



Reauthorization of the Federal Aviation Administration (FAA): Background and Issues for Congress

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Summary

Reauthorization of the Federal Aviation Administration (FAA) and other aviation programs is likely to be a high priority in the 110th Congress. Funding authorizations for aviation programs, as well as authorization of existing aviation tax structure that provides revenue for the aviation trust fund, are set to expire at the end of FY2007. Congress may consider a variety of financing options to maintain the ability of the aviation trust fund to provide a sufficient revenue stream for ongoing operational costs and planned infrastructure improvements. One particularly controversial alternative under consideration is a user fee system, which is supported by the airlines but strongly opposed by many other system users.

Faced with growing operational costs and fiscal needs to support system expansion, airport capital improvements, and modernization efforts, options to control costs within the FAA and the Air Traffic Organization (ATO) may be a particular focus of reauthorization. Cost control options generally revolve around two overarching strategies: consolidation of facilities and functions, and competitive sourcing. Some have recommended that a formal process, similar to the military's Base Realignment and Closure (BRAC) process, be implemented to assess how the FAA could best consolidate its functions to control costs and address future system needs. Besides controlling costs, options to maintain and balance air traffic controller staffing levels are likely to be of particular interest, as the FAA is facing a large wave of controller retirements over the next five years. Options for improving and streamlining training, increasing productivity, better balancing staffing needs, and perhaps consolidating air traffic facilities over the long-term may be considered during reauthorization.

Congress may examine a variety of aviation safety issues during debate over FAA reauthorization. Options for preventing runway overruns and for reducing the risk of runway collisions may be of particular interest. The adequacy of FAA safety oversight has been a continuing concern, and recent accidents may draw particular attention to oversight of contract repair facilities, smaller passenger service operators, as well as air charter and air tour operators. Other safety issues that may arise include longstanding concerns, such as mitigating the risks of fuel tank explosions, addressing concerns over aging aircraft, and addressing the unique safety issues affecting all-cargo operations. Issues regarding airliner cabin health and safety may also be considered. Options to mitigate the spread of infectious diseases among aircraft occupants and the safety-of-flight implications of cell phones and portable electronic devices may also be examined.

Growing interest in alternatives to petroleum fuel may generate some debate over alternative fuel technologies for aircraft and airport ground vehicles, and growing international pressures to regulate aircraft emissions may prompt debate on aviation's environmental impacts. Longstanding aircraft noise policies may also be examined to assess whether quiet aircraft technologies and policy changes could further mitigate the community impacts of aircraft noise. This report will be updated.

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Overview¹

The pending debate over reauthorization of the Federal Aviation Administration (FAA) is likely to be a high priority in the 110th Congress. Funding authorizations for aviation programs set forth in Vision 100—the Century of Aviation Reauthorization Act (P.L. 108-176, hereafter referred to as Vision 100), as well as authorization of the existing aviation tax structure that provides revenue for the aviation trust fund, are set to expire at the end of FY2007. CRS has identified nine broad categories of issues that Congress may address in the context of FAA reauthorization. These include FAA budgeting and finance; airport development and finance; FAA cost control measures; system-wide demand and capacity issues; modernization of national airspace system (NAS) infrastructure; aviation safety; airliner cabin issues; energy, environment, and noise issues; and international civil aviation issues.

FAA Budget and Finance Issues

Authorization of the existing aviation tax structure that provides revenue for the aviation trust fund will expire at the end of FY2007. While such tax authorizations have expired in the past, the current deliberations over FAA funding are considered particularly critical. This, in part, is because uncommitted balances in the airport and airways trust fund (AATF), commonly referred to as the aviation trust fund, have declined in recent years, leaving a relatively small reserve to pay for aviation programs in the event that tax collection authorities are allowed to expire. Also, major initiatives to develop and deploy the Next Generation Air Transportation System (NGATS) by 2025, initiated during the last reauthorization process, are reaching a stage where they will require additional funding resources if these plans are to be realized. While no official projections are yet available on the total cost for NGATS, early estimates indicate that it will require an average of \$200 million to \$1 billion annually in facilities and equipment costs over the next several years to keep NGATS development initiatives on track.

Congress may consider a variety of financing options to maintain the ability of the aviation trust fund to provide a sufficient revenue stream for ongoing operational costs and planned infrastructure improvements, in the near-term and to support the long-term NGATS development efforts. In the course of this debate, Congress may consider the appropriate cost allocation between aviation system users, the share of the cost burden to be borne by the aviation trust fund, and the share to be derived from Treasury general funds (the so-called public interest contribution).

The relative tax burden placed on various industry participants has been a source of controversy for over 36 years, since the aviation trust fund was created. The airlines argue that they have been paying a disproportionately larger share of the system costs compared to general aviation users since the largest revenue sources for the aviation trust fund are derived from passenger ticket taxes. The airlines claim that in their highly competitive industry, they must absorb some of the tax-related costs in their fare pricing schemes. The airlines have identified general aviation² users, and business jet operators in particular, as a segment of the aviation economy that, in their opinion, is not paying its fair share of the costs to maintain and improve the national airspace

¹ See **Appendix** for a glossary of key aviation technology terms and concepts.

² General aviation refers to all aviation activity except for commercial airline, all-cargo airline, and military operations.

system (NAS). General aviation users argue, on the other hand, that the NAS has largely been developed to support the airline industry, that the incremental costs to accommodate general aviation users is not that large, and that existing fuel taxes are sufficient to compensate for their impact on the system.

One alternative to the existing tax structure supported by the airlines is a fee-for-service system that would be more of a direct user fee system than what is in place now. Some industry observers claim that the FAA has been mulling the idea of a direct user fee structure to replace existing aviation taxes and fees, and an administration proposal has reportedly been under review by the Office of Management and Budget (OMB) for some time.³ While the details of the proposal are unknown, speculation is that it will conform more closely to international standards that stipulate user fees be computed as some function of the specific impact on air traffic facilities and services, such as the commonly used fees based on aircraft weight and distance flown used by many nations.

During the reauthorization debate, Congress may consider a variety of aviation trust fund revenue alternatives that may include keeping the existing passenger ticket and fuel taxes largely or completely intact, moving to a tax revenue scheme based solely on fuel taxes, adopting a user fee-based system, or developing a hybrid scheme that consists of some combination of these alternatives. One hybrid approach that has been discussed is to charge user fees for airlines and operators of larger general aviation aircraft, while small general aviation users would continue to contribute solely by means of a fuel tax, although these fuel tax rates and structure could differ from what currently exists.

Airport Development and Finance Issues

The Airport Improvement Program (AIP) provides federal grants for airport development. Its funding is derived from the airport and airways trust fund, and it is one of five major sources of funding for airport development and improvement. Airports also fund capital projects using tax-exempt bonds, passenger facility charges (PFCs; a local tax levied on each boarding passenger), state and local grants, and airport revenue. The preeminent reauthorization issue for AIP is whether its funding levels will be increased substantially, held steady/increased modestly, or reduced. The outlook for AIP funding will be influenced by the resolution of the debate concerning taxes and fees supporting the aviation trust fund as well as any decision concerning the scope of the general fund share of the FAA budget. A failure to secure more revenue for the FAA budget, in light of the recent decline in the uncommitted balance of the trust fund, could constrain any attempts to increase the AIP budget.

During the reauthorization process, Congress may also examine a wide variety of other issues pertaining to the AIP program including airport eligibility and apportionments among various sizes of airports; discretionary funding levels and uses of discretionary grants; the scope of grant assurances to protect federal interests in airport projects; funding levels set aside for noise-related projects; the appropriate federal share of funding for airport projects at airports of various sizes; possible expansion of or modification to the airport privatization pilot program; partial defederalization of airport funding allowing airports to use PFCs instead of AIP as a primary or sole source for project funds; limitations on the use of AIP funds for airport security projects; the

³ Paul Lowe, "Alphabet Groups Ready To Wage User-Fee Battle," *Aviation International News*, The Convention News Co., Inc., Midland Park, NJ, April, 2006.

possible impacts of accommodating new users classes such as very light jets (VLJs) and the Airbus A380 super-jumbo jet on airport infrastructure needs and airport financing; and the use of earmarks or “place naming” in legislation regarding airport infrastructure projects. In addition to AIP funding and related issues, Congress may consider options to raise the cap on PFC levels to provide additional funding availability outside of AIP, and options to make airport bonds more attractive to investors, although some may argue the latter may be more appropriately addressed through tax reform legislation rather than FAA reauthorization.

Cost Control Issues

Besides consideration of a revenue system for funding the aviation trust fund, controlling the costs of operating and maintaining the existing national airspace system has been an ongoing concern for the FAA and for congressional oversight. Cost control measures may be a particular issue of interest during the FAA reauthorization debate as Congress grapples with the prospect of escalating operational costs that must be balanced with the fiscal needs to support planned infrastructure development, both over the near-term to fund ongoing and planned system expansion and over the long-term to support the NGATS development.

Outsourcing has been seen as a viable alternative for controlling costs in some instances, such as the FAA’s federal contract tower (FCT) program and the recently privatized automated flight service stations (AFSSs). Expanded outsourcing of various FAA functions, such as further expansion of the contract tower program and privatization of the FAA’s aeronautical charting functions, are possible options that both the FAA and Congress may examine. Also, the FAA and Congress may look to increase the use of designees⁴ to carry out certain aviation oversight functions. However, some critics argue that these outsourcing options are likely to yield relatively small cost savings in comparison to the overall FAA operations budget. Further, these options are likely to be highly contentious and face strong opposition from labor organizations. Whether these outsourcing measures potentially compromise safety in any way remains a specific point of contention. While some have advocated large scale privatization of air traffic services—as has been done in Canada, Australia, the United Kingdom, and parts of mainland Europe—this approach would be highly complex to carry out, and this option has failed to garner much support in Congress. The current administration has indicated previously that it has no plans to privatize en route and terminal air traffic control facilities, but may opt to expand the contract tower program.

Consolidation of facilities and functions has also been viewed as a possible way to control operational costs at the FAA. The FAA is currently in the process of consolidating administration and support functions in its regional service areas, and has plans to consolidate weather services provided at en route centers. Also, under the privatized AFSS program, an extensive consolidation of flight service facilities is currently in process. Some have proposed that the FAA implement a systematic process, perhaps using something akin to the military’s Base Realignment and Closure (BRAC) process, to address future consolidation plans for facilities and functions. Congress may debate the merits of this proposal during the pending FAA reauthorization.

⁴ Designees are individuals that are neither government employees nor government contractors, that are authorized or designated by the FAA to carry out regulatory functions. Examples include designated medical examiners that issue medical certification, pilot examiners that issue pilot certificates and ratings, and manufacturing representatives that certify the airworthiness of production aircraft.

In the long term, under NGATS, consolidation of air traffic services and air traffic facilities may be possible. With increased reliance on automation and by increasing the autonomy, flexibility, and authority granted to individual flights operating in the national airspace system (NAS), the ratio of air traffic controllers to aircraft operating in the system is likely to drop. In the near term, this will likely be offset by the growth in air traffic operations, so that a modest increase in the overall number of air traffic controllers is expected. In the long-term, however, the changing nature of controller responsibilities and functions may result in a need for fewer controllers, and may allow for considerable consolidation in air traffic control facilities across the United States. The FAA has also expressed interest in consolidation of air traffic facilities as a possible means to address ongoing staffing issues, particularly among en route centers, where there is a shortage of fully qualified controllers to handle the most complex airspace sectors. The FAA believes that facilities consolidation could help in its efforts to better match controller skills and levels of experience with airspace complexity and provide controllers with better job advancement opportunities while, at the same time, reducing infrastructure and relocation costs.

With regard to controlling operational costs, air traffic controller pay remains a contentious issue as controller compensation and benefits make up a sizable proportion of the FAA's operational costs, comprising roughly 35% of total operating costs.⁵ Under a 1998 contract agreement between the FAA and controllers, controller compensation and benefits grew about 64% in eight years,⁶ outpacing the increase in labor costs for other FAA employees and federal workers. During contract renegotiations in 2005 and 2006, the FAA looked to obtain sizable concessions from controllers, but the two sides could not come to agreement. As called for in statute, the impasse was referred to Congress. However, Congress did not act on the impasse submittal, thus allowing the FAA to implement its final contract proposal, which became effective in September 2006. While the law giving the FAA authority to negotiate compensation and benefits in labor contracts, a rarity in the government sector, was enacted largely for the purpose of improving the FAA's ability to attract and retain a high quality professional workforce, it has been criticized by management for leading to escalating operating costs and by both management and labor for straining relations between the two sides.

While the main objectives of the law, to improve the recruitment and retention of high quality employees, is laudable, Congress may wish to examine whether options to improve the law are available to control escalating operational costs and maintain more positive and constructive management-labor relations within the FAA. With regard to labor negotiations, one legislative option offered during the 109th Congress proposed to add an additional phase, requiring management and labor to enter into binding arbitration, after the period of congressional review that follows an impasse in the contract negotiation process.⁷ While Congress did not take up formal debate on this proposal in the midst of the recent FAA/controller labor dispute, this proposal may resurface during debate over FAA reauthorization. Other options to streamline the labor negotiations process within FAA may also be considered in the context of FAA reauthorization, as recent labor negotiations were rather disruptive and highly contentious.

Controller staffing is also likely to be a key focus in the reauthorization debate, as the FAA seeks to effectively manage its controller workforce in preparation for an expected surge in retirements

⁵ CRS calculation based on FAA budget documents and statements regarding average air traffic controller workforce compensation and benefits.

⁶ "Soaring Controller Pay Looms Large in Discussions on ATC." *Air Transport World Daily News*, May 16, 2005.

⁷ See, e.g., see S. 2201 and H.R. 4755, which were introduced during the 109th Congress.

over the next several years. Some available options that Congress may consider include dedicated funding authorizations marked for new controller hiring and training; authorization for new hires from accredited collegiate air traffic programs to enter directly into on-the-job training; funding authorization for initiatives to enhance controller training using advanced simulation technologies; and consolidation of certain air traffic facilities and functions to provide for greater flexibility in meeting staffing needs.

System Demand and Capacity Issues

The current FAA reauthorization cycle comes at a critical time with respect to addressing increasing capacity needs at high-volume airports, in airspace around many major metropolitan areas, and along certain highly congested routes. While recent stopgap measures implemented by the FAA have served to stave off unacceptable congestion and delays thus far, long-term solutions are likely needed in consideration of future air traffic growth projections. Many believe that technology is needed to reduce low visibility aircraft spacing standards to those allowable in good visibility in order to accommodate projected future growth at busy airports. However, some experts caution that even with the implementation of these proposed options and the completion of planned airport expansions across the country, certain very busy airports, including both major commercial airports and busy general aviation reliever airports, may experience peak hour demand levels that exceed airport capacity limitations.

Besides addressing expected capacity needs, a significant challenge facing Congress and the FAA in the years ahead is accommodating new classes of airspace users in a manner that optimizes safety and efficiency for all users. New users will consist of the very big, such as the Airbus A-380 super-jumbo jet, as well as the very small, very light jets (VLJs). The most talked-about class of new system users are the VLJs, which are expected to begin operations in small numbers in 2007 and are projected to experience rapid growth over the next ten years. VLJs are seen by some as a possible solution to provide small communities improved access to the national air transportation system. Therefore, their introduction may spur renewed public policy debate over approaches to enhance air transportation in small communities. Also, because these VLJs will share high altitude airspace and congested airspace around major metropolitan areas with commercial passenger jets, their impact on system capacity and air traffic control workload is likely to be of particular interest. Besides VLJs, the introduction of pilotless Unmanned Aerial Vehicles (UAVs), or Unmanned Aerial Systems (UASs), also poses significant challenges to maintaining safety and not impeding access to airspace for other users such as small general aviation aircraft.

Due to persisting capacity limitations in certain locations, the FAA and Congress may be faced with difficult choices regarding how best to maintain access and address demand in an equitable manner at capacity constrained airports. Vision 100 provided the FAA with limited authority to implement negotiated scheduling among air carriers at a few capacity-constrained airports on a trial basis. This approach, along with other options such as peak-period pricing, slots, and quota systems have all been examined as possible options. The FAA's approach to addressing capacity constraints at New York's LaGuardia Airport is likely to be an issue of particular interest during the debate over reauthorization as the statutorily imposed slot system for LaGuardia expired in January 2007.

While capacity constraints are posing challenges at major metropolitan airports, several trends, including the continuing loss of commercial air carrier service in rural America, are making the essential air service (EAS) air carrier subsidy program more attractive to many rural

communities. However, even with increased funding for this program in recent years, it is becoming increasingly difficult for the EAS program to generate additional air service. Against this backdrop the EAS program faces a number of issues that are likely to be addressed in forthcoming reauthorization legislation. Primary among these is how to prioritize access to the program so that EAS funds are used in the most efficient manner possible. It is likely, however, that without a significant increase in funding, additional limitations on the use of EAS program funding may have to be considered. In addition to the EAS program, the Small Community Air Service Development (SCASD) Program was established to develop solutions for improving air carrier service to communities that are experiencing insufficient access to the national air transportation system. While an initial review of the program found mixed results, it has been noted that it is still too early in the program's history to fully assess its potential effectiveness.

System Modernization Issues

Present initiatives to modernize air traffic facilities and services have been channeled into a unified effort to develop the Next Generation Air Transportation System (NGATS) under a provision in Vision 100. Vision 100 created the Joint Planning and Development Office (JPDO), a multi-agency entity headed by the FAA and charged with the task of conceptualizing and integrating the development of the NGATS. The DOT envisions NGATS as a system capable of tripling effective system capacity by 2025. By some estimates, air traffic levels throughout the United States could increase at that pace thereby necessitating these system enhancements. The specifics of these efforts and future funding and management challenges facing the JPDO and the FAA in carrying forth the plans to build the NGATS are likely to be a major focus during the current FAA reauthorization process. A significant issue facing Congress during the upcoming FAA reauthorization process is obtaining working estimates of what building the NGATS will cost. CRS analysis of available preliminary cost estimates indicates that the total cost to build the NGATS by 2025 is estimated to be between \$69 billion and \$76 billion, which is roughly \$5 billion to \$12 billion above baseline facilities and equipment (F&E) spending levels.

Another significant issue that may be addressed during the reauthorization process is how to best manage the NGATS development effort. One major hurdle is that while the JPDO can set objectives, goals, and strategies for the NGATS framework, the funding stream for carrying out these plans will ultimately come from the budgets of the various agencies involved, primarily the FAA and NASA. In recognition of this, Congress may examine options to align budget elements of the various agencies involved within the NGATS framework. Another potential issue is the appropriate scope of the JPDO's efforts. While some consideration of various ancillary functions and issues—such as security and environmental impacts—may improve the overall system design for the NGATS, too much emphasis on these various issues could impede progress on the central issue of improving the efficiency and capacity of the air traffic system.

Besides the scope of the JPDO's efforts, another issue of interest is the JPDO's approach. Some observers contend that the JPDO has remained too focused on policy and establishing a paradigm for collaboration among agencies and stakeholders, and it has not yet translated these general objectives into a cohesive blueprint, with a high degree of engineering specification regarding timelines and contingencies among the various component elements of the NGATS. One possible option being discussed for streamlining NGATS system development is the use of an overarching lead systems integration (LSI) contract for overseeing the NGATS project.

While many questions still remain regarding the management approach to developing NGATS, there is a growing consensus among experts in the field regarding the technological objectives

and likely technologies that will comprise the core functionality of the NGATS system. The core technologies needed to meet these objectives include (1) precision navigation capabilities to pinpoint aircraft locations, project flight paths or flight trajectories, and predict future aircraft positions with a high degree of accuracy; and (2) highly integrated information networks to enable a shared situation awareness regarding traffic, weather, airport conditions, and other factors affecting flights and provide tools to facilitate distributed, adaptive decision-making and information-sharing about operational changes, such as flight path deviations and their potential impacts on other system users. The investment strategy for these technologies that is adopted and carried forth over the next three to five years is likely to have a lasting impact on both the end-state of NGATS and the path to reaching that end state.

In addition to deciding on a technology investment and deployment strategy for the NGATS, a challenging and potentially contentious issue is the phasing out of existing facilities and equipment for air traffic communications, navigation, and surveillance. Phasing out of existing systems must be addressed carefully because, on the one hand, maintaining legacy systems while deploying new technologies can be costly and resource intensive. On the other hand, phasing these systems out too quickly could place an undue burden on system users to equip aircraft and could pose safety concerns if adequate backups and redundancies are not in place. Congress may express particular interest in the FAA's efforts to assess how proposals envisioning new navigation and surveillance technologies will address the issue of providing equivalent safety to the current radar-based air traffic surveillance system. Congressional interest regarding the phase-out of legacy systems may also focus on how these plans may impact airspace system users, particularly smaller operators who may face a greater challenge in equipping aircraft to keep pace with the evolution from the existing national airspace system to NGATS compliant avionics and aircraft systems.

While advances in precision navigation and information sharing show great promise for reducing aircraft spacing in all weather conditions thereby increasing system capacity, wake turbulence produced by large transport aircraft currently imposes practical limitations on aircraft spacing, even under ideal weather conditions. Current air traffic procedures specify separation standards for aircraft departing behind large and heavy jets to allow their wake vortices to dissipate. Some view these standards as overly conservative and argue that accurate wake vortex prediction capabilities could allow for decreased separation, thereby increasing airport capacity in many weather conditions. Others argue that the limited capability of available technology and the complexities of wake vortex propagation make it difficult to predict wake turbulence or to use such predictions to significantly reduce arrival and departure spacing without compromising safety. Vision 100 authorizes the expenditure of such sums as may be necessary for the development and assessment of wake vortex advisory systems. Promising emerging technology for wake turbulence detection may be able to increase effective landing capacity at airports, perhaps by as much as 20%, but is still at a very early stage of research and development.

Safety Issues

Since the last reauthorization, major airlines have maintained an impressive safety record. Congressional oversight of FAA safety initiatives and programs has not been a major focus of Congress in several years, as concerns over aviation security since September 11, 2001 have been a much more dominant issue. However, there are many aspects of safety where there is still room for improvement in an industry that is, for the most part, very safe. One area of growing concern is the safety of the airport environment. Recent runway overrun accidents have highlighted

concern over the adequacy of runway safety areas and the level of attention the FAA has given to mitigating the risk of catastrophic runway overrun accidents. Also with regard to runway safety, the FAA has identified mitigating runway incursions, or potential ground collisions with departing or landing aircraft, as one of its highest priorities. However, the FAA's approach to addressing this issue has been criticized by the National Transportation Safety Board (NTSB) and other aviation safety advocates who maintain that improving pilot situation awareness of the airport environment is a critical need for effectively mitigating runway incursions.

A long-running safety concern is the adequacy of the FAA's oversight of air carrier operations and maintenance. The growing trend of outsourcing maintenance to third party maintenance, repair, and overhaul facilities has raised questions over the adequacy of these facilities' compliance with air carrier and FAA standards for work conditions and quality assurance. Particular concerns over repair facilities that service commuter aircraft, and work performed on air carrier aircraft by small repair shops that are not required to be certified by the FAA, are two particular issues where Congress may consider options to enhance regulatory requirements and FAA oversight of these maintenance activities.

Another continuing safety concern that Congress may again examine during this reauthorization process is the continued airworthiness of aging aircraft, which was highlighted by the ongoing investigation of a commuter seaplane built in 1947 that crashed while departing Miami for the Bahamas on December 17, 2005. A particular issue of interest is the FAA's approach to continued airworthiness and safety monitoring of the fleet of small commuter aircraft and the aging general aviation fleet, which are not covered under the aging aircraft inspections program established for large airliners.

The 10-year anniversary of the crash of TWA flight 800 on July 17, 2006, has renewed interest in measures being taken to mitigate the risk of fuel tank explosions on large transport-category aircraft. While technological advances in fuel inerting systems have been made in recent years and the FAA has proposed fuel tank flammability reduction requirements for new and existing passenger airliners, critics have expressed frustration that steps to prevent another catastrophe attributable to a fuel tank explosion are moving too slowly, in their opinion.⁸ Congress may debate available alternatives to accelerate safety initiatives to reduce fuel tank flammability and, perhaps, options to mitigate the financial impact of complying with proposed aircraft modifications on air carriers.

Airliner Cabin Issues

Issues related to passenger safety, comfort, and public health in aircraft cabins have often been of interest in past FAA reauthorization processes, and may again generate considerable debate during the current reauthorization cycle. One particular concern is the potential for spread of a deadly infectious disease, such as a communicable strain of avian flu, among airline passengers. The risk of such a threat was highlighted a few years ago when the deadly Sudden Acute Respiratory Syndrome (SARS) virus caused widespread concern over the public health risks posed by airline travel. Congress may debate whether more research is needed on methods to prevent the spread of infectious diseases in the aircraft cabin, and how to effectively deploy available methods to detect and mitigate the spread of disease among airline travelers. With

⁸ "10 Years After Flight 800, Just Hot Air," *Air Safety Week*, 20(31), August 7, 2006.

regard to cabin occupant safety, Congress may once again consider whether infants and toddlers under two years of age should be restrained in child seats on airline flights, or whether the current practice of allowing “lap children” should be continued. The FAA recently rescinded its plans to require child restraints for these children, as advocated by the NTSB, citing fears that families would opt to instead travel by car—an arguably riskier mode of travel—if faced with the prospect of paying for an additional ticket for their infant or toddler to fly. The NTSB maintains that the failure to restrain all aircraft occupants is an unsafe practice, and the FAA’s cross-modal safety comparisons detract from the central issue of whether such a practice should be allowed to continue.

Also, with regard to issues of passenger comfort, safety, and convenience in the airliner cabin, the use of cell phones and portable electronic devices (PEDs) has been an issue of growing interest. Technological advances in wireless voice and data communications are far outpacing the FAA’s ability to study the safety implications of using these radio frequency (RF) emitting devices on board aircraft and make sound policy decisions regarding the in-flight use of these devices. While vendors are pushing for approval of onboard systems to make cell phone and wireless Internet access available in flight, researchers have expressed continuing concern that cell phones and other PEDs may interfere with aircraft instrumentation. During the current reauthorization debate, Congress may consider whether more focused research on this issue is needed to determine if, and under what circumstances, these devices can be used in flight without any foreseeable safety consequences.

Energy, Environment, and Noise Issues

Issues related to energy and the environment may play a larger than usual role during the current reauthorization debate. Energy and fuel issues in particular have been part of the larger public policy debate in recent years, and may spur consideration of alternative fuels for aircraft and airport vehicles. Growing concerns over global warming and environmental impacts may also prompt debate over options for reducing aircraft emissions. Historically high fuel costs are driving much of the current push for more efficient aircraft, which also can be cleaner and quieter. However, Congress may debate available options to study alternative aircraft fuels, monitor international approaches to mitigating aircraft emissions and noise, sponsor research on aircraft emissions-reduction and quiet aircraft technologies, and provide incentives for manufacturers and operators to develop and utilize aircraft technologies that reduce dependence on fossil fuels and environmental impacts.

International Civil Aviation Issues

Although not technically within the jurisdiction of the FAA, there are at least three major international aviation issues, falling under the jurisdiction of the Department of Transportation (DOT), that may arise as Congress considers FAA reauthorization legislation. First, there is the potential that the “Open Skies” agreement with the European Union will remain unsigned and unimplemented, which is a major concern for many U.S. airlines seeking greater flexibility to operate flights in European markets. Second, is the closely related issue regarding DOT’s rulemaking on foreign ownership and control of domestic carriers. Although the administrative process has been completed, the DOT has not to date issued a final rule. The delay has been due in part to strong congressional opposition that has taken the form both of introduced legislation and attempts to prevent the final rule through appropriations riders. According to some commentators, as comprehensive as the proposed agreement appears to be, there cannot be

meaningful reform in the international aviation market until Congress repeals the so-called “citizenship test,” which limits foreign ownership and control of U.S. air carriers. Finally, there is the longstanding issue of cabotage, which is defined as the transportation of passengers or cargo by foreign air carriers from one point in the United States to another and is, with a couple of narrow exceptions, generally prohibited by U.S. law. A limited statutory exception to this prohibition, allowing international carriers to carry certain cargo shipments between airports within the United States and destinations in Alaska while en route to foreign destinations, was included in Vision 100. In light of these various ongoing international aviation issues, the FAA reauthorization process may provide Congress with a unique opportunity to legislate and play a major role with respect to these developments in international civil aviation.

The following sections of this report provide an in-depth examination of the various issues that may be considered during congressional debate over reauthorization of the FAA.

FAA Budget and Financing Issues

FAA Spending

The aviation taxes and fees associated with funding the federal aviation system will expire at the end of FY2007, as will most federal aviation programs. The FAA and others have expressed concern that the existing funding system for aviation is inadequate to meet future needs. The FAA receives the majority of its funding from receipts to the airport and airway trust fund (aviation trust fund). It also receives an annual appropriation of Treasury general funds (GF) to pay for the remainder of its activities. The trust fund pays for all of the FAA’s airport improvement program (AIP), facilities and equipment (F&E) program, and research, engineering and development (RE&D) program. It also pays for much of the FAA’s operations and maintenance (O&M) program, which also receives general funds.

As can be seen in **Table 1**, annual appropriations for the AIP program roughly followed the amounts authorized in the last two FAA reauthorization acts, AIR-21 (P.L. 106-181) and Vision 100, but appropriations for the other three programs have not. Funding for F&E tracked the authorization through FY2004, but has since been significantly below the authorized amount. Annual RE&D appropriations have been well below their authorized levels in each year. O&M appropriations have been higher than the amounts authorized in two years, below in the other four, but in only one instance, FY2003, did the program fail to grow on a year-over-year basis.

Table 1. FAA Major Program Funding: AIR-21 and Vision 100: FY2001 - FY2006
(\$ in millions)

		FY2001	FY2002	FY2003	FY2004	FY2005	FY2006
AIP (TF)	authorized	3,200	3,300	3,400	3,400	3,500	3,600
	obliment	3,193	3,475	3,378	3,380	3,472	3,515
F&E (TF)	authorized	2,657	2,914	2,981	3,183	2,993	3,053
	appropriations	2,651	3,021	2,942	2,863	2,525	2,555
RE&D (TF)	authorized	237	249	—	346	356	352
	appropriations	187	245	147	119	130	137

		FY2001	FY2002	FY2003	FY2004	FY2005	FY2006
O&M (TF/GF)	authorized	6,592	6,886	7,357	7,591	7,732	7,889
	appropriations	6,603	7,077	7,023	7,479	7,707	8,104
	GF share	2,198	1,104	3,248	3,010	2,828	2,619
Total (TF/GF)	oblomit & appropriations	12,634	13,818	13,490	13,843	13,858	14,311

Sources: Authorization amounts from AIR-21 and Vision 100 (AIR-21 did not include an RE&D authorization for FY2003). Appropriations information from FAA data.

Note: TF = aviation trust fund, GF = Treasury General Funds

As is discussed throughout this report, there are many in the aviation industry, and also within the FAA, who believe that significantly greater funding will be required in the years ahead for each of the four major FAA programs. These requests come against the backdrop of three years of FAA spending in which annual appropriations for the agency increased on a fairly modest basis.

Airport and Airway Trust Fund Issues

The forthcoming reauthorization debate is likely to focus on three major issues related to the trust fund. First is the question of whether the trust fund will provide sufficient revenue to meet the growing needs of the FAA's activities and programs. Second is the long standing issue of whether the existing tax and fee system is the appropriate mechanism for producing trust fund revenues, or whether an entirely new revenue collection mechanism should be adopted. And third is the controversial issue of how much of FAA's total funding should come from Treasury general funds (GF).

Aviation Trust Fund Revenue Adequacy

There is considerable discussion over the question of trust fund revenue adequacy for the years ahead. **Table 2** shows that total trust fund income rose dramatically in FY1998 following the last major reauthorization of trust fund directed taxes and fees by the Taxpayers Relief Act of 1997 (P.L. 105-34). Income increased even further in FY1999, declined somewhat in FY2000, and dropped precipitously after September 11th. As a result primarily, but not exclusively, of the post September 11th drop in airline activity, the revenue stream did not exceed the FY2001 level until FY2005, and was not expected to exceed the record FY1999 level until FY2006. Throughout this period FAA spending has not been reduced to accommodate the trust fund's reduced income stream. Rather, FAA spending has continued apace, mostly by spending down the uncommitted balance of the trust fund, which stood at over \$7.3 billion at the end of FY2001 and is expected to be down to around \$1.2 billion by the end of FY2006.⁹

When the FAA began discussing reauthorization in 2005, the future of the aviation trust fund was listed as a key item for consideration.¹⁰ The FAA contends that something needs to be done to increase the trust fund income stream and to prevent further erosion in the uncommitted balance of the fund. For a number of reasons detailed at its reauthorization website, the FAA sees little

⁹ The FY2006 Treasury estimate excludes interest payments to the trust fund which could significantly raise this amount.

¹⁰ http://www.faa.gov/airports_airtraffic/trust_fund/media/Trust_Fund.pdf.

prospect of a major increase in revenue from the trust fund's existing tax and fee system. Instead, as will be discussed subsequently, the FAA seeks a reexamination of the tax and fee system with an eye toward a new system that more closely tracks actual aviation industry activity than the current system and in the process ensures that the trust fund will receive adequate revenues to finance future FAA aviation system needs.

The FAA position is supported by the Department of Treasury estimates that suggest that annual revenue increases to the trust fund in the years ahead will be modest.¹¹ Treasury forecasts that annual increases in trust fund revenue will increase by \$766 million in FY2007 to \$11.6 billion. Increases in future years will be between \$710 million and \$816 million annually, Treasury projects, leaving the trust fund with total annual revenues of \$14.7 billion in FY2011. As will be discussed later in this report, in the section on Next Generation Air Transportation System (NGATS) funding requirements, these levels of increase may be insufficient to fund the FAA's already identified needs for the NGATS and other ongoing air navigation program upgrades, as well as expected increases in other necessary FAA program activities.

Table 2. Airport And Airway Trust Fund: Revenue Flow and Balances, FY1997-FY2006
(\$ in millions)

Fiscal Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006E
Income										
Ticket Tax	3,389	5,455	5,941	5,103	4,805	4,726	4,223	4,556	5,044	5,395
Flight Segment Fee	—	547	1,339	1,655	1,556	1,532	1,783	1,800	2,042	2,193
Waybill Tax	331	313	412	500	493	474	422	499	567	599
Fuel Tax	128	659	1,009	887	769	789	711	712	977	1,091
Rural Airports Tax	—	48	57	86	82	80	67	71	76	80
Frequent Flyer Tax	—	141	149	159	150	148	147	145	159	163
International Arrival/Depart. Tax	194	948	1,484	1,349	1,336	1,282	1,331	1,391	1,651	1,798
Tax Refunds	(35)	—	—	—	—	—	—	—	—	—
Interest on Balance	481	543	698	805	882	860	591	477	423	450
Offsetting Collections	20	42	32	144	76	178	97	36	152	152
Total Trust Fund (TF) Income	\$4,508	\$8,696	\$11,121	\$10,688	\$10,149	\$10,069	\$9,372	\$9,687	\$11,092	\$11,921
Operations TF Share Appropriations.	\$1,700	\$1,902	\$4,112	\$5,898	\$4,405	\$5,973	\$3,775	\$4,469	\$4,879	\$5,486

¹¹ U.S. Department of the Treasury. Office of Tax Analysis. *Airport and Airway Trust Fund: FY2007 Mid Session Review. Current Law Baseline.* Summer 2006.

Fiscal Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006E
Total Trust Fund Cash Outlays	(\$5,758)	(\$5,914)	(\$8,089)	(\$9,198)	(\$9,601)	(\$11,909)	(\$9,618)	(\$10,415)	(\$11,092)	(\$11,921)
End of Year (EOY) Balance	\$6,422	\$9,140	\$12,446	\$13,934	\$14,482	\$12,642	\$12,397	\$11,669	\$11,596	\$10,857
Commitments	(\$5,088)	(\$4,801)	(\$5,080)	(\$6,860)	(\$7,167)	(\$7,855)	(\$8,499)	(\$9,222)	(\$9,493)	(\$9,622)
Uncommitted Balance EOY	\$1,354	\$4,339	\$7,366	\$7,074	\$7,315	\$4,787	\$3,898	\$2,447	\$2,103	\$1,195
General Fund Share of FAA Appropriations										
Total FAA Appropriations	\$8,537	\$9,052	\$9,808	\$10,043	\$12,634	\$13,818	\$13,490	\$13,843	\$13,858	\$14,311
GF Share of FAA Budget	3,241	3,351	1,474	0	2,198	1,104	3,248	3,010	2,828	2,619
GF Percent Share	38%	37%	15%	0%	17%	8%	24%	22%	20%	18%

Sources: Air Transport Association, see <http://www.airlines.org/NR/ronlyres/AD28984D-CF8D-4C37-96D3-2681BD89776D/0/trustfund.pdf> for more detail concerning outlays. Also see Federal Aviation Administration websites: http://www.faa.gov/aba/html_budget/2003.html and http://www.faa.gov/about/office_org/headquarters_offices/aep/aatf/ for more trust fund information. Data for FY2006 income are estimates, appropriations data are enacted. Appropriations data (including trust fund and general fund share data) provided by FAA.

An estimate produced by the Congressional Budget Office (CBO) appears somewhat more positive about the future of the trust fund's finances long-term.¹² CBO expects that the annual trust fund revenue stream will increase at a slightly higher rate than inflation and that the trust fund, assuming FAA spending only increases at the rate of inflation, would have an uncommitted balance of \$4.3 billion in 2011 and an uncommitted balance of \$18.6 billion in 2016. In the CBO analysis "the trust fund can support about \$19 billion in additional spending over baseline levels (the 2006 funding level growing with inflation), provided that most of that spending occurs after 2010."¹³ Whether this scenario provides adequate future funding, assuming significant increased FAA investment needs in the years ahead, is likely to be a matter of considerable debate.

In line with the CBO estimate, a number of outside groups disagree with the Treasury and the FAA's assessment of future trust fund revenues as being insufficient to fund NGATS and other initiatives. The Aircraft Owners and Pilots Association (AOPA), for example, has produced its own revenue forecasts and predicts that the trust fund will have an adequate revenue stream well into the future.¹⁴ Unlike the FAA view, AOPA and others sharing their perspective, believe that rising airline fares and airline activity, increased income from fuel taxes, and cost reductions from air traffic control (ATC) modernization will be sufficient to result in an unexpended trust fund

¹² U.S. Congressional Budget Office. CBO Testimony. *Financing Investment in the Air Traffic Control System*, Statement of Donald B. Marron, Acting Director, House Committee on Transportation and Infrastructure, Subcommittee on Aviation, September 27, 2006.

¹³ *Ibid.*, p.6.

¹⁴ <http://www.aopa.org/whatsnew/la-userfees.html>.

balance of over \$4 billion by FY2011, with the possibility that the balance could be considerably higher.

Tax and Fee Structural Issues

The coming debate about how the FAA should be funded largely revolves around the concept of user fees. There are a number of variations as to how a user fee is defined. A useful definition of a user fee from a transportation perspective was provided in 1953 by the Department of Commerce, Office of Transportation, and is still valid for today's discussion:

... a user charge is defined as any charge made to beneficiaries or users of services and facilities directly related to transportation and furnished in whole or in part by the Federal Government. Such charge must be paid for use of such service or facility and shall be fixed to recover part or all of the capital, operating, and maintenance costs of such service or facility. The services shall not include cash subsidies, mortgage-aid, or tax-aid or certain other activities not confined to transportation or involving transportation only incidentally.¹⁵

For aviation, most of the interest in user fees has been in recovering the costs associated with industry use of the national air navigation system (airway system or air traffic control system).¹⁶

User fees can be direct (sometimes referred to as pay-for-use or pay-for-service), whereby an aircraft or pilot is charged for a specific activity. Examples of direct charges include radio contacts with ATC en-route centers, contacts with airport towers, and weight-distance charges of the type levied frequently outside the United States (the weight of the aircraft multiplied by the distance flown). The other type of user fee that can be levied is an indirect fee. Examples include fuel taxes, aircraft registration fees, and gross revenue taxes. Indirect fees and charges are often viewed by economists as proxies for user fees rather than as actual user fees. They are normally viewed as imperfect in that the fee charged is often more poorly correlated to the service provided than a direct fee would be. A common example is the existing airline passenger tax, where airline passengers flying on the same aircraft are charged user fees based on the fare that they paid, even though all are using exactly the same amount of airway resources. For a number of reasons, indirect fees are the dominant type of fee in use in the U.S. aviation system today.

On May 21, 1970, President Nixon signed the Airport and Airway Development and Revenue Acts of 1970 (P.L. 91-258; 1970 Act), which was the origin of the trust fund financing system still in place today. The fee system created to provide revenue for the trust fund consisted of an airline ticket tax, a freight/cargo waybill tax, an international departure tax (also applied to Alaska and Hawaii), a per gallon tax on noncommercial (primarily GA) use of gasoline and jet fuel, and finally, a graduated aircraft registration fee. Three and a half decades later, the same basic framework of taxes and fees—with the deletion of the aircraft registration fee, and the addition of a segment fee, an international arrivals tax, and a frequent flyer tax (which can be viewed as an extension of the ticket tax)—remain the principal sources of income for the trust fund (see **Table 2**).

¹⁵ U.S. Department of Commerce, Office of Transportation, *Charges for Private Use of Federally-Provided Transportation Services and Facilities, A Staff Study of the Principles Involved in Federal User Charges*, Washington, D.C., July 1953, p. 9.

¹⁶ The terms airway system and air traffic control are often used interchangeably. In the context of this report the airway system is broader, including air traffic control services, personnel, and equipment, as well as U.S. navigable airspace and some other supporting activities of the FAA.

In 2005, the FAA announced that it was beginning a detailed examination of how the agency was funded and whether there could be a more appropriate funding mechanism. A key element of the examination is the long-debated issue of whether the existing indirect system of taxation should be replaced by direct charges for specific air navigation services. To some degree the FAA tipped off the aviation industry as to the likely direction of its study when FAA Administrator Marion Blakey remarked that using the existing ticket tax mechanism was a system that “might as well be tied to the price of milk.”¹⁷ The FAA, however, has not yet made any public proposals for a new funding mechanism and no such proposal is expected during the 109th Congress. Although the elements of the FAA plan are still unknown in their totality, enough has been surmised for aviation interest groups to begin actively supporting or opposing various potential elements of a direct user fee system.

The concept of cost-allocation among system users and non-users permeates the discussion of federal aviation user fees. It has been perhaps the most crucial single issue in the now six-decade old discussion of how user fees should be charged and allocated. It is also a major focus of the FAA’s ongoing examination of the existing user fee system and is expected to be a major determinant of any new user fee proposal.

While the FAA continues its studies, aviation interest groups have in effect launched their own preemptive strikes for and against a fee-for-service system of financing. The airline industry, through the Air Transport Association (ATA), struck first, making its own proposal for a new financing system in early March 2006.¹⁸ ATA’s so-called “Smartskies” proposal would be based on charges for departures and flight duration that would apply to all aircraft regardless of size or type of use. The exception in the ATA proposal is that piston-powered general aviation aircraft should continue to pay only a fuel tax. By its own estimates, the ATA proposal, could shift an estimated \$2 billion of system costs to certain GA sector users, primarily corporate aircraft, which the ATA believes currently underpay for their use of the ATC system.¹⁹ The ATA proposal goes beyond just fee structure changes and suggests that the FAA’s air traffic organization (ATO) become an autonomous part of the agency, with the ability to operate without the need for direct congressional appropriations. Instead the fees collected from aviation system users, which would still be deposited in the aviation trust fund. One final feature of the proposal would give the ATO the authority to issue bonds for infrastructure improvements backed by expected future fee collections.

On the same day that the ATA made its proposal, a group of GA-related interest groups released a statement suggesting that the “airlines’ plan for improving the air transportation system is for them to pay less and control more.”²⁰ From the GA perspective, the ATA case that certain GA users underpay for their use of the ATC system is incorrect for a number of reasons. The GA contention is that the current structure of the ATC system was primarily created to support commercial airline use and that they are not putting a significant additional burden on the ATC system as a result of their flying activities. From the GA perspective fuel taxes remain the most appropriate type of user fee, and the ATA’s proposal to reorganize the ATO outside of the congressional appropriations process is viewed as undesirable public policy.

¹⁷ Wald, Matthew W. F.A.A. Seeks New Source of Revenue in User Fees. *The New York Times*. March 7, 2006. p. A18.

¹⁸ Bond, David. “Fire when Ready,” *Aviation Week & Space Technology*, March 13, 2006, p. 47.

¹⁹ *Ibid.*

²⁰ <http://web.nbaa.org/public/news/200607eaa/GAUnitedAgainstUserFees.pdf>.

The above discussion is a simplification of a very complex and contentious issue about who pays and who should pay for FAA aviation services, that goes back over at least six decades. It should be noted that the discussion of aviation user fees has been almost exclusively a conversation between the federal government and aviation industry. For example, the views of the largest group of current contributors to the aviation trust fund, airline passengers, are not well known. Little non-government or non-interest group-funded research on the aviation user fee system has been done and the lack of such outside research in itself might be a subject worthy of some attention as part of the reauthorization debate.

Privatization/Corporatization

Over the last two decades, part of the ATC debate has moved away from whether or not the airways system should be operated as a public good and is instead often focused on how the system could be operated more efficiently using business principles. Calls for ATC privatization in the United States, and the fact that other nations have at least to some degree allowed their airways systems to be privatized, would seem to indicate that the provision of airways services is not something that must always be exclusively performed by government.

Corporatization, the concept that the FAA's ATC services could be reorganized as a government corporation within the FAA and/or independent from the FAA, was considered at length in the 1990s during the Clinton Administration. The idea was that an independent entity operated along business principles, although not fully privatized, would be able to operate more efficiently and make needed system improvements on a more timely basis. Although the effort had the support of the Administration, and especially Vice President Gore, it ultimately failed to gain much congressional support and was abandoned in favor of other personnel system and procurement system reforms adopted in the latter half of the 1990s.²¹

Privatization, unlike corporatization, would most likely move the ATC organization outside of government and require that the organization act like a private corporation in most respects. This would include pricing (for example, setting fees) at levels designed to recoup operating costs and to provide capital for needed investment. Privatization in some form has been adopted in Canada, the United Kingdom, Australia, and New Zealand among other nations. Privatization has strong proponents²² and attempts have been made to make it at least an option for consideration during the upcoming reauthorization debate. It remains to be seen, however, whether the FAA or Congress will consider the concept in earnest.

The General Fund Share

Since the existing tax and fee structure was created in 1970 there has been general acceptance of the concept that there is a public interest component to the operation of the national aviation

²¹ For a full discussion of the corporatization debate see CRS Report 94-371, *Reorganization of the Federal Aviation Administration: Safety and Efficiency Issues*, by (name redacted), J. Glen Moore and Pamela Hairston (out of print; available from (name redacted)).

²² Numerous reports in support of privatization have been produced over the last two decades. Two recent discussions are: Robert W. Poole, *Business Jets and ATC User Fees: Taking a Closer Look*, The Reason Foundation. Policy Study 347. August 2006 (available at <http://www.reason.org>); and Clinton V. Oster, *Reforming the Federal Aviation Administration: Lessons from Canada and the United Kingdom*, IBM Center for The Business of Government, 2006 (available at <http://www.businessofgovernment.org>).

system. From the perspective of federal aviation policy, the public interest generally refers to that portion of the cost of the FAA's operation of the airway system that is appropriated from the Treasury general fund for the FAA's budget. This is the amount that is supposed to equate to what the military and nonuser beneficiaries (also known as societal users) of the aviation system might have contributed to the aviation trust fund through the payment of user fees, if they actually paid these fees. This has been one of the most contentious elements of the aviation funding debate and is likely to remain so in the year ahead. In sum, many aviation interest groups believe that the federal general fund contribution to the FAA's annual appropriation is too small to correspond to the existing and potential military and other public benefits of the airways system. Conversely, the FAA, OMB, and other government agencies, as well as congressional appropriations and budget committees, usually believe the general fund contribution is too large.

The authors of the 1970 Act envisioned that the trust fund would primarily support FAA capital programs. Although there are some who contend that the trust fund was intended "only" for capital programs, several studies have suggested that this was not the case, and that the 1970 Act allowed trust fund revenues to be spent for noncapital, mostly operations and maintenance activities.²³ Since President Nixon unsuccessfully sought to fund all FAA activities out of the trust fund in the early 1970s, a tension has existed between those who seek to maximize use of the trust fund for all aviation purposes and those who seek to have its funds directed only/primarily toward capital activities. As **Table 2** shows the general fund contribution to overall FAA appropriations has varied over the last decade ranging from a low of 0% in FY2000 to a high of 38% in FY1998 and FY1999. In the most recent four year period, however, the general fund share has been a more consistent 20% or so.

The issue of the general fund share is closely tied to the issue of spending guarantee provisions, including penalty and cap provisions, which are an almost routine portion of FAA reauthorization legislation. These provisions and their policy implications are discussed in the next section of this report.

Aviation Spending Guarantees

As mentioned above, since the 1971 creation of the user-supported airport and airway trust fund there has been disagreement over the appropriate use of the trust fund's revenues. This led, beginning in 1976, to the enactment of a series of legislative mechanisms designed to assure that federal capital spending for U.S. airports and airways (i.e., AIP and F&E) would be funded at their fully authorized levels. Supporters also hoped that these provisions would assure a significant general fund share for the FAA budget. Such funding guarantee proposals have been part of every FAA reauthorization debate since 1976.²⁴

The Cap and Penalty Era

From FY1977 through FY1990, the guarantees consisted of a variety of both "cap" and "penalty" provisions which, by law, set a ceiling on the amount of aviation trust fund money that could be

²³ U.S. Congressional Budget Office. *The Status of the Airport and Airway Trust Fund*. Washington, CBO, 1988. p. X, 1-7; and U.S. General Accounting Office, *Whether the Airport and Airway Trust Fund Was Created Solely to Finance Aviation "Infrastructure."* B-281779. Washington, GAO, 1999, 16 p.

²⁴ See CRS Report RL33654, *Aviation Spending Guarantee Mechanisms*, by (name redacted).

used to fund FAA operations, and a penalty that would reduce this ceiling by a formula linked to the capital programs' appropriations shortfall below their authorization for the fiscal year. Although the cap and penalty (C&P) provisions had some apparent early success (FY1977-FY1980), there was growing resistance to passing appropriations bills that adhered to the penalties during the 1980s. The cap alone appears to have been even less often adhered to during the mid-1990s, following the penalty's elimination in 1990. Over time, however, certain unintended consequences arose that continue to play a part in the debate over funding guarantee mechanisms. For example, the C&P appeared to have a significant role in the growth of the uncommitted balance in the trust fund (sometimes referred to as a surplus). Although the various mechanisms may have succeeded in restricting spending from the aviation trust fund on operations, they did not necessarily succeed in forcing full appropriation of authorized AIP and F&E funding levels. Overall congressional support for adherence to the annual caps and penalties during the appropriations process was not always sufficient to lead to their enforcement.²⁵ In addition, especially during the 1990s, within the context of the unified congressional budget, some appropriations and budget committee Members were more concerned about the overall size of the budget or deficit than with adhering to the spending guarantee mechanisms. Under the unified congressional budget, the growing unexpended balance of the trust fund could be viewed as, in effect, offsetting spending elsewhere in the budget or reducing the apparent size of the budget deficit. This broader budget situation and related appropriations priorities trumped the C&P mechanisms. Under the C&P (especially prior to the elimination of the penalty), the general fund share remained, in most years, significantly higher than most estimates of the appropriate public interest share. During FY1999 and FY2000, however, years when no spending guarantee was authorized, the general fund share dropped to 15% and 0%, respectively.

Current Law: Point of Order Enforced Spending Guarantees

In 2000, AIR21 included two new spending guarantees. One made it "out-of-order" in the House or Senate to consider legislation that failed to use all aviation trust fund receipts and interest annually. The second made it out-of-order to consider any bill that provided any funding for RE&D or O&M if it failed to fully fund the FAA's two capital programs, AIP and F&E, at their authorized levels. As a penalty of sorts, any failure to fully fund F&E would lead to an increased appropriation ("pop-up" budget authority) for AIP equal to the appropriations shortfall for F&E.

As was true under the C&P mechanism, the first years of the AIR21 guarantees, FY2001-FY2003, appeared to have successfully assured that both AIP and F&E were funded at or very near their authorized levels. However, as was true under the C&P mechanism, congressional support for adherence declined during the following years. Adherence to the guarantees in the annual appropriations bills during the last three years has been mixed. On the one hand, the obligation limitations for AIP for FY2004-FY2006 have been very close to their authorized levels for these years. On the other hand, F&E spending has been cut significantly in each of these years (see **Table 1**). F&E's annual appropriation fell below its authorization as follows: \$320 million for FY2004; \$468 million for FY2005; and \$498 million for FY2006. These F&E funding levels were out of conformance with the guarantees and should have made the funding of the O&M and RE&D components of FAA's budget out of order during these years. It also should have led to additional "pop-up" budget authority for the AIP equal to the annual underfunding of F&E.

²⁵ An element of this softening of support was that the implementation of the NAS fell behind the schedule that was assumed when F&E was being authorized.

There are a number of reasons that the guarantee provisions have not been adhered to in recent years. Specific to F&E spending, there has been the lack of confidence that Congress has had in the ability of the FAA to oversee NAS modernization. The hesitance to fully fund F&E may have more to do with this, than with specific resistance to adherence to the funding guarantees. However, some other weaknesses in the current guarantee mechanism have manifested themselves in recent years. Spending guarantees that are enforced by point-of-order actions only work if the point-of-order is raised by a Member and if they have not been waived by rule. In the House, recent annual appropriations bills have had all points-of-order waived by the Rules Committee. Senators have also chosen not to raise points-of-order against violations of the AIP and F&E funding guarantees.²⁶ Points-of-order have not been allowed on appropriations bill conference reports. Also the “pop-up” AIP budget authority, which some viewed as part of the mechanism for preventing appropriators from spending any F&E shortfall for noncapital aviation spending, can and has been rescinded. These rescissions allow appropriators to bring down the nominal total cost of the Transportation/Treasury Appropriations bills in the next budget year. As was true during the C&P era, the current spending guarantees can still be trumped by broader budget policy goals (such as deficit reduction) or, at times, by the spending priorities of appropriators.

Funding Guarantee Options

Aviation funding guarantees are expected to be considered in the FAA reauthorization debate during the 110th Congress and could include keeping the current system, modifying the current guarantees, resurrecting a mechanism analogous to the cap and penalty provisions, reconsidering taking the trust fund “off-budget,” or erecting budgetary “fire walls” as was done for the highway and transit programs in 1998. Some would argue that there should be no guarantees and that the normal congressional budget process should be allowed to progress unfettered. The absence of a large uncommitted trust fund balance could also have an impact on the support for new or continued aviation spending guarantee mechanisms during FAA reauthorization in the 110th Congress.

Airport Development and Finance

The Airport Improvement Program (AIP), the source of federal airport grants, is one of five major sources of funding for airport development and improvement. Airports also fund capital projects using tax-exempt bonds, passenger facility charges (PFCs; a local tax levied on each boarding passenger), state and local grants, and airport revenue.²⁷ Different airports use different combinations of these sources depending on the individual airport’s financial situation and the type of project being considered. Small airports are more likely to be dependent on AIP grants than large-or medium-sized airports. The larger airports are also much more likely to participate in the tax-exempt bond market or finance capital development projects with the proceeds

²⁶ In part, this may have been because, if a point of order were upheld, the entire AIP or F&E financing provision would be stricken from the bill that Senate conferees would take to conference. This absence of a funding provision could put the Senate conferees at a disadvantage in negotiating with House conferees over the contents of the bill to be voted out of conference.

²⁷ Airport revenues sources include airfield area fees/landing fees, terminal area concessions and rent, airline leases, parking, etc. See CRS Report 98-579, *Airport Finance: A Brief Overview*, by (name redacted). PFCs are sometimes referred to as a “head tax.”

generated from PFCs. Each of these funding sources places differing legislative, regulatory, or contractual constraints on the airports that use them. The two financing sources for airports with the most significant federal involvement are the AIP and the PFC programs.

The AIP provides federal grants to airports for airport development and planning. The airports participating in the AIP range from very large publicly-owned commercial primary airports to small public use general aviation airports that may be privately-owned, but are available for public use. AIP funding is usually limited to construction or improvements related to aircraft operations, typically for planning and construction of projects such as runways, taxiways, aprons, noise abatement, land purchase, and safety, emergency or snow removal equipment. Commercial revenue producing portions of terminals (such as shop concessions or commercial maintenance hangars), automobile parking garages, and off-airport road construction are examples of improvements that generally are not eligible for AIP funding. Airports smaller than medium hub, however, have broader eligibility on terminal projects under certain conditions.²⁸ AIP money cannot be used for an airport's operational expenses.

The PFC is a local tax imposed, with federal approval, by an airport on each boarding passenger. PFC funds can be used for a broader range of projects than AIP grants and are more likely to be used for "ground side" projects such as passenger terminal and ground access improvements. PFCs can also be used for bond repayments and in some cases to provide the local match for AIP projects.

Airport Capital Needs Estimates

Both the FAA in its 2005-2009 National Plan of Integrated Airport Systems (NPIAS) and the Airports Council International/North America (ACI/NA) have released estimates of U.S. airports' capital needs for 2005-2009.

The NPIAS report was based on planned project information taken from airport master plans and state system plans. FAA planners screened out projects that were not justified by aviation activity forecasts or that were not eligible for AIP grants. The FAA limits its estimate to AIP eligible projects at airports listed in the NPIAS. In the 2004 NPIAS report, the FAA has estimated that the national system's capital needs for 2005-2009 will total \$39.55 billion (an annual average of \$7.91 billion).²⁹

The Airport Council International / North America (ACI-NA) capital needs survey produced an estimate of \$71.5 billion for 2005-2009 (an annual average of \$14.3 billion).³⁰ ACI-NA concludes that airports face an annual \$3-4 billion shortfall every year through FY2009.³¹ The ACI-NA study reflects the broader business view of major airport operators and casts a substantially

²⁸ Primary commercial airports are categorized by the percentage of the total national passenger boardings (enplanements) that occur at the individual airport during a year: large hub airports enplane at least 1% of the national total; medium hub enplane at least 0.25% but less than 1%; small hub enplane 0.05% but less than 0.25% and nonhub enplane more than 10,000 but less than 0.05%. Large and medium hub airports accounted for almost 90% of all enplanements in 2002.

²⁹ U.S. Federal Aviation Administration, *National Plan of Integrated Airport Systems: 2005-2009*, pp. 41-47.

³⁰ A fact sheet of the ACI-NA, *2005 Airport Capital Development Needs* is available at http://www.aci-na.org/docs/70_capitalneeds2005.pdf.

³¹ ACI-NA, *ACI-NA 2005 Airport Capital Needs Survey v. FAA's NPIAS*. Washington, DC: ACI-NA, 17 p.

broader net, including AIP ineligible or low AIP priority type projects which would normally be funded by bonds, PFCs, airport revenues, or local funding; airport-funded air traffic control facilities; airport or TSA-funded security projects, etc.³² Because the \$14.3 billion is based on “proposals” for airport development projects, some would argue that this figure is high reflecting wants rather than needs and projects that would never be completed in any case.

The Air Transport Association (ATA) has not released an estimate in advance of the current reauthorization debate but in the past their estimates of needs were limited almost exclusively to AIP eligible projects at primary airports and tended to be lower than either the FAA or ACI/NA estimates.³³

In March 2004, FAA Administrator, Marion C. Blakey, stated that the agency’s goal was to improve the overall capacity at the top 35 U.S. airports by 30% over a ten-year period. These airports account for about 73% of commercial passenger boardings. The FAA’s Operational Evolution Plan (OEP) is intended to increase the capacity and efficiency of the National Airspace System (NAS) over a ten-year period to keep up with the expected growth in demand for air travel and shipping. The plan focuses on “infrastructure—primarily new runways—and technological and procedural initiatives at the top 35 airports.”³⁴ An AIP focus on the OEP could put substantial pressure on the availability of AIP discretionary funds.

Airport Improvement Program (AIP)

The preeminent reauthorization issue for AIP is whether its funding levels will be increased substantially, held steady/increased modestly, or reduced. As can be seen in **Figure 1**, AIP’s funding underwent a major increase in FY2001 and has had a relatively small increase of \$100 million each year since. The outlook for AIP funding will likely be influenced by the resolution of the debate concerning the taxes and fees supporting the aviation trust fund as well as any decision concerning the scope of the general fund share of the FAA budget. A failure to secure more revenues for the FAA budget, in light of the recent decline in the uncommitted balance of the trust fund, could constrain attempts to increase the AIP budget. A consensus in Congress to reduce the federal budget deficit or hold the deficits to existing levels, as happened during the mid-1990s, also could constrain any AIP budget increases.³⁵ These broader budget issues could have implications not only for the AIP program’s funding but also for its scope and formula and discretionary funding distribution. Under such overall budget constraints, Congress could consider changes ranging from the defederalization of some large airports to the reconsideration of the scope of funding provided for smaller noncommercial service airports currently in the NPIAS. Also, should AIP not be reauthorized by October 1, 2007, the program will go into abeyance: projects already funded could continue, but no new projects could be begun.

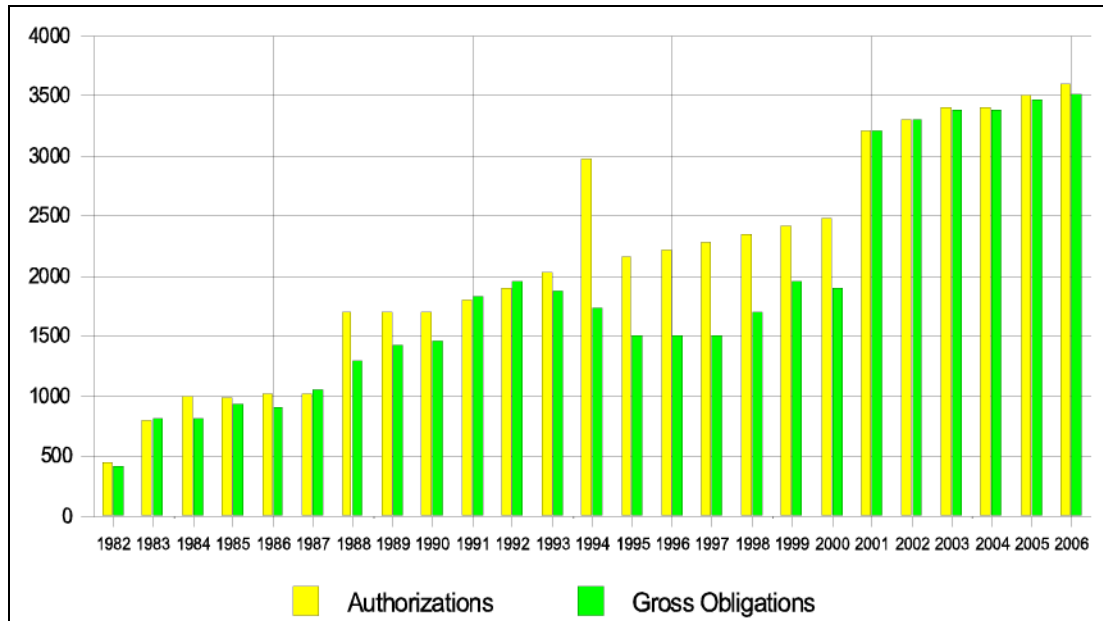
³² ACI-NA, *Executive Summary ACI-NA 2005 Airport Capital Development Needs*, Washington, DC: ACI-NA, 2006, 3 p.

³³ See GAO, *Airport Development Needs: Estimating Future Costs*, “GAO/RECD-97-99,” Washington, GAO, 1997, pp. 7-9.

³⁴ FAA and Mitre, *Capacity Needs in the National Airspace System*. See also FAA, *Operational Evolution Plan, 2005-2015: Executive Summary; Version 7.0*, Washington, DC: FAA, 2005.

³⁵ For a brief discussion of transportation policy within the broader fiscal environment, see U.S. General Accountability Office, *Fundamental Reexamination of Federal Transportation Programs and Policies Required: The Driving Force of the Nation’s Long-Term Fiscal Challenges*, Washington, DC: GAO, 2006, available at <http://www.highways.org/Mar06-speaker-slideshows/Hecker.ppt>.

Figure I. AIP Authorizations and Obligations (\$ millions)



Source: FAA, Fifteenth Annual AIP Report. FAA.

AIP Funding Distribution

The distribution system for AIP grants is complex. It is based on a combination of formula grants (also referred to as apportionments) and discretionary funds.³⁶ Each year, formula grants are apportioned automatically to specific airports or types of airports (primary airports, cargo service airports, states and insular areas, and Alaska airports). The funds are available during the year that they are first apportioned and continue to be available for use for two years thereafter. The remaining funds are apportioned to the discretionary fund. Airports sponsors apply for discretionary funds to pay for planned airport capital development needs. In recent years, however, significant amounts of discretionary funding have been earmarked by Congress.³⁷ In recent years AIP discretionary funds have ranged from roughly 25%-30% of the total annual AIP funding distribution.³⁸

Entitlement (formula) and discretionary small airport set-asides tend to be supported by smaller airports and most airport advocates. The air carriers tend to be critical of entitlements and set-aside funding, especially when it benefits the smaller noncommercial service airports and have argued that “Congress must reconsider the vast array of set-asides and earmarks under the AIP program, which have seriously undermined its utility in providing meaningful system capacity

³⁶ See U.S.C. 49 Chapter 471 and U.S. Federal Aviation Administration, *Airport Improvement Program Handbook*. Available at http://www.faa.gov/airports_airtraffic/airports/resources/publications/orders/media/aip_5100_38c.pdf.

³⁷ For an explanation of FAA’s policy for selecting discretionary projects see the 21st AIP Annual Report of Accomplishments, pp. 25-27. Available at http://www.faa.gov/airports_airtraffic/airports/aip/grant_histories/media/Annual_Report_2004.pdf.

³⁸ Based on figures from the *AIP Annual Reports of Accomplishments*, for FY2001-FY2003 and FY2004. The discretionary funding percentage for FY2001 was 30%, for FY2002 was 25%, for FY2003 was 25%, and for FY2004 was 27%.

improvements.”³⁹ Business and general aviation advocates take exception to this view and counter that airports of all sizes are critical to the national airport system as a whole and that reliever airports in particular are “a critical component of managing airline and general aviation traffic in an urban environment.”⁴⁰

Apportionment and Eligibility Changes

Apportioned funds (sometimes referred to as entitlements) were substantially increased in AIR-21 and the range of land-side projects that are eligible for AIP grants were increased somewhat in both AIR-21 and Vision 100. Most of the eligibility changes benefitted airports smaller than medium-hub.⁴¹ Although this trend could continue in the upcoming reauthorization debate, if the budget environment is constrained project eligibility might need to be reconsidered. If the overall authorization is reduced, the apportioned funds may have to be reduced to assure that sufficient funds remain to fund discretionary grants (in particular for operational evolution plan projects). The ACI-NA supports the maintenance of AIP funding for smaller airports and argues for giving these airports increased flexibility in the use of their entitlements. The case can be made that, over the years, the broadening of AIP eligibility at small airports has made it increasingly difficult to identify the federal interest that has been met by such spending. As mentioned earlier, air carriers are skeptical of the benefit to the national airport system of some proposals seeking to broaden project eligibility.⁴²

Discretionary Fund Set-Asides

The discretionary funds (which are the remainder funds after the apportionments are satisfied) are subject to set-asides for noise mitigation, the Military Airports Program (MAP), reliever airports, and the capacity/safety/security/noise set-aside. Any of these could be modified during reauthorization. However, the greater the total of all the set-asides, the smaller the remaining amounts that are truly unrestricted discretionary funds.

Minimum Discretionary Fund

U.S.C. 47115 requires that a minimum amount—\$148 million plus any outstanding pre-January 1, 1997 letters of intent—remains available for the discretionary fund after all apportionments and set-asides are satisfied. If less money remains, the apportionments are reduced pro rata to bring the discretionary funding up to the required level. Because AIP has been funded since FY2001 at historically high levels, the minimum discretionary fund provision has not been a factor in AIP funding. If, however, AIP’s budget is reduced substantially or if the entitlements are increased substantially, the appropriate minimum discretionary fund level may need to be reconsidered.

³⁹ “Airlines Seek Reduction in AIP Funding for Small Airports,” *The Weekly of Business Aviation*, Nov. 7, 2005: 212.

⁴⁰ Ibid.

⁴¹ Airports smaller than medium hub are airports that enplane less than 0.25% of the total national enplanements. Altogether they account for just under 11% of the total national of enplanements (2005-2009 NPIAS, p. 5).

⁴² Recently the Air Transport Association (ATA), which represents the major air carriers, argued that the current AIP entitlements and set-asides provides nearly one third of federal airport grants to airports that provide no commercial service. The ATA argued that such expenditures would be more appropriately funded from general fund revenues than from the airport and airway trust fund, which supports AIP.

Grant Assurances

Along with the acceptance of AIP funds come certain obligations (generally referred to as assurances) that airports must agree to. These assurances include the obligation to maintain and operate their facilities safely and efficiently, as well as more specific obligations such as not to discriminate against any class of air system users⁴³, to adhere to Davis-Bacon prevailing wage requirements, and to use airport revenue solely for spending on airport operations and capital costs. Proposals to alter the AIP grant assurances can be expected to arise during the reauthorization debate. For example, the ACI/NA is seeking a bill that “simplifies airport grant assurances including reforms that permit airports to use non aeronautical revenue sources to attract new and competitive air service to their communities.” Supporters of maintaining the grant assurances generally argue that they not only help establish and enforce federal policy priorities but also insulate airports from local efforts to limit or shut down airport operations (for example, because of noise concerns or for land development).

Airport Noise Issues

Airport noise policy is linked to airport development because airport noise is a major factor in local resistance to airport capacity projects. One issue is whether to again raise the AIP noise compatibility set-aside (Vision 100 raised the set-aside to 35%).⁴⁴ Funding eligibility issues could also arise. One is whether the FAA should be granted the flexibility to use AIP funds for noise mitigation projects that are outside the 65 decibel noise impact areas. Another issue is making the planning for noise mitigating arrival and departure operational (air traffic control) procedures eligible for AIP funding. In what was perhaps the most significant expansion of AIP noise funding eligibility, Vision 100 authorized the FAA to make grants for land use compatibility planning and projects around large and medium hub airports that have not submitted a part 150 noise compatibility plan, as was previously required. The provision is limited to grants that are awarded through FY2007. Congress may wish to review this provision and extend or modify it, or allow it to lapse.

Federal Share

Vision 100 raised the federal share from 90% to 95% for airports smaller than large and medium-hub and airports in states participating in the state block grant program,⁴⁵ but included a sunset clause that returns the federal share back to 90% after 2007. Should the federal or FAA budget be constrained or held at current levels Congress may wish to consider adjusting the federal share. The federal share for most projects at large and medium hub airports is 75%.

⁴³ For example, against cargo or commuter aircraft, or night time flight operators.

⁴⁴ For a more extensive discussion of noise issues see chapter “Energy and Environmental Considerations,” later in this report.

⁴⁵ Under the state block grant program participating states (Illinois, Missouri, North Carolina, Michigan, New Jersey, Texas, Wisconsin, Pennsylvania, and Tennessee) administer the AIP funding of nonprimary commercial service, reliever, and general aviation airports.

Privatization

The Airport Privatization Pilot Program authorizes the FAA to exempt up to five airports from certain federal restrictions on the use of airport revenue. Participating airports may be exempted from such requirements as repayment of federal grants. During the nine years since the application procedures were published only one airport, Stewart International Airport in New York, has obtained an approved exemption.⁴⁶ Congress may wish to review the pilot program. Although most U.S. airports are public entities, it is noteworthy that nearly all airport activities are carried out by private firms working under contract arrangements for the airport owners. The City of Chicago recently expressed interest in offering Midway Airport up for a long term lease. It has not yet applied for a privatization exemption, however.

Partial Defederalization

One way to reduce the amount of trust fund revenue needed for AIP would be to allow large and medium hub airports to opt out of the AIP program in favor of unrestricted or higher PFC financing. This would, in the view of some airport executives, give them the flexibility they would prefer to have in managing their airports. These airports would no longer be bound by all of the grant assurances that are currently required of participants.

Airport Security Project Eligibility

Vision 100, included a provision that repealed the language of the Federal Aviation Reauthorization Act of 1996 (P.L. 104-264) that permitted the use of AIP and PFC funds for security related improvement of facilities and the purchase or deployment of equipment for security purposes. Vision 100 did, however, allow for use of AIP formula funds for the replacement of baggage conveyor systems, and the reconfiguration of terminal baggage areas, necessary to install bulk explosive detection devices. Such use, however, has been specifically prohibited each year by appropriators in the legislative language for Grants-in-Aid for Airports in recent transportation appropriations acts. Despite this prohibition, some still view AIP as a potential source of funding for certain security-related airport improvements in the future.

Very Light Jets (VLJs) and the Airbus A380: Impact on AIP

Some predictions of the rapid growth of a new type of aircraft, the very light jet (jets with a takeoff weight less than 12,500 pounds that can land on a 3,000 foot runway), have, in turn led to concerns that increased airport funding will be needed to accommodate them. Even if the optimistic estimates of the speed of introduction of VLJs pan-out, given that VLJs have been specifically designed to operate at most existing general aviation airports, existing airport facilities should be able to handle the traffic. If, however, the advent of VLJs leads to increasing demands for installing all weather capabilities at small airports or if insurers place requirements on VLJ use, for example that VLJs only be used at airports with runways longer than 3,000 feet, the demand for AIP funded improvements at small airports could increase over time. As mentioned previously, small airports are more dependent on AIP funding for their capital projects

⁴⁶ The lease for this privatized airport was recently put up for sale by its United Kingdom-based holder, National Express Group (NEG), after seven years of a 99-year lease.

than larger airports. The potential impact of VLJs across the entire national airspace system is discussed further in the section on “Accommodating Future Airspace Users”.

More likely to have an impact on AIP funding in the short term is the Airbus super jumbo A380. The GAO identified 18 U.S. airports making changes to accommodate the A380 at an estimated cost of roughly \$927 million. These airports identified AIP as the planned source for 50% of these costs and PFCs for another 21%.⁴⁷ Some policy makers have expressed opposition to using federal funding for these A380-related projects.

Earmarking/ “Place Naming”

Historically, Congress has not earmarked AIP discretionary funding in the manner typical to highway or transit appropriations where specific projects have specific dollar amounts designated in the language of the appropriations bills or report. Since FY2001, dollar amounts and project descriptions have usually been specified in the appropriations bill conference reports. One of the issues related to the earmarking is the impact it has on the grant application process. Another is the impact of the earmarking on the availability of limited discretionary funds for national priorities such as the operation evolution plan (OEP).

Passenger Facility Charge Issues

The PFC is a local tax imposed, with federal approval, by an airport on each boarding passenger. The basic PFC issue is whether to raise the \$4.50 per emplaned (i.e., boarding) passenger ceiling or to eliminate the ceiling all together. Airports have long argued for elimination of the cap but would also be pleased with an increase of some sort. Although PFC revenues can be used for a broader range of projects than AIP, some airport advocates argue there is still room for more flexibility in PFC eligibility requirements. For example, some would like more freedom to use PFC funds on off-airport projects, such as transportation access projects. Airports would also like the application process to be streamlined. Additionally they would also like to have the competition plan requirement that is placed on large and medium hub airports that charge PFCs at the \$4.50 level eliminated. Air carriers and passenger advocates will probably oppose an increase in the PFC. Airlines feel that the passenger taxes have become a large enough component of the total ticket price that they constrain the airlines’ pricing ability.

Airport Bonding Issues

Historically, bonds have been a major source of funding for capital projects at primary airports. Because most airports are owned by public authorities, they can seek funds in the tax-exempt bond market. One change sought by ACI-NA would be to make tax exempt airport bond income no longer subject to the alternative minimum tax (AMT). This would make airport bonds more attractive to investors. On the negative side, the change would cost the U.S. Treasury money. Some would argue it would make more sense to change the AMT as part of a tax bill rather than as a specific exemption provided for income on airport bonds in an FAA reauthorization bill.

⁴⁷ U.S. Government Accountability Office, *Commercial Aviation: Costs and Major Factors Influencing Infrastructure Changes at U.S. Airports to Accommodate the New A380 Aircraft*, “GAO-06-571” Washington, DC: GAO, 2006. Available at <http://www.gao.gov/new.items/d06571.pdf>.

Recently there has been interest in using private activity bonds for airport development. Private activity airport bonds could allow a private entity to enter the tax-exempt bond market to raise funding for a capital project at a public use airport. Generally, it is envisioned as facilitating public-private partnerships. As a possible precedent, the recently passed surface transportation act, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: a Legacy for Users (P.L. 109-59; SAFETEA-LU), allowed for up to \$15 billion in private facility bond funding for highways or freight transfer facilities.⁴⁸ The Congressional Budget Office (CBO), the Office of Management and Budget (OMB) and the Treasury Department, however, have generally opposed bonding as adding additional government borne costs to the airport improvement process.⁴⁹

Options to Control Operational Costs at the FAA

Faced with rising operational costs and future funding needs for infrastructure enhancements and system expansion, the FAA and Congress have made the identification of methods to reduce or control operational costs a priority over the last few years. Besides general measures to conserve resources, the FAA's approaches to controlling operational costs mostly fall into two general categories: (1) the consolidation of facilities and functions, and (2) the outsourcing or privatization of certain operational components. Additional options for controlling costs may involve shifting certain operational functions and costs onto private-sector users of the NAS and leveraging private-sector capabilities through government-industry partnerships, or other cost-saving arrangements.

Consolidation of Facilities and Functions

The FAA is currently in the process of consolidating administrative and support staff in its nine functional service area offices for terminal and en route support services and technical operations into three consolidated regional facilities, in Seattle, WA; Fort Worth, TX; and Atlanta, GA. The FAA is also consolidating its flight services information area offices for the lower 48 states to a single facility in Kansas City, MO. Flight service information for Alaska will continue to be coordinated out of the Anchorage office. The FAA selected these sites for placing its consolidated area offices primarily based on costs, but considered a variety of quality of life factors for employees. The FAA estimates that it will save between \$38 and \$41 million between FY2006 and FY2015 by relocating about 315 employees to areas with lower costs of living and lower locality pay rates.⁵⁰ Further, by reducing facilities-related costs, the FAA anticipates that total savings over next 10 years, from its overall consolidation of administrative and support functions, will total between \$360 and \$460 million.⁵¹

⁴⁸ For a description of the Federal Highway Administration program see: http://www.fhwa.dot.gov/ppp/private_activity_bonds.htm.

⁴⁹ CBO reiterated this position at recent (September 27, 2006) House Aviation Subcommittee hearings on *Financing Options for FAA and Redesign of the Air Transportation System*. GAO also expressed the reasons for its concerns about the costs of bonding. See GAO. *National Airspace System Modernization: Observations on Potential Funding Options for FAA and the Next Generation Airspace System*. "GAO-06-1114T" Washington, GAO, 2006. p. 16-17.

⁵⁰ Federal Aviation Administration, *Air Traffic Organization (ATO) Service Area Office Location Study*, October 2005.

⁵¹ Federal Aviation Administration, *Air Traffic Organization Administrative & Staff Support Function Restructuring* (Undated).

As the ongoing personnel transitions are expected to be fully completed by December 2006, the current service area consolidation plan is likely to be largely completed before Congress considers FAA reauthorization legislation. Therefore, the issues that may arise are likely to center on whether the FAA and the Air Traffic Organization's (ATO's) approach and implementation of this consolidation effort can serve as an effective model for future plans of this kind. One option Congress might consider is whether an analysis of the "lessons learned" from this consolidation process, conducted by an auditing agency such as the Department of Transportation's Office of Inspector General (DOT OIG) or the Government Accountability Office (GAO), could identify areas for improvement and establish a framework for conducting future consolidation efforts. Effective models for consolidation may aid the FAA in considering future consolidation efforts, such as consolidation of certain air traffic service functions, which are likely to be much more complex and could be much broader in scope compared to consolidation efforts carried out thus far. Consolidation of air traffic services has been identified by some as a potential means to adapt to anticipated changes in the controller workforce resulting from large scale retirements of experienced controllers as well as potential changes in controller job functions, and to address staffing shortages, particularly at certain en route facilities.

Congress may also have a particular interest in the FAA's future consolidation plans of this kind because relocation of federal workers is likely to have impacts on regions and congressional districts. Even if the size of the job losses in a particular location have a minimal impact on the local economy, they can be viewed as a symbolic loss to a community in terms of losing federal jobs, and the perception that the federal government viewed the particular locale less favorably than other sites. Placing regions and districts in competition for consolidated federal facilities has the potential of creating large political pressures that can complicate the location selection process. Some observers have suggested that the military base realignment and closure (BRAC) process is a well established model for conducting such assessments of proposed facility consolidation, and have suggested that the FAA develop or adopt a similar approach for its future assessments of consolidation proposals.⁵² During the upcoming reauthorization debate, Congress may consider whether utilizing such a process could benefit the FAA as it continues to look toward consolidation of facilities and functions as a means to control costs and adapt to anticipated changes in air traffic services under NGATS, or whether such a requirement would prove too burdensome and time consuming.

Because of the specific interest in how consolidation might apply to air traffic control facilities, the FAA's current efforts to consolidate weather support functions at air traffic control facilities may be of particular interest. How this ongoing consolidation effort unfolds may provide insight into how FAA might go about the much larger scale process of consolidating various air traffic control facilities and functions. The FAA has been actively pursuing the consolidation of center weather service units (CWSUs) that provide weather forecasting to en route air traffic control facilities. Initial plans for consolidation called for centralizing weather support functions, currently provided to the FAA by the National Weather Service (NWS), into a network of Joint Aviation Weather Sites (JAWS), intended to provide continuous (24/7) weather support for all FAA air traffic facilities, not just en route centers.⁵³ Presently, the NWS is conducting prototype

⁵² Frank L. Frisbie, "Give NAS a BRAC," *2nd National Airspace System Infrastructure Management Conference: NAS Infrastructure in Transition*, June 13, 2006, Washington, DC: The National Center of Excellence for Aviation Operations Research (NEXTOR).

⁵³ Dave Rodenhuis and Danny Sims, FAA ATO, *Restructuring Plans for the CWSUs: A Vision for Improved Weather Forecast Services*, Federal Aviation Administration: Washington, DC (Undated).

testing to demonstrate how it might provide the FAA with the remote service capabilities sought. But, the plan is controversial, and it has been criticized by the National Air Traffic Controllers Association (NATCA) who fear that air traffic controllers will lose critical on-site weather support, and by representatives of NWS employees who fear that the consolidation plans will result in lost jobs for NWS meteorologists, and possible wholesale competitive sourcing of air traffic weather support functions.⁵⁴ These entities have made their concerns known to various Members of Congress, and the FAA's plans are likely to come under considerable congressional scrutiny. However, from the perspective of examining overarching issues for FAA reauthorization, the current weather support service consolidation initiatives are likely to be of further congressional interest to the extent that they can provide insights into the manner that FAA might go about consolidation on a broader scale.

Again, because it appears that FAA's consolidation efforts do not fit into any readily identifiable overarching strategy, the proposal of adopting a BRAC-like process to develop a cohesive strategy for consolidating facilities and functions may receive greater attention during the FAA reauthorization process. Such a process may also serve to identify those functional elements where competitive source selections may be an effective strategy for cost-saving.

Competitive Sourcing and Privatization of Functions

While outsourcing, or competitive sourcing, of certain government functions has been a central element of the President's Management Agenda,⁵⁵ the current administration has not promoted the concept, advocated by some, of full privatization of air traffic services, as has been done in Canada, Great Britain, Australia, and much of mainland Europe. Testifying before a Congressional committee, FAA Administrator Marion Blakey asserted:

“The whole issue of privatization is an absolute red herring. [W]e are running, and very proud to be running, a federal system of air traffic control. In my estimation, that is the way it will stay. Certainly this Administration has no intention to privatize air traffic control or to change the status of our controller workforce overall and the way we approach the system.”⁵⁶

That said, the FAA has instead focused on identifying smaller scale services and programs that are more easily converted to contract operations. One example is the Federal Contract Tower (FCT) program, which has been in place for some time and has incrementally expanded over the years. Under the FCT, airport towers are staffed by private controllers under contract to the FAA. Another example, the recent outsourcing and ongoing consolidation of all automated flight service stations (AFSSs) in the lower 48 states and Hawaii, was conducted as a single large-scale, public-private sourcing competition, which was awarded to a private contractor in 2005. AFSS facilities provide weather and flight planning information and assistance to pilots and mostly support general aviation users. While some in Congress opposed this large-scale conversion of federal jobs to the private sector, they were ultimately unsuccessful in getting legislation passed to prevent the FAA from moving forward with the contracting of these AFSS positions.

⁵⁴ Beth Dickey, “Turbulent Weather,” *Government Executive*, August 1, 2006, pp. 26-27.

⁵⁵ See CRS Report RS21416, *The President's Management Agenda: A Brief Introduction*, by (name redacted).

⁵⁶ Transcript of Statement by Marion Blakey, Administrator, Federal Aviation Administration, in Committee on Transportation and Infrastructure, U.S. House of Representatives. *The Status of the Air Traffic Controller Workforce* (108-73), Hearing before the Subcommittee on Aviation of the Committee on Transportation and Infrastructure, House of Representatives, 108th Cong., 2nd sess., June 15, 2004, p. 28.

In general, most FAA positions, including air traffic controller positions, are considered commercial and not inherently governmental in nature. These jobs could, therefore, be outsourced at the FAA's discretion following guidelines set forth in the Federal Activities Inventory Reform Act of 1998 (FAIR) (P.L. 105-270) and OMB Circular A-76.⁵⁷ Hence, specific initiatives to outsource certain functions or programs within the FAA do not require additional authority, and therefore typically are not central issues in the reauthorization debate. However, as in the case of the debate over protecting air traffic functions from privatization during the Vision 100 reauthorization process and the introduction of legislation in the 109th Congress to prevent the outsourcing of flight service station positions, Congress may opt to consider limitations on the outsourcing of FAA functions. While the intent of outsourcing is to control escalating costs within the FAA, outsourcing initiatives are always likely to be contentious because they involve conversion of federal jobs to the private sector and large scale outsourcing efforts could impact morale and productivity among federal workers.

Under current policy, the FAA continues to expand the federal contract tower program, and consolidation of automated flight service station functions is underway under the private contract awarded in 2005. While these initiatives are not likely to be the focus of debate during the upcoming FAA reauthorization, they illustrate the FAA's approach to competitive sourcing and may provide a model for other FAA functional areas, such as aeronautical charting and operating and maintaining the FAA's telecommunications infrastructure, to streamline operations and improve cost savings through competitive sourcing. Therefore, these ongoing outsourcing programs are examined in further detail below.

The Federal Contract Tower (FCT) Program

The FCT program awards FAA contracts for staffing certain airport control towers with private contract controllers. During congressional debate over Vision 100 (P.L. 108-176), outsourcing of air traffic services under the FAA's Contract Tower Program became a highly contentious issue. Concerns were raised that further expansion of the program could escalate to wide-scale privatization of larger components of the air traffic system, such as en route and terminal area facilities.⁵⁸ These concerns were quelled by an Administration agreement to put any further privatization of FAA functions on hold during FY2004. The FCT has continued to expand to some degree since, and it currently encompasses about 45% of all federally funded towers in the United States.

The FCT program came into existence in 1982—initially as a pilot program at five airports—in an effort to provide continued air traffic services at low-activity towers in the wake of the nationwide air traffic controller strike and subsequent dismissal of striking FAA air traffic controllers. For the first twelve years, the program remained relatively small, growing to 27 towers by 1993. Nonetheless, the program gained the attention of the National Performance Review (NPR)—an initiative spearheaded by then-Vice President Al Gore that later became known as the National Partnership for Reinventing Government—which endorsed the program in 1993 as an effective means of reinventing government services and recommended its expansion.⁵⁹

⁵⁷ See CRS Report RL31024, *The Federal Activities Inventory Reform Act and Circular A-76*, by (name redacted).

⁵⁸ FAA air traffic control is currently segmented into en route, terminal area, and airport tower control functions and facilities. En route facilities are called centers and usually handle traffic in high-altitude airspace, while terminal area facilities refer generally to approach control facilities that control arrivals and departures to and from major airports.

⁵⁹ Vice President Albert Gore's National Performance Review. "From Red Tape to Results: Creating a Government (continued...)"

Beginning in 1994, the contract tower program rapidly expanded to 160 towers by the end of FY1997.⁶⁰

The FCT program was advocated by the NPR largely because of its perceived effectiveness as a cost-saving initiative. These cost savings were quantified in a 2003 audit by the DOT OIG. The audit compared operating costs at 12 contract towers to operating costs at comparable FAA-run towers and found the average annual cost savings of the contract tower program to be about \$917,000 per tower.⁶¹ The DOT OIG determined that the cost savings under the contract tower program are primarily due to lower staffing levels and lower salaries in comparison to similar FAA-staffed facilities. The same analysis was conducted by the FAA in 1999 using FY1998 data, when it was determined that the average annual cost savings of the contract tower program to be \$787,000 per tower. The DOT OIG attributed the increase in cost savings to increased costs associated with the controller pay system that was implemented in FY1998.

While the National Air Traffic Controllers Association (NATCA) has continued to challenge the FCT program on legal grounds, the program has continued to expand, and it now includes more than 230 airport control towers. Beginning in 1999, Congress funded a cost-sharing program allowing towers that would not otherwise meet the FAA's cost-to-benefit criteria to remain operational so long as needed funding above the determined cost/benefit level are provided by non-federal sources. As of January 1, 2006, more than 30 airports were included in the contract tower cost-sharing program.⁶²

With regard to safety, repeated audits of operations at contract towers conducted by the DOT OIG have indicated that these facilities provide a level of safety comparable to that of FAA-staffed towers. NATCA has challenged these findings, claiming that contract towers have fewer controllers, provide less training, and subject personnel to inadequate work conditions. NATCA contends that these conditions result in a degradation in the level of safety and service that controllers are able to provide.⁶³ While the DOT OIG did conclude that contract towers are staffed with fewer controllers, none of these other claims have been substantiated by DOT OIG findings or any other independent assessment of contract towers to date.

In 1999, Congress mandated an FAA study to examine further expansion of the FCT program to include FAA-run towers without radar capability. While FAA took a narrow view of this requirement and identified only 41 airport towers without any radar capability whatsoever, a subsequent review by the DOT OIG in 2000 identified an additional 30 airports for possible inclusion that had limited radar monitoring capability and provided limited aircraft separation services under instrument flight rules (IFR), but were, in its opinion, sufficiently similar to other airport towers already in the FCT program.⁶⁴ NATCA, however, raised significant objections to

(...continued)

that Works Better and Costs Less.” September 7, 1993. Government Printing Office: Washington, DC.

⁶⁰ Office of Inspector General, U.S. Department of Transportation. *Federal Contract Tower Program, Federal Aviation Administration*. Report Number AV-1998-047. May 18, 1998.

⁶¹ Office of Inspector General, U.S. Department of Transportation. *Safety, Cost, and Operational Metrics of the Federal Aviation Administration's Visual Flight Rules Towers*. Report Number AV-2003-057, September 4, 2003.

⁶² U.S. Contract Tower Association, *2005 U.S. Contract Tower Association Annual Report*, Alexandria, VA. Undated.

⁶³ National Air Traffic Controllers Association. *FACT SHEET: FAA Reauthorization and the Contract Tower Program*. Undated.

⁶⁴ Office of Inspector General, U.S. Department of Transportation. *Contract Towers: Observations on FAA's Study of Expanding the Program*. Report No. AV-2000-079, April 12, 2000.

the proposal to further expand the contract tower during debate over reauthorization of the FAA in 2003 in part because 11 of the 71 airports cited in DOT OIG's report were among the 50 busiest towers in the United States.⁶⁵

Primarily because the staffing levels and costs of federally-operated towers are significantly greater than those of contractor-operated towers, the contract tower program has largely been viewed as an effective means for funding the continued operation of certain towers that would otherwise be cost prohibitive to operate as FAA-run facilities. Audits and reviews of the program have not found any meaningful differences in the quality and safety of air traffic services provided by contract and subcontracted towers under this program compared to FAA-run towers.

Ongoing issues for continuance and possible expansion of the contract tower program include continued oversight of costs to ensure that the cost efficiencies that have made the program a success are maintained or improved upon and determination of whether all relevant factors such as the volume and complexity of operations are fully considered and evaluated in terms of safety, efficiency, and cost savings when new towers are considered for inclusion in the program.

Automated Flight Service Station Contracts

In 2005, the FAA completed one of the largest public-private competitive source selection processes ever conducted in the federal government, covering the functions of about 2,500 federal positions at 58 automated flight service station (AFSS) facilities, in all states except Alaska. These facilities provide pre-flight and in-flight weather briefings and flight planning services, mostly to general aviation operators, but are not directly involved in air traffic separation functions. Lockheed-Martin Corporation of Bethesda, MD won the source selection process and was awarded a five-year contract with an additional five-year renewal option to manage and operate AFSS facilities throughout the United States, except in Alaska. The FAA estimates that, over the 10-year period, transitioning the AFSS facilities to Lockheed-Martin under a cost savings plan that includes considerable consolidation of facilities, will save the government a total of \$2.2 billion, which amounts to a 56% reduction in operating costs.⁶⁶

Lockheed-Martin's plan for consolidating the AFSS functions is underway and once completed will reduce the number of facilities from 58 to 20 and will include three larger hub facilities that will coordinate services for the western, central, and eastern sectors of the country. The sites will be linked by modernized computing capabilities allowing access to local airport and airspace conditions at all facilities, a weakness of the older system where local information was often only available to the nearest flight service station.

While this consolidation will result in the elimination of a considerable number of AFSS positions in the end state, the transition plan was designed to minimize impacts on displaced federal employees. Each active AFSS specialist working for the FAA at the time of the transfer of operations to Lockheed-Martin was guaranteed a job with Lockheed-Martin for at least three years. Prior to the transition, the FAA used separation incentives to downsize staff in preparation for the transition to minimize the need for involuntary separations.

⁶⁵ National Air Traffic Controllers Association. *FACT SHEET: FAA Reauthorization & the Contract Tower Program*.

⁶⁶ Federal Aviation Administration, *A-76 Performance Decision Announcement*, Text of Remarks by Dennis DeGaetano, Vice President of Acquisition and Business Services, February 1, 2005.

Despite these steps, the reorganization and shift to contracted operations had a notable impact on those federal employees nearing retirement eligibility. Recognizing that some displaced AFSS employees close to reaching retirement eligibility were significantly disadvantaged by the transition to contract operations, Congress approved an amendment to the FY2006 Transportation Appropriations Act (P.L. 109-115), allowing involuntarily separated AFSS employees that were roughly within two years of retirement to work under the Lockheed-Martin contract as temporary federal employees until they reach federal retirement eligibility, provided that they would do so prior to October 4, 2007. This language was inserted after attempts to block the use of appropriations to fund the outsourcing of flight service functions failed to gain sufficient support in Congress.

In the context of the FAA reauthorization, Congress may examine the AFSS station competitive source selection and transition processes to assess whether lessons learned from these experiences could be applied to other agency consolidations and competitive sourcing initiatives. The DOT OIG is currently conducting a full audit of the AFSS transition process to assess whether the FAA has implemented effective plans and controls for transiting the flight stations to contract operations, realizing anticipated cost savings, and ensuring that the operational needs of users continue to be met. The results of this audit may be of particular interest to Congress in the context of FAA reauthorization.

Aeronautical Charting

While the FAA has not announced any additional plans to conduct competitive sourcing on the scale of the AFSS competition, one FAA function that may be a likely candidate for future competitive sourcing is the aeronautical charting function, which produces and distributes charts and flight information publications in hardcopy and electronic formats for system users. The aeronautical charting function is comparably small in scale however, consisting of about 220 positions, which is less than one-tenth the size of the AFSS function. The FAA assumed responsibility for aeronautical charting from the National Ocean Service (NOS), a component of the National Oceanic and Atmospheric Administration, in FY1999. Presently, the FAA's National Aeronautical Charting Office (NACO) publishes and distributes civil aeronautical charts and flight information publications to both government and public users.

In recent years, the move toward digital geospatial data and geographic information systems (GIS) has provided for easier consolidation and sharing of geospatial data used for, among other things, creating the FAA's aeronautical chart products. Most observers believe that NACO has done well in keeping pace with these technological changes thus far. However, as aviation moves more and more toward digital charts and flight information publications in the cockpit, NACO may find itself taking on new roles of developing digital products to interface with new avionics equipment and technology at all levels of aviation, rather than simply providing this information in hard copy and digital renditions to end users. Among airlines and other commercial operators already using digital flight information and chart products extensively, commercially provided data—used in flight management systems, electronic flight bags, and so forth—accounts for a large proportion of the disseminated data. Even with respect to hard copy charts and flight information publications, NACO products for the most part already compete in the market with products produced by commercial vendors, and have done so virtually since the government began disseminating aeronautical charts more than 70 years ago. Such direct competition between government-provided and commercial vendor products is often considered a telltale sign of whether a particular government function should be considered for possible competitive sourcing.

Outsourcing or competitive sourcing of NACO functions, however, raises safety and security concerns for some. In particular, unions representing NACO employees and lawmakers from Maryland—where NACO is principally located—have argued that because aviation charts are essential for flight safety, national security, and compliance with FAA regulations, the NACO function should be kept under direct control of the FAA.⁶⁷ Advocates for keeping NACO as a government run function also argue that because it is a highly efficient operation, it would be of little benefit to privatize it. During hearings preceding the last FAA reauthorization, the Aircraft Owners and Pilots Association (AOPA), another advocate for keeping NACO a federal function, sought legislative language to have NACO positions reclassified as “inherently governmental.” AOPA asserted that NACO provides pilots with essential sources of information for the safety of flight, national defense, and compliance with FAA regulations, and therefore should not be classified as commercial.⁶⁸ Small general aviation users that typify AOPA’s membership may also be concerned that if aeronautical charting functions were contracted out, they may be forced to pay more for charts and other products to fully cover the costs associated with updating and maintaining geospatial databases and creating and disseminating chart products. As previously stated, Congress did not include legislation to protect any FAA functions from privatization or competitive sourcing, including NACO functions, during that last reauthorization cycle.

Because NACO functions closely resemble aeronautical charting functions provided by at least one commercial vendor, it may be difficult to make a strong case that such functions should continue to be government-run. If Congress were to task the FAA with identifying functions that are readily amenable to competitive sourcing competitions, NACO functions already have a commercial corollary and therefore could be a prime candidate for inclusion. However, the small size and relative efficiency of the NACO organization may render any attainable cost savings from outsourcing relatively small, given that the total NACO budget is only about \$50 million annually.

FAA Telecommunications Infrastructure

Whereas the NACO is a relatively small, compartmentalized function that could be relatively easily scoped for a public-private competition, many other elements of the FAA are much more complex to identify and parse out. Such may be the case with the FAA Telecommunications Infrastructure (FTI), the backbone of the FAA’s intra-and inter-facility communications capability to support air traffic services. According to recent GAO testimony, some experts have been advocating full outsourcing of operations and maintenance functions for the FTI as a possible cost-saving option.⁶⁹

While the FTI program is still in developmental stages, it is expected to replace aging FAA telecommunications equipment used for air traffic control mission support. The FAA’s stated approach to engineering the FTI system will be consistent with a performance-based services

⁶⁷ Amelia Gruber. “Lawmakers, Union Push To Keep Flight Mapping In Government,” *Government Executive Daily Briefing*, September 2, 2003.

⁶⁸ Statement of Phil Boyer, President, Aircraft Owners and Pilots Association, Before the Committee on Transportation and Infrastructure, Aviation Subcommittee, U.S. House of Representatives, Concerning FAA Reauthorization, April 9, 2003.

⁶⁹ U.S. Government Accountability Office, Statement of Gerald L. Dillingham, Ph.D., Director Physical Infrastructure Issues, Testimony Before the Subcommittee on Transportation, Treasury, the Judiciary, Housing and Urban Development, and Related Agencies, Committee on Appropriations, U.S. Senate *Air Traffic Control: Status of the Current Modernization Program and Planning for the Next Generation System*, May 4, 2006, GAO-06-738T.

contract under which FAA will neither own nor operate any of the network equipment or software. However, scoping the program and meeting FAA user requirements for sustainment and maintenance will likely require close collaboration between the FAA and the contractor team led by Harris Corporation. Due to the size and complexity of the FTI, there is a substantial amount of risk associated with both the development and the continued operations and support of FAA operational telecommunications needs. Therefore, the FTI program will likely need to be monitored closely, but if successful, might serve as a useful model for government contracts to support FAA operations in the NGATS. Therefore, details of the FTI contract may be of particular interest to Congress in the context of FAA reauthorization.

The Use of Designees

Designees are individuals that are neither government employees nor government contractors, that are authorized or designated by the FAA to carry out regulatory functions. Examples include designated medical examiners that issue medical certification, pilot examiners that issue pilot certificates and ratings, and manufacturing representatives that certify the airworthiness of production aircraft. The use of designees has long been a part of the FAA's cost control strategy. Presently, FAA regulatory oversight functions are supplemented by more than 11,000 designees, including about 4,800 conducting aircraft certification, about 1,500 involved in flight standards, and almost 5,000 designated aviation medical examiners. While the use of designees is a long-standing policy at the FAA and it is widely considered an effective means for controlling operational costs, it has been considered controversial in some cases. While the use of aviation medical examiners that conduct medical exams on behalf of the FAA and check airman that conduct pilot tests for certificates and ratings is less controversial, the use of designees in aircraft design and manufacturing organizations and for oversight of airline operations and maintenance has raised some concerns among aviation safety experts. Also, the GAO recently identified FAA's inconsistent monitoring and inadequate oversight of designees as significant weaknesses in these programs.⁷⁰

Although the use of designees provides an effective means to control costs, safety oversight concerns may impose some limitations over the extent of using designees. To effectively utilize designees as a cost control measure and address these safety oversight concerns, the FAA may consider options to target designee use and give priority to qualified FAA retirees to perform designee functions. For example, the FAA may seek to expand the use of designees at manufacturer and airline facilities that have clearly demonstrated that they have effective safety management programs in place. By increasing the use of designees among these operators and facilities, the FAA may be able to better align its inspector workforce to concentrate more on sectors of the aviation industry where more extensive safety concerns have been identified, such as at contract repair stations and among smaller commercial operators. By using qualified former FAA employees in designee roles, the FAA may be able to further improve the quality of its designee workforce. Also, by increasing the number of federal annuitants with aviation experience in the designee workforce, the FAA may be able to reduce concerns over designees being mostly dependent on their salaries or compensation received from the companies or entities that they are overseeing on behalf of the FAA.

⁷⁰ U.S. Government Accountability Office, *Aviation Safety: FAA Needs to Strengthen the Management of Its Designee Programs*, October 2004, GAO-05-40.

Air Traffic Controller Staffing

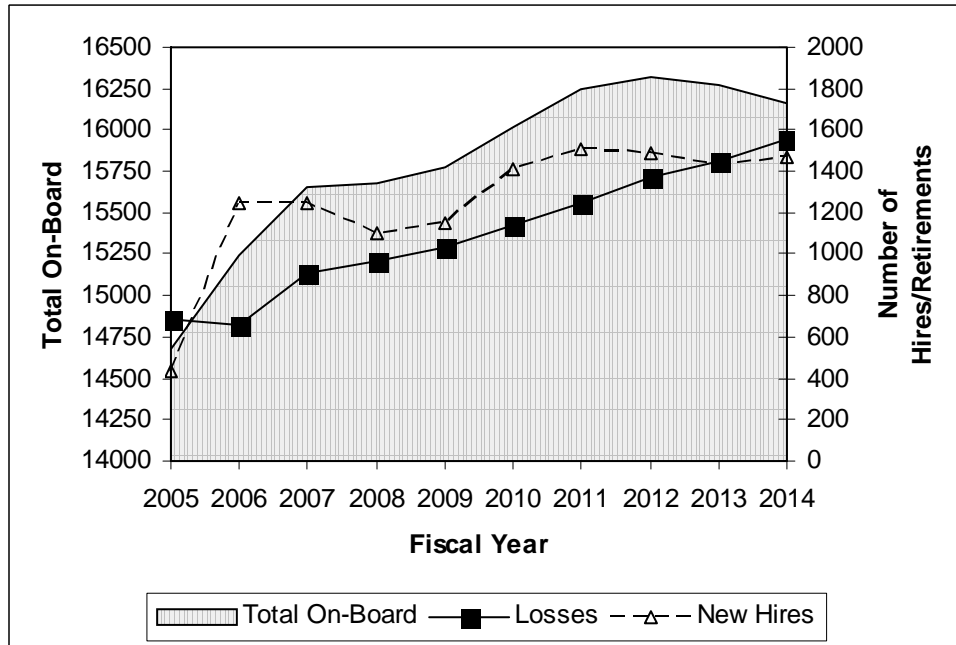
Given the large wave of controllers becoming eligible for retirement and mandatory retirement for most operational controllers at age 56, adequate controller staffing is likely to be a significant issue in the debate over FAA reauthorization. Vision 100 required the FAA to develop a controller workforce strategy to address the issue of the pending controller retirement wave, which is largely attributable to large scale hiring conducted in the early 1980s to fill positions left vacant by President Reagan's firing of striking controllers in 1981. The FAA's strategy for controller staffing, issued in December 2004, relies primarily on an accelerated rate of hiring of controllers through 2014 and achieving increased controller productivity through a variety of human resource management initiatives.⁷¹

The FAA's projections show a total of just over 11,000 active controllers—roughly 75% of the 2005 workforce—retiring or otherwise leaving the controller ranks between 2005 and 2014. About 8,250 of these losses will specifically be due to retirements. During this period, the FAA plans to hire 12,500 controllers to replace controller losses and meet future system needs.⁷² Historically, the FAA had filled controller positions once they became aware that a controller was planning to leave, which meant that there was usually little lead-time to hire replacements. The strategy for addressing the impending wave of controller retirements is intended to be more proactive. It involves a planned surge in hiring in the near-term, compared to historic hiring trends, to put controller trainees into the pipeline so that they can replace retiring controllers on a more accelerated pace given that it takes, on average, a little over three years for a controller to become fully certified. This initial surge in hiring is anticipated to be followed by a steady flow of new hires to keep pace with attrition rates (see **Figure 2**).

⁷¹ Federal Aviation Administration, *A Plan for the Future: The Federal Aviation Administration's 10-year Strategy for the Air Traffic Control Workforce*, December 2004.

⁷² *Ibid.*

Figure 2. FAA Projections of Controller Attrition, Planned Hiring Rates, and Anticipated Controller Staffing Levels



Source: CRS compilation of data presented in Federal Aviation Administration, *A Plan for the Future: The Federal Aviation Administration's 10-year Strategy for the Air Traffic Control Workforce*, December 2004.

The FAA is also taking steps to implement a provision in the law that allows high-quality controllers to remain in their positions for up to five years beyond the usual mandatory retirement age of 56.⁷³ The FAA has also taken steps to improve controller selection and training in order to reduce washout rates during training, streamline the training process, and develop a high quality workforce to replace retiring controllers. Simulation technologies are also being developed and deployed to improve and provide greater automation and assessment capabilities in the controller training environment. The FAA is continuing to work with universities through the collegiate training initiative (CTI) to recruit and provide baseline training to the future generation of controllers. Despite these steps, Congress may debate whether controller staffing standards and projected staffing levels provide an adequate level of safety, and whether funding and initiatives to train and place high quality controllers will adequately meet projected staffing needs over the next several years. Congress may also consider options to allow CTI program graduates to enter directly into on-the-job training. This approach may streamline controller training and could significantly cut the FAA's training costs, but questions remain regarding whether the CTI program by itself would provide sufficient screening of prospective controllers, or whether initial training at the FAA Academy is also needed to identify and weed out trainees not well suited for controller careers.⁷⁴

⁷³ See 5 U.S.C. §8335(a).

⁷⁴ Committee on Transportation and Infrastructure, U.S. House of Representatives. *The Status of the Air Traffic Controller Workforce* (108-73), Hearing before the Subcommittee on Aviation of the Committee on Transportation and Infrastructure, House of Representatives, 108th Cong., 2nd sess., June 15, 2004.

Beside hiring new controllers, the FAA strategy also consists of improving controller productivity. The FAA expects to achieve a savings of 10% by 2010 through better management of controller shifts, greater flexibility in shift staffing, better management and oversight of overtime and sick leave usage, reducing productivity losses due to medical restrictions and work-related disabilities, and reducing the amount of time controllers spend on paperwork, union business, and attending workshops, meetings, and conferences.⁷⁵ Progress on these initiatives may be of particular interest during congressional debate over FAA reauthorization.

The FAA asserts that the current situation is characterized more by staffing imbalances across the system, rather than a system-wide staffing shortage.⁷⁶ The FAA is addressing facility imbalances in its controller workforce strategy by restricting transfers that do not maintain balanced staffing objectives, and by offering voluntary reassignments to better balance staff allocations, particularly at those en route facilities that are understaffed.

A greater challenge in improving controller allocations and maintaining an appropriate staffing balance is reducing the number of on-the-job training failures among developmental controllers at en route centers, particularly those assigned to the most demanding facilities. Congress may consider whether better screening tools during initial training—such as simulation training and evaluations—can serve to better identify controller aptitude and assign to busy en route centers only those developmental controllers considered most likely to be successful in on-the-job training at these facilities. Such tools could help eliminate controller washout at busy en route terminals that results in transfers to smaller, less demanding terminal airspace. Increased use of emerging air traffic automation technologies may also help to improve staffing imbalances in the future, both by reducing staffing requirements and by decreasing job complexity that could greatly reduce failure rates.

One long-term option for reducing staffing imbalances is to consolidate air traffic facilities. The FAA asserts that co-locating facilities of different complexity levels can help developmental controllers progress to more complex airspace in a manner that better fits each controller's individual progression.⁷⁷ Co-located facilities may also provide experienced controllers with greater career advancement opportunities without having to relocate, and may help the FAA reduce operational costs for facilities and employee transfers. While options to consolidate air traffic facilities are only in the initial conceptual stages, Congress may consider options to require the FAA to examine consolidation alternatives, or for impartial observers, such as the National Academies, to study the feasibility, costs and benefits, and impacts of consolidating air traffic services on a system-wide basis. As previously discussed, Congress may also consider whether a BRAC-like process may provide a mechanism for evaluating air traffic control facility consolidation options.

FAA Labor Relations and Negotiations

With regard to controlling operational costs, air traffic controller pay remains a particularly contentious issue as controller compensation and benefits make up a sizable proportion of the

⁷⁵ Federal Aviation Administration, *A Plan for the Future*.

⁷⁶ See Testimony of Marion Blakey in Committee on Transportation and Infrastructure, U.S. House of Representatives, *The Status of the Air Traffic Controller Workforce*, June 15, 2004.

⁷⁷ Federal Aviation Administration, *A Plan for the Future*.

FAA's operational costs. During debate over FAA reauthorization, Congress may examine whether options to improve existing laws and policies regarding the FAA personnel system are available to control escalating operational costs and maintain more positive and constructive management-labor relations within the FAA.

Regarding labor negotiations, one legislative option offered during the 109th Congress proposed to add an additional phase to the existing process, requiring management and labor to enter into binding arbitration after the period of congressional review following an impasse in the contract negotiation process.⁷⁸ While Congress did not take up formal debate on this proposal in the midst of the recent FAA/controller labor negotiations, this proposal may resurface during debate over FAA reauthorization. Other options to streamline the labor negotiations process within FAA may also be considered in the context of FAA reauthorization, as recent labor negotiations have proven to be rather disruptive and highly contentious.

In 1995, Congress authorized the Administrator of the FAA to develop a new personnel management system for the agency's workforce. Section 347(a) of the Department of Transportation and Related Agencies Appropriations Act, 1996, provided for the development and implementation of a new personnel management system following consultation with FAA employees and any non-governmental experts in personnel management systems employed by the Administrator.⁷⁹ The new system was to provide for "greater flexibility in the hiring, training, compensation, and location of personnel."⁸⁰ As enacted originally, chapter 71 of the U.S. Code, relating to labor-management relations in most federal agencies, did not apply to the new personnel management system.⁸¹ However, in March 1996, Congress amended section 347 to make chapter 71 applicable to the new system.⁸²

In October 1996, Congress considered additional requirements for the FAA personnel management system. Section 253 of the Federal Aviation Reauthorization Act of 1996 amended title 49 of the U.S. Code to add a new section involving consultation and negotiation with respect to the new system.⁸³ 49 U.S.C. § 40122(a) provides, in relevant part:

(1) Consultation and Negotiation.—In developing and making changes to the personnel management system initially implemented by the Administrator of the Federal Aviation Administration on April 1, 1996, the Administrator shall negotiate with the exclusive bargaining representatives of employees of the Administration certified under section 7111 of title 5 and consult with other employees of the Administration.

(2) Mediation.—If the Administrator does not reach an agreement under paragraph (1) with the exclusive bargaining representatives, the services of the Federal Mediation and Conciliation Service shall be used to attempt to reach such agreement. If the services of the Federal Mediation and Conciliation Service do not lead to an agreement, the

⁷⁸ See S. 2201 and H.R. 4755, 109th Congress.

⁷⁹ P.L. 104-50, § 347(a), 109 Stat. 436, 460 (1995).

⁸⁰ *Id.*

⁸¹ See P.L. 104-50, § 347(b), 109 Stat. 436, 460 (1995) (identifying provisions of title 5, U.S. Code, that would be applicable to the new personnel management system).

⁸² P.L. 104-122, § 1, 110 Stat. 876 (1996).

⁸³ P.L. 104-264, § 253, 110 Stat. 3213, 3237 (1996).

Administrator's proposed change to the personnel management system shall not take effect until 60 days have elapsed after the Administrator has transmitted the proposed change, along with the objections of the exclusive bargaining representatives to the change, and the reasons for such objections, to Congress.

In the report that accompanied the Senate version of the 1996 Act, the Senate Committee on Commerce, Science, and Transportation indicated that "[i]n negotiating changes to the personnel system, the Administrator and the exclusive bargaining representatives would be required to use every reasonable effort to find cost savings and to increase productivity within each of the affected bargaining units, as well as within the FAA as a whole."⁸⁴ The House version of the act did not include a provision on consultation, negotiation, and mediation. The Senate provisions were incorporated into the final version of the legislation during conference.⁸⁵

In 2005, a federal district court considered the impact of 49 U.S.C. § 40122 on labor-management relations at the FAA.⁸⁶ After reaching bargaining impasses with the FAA, the National Air Traffic Controllers Association (NATCA) and the Professional Airways Systems Specialists (PASS) sought the assistance of the Federal Service Impasses Panel (FSIP), an entity within the Federal Labor Relations Authority (FLRA) that provides assistance with resolving negotiation impasses between federal agencies and unions. In 2004, unclear about whether it had the authority to resolve impasses involving the FAA in light of 49 U.S.C. § 40122, FSIP declined to provide assistance.⁸⁷

After reviewing the development of the FAA personnel management system and the enactment of 49 U.S.C. § 40122, the district court concluded that complaints related to an agency's participation in FSIP's impasse resolution procedures could be deemed an unfair labor practice.⁸⁸ Consequently, the court declared that "[w]hen agency action constitutes an arguable unfair labor practice, jurisdiction rests exclusively with the Authority and the Courts of Appeals ... For these reasons, the [court] concludes that it is without jurisdiction and should defer to the FLRA."⁸⁹

Although the FLRA did not address the matter, the U.S. Court of Appeals for the District of Columbia Circuit did review the district court opinion in February 2006. In *National Air Traffic Controllers Association v. Federal Services Impasses Panel*, the D.C. Circuit affirmed the district court decision, concluding that FSIP did not have a clear and specific statutory mandate to assert jurisdiction over the parties' bargaining impasses.⁹⁰ The court did observe, however, that the FAA's refusal to participate in proceedings before FSIP could form the basis of an unfair labor practice charge before the FLRA.⁹¹

On April 5, 2006, the FAA announced formally that it had reached an impasse in its negotiations with NATCA regarding its agency-wide contract covering the air traffic controller workforce.⁹² In

⁸⁴ S.Rept. 104-333, at 36 (1996).

⁸⁵ See H.Rept. 104-848, at 109 (1996).

⁸⁶ *National Air Traffic Controllers Association v. Federal Service Impasses Panel*, 2005 WL 418016 (D.D.C. 2005).

⁸⁷ *Id.* at 1-2.

⁸⁸ *Id.* at 4.

⁸⁹ *Id.*

⁹⁰ 437 F.3d 1256 (D.C. Cir. 2006).

⁹¹ *Id.* at 1265.

⁹² See *FAA Declares Impasse in Controller Talks; Next Stop for Two Sides is Congress*, Daily Lab. Rep. (BNA) No. 66, (continued...)

accordance with 49 U.S.C. § 40122(a)(2), the FAA Administrator indicated that the agency would send its last, best offer to Congress.⁹³ H.R. 5449 (109th Congress), a measure introduced by Representative Steven C. LaTourette on May 22, 2006 to repeal 49 U.S.C. § 40122(a)(2), that would have essentially eliminated any statutory requirement for federal mediation in the case of an impasse in contract negotiations, was defeated.⁹⁴

On June 5, 2006, the FAA imposed a new labor contract on NATCA. FAA maintains that the new contract will save the government approximately \$1.9 billion over five years through various measures, including the creation of a separate, lower pay scale for new employees.⁹⁵ The union's offer would have reportedly cost \$600 million more than the FAA's offer over five years.⁹⁶

Future Airport and Airspace Demand and Capacity Needs

The current FAA reauthorization cycle comes at a critical time with respect to addressing increasing capacity needs at high-volume airports, in airspace around many major metropolitan areas, and along certain highly congested routes. After a decrease in air travel brought about by a variety of factors, including, most prominently, the terrorist attacks of September 11, 2001, air traffic is again on the rise, and so are the associated congestion and delays at many commercial airports. While stopgap measures implemented by the FAA have served well to stave off unacceptable congestion and delays thus far, long-term solutions are likely to be needed in consideration of future air traffic growth projections.

Quantifying Delay and Mitigating Its Impacts

Delay is a multi-faceted metric that is largely regarded as a symptom of possible strains on capacity within the national airspace system (NAS). While there was a relatively large decrease in demand for air travel from 2001 to 2004 that produced fewer delays, over the past two years key delay statistics have been steadily rising, indicating possible strains on system capacity.⁹⁷ The FAA's implementation of ground delay programs (GDPs) at a variety of airports—designed to hold aircraft on the ground when it is anticipated that thunderstorms will affect their flight—has proven effective in smoothing traffic flows.⁹⁸ However, challenges are mounting as traffic during the summer of 2006 at many busy airports surpassed traffic levels during the summer of 2000,

(...continued)

at A-5 (Apr. 6, 2006).

⁹³ *Id.*

⁹⁴ H.R. 5449, 109th Cong. (2006). H.R. 5449 was considered under suspension of the rules and required a two-thirds vote to pass. The vote was 271-148. For additional information on the congressional consideration of H.R. 5449, *see FAA Imposes Labor Contract on NATCA Following 60-Day Congressional Review*, Daily Lab. Rep. (BNA) No. 111, at A-10 (June 9, 2006).

⁹⁵ *FAA Imposes Labor Contract on NATCA Following 60-Day Congressional Review*, *supra* note 94.

⁹⁶ *Id.*

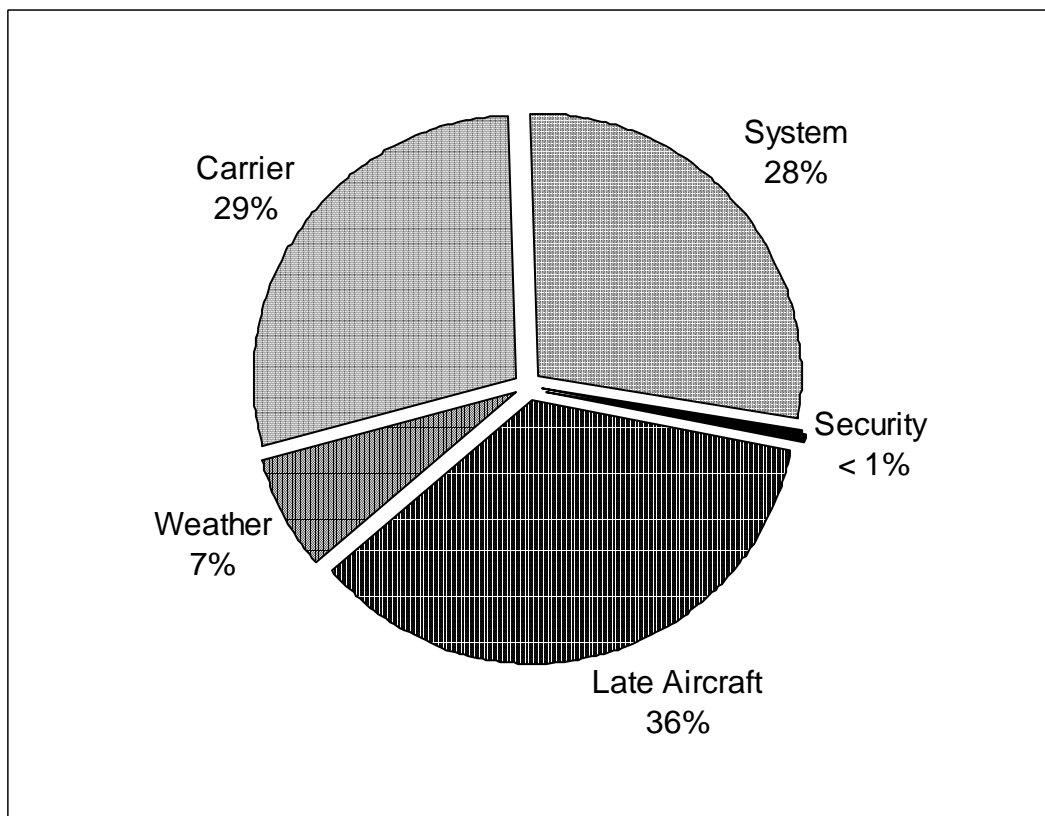
⁹⁷ See CRS Report RL32707, *Avoiding Gridlock in the Skies: Issues and Options for Addressing Growth in Air Traffic*, by (name redacted).

⁹⁸ "Ground Delays Down Due to New FAA Program, Chew Says," *Aviation Daily*, August 4, 2006, p. 1.

when the FAA's inability to cope with demand combined with thunderstorms and maintenance inefficiencies at airlines produced a large spike in delays, to the chagrin of air travelers.

While many travelers perceive that delays are frequently associated with weather, actual delays directly attributable to weather conditions account for only a small portion of total system-wide delays. Rather, delays are most readily attributable to a combination of the current system's inability to cope with weather, congestion, and other factors affecting the efficient flow of traffic at major airports and along crowded airways; maintenance difficulties and inefficiencies in air carrier operations; and cascading effects resulting from late arriving aircraft that cannot be turned around in time to maintain outbound flight schedules (see **Figure 3**). System delays, of course, are of the greatest concern to the FAA as these most directly reflect the inefficiencies in the air traffic control system and most readily point to existing or emerging capacity needs.

Figure 3. Causes of Air Carrier Flight Delays (2003-2005)



Source: CRS analysis of Bureau of Transportation Statistics aviation delay data.

While it is not fully understood what specific inefficiencies in the system have the most detrimental effects on delay, most experts agree that in order to alleviate capacity-related delay at busy airports, priority must be given to increasing the system's ability to handle traffic during low visibility conditions. Many believe that technology is needed to reduce low visibility aircraft spacing standards to those allowable in good visibility in order to accommodate projected future growth in air traffic operations at busy airports. However, some experts caution that even with the implementation of these proposed options and the completion of planned airport expansions across the country, certain very busy airports throughout the country, including both major commercial airports and the busiest general aviation reliever airports, may experience peak hour

demand levels that greatly exceed airport capacity limitations. While these capacity constrained airports, as well as surrounding airspace, and certain en route corridors between these busiest airports are becoming saturated at peak operating hours, these impacts are highly geographically specific. These geographic distributions of congestion and delay can be linked to population trends toward increased growth in major metropolitan areas throughout the United States, fast-growing cities in the southeast and southwestern states, and to socio-economic factors of particular metropolitan areas that have a strong effect on demand for air travel.⁹⁹

The Asymmetry of Capacity Straining Operations

One major challenge for system planners is that air traffic is highly concentrated among a relatively small number of airports serving major metropolitan areas across the United States. Therefore, across the entire national airspace system, the volume and distribution of air traffic is highly asymmetric or unbalanced. Specifically, in high altitude airspace there are choke points where aircraft transitioning between cities in the northeast and Chicago and the west coast converge, and also along the heavily congested air routes up and down the east and west coasts of the United States. Prior CRS analysis found that projected future system demand, based on geographic population distribution trends, is likely to continue along the path of increasing air traffic density at these already congested major metropolitan airports and along the busiest traveled flight routes.¹⁰⁰

Similarly, analysis by the FAA and the MITRE Corporation found that, despite ongoing efforts and plans to expand airport and system capacity under the FAA's Operational Evolution Plan (OEP), capacity constraints are likely at several airports that serve major metropolitan areas, and fast-growing cities.¹⁰¹ In addition to examining projected increases in flights between major cities, extensive socio-economic information was used in the study to identify locations where additional capacity needs are anticipated that would not otherwise have been identified. The study concluded that by 2013, 15 airports will need additional capacity improvements, assuming planned enhancements at airports are completed before then. All three major airports in the New York metropolitan area (Newark, LaGuardia, and John F. Kennedy International) made the list as did three airports in the Los Angeles area. If planned improvements don't occur, the total number of airports needing additional capacity may rise to 26. By 2020, the study predicts that the number of airports needing additional capacity will grow to 18, assuming planned enhancements stay on track before then. An additional 23 airports were identified as potentially needing additional capacity by 2020 if planned improvements are delayed or cancelled. For some metropolitan areas, the outlook is not particularly promising. In Los Angeles, for example, if planned enhancements don't occur, additional capacity will be needed at all major commercial airports and two key reliever airports. Even with the planned enhancements in place, the Los Angeles metropolitan area will face significant capacity constraints in the next 10 to 15 years. While major metropolitan areas like Los Angeles and New York face significant challenges to meet aviation capacity needs over the next 15 years, anticipated capacity needs identified in the study were not just limited to the largest metropolitan areas and the current busiest airports. For

⁹⁹ See CRS Report RL32707, *Avoiding Gridlock in the Skies: Issues and Options for Addressing Growth in Air Traffic*, by (name redacted); Federal Aviation Administration and The MITRE Corporation, *Capacity Needs in the National Airspace System: An Analysis of Airport and Metropolitan Area Demand and Operational Capacity in the Future*, June 2004.

¹⁰⁰ See CRS Report RL32707, *Avoiding Gridlock in the Skies: Issues and Options for Addressing Growth in Air Traffic*, by (name redacted).

¹⁰¹ Federal Aviation Administration and the MITRE Corporation, *Capacity Needs in the National Airspace System*.

example, the study found that the fast-growing metropolitan areas of Austin and San Antonio, Texas, and Tucson, Arizona, while not included among the nation's 35 busiest airports (the OEP-35), are nonetheless anticipated to have a significant need for additional capacity over the next 15 years, spurred by large economic growth. In sum, the capacity needs study identified significant challenges ahead for meeting aviation capacity demand in large and fast-growing metropolitan areas.

Accommodating Future Airspace Users

Besides addressing expected capacity needs and recognizing that these needs are likely to be highly specific to particular geographic regions of the United States, a significant challenge facing Congress and the FAA in the years ahead is accommodating new classes of airspace users in a manner that optimizes safety and efficiency for all users. New users will consist of the very big, such as the Airbus A-380 super-jumbo jet, as well as the very small, very light jets (VLJs). The most talked-about class of new system users are the VLJs, which are expected to begin operations in small numbers in 2007 and are projected to experience rapid growth over the next ten years. VLJs are seen by some as a possible solution to provide small communities improved access to the national air transportation system. Therefore, their introduction may spur renewed public policy debate over approaches to enhance air transportation in small communities. Also, because these VLJs will share high altitude airspace and congested airspace around major metropolitan areas with commercial passenger jets, their impact on system capacity and air traffic control workload is likely to be of particular interest. Besides VLJs, the introduction of pilotless Unmanned Aerial Vehicles (UAVs), or Unmanned Aerial Systems (UASs), poses significant challenges to maintaining safety and not impeding access to airspace for other users such as small general aviation aircraft. Also, there is continued interest among some developers to build "quiet" supersonic aircraft, initially designed for the high-end business and corporate jet market. Consideration of over-land supersonic flight and the designation of specific supersonic corridors over the United States, however, could open up a contentious public-policy debate. Finally, commercial space transportation continues to grow with increasing demand for commercial space launches of payloads for orbital deployment. Also, the anticipated launch of a space tourism industry, consisting initially of suborbital passenger flights, poses unique challenges for the FAA with regard to safety oversight as well as providing safe separation between these activities and other airspace users. The two newly emerging classes of airspace users anticipated to have the greatest impact on the airspace system over the next several years are the VLJs and UAVs. These vehicles and the policy issues concerning their utilization is considered in further detail below.

Very Light Jets

Very light jets or VLJs are a class of small jet aircraft, weighing less than 12,500 pounds maximum takeoff weight, with typical seating configurations for two to seven occupants. Marketing of VLJs has targeted fractional ownership programs and air-taxi operations as an alternative to airline travel with much lower operating costs than traditional business jets. Growth projections for VLJs operations over the next 10 years suggest that the FAA considers that VLJ utilization may have a significant impact on aviation system demand. The FAA's optimism over VLJ utilization are reflected in its most recent aviation forecasts which project an average annual

growth of 10.2% in general aviation turbojet activity over the next ten years, attributable in large part to the anticipated popularity of VLJs.¹⁰²

While there appears to be a considerable market for VLJ aircraft, their specific impact on the airspace system will largely depend on how they are utilized. If the utilization of VLJs is predominantly accounted for by individual owners, corporations, and fractional ownership programs, then VLJs may have a more substantial impact on general aviation reliever airports. If, on the other hand, a large number of VLJs are used for air-taxi service with connectivity to commercial air carrier networks, then the VLJ impact could exacerbate concerns over congestion and delay at larger commercial airports, or perhaps secondary commercial airports such as Chicago's Midway airport.

There is varying speculation regarding how significant of an impact VLJs will have on the national airspace system. Pointing to historical trends, some have concluded that much of the speculation over a VLJ boom that could cripple the existing airspace system is largely hype.¹⁰³ But others see great promise in the VLJ concept because of their comparatively low operating costs and flexibility to utilize small airports that are inaccessible to larger aircraft used in airline and commuter operations.¹⁰⁴ The VLJ aircraft are envisioned by some to fulfill perceived needs for air transport in small communities where attracting or maintaining commercial air transportation has been very difficult.

For several years, the FAA, NASA, and the National Consortium for Aviation Mobility (NCAM) have touted the Small Aircraft Transportation System (SATS) and related concepts as possible options for providing air service to small communities, particularly those that have limited access to air transportation. The SATS vision conceptualizes a future network of on-demand, widely-distributed networks of small aircraft capable of providing transportation access to large number communities in less time.¹⁰⁵ Many regard VLJs to be the enabling technology of this SATS vision. Whether this vision will come to fruition largely depends on whether a business case can be made for operating profitable air-taxi services using these small jets. This, in turn, will likely depend on a variety of factors including the public perception of VLJ safety and reliability; public demand for newly offered services; and the ability of companies to control operational costs so that VLJ transportation can be offered at a reasonable price. One operational issue that may arise is whether the FAA will allow these jets to fly with a single pilot in air-taxi operations. While the jets are certified for single pilot operations, current commercial flight regulations require two pilots on flights conducted for hire. This could have a significant impact on costs in an environment where revenues on each flight can be generated from only five or six available seats.

Thus far, only one company, DayJet, is poised to try out the concept of using VLJs in an air-taxi operation, with plans to initiate service in the southeast United States within one year.¹⁰⁶ DayJet has developed an extensive program for monitoring operations, and has received safety

¹⁰² Federal Aviation Administration, *FAA Aerospace Forecasts 2006-2017*.

¹⁰³ See, for example, J. Mac McClellan, "VLJ Myth May Cost Us All," *Flying*, June 2006, p. 11.

¹⁰⁴ Philippe A. Bonnefoy and R. John Hansman, *Implications of Very Light Jets for the Air Transportation System*, Presented at the Global Airline Industry Program Industrial Advisory Board/Airline Industry Consortium Joint Meeting, November 4, 2005, Massachusetts Institute of Technology, International Center for Air Transportation.

¹⁰⁵ National Consortium for Aviation Mobility. *NCAM, SATS Program Objectives*.

¹⁰⁶ George C. Larson, "Infinite Perturbations, the DayJet Challenge," *Business & Commercial Aviation*, July 2006, pp. 54-61.

compliance certification from key industry auditing firms. Meanwhile, others that have expressed interest in launching a VLJ air-taxi operation, including the much-talked-about Pogo Jet company, appear to be taking a wait-and-see approach before launching operations. The high degree of uncertainty regarding the extent of the market for VLJ air-taxi operations makes it difficult to predict how and where VLJ operations will specifically impact the national airspace system (NAS). During debate over FAA reauthorization, Congress may consider options involving the use of VLJs to provide service to small communities with limited access to air transportation, however geographically-specific demand for VLJs may, nonetheless, concentrate their operations in already busy airspace around major metropolitan areas, and along routes connecting these highly populated locales.

In Vision 100, Congress included language expanding the essential air service program (EAS) to permit funding of alternatives to traditional air carrier service in small communities, such as cost-sharing for on-demand operations designed to specifically meet a community's air transportation needs. While this appears to open the possibility for federal funding to encourage VLJ air-taxi type operations, this concept has not yet been tested. During the course of reauthorization, Congress may consider options to provide stimulus for VLJ air-taxi operations, either through the existing EAS program or the Small Community Air Service Development (SCASD) program, or by establishing a new or pilot program to promote VLJ air-taxi operations in specific small communities seeking such service to provide connectivity to the national air transportation system.

Unmanned Aerial Vehicles

Growing interest in the use of unmanned aerial vehicles (UAVs), or unmanned aerial systems (UASs), particularly for aerial surveillance in homeland security and law enforcement applications, is spurring considerable debate over how to accommodate these unmanned systems and keep them safely separated from other air traffic.

In response to the Department of Homeland Security's initiative to establish an unmanned aerial surveillance capability to monitor the United States-Mexico border, the FAA carved out a large section of airspace—300 miles long and 17 miles wide—where air traffic was prohibited at middle altitudes, between 12,000 and 14,000 feet, from 5 p.m. to 7 a.m. General aviation advocates, such as the Aircraft Owners and Pilots Association (AOPA), raised significant concerns over the implementation of these temporary flight restrictions, fearing that they could set a precedent for establishing wide swathes of restricted airspace around UAV operating areas which could significantly impede the flow of air traffic, particularly among general aviation users that typically utilize low and middle altitudes.¹⁰⁷ Safety concerns over UAV operations were heightened after a DHS Predator UAV conducting aerial surveillance of the southern border crashed in Arizona on April 25, 2006.

Over the next five to ten years, the FAA anticipates that civilian use UAVs will rapidly transition to operational status and users will seek permission to fly UAVs in all airspace throughout the United States in all weather conditions, including conditions where pilots would be unable to see and avoid UAVs without assistance from air traffic control radars or other electronic surveillance technologies. Beyond 2015, the FAA believes that UAV operations could begin to dominate

¹⁰⁷ Aircraft Owners and Pilots Association. *AOPA Alerts Congress to UAV Threat to GA Operations*. Frederick, MD, March 29, 2005.

certain aviation sectors, particularly those considered to be particularly “dirty, dull, or dangerous,”¹⁰⁸ such as homeland security and law enforcement, aerial application of pesticides, and aerial surveying and sensor platforms. UAV manufacturers and users will likely push for a regulatory structure for approving UAV systems for operation in the NAS, allowing operators of approved systems to “file and fly,” rather than going through the arduous process of obtaining waivers and special operating authority from the FAA on a case-by-case basis.¹⁰⁹ Over the next five years, demand for UAV operations will likely necessitate that the FAA develop standard policies and regulations for UAV operations.

The rapid technological advances and substantial interest in UAV aircraft is placing a strain on the FAA to develop policies and regulations for safe UAV operations. The FAA, largely following NASA’s lead, is recommending a phased approach, called Access 5, to granting UAV access to the national airspace system.¹¹⁰ The first phase, currently being initiated, involves certification of UAV operations of high-altitude, long-endurance (HALE) craft that climb and descend through restricted airspace and operate above 40,000 feet, higher than most commercial airline traffic, for long periods of time. Based on the experience with these high-altitude UAV operations, the FAA may allow UAV operations within controlled airspace above 18,000 feet and specify regulations governing type certification of UAV systems. This is expected to occur in the late FY2008 or early FY2009 time frame. Based on safety experience of these operations and technological improvements to address any identified safety concerns, the FAA may then progress to further stages or access levels, allowing UAVs to operate alongside manned aircraft at civilian airports, and intermingle with other air traffic on a more routine basis at all altitudes, in more congested airspace, and in populated areas. However, no specific time frame has been set yet, as there is still much uncertainty regarding how fast technology will improve to meet safety requirements for these types of operations. Given the intense interest in UAV technologies and the safety concerns raised by other airspace users, the FAA’s approach to regulating the safety of UAVs could be a topic of particular interest as Congress engages in debate over FAA reauthorization.

Options for Maintaining Access and Controlling Demand at Capacity-Constrained Airports

Despite progress under the FAA’s Operational Evolution Plan (OEP)—the evolving blueprint for near-term airport and airspace capacity enhancement—and the anticipated increase in effective capacity and operational efficiency envisioned under the NGATS plan, several airports throughout the United States either are already constrained by available capacity or will become capacity constrained in the coming years if future growth projections prove accurate.¹¹¹ Due to these persisting capacity limitations in certain locations, the FAA and Congress may be faced with difficult choices regarding how to best maintain access and address demand in an equitable manner at capacity constrained airports. Vision 100 provided the FAA with limited authority to implement negotiated scheduling among air carriers at a limited number of capacity-constrained airports on a trial basis. This approach, along with other options such as peak-period pricing, slots, and quota systems have all been examined as possible options. The FAA’s approach to

¹⁰⁸ John Timmerman, Federal Aviation Administration. *Unmanned Aircraft Systems: Integration Into the National Airspace System*. Presentation to Access5, July 12, 2005.

¹⁰⁹ Katherine McIntire Peters and Beth Dickey, “Droning On,” *Government Executive*, October 15, 2004, pp. 68-76.

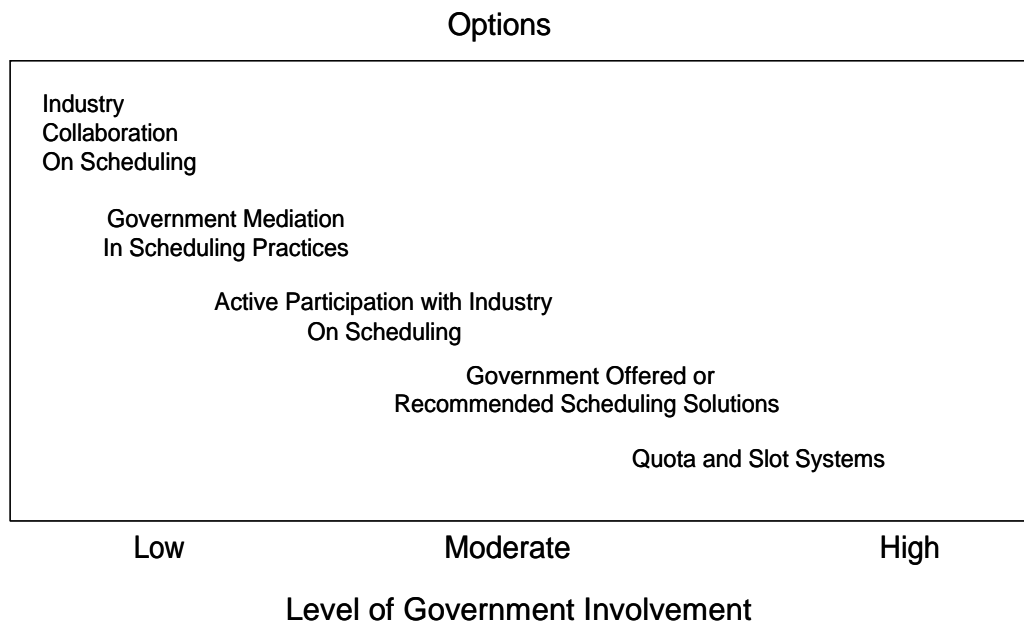
¹¹⁰ *Ibid.*

¹¹¹ Federal Aviation Administration and The MITRE Corporation, *Capacity Needs*.

addressing capacity constraints at New York’s LaGuardia Airport is likely to be an issue of particular interest during the debate over reauthorization as the statutorily imposed slot system for LaGuardia expired in January 2007.

Options under consideration vary along a continuum of government involvement (see **Figure 4**). On one end of the continuum, airlines and other operators could be left to work it out amongst themselves to define market approaches and schedules that will cause minimal delay. Although, under current antitrust laws, this is generally prohibited except in limited cases where specific exemptions have been granted, with government oversight. In some cases, there could be limited government involvement in these activities, such as having the FAA or DOT serve as a mediator during discussions of scheduling or as an observer to ensure that there is no collusion or other violation of antitrust statutes and regulations and that no specific user groups are unfairly disadvantaged in establishing schedules and access to airports. The government may take a somewhat more active role in such activities by discussing air traffic concerns over proposed schedule options, or even suggesting scheduling options based on air traffic management considerations and models of traffic flow.

Figure 4. Continuum of Government Involvement in Market-Based Strategies to Alleviate Aviation Congestion



Another way in which government could exert limited control over scheduling practices is to implement incentives for off-peak scheduling, or disincentives for operations during peak hours. Incentive programs could be accomplished through quota systems (for example, multiplying a landing or takeoff during peak hours by a weighting factor when calculating an operator’s daily or monthly quota of operations at a specified airport). Incentive programs could also be implemented by increasing or imposing fees, such as landing fees or ATC impact fees, during peak hours. More direct government involvement may involve the use of slot or quota systems where operators and air carriers are allocated limited access to certain congested airports. At the other end of the spectrum from no government involvement at all over airline scheduling practices, is government regulation of the airline industry, which was de-regulated in 1978. Since

it is likely that any proposal to re-regulate the airline industry would face strong opposition from both the airlines and consumers, such an option is not considered further.

In the current debate over alleviating congestion at major airports, a significant policy question that remains is: what degree of government involvement in airline scheduling and airport access is most likely to provide an appropriate balance between equitable and efficient access to limited airport capacity on the one hand and fair and open competition between air carriers in desirable markets on the other? Options under consideration to address this issue fall into two broad categories: (1) strategies for curtailing peak hour demand at busy airports through various incentives or disincentives, and (2) the use of slots or quotas to allocate access at capacity-constrained airports.

Non-price De-peakng Strategies and Incentives

De-peakng strategies are designed to alleviate congestion and delay at airports during peak travel times. De-peakng strategies can be implemented with varying degrees of government involvement. With a minimal level of government involvement, airlines may negotiate schedules in a manner that would reduce delay under recently passed statutes that exempt airlines from antitrust laws to allow them to hold meetings for these purposes. Specifically, Vision 100 established a collaborative decision-making trial program at two of the most capacity-constrained airports in the United States. Under the experimental program, airlines are provided special immunity from antitrust laws in order to hold collaborative discussions regarding flight scheduling in order to use air traffic capacity most effectively.¹¹²

Under this program, airlines have negotiated peak hour schedules at Chicago's O'Hare airport over the past two years with some limited success. The FAA persuaded United Airlines and American Airlines to voluntarily cut peak hour flights at O'Hare. However, there is concern that these concessions alone were not sufficient to alleviate congestion because other carriers have added peak time flights at O'Hare.¹¹³ Consequently, the FAA has been working with industry to come up with an equitable schedule arrangement for addressing congestion at O'Hare. In a recent decision, the FAA has limited the number of unscheduled operations at O'Hare to 5 per hour, but some operators have criticized this measure because they assert that it disadvantages charter operators who are no longer able to use Meigs Field—a nearby general aviation reliever airport that was closed by the city of Chicago in the spring of 2004—as well as operators who base or perform maintenance on their aircraft at O'Hare.

The process for managing schedules at O'Hare is increasingly leading the two legacy carriers who have curtailed operations to complain about losing market share to smaller low cost airlines that are expanding in the Chicago market. The ongoing frustrations in effectively managing schedule demand at O'Hare highlights the challenges of trying to do so in an equitable fashion that does not impact competition in the market. Ironically, the statutory use of slots at O'Hare was eliminated in 2002 under provisions in AIR-21 (P.L. 106-181). The current scenario at O'Hare suggests that some government intervention to control schedules at some of the nation's busiest airports may be needed in the near future. Whether this means a return to slots or some other form of regulation is likely to be an issue of considerable interest to Congress.

¹¹² See 49 U.S.C. §40129.

¹¹³ "Airline Overscheduling Still Hurting O'Hare, Controllers Say." *Aviation Daily*, July 15, 2004, pp. 1-2.

Despite the ongoing challenges with scheduling at O'Hare, there are some examples that suggest that airlines may find some instances where spreading out operations could provide business advantages by reducing operating costs. For example, a recent analysis of American Airlines de-peak efforts at three of its main hubs—Dallas-Fort Worth, Chicago-O'Hare, and Miami International—indicates that spreading flights out over the day rather than clumping them can improve operational efficiency. In reworking its schedule at Dallas-Fort Worth, American reduced daily departures by almost 10% compared to 2000 levels, but lost only 1.1% of available seats.¹¹⁴ This analysis indicates that, by de-peak operations, carriers may be able to increase productivity, make more efficient use of gates, and consolidate terminal operations. Thus, there appears to be a viable business case for de-peak operations in certain instances. Consequently, airlines may be quite willing to adopt non-price de-peak strategies that could serve a mutual benefit to both airline operations as well as FAA air traffic operations.

In cases where there are no clear cut business advantages to non-price de-peak operations and where no equitable solutions can be attained by airline industry collaboration and bargaining over flight schedules, the federal government, or more likely airport operators, may look to specific de-peak incentives such as peak hour pricing as a means to manage schedule demand. Few in the airline industry are in favor of such a system. The ATA opposes congestion pricing schemes because they argue that these mechanisms siphon off revenues from airlines and put the money in the hands of the airports, which are natural monopolies and do not have to compete in the highly competitive and price sensitive airline industry.¹¹⁵ Similarly regional airlines, and general aviation operators object to peak-hour pricing because they believe that such pricing schemes would unfairly limit access to major airports to large carriers who can pass along increased landing fees to a larger consumer base. There is concern that peak-hour pricing may further limit air service to small communities served by regional carriers who will essentially be priced out of major airports.¹¹⁶ Airport operators may also look less favorably on peak-hour pricing schemes over alternatives such as slots and quotas because a peak-hour pricing scheme is more complex to manage and may not result in meeting scheduling objectives to the extent that can be achieved by implementing slots and quotas.¹¹⁷

Slots and Quotas

Since economic deregulation of the airline industry in 1978, slots have been used at a few busy airports as a method to control airport scheduling. Under AIR-21, statutory language was enacted phasing out the use of slots largely over concerns that slots could preferentially advantage well established carriers and make it difficult for new entrant carriers to gain a foothold in certain desirable markets. Under these provisions, the only airport that continues to have a statutorily defined slot system for regulating flight schedules after January 2007 is Washington Reagan National Airport. However, with the phase out of statutory slot systems, policymakers will likely face challenges in managing demand to avoid strains on capacity that could induce congestion and increased delay. During the FAA reauthorization process, debate over slot systems for specific capacity constrained airports may arise because the statutory slot restrictions at New York's LaGuardia, as well as the authority for slot restrictions at the nearby John F. Kennedy

¹¹⁴ Steve Lott. "Redistributing hub flights saves time, dollars." *Aviation Daily*, June 16, 2004, p. 5.

¹¹⁵ "Airport Slot Auctioning 'Simulation Games' Will Pinpoint Service Disruptions." *Aviation Today*, July 19, 2004.

¹¹⁶ See CRS Report RS20914, *Aviation Congestion: Proposed Non-Air Traffic Control Remedies*, by (name redacted).

¹¹⁷ "Airport Slot Auctioning." *Aviation Today*, July 19, 2004.

International Airport, expired in January 2007, under the same provisions of AIR-21 that eliminated slots at Chicago's O'Hare airport in 2002.

In early September 2006, the FAA issued a notice of proposed rulemaking (NPRM) that would govern slot allocations at New York's LaGuardia (LGA) airport after existing slot controls expired in January 2007. The NPRM calls for several changes in the current system designed to foster more use of larger aircraft, adoption of market and lottery systems to increase LaGuardia access for air carriers currently unable to gain slots at the airport, and provisions to insure continued LaGuardia access for EAS and other small community service.¹¹⁸ The NPRM is viewed as being in sync with existing temporary slot restrictions at Chicago O'Hare airport. In December 2006, the FAA issued an order establishing temporary limits to prevent congestion-related delays at LaGuardia. While the FAA retains the authority to limit flight operations in this manner on the basis of safety, concerns over the potential that the allocation of slots could result in unintended market imbalances or may disadvantage service to small communities could prompt congressional oversight or possible legislative action on the issue of airport slot allocations.

The ATA opposes such a system largely on the belief that exceptions and variances for slots—such as those that currently exist for new entrant carriers and for flights serving small communities—undermines the purported basis of these schemes for managing operational demand at busy airports and instead melds facets of market controls that directly affect airline business practices. On the other hand, the Airport Council International—North America (ACI-NA), a trade organization representing several large airport operators, favors slot auctions over other schemes such as congestion pricing, noting that allocating slots is administratively easier to implement, and results in regular, predictable schedules with fixed numbers of flights that can be tied directly to available airport capacity. In contrast, congestion pricing schemes can be difficult to manage and may have little or no impact on congestion if they do not correctly predict market factors and demand for peak travel times that may fluctuate based on a variety of market factors.¹¹⁹

Providing Air Service to Small Communities

The Essential Air Service (EAS) program and the Small Community Air Service Development (SCASD) Program were designed to address the difficulties in obtaining and maintaining air service in small, isolated communities where access to the national air transportation system is limited.¹²⁰

The Essential Air Service Program

EAS provides subsidies directly to air carriers for providing service between selected small communities and hub airports. The program was originally established in 1978 as part of airline

¹¹⁸ Bond, David, "The FAA's demand-management plans for LaGuardia call for bigger aircraft, market-based slot turnover" *Aviation Week & Space Technology*, September 4, 2006, p. 32.

¹¹⁹ *Ibid.*

¹²⁰ The Senate Committee on Commerce, Science, and Transportation, Subcommittee on Aviation, held Hearings on Rural Air Service on September 14, 2006. Further information on current issues affecting rural air service is available at

http://commerce.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing_ID=1794.

deregulation to ensure a minimum level of air service to smaller communities that might otherwise lose service because of economic factors. In FY2006, 149 communities in the United States and its territories participated in the EAS program (39 of the communities served are in Alaska). Participation has grown in recent years.

The EAS program received \$110 million in appropriations for FY2006. This is less than the \$127 million annual level authorized in existing FAA reauthorization legislation. The EAS program has a permanent \$50 million per year appropriation dating back to 1996 (P.L. 104-264). Congress can and does appropriate additional funds for EAS, normally from Treasury general fund accounts. For FY2007 both House and Senate appropriations legislation (H.R. 5576) would fund the program at \$117 million.

The EAS program has successfully weathered attempts by several Administrations to dramatically reduce its size and otherwise change a community's eligibility to participate in the program. Most recently, as part of its FY2007 budget proposals, the Bush Administration has suggested limiting EAS funding to \$50 million and requiring local cost-sharing as a condition for a community's continued participation in the program. This proposal did not receive significant congressional consideration.

Several trends, including the continuing loss of commercial air carrier service in rural America, are making EAS more attractive to many rural communities. At the same time, even with increased funding, it is becoming increasingly difficult for the EAS program to generate additional air service. For a number of reasons commercial air service in rural America has been falling since September 11th, and this trend has continued even though air service nationally has largely returned to pre-September 11th levels. With traffic falling, air carriers have been reducing and/or eliminating service at many rural locations. Many of these locations have looked to the EAS program as a way to ensure a continuation of at least some air service. The costs of providing air services, however, have been rising due to increased fuel and other costs. Hence the finite amount of annual EAS funding cannot provide subsidy for all of the air service that many communities would desire.

Against this backdrop the EAS program faces a number of issues that are likely to be addressed in forthcoming reauthorization legislation. Primary among these is how to prioritize access to the program so that EAS funds are used in the most efficient manner possible. There already are a number of restrictions that limit where and how EAS funds may be used. By way of example, the per passenger subsidy is limited to a fixed dollar amount and services cannot be provided at destinations that are within prescribed driving distances of certain larger hub airports.¹²¹ It is likely, however, that without a significant increase in funding, Congress would face consideration of additional limitations on the use of EAS program funding.

Vision 100 included several mechanisms and incentives designed to move communities out of the standard EAS program. Communities have not sought to participate in these incentive regimes, however, suggesting that the incentives themselves need to be reconsidered if they are to be effective. Vision 100 also included a somewhat controversial provision that created a trial program that would have required community financial participation as a condition for continued access to EAS funding in some instances. (This is not entirely unlike the aforementioned Bush Administration proposal of FY2007) Each annual appropriations bill since passage of Vision 100,

¹²¹ All program restrictions on EAS are detailed in: 14 CFR 398.

however, has prevented the use of any appropriated funds to implement the cost-sharing pilot program.

Small Community Air Service Development Program

The Small Community Air Service Development (SCASD) Program was established under AIR 21 to develop solutions for improving air carrier service to communities that are experiencing insufficient access to the national air transportation system. Program funding provides direct grants to selected communities for implementing strategies to improve the availability and pricing of air service. All program grants require significant local financial or other participation. Since the program first received funding in FY2002, DOT has awarded 182 grants under this program. Although the program was authorized at \$35 million per year by Vision 100, the program has been funded by appropriations at a significantly lower level. In FY2006, for example, the program received a \$10 million appropriation, half of what it had received in the previous fiscal year.

As the program has matured the annual number of applications for new grants has dropped, although there are still more applicants than available funding. Recent testimony by the Government Accountability Office (GAO) suggests that the results of the program have been mixed but that it was too early in the program's history to determine its effectiveness.¹²²

Fostering Investment and Development of the Next Generation Air Transportation System (NGATS)

A provision in Vision 100 created the Joint Planning and Development Office (JPDO), a multi-agency entity headed by the FAA and charged with the task of conceptualizing and integrating the development of the Next Generation Air Transportation System (NGATS). The DOT envisions NGATS as a system capable of tripling effective system capacity by 2025.¹²³ By some estimates, air traffic levels throughout the United States could increase at that pace thereby necessitating these system enhancements. The JPDO has initiated operations and has made some progress toward identifying an enterprise architecture for building the NGATS since the last FAA reauthorization. The specifics of these efforts and the future funding and management challenges facing JPDO and the FAA in carrying forth the plans to build the NGATS are likely to be a major focus during the current FAA reauthorization process.

NGATS Funding Requirements

A significant issue facing Congress during the upcoming FAA reauthorization process is obtaining working estimates of what building the NGATS will cost to the federal government, at least with regard to anticipated federal spending toward developing NGATS over the next three to

¹²² U.S. Government Accountability Office. *Commercial Aviation: Programs and Options for the Federal Approach to Providing and Improving Air Service to Small Communities*. Testimony. GAO-06-398T. September 14, 2006. p. 2.

¹²³ Remarks for the Honorable Norman Y. Mineta, Secretary of Transportation. *Securing America's Place as Global Leader in Aviation's Second Century*. Aero Club of Washington, Washington, DC, January 27, 2004. U.S. Department of Transportation, Office of Public Affairs.

five years. Preliminary FAA analysis, cited in GAO testimony in July 2006, suggests that the average annualized cost for implementing NGATS would be about \$2.7 billion for NGATS facilities and equipment in constant 2005 dollars, roughly \$200 million above FY2006-enacted and FY2007-requested funding levels for the FAA's facilities and equipment (F&E) account.¹²⁴ From FY2007 through FY2025, the total anticipated cost to build NGATS facilities and equipment, using these initial estimates, is about \$50 billion in constant 2005 dollars, or \$66 billion when factoring in inflation over the development period. These estimates do not consider all the costs of the transition to NGATS because they do not take into account all of the FAA costs associated with launching NGATS, such as certification of NGATS-compliant avionics; they assume that all research and development efforts, primarily carried out to date by NASA, have been fully completed and transitioned to advanced development stages; and they do not factor in other government agency costs, such as homeland security costs to improve security technologies and military spending to ensure that military aircraft and air traffic facilities are NGATS compliant.

The DOT OIG has testified that the annual costs over the next six years for both NGATS and existing programs, would be about \$600 million above FY2007 requested funding levels in FY2008, and gradually climb to \$1 billion above the FY2007 baseline by FY2012.¹²⁵ The large differences in the GAO and DOT OIG cited estimates are likely due to the GAO's reference to cost estimates that are averaged across the entire period of NGATS development from FY2007 to FY2025, whereas the DOT OIG focused solely on near term spending through 2012. The GAO recognized that these projected system costs will trail off in future years as legacy systems are phased out and deployment of NGATS technologies are completed. However, the GAO also recognized that these estimates don't take into consideration that, by the time NGATS begins reaching maturity in the 2020 to 2025 time frame, the FAA will likely need to budget for research and development of a successor system as well as evolutionary improvements and enhancements to NGATS technologies.

Figure 5 shows the preliminary cumulative and annual cost estimates for the FAA's F&E account through 2025. These estimates are based on information provided in GAO and DOT OIG testimony to Congress based on an initial cost analysis performed by the FAA's Research, Engineering, and Development Advisory Committee (REDAC), an advisory panel that includes representatives from industry, academia and government. Whereas the GAO indicated an average annual cost increase of \$200 million above the baseline F&E funding level of \$2.5 billion in FY2005 dollars, the DOT OIG provided cost estimates through 2012 that increased to \$600 million over the initial baseline (\$2.5 billion) in FY2008, and grew to \$1 billion above the baseline by 2012. For our analysis, we applied an inflation-based increase of 2.5% annually, which is the average annual increase in the consumer price index (CPI) assumed in the most recent FAA aviation forecasts.¹²⁶ While it is recognized that some uncontrollable cost increases, particularly labor rates, may exceed these year-by-year inflationary adjustments, NGATS planners

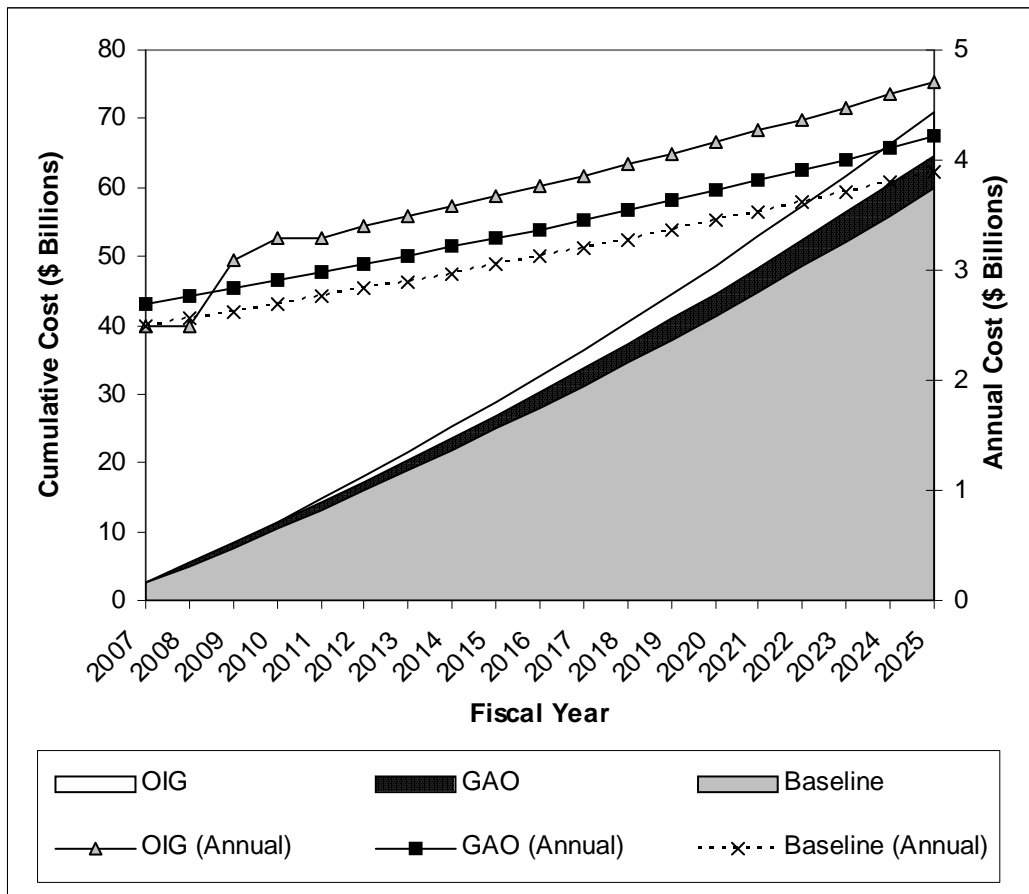
¹²⁴ Statement of Gerald L. Dillingham, Director Physical Infrastructure Issues, U.S. Government Accountability Office, Testimony Before the Subcommittee on Aviation, Committee on Commerce, Science, and Transportation, U.S. Senate, *Next Generation Air Transportation System, Preliminary Analysis of Progress and Challenges Associated with the Transformation of the National Airspace System*, July 25, 2006, GAO-06-915T.

¹²⁵ Statement of David A. Dobbs, Assistant Inspector General for Aviation and Special Program Audits, U.S. Department of Transportation, *Perspectives on the Progress and Actions Needed to Address the Next Generation Air Transportation System*, Before the Committee on Commerce, Science and Transportation, Subcommittee on Aviation, United States Senate, July 25, 2006, CC-2006-065.

¹²⁶ Federal Aviation Administration. *Aerospace Forecasts 2006-2017*.

expect that this will be offset by increased efficiencies and cost savings as the system transitions to technologies that have lower acquisition, operational, and maintenance costs. Using the 2.5% average annual increase in costs produced an overall cost estimate for F&E expenditures of almost \$69 billion. This total was roughly \$5 billion above the baseline, which assumed that current F&E spending simply kept pace with inflation at a constant rate of 2.5%. Using the DOT OIG provided estimates, and extrapolating by applying the 2.5% inflation estimate beyond 2012, yielded a total F&E spending estimate of almost \$76 billion, which is about \$12 billion over the baseline assumption.

Figure 5. Preliminary Estimates of Increased F&E Funding Needs to Support NGATS Development



Source: CRS analysis of data presented in: Statement of Gerald L. Dillingham, Director Physical Infrastructure Issues, U.S. Government Accountability Office, Testimony Before the Subcommittee on Aviation, Committee on Commerce, Science, and Transportation, U.S. Senate, *Next Generation Air Transportation System, Preliminary Analysis of Progress and Challenges Associated with the Transformation of the National Airspace System*, July 25, 2006, GAO-06-915T (GAO); and Statement of David A. Dobbs, Assistant Inspector General for Aviation and Special Program Audits, U.S. Department of Transportation, *Perspectives on the Progress and Actions Needed to Address the Next Generation Air Transportation System*, Before the Committee on Commerce, Science and Transportation, Subcommittee on Aviation, United States Senate, July 25, 2006, CC-2006-065 (OIG).

Besides F&E costs, the FAA’s REDAC also examined the future costs from a broader perspective, developing cost estimates not only for facilities and equipment, but also for research and development, operations, and airport improvements. These estimates will likely be of particular interest during the reauthorization process, as Congress attempts to establish authorized funding

levels for the various FAA accounts. Based on the REDAC initial cost estimates and the aforementioned inflationary assumptions, CRS computed estimated costs in each of the FAA accounts over the next five years (see **Table 3**).¹²⁷ The table compares these future estimates (analysis) to historic authorization and appropriations levels. However, the future year cost projections do not fully take into account any potential cost savings that may be realized and could offset inflationary adjustments, because these anticipated cost savings have not yet been fully identified in FAA planning documents. While the FAA anticipates future year cost savings through various initiatives, the full amount of these projected costs savings is still uncertain.

The uncertainty in these projections, due both to uncertainty about cost saving initiatives and uncertainty over NGATS funding needs, makes this funding authorization particularly challenging. Setting authorization levels will likely be regarded as a particularly important element of pending reauthorization legislation. Setting appropriate funding levels over the next several years to support NGATS development might prove particularly challenging given relatively high levels of uncertainty in the schedule for deploying NGATS technologies. While large increases to funding may be needed, FAA may have difficulty obligating these additional funds efficiently until the system enterprise architecture and schedule for NGATS development more fully mature.

Table 3. Authorized, Appropriated Funding Levels and Analysis of Future Funding Needs for FAA Programs

(\$ in billions)

Program	2004	2005	2006	2007	2008	2009	2010	2011
O&M								
Vision 100:	7.6	7.7	7.9	8.0	8.7	8.9	9.2	9.4
Appropriations:	7.5	7.7	8.1	8.5				
Analysis:								
F&E								
Vision 100:	3.2	3.0	3.0	3.1	2.8	2.9	2.9	3.0
Appropriations:	2.9	2.5	2.5	2.7	2.5	3.1	3.3	3.3
Analysis: (GAO)* (OIG)				2.5				
AIP								
Vision 100:	3.4	3.5	3.6	3.7	3.7	3.8	3.9	4.0
Appropriations:	3.4	3.5	3.6	3.6				
Analysis:								
R, E, &D								
Vision 100:	0.3	0.4	0.4	0.4	0.7	0.7	0.8	0.8
Appropriations:	0.1	0.1	0.1	0.7				
Analysis: (GAO)*								

Source: Vision 100; Appropriations Acts and Conference Reports; and CRS analysis of cost projections presented in: Statement of Gerald L. Dillingham, U.S. Government Accountability Office, Director Physical Infrastructure Issues, Testimony Before the Subcommittee on Aviation, Committee on Commerce, Science, and Transportation, U.S. Senate, *Next Generation Air Transportation System, Preliminary Analysis of Progress and Challenges Associated with the Transformation of the National Airspace System*, July 25,

¹²⁷ The CRS methodology used an inflationary adjustment of 2.5% per year for deriving cost estimates for future fiscal years that were not provided in cited sources.

2006, GAO-06-915T (GAO) ; and Statement of David A. Dobbs, Assistant Inspector General for Aviation and Special Program Audits, U.S. Department of Transportation, *Perspectives on the Progress and Actions Needed to Address the Next Generation Air Transportation System*, Before the Committee on Commerce, Science and Transportation, Subcommittee on Aviation, United States Senate, July 25, 2006, CC-2006-065 (OIG), and FAA appropriations data. *GAO estimates only provided average annual costs in 2005 dollars, however, the CRS analysis applies a 2.5% annual increase to these cost estimates. O&M = Operations and Maintenance; F&E = Facilities and Equipment; AIP = Airport Improvement Program; and R, E, & D = Research, Engineering, and Development. See text.

Management of the NGATS Development Effort

Another significant issue that may be addressed during the reauthorization process is how to best manage the NGATS development. A variety of issues may arise during the reauthorization debate, including

- Whether sufficient progress on the NGATS effort has been made to date, and whether it is anticipated that NGATS plans can stay on schedule;
- Whether metrics to sufficiently define and monitor progress in the development of NGATS are available and can be adequately defined and measured;
- Whether timelines and milestones to reach NGATS objectives by 2025 need to be more explicitly defined through legislation;
- Whether the Joint Planning and Development Office (JPDO), the organization charged with overseeing and integrating the NGATS project, has sufficient access and input into the budgeting and acquisition processes at the various agencies involved, including the FAA, NASA, and others;
- Whether the scope of the NGATS project is too broadly defined by considering security and environmental issues and defining air travel from airport curbside to airport curbside, and therefore should be narrowed to focus more intensively on the safe and efficient flow of aircraft (rather than passengers in the system); and
- Whether the JPDO has sufficient staffing to monitor the NGATS system integration, or whether the use of a systems integration contractor to oversee and integrate the NGATS project is needed;

To further examine these issues, the role of the JPDO, as set forth in Vision 100, and the JPDOs approach to defining and carrying out this role is considered in additional detail.

The Role of the Joint Planning and Development Office (JPDO)

Vision 100 included a mandate to establish the JPDO as a multi-agency entity led by the FAA. Vision 100 charged the JPDO with the tasks of establishing the enterprise architecture or blueprint for the NGATS and providing overarching leadership and direction to ensure interagency cooperation and collaboration with industry to bring the NGATS vision to its fruition.

In 2005, the National Research Council (NRC) issued a critical review of the JPDO, raising concerns that the JPDO was not sufficiently focused on its primary objective: to resolve demand issues and increase capacity in the NAS.¹²⁸ Among its recommendations, the NRC suggested that the JPDO restructure to become more product-focused on solutions for airport operations, terminal area operations, and en route and oceanic operations. The JPDO has elected to largely ignore this advice and continue along its more broadly defined issue-focused program areas, because it believes that the technical challenges facing the development of the NGATS are cross-cutting in nature and cannot be easily segmented by the operational areas identified by the NRC, which are based on the current segmentation of airspace and air traffic operations and do not necessarily fit well in the future NGATS architecture.¹²⁹

While the JPDO's position is seen as reasonable by some in light of the complexity and synergy of the issues facing NGATS development, the NRC also voiced concerns that the various integrated product teams (IPTs) "...are functioning primarily as experts in specific disciplines rather than as cross-functional, integrated, multidisciplinary teams organized to deliver specific products that will improve operational capabilities of the air transportation system."¹³⁰ The ability of the JPDO to identify and fully exploit multidisciplinary synergies by bringing together multiple government agencies and aviation stakeholders under a unified umbrella structure is an underlying central issue in assessing the JPDO's overall effectiveness in developing and executing the NGATS enterprise architecture. On this issue, GAO's preliminary analysis of the JPDO was much more favorable than that of the NRC. The GAO found that JPDO is implementing several best-practices to foster collaboration among federal agencies, but recognized that the JPDO faces ongoing challenges in defining a common objective, establishing and reinforcing common strategies, and effectively leveraging multi-agency resources.¹³¹

One major hurdle is that while the JPDO can set objectives, goals, and strategies for the NGATS framework, the funding stream for carrying out these plans will ultimately come from the budgets of the various agencies involved, primarily the FAA and NASA. As a planning and coordination entity, the JPDO does not have authority over the funding, personnel, and resources needed to ultimately implement the NGATS plan. In recognition of this fact, Congress may examine options to align budget elements of the various agencies involved within the NGATS framework.

Another potential issue is the appropriate scope of the JPDO's efforts. The GAO noted that "JPDO's scope is broader than traditional ATC modernization in that it is 'airport curb to airport curb,' encompassing such issues as security screening and environmental concerns. The broad scope could be either a benefit or a hindrance to the JPDO as it lays out the NGATS blueprint. While some consideration of various ancillary functions and issues—such as security and environmental impacts—may improve the overall system design for the NGATS, too much

¹²⁸ National Research Council, *Technology Pathways: Assessing the Integrated Plan for a Next Generation Air Transportation System*, Washington, DC: The National Academies Press, 2005.

¹²⁹ See U.S. Government Accountability Office, *Next Generation Air Transportation System: Preliminary Analysis of the Joint Planning and Development Office's Planning, Progress, and Challenges*, Statement of Gerald L. Dillingham, Director, Physical Infrastructure Issues, Before the Subcommittee on Space and Aeronautics, Committee on Science, House of Representatives, GAO-06-574T, March 29, 2006, p. 7-8.

¹³⁰ *Ibid.*, p. 1-2.

¹³¹ U.S. Government Accountability Office. Statement of Gerald L. Dillingham, Director Physical Infrastructure Issues, Testimony Before the Subcommittee on Aviation, Committee on Commerce, Science, and Transportation, U.S. Senate, *Next Generation Air Transportation System, Preliminary Analysis of Progress and Challenges Associated with the Transformation of the National Airspace System*, July 25, 2006, GAO-06-915T.

emphasis on these issues could impede progress on the central issue of improving the efficiency and capacity of the air traffic system. During the FAA reauthorization, the scope of the JPDO's portfolio may be an issue of considerable interest.

Besides the scope of the JPDO's efforts, another issue of interest is the JPDO's approach. Some observers have claimed that the JPDO's process has been too driven by issues or areas of interest and not enough attention has yet been paid to specific goal-directed products and processes.¹³² In general, some observers contend that the JPDO has remained too focused on policy and establishing a paradigm for collaboration among agencies and stakeholders, and it has not yet translated these general objectives into a cohesive blueprint, with a high degree of engineering specification regarding timelines and contingencies among the various component elements of the NGATS. Some have expressed concern that what the JPDO has achieved thus far appears to be little more than a general conceptual framework for the NGATS. While this general framework conforms to what most experts believe is the most appropriate approach to developing the NGATS, the lack of specificity and detail in what has been developed thus far is concerning to some.¹³³ In this view, while the JPDO has only been in existence for little more than two years, there is a pressing need to develop an enterprise architecture of sufficient specificity in the near future, so that new initiative and programs needed to support the NGATS development are adequately reflected in congressional authorization and appropriations legislation and NGATS development can proceed on schedule to meet the 2025 target completion date. One possible option for streamlining NGATS system development is the use of an overarching lead systems integration (LSI) contract for overseeing the NGATS project.¹³⁴ During the FAA reauthorization process, Congress may debate the merits of this approach and may discuss other options to improve the technical management of the NGATS initiative.

Further, the JPDO's ability to coordinate and align budgetary objectives and research and engineering and acquisition processes across multiple agencies is a daunting challenge. Vision 100 charged the JPDO with this specific task. However, a DOT OIG initial review of the JPDO's progress toward establishing mechanisms to carry out this requirement found that information on the JPDO's progress, summarized in its March 2006 progress report to Congress, lacks sufficient detail to identify how the JPDO expects to leverage research projects and funding at FAA and among the other agencies involved in the NGATS development to ensure that they are coordinated and avoid duplication of effort. The DOT OIG asserted that "[w]ithout this information, it is difficult to assess progress with alignment of budgets."¹³⁵ Such information is likely to be considered critical to Congress for setting both authorization levels and annual appropriations amounts for NGATS-related research and acquisition programs. Therefore, Congress may consider various options to improve the interagency coordination of budgetary alignment and improve the transparency of this information for relevant congressional committees. One option may be to require specific budgetary alignment reporting for NGATS-related efforts across the various agencies represented in the JPDO. Under such a scheme,

¹³² See, especially, National Research Council, *Technology Pathways*.

¹³³ Kerry Lynch, "A Look Into the Future: Are We Ready?," *Business & Commercial Aviation*, July 2005.

¹³⁴ U.S. Government Accountability Office. Statement of Gerald L. Dillingham, Director Physical Infrastructure Issues, Testimony Before the Subcommittee on Aviation, Committee on Commerce, Science, and Transportation, U.S. Senate, Next Generation Air Transportation System.

¹³⁵ Department of Transportation, Office of Inspector General. Statement of David A. Dobbs, Assistant Inspector General for Aviation and Special Program Audits, U.S. Department of Transportation, *Perspectives on the Progress and Actions Needed to Address the Next Generation Air Transportation System*, Before the Committee on Commerce, Science and Transportation, Subcommittee on Aviation, United States Senate, July 25, 2006, CC-2006-065.

agencies may be required to provide matrices or other supporting information, indicating how specific programs and projects align with NGATS objectives and how these efforts interface with initiatives being carried out by other agencies involved in the NGATS development.

While many questions still remain regarding the management approach to developing NGATS, there is a growing consensus among experts in the field regarding the technological objectives and likely technologies that will comprise the core functionality of the NGATS system. These technological objectives and core technologies, discussed in various JPDO planning documents including its draft concept of operations,¹³⁶ are described in further detail below. Because this discussion introduces a large number of new technical terms and acronyms, a brief glossary of key terms is provided in **Appendix**.

Technological Objectives and Core Technologies

The NGATS is likely to address capacity needs in the national airspace system largely through the deployment of new technologies. The technological objectives of the NGATS are designed to allow for a greater volume of traffic to flow through the system without compromising safety, and when feasible, improving safety as well as efficiency. The core technologies needed to meet these objectives include (1) precision navigation capabilities to pinpoint aircraft locations, project flight paths or flight trajectories, and predict future aircraft positions with a high degree of accuracy; and (2) highly integrated information networks to enable a shared situation awareness regarding traffic, weather, airport conditions, and other factors affecting flights and provide tools to facilitate distributed, adaptive decision-making and information-sharing about operational changes, such as flight path deviations and their potential impacts on other system users.

The working operational concept for NGATS incorporates a variety of new technologies and approaches to air traffic management (ATM) and communications, navigation, and surveillance (CNS) of air traffic. The technological objectives, as defined by the JPDO, include:

- Trajectory-based operations that will provide for system wide coordination of flight path trajectories among airspace users;
- Performance-based operations and services that will be defined based on performance capabilities for aircraft equipage rather than specific technologies and will align air traffic services with aircraft performance capabilities in terms of precision navigation, communications capabilities, etc.;
- Collaborative traffic flow management solutions incorporating automation and decision support capabilities that will be integrated across the entire air traffic system;
- Flexible and dynamic allocation of airspace to users to maximize efficiency and airspace utilization;
- Reduced separation of aircraft that exploits enhanced capabilities of performance-based navigation capabilities and automation support; and

¹³⁶ Joint Planning and Development Office, *Concept of Operations for the Next Generation Air Transportation System*, Draft Version 0.2, July 24, 2006.

- Enhanced weather forecasting and decision support tools that integrate strategic and tactical weather planning on a system-wide basis.¹³⁷

Technological approaches identified by the JPDO to meet these goals include a network-centric infrastructure for system-wide information sharing and airborne data communications, and platforms for shared situation awareness of weather, precision navigation, air traffic, and flight plan data. CRS has identified two core technological underpinnings likely to be central elements of the NGATS that roughly parallel these approaches: (1) precision navigation capabilities, and (2) shared situation awareness and distributed, adaptive decision-making. Technologies to meet these specific technological objectives are maturing, and strategies for investment in these technologies are likely to be an area of specific interest for Congress in the upcoming FAA reauthorization process.

The investment strategy for these technologies that is adopted and carried forth over the next three to five years is likely to have a lasting impact on both the end-state of NGATS and the path to reaching that end state. Therefore, these investment decisions have been a considerable focus within the FAA, are already making their way into the appropriations process, and are likely to be an area of considerable interest during the reauthorization debate. Debate and consideration of these technology investments may include consideration of the appropriate selection of technologies, transition plans, support for legacy air traffic technologies and systems, selection of reliable backup systems and procedures, and additional research and development needs to integrate and synthesize emerging and maturing technologies to achieve the NGATS objectives. To put these issues into perspective, the following discussion provides a brief examination of the stated technological objectives and core technologies under consideration to meet these objectives. To contrast these proposed technologies and operational procedures envisioned under NGATS to the current national airspace system (NAS), the following discussion provides a brief synopsis of operations in the present-day NAS.

The Present-Day Airspace System and Its Technologies

To understand the manner in which the NGATS plan would transform the existing airspace system, a basic understanding of the present-day airspace system is needed. The present-day national airspace system consists of a network of en route airways or highways in the sky interconnected by ground-based navigation facilities that emit directional signals that aircraft track. Limits on the transmission distances of these signals prevent aircraft from flying direct routes on long distance flights and limit the utilization of airspace to predefined routes where aircraft can reliably transition from one navigational signal to the next. In the terminal environment, near busy airports and metropolitan areas, aircraft follow arrival and departure routes by tracking ground-based navigational signals, much like navigation during the en route phase of flight, or by following the instructions of air traffic controllers, often referred to as receiving radar vectors.

Surveillance and separation of aircraft, both en route and in terminal airspace, is largely provided by an extensive network of radar sites, and air traffic controllers who are directly responsible for ensuring adequate separation between aircraft receiving radar services. Maintaining this separation is achieved through extensive use of voice communications between controllers and pilots over open two-way radio frequencies. Under this system, controller workload, radio

¹³⁷ Joint Planning and Development Office, *Concept of Operations*.

frequency voice-communication congestion, and the coverage and accuracy of ground-based navigational signals impose practical limitations on the capacity and throughput of aircraft in the system, particularly in busy terminal areas near major airports and around certain choke-points in the en route airway infrastructure, where many flight paths converge. Strict adherence to standardized navigation procedures may reduce controller workload and communications demands and expand capacity to some degree, but this too has practical limitations, mostly related to the relatively low level of precision available from the current ground-based navigation infrastructure and the relatively imprecise methods currently available for coordinating, tracking, and monitoring flight plans and intentions. Experts largely concur that achieving the NGATS goal of tripling system capacity by 2025 would be extremely difficult, if not impossible, using existing infrastructure, technologies, and operational procedures that evolved from concepts and technologies developed in the 1950s and are being pushed to their practical limits in certain highly congested sectors of airspace and near the busiest airports by current level system demand. Therefore, most observers envision that the NGATS will consist of revolutionary systems concepts for air traffic management (ATM), and communication, navigation, and surveillance (CNS) that rely on satellite-based navigation capabilities; technological advances in digital voice and data communications; shared, distributed, information technology architectures; and advanced automation and decision-aiding tools. These functional capabilities can be grouped into two broad operational concepts—precision navigation, and shared situation awareness and distributed, adaptive, decision-making.

Precision Navigation

One core element of the future airspace system is precision navigation capabilities that can pinpoint the location of aircraft with much greater precision than existing ground-based navigational aids, and provide for much greater accuracy and reduced uncertainty regarding aircraft flight plans and trajectories.

The FAA's approach to defining the navigational requirements of the future airspace system has been to set forth a policy defining performance-based requirements specifying a certain level of navigational accuracy required to participate in certain types of flight operations, rather than identifying specific technologies or navigational equipment standards or requirements.¹³⁸ While these performance requirements are just being established, they are likely to form a framework for minimum requirements to operate to and from the nation's busiest airports and terminal areas and in high-altitude airspace. While the FAA's objective is to define performance requirements in operational terms, rather than tying them to any specific technology or technical capability, it is widely agreed that, at least in the near term, satellite-based navigation, relying on systems such as the Global Positioning System (GPS), will likely become the primary means for navigation under the NGATS concept.

Satellite-Based Navigation

Since it is widely held that the GPS will initially serve as a primary means for navigating in the future airspace system, many experts regard the evolution to the NGATS with regard to navigation systems to involve a shift away from ground-based navigation transmitter stations to

¹³⁸ See Federal Aviation Administration. *Roadmap for Performance-Based Navigation: Evolution for Area Navigation (RNAV) and Required Navigation Performance (RNP) Capabilities 2006-2025*. July 2006, Version 2.0.

primary reliance on satellite systems such as GPS. GPS consists of a constellation of satellites that transmit precise timing signals used to compute highly accurate position and time information. GPS is already used for a wide variety of applications, including aviation navigation.

While Russia maintains a smaller, less capable, satellite navigation system called GLONASS, short for the Global Navigation Satellite System, and the European Union is working on a constellation of navigation satellites called Galileo, which is expected to be completed around 2010, GPS is currently the only fully operational satellite navigation system that provides accurate and reliable worldwide coverage. Although GPS is currently the only system that can fully meet the FAA's performance expectations for future navigation requirements, the FAA is not framing operator requirements for navigational systems in terms of specific technologies like GPS, but rather has established a policy of setting performance-based criteria for navigation systems that may, in the future be met by other satellite-based systems besides GPS, or novel navigation technologies that have not even been conceptualized yet.

Nonetheless, the federal government has invested heavily in GPS and it is generally viewed as the primary means for precision navigation for the foreseeable future. The military has committed to fully deploying the next generation of GPS satellites to further improve the systems accuracy and reliability. Recognizing the growing performance requirements for high precision navigation capabilities among aviation system users, the FAA has also invested heavily on an auxiliary system to augment GPS signals known as the Wide Area Augmentation System or WAAS. The FAA has spent nearly \$3 billion over the past 10 years to achieve initial operating capability of WAAS, which is comprised of 25 ground-based reference sites, two master stations, and two geostationary satellites.¹³⁹ WAAS improves the accuracy of GPS position information using its array of ground-based reference stations to monitor GPS satellite signals and apply corrections to compensate for signal errors such as errors due to normal atmospheric variations. These signal compensations computed by the array of ground based receiver stations are continuously beamed to two geostationary satellites that, in turn, transmit these corrections to any WAAS-enabled GPS unit, including aircraft with WAAS-enabled GPS navigation systems. WAAS-enabled avionics improve position accuracy from about 20 meters to within 1.5 to 2 meters both horizontally and vertically.¹⁴⁰ Factoring in a margin of safety, the FAA certifies WAAS-enabled GPS avionics to provide guaranteed accuracy of 50 meters vertically and 40 meters horizontally.¹⁴¹

The WAAS system began initial operations in July 2003. In March 2006, the FAA began approving instrument approaches to airports for aircraft with certified WAAS-enabled GPS avionics allowing qualified users to descend to 200 feet above the ground in instrument weather conditions, matching the capability currently provided by instrument landing systems (ILS) and standard ILS approach procedures. The FAA has also been looking to develop a more precise Local Area Augmentation System (LAAS) that may enable precision landings using satellite-based navigation during very low visibility operations at selected airports. While WAAS is operationally available and the FAA has expressed its commitment to the WAAS program, there are still questions regarding the future of LAAS. Issues regarding LAAS include whether the improvement in navigational accuracy of current LAAS systems over WAAS is enough to justify their cost, and whether the relatively small user base for highly precise instrument landing capabilities needs LAAS, or if it can adequately be served by existing high precision (Category II

¹³⁹ John Croft, "More WAAS, less LAAS," *Professional Pilot*, April 2003, pp. 60-64.

¹⁴⁰ Federal Aviation Administration. *Wide Area Augmentation System*. HQ-021306.psd.

¹⁴¹ John Croft, "More WAAS, less LAAS."

and III) ILS systems. The FAA's continued investment strategy to support WAAS and its plans for LAAS may be a particular issue of interest for Congress during the FAA reauthorization process.

Performance-Based Navigation: Required Navigational Performance (RNP) and Area Navigation (RNAV)

Besides precision approach capabilities, the FAA considers WAAS to be an enabler of specific performance-based navigational procedures in the national airspace system.¹⁴² Two key operational concepts for precision navigation are area navigation (RNAV), and required navigation performance (RNP). Required navigational performance (RNP) is a performance standard that defines the required position accuracy needed to keep the aircraft within a specified containment area, or bubble, 99.9% of the time. The required navigational performance is not tied to any specific technology, but sets a technical standard that can be met using various FAA-approved equipment. While precision satellite-based navigation is currently the principal technology for meeting RNP standards, these standards allow for the use of other technologies—including yet to be developed technologies—to meet navigational performance standards. RNAV is also a navigational performance standard for aircraft that provides a specific capability to establish very accurate waypoints, or specific navigational reference points, that can be positioned anywhere in the airspace system, thus eliminating the need to define airways and terminal arrival and departure procedures in references to specific ground-based navigational stations. The RNAV concept has been around since the 1970s, and has historically relied on ground-based navigational stations and distance measuring equipment (DME) to navigate using more direct routing. At present, the primary aircraft technology being utilized to meet these performance requirements is WAAS-enabled GPS, with DME considered by many to be a viable backup, or secondary means to determine aircraft position and accurately follow precise flight routes in cases of equipment outages or disruption of satellite-based navigational services.

Over the next five to ten years, the FAA anticipates issuing mandates for RNP at the busiest airports and in high altitude airspace. In the 2016 to 2025 time frame, system wide mandates for performance-based navigation capabilities are expected to meet anticipated interoperability requirements for the NGATS and to respond to a gradual phase-out of the current ground-based navigational infrastructure. While the specific levels of navigation performance for various segments of airspace and operations are yet to be determined, it is likely that relatively precise means of navigation will be required for users of high altitude airspace and busy en route corridors and when operating to and from large commercial airports and busy general aviation airports in highly congested terminal areas, sometimes referred to as “super-density airports” and “super-density operations.”

While meeting precision navigation performance requirements will likely involve equipping aircraft with precision WAAS-enabled GPS systems as a primary means of navigation, questions remain regarding reliable backup navigation capabilities, as well as specific details regarding what levels of performance will be required for specific classes of airspace and types of operations.

¹⁴² *Ibid.*

Shared Situation Awareness and Distributed, Adaptive Decision Making

The present-day air traffic system is characterized by extensive reliance on an elaborate network of radar sites to track air traffic. Radar data provide air traffic controllers with a reliable means of air traffic surveillance. A rigid set of protocols and procedures delineating controller and pilot responsibilities has been established to maintain a high level of operational safety in the existing airspace system. However, because the existing system is heavily dependent on direct controller surveillance of air traffic and structured voice communications between controllers and pilots, airspace capacity is constrained to a large degree by controller workload limitations. Present day capacity is also constrained by large air traffic separation requirements that are considered necessary in the current operating environment based on current technology capabilities and controller workload considerations.

The working concept for the NGATS envisions a system in which air traffic surveillance and separation of aircraft will become more of a shared responsibility between air navigation service provider personnel, such as air traffic controllers and air traffic managers and planners, and system users.¹⁴³ A key technological objective needed to support this concept is to establish a data network that provides a scalable, shared information data repository for system users and service providers, referred to as shared situational awareness services. Elements of the shared situation awareness data repository would likely include elements such as dynamic weather information, air traffic surveillance, flight plans and flight trajectories, air traffic control clearances, and aeronautical information such as airport and airspace conditions and restrictions. Service providers and users would be able to tap into these data repositories at scalable levels of detail. For example, pilots might receive information—such as weather, traffic, and airport and airspace conditions—pertinent to their own aircraft’s flight, while an air traffic controller might receive information and analysis of data pertinent to a specific sector of airspace, and an air traffic manager or system planner might receive data on a more global scale that might provide information and analysis of traffic flows, weather conditions, and other factors that may impact system flow across an entire day of operations.

One key element of achieving such a capability is a reliable air-ground data network that can provide system data to airborne aircraft and receive critical information, such as precision navigation positioning and trajectories, from these aircraft. The primary candidate system to fill such a role is a system called ADS-B, which stands for Automatic Dependent Surveillance - Broadcast.

Automatic Dependent Surveillance - Broadcast (ADS-B)

ADS-B is a technology that is just being introduced to aviation system users, but is expected by many to become the backbone of future aircraft surveillance capabilities, perhaps replacing radar facilities across much of the country. ADS-B relies on GPS or other precision navigation signals to pinpoint aircraft position, and works by automatically broadcasting that position information along with a unique aircraft identifier, and other information—such as the aircraft speed and whether it is turning, climbing, or descending—from aircraft equipped with ADS-B out

¹⁴³ Joint Planning and Development Office. *Concept of Operations*.

capability.¹⁴⁴ These broadcasts can be picked up by ground stations and by aircraft equipped with ADS-B capable receiver equipment. In the United States, the FAA intends to operate ADS-B as a dual frequency broadcast, transmitting aircraft data on the 1090 MHz spectrum band, compatible with commercial aircraft Mode-S transponders, and on the 978 MHz spectrum band for general aviation aircraft, to conform to Universal Access Transceiver (UAT) equipment standards.¹⁴⁵

The FAA regards ADS-B as the backbone of the NGATS and, in 2006, expressed high level support for moving forward with plans to expand ADS-B availability and usage and, ultimately, to transition to a system that uses ADS-B instead of radar as the primary means for air traffic surveillance.¹⁴⁶ The benefits of ADS-B include the potential large-scale cost savings of replacing multi-million-dollar radar systems with ground-based transceivers that cost less than \$200,000 to purchase; more accurate tracking than radar which may allow reduced aircraft spacing; and anticipated safety improvements by providing pilots and controllers with shared situation awareness, allowing them to see the same real-time displays of air traffic. By establishing a datalink communication platform, ADS-B also provides a means to receive weather and flight information, such as temporary flight restrictions, that can be graphically presented on cockpit displays. These datalink services also may greatly improve pilot situation awareness by providing accurate, real-time weather information and critical flight information in the cockpit.

Virtually all aviation system users support the transition to ADS-B surveillance, with the general caveat that costs imposed on system users be carefully controlled. The ATA asserts that while the technology is promising, its ultimate feasibility should be determined through detailed assessments of all costs and benefits to both system users and the FAA. The AOPA, representing mostly small general aviation aircraft owners and operators, has stressed that the costs to these users be kept as low as possible. The AOPA has proposed that the present cost of transponder equipment—the avionics needed to interface to the current radar surveillance capabilities of the NAS—be used as a benchmark or target price point for the minimum equipment requirements to operate in a future airspace system based on ADS-B surveillance.¹⁴⁷ AOPA also believes that a 10-year transition before such equipment would become mandatory for all users would be a reasonable time frame to minimize the impact of compliance on users, and stresses that providing free access to datalink traffic, weather, and essential flight information can greatly enhance the objective of providing enhanced situation awareness to improve flight safety.¹⁴⁸

The FAA has requested \$80 million for FY2007 to begin initial full-scale ADS-B national implementation. Some degree of ADS-B infrastructure, which was deployed under ADS-B research and development initiatives conducted under the Safe Flight 21 program, already exists in Alaska and along the east coast. The FAA also has plans to deploy ADS-B in the Gulf of Mexico starting next year to provide flight surveillance in areas where radar coverage is

¹⁴⁴ ADS-B out capability refers to a basic level of ADS-B functionality that only broadcasts outbound transmissions of aircraft position, tracking, and identification information. ADS-B in refers to an enhanced ADS-B capability that involves receiving air traffic data from either other aircraft, ground stations, or some combination of these two sources.

¹⁴⁵ Federal Aviation Administration. *Fact Sheet: Automated Dependent Surveillance - Broadcast (ADS-B)*, Washington, DC, May 2, 2006; David Hughes, “Dawn of ADS-B,” *Aviation Week and Space Technology*, May 8, 2006, p. 37.

¹⁴⁶ See Federal Aviation Administration. *Fact Sheet: Automated Dependent Surveillance - Broadcast (ADS-B)*, Washington, DC, May 2, 2006.

¹⁴⁷ David Hughes, “Dawn of ADS-B.”

¹⁴⁸ See Phil Boyer, “President’s Position: ADS-B,” AOPA Pilot, January 2006.

limited.¹⁴⁹ Vision 100 authorized the expenditure of such sums as may be necessary to improve air traffic services in the Gulf of Mexico, and the FAA has plans to deploy ADS-B ground stations on oil rigs in the gulf to meet this mandate. This provision will most directly benefit helicopter operations that support the large offshore oil industry, but may also benefit smaller aircraft operating below 18,000 feet over the Gulf and high altitude commercial flights operating over the Gulf. The program is also expected to improve aerial surveillance in the Gulf for national security and law enforcement purposes.

During reauthorization, the FAA's plan for deploying and supporting the network of ADS-B sites is likely to be of considerable interest to Congress. Particular issues of interest include the anticipated time frame for transition to ADS-B and how regulatory mandates for ADS-B equipage may impact system users. Also of particular interest are the FAA's plans to ensure availability and reliability of the ADS-B system, and selection of a reliable backup system to maintain adequate levels of situation awareness in instances of ADS-B equipment failures.

System Wide Information Management (SWIM)

Besides airborne datalink capabilities provided by ADS-B, the FAA envisions an extensive data network to share operational information, such as flight plans, flight trajectories, weather, airport conditions, and temporary airspace restrictions. The FAA refers to the various protocols and technologies to enable this data sharing as the System Wide Information Management (SWIM). While the SWIM framework has only been recently conceptualized, the FAA has indicated that the SWIM infrastructure will be designed to use commercially available equipment and will be implemented based on accepted industry standards and practices.¹⁵⁰ The SWIM network architecture is intended to create a seamless infrastructure, similar to the World Wide Web, allowing users to readily access needed data they are authorized to receive, replacing currently cumbersome and non-integrated databases and communications protocols.

Some key issues regarding SWIM include how to determine which users will have access to what data; what measures will be put in place to ensure data availability and continuity of service; and how robust security measures will be integrated into the system architecture to ensure data integrity and prevent any denial of service or unauthorized use. Another key issue is what types of interfaces and interoperability will exist between ADS-B and SWIM and how each of these specific technologies fit into the overall enterprise and system architectures for NGATS. While these questions are mostly of a highly technical nature, Congress may be particularly interested in assessing how the FAA will leverage the work of others—such as military net-centric architectures and corporate internet service-provider networks—to develop a robust systems architecture for SWIM.

Phasing Out Legacy Systems

As the FAA and the JPDO move forward with implementing the NGATS and associated technologies, a challenging and potentially contentious issue is the phasing out of existing facilities and equipment for air traffic communications, navigation, and surveillance. Phasing out of existing systems must be addressed carefully because, on the one hand, maintaining legacy

¹⁴⁹ David Hughes, "Dawn of ADS-B."

¹⁵⁰ Federal Aviation Administration. Fact Sheet: System-Wide Information Management (SWIM).

systems while deploying new technologies can be costly and resource intensive. On the other hand, phasing these systems out too quickly could place an undue burden on system users to equip aircraft and could pose safety concerns if adequate backups and redundancies are not in place.

With regard to navigation infrastructure, the shift to satellite-based navigation will likely result in significant reductions in ground-based navigational facilities, which will ultimately translate into cost savings to the FAA by greatly reducing maintenance and sustainment costs for these facilities. To accommodate users as they slowly transition to satellite-based navigation, these phase-outs will likely be gradual, but nonetheless significant over the next fifteen years.

Non-directional beacons (NDBs), used primarily for non-precision approaches to smaller airports and as additional position references for some precision approaches and en route navigation, are already being phased out and will mostly be fully decommissioned over the next ten years.

Current plans also call for the gradual phase-down of ground-based very-high frequency omnirange (VOR) transmitter sites, the backbone of the current federal airway system, starting in 2010. The transition plan calls for an initial reduction of about 30% of the VORs in the United States by 2012, with a further reduction to about half of the current number by 2020, to maintain a minimum operating network to support airspace users that are not equipped with GPS, and to provide an interim backup capability for those users that are GPS equipped. While VOR sites will likely be phased down from current levels, distance measuring equipment (DME) transmitters are viewed as a potentially viable navigational backup to GPS, giving aircraft less precise RNAV capability in the event of a disruption to GPS signals. Such disruption could occur for a variety of reasons, from equipment malfunctions to intentional jamming. Therefore, DME sites may fill an important backup role in the NGATS, although final determinations regarding backup requirements and how they will be met have not yet been finalized.

Plans also call for a gradual phase-down of standard (Category I) instrument landing system (ILS) systems and approaches for airport runways starting in 2015. Advanced ILS equipment that provide lower landing minimums for operations in very poor visibility (Category II and Category III ILS systems) are not planned to be phased out, however. These approaches require special avionics and special flight crew qualifications. These facilities will continue to serve a relatively small user community that require these services, mostly consisting of large commercial aircraft operators. The FAA is continuing to evaluate whether LAAS can provide navigation performance and reliability equivalent to these advanced ILS systems.

Besides navigational facilities, the decommissioning of radar facilities, especially long-range radar, may become a future option if ADS-B is to be used as the primary means for aircraft surveillance in the NGATS. However, one significant weakness of ADS-B in comparison to radar is that it is completely dependent on aircraft-based systems to transmit position data to ground stations and other aircraft. Equipment or power failures on the aircraft could make an aircraft completely invisible to other aircraft and to air traffic controllers. By contrast, radars would at least give controllers the ability to see the aircraft's primary target generated by radar reflections off of an aircraft's skin. A loss of this capability without some backup means to identify aircraft could have implications for safety as well as for airspace security. One option being discussed is to keep terminal radars in place around busy airports as backup for safety reasons and maintain radar coverage near major cities and other potential terrorist targets for airspace security purposes. Under such a plan, many long-range radar sites that provide coverage on en route traffic may be decommissioned. For airliners and large aircraft that already have sufficient system

redundancies and backup power capabilities, reliance on ADS-B alone will likely provide an equivalent level of safety to the current en route radar environment. However, for small aircraft that typically don't have redundant systems and back-up power, maintaining an equivalent level of safety may be more challenging.

Congress may express particular interest in the FAA's efforts to assess how proposals envisioning ADS-B as the primary means of aircraft surveillance will address the issue of providing equivalent safety to the current radar-based air traffic surveillance system. Congressional interest regarding the phase-out of legacy systems may also focus on how these plans may impact airspace system users, particularly smaller operators who may face a greater challenge in equipping aircraft to keep pace with the evolution from the existing national airspace system to NGATS compliant avionics and aircraft systems.

Wake Vortex Detection, Prediction, and Avoidance

While advances in precision navigation and information sharing show great promise for reducing aircraft spacing in all weather conditions thereby increasing system capacity, wake turbulence produced by large transport aircraft currently imposes practical limitations on aircraft spacing, even under ideal weather conditions.

While most casual observers think of wake turbulence as primarily an issue during takeoff and departure, and during approach and landing, wake encounters occur during all phases of flight and some experts are concerned that reduced aircraft spacing—both around airports and in the en route environment—increases the risk of inadvertent wake turbulence encounters during all phases of flight. Such encounters resulted in 130 accidents and 60 aircraft incidents over an 18-year period between 1983 and 2000, mostly involving smaller aircraft weighing less than 5,000 pounds.¹⁵¹ Despite the fact that most accidents involved smaller aircraft following larger aircraft, experience indicates that most encounters involve wakes generated by aircraft of similar size, and experts note that even a widebody MD-11 aircraft was substantially damaged following a wake turbulence encounter.¹⁵² From the standpoint of addressing capacity needs, safety concerns over wake turbulence encounters impose significant limitations on various approaches, such as reducing aircraft arrival and departure spacing, and increasing the utilization of closely spaced parallel runways.

Current air traffic procedures specify separation standards for aircraft departing behind large and heavy jets to allow their wake vortices to dissipate. Some view these standards as overly conservative and argue that accurate wake vortex prediction capabilities could allow for decreased separation, thereby increasing airport capacity in many weather conditions. Others argue that the limited capability of available technology and the complexities of wake vortex propagation make it difficult to predict wake turbulence or to use such predictions to significantly reduce arrival and departure spacing without compromising safety. Wake turbulence separation standards have been the focus of considerable attention recently as the FAA and international regulators mull the appropriate following distance behind the Airbus A380 super-jumbo aircraft currently in development. The International Civil Aviation Organization (ICAO) has set an interim following distance behind the A380 of 10-nautical miles, double that of current heavy jets

¹⁵¹ Patrick R. Veillette, "A Wake-Up About Wake Turbulence," *Business & Commercial Aviation*, January 2004, pp. 40—45.

¹⁵² *Ibid.*

currently in operation, despite Airbus' claims that the A380 wake is no more powerful than the wake of Boeing 747 aircraft.¹⁵³ This ruling has concerned Airbus and others that wake turbulence separation requirements could significantly impact system and airport capacity as A380s enter service in the coming years.

Vision 100 authorizes the expenditure of such sums as may be necessary for the development and assessment of wake vortex advisory systems. Vision 100 also directs the National Research Council to conduct an assessment of FAA's wake turbulence research program and authorizes \$500,000 for FY2004 for this assessment. One promising emerging technology for wake turbulence prediction utilizes both laser-based light detection and ranging (LIDAR) and acoustic sensors to identify and track wake turbulence trails behind aircraft.¹⁵⁴ Preliminary research is showing that in many instances an airplane's wake turbulence trail dissipates rapidly, sometimes in as little as 15 seconds. While this system is still in the relatively early stages of research and development, if an effective operational version can be fielded, it may be able to increase effective landing capacity at an airport by as much as 20%.¹⁵⁵ However, making regulatory changes to reduce wake turbulence spacing will likely require extensive demonstrations that using such a system to space aircraft provides an equivalent level of safety to current time and distance based spacing procedures for airport operations.

Improving Aviation Safety

Travel on commercial passenger airlines in the United States is extremely safe, and major aviation accidents are extremely rare. In fact there have been few major airline accidents in the United States in recent years.¹⁵⁶ For the most recent five-year period where full final data were available, major accidents in the United States occurred at a rate of less than one in every 8.8 million flight hours.¹⁵⁷ Nonetheless, aviation safety experts are, to some degree, at odds over whether the current level of commercial airline safety can be further improved upon. Experts also have differing views on whether the current low rate of accident occurrence may obscure the potential future effects of a variety of underlying safety trends such as current airline maintenance practices, the adequacy of efforts to address identified critical safety-related aircraft design and operational issues, and current airport design initiatives and operational considerations to prevent ground collisions and runway overruns.

Looking beyond commercial passenger operations, the safety of all-cargo operations and other commercial aviation activities has been examined to determine whether targeted safety enhancements can improve the safety record of these sectors of the aviation industry. For example, some have argued that bringing the safety standards of all-cargo operations on par with

¹⁵³ Andrea Rothman, Bloomberg News, "Airbus A380 Wake Turbulence Still An Issue," *The Wichita (Kansas) Eagle*, June 13, 2006, p. 8.

¹⁵⁴ "NASA Wake-Vortex Sensing Tests Detect Variety of Aircraft Types," *Flight International*, January 20-26, 2004, p. 24; Steven K. Paulson, "Lasers Could Warn of Deadly Airplane Turbulence," *Associated Press*, October 7, 2005.

¹⁵⁵ Steven K. Paulson, "Lasers Could Warn."

¹⁵⁶ The National Transportation Safety Board (NTSB) classifies a major accident as one involving an airline (operating under Title 14 Code of Federal Regulations Part 121) in which either the aircraft was destroyed, there were multiple fatalities, or there was a single fatality and the aircraft was substantially damaged.

¹⁵⁷ CRS calculations based on National Transportation Safety Board (NTSB) scheduled airline accident data for the period from 2000-2004. Data do not include aircraft lost in the terrorist attacks of September 11, 2001.

those of passenger airline operations could reduce accidents and is needed because the size of aircraft, the range of operations flown by all-cargo operators, and large growth in the all-cargo sector introduce unique risks to operators, airports, and the public. Other commercial aviation activities that have also been the subject of recent safety inquiries include air tour and air ambulance operations.¹⁵⁸

A variety of approaches to improving safety have been offered and implemented to address these persisting and emerging safety issues in commercial aviation. Options to incorporate these approaches into legislation or to step-up congressional oversight of FAA initiatives related to safety may be brought up in Congress during the FAA reauthorization process. Issues of particular interest in the current context include options for preventing runway overrun accidents, preventing runway incursions and collisions, improving maintenance oversight, mitigating the risk of fuel tank explosions on commercial airliners, monitoring aging aircraft and aircraft systems, and addressing safety concerns in the all-cargo industry.

Preventing Runway Overrun Accidents

Since the last FAA reauthorization, runway overrun accidents have been a focus of concern, stemming from several high-profile accidents during a period of otherwise exceptional safety in the airline industry. Notably, on August 2, 2005, an Air France Airbus A340 landing at Toronto Pearson International Airport, in the midst of nearby thunderstorms, overran the runway. Despite a large post-impact fire, all 309 occupants survived the crash. While the investigation of the accident continues, runway contamination¹⁵⁹ and a long, fast touchdown are suspected as factors in the crash. Later that same year, the issues of air carrier, air traffic control, and airport operating procedures when runway conditions are marginal were highlighted by a tragic overrun accident at Chicago's Midway Airport. On December 8, 2005, a Southwest Airlines Boeing 737 overran the runway at Chicago's Midway Airport during a snowstorm. The airplane careened through the airport perimeter fencing and collided with a vehicle on an adjacent highway, killing a six-year-old boy.

While the circumstances were quite different, the crash at Chicago Midway reminded many of the March 5, 2000, runway overrun of a Southwest Airlines Boeing 737 at Burbank, California. Although there were no fatalities in that crash, the aircraft finally halted only feet from gas station pumps that could have fueled a post-crash fire. Runway overrun accidents have not been limited to airliners, as there have been many such mishaps involving business jets. One such incident that received considerable attention occurred on February 2, 2005, at Teterboro Airport in New Jersey. While there were no fatalities, the airplane went through a fence, crossed a busy highway colliding with vehicles, and struck a warehouse igniting a post-crash fire.

Of particular concern are airports that are not in compliance with the FAA's standard runway safety area criteria that require a 250 foot wide clear zone for 1,000 feet beyond the runway end. Almost 300 of about 430 airports that have regularly scheduled commercial passenger flights have one or more runways that do not meet this criteria.¹⁶⁰ Following the March 5, 2000 crash in

¹⁵⁸ For a detailed discussion of air ambulance safety issues see CRS Report RL33430, *The Safety of Air Ambulances*, by (name redacted).

¹⁵⁹ Runway contamination is caused by any substance that reduces braking action. Typical contaminants found during operations are the result of precipitation and include snow, slush, ice, and rain.

¹⁶⁰ Jon Hilkevitch, "Midway Got FAA Runway Edict in '04," *The Chicago Tribune*, December, 13, 2005.

Burbank, California, the NTSB urged the FAA to bring all airports with regularly scheduled commercial passenger airline operations in compliance with these criteria when feasible, and deploy Engineered Materials Arresting System (EMAS) arrester beds at the ends of runways where these criteria cannot feasibly be met.¹⁶¹

EMAS provides an alternative mitigation for overrun accidents at airports where a 1,000 foot overrun area is not available. EMAS consists of a bed of specially mixed lightweight concrete that crushes under the weight of an aircraft, causing rapid deceleration. EMAS was installed at Little Rock, Arkansas following the American Airlines MD-82 overrun accident, and was also put in place at New York's Laganardia Airport, which has been the site of two runway overrun accidents where aircraft have plunged into Flushing Bay. The FAA credits EMAS with mitigating the severity of at least three incidents at New York's John F. Kennedy International Airport, where the system was first operationally installed in 1996, including a January 2005 incident involving a heavily loaded Boeing 747 cargo airplane. The system previously mitigated the overrun of another heavy cargo airplane and a small commuter flight loaded with passengers.¹⁶² Since 1996, the FAA has installed a total of 22 EMAS arrester beds at 18 airports throughout the United States. While a standard EMAS installation extends 600 feet beyond the runway end, the FAA notes that "[a]n EMAS arrester bed can still be installed to help slow or stop an aircraft that overruns the runway, even if less than 600 feet of land is available."¹⁶³ EMAS is a particularly appealing option because other overrun mitigation techniques used by the military such as arresting cables and nets are not readily adaptable to the civil aviation environment.

Other options to slow aircraft, such as frangible barriers¹⁶⁴, provide a less than optimal solution. Although they are designed to slow aircraft and mitigate the severity of impact, they still involve an impact that, under ideal circumstances, should be avoided. These devices may, nonetheless, provide limited mitigation when available land for runway safety areas is significantly limited. From a safety standpoint, a preferable long term solution would involve land acquisition to extend runway safety areas and runways to meet FAA guidelines or, at a minimum, allow sufficient area to construct an effective EMAS arrester bed. During the reauthorization process, Congress may consider options to identify those airports where the risk of runway overrun accidents and incidents is greatest and prioritize efforts to improve inadequate runway safety areas at commercial airports, and perhaps also at busy general aviation reliever airports with high volumes of business jet activity.

Other options for preventing runway overruns focus on operational changes to establish a greater margin of safety in determining adequate runway length. While the investigation of the December 2005 crash at Chicago Midway Airport is still ongoing, one lesson learned is that, when runway conditions are poor, calculations of required runway length may offer little or no margin for safety. The FAA has taken action to build a margin of safety into certain calculations of landing distances to provide an additional margin of safety. Specifically, the FAA has implemented a 15% safety margin that is to be added to the in-flight aircraft landing distance calculation when conditions dictate that an additional safety assessment of the landing is needed. Typically, these assessments would be made when a runway is contaminated with snow, slush, or standing water,

¹⁶¹ National Transportation Safety Board. *Safety Recommendations A-03-11 and -12*. May 6, 2003.

¹⁶² Edmund Pinto, "Why No Outcry Over Runway Overrun Accidents?," *Aviation Daily*, March 3, 2006, p. 5.

¹⁶³ Federal Aviation Administration, *Engineered Materials Arresting System (EMAS), Fact Sheet*, August 2005.

¹⁶⁴ Frangible barriers are designed to break apart on impact, ideally in a manner that will slow the aircraft or vehicle to some degree without creating large impact forces.

or other factors compromise braking action and increase stopping distances, although there is some room for interpretation as to when the safety margin must be applied. To comply with this regulatory change, airlines, charter operators, and fractional ownership programs must come up with plans for incorporating the use of this safety margin into their standard operating procedures, which must then be approved by the FAA. The NTSB had also mulled the idea of eliminating the assumption that thrust reversers will properly deploy and require calculations of landing distance be made based on the use of brakes and spoilers alone. While the 15% safety margin attempts to account for this or other possible scenarios involving less than full deceleration capability and is supported by the airline industry, it has been criticized by charter operators, because it seems too arbitrary and could significantly restrict flight operations at certain airports, particularly in winter weather conditions.¹⁶⁵

Another option to mitigate overrun accidents is to develop and deploy effective means for airports to maintain adequate runway braking action under various adverse weather conditions. Research on techniques to effectively remove contaminants like snow, slush, ice, and water from runways and improve runway friction coefficients, particularly in winter conditions, is still ongoing, but could yield advances in contamination removal and improving runway friction under a variety of environmental conditions.¹⁶⁶ While these programs have historically been funded out of NASA's aeronautics research program, Congress may opt to review this research to assess its progress and determine whether any advances can be transitioned to the FAA for operational deployment.

Preventing Runway Incursions and Collisions

Since 1990, there have been four runway collisions in the United States involving large commercial airliners. The deadliest runway collision in the United States occurred on February 1, 1991, at Los Angeles International Airport (LAX), when a USAir Boeing 737 was cleared to land on a runway occupied by a commuter flight that had been instructed to line up on the runway and await takeoff clearance. The crash destroyed both aircraft and resulted in 36 fatalities. The most recent major runway collision accident worldwide occurred at Milan, Italy's Linate Airport on October 8, 2001. A Cessna business jet strayed onto the active runway in foggy conditions and was struck by a departing airliner killing 118 people and injuring 4. The world's deadliest aircraft accident—the 1977 collision of two Boeing 747 jumbo jets on the island of Tenerife that resulted in 583 fatalities—was also the result of a runway collision in low visibility conditions. These catastrophes illustrate why mitigating the risk of runway collisions has been considered a top priority by the FAA, the NTSB, and other aviation safety experts for some time. The NTSB has listed the prevention of runway collisions on its list of “Most Wanted Transportation Safety Improvements” since the list was first released in 1990.

To get a better grasp on the existing risks of runway incursions, the FAA has been closely tracking and studying errors that could have led to runway collisions since 1999. Whenever an aircraft or ground vehicle strays onto a runway when an aircraft is taking off or landing there is a potential for a collision. These errors—whether caused by pilots, air traffic controllers, or ground vehicle operators—are referred to as runway incursions. Curtailing runway incursions has been a priority for the FAA. However, statistics indicate that the overall runway incursion rate has

¹⁶⁵ Matthew L. Wald. “Safety Plan for Airplanes Sets Up Clash,” *The New York Times*, June 22, 2006.

¹⁶⁶ National Aeronautics and Space Administration. *Research Aims to Prevent Accidents on Hazardous Runways*, FS-2002-02-45-LaRC, Langley Research Center, Hampton, VA.

remained relatively constant, slightly above a level of five incursions per million flight operations, since 1999. Data do, however, suggest that the severity of these incursions has decreased somewhat in recent years, from 0.8 serious incursions per million flight operations in FY2001 to 0.6 serious incursions per million flight operations in FY2004. Nevertheless, high profile events involving aircraft coming within a few hundred feet of each other continue to occur and raise concerns over the potential for a large scale disaster. For example, two high-profile incidents at Chicago's O'Hare airport in March 2006 raised questions about controller training and experience, controller fatigue, and the effectiveness of currently available runway safety technology.¹⁶⁷

The NTSB concluded that the airport movement area safety system (AMASS), a technology currently being deployed at large airport control towers as FAA's primary tool for reducing the severity of runway incursion incidents, fails to provide an acceptable solution to reduce the risk of runway collisions because it does not provide a direct warning capability to flight crews. The NTSB has, consequently, classified its recommendation for preventing runway collisions and incursions as having an "unacceptable response" from the FAA. In 2001, the NTSB evaluated AMASS and determined that it was not capable of providing sufficient warning to prevent runway collisions in all instances and, as currently implemented, provides no capability to issue warnings directly to pilots and other vehicle operators.¹⁶⁸ In essence, the AMASS system inserts controllers into the decision cycle, thereby increasing the time needed for pilots to take evasive action to prevent a collision. Providing traffic information and alerting directly to pilots, as opposed to only alerting controllers, is viewed as preferable in this regard, but this is not what the NTSB's original recommendation sought. Rather the NTSB specifically asked the FAA to develop a system analogous to cockpit traffic collision avoidance systems (TCAS) to alert *controllers* to pending runway incursions.¹⁶⁹ However, TCAS provides alerts and conflict resolutions directly to *pilots*.

The NTSB assessment went on to conclude that FAA's efforts to curtail runway incursions largely through technological approaches aimed at improving air traffic controller situational awareness was an incomplete solution, and specifically called for specific actions to address recommended changes in operational procedures at airports. The NTSB's recommendations urged the FAA to install ground movement safety systems at all airports with passenger service that provide a direct warning capability to *pilots*, and demonstrate through computer simulations or other means that the system will, in fact, prevent runway incursions. The recommendations also included numerous suggested changes to operational procedures to increase pilot and controller situation awareness and resolve ambiguities regarding runway crossing clearances, eliminate the practice of positioning an aircraft on a runway to await takeoff at night and in poor weather, modify phraseology of airport movement instructions to be consistent with international standards, and

¹⁶⁷ Jon Hilkevitch, "2 Close Calls In One Week Jolt O'Hare," *The Chicago Tribune*, March 25, 2006; Jon Hilkevitch, "U.S. Links Fatigue to Mishaps at O'Hare," *The Chicago Tribune*, May 24, 2006; "Feds: Tired Air Traffic Controllers May Be Cause of Runway Mishaps," USA Today, May 25, 2006.

¹⁶⁸ Carol J. Carmody, *Testimony before the Committee on Transportation and Infrastructure, House of Representatives Regarding Runway Incursions*, June 26, 2001. Washington, DC: National Transportation Safety Board.

¹⁶⁹ National Transportation Safety Board. *Runway collision of Eastern Airlines Boeing 727, flight 111 and Epps Air Service Beechcraft King Air A1000, Atlanta Hartsfield International Airport, Atlanta, Georgia, January 18, 1990* (NTSB/AAR-91/03).

provide controllers with guidance on appropriate phraseology and speaking rates, especially when communicating with foreign flight crews.¹⁷⁰

The FAA continues to address many of these procedural changes to enhance runway safety. However, the NTSB has expressed continued frustration with the FAA's progress. The NTSB questioned the completeness of the FAA's runway incursion incident reporting and cast doubt on FAA's claims that the incursion rate is declining.¹⁷¹ Most observers agree that there is no single solution to mitigating runway incursions and continued investment in airport design, procedural modifications, pilot and controller training, and technology is needed to reduce the risk of runway accidents.

In addition to AMASS, the FAA has viewed the Airport Surveillance Detection Equipment (Model X), or ASDE-X, as a primary means to provide controllers with situation awareness of airport surface movements. The GAO found that costs for equipping airports with ASDE-X have escalated by \$85.9 million since the program's inception largely due to the inclusion of seven additional airports, and the timetable for fully deploying ASDE-X to selected airports has slipped two years and is now projected to be completed in FY2009 instead of FY2007, largely due to budget cuts to the program in FY2004 and FY2005.¹⁷² The full deployment plan for ASDE-X includes 35 airports and three support systems.

Besides these technology approaches, policy options, including improved training and awareness for pilots, controllers, and vehicle operators, operational changes such as increased standardization of taxi procedures, and improved runway signs and markings, have been implemented across the aviation system. However, the NTSB and many safety experts still contend that technology that provides direct warning capability to flight crews is needed and point to the FAA's failure to significantly reduce runway incursion rates as proof that steps taken thus far do not adequately mitigate the risk of potential runway collisions.

The FAA recognizes that its current approach to mitigating runway collision risks is not a complete solution. The FAA notes that its current runway safety risk models indicate a residual risk of runway collisions at airports with ASDE-X and AMASS. The cumulative risk, expressed in monetary terms, across all of these airports is estimated to be about \$200 million.¹⁷³ The FAA notes that the runway status lights (RWSL) system—a new lighting system embedded in taxiways at runway intersections akin to roadway traffic lights—is expected to address a significant portion of this remaining risk.

The runway status lights system, as currently configured, consists of runway entrance lights that are imbedded in the taxiway pavement and positioned where taxiways feed onto or cross runways. These lights illuminate red when the runway is unsafe to enter or cross due to high speed operations, such as landings or departures, currently in progress. According to the FAA, preliminary cost-benefit data support a limited deployment of runway status light installations to

¹⁷⁰ National Transportation Safety Board. *Safety Recommendations A-00-66 through A-00-71*.

¹⁷¹ National Transportation Safety Board. *NTSB calls for federal action to adopt "most wanted" safety improvements*. Press Release SB-04-33, November 9, 2004.

¹⁷² United States Government Accountability Office. *FAA Has Made Progress but Continues to Face Challenges in Acquiring Major Air Traffic Control Systems*. GAO-05-331 (June, 2005).

¹⁷³ Risk estimates are expressed in monetary terms by estimating the probability or likelihood of an accident or accidents attributable to a specific safety condition, such as an unmitigated runway incursion, and multiplying this probability by the estimated cost to the FAA and the industry of such events.

about 15 or 20 airports. The FAA has requested an appropriation of \$13.7 million for FY2007 to operationally deploy runway surface lights at three airports considered to pose a high risk for runway incursions.

While runway status lights appear to be a near-term approach for providing information to flight crews regarding runway status, the use of Global Positioning System (GPS) and Automatic Dependent Surveillance - Broadcast (ADS-B), in the future, may provide improved situation awareness to both pilots and controllers to mitigate runway incursions. In cases where GPS and ADS-B are not sufficiently accurate to provide ground separation of aircraft, another technology, called multilateration, may provide the needed accuracy to maintain surveillance and separation of aircraft in the airport environment. During debate over reauthorization, FAA's progress on the various technology and policy approaches to mitigate runway incursions may be an issue of particular interest.

Improving Oversight Of Maintenance Facilities

Congress has also expressed a continued interest in the FAA's oversight of air carrier maintenance practices. U.S. air carriers are increasingly outsourcing maintenance to third-party repair stations and outsourced maintenance now accounts for more than 50% of air carriers' total maintenance costs. However, FAA inspections of domestic repair stations are only required once annually. Oversight of many repair stations located in foreign countries is delegated to inspectors from those foreign countries and the FAA's direct oversight of these facilities is more limited.

The FAA recently revised regulations governing the almost 5,000 FAA-certified repair stations, about 680 of which are located in foreign countries, to improve bookkeeping, training, and quality control at these maintenance facilities. FAA currently employs about 600 aviation inspectors to oversee these repair stations. However, some in Congress have expressed concern over these staffing levels and the degree of FAA oversight at repair stations, particularly at the 2,800 repair stations that perform maintenance on the air carrier fleet. Vision 100 contains provisions that require the FAA to develop an action plan for providing adequate oversight of repair stations and ensure that repair stations in foreign countries are subject to the same level of oversight and quality control as domestic repair stations. However, there is growing concern that a larger than expected amount of maintenance and repair may be conducted by on-site contract maintenance workers and by non-certificated subcontractors that are not as tightly regulated by the FAA.¹⁷⁴

It was recently reported that there are many perceived weaknesses in regulations pertaining to contract maintenance work. While workers servicing air carrier aircraft must get at least one day off in a seven-day workweek, or the equivalent amount of time off in a month's time, there are no periodic relief requirements for contract maintenance personnel servicing commuter and air taxi aircraft. Fatigue among these workers, and its impact on work quality and safety, is a growing concern. Also, across the contract maintenance industry, the ratio of workers to supervisors is not regulated and often exceeds 10 to 1, raising questions over the adequacy of supervision in contract maintenance operations. Further, contracted maintenance workers, many of whom work part-time at repair facilities alongside full-time regular employees, often are not required to obtain

¹⁷⁴ See Bart Crotty, "Aviation Contracted Maintenance Workers, Are They Safe Enough," *Aviation Maintenance*, July 2006, pp.14-17, and U.S. Department of Transportation, Office of Inspector General, *Air Carriers' Use of Non-Certificated Repair Facilities*, December 15, 2005, AV-2006-031.

FAA certification, and the screening and selection processes for these workers has been described as minimal.¹⁷⁵

Concerns over FAA oversight of contract maintenance practices surfaced during the NTSB's investigation of the March 16, 2003 crash of a US Airways commuter flight operated by Air Midwest in Charlotte, NC. The investigation found that the elevator control cables were improperly rigged by subcontracted maintenance workers at a non-certificated facility, and it has been suggested that FAA had little knowledge over the contract arrangements and minimal knowledge of the work conditions and supervision in this case.¹⁷⁶

That crash, along with growing concerns over FAA oversight of maintenance at facilities not required to be certificated as designated repair stations prompted a DOT OIG audit of air carrier use of these non-certificated maintenance facilities.¹⁷⁷ Prior to the audit, FAA officials advised that non-certificated facilities were only used on a limited basis to perform minor services. However, the audit instead found that non-certificated facilities were often used extensively, sometimes for major repairs and overhauls, largely without the FAA's knowledge. The DOT OIG found that while these facilities operate beyond the scope of regulations pertaining to certificated repair facilities, there are no specific limitations regarding the type and scope of work they perform, and maintenance performed at these facilities is largely unmonitored by FAA inspectors. Further, oversight by air carriers of work performed on their aircraft by these non-certificated facilities was found to also be inadequate. Based on the findings of this audit, the DOT OIG recommended that the FAA inventory air carrier maintenance vendor lists to get a grasp on exactly what entities are performing maintenance on air carrier aircraft, assess whether the type and scope of maintenance work performed by non-certificated entities should be limited, and expand maintenance oversight of these entities if they are permitted to continue performing unlimited maintenance work on air carrier aircraft. During hearings on reauthorization, Congress may focus on the steps that the FAA is taking to address these recommendations.

Another concern is that FAA maintenance and operations inspectors may lack the continuing training needed to keep up with current technologies. Vision 100 directed the GAO to study the training of FAA aviation safety inspectors, expressing a sense that FAA inspectors should get the most up-to-date initial and recurrent training on job-related aviation technologies. The GAO found that while the FAA approach to inspector training was mostly effective, a more systematic approach to identifying technical training needs could better ensure that inspectors receive the most up-to-date training.¹⁷⁸ Congress has also expressed concern over the adequacy of the FAA's inspector workforce, particularly their ability to adequately oversee the aviation industry, and the increased use of designees to carry out inspection duties. Vision 100 also directed the National Academy of Sciences to study the staffing methods FAA employs for determining its air safety inspector workforce and suggest improved methods for assessing inspector staffing needs. This work is still ongoing, but may be of particular interest to Congress in examining how the FAA can best adapt its maintenance inspector workforce to address the changing nature of maintenance practices among air carriers and commuter airlines.

¹⁷⁵ Bart Crotty, "Aviation Contracted Maintenance Workers."

¹⁷⁶ *Ibid.*

¹⁷⁷ U.S. Department of Transportation, Office of Inspector General, *Air Carriers' Use of Non-Certificated Repair Facilities*.

¹⁷⁸ U.S. Government Accountability Office, *Aviation Safety: FAA Management Practices for Technical Training Mostly Effective; Further Actions Could Enhance Results*, September 7, 2005, GAO-05-728.

Improving Oversight of Charter and Air Tour Operators

The FAA's ability to conduct effective oversight of air charter operators has been made difficult by complicated leasing and management arrangements between aircraft owners and holders of operational certificates to conduct charter flights. In many instances, NTSB accident investigations have raised significant questions over whether these arrangements met regulatory requirements and whether specific aircraft were covered under the operating certificates required to conduct charter flights. For example, a charter jet that crashed on takeoff from Teterboro Airport in New Jersey on February 2, 2005, was being operated by a company that paid a monthly fee to a charter flight certificate holder to use its certificate to conduct flights using contract pilots.¹⁷⁹ This practice was determined to be in violation of FAA regulations. Based on these findings, the FAA instructed its inspectors to ensure that charter certificate holders maintain "operational control" over aircraft using their certificates to conduct charter flights. The FAA has also been providing briefings to the charter industry to better define and explain the concept of "operational control" and what is, and what is not, permissible under the regulations. The FAA's oversight of charter operators and business practices in the charter industry may be of particular interest during the current reauthorization as Congress may look for options to ensure that the FAA maintains adequate oversight of air charter safety without unduly interfering with or impeding sound business practices in the industry.

In addition to air-taxi operators that are covered under on-demand and commuter operator regulations, questions have also been raised about the safety of the air tour industry that provides sightseeing flights to the public. Because of a general exemption from commercial operator regulations if flights are conducted within 25 miles of the base airport, air tour operators are largely unregulated. Three specific exceptions to this include (1) a set of special flight regulations covering air tour operators in Hawaii;¹⁸⁰ (2) a special set of regulations governing air tours over the Grand Canyon;¹⁸¹ and (3) air tour operators routinely flying over other lands in the National Parks system or tribal lands that are required to participate in the National Parks Air Tour Management program.¹⁸² Other air tour operators may operate under general flight rules with minimal FAA oversight.

On October 22, 2003, the FAA issued a notice of proposed rulemaking to establish national safety standards for commercial air tour operators of siteseeing aircraft.¹⁸³ The FAA's proposal, issued largely in response to continuing NTSB concern over air tour safety, seeks to bring virtually all air tour operators under a single set of air tour safety standards set forth in regulation. However, the proposal has been ardently opposed by many affected entities and representative trade organizations, in large part because the cost of regulatory compliance would significantly impact small business entities engaged in the air tour industry. Essentially, those objecting to the FAA's approach were seeking to have the FAA scrap the proposal, and start over with a systematic rulemaking approach involving early input from advisory groups to come up with a plan that would better balance safety with the operational constraints and limitations of small operators. Safety regulation of both on-demand charter operators and air tour operators may be an issue of

¹⁷⁹ "Operational Control," *Air Safety Week*, June 20, 2005.

¹⁸⁰ 14 CFR, SFAR 71.

¹⁸¹ 14 CFR Part 93, Subpart U.

¹⁸² 14 CFR, Part 136.

¹⁸³ Federal Aviation Administration, "National Air Tour Safety Standards; Proposed Rule," *Federal Register*, 68(204), October 22, 2003, pp. 60572-60591.

particular interest during reauthorization in recognition of persisting challenges to the FAA's ability to effectively regulate and conduct oversight of these entities within the existing regulatory framework.

Mitigating the Risk of Fuel Tank Explosions on Commercial Airliners

July 17, 2006 marked the tenth anniversary of the crash of TWA flight 800, a Boeing 747 carrying 230 passengers that exploded and broke apart in-flight while departing New York's John F. Kennedy International Airport for Paris, France. The NTSB attributed the crash to an explosion in the center wing fuel tank that resulted from the ignition of fuel vapors. While the specific ignition source was never determined, it was attributed to an electrical failure that likely produced arcing in wiring that introduced electrical energy into the tank.¹⁸⁴

Since the tragic crash of TWA flight 800, two fuel tank explosions, both while aircraft were on the ground, have been documented. These include the March 3, 2001 destruction of a Thai Airways Boeing 737 in Bangkok, Thailand, and the May 4, 2006 explosion on a Transmile Airlines Boeing 727 in Bangalore, India. These events demonstrate that the risk of fuel tank explosions still exists and is not unique to the design of the Boeing 747 fuel system.

The NTSB and other aviation safety advocates have been befuddled by the slow progress to address the risks of fuel tank explosions over the past ten years. Options for using less volatile aviation fuels, such as JP-5¹⁸⁵ (which is sometimes used by the military) or anti-static additives, were discussed but were never considered to be fully adequate and viable solutions. Also, the FAA and the aviation industry largely rejected the use of available fuel inerting foam technology that has been used by the military since the late 1960s.¹⁸⁶ The foam, which is placed inside aircraft fuel tanks, greatly reduces the risk of explosions and post-crash fires, but would be costly to install, adds weight to aircraft, and reduces the distance an airplane can travel by reducing the amount of fuel that can be carried.

The NTSB and other safety advocates also have expressed disappointment that the FAA and the airline industry did not take adequate steps to make interim changes to operational practices to reduce fuel tank flammability until long-term solutions could be identified and put in place. The NTSB believes that relatively simple steps—such as filling tanks to levels that sufficiently reduce the flammability of the fuel/air mixture, and minimizing the use of heat-generating equipment, such as cabin air-conditioning systems, before flight—would effectively mitigate risk, until proven technologies to reduce fuel tank flammability were identified and deployed. The FAA never mandated that these steps be taken, and an FAA survey of the airline industry found that recommended changes to operating procedures, which were only advisory in nature, were never widely adopted.

¹⁸⁴ National Transportation Safety Board, "NTSB Marks 10th Anniversary of Crash of TWA 800; TWA Flight 800 Fact Sheet," June 29, 2006, Washington, DC.

¹⁸⁵ Jet Propellant Number 5 or JP-5 has a minimum flash point of 140^oF, compared to about 100^oF for Jet-A fuel, used in commercial aircraft.

¹⁸⁶ T. O. Reed, *The Use of Polyurethane Foam for Fuel Tank Inerting*, Defense Technical Information Center, March 1972, #ADD702826.

Recently, technology advances in fuel inerting systems have led to the development of small, light-weight fuel inerting pumps that extract oxygen from the air in fuel tanks, replacing it with a nitrogen-rich mixture that greatly reduces flammability. In May 2002, the FAA announced an innovative prototype inerting system.¹⁸⁷ This system—unlike earlier versions used by the military—weighs significantly less, uses no moving parts, is more reliable, and could be retrofitted into airplanes currently in service at a fraction of the industry-estimated cost.¹⁸⁸ Boeing is now shipping new aircraft from its factories with these systems already installed. The issue of retrofitting the existing fleet with these systems or other alternative solutions to reduce flammability, such as inerting foam, and establishing a fuel tank flammability reduction requirement for new airplanes, has not yet been fully resolved, but the FAA is proposing an approach that would require passenger airlines to take such steps to reduce fuel tank flammability in their aircraft fleets over the next eight years.

Specifically, on November 23, 2005, the FAA issued a proposed rulemaking to require that operators of large transport category airplanes used in passenger airline service take steps to reduce fuel tank flammability, such as installing fuel inerting systems. The proposed rule, however, does not require fuel tank flammability reduction for wing tanks as it only establishes requirements for an aircraft's main fuel tank, and would exempt all-cargo aircraft. Also, contrary to some commonly held misconceptions about the proposed rulemaking, it does not specifically require the fuel tank inerting systems discussed above for all passenger airliners, but leaves the door open for alternative means of compliance. The proposal actually seeks to set a flammability exposure criterion. How this criterion would be met may become a particular point of contention over the certification of both new aircraft types and retrofit modifications of the existing air carrier fleet to meet the requirements set forth in the proposed rulemaking. Airbus, for example, would like its double-decker A380 to be certified without fuel tank inerting systems, arguing that design considerations for the center fuel tank already take into consideration and adequately mitigate the risk of explosive fuel/air mixtures.¹⁸⁹

Under the FAA's proposed timetable, depending on fleet composition, 50% of an air carrier's fleet would have to be in compliance in the 2009 to 2011 time frame, and airlines would have to achieve 100% compliance between 2012 and 2014. The FAA estimates that it will cost passenger airlines about \$809 million 2005 dollars to comply with the proposed fuel tank flammability reduction measures over the next 50 years. Based on FAA assumptions of explosion risk that conclude that four explosions would be prevented over the next 50 years if the proposed action is taken, the estimated benefit of the rulemaking over this time period was calculated to be \$490 million in 2005 dollars, assuming the cost of one human life is \$3 million. If the assumed cost of a human life is raised to \$5.5 million, then the estimated benefits over the next 50 years climb to \$890 million in 2005 dollars. The FAA notes that while these benefits assume four explosions over the next 50 years, they calculated a 37% chance that five or more accidents could occur during that period, and noted that the estimated benefit could be much higher if the prevented accidents were assumed to have involved large jets, like Boeing 747 or Airbus A380 aircraft, carrying large numbers of passengers.

¹⁸⁷ Federal Aviation Administration, *FAA and Airlines to Reduce Fuel Tank Flammability*, Press Release APA 02-04, February 17, 2004.

¹⁸⁸ National Transportation Safety Board, *Most Wanted Transportation Safety Improvements, Federal Issues, Aviation, Eliminated Flammable Fuel/Air Vapors in Fuel Tanks on Transport Category Aircraft*, Washington, DC. (Undated).

¹⁸⁹ "10 Years After Flight 800, Just Hot Air," *Air Safety Week*, 20(31), August 7, 2006.

Based on these considerations, the FAA concluded that the costs of the proposed action were justified, but some observers may question this conclusion because slight alternations in assumptions can tip the benefit to cost ratio in either direction. One particular assumption that the FAA attempted to account for is how effective special regulations put in place in 2001 will be in terms of identifying potential ignition sources and mitigating the risks they pose. In the baseline case cited above, the FAA assumed that these steps would be 50% effective in reducing ignition sources. The FAA presented several other cases varying their assumptions, with about half showing benefit to cost ratios greater than one and about half showing benefit to cost ratios less than one. The FAA also noted that because the flying public may assume a terrorist act has occurred following an aircraft explosion, this could have a sizable impact on airline revenues if people subsequently avoid flying. The FAA thought that this could cost airlines \$5 billion per accident. While this wasn't considered in the formal cost/benefit analysis, some argue this possibility alone could sufficiently justify a requirement for fuel tank flammability reduction.

In the end, the FAA asserted that the benefits justify the compliance cost. However, aircraft manufacturers and airlines may challenge this conclusion and assert that, if ongoing efforts to remove ignition sources are effective, costly retrofits to inert fuel tanks may not be fully justified by the expected benefits. However, because of the considerable attention given to this issue stemming from the TWA 800 crash, there may be considerable pressure to do all that is feasible to reduce both ignition sources and fuel tank flammability. The NTSB points out that “dealing just with ignition sources was not sufficient to ensure safe flight and that fuel tank flammability must be addressed.”¹⁹⁰ While the NTSB supports the proposed rulemaking as a positive step toward reducing the risk of fuel tank explosions, it has been frustrated by the slow rulemaking process and notes that while implementation of an effective mitigation technology is now on the horizon, “[a]irliner fuel tanks are as flammable today as they were ten years ago.”¹⁹¹

During the FAA reauthorization process, Congress may examine in detail the FAA's approach to reducing fuel tank flammability among transport category aircraft and its justification for proposing that these actions be required for passenger airlines. Particular concerns may be raised about the sufficiency of the scope of aircraft covered under the FAA proposal given that it exempts all-cargo aircraft and doesn't mitigate fuel tank flammability in wing tanks. Congress may also debate whether the FAA timeline for compliance is appropriate given the significance of the risk to aviation safety posed by fuel tank explosions and the financial burden to the industry to comply.

Addressing Aging Aircraft Issues

Age-related aircraft structural fatigue which can cause structural failures and aging wiring which can cause in-flight fires remain significant concerns for all sectors of the aviation industry. All-cargo aircraft are a particular concern because statistics indicate that while the average age for passenger airliners in the United States is under 10 years, the average age of jet freighters is more than 20 years. General aviation aircraft may also be at particular risk because the average age of the fleet is already 35 years, and it is expected to increase to 50 years by 2020. However, general aviation advocates are resisting proposals to require continuing inspections of aging aircraft and aircraft systems, citing concerns over operational costs that could escalate considerably if owners

¹⁹⁰ National Transportation Safety Board, “NTSB Marks 10th Anniversary.”

¹⁹¹ *Ibid.*

and operators are faced with requirements for periodic detailed examinations of aircraft systems and structures. Aging aircraft used in commuter and charter service may also be a safety risk because the FAA's regulatory framework to comply with aging aircraft requirements does not include aircraft with fewer than 30 seats or those not used in scheduled air carrier service.

Aging Airliners

In 1991, Congress passed the Aging Aircraft Safety Act of 1991 as part of the DOT Appropriations Act for FY1992 (P.L. 102-143), establishing an aging aircraft inspections program to study age-related structural issues in the air carrier fleet through a process of inspections and systematic record keeping.¹⁹² Action was prompted by several age-related incidents and accidents, including the high-profile structural separation of a large section of fuselage above the passenger cabin aboard an Aloha Airlines Boeing 737 airplane in 1988. In immediate response to this accident, Congress passed the Aviation Safety Research Act of 1988 (P.L. 100-591) mandating research on the effects of fatigue and environmental degradation of aircraft structures and approaches to mitigating associated safety risks. Subsequent research pointed to a need for a proactive approach to inspecting aging aircraft.

Under the aging aircraft inspection program, the FAA has stepped up requirements for maintenance inspections to check for small fatigue cracks (which can propagate, causing component and major structural failures of the airframe), and preventative measures to slow corrosion on aircraft structural components. Maintenance experience over these years has demonstrated that tiny fatigue cracks and areas of corrosion are often quite insidious, lurking in hard to access locations and often are not visible to the naked eye. Ultrasound inspection techniques have played an important role in identifying fatigue cracks during periodic inspections, allowing airlines to take corrective actions before these fatigue cracks propagate. However, these inspection methods can be costly and time consuming, so inspections are usually targeted based on risk assessments considering what structures are most prone to fatigue and are structurally most critical.

There has been growing concern that widespread fatigue damage may impose practical limitations on the continued airworthiness of airframes. On April 18, 2006, the FAA issued proposed rulemaking to establish operating limits for transport category aircraft, mostly large airliners and commuter jets, based on the numbers of cycles (takeoffs and landings).¹⁹³ Many aircraft components are life limited based on numbers of cycles, but to date, the airframe itself can continue in service indefinitely so long as it is kept in an airworthy condition by following all FAA and manufacturer requirements regarding inspections, maintenance, and repair. The FAA proposal would change this by setting a maximum number of cycles for airframes, after which an aircraft must be retired, unless an operator demonstrates that it able to extend this service life through a detailed inspections and maintenance program, in which case a service life extension may be granted. While most passenger airlines in the United States divest of their airplanes long before what most consider a commercially viable service life of about 25 years, they might nonetheless experience a sizable financial burden from this proposed action because aircraft would likely depreciate much faster if they have a limited service life imposed through regulation. Therefore aircraft leasing would likely cost more, and those aircraft that airlines

¹⁹² See 49 USC §44717.

¹⁹³ Federal Aviation Administration, "Aging Aircraft Program: Widespread Fatigue Damage; Proposed Rule", *Federal Register*, 71(74), April 18, 2006, pp. 19928-19949.

purchase outright would likely be worth less on the used aircraft market when they go to sell and replace them. Cargo operators also could be impacted financially because they tend to utilize older aircraft and therefore, may have to increase their fleet replacement rates under the proposal. However, the costs to operators that currently operate fleets consisting of mostly older aircraft may, in particular, be offset to some degree, if transitioning to a younger fleet of aircraft as a consequence of the proposed rule results in lower maintenance costs.

Aging Commuter Aircraft

The FAA's proposal would only cover aircraft weighing more than 75,000 pounds at maximum takeoff weight, potentially raising questions of whether similar rules should be considered for smaller aircraft, such as the commuter seaplane involved in the December 2005 crash off the coast of Miami, FL. The December 19, 2005 crash of a turboprop powered Grumman Mallard seaplane departing Miami for Bimini Island in the Bahamas drew attention to the potential catastrophic effects of structural fatigue on aging aircraft being used by smaller specialty airlines and charter operators. While the NTSB's investigation of that accident, which killed all 20 on board, is still ongoing, investigators have identified fatigue cracks near the location where a failure and separation of the right wing surface is suspected to have occurred shortly after takeoff. These smaller operators may be a particular concern because they don't have as extensive capabilities to inspect aircraft for fatigue and corrosion, and don't typically come under as much scrutiny and oversight from the FAA compared to major airlines. This stems, in part, from an FAA regulatory change issued in February 2005, limiting the scope of supplemental inspection requirements for aging aircraft to only those aircraft manufactured after 1957 that have 30 or more passenger seats or a payload capacity of more than 7,500 pounds. The NTSB, in the course of its ongoing investigation of the Miami crash, noted this exemption of smaller aircraft as a particular safety concern and issued a recommendation calling for the broadening of aging aircraft inspection and records-keeping requirements to include virtually all aircraft used in commercial passenger and scheduled all-cargo service.¹⁹⁴

Aging General Aviation Aircraft

With respect to age-related fatigue and corrosion, general aviation (GA) aircraft are also a particular concern. As previously stated, according to the FAA, the average aircraft age across the GA fleet is about 35 years, and this is expected to increase to almost 50 years by 2020.¹⁹⁵ Several GA accidents have been attributed to aging aircraft structures and component failures. The FAA has also uncovered many trends in age-related effects among specific GA aircraft models. Presently GA aircraft are specifically excluded from the Aging Aircraft Program. The AOPA has resisted specific aging aircraft inspection programs across the GA fleet, fearing that a mandated program would impose significant costs on operators. The AOPA argues that such a requirement is unnecessary without specific data that age-related corrosion or component failures affect a particular model of aircraft. The AOPA points to a 39% reduction in maintenance-related GA crashes over the past 20 years, despite a steady increase in the average age of the fleet over that same time frame.¹⁹⁶ They advocate a continuation of the current approach, which largely relies on

¹⁹⁴ National Transportation Safety Board. *Safety Recommendation A-06-52*, July 25, 2006; Alan Levin, "NTSB Concerned Rules Don't Apply to Aging Planes," *USA Today*, July 25, 2006.

¹⁹⁵ Federal Aviation Administration. "Aviation Summit: Notice of Public Meeting." *Federal Register*, 71(18), 4631-4632, January 27, 2006.

¹⁹⁶ Aircraft Owners and Pilots Association. "Aging GA aircraft not a safety issue, AOPA reiterates," Frederick, MD, (continued...)

individual operators to adopt recommended best practices for maintaining and inspecting their aircraft to minimize and correct age-related effects. The FAA is studying the issue of whether a more proactive approach may be needed to identify and correct specific age-related effects across the GA fleet before they lead to catastrophic failures and accidents. During the debate over FAA reauthorization, Congress may consider whether a more formal approach to assessing age-related effects among GA aircraft is needed, and may discuss various options regarding the depth and scope of specific inspection programs to assess the effects of aging on the GA aircraft fleet. Advocates for GA operators, such as the AOPA, are most concerned about the possibility that aircraft life limits, such as those being considered for large transport aircraft, might be considered for some or all of the GA fleet. They point to the unique challenges of owners and operators of vintage airplanes, whose manufacturers are often long since defunct, as a particular area where a flexible approach is needed to insure that aviation heritage can be maintained in a manner that is not overly burdensome or overly costly to operators.¹⁹⁷

During consideration of FAA reauthorization, Congress may engage in specific debate over the merits of imposing specific life limits on airframes across all sectors of aviation, the costs and benefits to operators of aging aircraft inspections and records-keeping programs, and the appropriate scope of applicability of these various approaches to mitigating aging aircraft safety concerns.

Addressing the Safety of All-Cargo Operations

All-cargo operations are conducted under various sets of rules that are less stringent than the regulatory structure for passenger airlines. Large cargo operators, like FedEx and UPS, operate under a special subset of airline rules, called “supplemental” operations.¹⁹⁸ Others, such as ASTAR Air Cargo, were certificated more in line with passenger air carrier standards, but have been granted certain exemptions from typical operating requirements.¹⁹⁹ In contrast to passenger airline operations, large cargo carrier operations have less stringent requirements for pilot flight and duty times and have no requirements for flight dispatchers. The large majority of smaller regional freight haulers operate under a less stringent set of requirements that also cover charter flights.²⁰⁰

In general, air cargo pilots operate in an environment in which they are permitted to work longer hours than commercial airline pilots, and often do so during late-night and early-morning periods where humans are particularly susceptible to fatigue effects. Also, in air cargo operations, pilots have more direct responsibility for assessing weather, airport conditions, proper aircraft loading, and other safety-critical aspects of a flight. In the case of small operators, the pilots are very much on their own with regard to safety-critical decision making, not unlike charter operators covered under the same set of rules. However, cargo pilots on a more routine basis operate in demanding

(...continued)

April 20, 2006.

¹⁹⁷ *Ibid.*

¹⁹⁸ Air carrier operations covered under 14 CFR Part 121 are subdivided into domestic, flag, and supplemental operations.

¹⁹⁹ Jan W. Steenblik, “Cargo Issues Take Center Stage,” *Air Line Pilot*, March 2004, Washington DC: Air Line Pilots Association.

²⁰⁰ See 14 CFR Part 135.

environments where pressures to complete flights to maintain delivery schedules compete with safety considerations regarding weather and airport conditions, and cargo pilots more frequently fly in night conditions.

Additionally, because airports are regulated largely based on the size of scheduled passenger aircraft they handle, air rescue and firefighting (ARFF) equipment may either be inadequate for effectively responding to an emergency involving the size of all-cargo aircraft operating at a given airport, or may not be available during periods of all-cargo operations, such as late night and early morning, when there are no scheduled passenger operations.²⁰¹ The FAA has indicated to stakeholders that its hands are tied on this matter, because the guidelines for airport operating certification are clearly spelled out in statute with specific reference to scheduled passenger operations.²⁰² While some dispute whether the FAA is correctly interpreting the law,²⁰³ stakeholders are likely to turn to Congress for clarification and statutory change making airport certification requirements a potential issue for reauthorization.

In general, the Air Line Pilot Association's (ALPA), under its "One Level of Safety" initiative, is seeking a variety of changes to the way the air cargo industry is regulated to better harmonize the regulatory structure and bring it in line with what is required of passenger air carriers. On the issue of pilot fatigue, ALPA would like the FAA to go beyond bringing all-cargo regulations in line with passenger airline regulations, and develop rules that specifically address the unique aspects of air cargo operations that contribute to fatigue. Their recommendations include lowering permissible flight and duty limits when these hours are logged between midnight and dawn and whenever flights cross six or more time zones.²⁰⁴

One specific safety concern for all-cargo operations, is carriage of hazardous materials (HAZMAT) that is either restricted or limited to smaller quantities on passenger airplanes. HAZMAT presents unique challenges for firefighters responding to a crash of a cargo aircraft, and also introduces unique risks in the flight environment. Undeclared HAZMAT is a particular concern, and options to reduce the amount of undeclared HAZMAT include better dissemination of information to shippers to make them aware of what constitutes HAZMAT and the proper declaration requirements and procedures, as well as better screening for HAZMAT at points of origin. Regulating the carriage of HAZMAT is a shared responsibility of the FAA, the DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA), and for mail shipments, the U.S. Postal Service. Additionally, over the past few years, the TSA has had an expanding role in cargo screening processes. The industry has been frustrated by the lack of consistency in interpreting and applying HAZMAT regulations among these various agencies.²⁰⁵ While progress toward developing standardized security and screening procedures has been slow, forthcoming security initiatives for all-cargo operations may provide some added benefit of improving the screening and handling of HAZMAT carried on aircraft. Another concern is the proper loading of HAZMAT to ensure its accessibility during flight in the event of a fire or leakage, as required. Also, flight crews have raised concerns about the adequacy of both the information they are

²⁰¹ See 14 CFR Part 139.

²⁰² See 49 USC §44706.

²⁰³ Jan W. Steenblik, "Cargo Issues Take Center Stage."

²⁰⁴ Captain David J. Wells and Jay Wells, Esq., *The Call for One Level of Safety, Flight and Duty Time Issues in Air Cargo Operations*, Air Line Pilots Association International, Herndon, VA. Presented at the NTSB Air Cargo Safety Forum, March 30-31, 2004.

²⁰⁵ Jan W. Steenblik, "Cargo Issues Take Center Stage."

provided regarding HAZMAT on board and the training they receive in HAZMAT handling procedures and safety.²⁰⁶ The regulation of HAZMAT carriage and handling may be an issue of considerable interest to Congress during the debate over FAA reauthorization.

A continuing concern in all-cargo operations is the carriage of lithium batteries. The risk of fires from these batteries was the focus of a recent NTSB hearing regarding an in-flight fire aboard a UPS DC-8 cargo plane that burned for four hours after an emergency landing in Philadelphia on February 7, 2006.²⁰⁷ This wasn't the first time the NTSB expressed concern regarding the carriage of lithium batteries. In April 1999, fire erupted among pallets of lithium batteries offloaded from a Boeing 747 at a cargo facility at Los Angeles International Airport. In response to this incident, the NTSB issued a series of recommendations to the DOT to fully assess the fire hazards of these batteries in the air transportation environment, ban their shipment on passenger aircraft, and require appropriate labeling on all lithium battery shipments transported on aircraft.²⁰⁸ In response to these concerns, the DOT banned primary shipments of lithium batteries on passenger aircraft.²⁰⁹ In the aftermath of the Philadelphia incident, ALPA has recommended that the DOT also ban bulk shipments of lithium batteries on all-cargo aircraft until adequate packaging standards are developed.²¹⁰ Recently, lithium batteries also been the focus of several consumer product safety recalls due to fire risk. The risks that these batteries pose to aviation is likely significant because the use of lithium batteries to power portable electronics is prolific, and portable electronics—because of their high value to weight ratio—make up a significant portion of goods shipped by air. In recognition of these ongoing concerns over fire risks posed by shipments of lithium batteries, both as primary shipments and as integrated shipments in electronic devices, Congress may consider whether more detailed safety assessments of shipments containing lithium batteries is needed.

Several air carrier accidents have been traced to improper loading, including overloading aircraft, improperly distributing loads, and inadequately securing freight resulting in weight shifts during flight. Mishandling of cargo can also cause damage to aircraft that, if undetected or unreported, can lead to future incidents and accidents.²¹¹ While the NTSB called for improved flight crew oversight of loading procedures following the 1997 crash of a Fine Air DC-8 in Miami, pilots report that they often are not able to observe the loading process, and a lack of uniformity in forms and procedures among loading contractors and facilities makes it difficult to ensure that the job has been done right.²¹² Several options exist for improving the safety of cargo handling. ALPA believes that incorporating the industry's best practices into universal standard operating procedures for cargo loading is needed.²¹³ ALPA also believes that better training, supervision,

²⁰⁶ *Ibid.*

²⁰⁷ "The Laptop Flare-up, The NTSB Rekindles Objections to Onboard Electronics," *Air Safety Week*, August 21, 2006, p. 1.

²⁰⁸ National Transportation Safety Board, *Safety Recommendations A-99-80 through A-99-84*, Washington, DC, November 16, 1999.

²⁰⁹ Research and Special Programs Administration, "Hazardous Materials; Prohibition on the Transportation of Primary Lithium Batteries and Cells Aboard Passenger Aircraft; Final Rule," *Federal Register*, 69(240), December 15, 2004, pp. 75208-75216.

²¹⁰ "Carrying the Torch for HAZMAT and Cargo Safety: ALPA Concerns and Positions," *Air Line Pilot*, September 2006, p. 33.

²¹¹ *Ibid.*

²¹² *Ibid.*

²¹³ Captain Terry McVenes and Captain William McReynolds. *The Current State of the Cargo Industry: An ALPA Perspective*. Presented at the NTSB Air Cargo Safety Forum, NTSB Academy, Ashburn, VA, March 30-31, 2004.

and oversight of cargo handlers and establishing certification requirements for loadmasters would improve safety. Also, the NTSB has recommended that the FAA mandate drug and alcohol testing for cargo handlers, load planners, and ramp supervisors.²¹⁴ The merits of these various recommendations and proposals may be a topic of debate in Congress in the context of the current FAA reauthorization process.

Aircraft Cabin Occupant Safety, Comfort, and Public Health

In Vision 100, Congress enacted legislation directing the FAA to establish a research program on airliner cabin air quality and establish a cabin air quality incident reporting system. However, a 2004 GAO study found that many experts do not believe that the FAA's planned actions will adequately address these recommendations.²¹⁵ Further, growing public health concerns over potential human-to-human spread of the deadly avian influenza virus may elevate the issue of preventing the spread of infectious diseases on commercial airline flights during the current reauthorization process. Also, rapidly changing cell phone and wireless technologies and consumer demand for these technologies is placing pressure on policy makers to approve these devices for use on airline flights. However, significant safety concerns remain, raising the issue of how well research and testing of these devices to determine whether they pose any risk to aviation safety is keeping pace with industry demand to approve these devices for in-flight use. Also, a decade-old debate between the NTSB and the FAA regarding whether it is safe to allow infants and toddlers to ride on the laps of adults remains unresolved. The NTSB argues that children should instead be restrained in child restraints, while the FAA believes that the cost to consumers would create a greater safety risk by diverting many families to highway travel, which is statistically less safe. These various issues related to airliner cabin safety, comfort, and public health may be considered during the course of the FAA reauthorization debate in Congress.

Cabin Air Quality

Air quality in airliner cabin environments has been a continuing concern of Congress during prior FAA reauthorization debates. Following congressionally mandated studies and recommendations regarding the airliner cabin environmental and health effects on passengers and crew performed by the National Research Council (NRC), Congress included in Vision 100 a mandate calling for FAA monitoring and assessments of cabin air quality as recommended by the NRC. The legislative language specifically directed the FAA to monitor ozone levels in the cabin on a representative number of flights and aircraft to determine compliance with existing federal aviation regulations for ozone, to collect pesticide exposure data, to identify contaminants that passengers are exposed to, to analyze and study cabin air pressure and altitude, and to establish an air quality incident reporting system.

A 2004 GAO study of FAA's progress toward addressing the NRC recommendations and the congressional mandate set forth in Vision 100 found that while the FAA was making progress,

²¹⁴ National Transportation Safety Board, *Safety Recommendation A-03-02*,

²¹⁵ U.S. Government Accountability Office, *Aviation Safety: More Research Needed on the Effects of Air Quality on Airliner Cabin Occupants*, January 2004, GAO-04-54.

additional steps were needed to fully assess cabin air quality, conduct air quality surveillance of the air carrier fleet, fully assess the costs and benefits of air filtration, and provide the traveling public with adequate information regarding the health risks of posed by cabin air quality.²¹⁶ The GAO noted that FAA's planned actions will likely not be adequate to fully answer the long-standing questions regarding the nature and extent of potential health effects related to airliner cabin environments. The GAO concluded that more extensive research will likely be needed to address these questions. Further, GAO noted that while various technologies to filter pollutants and biological agents are readily available, they are not required on aircraft. The GAO found that while high-efficiency particulate air (HEPA) filters are widely used by airlines on larger aircraft and their use is recommended for recirculated air systems by air quality experts, they are not commonly used in commuter aircraft. Retrofitting these smaller aircraft to incorporate filtering could be very costly to the airlines, and more detailed cost and benefit analyses will likely be needed to determine if these filtration system provide a viable, cost effective means to improve air quality on smaller aircraft.

Preventing the Spread of Infectious Disease in the Aircraft Cabin

Besides general concerns over air quality on board airliners, heightened concern over the spread of infectious disease on aircraft may prompt action to address this issue. In 2002, fear over the spread of severe acute respiratory syndrome (SARS) had a notable economic impact on the airline industry. In the current context, growing concern over potential human-to-human transmission of the avian flu virus is spurring research and public policy debate on how to mitigate disease transmission in the aircraft cabin. Current research efforts are focused on screening and detection methods, such as test strips and on-board sensors, and practical decontamination techniques, such as cabin heaters and hydrogen peroxide vapors.²¹⁷ These techniques could become part of an overall public health policy to control the spread of an infectious disease such as the avian flu. Current research in this area is being federally funded through the Center of Excellence for Airliner Cabin Environmental Research (ACER), an FAA-funded consortium of eight university programs led by Auburn University. In the current reauthorization process, Congress may examine these efforts to assess the adequacy of the program and its funding levels and to identify any potential technologies and policy considerations stemming from this research that could improve the United States' response to an infectious disease outbreak to mitigate disease transmission in airliner cabins.

Faced with a possible pandemic outbreak of a deadly disease, restricting travel has been suggested as an option to limit the spread of such an infectious disease. During the upcoming FAA reauthorization Congress may consider whether further study and perhaps an action plan is needed to establish policies on air travel in such a situation. Recently reported medical findings indicate that the slowdown in air travel following the terrorist attacks of September 11, 2001 delayed the onset of that year's flu season by about two weeks.²¹⁸ Experts, however, note that there was no observable change in the number of flu-related deaths that year, and caution that travel restrictions, therefore, may not be a particularly effective mitigation strategy for the long-term. Travel restrictions are likely to be considered a highly controversial option because they could have widespread economic implications for the airlines, particularly if travel restrictions or

²¹⁶ *Ibid.*

²¹⁷ "Cabin Air Quality to Become New Frontier of 'Air Safety'." *Air Safety Week*, 20(26), p. 1-2.

²¹⁸ Luran Neergaard, "9/11 Air Travel Drop Slowed Flu's Spread," *The Washington Post*, September 12, 2006.

government-issued travel warnings were released prior to or during busy holiday travel times. Moreover, screening or restricting travel of infected individuals, particularly individuals not displaying symptoms of disease, is likely to be difficult and may raise significant privacy issues.

Cell Phones and Portable Electronic Devices

Recently, there has been considerable interest in approving cell phone use aboard aircraft. However, studies by the British Civil Aviation Authority (CAA) demonstrated interference to various avionics equipment from signals similar to a cell phone transmitting at maximum power.²¹⁹ A possible compromise is to ensure that cell phones transmit only at low transmission powers. The pico cell concept, which consists of a small cell-phone interface installed on the aircraft that forces active cell phones to transmit at low power, attempts to utilize such an approach. However, there is still lingering concern that the power outputs of multiple cell phone devices in aircraft could be additive, potentially resulting in signals that could interfere with critical aircraft systems. There is also concern that systems like the pico cell concept don't have enough safeguards to prevent transmissions that exceed acceptable output levels.

Other portable electronic devices (PEDs), like laptops, portable media players, personal digital assistants (PDAs) and handheld electronic games, have historically posed less of a concern because they are primarily non-intentional emitters of radio-frequency (RF) energy, and their RF emissions are of comparably low power. However, a new breed of intentional transmitters, imbedded in these kinds of devices, that use Wi-Fi and Bluetooth® wireless connection protocols represent a relatively new form of technology that is rapidly proliferating in PEDs. There is considerable interest in using RF emitting devices, relying on Wi-Fi protocols in particular, as a means for providing broadband internet access to air travelers.

Researchers from Carnegie Mellon University recently completed a study looking at emissions from PEDs on board commercial passenger aircraft. They found that, in violation of current FAA and FCC regulations, cell phone calls are regularly made from commercial aircraft.²²⁰ While the researchers noted that spurious emissions from a variety of PEDs are a potential safety concern, they focused their attention on emissions from cell phones and their impact on frequency bands used by aircraft navigation systems. They concluded that the most serious concern for interference from cell phones is for GPS receivers, which will become the primary means for aerial navigation over the next several years.

Passengers are typically informed that “approved portable electronic devices” may be used above 10,000 feet. However, in terms of regulatory standards, the FAA ultimately leaves it up to the individual air carriers to determine which PEDs are safe for use aboard their specific aircraft. In practice, besides the specific ban on cell phones, most commonly used consumer PEDs are permissible.

²¹⁹ Civil Aviation Authority (United Kingdom), *CAA Paper 2003/3: Effects of Interference from Cellular Telephones on Aircraft Avionics Equipment*, Gatwick Airport, West Sussex, England; Civil Aviation Authority (United Kingdom), *Report: Interference Levels In Aircraft at Radio Frequencies used by Portable Telephones*, Gatwick Airport, West Sussex, England.

²²⁰ Bill Strauss, M. Granger Morgan, Jay Apt, and Daniel D. Stancil, “Unsafe At Any Airspeed?, Cellphones and Other Electronics Are More of a Risk Than You Think”, *IEEE Spectrum*, 43(3), March 2006.

The rapid proliferation of these various wireless technologies has far outpaced the ability to conduct thorough research and testing to determine their potential to interfere with aircraft communications, navigation, and surveillance equipment. Protection of avionics from interference is likely to become increasingly important in the future as these functions become more fundamentally integrated in technologies such as ADS-B, GPS, and cockpit multi-function displays of navigation, traffic, and weather information.²²¹ In approaching this issue, safety concerns may conflict with airline consumer demand for in-flight access to wireless voice communications and Internet connectivity. Congress may consider options to more fully assess the safety implications of RF emitting devices on aircraft, and available means for protecting aircraft systems from RF interference. Options may include extensive study of the issue by an independent agency such as the National Academies, and the implementation of more clearly defined safety standards and safety monitoring capabilities for assessing RF interference and for reporting and monitoring suspected RF interference with aircraft systems.

Besides concerns over RF interference, lithium batteries in carry-on portable electronic devices also pose a potential fire hazard.²²² However, because fires in accessible areas of the cabin are more likely to be quickly detected, these types of fires may pose less of a threat of causing a catastrophic loss of the aircraft than a fire that propagates in an inaccessible baggage or cargo hold. Nevertheless, any fire during flight poses a significant threat to cabin occupants from both heat and smoke, and could potentially be catastrophic if not handled effectively by the flight and cabin crew. From a policy perspective, general prohibitions against carrying PEDs using lithium batteries on aircraft are seen as unpopular options because the use of lithium batteries in such devices is so commonplace. During the course of reauthorization, Congress may consider whether the FAA needs to work more closely with the Consumer Product Safety Commission, the National Institute of Standards and Technology (NIST), and other government entities to ensure that risks to aircraft safety posed by consumer PEDs are minimized.

Infant and Toddler Seats

The lack of specific regulations for restraining children under two years of age in airliner cabins has been a continuing point of contention between the FAA and the NTSB. While the NTSB has recommended that the FAA issue child restraint requirements since 1995, the FAA has resisted. The FAA had issued an advanced notice of proposed rulemaking to comply with the NTSB recommendation in May 1999, but withdrew this proposal in August 2005, largely based on the argument that the increased cost of purchasing a seat for a young child would prompt many families to drive instead of fly, which arguably poses a greater risk of death or serious injury to all family members. The NTSB, on the contrary, believes that all aircraft occupants should be restrained during takeoff, landing, and in turbulence, and that infants and small children should be restrained using a restraint system tailored to their height and weight. Also, the NTSB questions the validity of the argument that diversion to highway travel is a valid justification for not mandating the use of child restraints for occupants under two years old.²²³ The airlines view the potential of diversion to highway travel as a significant threat to the industry, and note that

²²¹ These aircraft technologies are discussed in greater detail in the section on technological objectives and core technologies of the next generation air transportation system.

²²² “The Laptop Flare-up, The NTSB Rekindles Objections to Onboard Electronics,” *Air Safety Week*, August 21, 2006, p. 1.

²²³ National Transportation Safety Board, *Most Wanted Transportation Safety Improvements—Federal Issues, Aviation, Require Restraint Systems for Children Under 2*, Washington, DC.

increased security measures following the 9/11 terrorist attacks have already diverted large numbers of potential customers to travel by highway instead. The airlines believe that the revenue loss due to diversions would far outweigh any revenue gains realized by requiring occupants under two years to be ticketed.

Instead of imposing mandatory regulatory requirements for child restraints, the FAA encourages voluntary compliance with its stated recommendation that “strongly urges” travelers to secure children in an appropriate restraint based on weight and size, and recently issued public education materials to promote these safe practices.²²⁴ The FAA also announced in September 2006 its approval of new lightweight child safety restraint designed solely for use in aircraft.²²⁵

Congress has largely remained silent on this issue, allowing the FAA to pursue regulatory options and promoting voluntary compliance as it sees fit. However, in consideration of the continuing disagreement between the NTSB and the FAA on this issue, options for improving the safety of child occupants of airliner cabins may be debated in the current reauthorization process. Besides regulatory mandates, options to increase the use of child restraints on aircraft may include improved public education and awareness of the safety risks to unrestrained occupants including infants and toddlers, and incentives to airlines that develop innovative approaches to increase the use of child restraints for passengers under the age of two.

Energy and Environmental Considerations

Recent uncertainty over petroleum supply and growing policy interest in identifying alternative fuel sources may generate interest in this issue during debate over FAA reauthorization. Although energy issues have not been a major focus of past FAA reauthorization processes, a provision allowing the use of passenger facility fees to fund the acquisition of low-emission airport ground vehicles was included in Vision 100. Further assessment of alternative fuels both for airport ground vehicles and for aircraft may arise as an issue during debate in Congress over FAA reauthorization. With regard to environmental impacts, concerns over noise have long dominated the policy debate. However, debate over aircraft emissions policies could play a larger role in this reauthorization process, in response to growing international pressures to set standards and goals for reducing aircraft emissions. A key policy issue centers on whether current industry demand for more fuel efficient aircraft will result in adequate emissions reductions over time, or whether more proactive policies to curtail aircraft emissions are needed. Debate over aircraft noise policy may focus on whether emerging quiet aircraft technologies can yield substantive noise reductions, whether adequate noise level reductions can be attained through industry demand for more efficient aircraft designs or whether stricter aircraft noise standards may be needed, and whether existing community noise standards and noise policies are sufficient to mitigate noise impacts considering forecast growth in air traffic and possible community growth in noise impacted areas.

²²⁴ Federal Aviation Administration, *Childproof Your Flight* (Undated).

²²⁵ Federal Aviation Administration, *FAA Approves New Child Safety Device Government Gives Parents More Options for Safe Air Travel with Children*, September 6, 2006.

Alternative Fuels for Aircraft

Recently, oil and refined petroleum prices have been relatively high. As a result, airlines and other users of aviation fuels are increasingly interested in ways to decrease fuel consumption which would have the effect of reducing air emissions, to a lesser extent. Most of this attention has focused on increasing the fuel-efficiency of jet aircraft, but plane manufacturers, fuel suppliers, and others have also turned their attention to alternatives to petroleum fuels.

Roughly 99% of civilian aviation fuel used in the United States is jet fuel,²²⁶ and most efforts have focused on jet fuel alternatives. Jet fuel is similar in composition to kerosene or diesel fuel, so diesel fuel substitutes are of particular interest. Synthetic diesel fuel can be produced from various processes, including the conversion of natural gas to liquid fuel (often referred to as “gas-to-liquids” or GTL), and the conversion of biological oils into biodiesel. Coal-derived fuels can also be produced using processes similar to GTL. These fuels could potentially be used as blending components to extend conventional jet fuel stocks, or as direct substitutes for conventional fuel. However, there are some key cost and technical barriers to using these fuels for aviation. Technical barriers include issues related to the reliability, safety, and performance of the fuel. For example, biodiesel freezes at higher temperatures than conventional jet fuel, which can be a problem in high-altitude, low temperature environments. Therefore, research on biodiesel for aviation has included studying whether additives can be used to lower the freezing point, or whether heaters could be added to fuel tanks to maintain fuel temperature.

The U.S. Department of Defense (DOD), and the U.S. Air Force particularly, are keenly interested in alternative supplies of jet fuel, both in terms of cost and in terms of supply security. One of DOD’s goals is to use a single fuel, JP-8, in all of its battlefield operations. JP-8 is a military-grade fuel similar to commercial Jet-A. Roughly half of DOD’s total energy consumption (and 2/3 of DOD’s petroleum consumption) in FY2005 was JP-8, much of it consumed by the Air Force in jet aircraft.²²⁷ This heavy reliance on jet fuel has led the Air Force to study jet fuel alternatives. In May 2006, the Air Force signed a contract with Syntroleum corporation to supply 100,000 gallons of GTL for testing.²²⁸ In September 2006, the Air Force began testing a blend of GTL and conventional JP-8 in a B-52 bomber. Under the initial test plan, two of the plane’s eight engines were fueled with the blend. If the test is successful, the Air Force plans to acquire an additional 100 million gallons of the fuel by 2008.²²⁹

While the vast majority of aircraft fuel is jet fuel, smaller piston engine planes use high-octane leaded gasoline. A small number of general aviation planes are operated on ethanol, a high-octane fuel produced from grains or sugar (mostly corn in the United States). Leaded gasoline has been banned for automotive use since the mid-1990s, and there is concern among some general aviators that leaded aviation gasoline will eventually be banned as well. Therefore, there is interest in expanding the use of ethanol and other alternatives in these smaller planes.

²²⁶ Stacy C. Davis and Susan W. Diegel, U.S. Department of Energy, *Transportation Energy Data Book, 25th Edition*, 2006, Table 2.4.

²²⁷ U.S. Energy Information Administration. *Annual Energy Review 2005*. July 27, 2006. Table 1.13: U.S. Government Energy Consumption by Agency and Source, Fiscal Years 1995 and 2005.

²²⁸ Staff Sgt. C. Todd Lopez, “Alternate fuel-powered B-52 to fly in September,” *Air Force Print News*, May 15, 2006. <http://www.af.mil/news/story.asp?storyID=123020290>.

²²⁹ Tom Shanker, “Military Plans Tests in Search for an Alternative to Oil-Based Fuel,” *The New York Times*, May 14, 2006.

In addition to substituting alternative fuels in existing jet and piston aircraft, research is ongoing on new engine technologies to incorporate other fuels and engines. For example, various early, unmanned prototypes have been developed to test the feasibility of solar-or hydrogen fuel cell-powered aircraft.

Alternative Fuels for Airport Ground Service Vehicles

While alternative fuels have been slow to penetrate into aviation, natural gas, propane, and electric vehicles are widely used in airport ground service fleets, including people movers, baggage transport, and food service. Often, alternative fuel airport service vehicles are chosen mainly for air quality purposes, though in some cases they can lead to cost reductions, as well. Generally, alternative fuel airport service vehicles are incorporated into a State Implementation Plan (SIP) under the Clean Air Act. If an area is not in compliance with federal air quality standards, a state must submit an SIP to the Environmental Protection Agency outlining the measures it will take to bring the area back into compliance. Often, SIPs include the use of alternative fuel vehicles in state and municipal fleets, particularly at airports located within nonattainment areas.²³⁰ Further, there is often state and federal funding available for airports to purchase alternative fuel vehicles and to install the fueling infrastructure (pumps, tanks, etc.) to support those vehicles.²³¹ Vision 100 included a provision allowing passenger facility fees to be used for conversion to low-emissions airport vehicles and ground support equipment. However, the provision stipulates that the cost of conversion must not exceed the cost of a similar vehicle used for the same purpose that is not considered low-emission, or the cost of retrofitting existing vehicles to meet low-emission standards. During reauthorization debate, Congress may examine this provision in particular, and how airports have utilized this provision to fund purchases of low-emission vehicles.

Air Pollution

There are two major air pollution issues associated with aircraft and airports: first, their contribution to the nonattainment of air quality standards (primarily ground-level ozone in major metropolitan areas); and second, their contribution to global climate change, from the emissions of aircraft in the upper troposphere.

Ozone Nonattainment Areas

Aircraft account for only about 0.5% of the major categories of emissions from mobile sources in the United States, according to the Government Accountability Office,²³² but the emissions tend to be concentrated at airports in major cities. Most of these cities have not attained EPA's National Ambient Air Quality Standard for ozone, and must reduce emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) to reach attainment. Ozone forms in the atmosphere as a

²³⁰ Nonattainment areas are localities where air pollution levels persistently exceed national ambient air quality standards, or that contribute to ambient air quality in a nearby area that fails to meet these standards.

²³¹ For more information, see U.S. Department of Energy, Alternative Fuels Data Center. *Alternative Fuel Vehicle Fleets and Niche Markets for Airports*. http://www.eere.energy.gov/afdc/apps/afvinfo_airports.html.

²³² U.S. Government Accountability Office, *Aviation and the Environment: Strategic Framework Needed to Address Challenges Posed by Aircraft Emissions*, Report No. GAO-03-252, February 2003, p. 39. GAO's data were obtained from the Environmental Protection Agency.

result of reactions between VOCs and NO_x (and to a lesser extent, carbon monoxide) in the presence of sunlight. Comprehensive data on the extent of airport/aircraft contributions to the problem are not available, but, as one example, GAO estimated that aircraft produced about 3% of the nitrogen oxides (NO_x) and 5% of the carbon monoxide present in the Dallas-Fort Worth (DFW) metropolitan area. GAO also estimated that ground support equipment (which provide services such as aircraft towing, baggage handling, maintenance/repair, refueling, and food service) accounted for nearly 3% of the area's NO_x, concluding, "When all airport-related emissions are added together, we estimated that the Dallas/Fort Worth International Airport was responsible for 6 percent of nitrogen oxides in the metropolitan area."²³³ Auxiliary power units, which generate electricity and provide heat or air conditioning for planes parked at terminals, are also significant sources of emissions.

The emission estimates for DFW may represent the high end of the spectrum. At Boston's Logan Airport, emissions of VOCs and NO_x were estimated to contribute less than 1% of the emissions in the Boston area.²³⁴ Whatever the figure, aircraft and airport operations are among the largest identifiable sources of emissions. As other sources of pollution are subjected to more stringent controls, and as air traffic grows, their relative contribution to emissions inventories is expected to increase.

Many of the mobile sources of emissions involved in airport operations (automobiles, vans, buses, and trucks) are subject to the same emission controls as similar vehicles in use elsewhere. But aircraft themselves have not been subjected to stringent controls. In general, emission standards for aircraft are imposed only after agreement with members of the International Civil Aviation Organization (ICAO). Unlike new automobiles, for example, which are required to reduce pollution approximately 99% in comparison to uncontrolled models, standards for aircraft NO_x emissions were reduced 20% at the end of 1999 and a further 16% at the end of 2003. When the Environmental Protection Agency (EPA) promulgated the latest set of standards, it said:

EPA believes that today's standards will not impose any additional burden on manufacturers, because manufacturers are already designing new engines to meet the ICAO international consensus standards.... Today's standards are aimed at assuring that this progress is not reversed in the future.²³⁵

It is unlikely that aircraft emission standards will play a prominent role in FAA reauthorization. After negotiations with ICAO, these standards are set by EPA—not by FAA—using the authority of the Clean Air Act. Attempting to control aircraft emissions through legislation reauthorizing FAA could raise jurisdictional issues, particularly in the House.

Airport *operations* are more likely to be addressed in an FAA bill. As part of the state implementation plans for achieving air quality standards, several airports have already implemented programs to require the use of alternative fuels in certain ground support equipment or shuttle services. A related area of interest is the electrification of airport gates to eliminate emissions from auxiliary power units. Vision 100 directed the FAA to establish a national program to reduce airport ground emissions at commercial service airports located in air quality nonattainment and maintenance areas.²³⁶ The Voluntary Airport Low Emissions (VALE) program

²³³ Ibid., pp. 40-41.

²³⁴ Ibid., p. 40.

²³⁵ 70 *Federal Register* 69675, November 17, 2005.

²³⁶ Currently, roughly 160 airports can participate.

allows airport sponsors to use Airport Improvement Program (AIP) grants and Passenger Facility Charge (PFC) funds to finance low emission vehicles, refueling and recharging stations, gate electrification, and other airport air quality improvements.²³⁷

VALE is restricted to financing capital improvements and cannot pay for operations or maintenance costs such as fuel purchases. The range of uses for PFC funding is broader than are allowable under AIP. For example, AIP funds are limited to vehicles and infrastructure for “alternative fuel” use as defined by the Department of Energy whereas the PFC program allows for use of clean conventional fuels. Significantly, VALE program funding is restricted to the “incremental” cost differential between the higher priced low-emission vehicle and the lower price of a conventional fuel vehicle. Retaining, changing, or eliminating these restrictions or eligibility criteria could be considered during reauthorization.

Aircraft and Climate Change

Aircraft appear to play a larger role in global climate change than in ground-level pollution. According to ICAO, “aircraft are estimated to contribute about 3.5 per cent of the total radiative forcing (a measure of change in climate) by all human activities and ... this percentage, which excludes the effects of possible changes in cirrus clouds, was projected to grow.”²³⁸ The United States is not a party to the Kyoto Protocol, which sets limits on emissions of the gases that contribute to climate change, but most U.S. trading partners are. Several of these partners (including the European Union) are considering fees or other programs to encourage airlines to reduce emissions. Thus, there will be pressure in the coming years to develop aircraft that are more fuel efficient and have fewer emissions. Whether the FAA bill would be a vehicle for such efforts remains to be seen.

Mitigating Aircraft Noise Through Policy and Technology

Since the introduction of civil jet airliners in the early 1960s, significant reductions in noise emissions have been made. A systematic effort to curtail aircraft noise impacts has reduced the number of people in the United States exposed to what is considered significant noise levels from about 7 million in 1975 to less than 400,000 today. This has been accomplished by technological advancements in reducing noise emissions as well as efforts to mitigate community noise exposure around airports. While significant advances have been made over the years, the United States is now at a crossroads in terms of its public policy toward aircraft noise mitigation. Some experts predict that while the pace of noise reduction technology will slow largely due to diminishing marginal gains in noise reduction capability, increases in the demand for air travel coupled with continuing population growth may largely offset any technical advances if there are no changes to existing policies and approaches to mitigating aircraft noise and its impacts on communities.

Policymakers have long debated the relative merits of investing in noise reduction technology or investing in noise mitigation efforts in affected communities. In the past, a combination of both of these approaches has been applied. However, faced with current challenges to reduce budget

²³⁷ See [http://www.faa.gov/airports_airtraffic/airports/environmental/vale/].

²³⁸ ICAO, “Environmental Protection (ENV), Aircraft Engine Emissions, Definition of the Problem,” at http://www.icao.int/cgi/goto_m_atb.pl?/icao/en/env/aee.htm, visited August 18, 2006.

deficits and balance competing priorities and programs, policymakers will likely face difficult decisions in allocating future year budgets for noise reduction technology and noise mitigation.

Aircraft Noise Reduction Technologies and Technology Policy

Policymakers may also face difficult decisions in setting realistic goals for future reductions in aircraft noise levels. Some observers question whether meaningful advances in noise reduction technology can be achieved citing diminished marginal gains in noise reductions in recent years, while others, citing historical trends, suggest that aircraft noise emissions can be reduced to one-half of their current levels over a period of about 20 years.²³⁹ In line with this optimistic view, NASA has set ambitious goals to cut the perceived aircraft noise in half from 1997 baseline levels by 2007, and in half again by 2022.²⁴⁰ Whether technological advancements to reduce aircraft noise will continue to progress at these historical rates may depend, in part, on the adequacy of funding for aircraft noise technology programs. However, these investments are seen as being of relatively high risk because it is not certain to what extent these historical trends can continue or whether significant technological advances in noise reduction beyond what has already been achieved or demonstrated are even possible.

Stage 3 and Stage 4 Noise Standards

Aircraft noise reduction technologies over the past decade have been driven to some degree by national and international noise standards. Current Stage 3 noise standards were completely phased-in under rules promulgated by the FAA to meet the mandate of the Airport Noise and Capacity Act of 1990 (ANCA; P.L. 101-508). Under the phase-in plan, all aircraft operators were required to gradually transition to 100% Stage 3 compliant aircraft operations by 2000 for aircraft weighing 75,000 pounds or more. For most aircraft types, Stage 3 aircraft are considerably quieter than earlier generation Stage 2 aircraft whose noise guidelines were established in the early 1970s based on available technical capabilities at that time. The most significant reductions in permissible noise levels under Stage 3 were for 2-engine aircraft weighing between 125,000 and 600,000 pounds. This includes most airline fleets currently in operation and typical reductions in permissible noise levels for these aircraft were in the range of eight to 10 decibels, which is roughly equivalent to cutting the perceived noise level by half.²⁴¹ The International Civil Aviation Organization (ICAO) has since adopted more stringent noise standards, called Chapter 4 noise standards, for new aircraft designs. These became effective in January 2006.²⁴² The FAA followed suit, establishing Stage 4 noise regulations mirroring the ICAO Chapter 4 requirements.²⁴³ Stage 4 noise standards are required to be at least three to four decibels less than Stage 3 permissible noise levels for all measurements, and must be at least two decibels lower

²³⁹ National Research Council, *For Greener Skies: Reducing Environmental Impacts of Aviation*, National Academies Press, Washington, DC, 2002.

²⁴⁰ *Ibid.*

²⁴¹ While a reduction of 3 decibels corresponds to reducing the acoustic energy emitted by half, it generally takes about 10 decibels of noise reduction for human listeners to perceive the sound as being half as loud.

²⁴² Because the proposed Stage 4 standards will apply only to new aircraft type designs, aircraft manufactured after the January 6, 2006 compliance date will only have to meet these standards if they are based on an entirely new type design. Aircraft manufactured under existing type designs, such as the Boeing 737 or Airbus A-320, would not be required to comply.

²⁴³ Federal Aviation Administration. "Stage 4 Aircraft Noise Standards; Final Rule." *Federal Register*, 70(127), 38741-38750, July 5, 2005.

than Stage 3 permissible noise levels for each noise certification configuration. Unlike Stage 3 regulations, Stage 4 requirements will only apply to new aircraft type designs. Nonetheless, many modern aircraft with very high bypass ratio turbofan engines, such as the Boeing 777 and the Airbus A-340, already meet the proposed Stage 4 requirements.

NASA's Quiet Aircraft Technology Program

Besides regulatory action, the federal government has fostered aviation noise reduction technology through NASA's quiet aircraft technology (QAT) program. The program's goals are to identify and develop technologies capable of reducing aircraft noise by 10 decibels, compared to 1997 levels, by 2007 and by another 10 decibels by 2022. By implementing these technologies, NASA hopes to keep aggregate aircraft noise below a 65 decibel day-night average sound level (DNL) anywhere outside the airport boundary at most airports.²⁴⁴ The 65 DNL criterion is considered the maximum permissible exposure level to aircraft noise in residential settings in land use planning guidelines. NASA's QAT program is focused on a variety of technical solutions to reducing aircraft noise emissions and their impacts on residential communities that are discussed in further detail below. Technologies being pursued under this program include active noise reduction for turbine engines, engine fan blade and exhaust nozzle designs, and improved landing gear fairings and other measures to reduce airframe noise.

The FAA's Center of Excellence in Aircraft Noise and Aviation Emissions Mitigation

Besides the ongoing NASA QAT program, the FAA has established a Center of Excellence in Aircraft Noise and Aviation Emissions Mitigation to foster research in these areas. The lead university for this center is the Massachusetts Institute of Technology. Seven other universities are also participating along with 29 industry partners representing various interests and technical perspectives. The program currently has nine ongoing projects: (1) Low Frequency Noise Study; (2) Measurements, Metrics and Health Effects of Noise; (3) Valuations and Tradeoffs of Policy Options; (4) Continuous Descent Approach at Louisville International Airport (SDF); (5) Aircraft Operations & Air Traffic Control; (6) Land Use and Airport Controls; (7) Quiet Rotorcraft and Short-Field Operations; (8) Supersonic Transport Project; and (9) Measurements, Metrics and Health Effects of Emissions.

Airport Noise Mitigation Policy

In terms of airport noise mitigation policy, the various approaches to addressing noise problems at airports are addressed in two chapters of the Code of Federal Regulations (CFR): Title 14 CFR Part 150, *Airport Noise Compatibility Planning* and Title 14 CFR Part 161, *Notice and Approval of Airport Noise and Access Restrictions*. These regulations are commonly referred to as the Part 150 and Part 161 processes. Additionally, airspace management and noise abatement procedures are discussed in FAA policy documents and advisory materials. These approaches include assessing noise levels and establishing noise compatibility programs, reviewing and implementing noise-based access restrictions at airports, and making modifications to airspace

²⁴⁴ DNL refers to the day-night average sound level at airports. The DNL is an energy average of the aggregate noise exposure at a location that applies a specific penalty of 10 decibels for noise events occurring between 10 PM and 7 AM. The FAA has adopted the DNL metric for describing community noise exposure around airports.

design and flight procedures to mitigate noise in affected communities. The FAA has adopted formal procedures for carrying out these approaches to meet statutory mandates for noise controls and work with airport operators and local communities to address airport noise issues. Each of the approaches is discussed in further detail below.

Noise Exposure Maps and Noise Compatibility Programs

The formal process for assessing airport noise and establishing programs to mitigate noise is through the process described in Title 14 CFR Part 150. Completion of the Part 150 process, while not a mandatory requirement for airports, is a prerequisite for federal funding of noise mitigation programs at airports, such as home and land purchases and soundproofing of residences and schools, and is carried out to comply with the National Environmental Policy Act (NEPA; 42 U.S. Code §4331 *et seq.*) Thus, Part 150 defines the regulatory process for FAA compliance with NEPA and related statutes pertaining to the submission of noise exposure maps (49 U.S. Code §47503) and noise compatibility programs (49 U.S. Code §47504). Completion of a Part 150 process primarily involves development of a noise exposure map for the airport detailing noise exposure levels in surrounding areas, and establishment of a noise compatibility program. The purposes of a noise compatibility program are:

- To promote a planning process through which the airport operator can examine and analyze the noise impacts, perform cost-benefit analyses of various approaches to noise mitigation, and identify existing and forecast areas of non-compatible land uses and consider actions to reduce non-compatible use areas;
- To bring together through public participation, agency coordination, and overall cooperation, all interested parties to facilitate the development of an agreed upon noise abatement plan tailored to the individual airport while not unduly affecting the national air transportation system; and
- To develop feasible, comprehensive noise reduction techniques and land use controls which, to the maximum extent possible, confine noise levels of 75 DNL or greater to areas inside the airport boundary and establish and maintain compatible land uses in the areas affected by noise between the 65 DNL and 75 DNL contours.²⁴⁵

Because land use zoning is largely a local function that is seldom preempted by state or federal action, achieving compatible land uses typically involves close cooperation with local officials.²⁴⁶ In other words, simply having a Part 150 noise compatibility program does not establish any formal requirement or obligation regarding land use, but rather acts as a guideline for zoning. While the FAA notes that the responsibility for determining acceptable and permissible land uses and the relationship between specific properties and specific noise levels rests with local authorities, its published land use compatibility tables specify that a DNL of 65 or above is incompatible with residential use and schools, while other noise sensitive facilities like hospitals and churches may be located in areas where the DNL value exceeds 65, but only if additional noise level reductions are achieved through design and construction.²⁴⁷ Adopting local zoning

²⁴⁵ 14 CFR Part 150 §B150.1.

²⁴⁶ While zoning is done at the local level in most states, in some states, the state government can preempt local zoning and land use planning and plays a larger role in these decisions.

²⁴⁷ 14 CFR Part 150 §A102.

practices that adhere to these guidelines, while not obligatory, is recommended. According to FAA records, 260 airports are participating in the Part 150 program, 241 of which have received federal Airport Improvement Program (AIP) grants for completing a Part 150 study.

Noise-Based Access Restrictions at Airports

The Airport Noise and Capacity Act of 1990 (ANCA, 49 U.S. Code §47521 *et seq.*) mandates a national aviation noise policy for reviewing noise and access restrictions at airports. The statute limited the applicability of this program to restrictions proposed after October 1, 1990. Under the provisions of the statute, limitations on Stage 3²⁴⁸ aircraft can only be imposed if agreed to by the airport and all affected aircraft operators, or adopted through a review process administered by the FAA. The types of aircraft operating limitations covered under this provision include noise level restrictions using either a single event or cumulative exposure criteria, a direct or indirect limitation on the number of Stage 3 operations, a noise budget or noise allocation program encompassing Stage 3 aircraft, a limitation on the hours of operation for Stage 3 aircraft, or any other limit on Stage 3 aircraft. Proposed restrictions will be approved only in cases where there is substantial evidence that the proposal: is reasonable, nonarbitrary, and nondiscriminatory; does not create an undue burden on interstate or foreign commerce; is not inconsistent with maintaining safe and efficient use of navigable airspace; does not conflict with any existing federal statute or regulation; and does not create an undue burden on the national aviation system.

The statute also limited the ability of airports to impose restrictions on noisier Stage 2 aircraft, but made these restrictions relatively easier to impose. Under the statute, airport operators are required to provide public notice of the proposed access restriction, including a cost-benefit analysis and an analysis of alternatives. The statute also phased-in the elimination of noisier Stage 2 aircraft weighing more than 75,000 pounds by December 31, 1999. Large Stage 2 aircraft, including all aircraft in air carrier fleets, were either retired or retrofitted with new engines or hush-kits to bring them into compliance with Stage 3 standards by the compliance date. Consequently, a significant number of actions initiated under the Part 161 process have been directed at curtailing or eliminating Stage 2 aircraft weighing less than 75,000 pounds, which is mainly targeted at smaller, older business jets and charter aircraft.

The experience of Naples Airport in Florida illustrates the complexities of attaining noise access restrictions.²⁴⁹ While the FAA approved the Naples Airport Part 161 study in October 2001, the FAA subsequently denied the Naples Airport Authority's proposal to ban all Stage 2 aircraft on the basis that it appeared to contradict the airport's grant obligations under the Airport Improvement Program (AIP, Title 49 U.S. Code §47101 *et seq.*). While the Naples Airport has moved forward with imposing its ban on Stage 2 aircraft, it did so at the jeopardy of losing future federal grants. The Naples Airport Authority, however, challenged the FAA's decision in federal court. On June 3, 2005, the U.S. Circuit Court of Appeals for the District of Columbia found that the Naples Airport Authority had provided ample evidence justifying the Stage 2 ban and

²⁴⁸ The term Stage 3 and Stage 2 refer to specific aircraft noise certification requirements described in Title 14 CFR Part 36. In general, Stage 2 aircraft are older and noisier than similarly sized current generation Stage 3 aircraft. However, because the noise certification requirements are dependent on weight and the number of engines, a small Stage 2 aircraft may be quieter than a large Stage 3 aircraft. New aircraft designs must now meet more stringent Stage 4 requirements.

²⁴⁹ John Henderson, "Stage 2 jet ban battle scrutinized by airports throughout U.S.," *Naples Daily News*, June 15, 2003; David Esler, "Stage 2 Aircraft Drive Noise Policy," *Business & Commercial Aviation*, November 2002, pp. 54-74.

remanded the case back to the FAA.²⁵⁰ Despite this favorable outcome for airports, Stage 2 bans may be hard to justify from a cost-benefit standpoint given their lengthy and costly process and the estimate that only about 2,000 Stage 2 jets continue to operate in the United States and are being phased-out over time.²⁵¹ In the case of Naples Airport, the number of aircraft affected by the ban accounted for less than one percent of its total operations.²⁵²

Because the Part 161 process has proved to be such a significant hurdle for airports seeking to impose access restrictions, as evidenced by the experience of Naples Airport, a specific statutory waiver to the requirements of ANCA and the Part 161 process was included in Vision 100. Specifically, Section 825 of that act states that "...a sponsor of a commercial service airport that does not own the airport land and is a party to a long-term lease agreement with a Federal agency (other than the Department of Defense or the Department of Transportation) may impose restrictions on, or prohibit, the operation of Stage 2 aircraft weighing less than 75,000 pounds, in order to help meet the noise control plan contained within the lease agreement." This particular language was specifically for the benefit of Jackson Hole Airport in Jackson Hole, Wyoming where the airport is sited within the boundaries of Grand Teton National Park. Pursuant to this provision, Jackson Hole Airport implemented a Stage 2 ban that went into effect June 28, 2004. Given the complexities of the Part 161 process and airports' experiences with proposing noise-based access restrictions, airports may increasingly turn to Congress for relief from the requirements of ANCA and the Part 161 process of this sort in special circumstances. Airports may also seek modifications to ANCA addressing ambiguities and streamlining the review process, although CRS is unaware of any specific proposals to pursue such options.

Since noise ordinances and access restrictions that existed prior to the passage of ANCA were "grandfathered" in, these restrictions can remain in full force without review under the provisions set forth in ANCA. However, such ordinances may also be required to meet federal grant obligations specifying that the airport will be available for public use on reasonable conditions and without unjust discrimination if the airport receives AIP grants for airport improvements.²⁵³ In other words, if an airport continues to enforce a noise ordinance and accepts AIP federal grants, the airport may be compelled by the FAA or by user groups challenging the restriction in the federal court system to substantiate that the noise restrictions do not unjustly discriminate against certain users. One example of an access restriction challenged on such grounds that was ultimately upheld was the non-addition rule and quotas on Stage 2 aircraft at Van Nuys Airport in Van Nuys, California. At Van Nuys Airport, there are restrictions on adding Stage 2 aircraft to the fleet based at Van Nuys, and restrictions on the number of non-based Stage 2 aircraft operations. These restrictions, which were proposed before the passage of ANCA and considered exempt from Part 161 requirements by the FAA, were challenged by the National Business Aircraft Association but upheld in federal court.²⁵⁴

²⁵⁰ "Airports Claim Victory After Federal Court Upholds Stage 2 Noise Ban," *Inside FAA*, Vol. 9, No. 13, June 21, 2005.

²⁵¹ John Henderson, "Stage 2 jet ban battle scrutinized."

²⁵² "Airports Claim Victory After Federal Court Upholds Stage 2 Noise Ban," *Inside FAA*, Vol. 9, No. 13, June 21, 2005.

²⁵³ 49 U.S. Code §47107.

²⁵⁴ National Business Aircraft Association, *Update: Airport Noise and Access Restrictions*. <http://web.nbaa.org/public/ops/airports/200405.php>.

Weight-Based Restrictions

Because permissible aircraft noise levels generally increase as a function of aircraft weight, one method to curtail noise would be to limit or restrict aircraft over a certain size. Doing so solely on the basis of noise emissions would be governed by ANCA and the Part 161 process. However, some airports have also sought to restrict larger aircraft outside of the Part 161 process solely on the basis of pavement load-bearing criteria. In other words, airports have sought to limit larger aircraft for reasons other than noise emissions, although arguably noise emissions may be the most salient factor in community opposition to the operations of such aircraft.

To curtail the practice of using pavement weight-bearing data to justify what some may arguably consider noise-related restrictions, the FAA has proposed to adopt a policy for justifying airport restrictions on the basis of pavement strength and separating these types of actions from noise-related access restrictions. The FAA proposes that the pavement load-bearing capacity be considered a design standard that can be exceeded on occasion rather than an absolute limit on aircraft weight, and has drafted a policy that would require airports adopting weight-based restrictions based on pavement load-bearing capacity to demonstrate that those restrictions are reasonable and not unjustly discriminatory.²⁵⁵ The FAA notes that many airport pavements are capable of supporting limited operations that exceed engineering weight limits for pavement by up to 50%. The proposed policy goes on to note that it applies only for considerations of operator investment in pavement, and is not a substitute for noise restrictions. In other words, the FAA's proposed policy, if adopted, could significantly limit an airport's capability to impose weight-based restrictions without justifying these restrictions in terms of their direct impacts on improving pavement durability, and could prevent airports from limiting larger aircraft on the basis of weight alone outside of the Part 161 process.

To date, one airport—Teterboro Airport (TEB) in New Jersey—has been successful in obtaining a specific statutory exemption from this proposed FAA policy. Teterboro's operational weight limit restricts aircraft weighing more than 100,000 pounds unless prior permission is obtained from the airport manager. The intent of the legislation is to keep this requirement in full force regardless of the FAA's action regarding its proposed policy on airport weight limits.

Airspace Redesign and Procedural Modifications

Often noise problems tied to a specific airport or airports in a regional area can be mitigated through airspace redesign or modifications to operational procedures. Examples of such actions abound and include actions such as reconfiguring approach patterns, redefining preferred runways, and establishing airport traffic patterns that avoid residential communities and other noise-sensitive areas. Large scale airspace reconfigurations are currently in the planning and public review stages in the New York-New Jersey-Philadelphia region, and in the Los Angeles Basin region. While these airspace reconfigurations were initiated by the FAA for operational reasons, they provide an opportunity to address community noise implications as required under National Environmental Policy Act (NEPA) requirements.

²⁵⁵ Federal Aviation Administration, "Weight-Based Restrictions at Airports: Proposed Policy." *Federal Register*, Vol. 68(126), Tuesday, July 1, 2003, pp. 39176-39178, as corrected in Federal Aviation Administration, "Weight-Based Restrictions at Airports: Proposed Policy," *Federal Register*, Vol. 68(130), Tuesday, July 8, 2003, p. 40750.

Recourse for seeking modifications to airspace layout or operational procedures may be formally sought through a petition for rulemaking as described in Title 14 Code of Federal Regulations §11.17. Some airspace modification options may also be considered as part of a larger Part 150 study and may benefit from the detailed assessment of such options conducted as part of the Part 150 process. If a Part 150 study is not contemplated, then informal dialogue with the FAA may be a useful avenue for discussing possible options for airspace modifications and operational changes to mitigate noise. Such exchanges may provide a more complete perspective on what options may be viable and what options may be significantly constrained by concerns over the safety and efficiency of traffic flow of both arrivals and departures as well as aircraft transiting the surrounding airspace.

One specific option that is being studied is implementing steeper, quieter descents. Research examining the use of steeper approaches to runways has shown particular promise in reducing community noise levels. Steeper approaches reduce community noise by keeping aircraft at higher altitudes for longer periods, reducing required engine power during descent, and delaying flap extension thus reducing airframe noise. Recent testing of Continuous Descent Approach (CDA) noise-abatement procedures that can be programmed into existing aircraft onboard flight management systems yielded noise reductions of three to six decibels on average. The most substantial noise reductions using such procedures are in communities that lie about seven to 15 miles from the airport. However, traffic flow issues may limit the ability to implement these types of approaches at a specific airport. Because these procedures show particular promise for reducing noise levels, they may merit specific study to determine their applicability for a specific airport environment.

International Civil Aviation Issues

Although not technically within the jurisdiction of the FAA, there are at least three major international aviation issues that may arise as Congress considers reauthorization of the agency. First, there is the potential that the “Open Skies” agreement with the European Union will remain unsigned and unimplemented, which is a major concern for many U.S. airlines given the legal uncertainty that currently surrounds existing agreements with European Union members. Second, and closely related to the “Open Skies” agreement, is the DOT’s rulemaking relating to foreign ownership and control of domestic carriers, which, although the administrative process has been completed, has not to date yielded a final rule. The delay has been due in part to strong congressional opposition that has taken the form both of legislation and attempts to prevent the final rule through appropriations riders.²⁵⁶ Finally, there is the longstanding issue of cabotage, which is defined as the transportation of passengers or cargo by foreign air carriers from one point in the United States to another and is, with a couple of narrow exceptions, generally prohibited by U.S. law. In light of these pending and unresolved issues, a major piece of aviation related legislation, such as the FAA reauthorization, may provide Congress with a unique opportunity to legislate and play a major role with respect to these developments in international civil aviation.

²⁵⁶ See H.R. 4542, 109th Cong. (2005); see also S. 2135, 109th Cong., 1st sess. (2005); H.R. 4939, 109th Cong., 1st sess. (2006) (The 2006 Emergency Supplemental Appropriations Bill); Transportation, Treasury, and Housing and Urban Development, the Judiciary, District of Columbia and Independent Agencies Appropriations Act, 2007, H.R. 5576 § 952, 109th Cong., 2nd sess. (2006); Transportation, Treasury, and Housing and Urban Development, the Judiciary, District of Columbia and Independent Agencies Appropriations Act, 2007, H.R. 5576 § 104, 109th Cong., 2nd sess. (2006).

“Open Skies” Agreements

In 1992, the DOT introduced the “Open Skies” initiative and began negotiating and entering into modern civil aviation agreements with foreign countries, as well as individual members of the European Union (EU). Currently, the United States is a party to 74 “Open Skies” Agreements worldwide.²⁵⁷ Among those countries are the Netherlands, Austria, Czech Republic, Belgium, Denmark, Finland, Germany, Luxembourg, Norway, Sweden, Switzerland, and Iceland.²⁵⁸ As a result of a 2002 European Court of Justice ruling that several provisions of these bilateral “Open Skies” Agreements violated EU law, the United States and the EU have been negotiating a new Open Skies Agreement.²⁵⁹ An agreement appears to exist between the parties that if enacted would, *inter alia*, allow every EU and U.S. airline to fly between every city in the European Union and every city in the United States and would permit U.S. and EU airlines to determine the number of flights, their routes, and fares according to market demand.²⁶⁰ In addition, the agreement would allow carriers to freely enter into cooperative arrangements with other airlines, such as code-sharing and leasing.²⁶¹

According to some commentators, as comprehensive as the proposed agreement appears to be, there cannot be meaningful reform in the international aviation market until Congress repeals the so-called “citizenship test,” which limits foreign ownership and control of U.S. air carriers.²⁶² The proposed agreement itself does not appear to address foreign ownership or control, thus it would seem to be left to each party to determine its own rules and regulations independently.

Foreign Ownership and Control

Some news reports have indicated disappointment on the part of the EU over the U.S.’s failure to formally adopt changes to U.S. foreign ownership and control rules.²⁶³ Presently, U.S. law requires that, to operate as an air carrier in the United States, an entity must be a “citizen of the United States.” To be considered a citizen for civil aviation purposes, an entity must be owned either by an individual U.S. citizen, a partnership of persons who are each U.S. citizens, or a

²⁵⁷ See Open Skies Partners, U.S. Department of State, Bureau of Economic and Business Affairs, available at <http://www.state.gov/e/eb/rls/othr/2005/22281.htm> (providing a list of the “Open Skies” Agreements currently in effect).

²⁵⁸ See Benoit M.J. Swinnen, *An Opportunity for Trans-Atlantic Civil Aviation: From Open Skies to Open Markets*, 63 J. AIR L. & COM. 249, 270 (1997).

²⁵⁹ The United States has publically asserted that “the current agreements would remain in force as the legal basis for air services between the United States and individual Member States.” See “U.S. Says “Open Skies” Pact with E.U. Nations in Force,” Agence France Presse, Nov. 5, 2002 (quoting DOT spokesman Leonardo Alcivar). However, EU Vice President Loyola de Palacio subsequently reminded EU nations that “they should start procedures to terminate those agreements in order to ensure that they comply with their obligations under Community law.” See EU Press Release No. 116/04, “EU Commission Takes Action To Enforce ‘Open Skies’ Court Rulings,” July 20, 2004, available at <http://www.eurunion.org/news/press/2004/200400116.htm>.

²⁶⁰ See U.S. Department of State, Office of the Spokesman, *Fact Sheet: U.S., E.U. Air Transport Agreement*, November 18, 2005, available at <http://usinfo.state.gov/eur/Archive/2005/Nov/21-680403.html>.

²⁶¹ See *id.*

²⁶² See Professor Brian F. Havel, Commentary at the Institute of Economic Affairs’ 13th Annual Conference “The Future of Air Transport,” (Nov. 29, 2005) (transcript available at http://dmses.dot.gov/docimages/pdf95/378128_web.pdf).

²⁶³ See, e.g., Darren Goode, DOT Delays Decision on Foreign Ownership of Airlines, *National Journal’s CongressDaily PM*, August 16, 2006.

corporation (1) whose president and at least two-thirds of the board of directors and other managing officers are U.S. citizens, (2) that is under the actual control of U.S. citizens, and (3) has at least 75 percent of its voting stock owned or controlled by U.S. citizens.²⁶⁴ These “objective” citizenship requirements can only be amended by Congress enacting a change to the statute. The DOT, however, has initiated a rulemaking proceeding that exercises its discretionary authority to interpret the statute’s requirement of “actual control” in a manner that would likely increase opportunities for foreign investment in U.S. airlines.²⁶⁵

The DOT has received numerous comments, both in favor of, and in opposition to its proposed interpretation of the actual control rule. Commentators have focused specifically on the DOT’s legal authority to reinterpret the “actual control” requirement. Supporters of the DOT’s action generally assert that the phrase “actual control,” though it appears in the statute, is vague, undefined and, therefore, subject to departmental interpretation.²⁶⁶ Conversely, opponents of the rulemaking assert that when Congress specifically added the phrase “actual control” to the statute, they were in effect codifying the DOT’s long-standing precedent and not granting any additional authority over the interpretation of the phrase than previously existed.²⁶⁷

The proposed rulemaking has also received significant attention from some Members of Congress, with several Members filing written comments with the DOT expressing concerns with respect to Civil Reserve Air Fleet commitments, airline employees, and consumer protection issues.²⁶⁸ Additionally, companion House and Senate bills were introduced in the 109th Congress to address this issue. H.R. 4542 and S. 2135 (109th Congress) both contain provisions that would prevent the DOT from issuing a final decision on the rulemaking for a period of one year after the date of enactment.²⁶⁹ Finally, appropriations riders have been drafted that would effectively forestall the DOT from finalizing its rulemaking on this issue. Lawmakers were unsuccessful with their attempt at a rider in the 2006 Emergency Supplemental Appropriations Bill.²⁷⁰ However, attempts to include language in the 2007 Transportation, Treasury, and Housing and Urban Development, the Judiciary, District of Columbia Appropriations Bill²⁷¹ continue, and if unresolved could resurface during the drafting and debate on the FAA reauthorization language.

²⁶⁴ See 49 U.S.C. § 40102(a)(15)(A)-(C) (2000).

²⁶⁵ See 70 Fed. Reg. 67,389 (Nov. 7, 2005). DOT has subsequently issued a Supplemental Notice of Proposed Rulemaking on the foreign control issue that clarifies its initial proposal and responds to many of the comments and concerns raised by both congressional and industry participants. See 71 Fed. Reg. 26,425 (May 7, 2006).

²⁶⁶ See Comments of United Airlines, Docket OST-2003-15759, 7-9 available at http://dmses.dot.gov/docimages/pdf95/380696_web.pdf (Jan. 6, 2006); see also Comments of Delta Airlines, Docket OST-2003-15759, 9, available at http://dmses.dot.gov/docimages/pdf95/380757_web.pdf (Jan. 6, 2006); Comments of Federal Express Corporation, Docket OST-2003-15759, 9, available at http://dmses.dot.gov/docimages/pdf95/380710_web.pdf (Jan. 6, 2006).

²⁶⁷ See Comments of Continental Airlines, Docket OST-2003-15759, 5-6, available at http://dmses.dot.gov/docimages/pdf95/381133_web.pdf (Jan. 6, 2006) (citing 149 Cong. Rec. S7813 (June 12, 2003) (stating that the DOT assured the Congress that the amendment “will not in any way affect DOT’s existing determination of what constitutes a citizen of the United States”)). For a more detailed and complete analysis of the rulemaking and subsequent comments, see CRS Report RL33255, *Legal Developments in International Civil Aviation*, by (name redacted).

²⁶⁸ See, e.g., Letter from The Honorable Don Young, Chairman of the House Committee on Transportation and Infrastructure and The Honorable John L. Mica, Chairman of the Subcommittee on Aviation to The Honorable Norman Y. Mineta, Secretary of the U.S. Department of Transportation 2-3 (Dec. 8, 2005) available at http://dmses.dot.gov/docimages/pdf95/378411_web.pdf.

²⁶⁹ See H.R. 4542, 109th Cong. (2005); see also S. 2135, 109th Cong. (2005).

²⁷⁰ See H.R. 4939, 109th Cong. (2006).

²⁷¹ See, e.g., Transportation, Treasury, and Housing and Urban Development, the Judiciary, District of Columbia and Independent Agencies Appropriations Act, 2007, H.R. 5576 § 952, 109th Cong., 2nd sess. (2006).

Cabotage

Another major issue facing international civil aviation law is cabotage. Cabotage is the right of a foreign airline to carry passengers and/or cargo between airports of the same country (e.g., from New York to Los Angeles).²⁷² Currently, the Federal Aviation Act contains a general prohibition against cabotage activity by foreign air carriers.²⁷³ Congress last amended the cabotage laws as part of Vision 100.²⁷⁴ The enacted changes permit “eligible cargo” to be removed from aircraft, including foreign aircraft, in Alaska and “not be deemed to have broken its international journey in, be taken on in, or be destined for Alaska.”²⁷⁵ These provisions provide for a very limited statutory exception to the general prohibition against cabotage activities.

Although currently not a major negotiation point with respect to U.S. “Open Skies” agreements, it appears that statutory changes would be required before the executive branch can enter into any sort of agreement purporting to liberalize the cabotage rules. Although foreign aircraft are allowed to navigate within U.S. airspace, unless specifically authorized either by statute or DOT regulations they are not permitted to perform any form of cabotage within the United States.²⁷⁶ While it is unclear what, if any, economic effect a more liberal cabotage policy would have on the domestic airline industry, only Congress has the legal authority to amend the Federal Aviation Act and permit foreign carriers to have cabotage rights.

²⁷² See BLACK’S LAW DICTIONARY 194 (7th Ed. 1999).

²⁷³ 49 U.S.C. § 41703(c)(1)-(2) (2000) (stating that “aircraft may take on for compensation, at a place in the United States, passengers or cargo destined for another place in the United States only if—(1) specifically authorized under section 40109(g) of this title; or (2) under regulations the Secretary prescribes authorizing air carriers to provide otherwise authorized air transportation with foreign registered aircraft under lease or charter to them without crew”).

²⁷⁴ Vision 100—Century of Aviation Reauthorization Act, P.L. 108-176, § 808 117 Stat. 2588 (Dec. 12, 2003).

²⁷⁵ *Id.* (codified at 49 U.S.C. § 41703(e)(1)).

²⁷⁶ 49 U.S.C. § 41703(c)(1)-(2) (2000).

Appendix. Glossary of Key Aviation Technology Terms and Concepts

Aviation is a field rich with acronyms and system specific terms. This glossary provides a listing of some of the key new technical terms and their acronyms associated with near-term and long-range operational concepts for air traffic management (ATM), and communication, navigation, and surveillance (CNS) infrastructure. While this is far from an exhaustive list of aviation terminology and acronyms, its purpose is to provide the reader with a reference to several of the key new terms and concepts likely to be encountered during debate over FAA reauthorization.

Automatic Dependent Surveillance - Broadcast (ADS-B)

A system for broadcasting aircraft identification, position, altitude, heading, and speed data derived from on-board navigation systems such as a Global Positioning System (GPS) receiver unit. ADS-B out functionality refers to a basic level of ADS-B aircraft equipment where navigation data is transmitted only. Aircraft reception of ADS-B signals from other air traffic or traffic, weather, and flight information from ground stations is referred to as ADS-B in. The ADS-B system is envisioned as a future means for air traffic surveillance that may, to a large extent, replace radar surveillance of air traffic in the future.

Next Generation Air Transport System (NGATS)

A proposed major overhaul of the national airspace system (NAS) relying on new air traffic communications, navigation, and surveillance (CNS) and air traffic management (ATM) technologies to greatly enhance effective system capacity. The DOT envisions NGATS as a system capable of tripling effective system capacity by 2025.

Joint Planning and Development Office (JPDO)

A multi-agency office of the federal government headed by the FAA that was created under Vision 100 that is charged with the tasks of establishing the enterprise architecture or blueprint for the NGATS and providing overarching leadership and direction to ensure interagency cooperation and collaboration with industry to bring the NGATS vision to its fruition.

Required Navigation Performance (RNP)

A performance standard that defines the required position accuracy needed to keep the aircraft within a specified containment area, or bubble, 99.9% of the time. The required navigational performance is not tied to any specific technology, but sets a technical standard that can be met using various FAA-approved technologies. While precision satellite-based navigation is currently the principal technology for meeting RNP standards, these standards allow for the use of other technologies—including yet to be developed technologies—to meet navigational performance standards.

Area Navigation (RNAV)

A navigational performance standard for aircraft that provides a specific capability to establish very accurate waypoints, or specific navigational reference points, that can be positioned anywhere in the airspace system, thus eliminating the need to define airways and terminal arrival and departure procedures in references to specific ground-based navigational stations. The RNAV concept has been around since the 1970s and has historically rely on ground-based navigational stations and distance measuring equipment (DME) to navigate using more direct routing. At present, the primary aircraft technology being utilized to meet these performance requirements is WAAS-enabled GPS, with DME considered by many to be a possible backup, or secondary means, to determine aircraft position and accurately follow precise flight routes.

Global Positioning System (GPS)

A system that utilizes receivers that monitor signals from a constellation of satellites that transmit precise timing signals to compute highly accurate position and time information. GPS is already used for a wide variety of applications, including aerial navigation. However, augmented GPS signals using a signal correction system called Wide Area Augmentation (WAAS) is regarded as an enabling technology for providing initial satellite-based precision navigation capability to fly precise flight paths and approaches and perhaps, for future application to provide accurate surveillance capabilities through the Automatic Dependent Surveillance - Broadcast (ADS-B) capability.

Wide Area Augmentation System (WAAS)

A system that improves the accuracy of Global Positioning System (GPS) data, providing aircraft with accuracy within three meters horizontally and vertically, 95% of the time. The system was launched throughout the United States in July 2003, and in March 2006 the FAA certified the system for providing primary navigational guidance to descend as low as 200 feet above the ground during precision approach procedures in low visibility and cloud conditions, matching the minimum descent altitudes of standard (Category I) Instrument Landing System (ILS) approach procedures.

System Wide Information Management (SWIM)

A proposed system for aviation system data sharing, consisting of a seamless infrastructure for data exchange, similar to the World Wide Web, where users can readily access needed data that they are authorized to receive, replacing currently cumbersome and non-integrated databases and communications protocols. As envisioned, SWIM will consist of an extensive, scalable data network to share real time operational information, such as flight plans, flight trajectories, weather, airport conditions, and temporary airspace restrictions across the entire airspace system.

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