

Options for FAA Air Traffic Control Reform

Testimony of Dorothy Robyn

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Chairman LoBiondo, Ranking Member Larsen, and members of the Subcommittee. I appreciate the opportunity to testify this morning on options for Federal Aviation Administration (FAA) air traffic control reform.

I bring two overlapping perspectives to this debate. One is historical: as a member of President Clinton's White House economic team, I was involved in the Clinton Administration's long-running effort to reform the U.S. air traffic control system—an effort that advanced the ball but failed to score a touchdown. I also bring my perspective as an economist who continued to speak out on the issue after leaving the White House in 2001. Among other things, I wrote a report for the Brookings Institution's Hamilton Project in 2008 which called for structural reform of the governance and financing of air traffic control. Following a five-year stint in the Obama Administration at the Department of Defense and GSA,¹ I am again participating in the debate over air traffic control reform, as an independent member of the Eno Transportation Center's NextGen Working Group.

My testimony draws in part on the Hamilton Project report, a link to which appears below.²

Symptoms of the Problem

The United States has the busiest and safest airspace of any country. The FAA's Air Traffic Organization (ATO), made up of 15,000 highly skilled controllers and thousands of talented and dedicated engineers, technicians and analysts, orchestrates the safe transit of more than 30,000 commercial flights a day—an extraordinary feat. GAO's recent survey of stakeholders found that they have a high level of confidence in the ATO's day-to-day operation of the system.³

However, the system has struggled to adopt the advanced computing and telecommunications technologies that have enabled the dramatic improvements in productivity seen in so many other sectors. Controllers still use 1950s-era, ground-based radar to route planes, and pilots and controllers communicate using analog, voice-only radios (i.e., no email). Well into the 1990s, the FAA was the largest U.S. buyer of vacuum tubes for use in its 40-year old radios. (I brought with me the vacuum tube that Vice President Gore used to hold up when he spoke about the need

¹ I served as the Deputy Under Secretary of Defense for Installations & Environment (2009-2012) and Commissioner of GSA's Public Buildings Service (2012-2014).

² Dorothy Robyn, "Air Support: Creating a Safer and More Reliable Air Traffic Control System," Hamilton Project, Brookings Institution (July 2008); available at: <http://www.brookings.edu/research/papers/2008/07/air-traffic-robyn>.

³ GAO, "Air Traffic Control System: Selected Stakeholders' Perspective on Operations, Modernization, and Structure," GAO-14-770 (September 2014); available at: <http://gao.gov/products/GAO-14-770>.

to “reinvent” air traffic control; the FAA had to purchase the tubes overseas because they were no longer manufactured in the United States.). In many facilities, controllers still keep track of aircraft using paper strips.

The FAA’s reliance on antiquated technology is the clearest symptom of an underlying problem with the way the air traffic control system is run. When the FAA undertook air traffic control modernization in 1981, it estimated that the work would cost \$12 billion and take a decade to complete. Thirty-four years and \$56 billion later, the FAA still has not been able to achieve large-scale modernization; most of that money has gone to replace and upgrade existing equipment, yielding only incremental improvements in capacity and safety. Although the FAA is more than a decade into its effort to move to a next-generation, satellite-based system, NextGen is facing the same systemic problems that have plagued past modernization efforts.

A second symptom of the problem is flight delays, themselves due in part to the FAA’s reliance on antiquated technology. Although flight delays are a chronic nuisance, when a strong economy generates high levels of traffic, delays can become so severe as to create a national crisis. (Support for air traffic control reform typically peaks during these periods.) According to a study done for the ATO by a consortium of universities, in 2007, the direct cost of U.S. flight delays was \$32.9 billion, including \$8.3 billion in increased airline expenses (e.g., crew, fuel and maintenance); \$16.7 billion in passenger time lost due to schedule buffer, delayed flights, flight cancellations and missed connections; and \$3.9 billion in lost demand (i.e., the welfare loss incurred by passengers who avoided air travel as a result of delays).⁴

A third symptom is the rising unit cost of service provided by the air traffic control system. From 1984 to 1997, this cost (measured by FAA/ATO operating expenses divided by the number of instrument operations, controlling for inflation) was flat. Although this record compared poorly with the trend in most high-tech activities, which benefited from Moore’s Law, it was better than what followed. In 2008, I reported that unit costs had gone up by 45 percent from 1997 to 2007, largely because of a generous collective bargaining agreement that the FAA signed with air traffic controllers in 1998. Although the agreement envisioned that productivity gains would offset the wage increase, those gains had not materialized. In the last seven years, the unit cost of service has gone up by another 18 percent, for a 71 percent increase since 1997, due largely to a decline in operations with no offsetting decline in operating expenses.

The Problem

Antiquated technology, flight delays and rising unit costs are *symptoms*, but they are not the *problem*. The problem is the structural mismatch between the nature of air traffic control and the way the federal government manages it. Simply stated, air traffic control is a 24/7, capital-intensive, high-tech service business trapped in a regulatory agency that is constrained by federal procurement and budget rules, burdened by a flawed financing system, and micro-managed by Congress and the Office of Management and Budget. To be sure, air traffic control must be

⁴ Michael Ball, et al., “Total Delay Impact Study: A Comprehensive Assessment of the Costs and Impacts of Flight Delay in the United States” (October 2010); available at: http://www.isr.umd.edu/NEXTOR/pubs/TDI_Report_Final_10_18_10_V3.pdf.

regulated for safety. Moreover, it is a natural monopoly and must be managed as such. But air traffic control is not inherently governmental, and in my view, the current approaches to governance and financing of the system, both of which embody a governmental model, are directly to blame for the symptoms we observe.

Governance

Twenty years after the Clinton Administration proposed to “corporatize” the air traffic control system, it is no longer controversial, as it was then, to suggest that air traffic control is not inherently governmental. That change in thinking is due largely to empirical evidence: several dozen countries now provide air traffic control services through a self-supporting, autonomous agency outside of the traditional government bureaucracy (in 1995, only a few countries did so). Nevertheless, it is worth spelling out the “theory” behind the evidence.

The basic test for whether a governmental activity can be provided by a private entity (whether through outsourcing or some form of privatization) is this: can you write a contract? That is, can the function be reduced to an operational description such that a contractor can perform it and the performance of the contractor can be evaluated?

Air traffic control meets that test. First, the provision of air traffic control is purely operational: it involves the delivery of a complex but routine service through the equivalent of a production line. Although that “production line” is highly sophisticated and critical to aviation safety, it does not require policy judgments or tradeoffs that only a governmental entity can make. Second, because air traffic control is purely operational, the mission of the provider is clear and its performance is measurable. A third characteristic of air traffic control facilitates its provision as a commercial service funded by user fees (prices): the direct users of the system are identifiable, and most of the benefits and costs of the services accrue to those already paying the costs via user taxes.

Two aspects of air traffic control may explain why some have mistakenly seen it as inherently governmental. First, air traffic control is a natural monopoly, which means that, given the high fixed costs and large economies of scale associated with the current technology, it is less expensive to have a single service provider. Normally, when the federal government privatizes an activity, it does so to take advantage of competition. But while the market for air traffic control does not (currently) allow for competition, that does not preclude its private provision. The telecommunications system was a natural monopoly for many years, and yet the federal government did not operate the system (although it did regulate it).

Second, historically, the aviation safety regulator was also the air traffic control provider, which led many people to see regulation and operation as inextricably linked. Stated differently, there was a perception that separating the two functions would impose prohibitively high coordination costs. But we now know that is not the case from the experience in dozens of countries that have moved air traffic control operation out of the regulatory agency. In fact, as discussed below, experts now call for the separation of the regulator from the operator in order to *ensure* system safety.

“It’s the Incentives, Stupid”

As a traditional government agency constrained by federal rules and micromanaged by Congress and OMB, the FAA is poorly suited to run what amounts to a capital-intensive, high-tech service business.⁵ Much has been written about the shortcomings of the FAA’s management of air traffic control. In my view, the overarching problem is that FAA management faces the wrong incentives: whereas ordinary businesses must respond to customers to survive, the FAA faces more a more complex set of carrots and sticks. To paraphrase James Carville, “It’s the incentives, stupid.”

Just as a green plant turns toward the sun, organizations pay close attention to the sources of funding that sustain them. The FAA is no exception. Because it relies on appropriated funds, the FAA has historically viewed Congress rather than aircraft operators as its customer. One former senior FAA official observed that when funding was tight, the agency reduced services in the field and expanded headquarters staff—just the opposite of what an airline or other service business would do; such a response is “rational” if its customer is Congress, however.

Moreover, because Congress holds the purse, FAA decisions regarding facilities, investment, and staffing and pay are all subject to interference. Members opposed to the loss of jobs in their district have long blocked large-scale consolidation of the FAA’s aging and inefficient facilities—a much-needed step that would save the system hundreds of millions of dollars a year. Appropriators routinely give the agency less money than it requests for some programs and more for others, based in part on lobbying by private contractors. And “logrolling” can necessitate giving a rural state the same technology as, say, New York, despite major differences in demand.

Congressional micromanagement of the FAA is doubly harmful because it crowds out much-needed input from airlines and other aircraft operators—the air traffic control system’s real customers. According to an expert panel convened by the National Academy of Sciences to assist the GAO in understanding the impediments to FAA modernization, because the ATO is beholden to Congress, “the users lack incentives to monitor the ATO’s spending and may not insist on cost control, while the ATO lacks incentives to consult the users and may invest in technologies that the users do not want.”⁶

Federal personnel, procurement and budget rules create their own flawed incentives. (I discuss the budget rules under financing.) For example, the FAA relies heavily on outside contractors for research and development, which is appropriate. However, as a result of federal salary caps and other constraints, the FAA has lost the in-house engineering expertise to oversee these outside contractors, even the best of whom have somewhat different objectives than the FAA.

⁵ David Osborne, whose 1992 book popularized the phrase “reinventing government,” used an automotive metaphor to sum up this fundamental mismatch. According to Osborne, “Air traffic control is a massive, complex, technology-intensive service business operating within a conventional U.S. government bureaucracy. It is a bit like putting a Ferrari engine into a dump truck body and still expecting it to win races.” David Osborne and Peter Plastrik, *The Reinventor’s Fieldbook: Tools for Transforming Your Government*, Jossey Bass (2000).

⁶ GAO, “National Airspace System: Experts’ Views on Improving the U.S. Air Traffic Control Modernization Program,” GAO-05-333SP (April 2005); available at: <http://www.gao.gov/new.items/d05333sp.pdf>.

The FAA's cultural resistance to change has been much discussed. I wrote in 2008 that NATCA had opposed new technologies that controllers feared would threaten their jobs, and that many FAA managers, insulated from the economic pressures that their counterparts in industry face, had resisted the shift to a performance-based ATO. However, in recent conversations with controllers and ATO managers alike, I have been struck both by their recognition that air traffic control truly is essentially a (safety-obsessed) business and by their frustration with the constraints that keep them from operating it like a business.

Potential Conflict of Interest

The governance of air traffic control is flawed in another way: the FAA's dual mission—as both operator and regulator of the air traffic control system—poses a potential conflict of interest. In every other area of aviation (e.g., the manufacture of aircraft and the operation of airlines), the FAA has no operational role, acting instead as an independent regulator. Independent regulation is no less desirable in the case of air traffic control, where the fundamental issue of how much space to maintain between planes involves a tradeoff between safety and airspace capacity. This change is becoming even more critical as the air traffic control system shifts to satellite-based technology, which allows for closer spacing of aircraft.

The notion that operation and regulation should be separate is fundamental. The International Civil Aviation Organization, whose principles are the basis for aviation safety regulation throughout the world, calls for the air traffic control safety regulator to be separate from the operation it regulates. Dozens of countries have elected to follow ICAO's guidance. In fact, for some countries, adherence to this principle was the major motivation for moving air traffic control outside of the traditional government bureaucracy. Although the U.S. aviation system has an excellent safety record, the United States is one of the only advanced industrial countries in which air traffic control is still both operated and regulated by the same agency.

Financing

The federal government's approach to financing air traffic control is no less problematic than its approach to governance. First, the use of excise taxes creates incentives that are flawed and even perverse. Second, because the federal government does not have a capital budget, capital investments must be funded out of annual appropriations, and that creates additional distortions.

Aviation Excise Taxes Create Perverse Incentives

The air traffic control system is supported largely by federal excise taxes on passenger tickets, cargo and fuel. Ideally, the funding mechanism for such a critical piece of infrastructure should achieve three goals.⁷ First, it should encourage efficient behavior on the part of users as well as the service provider (economic efficiency). Second, it should recover most or all of the revenue needed to support the continued operation and expansion of the system (revenue adequacy). Finally, it should be equitable. The existing funding mechanism fails on all three counts.

⁷ Congressional Budget Office, *Paying for Highways, Airways, and Waterways: How Can Users be Charged?* (August 1992).

The inequity of the present tax-based funding system has been well documented, as have its failings with respect to revenue adequacy (see my Brookings report for a summary). Let me focus here on an issue that has received less attention—namely, the way excise-tax funding undermines the goal of economic efficiency by creating flawed and even perverse incentives.

The current system of tax funding encourages commercial airlines to overuse scarce air traffic control capacity in part because they pay for that capacity indirectly, through passenger taxes, rather than directly, for each use. Moreover, because the taxes collected are linked to the number of passengers (and the price of their tickets), a small aircraft contributes significantly less than a large one, even though it costs the air traffic control system about the same amount to serve them. This is a critical point: broadly speaking, the cost to the air traffic control system of handling an individual flight is independent of the size of the aircraft operating the flight; this is so because, for a controller looking at a computer screen, “a blip is a blip.”

Because they impose a disproportionate burden on large aircraft, passenger taxes have the perverse effect of encouraging airlines to use smaller planes. Airport runway landing fees, which are based on aircraft weight, serve to reinforce that effect.⁸ These implicit subsidies to small aircraft are one reason that the use of regional jets expanded so rapidly, and with it delays, during the heated economy of 2006-2008. Although that trend has reversed for a number of reasons, the perverse incentive remains, encouraging airlines to offer more frequent service on smaller planes without having to pay the true costs.

Turbine-powered business aircraft, which pay a fuel tax, contribute even less relative to the burden they impose. In addition to being inequitable, this creates another market-distorting subsidy to small aircraft. And while business jets tend typically avoid the most crowded large-hub airports, the expansion of traffic to neighboring reliever airports has added to congestion in the terminal airspace.

Tax funding creates the wrong incentives for the FAA as well because, under the present system, the connection between the volume and mix of air traffic control services provided and the revenues received by the air traffic control system is rather tenuous. Unlike a commercial provider that charges its customers for what they consume, the FAA cannot compare its costs and revenues to learn how customers value its various services, where it needs to reduce costs, which services to develop or improve, or where to invest new capital.

Missed opportunities for the FAA to add value abound. For example, there may well be significant latent demand by users of the system for location-specific improvements in service quality, quantity and/or reliability. The widely-used hub-and-spoke system makes individual carriers highly dependent on the smooth and reliable operation of hub airports. Might they be willing to pay a premium to assure a higher degree of reliability at these critical network

⁸ See Michael E. Levine, “Landing Fees and the Airport Congestion Problem,” *Journal of Law and Economics*, Vol. 12 (April 1969).

locations? Under the current system the FAA has no incentive to provide location-specific value-added services because it cannot charge users for them.

Federal Government's Lack of a Capital Budget is Debilitating

The federal budget process is another source of the financing problem. Unlike states and corporations, the federal government does not have a capital budget; federal investment in capital must be fully funded up-front, out of annual appropriations. Stated differently, the federal budget makes no distinction between spending on consumption and investment. This is a major challenge when it comes to maintaining and upgrading a capital-intensive system such as air traffic control.

Businesses are able to fund a capital asset by borrowing against the expected stream of revenue it will produce. In this way, capital investment reflects the level of demand for a good or service. By contrast, federal investment is based on what the annual budget will allow. In a constrained budget environment, federal investment in infrastructure and R&D arguably gets short-changed.

In addition to the sheer level of funding, the timing of funding is a problem. Federal agencies must budget for programs far in advance, which means the FAA has to request funding for a new system well before the application has been proven in some cases. This contributes to the cost growth and schedule slippage that FAA programs experience once they get under way. Moreover, with annual funding, it takes years to carry out major acquisitions. This drives up the cost of an acquisition. It also means that the technology may be out of date by the time it is deployed. Budget shortfalls and delays in the appropriations process further slow capital projects and drive up their costs.

The budget process has other unintended consequences. As with other government agencies dealing with large infrastructure projects, FAA managers face strong pressures to overestimate the benefits, underestimate the costs and downplay the risks in order to sell the projects to decision makers in the first place.⁹ The lack of in-house engineering expertise discussed above contributes to the FAA's chronic miscalculation of costs and risks.

The lack of a capital budget is a debilitating problem for a number of federal agencies. Having run GSA's Public Buildings Service, which acquires and manages large capital assets, I experienced firsthand the challenges of the federal government's up-front funding approach to capital investment.¹⁰ Although a debate is brewing about whether (and how) to address that problem, any resolution will come too late to help the air traffic control system.

Clinton Administration and USATS

To allow the U.S. air traffic control system to operate more like a business, the Clinton Administration proposed to transfer it to a wholly owned government corporation governed by a

⁹ Statement of Mark M. Hansen, Professor of Civil and Environmental Engineering, University of California, Berkeley, before the Senate Committee on Finance (July 12, 2007).

¹⁰ Dorothy Robyn, "Reforming Federal Property Procurement: The Case for Sensible Scoring," Brookings Institution (April 29, 2014); available at: <http://www.brookings.edu/blogs/fixgov/posts/2014/04/24-federal-property-procurement-sensible-scoring-robyn>.

board of directors and a CEO. The U.S. Air Traffic Services Corporation (USATS) was designed to be self-supporting, based on cost-based charges on commercial airlines (general aviation would continue to pay a fuel tax). Based on the revenue stream from those charges, USATS would be able to borrow either from Treasury or (with approval of the Secretaries of Transportation and Treasury) from the private capital markets up to a cap of \$15 billion.¹¹

The USATS proposal was dead on arrival in Congress: some Members felt it went too far, others not far enough. The user fee proposal was particularly controversial, in part because it was contained in an Administration budget that eliminated the \$2 billion contribution that the general fund made to FAA operations at the time. In addition, the shift from an ad valorem ticket tax to cost-based user fees had potential adverse implications for low-cost carriers.

In 2000, amid growing concerns about flight delays, Congress authorized the FAA to restructure air traffic control internally as a “performance-based organization” run by a chief operating officer (COO). In December 2000, President Clinton issued an executive order directing the establishment of the Air Traffic Organization (ATO) and announced the five members of an Air Traffic Services Subcommittee to oversee its management.¹² In 2003, the Bush Administration named a highly respected airline executive to the COO position, and it formally stood up the ATO in early 2004.

Under two Administrations and a series of able COOs, the ATO has made visible progress toward becoming more customer-oriented and business-like. However, severe constraints remain. And although it created a separate regulatory office to provide safety oversight of the ATO, the FAA still polices itself.

NextGen

In 2008, I wrote that the federal government’s approach to NextGen raised real concerns. Its focus on technological transformation and a tripling of capacity was highly ambitious, given the FAA’s track record, and its success depended on a complex three-part harmony involving FAA deployment of new technology, airline investment in advanced avionics (equipage), and FAA adoption of revised operating procedures to exploit the new technology. I also wrote that NextGen’s top-down, technology-driven planning process lacked the kind of bottom-up feedback

¹¹ The seed for the USATS proposal was a recommendation contained in an August 1993 report by a blue-ribbon commission, chaired by former Governor of Virginia Gerald Baliles, on ways to address the poor health of the U.S. airline industry. (National Commission to Ensure a Strong Competitive Airline Industry, “Change, Challenge and Competition: A Report to the President and Congress” (August 1993).) President Clinton had announced the Commission in February 1993, at a meeting with airline and aerospace CEOs in Everett, Washington, on his first trip outside of Washington, DC. As President Clinton said later, “we had to turn the airline industry around if we wanted to turn the American economy around.” The Vice President made the recommendation part of his government-reinvention agenda. (Vice President Gore, “Report of the National Performance Review—Creating a Government That Works Better & Costs Less” (September 1993).) The detailed USATS proposal came out of a six-month interagency process led by then-Secretary of Transportation Federico Pena. (Report of the Executive Oversight Committee to the Secretary of Transportation, “Air Traffic Control Corporation Study” (May 1994).)

¹² The Air Traffic Services Subcommittee was created to serve as a board of directors for the ATO. The five original members included former U.S. Senator Nancy Kassebaum Baker, who had earlier chaired the Senate Aviation Committee; John Snow, the CEO and Chairman of CSX Corporation (and later Secretary of the Treasury); and Leon Lynch, an international vice president of the United Steel Workers. Snow served as the group’s first chair.

from users that only market signals provide. I concluded that “the federal government’s overly ambitious, technocentric, one-size-fits-all approach to NextGen seems to embody much of what is wrong with the current air traffic control system. Unless there is some fundamental reform of the governance and financing problems ... it seems likely that NextGen will go down the same troubled path as modernization.”

Although I am far from an expert on NextGen, my reading of recent reports by GAO, the Inspector General and others, and my conversations with stakeholders, suggests that the concerns I raised in 2008 were justified. NextGen addresses the symptom of antiquated technology, but it does not address the underlying problem. Until we address the underlying problem, I believe that NextGen’s path will remain troubled.

What is Needed

Two major changes are needed to address the structural problems I have described. First, Congress should move the ATO out of the FAA and preferably out of the federal government altogether, with the remaining FAA providing independent safety oversight.¹³ Second, Congress should replace excise taxes on passengers, cargo and fuel with cost-based charges on commercial and business aircraft operators.

Options for Governance Reform

With respect to governance, while the goal is to allow the air traffic control system to operate like a business, outside of the traditional government bureaucracy, the constraint is that it remains a natural monopoly. In my view, there are three basic options for giving such a system the necessary flexibility while ensuring that it cannot abuse its monopoly power. One is a government corporation, such as Airways New Zealand or Germany’s DFS (Deutsche Flugsicherung). A second option is a private, non-profit corporation governed by a stakeholder board. Nav Canada, established in 1996, is the only air traffic control operator I am aware of that employs this model, which is similar to the “user-owned cooperative” seen in other sectors (e.g., utilities). A third option is a for-profit corporation that is subject to rate-of-return regulation. The United Kingdom’s NATS is an example of this model.

My informal evaluation of these three models is based on two criteria. First, does the governance structure align the incentives of the operator with the needs of the users, so that the service is provided both efficiently and at an appropriate price? Second, does the structure limit opportunities for external interference? (All three models ensure that there is appropriate safety oversight by an independent regulator.)

User-Owned Cooperative: I have a strong preference for the user-owned cooperative model, largely because I think it achieves a better alignment of economic incentives. Because the users themselves run the air traffic control system, they have an incentive to keep costs low and to

¹³ In my 2008 Brookings report, I proposed that the ATO be moved out of the FAA and made a separate modal administration within the Department of Transportation. I was explicit in saying that it would be preferable to move the air traffic control system out of the traditional government bureaucracy altogether. However, I concluded that such a step was not politically feasible at the time.

invest in capital at the optimal level. Moreover, because the organization is self-regulating (with respect to charges) by virtue of its basic design, there is no requirement for outside oversight by an economic regulator—an intervention that could create opportunities for external interference and/or to lead to unintended consequences from the regulation itself. Nav Canada’s 20-year track record is superb. I believe that performance is largely a result of the elegant alignment of incentives that the organization achieves through its basic governance structure. In addition, Nav Canada appears to operate free of external interference, and the fact that it is outside of government no doubt contributes to that autonomy.

For-Profit Corporation: The other two models have potential drawbacks in my view. The NATS model requires an outside regulator to ensure that the rates charged by the air traffic control provider are appropriate. We know from decades of experience with rate-of-return utility regulation that the regulated entity has an incentive to over-invest in capital so as to expand its rate base. Although it may be possible to devise a regulatory scheme to limit that problem, generally speaking, economic regulation tends to create unintended consequences. For that reason, I think it is preferable to avoid the need for economic regulation of a business undertaking if at all possible.

Government Corporation: With a non-profit government corporation, by comparison, there is typically no explicit rate regulation: in theory, the corporation behaves in the public interest because it is not operating to make a profit and because the government retains some (non-safety) involvement or oversight. That governmental involvement can take different forms, including the authority to appoint the members of the corporate board, participation on the board, and financial oversight. To be sure, this approach works well in some countries, where government corporations are allowed to function with the necessary autonomy. However, I worry that, in the U.S. context, a government corporation would not be as politically insulated as it is elsewhere. For evidence of that, one need look no further than the U.S. Postal Service, whose efforts to close facilities have been continually thwarted.

I recognize that the challenge for this committee is to craft a practical solution, and for that reason, I am hesitant to say that I believe a user-owned cooperative is the only acceptable approach. But a practical solution must get the basics right, which in this case means ensuring that the governance structure incentivizes efficient, cost-effective service provision and provides insulation from external interference. I worry that it would be difficult if not impossible to accomplish that with a government corporation.

Financing Reform

In addition to making the air traffic control system an autonomous entity, Congress should replace tax financing of the system with cost-based prices on commercial and business aircraft operators. Under my vision of a pricing system, commercial operators and turbine-powered aircraft would pay a per-flight price roughly equal to the long-run marginal cost they impose on the system. To minimize transaction costs and reflect their lower demand on the system, operators of piston-engine aircraft, many of which operate out of separate and uncongested facilities, would pay a flat annual charge linked to aircraft size.

Adoption of a well-designed pricing system could have far-reaching beneficial effects on the air traffic control system over time. First, prices will provide valuable market signals, enhancing economic efficiency (pricing will also improve equity and revenue adequacy). If aircraft operators have to pay their way, they will have an incentive to use scarce capacity more sparingly, thereby reducing delays. Prices should reflect not just monetary costs, but also (in congested airspace) the delay costs that each user imposes on other users. Second, the air traffic control operator will get the kind of feedback that price signals routinely provide, encouraging more efficient production of services. For example, with real prices, the ATO could offer, and customers could purchase, the services that best meet their needs, as opposed to the current, one-size-fits-all. Third, reliance on user charges will allow the air traffic control system to borrow on capital markets, addressing the unintended but debilitating consequences of the federal government's pay-as-you-go approach to capital investment.

Radio Spectrum

Finally, let me say a word about the FAA's most valuable "physical" asset—radio spectrum. The FAA uses spectrum for two basic purposes: radar and communications. The spectrum assigned to the FAA is extremely valuable, both because of its prime location on the radio frequency band (it is ideal for the provision of mobile broadband service) and because of its sheer quantity (next to the Department of Defense, the FAA is the federal government's largest user of radio spectrum). The FAA uses spectrum inefficiently because of the antiquated nature of its technology. Stated differently, as it moves to more sophisticated technology, the FAA should be able to meet its needs with less spectrum. This might allow for some win-win transactions, if the FAA (or a corporatized ATO) were able to leverage its spectrum assignments to help finance the adoption of advanced, more spectrum-efficient technology. At a minimum, the Committee's analysis of how to reform air traffic control should take into account both the extremely high value of the spectrum assigned to the FAA and the corresponding need to incentivize its efficient use.