

Sector Capacity Impacts with a Next Generation Air Transportation System (NGATS): Linking Funding Issues with a Congestion Solution

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The Next Generation Air Transportation System (NGATS) is a vision to secure the safety and efficiency of aviation as we move forward to accommodate the future growth in traffic levels that are expected. This program has various technological aspects designed to increase capacity in the system, such as streamlined digital communication between pilots and controllers, and transferral of some separation responsibilities towards the cockpit and away from ATC. In addition, there is an emphasis towards moving away from the current ground-based navigation systems that are outdated and expensive to maintain, and including more satellite navigation technologies for everyday flight planning and execution. These concepts represent potential for significant improvements compared to today's system, but also require financial investment by the FAA in the form of infrastructure development and by the users in the form of aircraft equipment to take advantage of this new technology. From the perspective of the Administration, some estimates say implementation of NGATS will cost an additional \$1 billion annually [Mica, 2006]. Naturally this is a cause for critical examination of how to best handle the funding issue, particularly in this time of increased watchfulness over government spending.

One of the primary means of paying for the FAA's business today is through the Airport and

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Airway Trust Fund. Contributions to the Trust Fund are currently made through a series of excise taxes, such as the 7.5% ticket tax that airline passengers pay based on their airfare. This current tax system is under scrutiny and debate by the various constituencies involved. One main argument against the current funding approach is that the uncommitted balance in the Trust Fund has been drawn down from \$7.3 billion at the end of fiscal year 2001 to \$1.9 billion at the end of fiscal year 2005 [Mica, 2006]. This reduction of over 70% of the fund in a few years can clearly be seen as unsustainable use of the resource. To add urgency to this discussion of funding mechanisms, the laws that set the current excise taxes in place are due for reauthorization by Congress at the end of this current fiscal year 2007. In other words, the current tax system must either be extended or replaced or else it will expire at the end of the year. A likely outcome from this is that the FAA will ask for the authorization to explore and implement alternative tax structures. The timing of when these might actually be implemented is still up in the air, but the looming reauthorization has brought the issue to the forefront of the industry's attention.

This represents an opportunity to rethink the way the FAA funds its business, and hopefully come up with a smarter way of operating that will best suit the efficient and effective implementation of the NGATS vision. Critics of the current tax system are quick to point out the disconnect between the revenue that is generated and the costs of operating the system. The main components of the Trust Fund revenue are the ticket tax mentioned above and the segment tax, which contributes \$3.50 for each hop of a passenger's itinerary. Particularly in the case of the ticket tax, the airfares paid by passengers have no direct link with the costs the FAA incurs by handling a flight. Consider the example of two similar sized aircraft flying through the system, one completely full of passengers and the other nearly empty. These two aircraft look identical with respect to the effort needed by controllers to handle them, the separation required, and other measures of strain on the NAS. Yet, their tax contributions to funding the system are completely different. The disconnect between cost incurred and revenue collected in such cases represents a missed opportunity to create incentives for actions that are taken in line with the overall system good. As a result, an airline that decides their business priorities are best served by operating more frequent flights on smaller

45-seat regional jets than less frequent operations by larger 130-seat narrow body jets could be generating two or three times the air traffic as the alternate business plan, without incurring any penalty. Many airlines in fact made these replacements in their operations in the early part of this decade as illustrated in Figure 1, which shows declining average seat size in the years corresponding to the crisis with the Trust Fund balance. A smarter, next generation, Air Transportation System should have the sources of its costs and revenues more closely in line, and ideally will have built in disincentives for actions that increase demand on the system and incentives for actions that create more efficient use of the available resources.

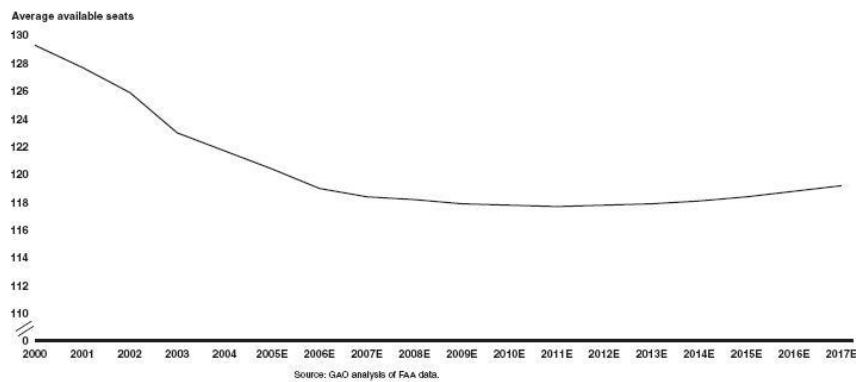


Figure 1: Average available seats per domestic aircraft, 2000-2004, forecasts for 2005 and beyond[Dillingham, 2006]

The possible alternative funding mechanisms for NGATS are still a source of heated debate among the constituency groups involved, and this will surely continue as the reauthorization approaches. However, one likely outcome, as hinted above, will be a move towards a more direct charging scheme where users are taxed in proportion to the specific ways in which they use the system. These types of “user fee” based funding techniques are in place in many portions of the world today including Europe and Canada. One commonly used variant of this approach in Europe is a formula where the fee is proportional to the square root of the aircraft weight times the distance. These questions get sensitive as there are equity implications of any specific charging formula due to the different type of aircraft and type of operations performed by distinct user groups in any portion of the Air Transportation System. A good overview of alternative tax structures for the United

States and the possible equity implications of each is given by [Dillingham, 2006]. Putting aside the specific details, a scheme in which the users of the NGATS are charged for the specific parts of the system and the ways (methods, aircraft characteristics, etc.) in which they use the system would represent an important philosophical shift for this country's Air Traffic Control system.

Within the scope of a NGATS philosophy in which users pay more directly for the costs they impose on the system, there is also potential to incorporate an incentive structure within the fees to help the FAA address congestion issues as well. In such a system, users will likely be quick to point out that the airspace is very heterogeneous and a flat rate charged without respect for the type of airspace does not make sense. Surely the use of a highly demanded and often congested corridor in the Northeast airspace effects the system differently than the comparable per aircraft-mile or per aircraft-minute use of airspace over Montana, say, that is largely empty. If the system is truly charging in proportion to the costs incurred due to a flight's use of the system, then the logical next step is to scale the user fees relative to the demand that particular system resource is undergoing at that time. A congestion pricing scheme like this could be implemented similar to what is being done in ground transportation, where tolls are dynamically computed for High-Occupancy Toll (HOT) lanes on a highway using gradient estimation or other techniques based on the expected difference in travel speeds between alternative lanes [Yin and Lou, 2007]. Obviously there are implementation details to the aviation analogy that could be challenging, including choosing the correct planning horizon for calculating and communicating the fees to users. Placing such details aside for the time being, simply incorporating a procedure where the direct fees are adjusted slightly upwards or downwards based on whether the sectors to be traversed are expected to be at or near capacity or well below capacity, could go a long ways towards the incentives desired for the NGATS. At the very least there would be some additional revenue generated from users who choose to stress the system with more frequent flights at peak times and places of demand. Detailed scientific studies on this concept of dynamic charging for airspace are starting to show up in the recent literature, including the works [Raffarin, 2004] and [Deschinkel et al., 2002]. Realistically, this idea is more long-range in the time frame with which it could be implemented. However,

some of the driving concepts such as an intelligent incentive structure can be utilized in the more near-term iterations of NGATS as well.

One of the big concepts in the NGATS vision is that of Performance-Based Air Traffic Management (PATM). This involves some automation and precision trajectory tools where aircraft self-deliver to a specific point in the airspace at a specific time. There are also equipment requirements on the user end for aircraft to participate in these programs. Naturally the realization of the full potential benefits of the FAA's investment in the technology depends on having a significant portion of the fleet equipped to the necessary level. It makes sense that the FAA should provide incentives to encourage the adoption of the necessary equipment levels for these programs as early as possible. Whether the form of these incentives is through monetary advantages or in terms of access to the system, the NGATS goal of improved sector capacity can be furthered in this manner.

In concluding, the NGATS has substantial challenges ahead in terms of lofty objectives and funding constraints on how to achieve them. This, combined with the timing of Congressional reauthorization of the aviation excise taxes, presents an opportunity to improve both the ways the FAA does business and how it pays for it. We propose in this paper that one of the most surefire ways of achieving the NGATS objectives for sector capacity and other factors, is through a policy of incentives for users to take actions towards the system good. This can be as simple as realigning the tax system to create a direct link between the costs the FAA incurs and the revenues collected. More advanced concepts along these lines include cutting users a break for adopting technologies that improve throughput, and dynamically charging for access to the system based on expected congestion. With the incorporation of any or all of these techniques, the NGATS can set itself up for future success by viewing its funding issues in connection with its capacity objectives.

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