outpace the growth of traditional scheduled air transportation services.[10] Over the next 20 years, market projections for microjets and unmanned vehicles number in the tens of thousands.[11][12] In the same period, it is projected the cumulative value of aircraft sales and aircraft service markets will reach $2 trillion.[13] The United States must retain leadership to reap this international economic harvest.

Objectives

- Retain our role as the world leader in aviation
- Reduce costs for air transportation (by at least 25%)
- Enable services tailored to traveler and shipper needs
- Encourage world markets for U.S. products and services

3.3 Expand Capacity

The air transportation system of 2025 must accommodate a wide range of customers and an even wider spectrum of issues including:

- **Access requirements for private, commercial, civil, and military aviation**
- **Unforeseen changes in traveler and shipper needs**
- **Access to a more global economy**
- **Continuously evolving safety and security concerns.**

The only way we will meet those customers' evolving needs is to build new capacity, while making better use of our airports and airspace.

Existing operations will grow in a variety of dimensions including the number of passengers (enplanements), the number of flight departures — scheduled carriers, business aviation, and owner-operated general aviation — and the volume of cargo (cargo ton-miles). The air transportation system will provide sufficient capacity to satisfy the demand resulting from growth in existing operations as well as growth in new and emerging market segments.

The airport and airspace capacity in 2025 must be more responsive, adaptable and dynamic. The system will accommodate changing needs, both globally and locally, by leveraging new technologies and new operational procedures. The air traffic management system will be capable of shifting resources from servicing one geographic area to another with minimal training and little or no relocation of equipment or personnel. The system will be nimble enough to adjust in cost effective ways to varying levels of demand. The system will allow more creative sharing of airspace capacity for civil, law enforcement, military, and commercial users through ever-present access to operational information.

Trends and industry studies forecast a system that will continue to grow. The following chart depicts ranges of forecast growth focused on the existing operational paradigms including legacy and low-cost carriers.

While growth by traditional air transportation system-users is likely to continue, the system will also need to accommodate new aviation vehicles and business models. In just one area, a U.S. Government

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6 Bureau of Census, 2003.

7 Based upon extrapolated growth rates reported in Federal Aviation Administration. FAA Aerospace Forecasts FY 2004 – 2015. March 2004

8 Boeing, Current Market Outlook. 2004

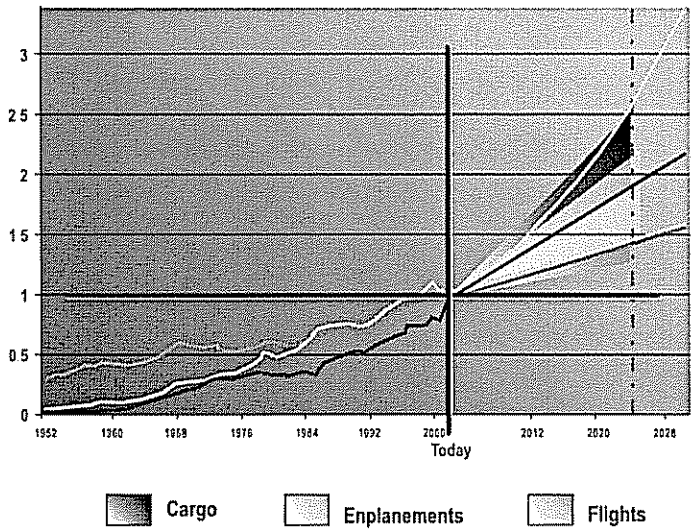
9 Airbus, Global Market Forecast. 2003.

10 Dollyhigh, Samuel, Analysis of Small Aircraft as a Transportation System. NASA September 2002.

11 Dollyhigh, Samuel, Analysis of Small Aircraft as a Transportation System. NASA September 2002.

12 Teal Group, World Unmanned Aerial Vehicle Systems – Market Profile and Forecast 2003.

13 Boeing, Current Market Outlook 2004



study estimates there may be as many as 5,000 microjets employed by on-demand air taxi services by 2010 and 13,500 by 2022 Microjets alone may represent 40 percent of daily operations by 2025.[16] An even higher percentage of operations by new vehicle types is anticipated when UAVs and other new entrants are considered

Objectives

- Satisfy future growth in demand (up to 3 times current levels) and operational diversity
- Reduce transit time and increase predictability (curb-to-curb transit time cut by 30%)
- Minimize the impact of weather and other disruptions (95% on time)

3.4 Ensure Safety

The U.S. air transportation system in 2025 will continue to be the safest form of transportation. Despite the anticipated growth in all sectors of the air transportation system the actual loss of property and more importantly human life will continue to decline. This will be accomplished through an integrated safety management approach and new air vehicles that will introduce inherently safer design characteristics. The approach will provide a proactive means for building safety into the air transportation system we are developing, and safely managing it through the transition Adoption of the safety management approach will deliver safety benefits on a global scale As an additional benefit, this approach will shorten the civil aviation implementation cycle times for products and procedures.

Objectives

- Maintain aviation's record as the safest mode of transportation
- Improve the level of safety of the U.S. air transportation system
- Increase the safety of worldwide air transportation

3.5 Protect the Environment

As aviation grows, we must reduce aircraft noise and emissions as well as contaminants from airports. Aviation simply must become a better neighbor. Improved environmental protection will be a vital element to ensure U.S. air transportation viability and global leadership. Certain regions of the world already have adopted policies that limit aviation growth to protect the environment. Noise and emissions at the Nation's largest airports would limit capacity if they not aggressively addressed. The NGATS will apply advances in design, engineering, and emerging technologies to ensure that growth in the number of aircraft and airports does not exceed approved environmental limits.

This environmental compatibility will be achieved through a combination of improvements in aircraft performance and operational procedures; land-use around airports; policies and incentives to accelerate technology introduction into fleets; and aircraft de-icing. Further gains will be realized from new policies and approaches in regulation and mitigation. Long-term, sustained research and development, and refined technology implementation strategies will help to keep pace with changing environmental requirements.

Policy and financial incentives will be used to accelerate introduction of environmental technology improvements in aircraft, including propulsion technologies, materials development, and airframe designs. Intelligent flight planning, coupled with improved flight management capabilities, will enable more fuel-efficient profiles throughout the flight envelope. Noise and local emission reduction efforts will be coordinated among multiple aviation operations in large metropolitan areas.

By 2025, community noise and local air quality impacts of aviation will be reduced in absolute terms, even with anticipated growth in air traffic. Uncertainty in emerging issues of climate change, health, and welfare effects of emissions will be reduced to a level that enables appropriate actions to be undertaken to address these effects. Airports will be valued neighbors keeping the public well informed about aviation and environment issues. Airlines and airframe/engine manufacturers will be recognized as global leaders in jointly addressing mobility and environmental needs

16 Data on potential numbers of microjets is based upon Dollyhigh, Samuel, Analysis of Small Aircraft as a Transportation System. NASA September 2002 Estimate on percent of daily operations uses approximation of the number of "traditional IFR operations" from Federal Aviation Administration. FAA Aerospace Forecasts FY 2004 – 2015, March 2004 extrapolated to the 2025 timeframe and estimates on the utilization rate of five flights per day.

Objectives

- Reduce noise, emissions, and fuel consumption
- Balance aviation's environmental impact with other societal objectives

3.6 Ensure Our National Defense

The future air transportation system must be able to facilitate the Nation's ability to respond rapidly to emerging threats while maintaining commercial and civilian access to our airspace. Integrating the information and communication systems of defense agencies is essential to ensuring that our Nation is prepared to combat threats.

Integrated capabilities will support national defense by improving the ability to share information among agencies and organizations responsible for protecting our country. Sharing information and obtaining a common picture of our skies will enable a proactive approach to protection. It also will facilitate rapid responses to a variety of threats. For example, improved information regarding aircraft that may be entering restricted airspace will likely reduce the need for combat air patrols.

The future, air transportation system also will improve support for military missions. Commercial carriers will be able to provide more capable and economical transportation services and the access to global airspace. Additionally, global harmonization of standards, procedures, and operations will reduce the investment necessary to ensure US military access to international airspace.

The availability of improved tracking and surveillance technologies will allow continued commercial and civilian access to our national airspace, while mobilizing defense activities. The future system will feature the ability to define flexible airspace, quickly changing boundaries required by military and civilian operations. This will enhance the ability to support military missions and ensure continuous quality service to other airspace users.

Objectives

- Provide for the common defense while minimizing civilian constraints
- Coordinate a national response to threats
- Ensure global access to civilian airspace

3.7 Secure the Nation

In light of the continuing threat of terrorism, new defense tactics and technologies must be put in place without compromising efficiency. These measures must address a wider range of threats, while at the same time lowering the cost and impact of these measures on pilots and the traveling public.

Growth in air travel and air cargo will challenge our ability to manage security risks while ensuring efficiency of operations. The advent of increased operations at thousands of small airports will increase ease of access to the system and the difficulty of securing it. UAVs will be used to aide security monitoring, but also could create a new threat as they become more widely available to commercial users.

An integrated, multi-layered security approach for air transportation will help ensure the security of U.S. borders and airspace, and minimize risks associated with an expanding range of potential security threats. Additionally, security measures will address the need of protecting the system itself from hostile actions without limiting personal liberty.

Future air transportation screening and detection systems will enable positive identification of travelers while minimizing unauthorized access. Baggage and cargo screening systems will not only reveal explosives and weapons, but will also detect chemical, biological, radiological, and nuclear threats. The future system will be highly resistant to disruptions, incidents, and false positive alarms. Therefore, in spite of increases in demand for the air transportation system, security systems will process travelers, baggage, and cargo with greater speed, accuracy and efficiency.

Objectives

- Mitigate new and varied threats
- Ensure security efficiently serves demand (less than 30 minutes total through an airport)
- Tailor strategies to threats, balancing costs and privacy issues
- Ensure travel and shipper confidence in system security

Chapter 4: Operational Concepts

The NGATS will be well equipped to adapt to future demands by using new concepts, technologies, networks, policies, and business models. Air traffic control will be integrated using its ability to share timely, accurate, and secure information with a common operational picture.

Multi-layered systems with up-to-the-minute information and new technologies will ensure America's security. The safety of air travel will be designed into every air transportation component. Airports will ensure convenience and security for travelers and shippers while increasing capacity. The air transportation system will take full advantage of enhanced aircraft performance capabilities, but will also accommodate aircraft with less sophisticated equipage and different performance characteristics. Improvements in air traffic management systems will result from employing advanced information management technology, enhanced sensor and detection capabilities, upgraded aircraft performance capabilities, and more accurate and tailored weather forecasts.

4.1 Security Operations

The future, air transportation system will be designed with security measures embedded and interwoven throughout the system. Security systems will operate seamlessly across all aspects of air transportation. Airport security screening will be non-intrusive and integrated with other airport-based processes such as check-in, customs, immigration, agriculture screening, manifest processing, and load planning.

Passenger screening will begin well before arrival with the implementation of new, reliable, unobtrusive, and more accurate forms of identification. To achieve the desired level of security, passenger and baggage identification and security detection systems will employ cheaper, smaller, and faster technologies. In addition, security systems employed for air transportation will be integrated across other modes of transportation.

Command and control protocols will be established, allowing agencies to retain responsibility while enabling a coordinated national response, for protecting the homeland against all threats. Law enforcement and other agencies responsible for the Nation's security must have access to a common integrated operating picture via secure data link, air-to-ground communication systems, and airborne Internet. This common operating picture permits secure and accurate communication among command and control entities.

Information must flow freely to establish and monitor continuity of operations within the air transportation system. Position and intent information received from individual aircraft needs to be fully integrated with surveillance systems that will create a national surveillance network, which will support homeland security and national defense needs, as well as the needs of air traffic management. This new model ensures that when an object is detected on the ground or within the airspace, information about that object will be made available to the correct agency. This enables a coordinated response from appropriate authorities. Distribution, process, correlation, and display systems enhance the quality of a common operating picture that will quickly identify abnormal deviations, erratic or errant behavior and transfer information to the appropriate authorities.

Security strategies will be tailored to address a wider range of threats, considering cost and impact on operations, and ensuring that security solutions are balanced. New systems will mitigate impacts of chemical, biological, radiological, and nuclear threats. Sensor technology and countermeasures will be used to detect and render Man-Portable Air Defense Systems (MANPADS) ineffective.

System-wide safety and security monitoring allows analysis of failure, threat, and vulnerability trends in real-time, based on data gathered throughout the system. Whenever an incident occurs, it will be quickly isolated, assessed, and managed. More precise real-time diagnoses of risk will enable air traffic flows that ensure continued access to airspace, while protecting assets and infrastructures.

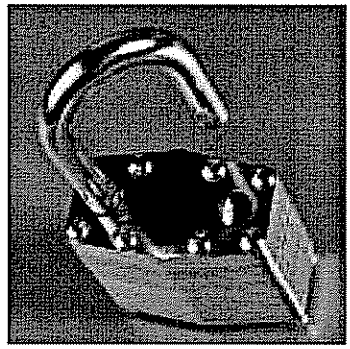
4.2 Safety Assurance

The air transportation system in 2025 will remain the world's safest form of transportation. However, achieving this outcome will require a new approach, one that will ensure that safety requirements are established at the front end of every aviation process to prevent accidents before they happen. A more comprehensive safety approach will be implemented by airport authorities, civil aviation authorities, air traffic service-providers, aircraft equipment manufacturers, and other Government agencies involved in aviation.

This new approach changes the regulatory authority's role from testing, inspecting, and certifying individual system elements to comprehensive approval and periodic audits of the safety management programs within the civil aviation industry. Safety risk management and design assurance responsibility reside squarely with the aviation industry programs. This in no way abrogates the regulatory authority's safety assurance obligations to the public. Compliance with regulations will remain the elementary basis of this new approach. However, the regulatory authority will be able to dedicate more resources to addressing safety issues before they become safety problems.

Accordingly, safety needs to be embedded at the core of all procedures, products, policies, or technologies associated with aviation. A comprehensive air and space safety management doctrine will create high-level standards and procedures for Government and industry safety management programs. It will give any aviation regulatory authority the confidence that resulting products or operations were conceived, designed, developed, and implemented with safety as a core feature with appropriate compliant regulatory requirements.

These standards cannot be put in place without implementing a data analysis capability to identify and resolve accident precursors. This new capability will transform today's incompatible databases scattered throughout Government and industry into a proactive safety analysis tool. Procedures and mechanisms will be in place to move safety management from the reactive mode to a data-driven, proactive mode that continuously searches for accident precursors. Data collecting and sharing among stakeholders will be key. To get the detailed level of data needed for this analysis tool will require implementing a non-punitive reporting system to alleviate concerns about the corrective action process.



Finally, this new approach to safety management must be adopted globally and made consistent with the International Civil Aviation Organization (ICAO) requirements. We are committed to work with our international partners to get this accomplished.

4.3 Airport Operations

Landing and departure capacity at busy airports will increase through greater use of parallel runways, relaxation of single runway occupancy restrictions, and improved wake vortex sensing and prediction systems. These systems and procedures will be integrated with other automated approach, landing, and departure systems to ensure that capacity demands are met. Coordinated planning among air traffic management, aircraft operators, and ground service providers can virtually eliminate surface delays. Precision approaches will potentially be available to every runway in the Nation without reliance on costly ground-based equipment. This will provide the needed flexibility to adapt to changing air transportation needs and will help to ensure worldwide interoperability for airspace users.

The airport system in 2025 will need to provide sufficient infrastructure to accommodate user demand. To attract travelers and operators increased competition among major commercial, secondary, and reliever airports can be expected. Airports will respond with measures to stay cost effective, while remaining convenient for travelers and shippers alike. To maintain positive community relationships, multiple airports in a geographic region will coordinate planning to provide a range of facilities that balance transportation needs with environmental standards for noise and emissions.

When airport infrastructure expansion cannot be accomplished using existing resources, due either to physical or political constraints, alternative means will be employed to match demand with capacity to reduce or avoid congestion and travel delays. Airports and air traffic services may use market-based mechanisms such as peak period pricing to ease congestion and ensure that the maximum economic value is obtained from resources in high demand.

Operators nationwide will make greater use of satellite or reliever airports in an effort to avoid congestion and higher airport fees. However, some incentives may still be required to encourage affordable service to small communities. Air traffic services will use airspace over major metropolitan areas or along major travel routes in a manner that reflects the priorities for using that capacity.

4.4 Aircraft Operations

Avionics plays a key role in transforming the U.S. air transportation system. Future aircraft will sense, control, communicate, and navigate with increasing levels of autonomy. These new vehicle capabilities, in turn, allow for development of new concepts in air traffic management. Improved technologies, human-computer interfaces, and training techniques increase flight deck situational awareness. Enhanced flight-deck technologies keep flight crews informed of location in both geographic reference and in relation to nearby aircraft. Increased use of automation keeps an individual constantly aware of what is happening and warns of impending issues, while allowing the individual to handle non-routine situations and act as part of the designed redundancy built into the system.

In designated airspace, flight crews can cooperatively separate aircraft from each other using on-board automation capabilities. Ground automation may facilitate the interaction of aircraft; but pilots will retain managerial control over the flight.

New vehicle capabilities may include single-pilot and no-pilot operations, autonomous operations, quieter approaches, and greater

safety. New air vehicle designs will increase the level of crash survivability by incorporating design features that reduce the effects of the crash on the airframe and occupants. The use of new materials, fuels, and design processes will make aircraft more resistant to impact damage and flammability. Flight deck automation will reduce potential aircraft from being maneuvered into unsafe situations. This will prevent controlled flight into terrain, aircraft collision, and airspace violations. Furthermore, the remote piloting capabilities may enable ground intervention in case of pilot incapacitation or for security reasons. Automatic health monitoring combined with self-healing systems will improve reliability and predictability of service. Clearly, beneficial uses of new technologies will be supported with all the necessary decisions on procedures, roles, and assumptions about the operating environment and efficiency. This will ensure that operational procedures and policies are understood and accounted for in the design of the technologies.

While many of today's aircraft will be operating in 2025, the diversity of the commercial operating fleet will increase dramatically as new aircraft and new operational envelopes are designed. Future commercial aircraft will incorporate many environmentally compatible propulsion technologies and quieter, more efficient airframes. New materials, including composites and nanotechnology applications will lower noise, improve efficiency, and reduce emissions. These aircraft will have lower emissions per passenger trip than today's larger commercial jets, and noise footprints will fall well within acceptable airport noise limits. Reduced operations costs and improved operational efficiencies, through more fuel-efficient engines and airframes, will allow a new generation of aircraft owners to enter the system.

Harmonized civil and military equipment as well as operations that require communications, navigation, and spectrum availability will be vital in planning and executing global missions. International harmonization of equipage standards and procedures will also address key cost drivers such as maintenance and training. Global procedures for operating and spacing aircraft, based on the capability of an individual aircraft and the flight crew's operational performance will mean common operations worldwide.

4.5 Air Traffic Management Operations

Achieving the vision for 2025 will employ a different approach to monitoring and managing the air traffic management system. New technologies and procedures will allow for a responsive air traffic management system in a dynamically changing environment. Additionally, these procedures and technologies will include the ability to provide services to airspace users on demand from any location.

In addition to the improvements previously described for aircraft and airports, performance of the new air traffic management system will be enhanced by:

- **Reduced separation standards**
- **Flexible spacing and sequencing of aircraft on the ground and in the air**
- **Use of new equipment, procedures, and infrastructures enabling increased service of under utilized airspace, airports, and runways**
- **Improved and tailored weather forecasts**
- **New and enhanced technologies and procedures, reducing environmental effects of noise and emissions.**

A new model for managing air and ground surveillance information will be in place. Reduced costs for associated infrastructures can be expected from operating from a common Government capability.

To accommodate shifts in demand from a wide variety of users, air traffic control will migrate from control of individual flights to air traffic management, where airspace is allocated based on traffic flows. Although there will be a continued need to handle flight specific exceptions on a tactical basis, the role of dispatchers, flight planners, controllers, and flow managers will emphasize end-to-end strategic flow management with minimal individual flight interventions. Automation will assist flow managers in monitoring flight conformance to ensure compliance with flow restrictions. Additionally, decision-makers will use information management systems to collaborate, develop, and update flow plans as well as react and recover from system disruptions.

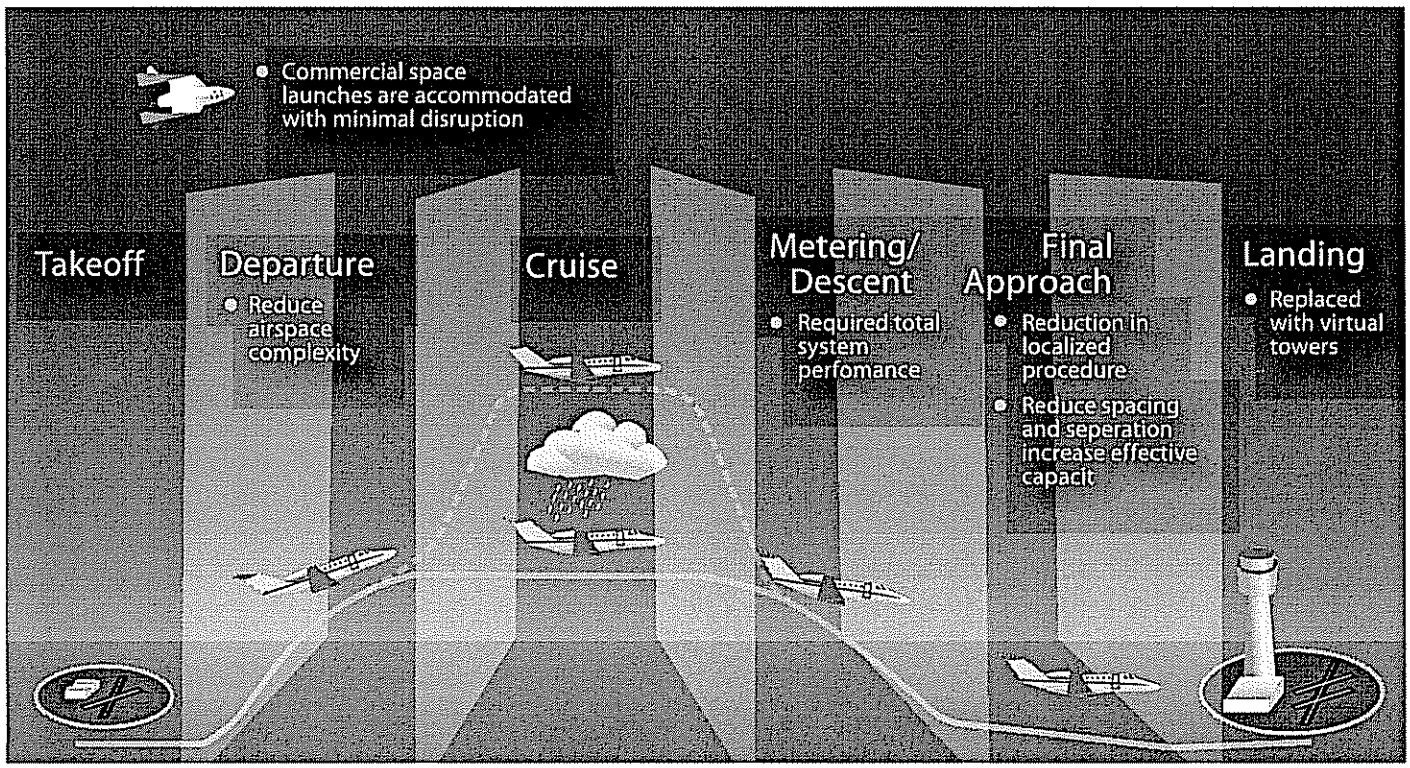
Data link communications will replace voice communications between aircraft and air traffic management systems improving the accuracy and timeliness of information transmission. Data link communication will be routine for air traffic management and operational control purposes. Voice communications will only be used for data-link equipped aircraft under extraordinary circumstances, and for routine and operational control of aircraft without data link capabilities.

Ultimately, air traffic management services will be tailored and flights will be managed based on individual aircraft and flight crew performance capabilities. An aircraft's ability to communicate, accurately navigate, be tracked by other aircraft or ground systems,

and provide precise operational control will determine the extent of services provided within the system. Additionally, end-to-end flow planning, coupled with enhanced aircraft flight management systems, must create fuel-efficient flight profiles. Flights requesting use of high demand airspace or airports will contract for use of these resources through a variety of mechanisms.

New technologies and operational procedures can eliminate the differences between procedures for instrument meteorological conditions (IMC) or visual meteorological conditions (VMC). Aircrews and air vehicle operators need access to technologies that will provide a clear 3-dimensional picture of terrain, obstacles, runways, and taxiways so that capacity will not be reduced during most inclement weather conditions and other system disruptions. Further, disruptive weather and other environmental impacts on end-to- end flow management will be reduced through a combination of improved forecasts and strategic flow-management support tools.

Lastly, in the future, air traffic management services will become less tied to a geographic location and be more readily configurable and scalable. Shifts in demand from military, civil, and commercial aviation users can be accommodated by shifting or sharing air traffic services from one geographic area to another with minimal training and little or no relocation of equipment or personnel. Ultimately, air traffic management facilities will be able to take full advantage of aircraft and ground system automation, resulting in facility consolidation and virtual facilities.



Chapter 5: The Next Generation Air Transportation System Roadmap for Success

Achieving the vision for air transportation will be done via collaboration among Federal, State, and local Government and private industry. These efforts will be coordinated through eight major strategies that broadly address the goals and objectives for the Next-Generation Air Transportation System. Supporting these strategies will be combination of research, development, and implementation activities. These activities will involve a review of policy and financial mechanisms as well. The eight major strategies along with their key research areas are as follows:

1. *Develop Airport Infrastructure to Meet Future Demand*

   Strategy:

   - Provide a system that meets or exceeds user demand by integrating airport, airspace and air traffic management design, development, and deployment. Airport infrastructure must address the need to expand in a way that meets future capacity. This strategy provides customers a wide range of options for air transportation in an efficient cost conscious manner.

   Research areas:

   - Develop requirements and concepts for servicing a variety of future demands, from maximizing overall metropolitan area capacity to servicing smaller communities. Ground-side questions include airport access alternatives and associated transportation, security, and information systems requirements such as regional airports, and city check in by specific location.

2. *Establish an Effective Security System Without Limiting Mobility or Civil Liberties*

   Strategy:

   - Establish a global security system to ensure reservation-to-destination security for travelers and the stream of commerce. Travelers and shippers will be confident that no undue security or health risks exist in the transportation system, and that movements and civil liberties are not unduly impeded by security measures.

   Research areas:

   - Explore integrated, scalable security methods and implementation to mitigate potential threats to the air transportation system.
   - Develop advanced sensors, information systems, and mitigation strategies for identifying threats and recovery from attack.
   - Develop automated security screening of passengers, baggage, and cargo—integrated with the normal flow of people and items.
   - Improve chemical, radiological, biological, and health sensors, including automation for detection and recognition of hazardous items.

3. *Establish an Agile Air Traffic System*

   Strategy:

   - Establish an agile air traffic system that accommodates future requirements and readily responds to shifts in demand from all users. The system will be responsive to market elasticity; have flexibility to deliver capacity and efficiency improvements; and ensure that equipment and personnel are able to support a wide-range and number of operations tailored to customer needs.

   Research areas:

   - Conduct research to evaluate alternative allocations of air traffic management services and functions between the ground and the air and the automation and the human to address critical system attributes such as capacity, agility, cost, human factors, reliability, safety, performance, and transition paths.
   - Determine the requirements for communications, navigation, and surveillance infrastructure to meet the traffic and performance needs of the future in a cost-effective manner while accommodating all air traffic, defense, and security stakeholders.
   - Define and evaluate fundamental communications, navigation, and surveillance architecture options such as moving to digital data links and away from voice command and control, satellite-based only or continued reliance on ground-based communications systems, spectrum and bandwidth needs and likely spectrum availability.
   - Investigate feasible architecture options that allow all aircraft to operate the same within the specific airspace.
   - Develop cost-effective concepts, technologies, and procedures for providing comprehensive air traffic services at small airports.
   - Define a portfolio of the most effective alternatives for expanding airfield throughput.
   - Undertake research on cost-effective technologies, procedures, or other actions needed to make instrument

capacities equal to visual weather capacities at the most critical airports. The results will address fundamental system architecture questions, enable or modify the trend toward adoption of net-centric architectures that distribute intelligence and functions to smarter and smaller nodes in the system, and permit routine National Airspace System access by UAVs, commercial space launch, and other new vehicles.

4. *Establish User-Specific Situational Awareness*

Strategy:

- Establish globally compatible information-sharing capabilities to provide on-demand, real-time knowledge to support more distributed decision making roles of users, operators, and service providers. Each stakeholder will be able to reach informed decisions through increased knowledge of current conditions, plans and events affecting the system.

Research areas:

- Define integrated requirements for shared situational awareness. What user groups are being serviced and what are their explicit requirements? What temporal and performance requirements will be levied on the system? What are the data sharing and access policies to ensure security while enabling appropriate access to data? How can one deal with liability issues that arise?
- Define system architectures that are readily responsive to the demand for flexibility. What standards should be established to authorize changes to information security criteria? To what extent do user requirements need to be supported, at what cost? Who pays for what services? What organizations will be responsible for what part of the system, and who will be assigned overall system responsibility?

5. *Establish a Comprehensive Proactive Safety Management Approach*

Strategy:

- Develop and implement a common and comprehensive risk management doctrine at the national level that is applied to aviation and space travel. Encourage and participate in global safety practices to ensure the safety of the traveling public and cargo. Develop and implement a cutting-edge operational data analysis capability that identifies safety issues. Promote expansion of the United States capability to meet national and international safety goals and objectives.

Research areas:

- Explore key issues such as risk propagation in complex systems required for design of and transition to a capability for advanced safety assessment methodologies enabling multiple, major changes to be made to the system in a decade without compromising safety — increased traffic density, distributed control, increased small jet use, increased use of smaller airports, change in human roles, new procedures, and introduction of UAV.
- Leverage lessons and methods from industries that have developed advanced risk assessment methods due to the absence of statistically meaningful accident data.
- Explore policy and liability issues related to a standardized data-sharing program; an analysis capability using the data-sharing program to identify accident precursors; and a safety assessment doctrine for introducing new procedures and technologies such as strategies for managing system safety and labor issues while introducing changes.
- Develop and implement program of education training and enforcement to address ongoing safety risks.

6. *Develop Environmental Protection that Allows Sustained Aviation Growth*

Strategy:

- Develop and implement new models, metrics, policy approaches, operational, and technical improvements to mitigate environmental impacts related to the growth of aviation to foster public acceptance of air transportation growth.

Research areas:

- Explore aircraft, engine technology and flight procedures to minimize environmental impact such as noise and emissions, and depletion of limited fuel supplies. This includes getting a better understanding of the trade-offs between noise and emissions.

- Explore zero-emission airport ground operations such as aircraft ground movement and service vehicles, and eliminate ground environmental contaminants including deicing fluid runoff.
- Explore the impact of alternative environmental policy approaches on the air transportation system.
- Explore potential models and metrics to support the development of environmentally friendly air transportation.

7. *Develop a System-Wide Capability to Reduce Weather Impacts*

Strategy:

- Achieve increased safety and efficiency in the national aviation system by deploying and integrating scientific and operational advances in weather technology, enabling aviation system users to mitigate the negative impact of adverse weather

Research areas:

- Develop enhanced weather observations and forecasts, and integrate them with decision-support tools to enhance capacity and efficiency of the airspace while improving safety.
- Develop integrated user requirements and appropriate spatial, temporal, and probabilistic characterization of each hazard in the airspace, and establish the means of disseminating these characterizations to the users of the air transportation system.

8. *Harmonize Equipage and Operations Globally*

Strategy:

- Ensure global interoperability for the NGATS by developing and supporting implementation of global air and space transportation policies, standards, and procedures. U.S. leadership toward global standards will improve safety, security, mobility, environmental quality, and economic viability.

Research areas:

- Identify air transportation system technologies, air traffic management operational concepts, policies, and procedures that require or benefit from global standardization or interoperability.
- Assess current plans for transformation in other countries and international organizations.
- Identify similarities and potential conflicts between air transportation developments in the United States and in other countries.

Detailed plans for each of the strategies are under development and outlined in Chapter 7. The Joint Program and Development Office (JPDO is working with member Agencies to Roadmap High-level Strategies and Key Events further identify the research and development needs, on-going activities, and significant gaps towards the execution of the strategies. By understanding the overall research landscape, the JPDO will be able to (1) identify priorities and interdependencies; and (2) manage the convergence of results.

5.1 High-level Roadmap

Many of the steps toward transformation will involve changes in policy, procedures, and technology. Industry, local governments, the aviation community, and the agencies involved with this project will work together to assess the effectiveness of change, its cost to implement, and the level that change is complementary to overall goals and objectives.

5.2 Key Challenges

At a national level, key policy and technical challenges need to be addressed for the strategies to be successful. These challenges must be resolved through the research and maturation of the strategies. Guiding principals for resolving differing stakeholder positions and transitional issues will be tailored to work these key areas of concern.[17]

- **Alignment of responsibilities and decision-making across stakeholders.**

  Creating a more integrated system will involve redistributing operational responsibilities and decision-making among multiple Federal, State and local Governments, and private entities.[18] A major policy challenge is to understand the roles of all stakeholders and the mechanisms for shared decision-making in a more integrated public-private operation. This new approach applies to all aspects of air transportation, including integrated public-private sector operations for security, a shift in the distribution of public and private roles and responsibilities for air traffic operations, and handling the cultural change associated with this shift. It will be a new way of doing business, a difficult task for a system that has archived preeminence around the world in its present structure.

17 National Research Council. "Securing the Future of U.S. Air Transportation." 2003.

18 National Research Council. "Securing the Future of U.S. Air Transportation." 2003, pg. 15.

- **Alignment of investments and coordination of transition.** Successful transition depends on how quickly the benefits can be delivered. If not synchronized with the natural occurring windows of opportunity, such as technology updates, change can be prohibitively expensive. For example, accommodation of mixed levels of aircraft capability, due in some cases, to long aircraft life cycles, may limit operational benefits and increased cost. It will be equally difficult to align planning and investing cycles for many Government entities that have a role in air transportation improvements. This includes balancing the potential cost savings from consolidation of buildings and equipment across multiple missions, and decommissioning of facilities with political pressure for the status quo. Investments among all of the stakeholders need to be aligned and coordinated to minimize risk exposure and unbalanced commitments.
- **Definition of equity and contribution toward national goals.** Striking a balance between competing goals of many air transportation system stakeholders also will be a challenge. Goals for growth in air transportation must be balanced with needs for safety, environment, and security. A comprehensive safety management system, environmental doctrine, and multi-layer security architecture are part of this plan.

  Questions will arise on the balance of these goals. For example, how are security and national defense needs balanced with personal liberty and privacy issues? What is the balance between security needs, and access to widely available information? Who will have access to parts of the system that still have resource limitations? What are the potential trade-offs among local, national, and international environmental pressures with the higher levels of air traffic? Will policies exist to provide air transportation access, for the public good, to areas of the market that will not provide access on its own? What is the appropriate level of contribution by different stakeholders such as airlines, general aviation, Government, and passengers to funding the maintenance and improvement of the air transportation system?

- **Innovation in managing the safety effects of changes.** Ensuring safety while implementing complex transformational changes represents a major challenge. To accelerate the introduction of transformational changes, a comprehensive safety management approach built on new means of modeling, predicting, and mitigating the overall safety effects is needed. We must understand system safety and, based on this, determine acceptable safety levels for new concepts.

- **Responding to future demand and complexity.** New modes of operation and a shift in roles and responsibilities will be required, resulting from significant increases in traffic level and diverse traffic types. As responsibilities change, liability issues arise. The use of automation in complementing human roles to handle increased traffic becomes increasingly important and in mitigating potential threats to the system.

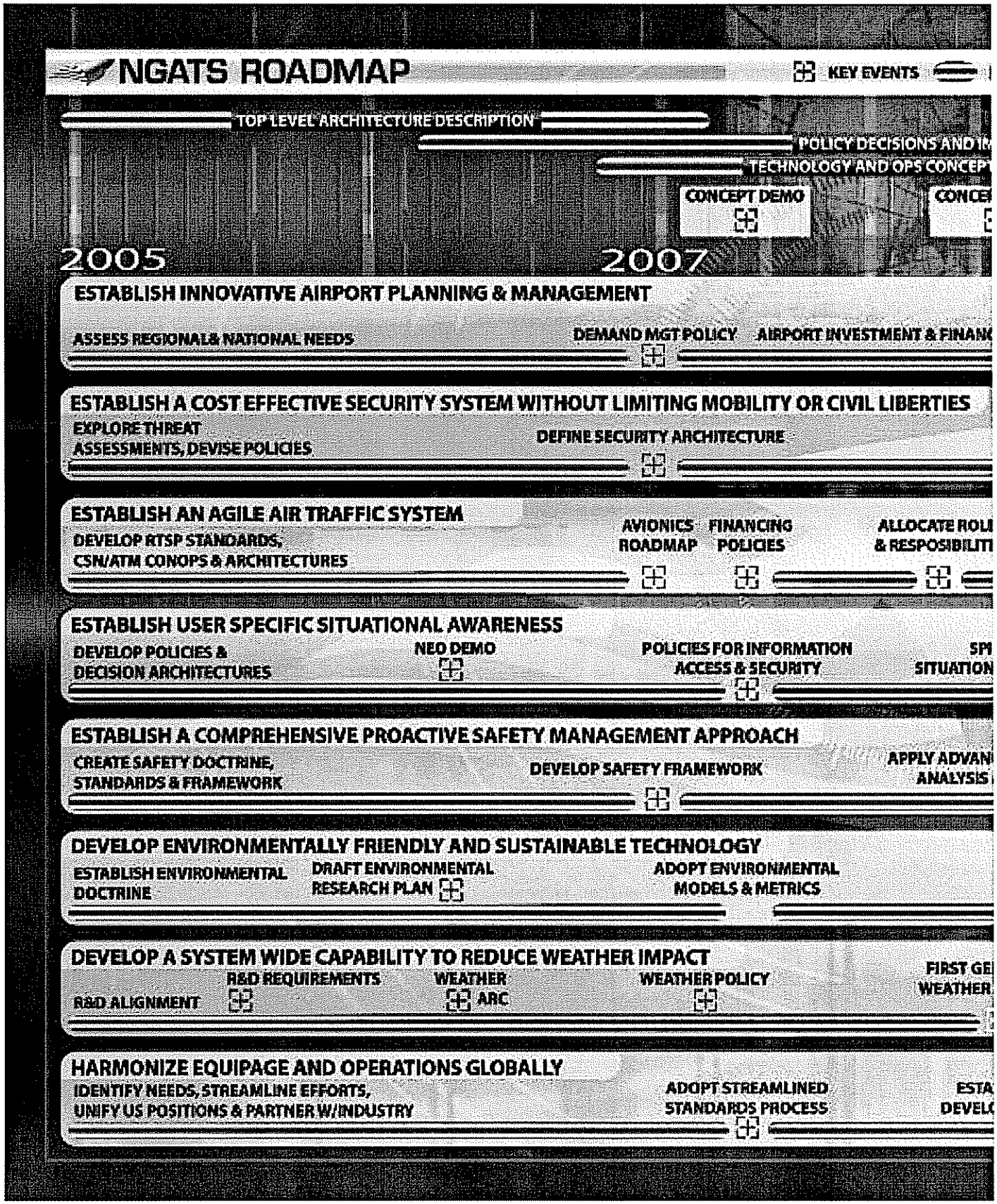
- **Creative treatment of a mixed legacy and future fleet.** From an operational perspective, achieving seamless operations with a mixture of legacy and new aircraft represents a significant challenge. Thus, strategies with potential major policy implications to influence aircraft equipage, and improve uniformity of the fleet need to be explored. Another promising direction will build on a policy that creates performance-based services that allow mixed environmental operations that are tailored to each aircraft capabilities.

- **Assessing the merits of transformation.** A major challenge, cutting across all strategies, is the assessment of overall effectiveness of transformation to the air transportation system including operational, technology, and policy changes. Given the complex interactions of goals and operations, an innovative approach for assessing operational concepts must account for the interdisciplinary nature of the problem.[19] We need to better measure the effects of the changes we implement. With the broad scope of proposals outlined in this plan, our research and development must take into account the need for precise measurements of performance. Reliance on anecdotal information should not be confused with data-driven assessments. Likewise, this measurement needs to take place at both strategic and tactical levels.

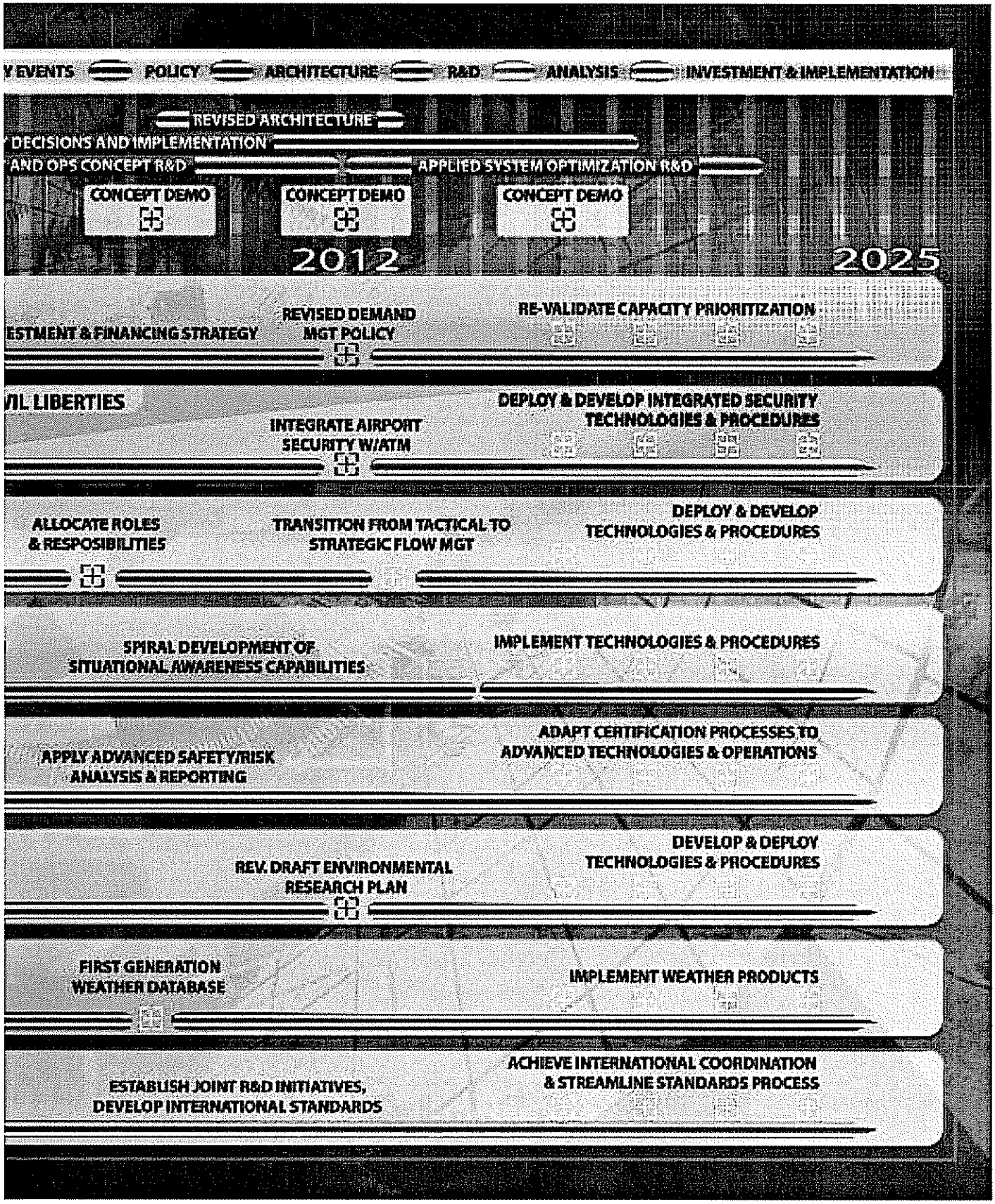
This following figure provides a high level view of the roadmap, reflecting the confluence of major activities and milestones for the transformation to the NGATS, and schedules for each of the eight transformation strategies.

19 National Research Council, "Securing the Future of U.S. Air Transportation," 2003, pg. 20.

Diamonds denote key events or decisions in the roadmap, and solid lines denote time phased activities Events preceding 2012 are specified Most events beyond 2012 are generic milestones that represent incremental building blocks of a spiral development process Both key events and time-phased activities are color coded to reflect primary areas of policy, architecture, analysis, research and development (R&D), or investment/implementation Timelines at the top of the roadmap indicate three overarching activities: • Definition of the NGATS architecture • Policies that may need to be implemented • Technologies and operational changes that need to be implemented These are incorporated into timelines, often as spiral development activities Finally, the approach of conducting major demonstrations of technology and new operational paradigms is reflected in the diamonds at the bottom of the roadmap While on the surface, the roadmap looks like eight separate timelines, the milestones and activities for any given strategy are connected and often interdependent with



milestones from other strategies For example, the avionics roadmap depends on weather and security architectures, all three of these are integral to the enterprise architecture, and all of these architectures must reflect the regional and national airport needs Transformation will occur in discrete transition steps, and many evolutionary changes already under way As the system architecture and details of the strategies are defined, on-going changes will be aligned to support the transformation and new initiatives will commence By 2012, the technology and operations concept R&D and architecture definition will be mature and the policy decisions made, setting the stage for the more revolutionary transformational steps The key steps to achieve vision transformational goals will be better understood, research on concepts and technologies will provide initial results, and the overall operational concept of the NGATS as well as for the plan for implementation will be clarified



Chapter 6: Approach to Transformation

The resolution of the challenges described earlier is interwoven across many Government agencies as well as private corporations. The ability to manage effectively across Government agencies and fuel Government/industry partnerships, as the engine of transformation, has never been more critical to this country. This effort represents a sea chnage in how efforts will be leveraged both within government and with industry.

6.1 Changes within Government

Planning and executing a transformational program through partnership requires identifying the key partners, establishing an organizational framework, and implementing processes that support their collaboration. Transformation must be realized by allocating responsibility for portions of the task among the multiple Federal agencies and industry partners that have relevant missions, capabilities, and budgets.

In Public Law 108-176 Congress recognized the need to do business differntly. It identified the essential Federal agency partners, and called for them to work together to leverage their efforts. To ensure this change occurs, Congress created two key entities. First, an executive-level interagency team, called the Senior Policy Committee (SPC). This committee is composed of each agency Secretary/Administrator or designee, and is chaired by the Secretary of Transportation. Second, the legislation requires the Secretary of Transportation to establish a JPDO within the FAA to manage the work related to the NGATS. The JPDO is ultimately accountable to the SPC and reports directly to the FAA Administrator. The Director of the JPDO is answerable to the Air Traffic Organization with the responsibility to ensure smooth transition and implementation of National Airspace System infrastructure. In the roles and mechanisms next described, the JPDO Director is also responsible for determining the issues that must be further worked by agencies and those that must be elevated to the SPC. Specific roles of these two governance bodies are as follows:

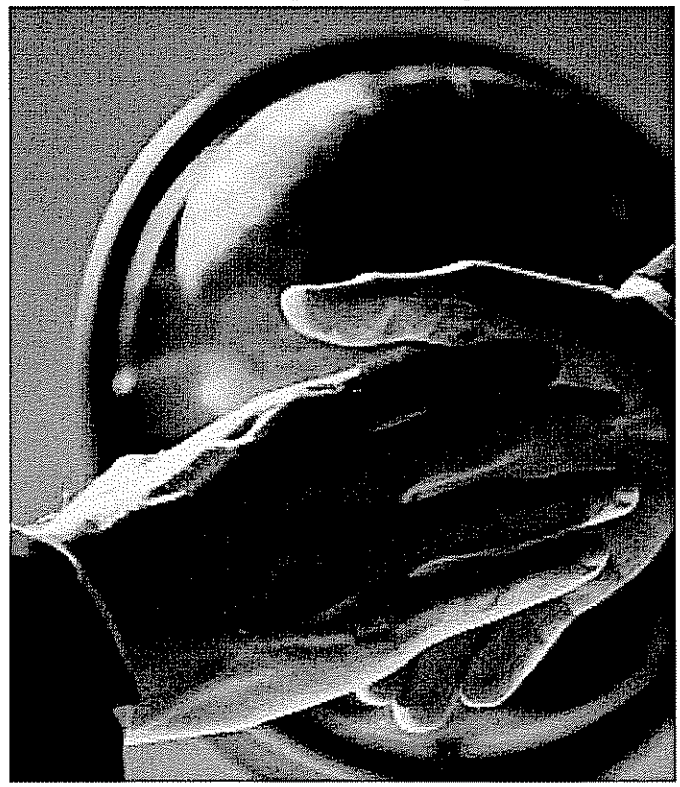
Senior Policy Committee (SPC)

- **Advises the Secretary of Transportation regarding the national goals, objectives, and strategies for the transformation of the Nation's Air Transportation System to meet its future needs**
- **Provides policy guidance for the NGATS, which is to be developed by the JPDO, and ongoing policy review for the transformation**
- **Identifies resource needs and makes recommendations to respective agencies for funding of planning, research, and development activities**
- **Makes legislative recommendations, as appropriate, for the future air transportation system.**

The Senior Policy Committee shall consult with, and ensure participation by, the private sector to guarantee the progress of the initiative.

Joint Planning and Development Office (JPDO)

- **Creates and carries out the Integrated Plan for the NGATS**
- **Oversees research and development of the NGATS**
- **Coordinates aviation and aeronautics research programs to achieve the goal of more effective and directed programs that will result in applicable research**
- **Coordinates goals, priorities, and governmental research activities with U.S. aviation and aeronautical firms**
- **Coordinates the development and utilization of new technologies and operations to ensure that, when available, they are used to fullest potential**
- **Creates a transition plan for the implementation of the**



NGATS

- **Facilitates the transfer of technology from research programs such as the National Aeronautics and Space Administration (NASA) program and the Department of Defense (DOD) Advanced Research Projects Agency program, Federal agencies with operational responsibilities, and to the private sector**
- **Reviews activities relating to noise, emissions, fuel consumption, and safety conducted by Federal agencies**
- **Monitors and reports progress of the activities outlined within the Integrated National Plan.**

Integrated Product Teams

For each strategy, an integrated product team (IPT) will be reponsible for applying best practices from industry and the DOD to achieve the mission of that strategy. Primary responsibility for assembling and leading each IPT belongs to one agency. The agency will coordinate and assemble expertise from across the Federal Government and private industry to empower and leverage participation by all affected partners in the transformation including manufacturers, suppliers, and customers from the private sector.

The IPTs will establish detailed plans for execution around the top-level descriptions and within the master schedule contained in this plan. Specific IPT activities include:

- **Managing the planning and orchestrating the execution of all relevant work to complete the assigned strategy**
- **Conducting analyses and trade studies to select and validate implementation alternatives**
- **Analyzing changes currently underway, identifying gaps, and establishing the required Government and/or industry research and development activities to close necessary gaps**
- **Coordinating with Government and private industry on research and development resources**
- **Collaborating with industry on research and implementation for the initiative • Identifying non-technical approaches such as policy, regulation, and operational procedures**
- **Establishing detailed requirements for individual mission areas**
- **Conducting advanced concept and technology demonstrations**
- **Creating a transition plan for implementation of products**
- **Creating public/private partnerships that include multi-agency, industry, and Government participation.**

Cross Integrated Product Team Coordination

The JPDO is the glue that orchestrates the efforts of the IPTs and keeps the focus on fulfilling the vision. The JPDO will establish an architecture council that encompasses expertise from the executing IPTs and selected industry representatives. A chief architect will be designated to chair the council, guide the development, and coordinate a system-of-systems view of the NGATS. In addition, the chief architect is responsible for the managing the system engineering and integration efforts. A portfolio management council will be established to provide high-level guidance and monitoring of the programmatic aspects of the transformation efforts. Through these mechanisms, the JPDO is responsible for:

- **Approving broad strategies of the executing IPTs as part of the Integrated Plan**
- **Ensuring IPT plans and schedules are consistent with the roadmap and architecture**
- **Providing a forum for issue resolution**
- **Managing technology transfer opportunities between IPTs or agencies**
- **Scanning for external influences and developments affecting the NGATS initiative**
- **Evaluating trade-offs that cross-cut IPT objectives, and coordinating necessary decisions with the JPDO Director**
- **Developing the means and providing performance monitoring for the IPT efforts**
- **Implementing a strategic planning activity**
- **Providing on-going maintenance of the Integrated Plan**
- **Establishing and implementing schedule and budget tracking capabilities.**

During the process, the SPC and JPDO must make a difference. A difference felt by the passenger — confident that Government is working for them, that they are safe and secure. To accomplish this daunting task, we must create a new model of collaboration throughout Government and industry. The engine of this transformation is the partnerships among key stakeholders. Success of these partnerships will require organizational governance that empowers all stakeholders. The results will be a spirit of confidence the American people will hold in their Government, an assurance their Government is working for them, that they are safe and secure and that the Next Generation Air Traffic System is an efficient and effective investment of their hard-earned taxpayer dollars.

6.2 Changes in Government-Private Interactions

The JPDO must bring together the best of Government with the best-of-breed solution providers and an improved understanding of customer needs to foster the innovative use of technology along with effective public policy. The mandate given to the JPDO by Public Law 108-176 repeatedly emphasized the importance of close coordination of activities with U.S. aviation and aeronautics firms in order to establish more effective and directed programs. The expectation is that new technologies and operations will be used to the fullest when available. Therefore, it is incumbent upon the JPDO and SPC to ensure that broad communication and partnership exist at all levels of this enterprise – from the SPC through the IPTs. As appropriate, Federal advisory committees will be used to ensure all plans and decisions receive broad review and public comment. These committees will include senior-level executives from across industry, empowered to provide advice on strategy and transition issues. Furthermore, they will be able to gauge industry reaction and support for system developments and to develop and gain industry support for major decisions.

We will also establish mechanisms for direct input and participation from experts in the private sector in the generation and execution of the INP, and the detailed activities of the IPTs. Combining these efforts will ensure the establishment of a collective enterprise among key stakeholders to achieve the transformation, as well as ensure we fulfill our critical obligation to create a process that is fully open to public scrutiny. Moreover, the agencies retain statutory responsibility to manage their programs, and ensure the implementation of the solutions developed through this effort.

Chapter 7: Transformation Strategies

As previously described, the roadmap is sub-divided into eight large transformation strategies that collectively are intended to create the NGATS. IPTs will work to establish the detail plans and execute these strategies. The following outlines the goals, mission, transformation direction, and linkage between the integrated product teams. These outlines will become more detailed in the second edition of this plan. This will include refining the materials presented in outline form here and identifying the most significant technical obstacles, and the research and development activities necessary to overcome them.

7.1 Develop Airport Infrastructure to Meet Future Demand

Airport infrastructure must address the need to expand in a way that meets future capacity, and provide a system that meets or exceeds user demand by integrating airport, airspace and air traffic management design, development, and deployment.

Tie into Objectives:

- **To provide sufficient capacity to satisfy demand**
- **To provide sufficient resources to ensure that the development of new technology remains on track**
- **To ensure the efficient flow of passengers through airport terminal facilities**
- **To provide air traffic control and airport authorities with greater flexibility to match demand with capacity, when necessary, to reduce congestion and travel delays**

IPT Mission

To examine requirements and work for infrastructure and capacity development, through the expansion of existing airports and, in limited circumstances, the establishment of new airports to accommodate level and type of market.

Transformation Direction

The predominant trend over the next two decades will be the expansion of existing airports to meet the forecasted increase in capacity demand. At the same time, new metropolitan areas will emerge that will prompt additional air capacity issues. National and regional airport planning will be facilitated with detailed analysis of needs to ensure planning of sufficient capacity across the country.

If airport infrastructure expansion cannot be accomplished using existing resources due either to physical or political constraints, alternate means will be employed to match demand with capacity to reduce or avoid congestion and travel delays. Such methods may include congestion pricing and other market-based approaches to demand management, as well as administratively, established limits on the frequency of operations or hybrid measures incorporating the advantages of both.

Planning efforts will be directed toward determining appropriate locations for infrastructure to accommodate alternative landing facilities such as uninhabited air vehicle terminals, or support runway-independent flight operations that may include rotorcraft and tiltrotor that might have mobility or economic growth benefits. Federal and local roles in the deployment and maintenance of infrastructure will be reviewed.

Developed creative means to accelerate the deployment of capacity enhancing systems.

Cross-strategy Linkage:

This IPT will coordinate its work with the following IPT's to fulfill its mission:

- **Establish an Agile Air Traffic System**
- **Establish an Effective Security System with out Limiting Mobility or Civil Liberties**
- **Harmonize Equipage and Operations Globally**
- **Develop Environmental Protection that Allows Sustained Economic Growth**
- **Establish a Comprehensive Proactive Safety Management Approach**
- **Develop system-wide capability to Reduce Weather Impacts**

7.2 Establish an Effective Security Sytem without Limiting Mobility or Civil Liberties

Establish a global security system to ensure reservation-to-destination security for travelers and the stream of commerce. Travelers and shippers will be confident that no undue security or health risks exist in the transportation system, and that movements and civil liberties are not unduly impeded by security measures.

Tie into Objectives:

- **Adapt to changing market forces**
- **Ensure security efficiently serves demand and time constraints**
- **Prepare for new and varied security threats**
- **Increase the speed and predictability of air travel**
- **Reduce aviation system security costs**
- **Instill high public confidence in the aviation security system**

IPT Mission

- **Serve as the central activity to ensure alignment — operational effectiveness and suitability — of appropriate processes, policies, and technologies in the transformation to the NGATS**
- **Ensure program coordination with stakeholders in the aviation industry, airports, operators, service industries, academia, and related associations**
- **Align resources necessary for timely RDT&E of candidate security systems for the NGATS**
- **Align resources necessary to ensure timely acquisition, deployment, and life cycle support of transformational security systems**

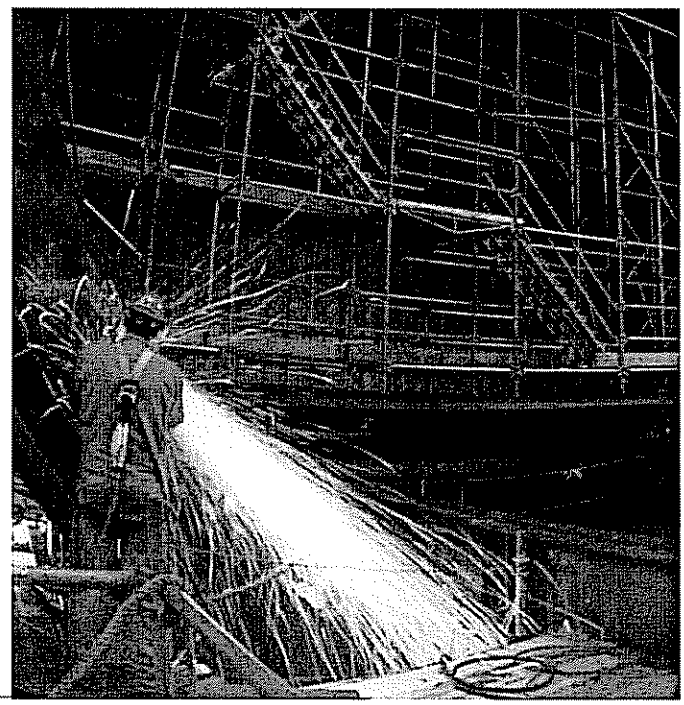
Transformation Direction

Develop reliable means to identify and mitigate security risks:

- Ensure real-time aviation security situational and domain awareness for all security stakeholders to eliminate security breaches or mitigate impact
- Develop and deploy appropriate NGATS communication systems or the Federal Air Marshal Service (FAMS) including an Air-to-Ground Communications System (AGCS) and Airborne Internet (AI). Integrate security input and needs into a NGATS System Wide Information Management (SWIM) capability
- Provide the user community and operators with accurate vulnerability assessments and a comprehensive security incident reporting system
- Develop and integrate technologies into aircraft/airborne vehicles to prevent the use of aircraft/airborne vehicles or MANPADS as effective weapons
- Collaborate with industry and other government agencies to develop and apply appropriate procedures and higher accuracy and sensor technology to identify aviation threats including chemical, biological, radiological, nuclear, and explosives (CBRNE)
- Implement techniques to positively identify and rapidly screen air travelers and air cargo for threats to, or conveyed by, the air transportation system.
- Reduce cycle time for security system certification and deployment

Integrate cost effective, scalable to variable passenger and cargo demand, security procedures and technologies fully into the aviation transportation system resulting in improved airport landside flow and elimination of the hassle factor of air travel as follows:

- Passengers and baggage screening will not add time to the curb to gate transit



- Terminals will have an effective physical security design that minimizes vulnerabilities while facilitating passenger and baggage flow.
- Parking facilities will be consistent with physical security and will not impede passenger transport.
- Cargo will be fully screened and continuously tracked with intrusion detection systems.
- UAVs will provide maximum benefit for security surveillance and threat identification. Develop appropriate sensor capabilities for UAVs to expand their use for security application and integration into the NGATS.
- Facilities and sites for inter-modal connections will maximize transfer efficiency with standardized and non-redundant security processes.
- Security policies and procedures requiring review or change will be identified and corrected.

Ensure worldwide integrity of transportation security safeguards by actively promoting international cooperation to:

- Identify and standardize requirements for security, public health, and identification of passengers and cargo
- Minimize health and security risks within the global transportation sector
- Conduct on-going comprehensive vulnerability assessments
- Assist other countries in achieving a minimum aviation security standard for flights arriving in or departing from U.S. airspace.

Cross-strategy Linkage

This IPT will coordinate its work with the following IPT's to fulfill its mission:

- **Establish an Agile Air Traffic System**
- **Enable User-specific Situational Awareness**
- **Harmonize Equipage and Operations Globally**
- **Develop Environmental Protection that Allows Sustained Economic Growth**
- **Establish a Comprehensive Proactive Safety Management Approach**

7.3 Establish an Agile Air Traffic System

Establish an agile air traffic system that accommodates future requirements and readily responds to shifts in demand from all users. The system will be responsive to market elasticity; have flexibility to deliver capacity and efficiency improvements; and ensure that equipment and personnel are able to support a wide-range and number of operations tailored to customer needs.

Tie into Objectives

- **Accommodate future growth in demand**
- **Increase the speed and predictability of air travel**
- **Enable transparent military and space vehicle operation**
- **Improve resilience to system perturbations, including those caused by weather conditions**
- **Accommodate new types of vehicles**

IPT Mission

- **Develop a system capable of maximally using airspace and landing/departure capacities to efficiently and effectively satisfy market-driven demands**
- **Develop and deploy new technologies, and establish policies and procedures, which promote capacity growth and increased efficiency**
- **Enable deployments to occur throughout the transformational process**
- **Employ a right-sized approach, redefining roles and responsibilities to ensure affordable and scalable to varying levels of demand**
- **Establish basis for seamless airspace allocation**
- **Align resources for research, development, and deployment of transformational technologies, policies and procedures**

Transformation Direction

- **Transition to an end-to-end traffic flow management schema**
  Control by exception

  Distribute decision-making processes thus decreasing transaction burdens
- **Create a more optimal allocation of functions between automation and humans, and between ground and air vehicles, to**

cost-effectively and safely deliver reliable and robust air traffic services

- **Transition to a system with less dependence on ground infrastructure and facilities that are more scalable to varying levels of user demand**
- **Improve use of existing capacity and airspace**

  Provide more routine operations in adverse weather conditions, achieving VMC operational performance in IMC conditions

  Provide routine reliable access to the airspace system by new vehicle types such as UAV, microjets, and single-pilot

  Provide strategic negotiation for priority uses – balance transportation benefits, equity of access, and national security requirements

- **Create global interoperable communications, navigation, and surveillance infrastructure that can function reliably within available spectrum**
- **Achieve better context-relevant information formats and distribution methods for aircraft operators, air traffic service providers, airports, and transportation service users**

  Provide 4D flight path prediction

  Provide weather information

  Provide wake vortex location/strength prediction

  Provide current and projected system status

- **Move to performance-based air traffic services – extend definition to include required weather and environmental performance**
- **Reduce time from technology development to air traffic service implementation at new and existing locations**
- **Develop cost and risk sharing for air traffic services through public-private partnerships**

Cross-strategy Linkage

- Develop Airport Infrastructure to Meet Future Demand
- Develop System-wide Capability to Reduce Weather Impacts
- Enable User-specific Situational Awareness
- Harmonize Equipage and Operations Globally
- Develop Enviornmental Protection that Allows Sustained Economic Growth
- **Establish a Comprehensive Proactive Safety Management Approach**

7.4 Establish User-specific Situational Awareness

Develop and deploy globally compatible information sharing capabilities to provide on-demand, real-time knowledge for users of the air transportation system. Each stakeholder will be able to reach informed decisions through increased knowledge of current conditions, plans, and events affecting the system.

Tie into Objectives

- **Provide all stakeholders with a comprehensive, secure, integrated awareness of relevant aspects of the air transportation system, including real-time notifications of changes and information**

IPT Mission

- **Develop globally compatible information sharing capabilities to provide comprehensive, secure, integrated, real-time knowledge for all air transportation stakeholders:**

  Stakeholders include air transportation management service providers, military services, security and law enforcement services, airlines and other aircraft operators, as well as shippers, travelers and other users of the air transportation system.

  Stakeholders will have access to relevant real-time data such as current and projected airspace demand, weather information, and airport delays to meet mission needs and to improve decision-making.

  Flight operations, airspace use planning, and air traffic management will integrate data into a shared situational awareness accessible to users requiring this information.

  The integration of surveillance and intent information, including conformance monitoring and anomaly detection into a single information exchange network will enable rapid response to defense, security, and other threats.

  Assemble the decision-making architecture— business architecture.

Transformation Direction

- **Accommodate future growth in demand by enabling an agile**

air transportation management system through timely information exchange

- **Enable security efficiency by providing a method for timely and accurate security-related information exchange**
- **Enable preparedness for new and varied security threats by allowing ready access to information that could be harvested for intelligence cues**
- **Increase the speed and predictability of air travel by sharing information such as flight path data, aircraft characteristics, projected demand, airspace constraints, and weather information for effective planning and recovery from disruption**
- **Improve aviation safety record by ensuring users are constantly informed of changes in system conditions so they can make safer, better informed actions**
- **Develop complementary policies between and among Government stakeholders**

  Develop a shared situational awareness requirements process.

- **Support containment of Government costs by:**

  Eliminating development and maintenance of duplicative and conflicting data

  Reducing workload in some operational areas

  Reducing unnecessary security actions

- **Provide for common defense and air security by distributing relevant intelligence and system status information in a timely manner**
- **Define shared situational awareness security approach and architecture for 2025**

  Baseline current systems

  Define incremental growth

Cross-strategy Linkage

- **Harmonize Equipage and Operations Globally**
- **Establish an Effective Security System without Limiting mobility or Civil Liberties**
- **Establish an Agile Air Traffic System**
- **Establish a Comprehensive Proactive Safety Management Approach**
- **Develop System-wide Capability To Reduce Weather Impacts**

7.5 Establish a Comprehensive Proactive Safety Management Approach

Develop and implement a common and comprehensive risk management doctrine at the national level that is applied to aviation and space travel. Encourage and participate in global safety practices to ensure the safety of the traveling public and cargo. Develop and implement a cutting-edge operational data analysis capability that identifies safety issues. Promote expansion of the United States capability to meet national and international safety goals and objectives.

Tie into Objectives

- **Maintain aviation record as the safest mode of transportation**
- **Improve the level of safety of the U.S. air transportation system while accommodating future growth and changes in system operations**

IPT Mission

- **Create a national-level integrated safety management framework that addresses all facets of the air transportation system, building safety design assurances into operations and products**
- **Establish an on-going, integrated operational data analysis capability to proactively identify and resolve safety concerns before incidents occur**
- **Establish and track a safety improvement culture where safety and its continuous improvement are seen as the primary goals**
- **Lead and manage research efforts to determine national safety strategy.**

Transformation Direction

- **Develop a comprehensive approach to safety across the system-of-systems at the national level**
- **Develop a comprehensive set of safety management principles and practices to establish a common framework for the aviation community**

  Create an integrated safety doctrine and program standards, and define national comprehensive safety management doctrine and terms of reference

  Develop the means to forecast and manage safety risks; apply advanced safety/risk analysis methodologies, including those from other industries, to design new operations and systems to target levels of safety; identify and model accident

precursors; identify and model incident investigation as it applies to the safety management system — how incident investigation is used to identify hazards.

- **Ensure an evolution of present certification, testing, and inspection of individual system elements to comprehensive approvals of operators and manufacturers safety management programs**

  Compliance with regulations is still the basis for future system safety management

  Promote the evolution to a comprehensive system management approach to certification

  Once safety management systems programs are approved, the industry and Government users are responsible for safety assurance for products, policies, procedures, practices, and training The regulatory authority does not abdicate its public safety obligations but rather, shifts regulator focus to proactive implementation of corrective measures based on hazard analysis, operational data analysis, risk modeling and monitoring

- **Promote safety through training, sharing of safety data, and dissemination of lessons learned**

  Create a standardized data integration capability to be shared among the aviation community

- **Establish a non-punitive reporting system relieving concerns of corrective action processes**

Cross-strategy Linkage:

- **Each IPT must follow the comprehensive safety management doctrine developed at the national level**
- **Furnish safety analysis data requirements to the situational awareness IPT**

7.6 Environmental Protection that Allows Sustained Aviation Growth

Develop and implement new models, metrics, policy approaches, operational, and technical improvements to mitigate environmental impacts related to the growth of aviation to foster public acceptance of air transportation growth.

Tie into Objectives:

- **Develop and implement policy, procedural, and technology solutions to allow expansion of the NGATS while ensuring that environmental protection measures are met**

  Noise - FAA
  Air and Water Quality - EPA

- **Harmonize national and global standards**

IPT Mission

Retaining Leadership
Develop standard setting at ICAO on environment matters, and harmonized global standards

- **Develop an environmental approach for aviation**

  Ensure the appropriate environmental approach is established at the national level and harmonized globally

- **Develop issues and metrics for aviation**

  Ensure the appropriate noise, air quality, and water quality metrics are established at the national level and harmonized globally

  Explore the possibility of developing a metric for global climate change effects.

Protecting the Environment while Ensuring Sufficient Capacity

Develop and implement policy, procedural, and technology solutions to allow expansion of the NGATS while ensuring that environmental protection measures are met:

- **Develop environmental models**

  Create new analytical tools to understand better the relationship between noise and emissions and different types of emissions, and analyze costs and benefits of different policies and actions

- **Promote solutions to resolve or address environmental issues**

  Research and development — technology and operations

  Research – policy and procedures

  COE- foster public/private research and solutions

  Streamline environment impact assessments

  Promote innovative financing and market-based options.

Transformation Direction

- **Develop necessary models and update/develop metrics**
- **Develop technology, policy, and procedures that will cost-effectively eliminate, or significantly reduce, environmental constraints on the expansion of the NGATS**

  Promote greater application of surface technologies at airports such as ground support equipment and ground equipment

  Begin long-term research on alternative fuels, engine improvements and other types of technological innovations in aviation that benefit emissions or provide noise reductions

  Develop understanding of market-based mechanisms to foster enhanced environmental objectives

  Harmonize approaches and compatible standards for US and international airports for noise local air quality issues

  Consider the use of market-based options and financial incentives to address environmental issues

  Gain better understanding of aviation and climate change issues

  Expand public and private partnerships to increase the effectiveness of environmental programs.

Cross-strategy Linkage

- **Harmonize Equipage and Operations Globally**
- **Develop Airport Infrastructure to Meet Future Demand**
- **Establish an Agile Air Traffic System**

7.7 Develop a System-wide Capability to Reduce Weather Impacts

Achieve increased safety and efficiency in the national aviation system by deploying and integrating scientific and operational advances in weather technology to enable aviation system users to mitigate the negative impact of adverse weather.

Tie into Objectives:

- **Maintain and improve aviation safety record**
- **Accommodate future growth in demand and increase the efficiency and predictablity of air**
- **Enable lower private-sector unit costs**
- **Ensure aviation remains a good neighbor**
- **Prepare for new and varied security threats**
- **Retain U.S. role as the world leader in aviation**

IPT Mission

- **Establish and document NGATS aviation weather requirements**
- **Develop partnerships and collaborative relationships in the United States to coordinate and implement long-term plans for aviation weather**
- **Conduct needs analyses, alternative analyses, and trade studies to select and validate implementation alternatives**
- **Oversee establishment of policies, processes and systems which efficiently and cost effectively address the nation's weather requirements**
- **Determine agency/industry responsibilities in fielding next generation aviation weather system**
- **Continuously improve and set new standards in aviation weather deployment, processes, and accomplishments**
- **Partner with situational awareness strategy IPT and foster development of globally compatible weather information sharing capabilities to provide comprehensive, secure, integrated, real-time knowledge for all air transportation stakeholders**
- **Partner with the private-sector innovators to ensure the necessary procedures, practices, training, and role changes are developed in parallel with new products**
- **Develop and continuously evaluate USG aviation weather performance metrics**

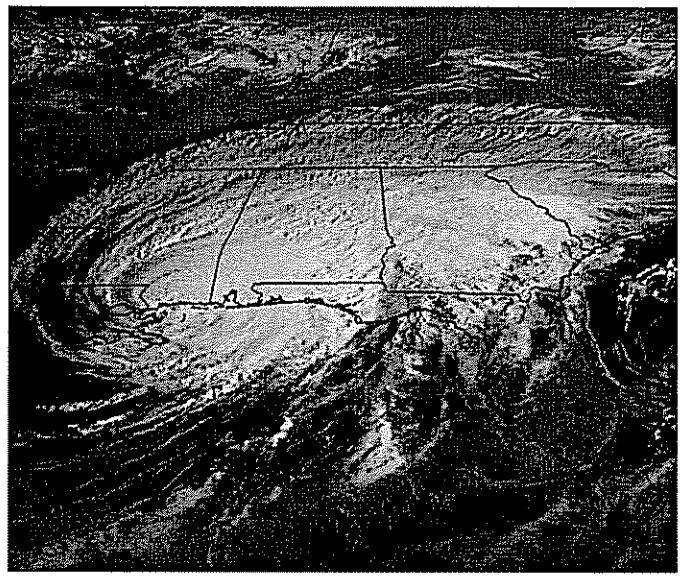
- Put in place a planning, programming, and budget oversight system responsive to requirements, and assures the most effective movement of research results to operational application
- Provide a seamlessly flexible and layered holistic architecture that supports NGATS weather requirements
- Provide the leadership and management, from requirements definition through R&D, to operational implementation, for the development of an integrated, cohesive, comprehensive aviation weather support system

Transformation Direction:

- Improve accuracy and timeliness of aviation weather information, allowing NGATS to proactively, vice reactively respond to weather
- Disseminate weather information to all users in a context relevant situation
- Develop changes in aircraft, airport, and system technology to enable operations in a wider spectrum of weather conditions
- Provide a streamlined method for infusing technology into the national airspace system, facilitated by a joint weather program office, to enable the rapid preplanned infusion of new weather capabilities into operations
- New, integrated operational products will allow greater decision-making on the ground and in the cockpit, greatly enhancing safety and capacity
- Enhance aviation safety and capacity through the use of weather support tools that increase the operational focus, relevance, and accuracy of weather predictions, and leverage technology to improve scientific understanding, efficiency, capability, and communications
- Promote advances in weather technologies from major breakthroughs in our scientific understanding of weather, major improvements in weather sensor technology, and a vast increase in the number and type of weather measurements made from ground-, satellite- and aircraft-based sensors
- Expedite the dissemination of information — enhanced weather information will be integrated with ground and flight deck-based decision support systems. New tools will assist operators in managing their information load to provide decision-makers with clear and concise facts to enable better and timelier decisions
- Employee forecaster expertise, where it adds value over using improved automated forecasting tools
- Transition present day deterministic ATM/ATC system into a probability based NGATS
- Document NGATS weather requirements including near-, mid-, and long-term NGATS decision support systems
- Survey existing USG and industry aviation weather efforts — identify gaps and establish the required Government and/or industry R&D activities for closure
- Identify policies, procedures, and training objectives requiring review and/or change
- Manage development of a national aviation weather database

Cross-strategy Linkage

- Establish an Agile Air Traffic System
- Enable User-specific Situation Awareness
- Develop Airport Infrastructure to Meet Future Demand
- Establish an Effective Security System with out Limiting Mobility or Civil Liberties
- Establish a Comprehensive Proactive Safety Management Approach
- Harmonize Equipage and Operations Globally



7.8 Harmonize Equipage and Operations Globally

Commit to fully supporting, developing, and employing global air and space transportation policies, standards and procedures. U.S. leadership toward global standards will improve safety, security, mobility, and economic viability.

Tie into Objectives

- **Make it as safe abroad as it is at home — safety**
- **Promote equivalent security measures that are compatible throughout the international system — security**
- **Promote U.S. aviation industry developments for global markets — leadership**
- **Seamless use of equipment and operational procedures across international boundaries that satisfy U.S. needs — leadership**
- **Perform a U.S. military mission worldwide — defense • Make aviation environmentally friendly throughout the world — environment**
- **Achieve cost reduction, capacity expansion, and enhanced quality of air and space transportation services through international harmonization — leadership**

IPT Mission

- **Coordinate U.S. positions on standards and policies for international negotiations/collaboration**

  Develop Government/industry partnerships and collaborative relationships in the U.S. to coordinate long-term plans for global standards and policies

  Organize unified U.S. policy positions related to all aspects of transformation, as developed by joint IPTs

  Identify and resolve any differences between U.S. national and international objectives such as security, and defense

- **Establish joint initiatives with international partners to develop technologies and policies**

  Expand existing or establish new collaborative relationships with international partners such as multilateral, regional, national as well as non-governmental, to coordinate long-term transformation plans globally

  Share research, synchronize timetables for development, and adopt new technologies and concepts

  Partner with major growth countries and regions such as India, China, and Latin America, in promoting common technology and procedures

  Promote interoperability internationally and harmonize standardization of required systems

- **Advocate global adoption/proliferation of U.S.-preferred transformation concepts, technologies, procedures, and standards**

  Identify and resolve potential conflicts between ATS developments in the United States and in other countries pursuing harmonization or interoperability, as appropriate

  Promote strategic aviation investment by other countries for economic growth and aviation safety and accessibility

  Engage other countries in discussions about, and facilitate their adoption of, best practices worldwide to enhance safety, and expand capacity

  Assist other nations to acquire/adopt U.S. technology, procedures

  Lead outreach campaign on global transformation

  Promote increased aviation market liberalization.

Transformation Direction:

- **Create unified U.S. national air transportation positions in all major technology and policy areas for use in international for a including timetables that can be used to align activities (Missing Text)**
- **Create economies of scale by aligning ATM and security developments across national boundaries**
- **Streamline and accelerate international standardization processes using nontraditional means such as:**

  Establishing collaborative relationship with other states and regions in promoting technology and procedures

  Engaging professional associations and workshops in the international standardization process

- **Foster development and use of performance-based and professional organizationdeveloped standards**
- **Ensure global collaboration in development of standards and policies and operations to achieve safety, efficiency, security, environment, and health benefits in air and space transportation system**

- **Enable information centric architectures for multiple objectives such as security, safety, and operational efficiency**
- **Implement the ICAO CNS/ATM global plan**
- **Implement ICAO ATM operational concept.**

Cross-strategy Linkage

- **Work toward global changes that are in concert with U.S. positions developed by the IPTs**

  Coordinate and promote U.S. efforts to ensure worldwide integrity of transportation security safeguards

  Coordinate global seamless CNS/ATM capabilities and achieving international operational compatibility

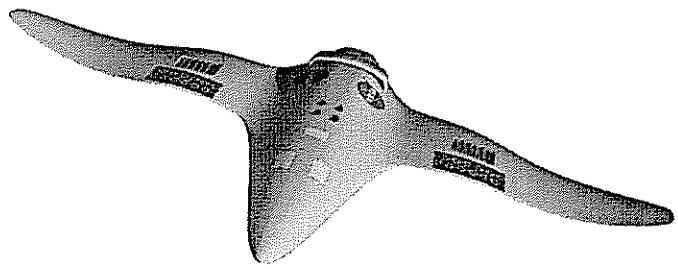
  Coordinate globally compatible information sharing capabilities and protocols

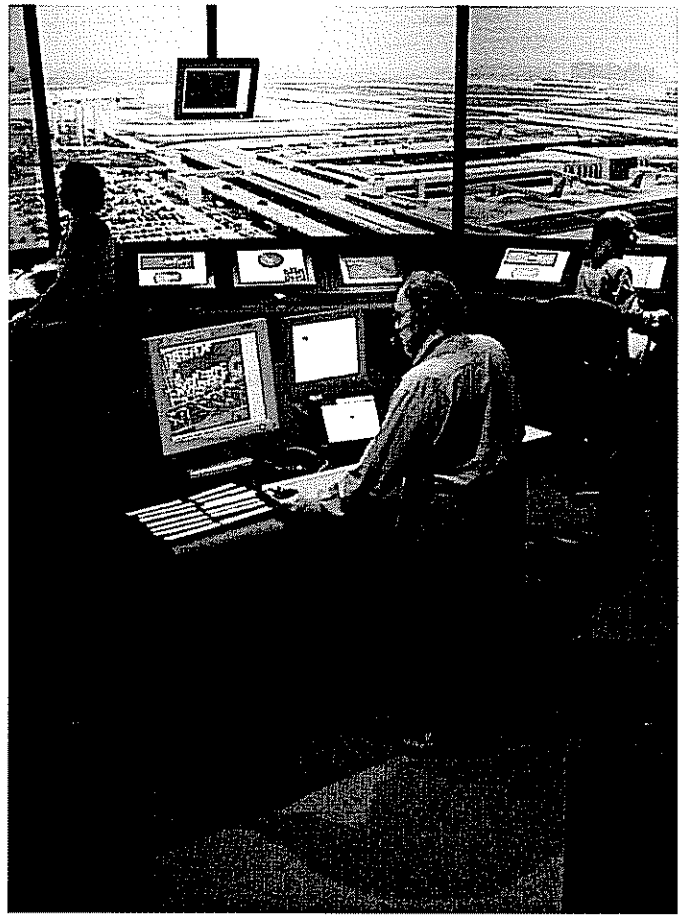
  Coordinate global understanding of and alignment with the U.S. safety management approach

  Coordinate international harmonization of environmental standards

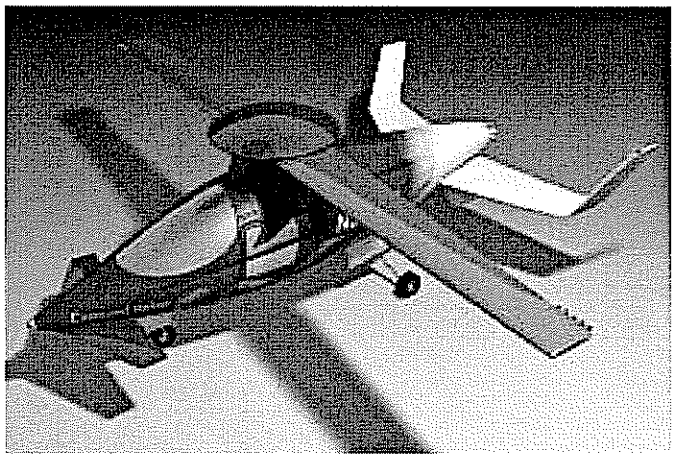
  Coordinate the development and adherence to global airport standards, share best practices, and promote infrastructure development globally

  Coordinate global efforts to enhance aviation weaether forecasts, information dissemination, and weather related technologies





Chapter 8: Resources



The President's budget for FY 05 funds the operations of the JPDO at a level of approximately $5million per year through the FY05 Five – Year Budget Plan. This is sufficient to fund essential operations and allow the JPDO to proceed with the basic actions in the critical areas of this plan such as establishing the framework of architectures and the basic systems engineering process. Many of the IPT efforts that are required to support the execution of this plan are already funded at some level in the individual agencies budgets.

The FY 05 IPT effort will focus on identifying those on-going efforts that are essential to the success of the program. Through the IPT activities, we will determine how to leverage the existing resources from all activities through coordinating and restructuring the programs of record, consistent with the developed architectures and identified requirements, to maximize the return on the investments. The need for funding augmentation will be determined as part of the SPC oversight of the program activities during FY05/06 and addressed as part of the administration's budget process.