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GPS FOR THE SKY: A SURVEY OF AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B) AND ITS IMPLEMENTATION IN THE UNITED STATES

GENEVRA WILLIAMS*

DESPITE ALL of the modern technological advances that everyday consumers enjoy, the United States' air traffic infrastructure is relatively antiquated. A typical college student very well may carry a cell phone with a broadband internet connection, email, a camera, and Global Positioning (GPS) technology,¹ and yet air traffic controller technology is so basic that it can only get an accurate read on an aircraft's position once every six to twelve seconds.² "[Y]our child's Xbox video game system is more advanced than the air traffic control system that has been guiding aircraft in and out of increasingly crowded airspace since the 1950s."³ Demand for air travel is on the rise. The Federal Aviation Administration (FAA) expects passenger traffic to double by 2025, and the World War II-era radar technology that currently manages air traffic in the national air space (NAS) will be incapable of handling it.⁴ The ineffective-

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³ Editorial, Grounded; Reauthorization of the Federal Aviation Administration is stuck on the legislative tarmac, WASH. POST, May 28, 2008, at A12 [hereinafter Grounded].

ness of radar impacts air safety, air capacity, and the environment. The solution is Automatic Dependent Surveillance-Broadcast (ADS-B), the central component to the U.S. government’s planned overhaul of the entire aviation infrastructure. ADS-B promises to improve safety by allowing aircraft to be precisely and continuously located in the sky, both by air traffic controllers and by other aircraft. This greater precision in air traffic monitoring may lead to improved air capacity by allowing planes to takeoff, fly, and land in tighter formation and in a greater range of weather conditions. This, in turn, will lead to less fuel waste and, consequently, fewer emissions polluting the environment. These benefits have already been proven in both passenger and cargo aircraft, and today we stand at the brink of mandatory use of ADS-B in most U.S. aircraft.

This survey of ADS-B technology aims to give aircraft owners and their counsel a comprehensive understanding of current air traffic control challenges and of the FAA’s push to implement ADS-B nationwide. Section I discusses today’s problems with air traffic management and safety, how ADS-B could solve those problems, and the ways that ADS-B has already been deployed. The FAA expects aircraft passengers to double in the next twenty years. The environment in which our current radar technology operates is chaotic, at best. Air traffic congestion problems are compounded by runway shortages. Air traffic

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8 NextGen Press Release, supra note 7.

9 See Peterson, supra note 6.

10 McKenna, supra note 6.

11 FAA Proposed Rule on ADS-B Out Performance Requirements, supra note 4, at 56948; McKenna, supra note 6; Peterson, supra note 6.

12 FAA Proposed Rule on ADS-B Out Performance Requirements, supra note 4, at 56949; Peterson, supra note 6.

controllers, who are stretched thin\textsuperscript{14} and embroiled in a bitter labor dispute,\textsuperscript{15} rely on World War II\textsuperscript{16} radar technology that is simply not equipped to handle such an increase.\textsuperscript{17} By utilizing ADS-B, the aviation community can improve situational awareness both on the ground and in the cockpit, increase air capacity,\textsuperscript{18} and improve safety.\textsuperscript{19} Additionally, this improved efficiency may reduce fuel consumption and consequently reduce greenhouse gas emissions.\textsuperscript{20} These benefits have already been demonstrated in Alaska, where there has been a forty-seven percent drop in fatal accidents among aircraft equipped with ADS-B,\textsuperscript{21} and at United Parcel Service (UPS), which has enjoyed an increase in flight efficiency and a reduction in fuel costs.\textsuperscript{22} Section II discusses ADS-B in the context of the FAA's much larger program to overhaul all aspects of the aviation infrastructure. The project, called Next Generation Air Transportation System (NextGen), aims to transform the aviation infrastructure by integrating all parts of air transportation into a unified information system.\textsuperscript{23} Because it will bring air traffic surveillance into the 21st century and provide substantial improvements to the accuracy of air traffic monitoring, ADS-B is a key piece of the broader NextGen program.\textsuperscript{24} However, the FAA's poor track record with modernization\textsuperscript{25} and an uncertain fund-

\textsuperscript{15} Dan Haugen, Staffing Problems for Nation's Air Traffic Control System are Growing, but State Doing Better than Most, MINNEAPOLIS POST, Nov. 10, 2008, available at http://www.minnpost.com/stories/2008/11/10/4461/staffing_problems_for_nations_air_traffic_control_system_are_growing_but_minnesota_is_doing_better_than_most.
\textsuperscript{16} FAA Proposed Rule on ADS-B Out Performance Requirements, supra note 4, at 56950.
\textsuperscript{17} Peterson, supra note 6.
\textsuperscript{18} Id.
\textsuperscript{20} McKenna, supra note 6.
\textsuperscript{22} Peterson, supra note 6.
\textsuperscript{23} See NextGen Press Release, supra note 7.
\textsuperscript{24} See id.
ing future for the FAA mean that NextGen’s success is less than certain. At a minimum, it is likely that the ADS-B portion of NextGen will be funded and implemented. Section III analyzes the FAA’s proposed regulation to require ADS-B in most U.S. aircraft by 2020. The proposed rule, first released in October 2007, was met with an overwhelming volume of comment and criticism. In response, the FAA convened a panel of stakeholders who analyzed and synthesized the comments into thirty-six recommendations. The panel’s recommendations cover a very broad range of topics. Section III focuses on three of their key concerns, including congestion on the radio frequency over which ADS-B will operate, a weak business case for adoption by the general aviation community, and the need for the FAA to develop incentives which will encourage early, voluntary adoption of ADS-B. The Aviation Rulemaking Committee’s (ARC) recommendations are discussed with an eye towards how the final rule might be impacted or altered by the feedback. And finally, Section Three discusses the new administration of President Barack Obama, and his newly appointed Secretary of Transportation Ray LaHood. This section makes inferences about how President Obama’s nascent administration may impact the ADS-B mandate and whether there will be funding for the program. Based on the Secretary’s testimony during his confirmation hearing, and based on the fact that installation

26 **Grounded, supra** note 3.
29 **See generally Report From the ADS-B Aviation Rulemaking Committee to the Federal Aviation Administration**, Sept. 26, 2008 [hereinafter Report from the ADS-B ARC].
30 **Report from the ADS-B ARC, supra** note 29, at 1.
32 **Report from the ADS-B ARC, supra** note 29, at 4.
34 Ari Natter, **Senate Confirms LaHood**, **Traffic World**, Jan. 23, 2009, at WP.
35 **The Nomination of Former Representative Ray LaHood (R-IL) to be Secretary of Transportation: Hearing Before the S. Commerce, Science and Transportation Comm., 111th Cong.** (2009) (statement of Mr. LaHood, Secretary of Transportation nominee) [hereinafter LaHood Confirmation Hearing].
of the ground system is already in progress,\textsuperscript{36} one can be optimistic that funding for ADS-B will be supported by his department.

I. A STORM IS BREWING: CROWDED SKIES, RUNWAY SHORTAGES, AND A LABOR CRISIS PUSH THE U.S. AVIATION INFRASTRUCTURE TO THE BRINK OF BREAKDOWN

Delays at the airport have been the media story \textit{de jure} for the past two years,\textsuperscript{37} but the issues that challenge the most basic components of the U.S. aviation infrastructure are no passing problem. The number of aircraft passengers is expected to double by 2025—up from 740 million today.\textsuperscript{38} This will be fueled both by an increase in commercial aviation passengers and in the number of private aircraft.\textsuperscript{39} Huge technological improvements are happening in the realm of private air travel; expansions in the charter plane and fractional ownership sectors have made private flight easier and dramatically more affordable.\textsuperscript{40} While this is great news for consumers, it will further tax an already stressed air traffic control system.\textsuperscript{41} “A shift of 2 percent of today’s commercial passengers to very light jets that seat 4-6 passengers would result in triple the number of flights neces-

\begin{footnotesize}
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\item \textsuperscript{38} FAA Proposed Rule on ADS-B Out Performance Requirements, \textit{supra} note 4, at 56949; Kjelgaard, \textit{supra} note 5.
\item \textsuperscript{39} FAA Proposed Rule on ADS-B Out Performance Requirements, \textit{supra} note 4, at 56950.
\item \textsuperscript{41} FAA Proposed Rule on ADS-B Out Performance Requirements, \textit{supra} note 4, at 56950.
\end{itemize}
\end{footnotesize}
sary to carry the same number of passengers."\textsuperscript{42} "The current system cannot handle the projected traffic demands expected by 2015. Absent modernization, the consequence[s] will be a total system collapse."\textsuperscript{43}

The U.S. aviation infrastructure faces many challenges if it is going to accommodate this expansion in air traffic. For example, there is a shortage in the number of runways from which all of these planes must take off and land.\textsuperscript{44} While an in-depth analysis of the airport capacity problems relating to takeoff and landing are outside the scope of this paper, it is worth noting that runway and airport expansion is a special kind of problem. Long takeoff and landing delays, often suffered in the cramped quarters of a plane on the tarmac or circling over an airport, are infuriating to passengers, yet no one wants an already noisy airport further crowding into their neighborhood.\textsuperscript{45}

Another problem is the profound shortage of qualified air traffic controllers.\textsuperscript{46} Over the next ten years, the bulk of today’s air traffic controllers must be replaced.\textsuperscript{47} The majority of today’s controllers were hired in the 1980s after President Reagan fired 10,000 striking controllers,\textsuperscript{48} and now they are all approaching the mandatory retirement age of fifty-six years.\textsuperscript{49} The FAA has been scrambling to retain experienced air traffic controllers who have not yet hit retirement age by offering six-figure salaries in some locations, and relocation bonuses of up to

\textsuperscript{42} Id.
\textsuperscript{43} Peterson, \textit{supra} note 6 (quoting Robert Sturgell, then-deputy Administrator of the FAA while testifying in front of the Senate Committee on Commerce, Science and Transportation in March 2007).
\textsuperscript{44} Peterson, \textit{supra} note 13.
\textsuperscript{47} Barrett & Stark, \textit{supra} note 14.
\textsuperscript{48} Wald, \textit{supra} note 46. "If you hire them all at once, they're going to retire all at once." \textit{Id.} (quoting Marvin L. Smith, coordinator of the aeronautics master's degree program at Embry-Riddle Aeronautical University).
The air traffic controller shortage has been blamed for at least one accident and a number of near misses. At the Lexington, Kentucky airport in 2006, Comair Flight 5191 crashed after attempting takeoff from a runway that was too short. Forty-nine of the fifty people on board were killed. The lone air traffic controller on duty at the time had only two hours of sleep between shifts, and did not see the plane as it turned onto the wrong runway. In another example, the air traffic controllers union blamed manpower shortages for a near-miss at Chicago O'Hare airport, where a controller cleared one plane to take off and another plane to cross the active runway. Once he realized what had happened, he was able to warn both planes and an accident was avoided, but only by two hundred feet.

Barrett & Stark, supra note 14. "It's a sign of desperation that staffing is so bad at these facilities that the FAA has to offer such an outrageously high sum of money . . . ." Id.

Haugen, supra note 15.

Id. (citing an Inspector General report published in June 2008). In New York, one union representative said that with the decrease in staff, there has also been a decrease in morale and an increase in both air traffic and controller fatigue. David Hughes, N.Y.'s Delay Donnybrook; Some Help is on the Way, but without More Runways, 'Demand Management' Looms, AVIATION WK. & SPACE TECH., Jul. 30, 2007, at 40. "All of the indicators in a safety-related industry are headed in the wrong direction." Id.


Controller in Ky. Crash Slept 2 Hours, supra note 54.

Id.

Id.

Union Leader Says Staffing Shortage, FAA Led to Near Miss, supra note 54.

Id. In 2008, a controller mistake lead to a near collision as two airplanes came in for a landing at the San Diego airport. Concerns Raised over Air Traffic Controller Shortage, supra note 54; see also Madhu Unnikrishnan, Watchdogs Warn House Panel of Climbing Runway Incursion Rate, AVIATION DAILY, Feb. 14, 2008, at 1.
It is against this backdrop that radar technology from World War II currently manages flight traffic in U.S. airspace. Radar works by line of sight and, consequently, an air traffic control center can only manage a plane for as long as it can see it. Like a game of hot potato, air traffic controllers must pass an airplane from control station to control station across the country until it reaches its destination. The technology is further limited in that it can take up to thirty-six seconds to accurately identify an aircraft’s position, and sometimes it is difficult to distinguish between planes and other “clutter” like birds or heavy weather. Furthermore, pilots do not even possess the situational awareness, albeit flawed, that controllers have. In general, pilots in radar-controlled airspace must be steered by air traffic control, both to the necessary navigational direction and to the required horizontal position in the airspace. They must ask “Mother may I?” if they ever want to deviate from their prescribed path.

The uncertainty and limitations of radar mean that air traffic controllers must build in a wide cushion between aircraft in flight; a minimum of five miles must be maintained between planes flying at the same horizontal level. These “wide safety buffers” reduce the number of planes that are allowed to travel in a given section of air space and slow down the takeoff and landing process. This also means that pilots are confined to a

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It is theorized that technological improvements would go a long way in preventing accidents like these. See discussion infra Section II.B.

60 FAA Proposed Rule on ADS-B Out Performance Requirements, supra note 4, at 56950.

61 Peterson, supra note 6.

62 Tracy Samantha Schmidt, An Answer to Flight Delays?, TIME, Aug. 15, 2007, available at http://www.time.com/time/nation/article/0,8599,1653304,00.html. “One cross-country flight, for example, could pass over two dozen air traffic control centers.” Id.

63 Peterson, supra note 6.

64 FAA Proposed Rule on ADS-B Out Performance Requirements, supra note 4, at 56950.

65 See Peterson, supra note 6.

66 See id.

67 See id.

68 Id. The minimum separation distance is three miles during takeoff and landing. Id.

69 Hughes, supra note 53.

70 FAA Proposed Rule on ADS-B Out Performance Requirements, supra note 4, at 56950.
network of "highways in the sky." Rather than flying the most
direct route between destinations, they must navigate our air
space via a web of flight paths designed to keep airplanes sepa-
rated, both vertically and horizontally. Pilots generally must
stick to these predetermined flight paths, and thus have little
flexibility to fly a more direct route or to navigate around traffic
jams.

These factors contribute to a flying environment which feels
like it teeters at the brink of chaos every day. For example, in
August 2008, a computer breakdown at an FAA facility which
processes flight plans caused hundreds of flights to be delayed,
impacting all forty of the nation's major airports. In another
example from September 2007, the system that feeds radar data
into the Air Route Traffic Control Center in Memphis, TN,
brought a halt to all air traffic within a 250-mile radius, causing a
"ripple effect in several airports" including Dallas, TX, and
Nashville, TN, among others. In July 2006, a vehicle crashing
into a power pole caused a power outage at the Palmdale, CA,
air traffic control facility, whose backup generator then malfunc-
tioned, silencing the center for eighty minutes. This caused an
hour long delay of flights into and out of Southern California
and triggered flight delays throughout the western United States
and Canada.

Additionally, we are in the midst of an air capacity crisis. In
2007, U.S. commercial air passengers experienced the second-
worst year on record in terms of flight delays. Over twenty-six
percent of all domestic flights either arrived late or were can-

71 Schmidt, supra note 62 (quoting Marion Blakey, former Administrator of
the FAA).
72 Peterson, supra note 6.
73 Id.
74 Hughes, supra note 53. According to MIT professor R. John Hansman, an
authority on air traffic control, "cascading" delays at one airport create "ripple
effects" of delays across the entire country. Id.
76 Woody Baird, Equipment Failure Halts All Flights in Memphis Area, AVIATION,
halted.html.
77 Daisy Nguyen, FAA Outage Delays Flights, AVPRESS, Jul. 19, 2006, available at
78 Id.
forbes.com/feeds/afx/2008/02/05/afx4617704.html.
celled altogether,\textsuperscript{80} costing passengers and the airline industry almost $41 billion.\textsuperscript{81} The following year was marginally improved, with 24.6\% of flights delayed or cancelled.\textsuperscript{82} According to Bobby Sturgell, then-deputy Administrator of the FAA, "[t]he system we have today is essentially not scalable. You're going to hit a wall."\textsuperscript{83} Clearly, something must be done and ADS-B appears to be the solution.\textsuperscript{84}

A. Hopes for the Future: How Might ADS-B Solve These Problems?

ADS-B is not a "panacea,"\textsuperscript{85} but it will be a substantial improvement. ADS-B utilizes GPS technology to accurately pinpoint an aircraft's position in the NAS at all times.\textsuperscript{86} It is the "backbone" of the FAA's effort to completely overhaul the entire air transportation system.\textsuperscript{87} The advantages of ADS-B are numerous. First, an airplane equipped with ADS-B broadcasts its location several times a second,\textsuperscript{88} whereas a radar hit only occurs once every six or twelve seconds.\textsuperscript{89} Second, signal quality does not degrade as it does with radar.\textsuperscript{90} As a plane moves farther and farther away from a radar station, the signal breaks down and becomes less accurate; ADS-B does not have this problem.\textsuperscript{91} Third, in contrast to radar's "passive detection," ADS-B provides the air traffic controller identifying information about the aircraft.\textsuperscript{92} So instead of simply knowing where a plane is fly-

\begin{thebibliography}{99}
\bibitem{} Id.
\bibitem{} See McCartney, supra note 37.
\bibitem{} Wald, supra note 46. This conclusion is not news to the industry. A capacity crisis has been foretold for many years. See generally, e.g., Chad Key, Comment, General Aviation in the New Millennium: Promising Rebirth—or Imminent Extinction?, 66 J. Air L. & Com. 789 (2001). "God's not making any more airspace and we're putting more airplanes into it. Unless we find a way to make the existing airspace both safer and more efficient, industry growth will necessarily be stifled." \textit{Id.} at 828; see also Mal Gormley, \textit{ATC Outlook 2000}, Bus. & Com. Aviation (2000).
\bibitem{} Peterson, supra note 6.
\bibitem{} FAA Proposed Rule on ADS-B Out Performance Requirements, supra note 4, at 56951.
\bibitem{} NextGen Press Release, supra note 7; see also discussion \textit{infra} Section II.
\bibitem{} Kjelgaard, supra note 5.
\bibitem{} Simonds, supra note 2.
\bibitem{} See Kjelgaard, supra note 5.
\bibitem{} Id.
\bibitem{} FAA Proposed Rule on ADS-B Out Performance Requirements, supra note 4, at 56950–51; Peterson, supra note 6.
\end{thebibliography}
ing in the NAS, air traffic controllers will know precisely which plane is flying in the NAS. Fourth, the benefits of this more comprehensive and accurate view of the sky are not limited to air traffic control. Other pilots within a 150-mile radius will enjoy the same view. This can be combined with displays of ground topography and weather to create an unparalleled level of sophistication in the cockpit.

The most important improvement is to the safety of our skies and airports. With ADS-B, "[a]ir traffic controllers and pilots will be able to identify potential safety problems quickly and avoid them." In Alaska, the technology has helped pilots avoid the most common cause of accidents in the region—accidentally flying into mountains. The program has resulted in an impressive forty-seven percent decrease in fatal accidents among aircraft equipped with ADS-B.

It is theorized that ADS-B will help prevent traffic incidents on the ground as well. Runway incursions are among the National Transportation Safety Board’s greatest safety concerns. ADS-B may help reduce the runway incursion rate by accurately pinpointing the position of aircraft on the ground and communicating with tracking devices installed on ground-based vehicles to give ample warning of any potential collisions.

Additionally, the precision with which aircraft can be identified and monitored promises to greatly improve air space congestion. Because ADS-B operates with substantially greater accuracy, that five mile cushion between aircraft in flight can be reduced to three miles, creating more room for more planes in

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93 Peterson, supra note 6.
94 See id.
95 Id. This requires ADS-B In. See infra text accompanying notes 186–231.
97 Kjelgaard, supra note 5.
98 Brewin, supra note 19.
101 Id.
102 See Peterson, supra note 6.
Pilots will also be able to fly more direct routes, rather than being confined to the "highways in the sky," and will be able to alter course more easily to avoid congestion in flight. The greatest impact to capacity is likely to be on the takeoff and landing process. If planes can be lined up for landing well in advance, while they are still at their cruising altitudes, the time spent circling the airport waiting for their turn to land can be virtually eliminated. This may reduce the time it takes for takeoff and landing by ten to fifteen percent. The technology will also help mitigate delays caused by bad weather. Even when low visibility causes instrument meteorological conditions, pilots will be able to fly in tighter formation during takeoff and landing than radar would typically support because both they and air traffic controllers will have an accurate and comprehensive view of the traffic and topography around them.

ADS-B is not a magic bullet however. Many point out that the relatively small number of runways available is the biggest contributor to airport congestion. Additionally, the manner in which ADS-B is implemented will play a big role in whether airport and airspace congestion is improved. However, there ap-


104 Peterson, supra note 6.

105 See David Hughes, ADS-B Pioneer: Cargo Carrier UPS Plans to Save Fuel and Improve Runway Safety Next Year, AVIATION WK. & SPACE TECH., Nov. 6, 2006, at 56.


107 Hughes, supra note 105.

108 The phrase "instrument meteorological conditions" refers to situations where visibility is compromised to the point that the pilot must rely on his instruments, rather than his eyes, to fly the aircraft. See FAA.gov, Pilot/Controller Glossary, http://www.faa.gov/airports-airtraffic/air_traffic/publications/atpubs/PCG/I.htm (last visited May 23, 2009).

109 Hughes, supra note 105.

110 Dave Demerjian, As Skies Grow Crowded, FAA Preps Air Traffic Control 2.0, WIRED, Oct. 25, 2007, available at http://www.wired.com/science/discoveries/news/2007/10/faq?currentPage=all; see also The Costs of Solving the Air-Traffic Mess, supra note 45 (N.Y. Times reporter, David Pogue, discusses the responses he received to his CBS News interview about the FAA’s implementation of ADS-B. Many air traffic controllers argued that a more effective solution to air traffic congestion is the construction of more runways).

111 See infra text accompanying notes 186–231.
pears to be a universal acknowledgement that current radar technology must be replaced.\textsuperscript{112}

B. \textbf{AN ADDED BONUS: ADS-B MAY REDUCE FUEL COSTS AND HELP THE ENVIRONMENT}

ADS-B technology may carry the added bonus of reducing fuel costs for airlines and general aviation pilots and help the environment at the same time. Along with the practical concerns of a substantial increase in air traffic, there are equally important environmental concerns.\textsuperscript{113} By 2020, the FAA expects “a 30 percent jump in takeoffs and landings by passenger airlines, a 63 percent surge in general aviation hours and a 5.3 percent increase in cargo operations,” and with this, “emissions grow pretty much in lockstep,” according to Carl Burleson, who runs the Office of Environment and Energy at the FAA.\textsuperscript{114}

Fuel consumption will necessarily decrease if pilots are allowed to fly directly between point A and point B, rather than adhering to the “highways in the sky.”\textsuperscript{115} It may also save fuel by making landings a faster and more direct process.\textsuperscript{116} Elimination of “low-altitude vectoring” that pilots must do while they wait for their turn to land will generate substantial fuel-cost savings,\textsuperscript{117} and, by extension, reduce emissions. Such maneuvers are “pure cost and no benefit,” according to a UPS representative that is already using ADS-B at its Louisville, KY, hub.\textsuperscript{118} “[I]f just 10\% of the low-altitude maneuvers . . . were eliminated, most airlines would be making a profit.”\textsuperscript{119} By utilizing ADS-B to improve landing efficiency, UPS expects to save one million gallons of fuel per year.\textsuperscript{120} ADS-B, in conjunction with a software

\begin{thebibliography}{99}
\item \textsuperscript{113} McKenna, supra note 6.
\item \textsuperscript{114} Id. Although Mr. Burleson also notes that, with a fuel efficiency increase, there will be “some trail off.” Id.
\item \textsuperscript{115} Id.; see generally Peterson, supra note 6.
\item \textsuperscript{116} McKenna, supra note 6.
\item \textsuperscript{117} Hughes, supra note 105.
\item \textsuperscript{118} Id.; see infra Section II.C.
\item \textsuperscript{119} Hughes, supra note 105.
\item \textsuperscript{120} UPS Pressroom: Fuel Management and Conservation at the UPS Airlines, supra note 106.
\end{thebibliography}
suite called SafeRoute, can also support more efficient use of
ground-time, further reducing overall emissions.121 "UPS ex-
pects to wring 1,581 hours of excess taxi time out of its Louisville
operations . . . reducing emissions on the ground and saving up
to $936,000 a year in fuel burn."122 This bodes well for the fu-
ture of ADS-B because the Obama Administration has indicated
that its transportation and environmental agendas are closely in-
tertwined, and that transportation efforts must "acknowledge
the new reality of climate change."123

C. WHAT HAVE YOU DONE FOR ME LATELY? ADS-B
IMPROVEMENTS ARE ALREADY ENJOYED BY PILOTS
IN ALASKA AND BY UPS

While ADS-B has long been talked about as the future of air
traffic control,124 the benefits are no longer theoretical. There
have been two successful U.S. implementations of this GPS-
based technology, one in the public sector and another in the
private sector.125 In 1999, the FAA began the Capstone program
in Alaska, where radar coverage is limited126 and air transpor-
tation is relied upon heavily to supply the many small communi-
ties across the state.127 Participating Alaska pilots have a
comprehensive, accurate view of traffic in the sky around them
and their position in relation to the topography below.128 The
result has been an impressive forty-seven percent drop in
Alaska's fatal accident rate for aircraft equipped with ADS-B.129
Furthermore, Alaska Airlines has enjoyed "millions" of dollars in
cost savings based on their ability to operate under weather con-

121 McKenna, supra note 6.
122 Id.
123 Joan Lowy, LaHood: Spending Stimulus Wisely a Top Priority, ASSOC. PRESS, Jan.
21, 2009 (quoting transportation secretary Ray LaHood); see also infra Section
III.D.
124 See, e.g., Alaska Aviation Crashes Down 47 Percent as Capstone Begins Phase III,
INSIDE FAA, Jun. 7, 2005; Key, supra note 83, at 830–31; Paul Richfield, ADS-B on
Target in Louisville, 86 BUS. & COM. AVIATION 44 (2000); Stephen A. Alterman, The
125 Hughes, supra note 105; WORTH KIRKMAN, COMMERCIAL AVIATION ACCI-
DENTS BEFORE AND DURING THE ALASKA CAPSTONE IMPLEMENTATION OF ADS-B, FIS-
B, TERRAIN SITUATIONAL AWARENESS, AND EXPANDED IFR INFRASTRUCTURE 1
(2003).
126 Id. at 1.
127 Kjelgaard, supra note 5.
128 See Peterson, supra note 6.
129 Next Generation Air Transportation System on Satellite-Based, supra note 21.
ditions that would have otherwise grounded or delayed approximately 1,000 flights a year.\footnote{130}

Just as the Capstone project is a compelling demonstration of the safety benefits of ADS-B, the UPS implementation is a compelling demonstration of the business benefits of ADS-B.\footnote{131} At its main hub in Louisville, KY, UPS has equipped approximately three-hundred planes with ADS-B and is boasting some impressive cost savings as a result.\footnote{132} Although it is still in the testing phase, UPS expects a “fuel savings of 1 million gallons a year” and a “10 to 15 percent increase in landings per hour,” not to mention the environmental benefits of noise and emission reductions.\footnote{133}

Additional business cases for adopting ADS-B will come to light as test cases continue to be launched throughout the country in the next few years. The FAA is currently in the process of installing ADS-B systems on oil rigs to bring air traffic support to the Gulf of Mexico.\footnote{134} Over 650 helicopters support the oil industry in the Gulf, making an average of 7,500 trips per day, yet these pilots fly relatively blind because they primarily operate in non-radar controlled areas.\footnote{135} When weather impacts visibility, as many as 95% of these trips are grounded.\footnote{136} Alaska Airlines and JetBlue Airlines will shortly begin using ADS-B in Washington State in an FAA study on operational and human factors issues.\footnote{137} U.S. Airways and UPS will begin using ADS-B at the Philadelphia International Airport to study the technology and aircraft spacing.\footnote{138}

\footnote{130} Peterson, supra note 6.\footnote{131} See UPS Pressroom: Fuel Management and Conservation at the UPS Airlines, supra note 106.\footnote{132} Peterson, supra note 6.\footnote{133} UPS Pressroom: Fuel Management and Conservation at the UPS Airlines, supra note 106.\footnote{134} Douglas W. Nelms, ADS-B in the Gulf, AVIONICS MAGAZINE, Apr. 1, 2007.\footnote{135} Id.\footnote{136} Id.\footnote{137} Three U.S. Air Carriers Picked to Lead ADS-B trials, AIR SAFETY WK., Nov. 10, 2008.\footnote{138} Id. The U.S. Airways project also involves the use of SafeRoute software, which is what UPS has been using in Louisville to optimize its flight operations. Id.; see also David Hughes, FAA Ok's UPS Advanced ADS-B Operations at Louisville, AVIATION DAILY, Jan. 7, 2008, at 2.
II. ADS-B AND THE NEXT GENERATION AIR TRANSPORTATION SYSTEM (NEXTGEN)

The FAA’s implementation of ADS-B is part of a broader overhaul of the nation’s air traffic control and flight safety systems, known as the Next Generation Air Transportation System (NextGen). The FAA describes ADS-B as the “backbone” of the NextGen project, a $20 billion effort to completely overhaul the aviation transportation system. In addition to implementing ADS-B, NextGen aims to move the infrastructure to one single information system, reducing the number of unique systems in use and thereby reducing redundancy; to create a stronger link for the exchange of data between the cockpit and air traffic control, reducing the dependency on voice communications; to improve weather detection; to replace the twenty-year-old equipment that currently drives voice communications between the ground and air; and to develop systems to allow more direct routes between arrival and destination.

The government has already committed substantial resources to NextGen. The project is managed by the Joint Planning and Development Office (JPDO), which is charged with planning for and coordinating the transition to an aviation infrastructure that will support potential air traffic demand by 2025. With respect to manpower, the JPDO consists of at least forty individuals, including political appointees, such as the Secretary of Transportation; high level staff from the White House Office of Science and Technology, the Department of Defense, NASA, NOAA, the Department of Homeland Security, and the FAA; and industry representatives from companies such as Boeing and Lockheed Martin.

However, there is skepticism that the NextGen effort will ever come to fruition. Critics note that “the FAA has spent $35 billion on modernization projects since the 1980s without the sig-

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139 NextGen Press Release, supra note 7.
140 Id.
141 Feliz, supra note 33.
142 NextGen Press Release, supra note 7.
143 Id.
144 See Kjelgaard, supra note 5.
nificant deployment of new technology." Further complicating matters is the uncertain future of FAA funding. In 2008, an FAA funding bill failed to pass Congress—falling victim to the distractions of election season and a $700 billion bailout of the financial industry. With the current temporary funding extension set to expire in March 2009, it will be one of the first issues that Congress and the new presidential administration will have to tackle. There was a great deal of disagreement between the Bush Administration and general aviation fliers about how FAA funding should be structured, but with a new presidential administration and a new transportation secretary in place, it is anyone’s guess what the funding structure will look like in the future.

However the funding is structured, it is likely that ADS-B will get funded. There is relatively general consensus that radar technology must be replaced, and although there may not be complete agreement about how ADS-B should be implemented, there seems to be a tacit agreement among all the major stakeholders that ADS-B is the right technology to move towards. Additionally, the FAA has already allocated considerable resources to the project. In August 2007, the FAA awarded ITT Corp. a $1.86 billion, eighteen-year contract to build the infra-


148 Grounded, supra note 3, at A12.


150 AviationNews.net, President Signs Six-Month FAA Extension and Temporary Funding Bill (Oct. 1, 2008), http://www.aviationnews.net/?doc=adline&news_ID=159851; the consensus appears to be that a long term funding bill will not get passed before the March expiration. Lori Ranson, Hopes Fade for FAA Funding Deal, AIRLINE BUS., Jan. 29, 2009, available at http://www.flightglobal.com/articles/2009/01/21/321368/hopes-fade-for-faa-funding-deal.html. In that case, the FAA will have to continue to operate on temporary funding bills, as it has since 2007. Id.

151 Janice Francis-Smith, Fight for Flights: Bush Plan Could Drive Up Costs for General Aviation, J. REC., Feb. 12, 2007 (the plan proposed charging user fees to general aviation pilots, which critics argued would shift $2 billion in costs away from the airlines and on to small aircraft owners).


153 See generally ADS-B: At What Price?, supra note 31; ADS-B ARC Report with FAA, supra note 31; Adams, supra note 112; Moorman, supra note 112; AOPA Wants WAAS and ADS-B, But with Some Qualifiers, supra note 112.
structure for ADS-B. The first phase involves setting up the ground-based portion of the infrastructure and is worth $207 million. The company has already installed the system in southern Florida. It was validated by the FAA in December 2008, clearing the way for a nationwide installation. Given the fact that, during his campaign, President Obama’s transportation platform focused on modernizing air traffic control and on creating new jobs through investment in infrastructure, it is likely that it will receive enough funding to be implemented in some form. It seems that failing to implement ADS-B is simply not an option.

III. PROPOSED FAA REGULATION WOULD REQUIRE ADS-B IN MOST U.S. AIRCRAFT BY 2020

In October 2007, the FAA issued a notice of proposed rulemaking (NPRM) proposing mandatory equipage of ADS-B Out technology by 2020. The proposed rule faced a great deal of criticism; over 1,400 comments on the rule were re-

155 ITT Achieves ADS-B In-Service Decision Milestone by the FAA, supra note 36.
156 Id.
157 Id.
158 BarackObama.com, Barack Obama and Joe Biden: Strengthening America’s Transportation Infrastructure, http://www.barackobama.com/pdf/issues/FactSheetTransportation.pdf; see also WileyRein.com, The Obama Agenda: Early Predictions on U.S. Aviation Policy, the Airlines, General Aviation and Airports, http://www.wileyrein.com/publication.cfm?publication_id=14054 (“The Obama administration and Congress will likely be tempted to move forward aggressively on new technologies that promise more efficient uses of resources and address environmental concerns and provide new jobs.”).
159 Section III discusses the manner in which ADS-B is likely to implemented, and posits that the full benefits of the technology are unlikely to be fully embraced and supported by the FAA in the short term. See generally infra Section III. However, it seems likely that, at the very least, there will be a minimum level of implementation which would allow radar to be replaced. Id.
160 In reference to the broader NextGen project, the newly-appointed Secretary of Transportation said “[t]here has to be a commitment from the Congress, from the FAA, from everybody, all the stakeholders, to get this done. The flying public deserves it.” LaHood Confirmation Hearing, supra note 35.
161 See infra text accompanying notes 186–251.
162 FAA Proposed Rule on ADS-B Out Performance Requirements, supra note 4, at 56951. This rule is proposed under the FAA Administrator’s authority set forth in 49 U.S.C. § 106. Id. at 56948. Furthermore, § 40103 requires the Administrator to regulate the “safe and efficient use of the navigable air space.” Id.
163 Robert Poole, Why is ADS-B So Far Off Track?, AIR TRAFFIC CONTROL REFORM NEWSLETTER (Reason Foundation, Los Angeles, CA), Jul. 1, 2008, available at
Complaints spanned a wide range of topics, including concerns about the timeline being too fast or too slow, radio frequency congestion, the cost to equip aircraft, insufficient benefits to general aviation fliers, lack of benefits to low altitude fliers, as well as concerns about security and privacy. Consequently, the FAA convened an Aviation Rulemaking Committee (ARC) to analyze the comments. The ARC made thirty-six summary recommendations to the FAA. In addition, the FAA made the "unusual" decision to reopen the comment period a second time, requesting further feedback on the ARC's recommendations. The final rule is expected to be released in April 2009 or in 2010, depending on the source. Very generally, the biggest areas of concern seem to center on problems relating to frequency congestion, the costs and benefits for general aviation and low-altitude fliers, and the need to create incentives to encourage early adoption.

http://www.reason.org/news/show/1003052.html (describing the response to the rule as "hugely negative"). However, it should be noted that the concerns appear to be more centered on how the technology will be implemented, rather than whether it should be implemented in the first place. See Report from the ADS-B ARC, supra note 29, at 1–11.

164 FAA Reopens ADS-B Comment Period, supra note 27.
166 ADS-B ARC Report With FAA, supra note 31. "The ARC could not reach consensus on whether the FAA should mandate equipment meeting interim ADS-B Out standards, three years earlier than the NPRM proposed compliance date, to achieve early benefits in certain airspace." Id.
167 Id.
170 Report from the ADS-B ARC, supra note 29, at 95–96.
171 Poole, supra note 163. The ARC is "a group of aviation stakeholders charged with advising [the] FAA on this issue." Id.
172 Hughes, supra note 28, at 3.
173 FAA Reopens ADS-B Comment Period, supra note 27. The second comment period closed November 3, 2008. Id.
174 Feliz, supra note 33.
176 These topics are the most frequently discussed in the press coverage of the ARC's release. See, e.g., Hughes, supra note 28; David Hughes, Aviation Rulemak-
A. 1090 MHz Frequency Congestion

The ARC's first recommendation is to request an "urgent study" on radio congestion on the 1090 MHz frequency. In addition to ADS-B, the 1090 MHz frequency is also used by collision avoidance systems and ground-based surveillance systems, and the FAA has previously expressed concern that the frequency will become overcrowded. The ARC views 1090 MHz frequency congestion as a "high risk to the ADS-B program" and noted that, without substantial changes to how the three systems will use the frequency, the infrastructure simply will not support "substantial future traffic growth." On the other hand, the FAA's ADS-B program manager, Vincent Capezzuto, has said that the problem of frequency congestion is well understood by the Agency, as it has had a "spectrum risk panel" studying the issue since 2006. This suggests that the current plans to operate ADS-B over 1090 MHz will remain in the final rule.

B. Imbalance in Cost vs. Benefit for the General Aviation Community

Another area of concern is the unbalanced impact of the regulation on the general aviation community. The Aircraft Owners and Pilots Association (AOPA) has repeatedly said that "the cost of ADS-B equipment currently outweighs the proposed benefits to [general aviation] pilots." Thus, "to the user community, the [proposed rule] spelled all costs but no benefits." In its current format, the rule requires general aviation pilots to carry an additional piece of equipment from which they receive no additional utility. While there is a benefit to the community at large, in that improved air traffic control surveillance is good for everyone, it does not have any direct, personal benefits.

\[\text{ing Committee Wants FAA to Fix ADS-B Mandate, Aviation Daily, Oct. 7, 2008, at 6;}\]
\[\text{Kerry Lynch, FAA Opens ADS-B Comment Period to Review ARC Recommendations, WKLY BUS. OF AVIATION, Oct. 6, 2008, at 159.}\]
\[\text{177 Report from the ADS-B ARC, supra note 29, at 1.}\]
\[\text{178 ADS-B ARC Report With FAA, supra note 31; David Hughes, Recalibrating ADS-B, Aviation Wk. & Space Tech., Oct. 6, 2008, at 62.}\]
\[\text{179 Report from the ADS-B ARC, supra note 29, at 1-6.}\]
\[\text{180 Hughes, supra note 178, at 62.}\]
\[\text{181 ADS-B: At What Price?, supra note 31.}\]
\[\text{182 Id.}\]
\[\text{183 Poole, supra note 163.}\]
for the individual pilot because none of that information is relayed back to the cockpit. The general aviation community does not even enjoy the benefit of reducing the equipment it must carry and maintain because it must continue to carry radar transponders which will serve as a backup in the event of a failure of the ADS-B network.

Wrapped up in this complaint is the FAA’s failure to fully embrace all that ADS-B has to offer. The proposed regulation does not require adoption of all aspects of available ADS-B technology. There are two key components of ADS-B: (1) the technology which broadcasts an airplane’s position, speed, direction, and identifying data—which is called “ADS-B Out”; and (2) “ADS-B In,” which allows an aircraft to receive ADS-B Out signals from other planes and allows the pilot to view surrounding aircraft in real time. The pilot of an ADS-B In-equipped plane has a comprehensive view of traffic in the sky, similar to what an air traffic controller sees. The FAA will support ADS-B In for those who choose to carry it, but some in the aviation community feel that the Agency has “dropped the ball” in failing to make ADS-B In mandatory. The Agency is struggling with a chicken-before-the-egg conundrum. Clearly, in order for NextGen to succeed, air traffic control capabilities must be dramatically improved. Succeeding at that effort requires that ADS-B be used on most of the nation’s aircraft, precisely broadcasting their position in the airspace. ADS-B Out is the minimum technology. Historically, aircraft owners strongly resist being forced to purchase equipment that gives them no direct benefits, and ADS-B Out really only benefits air traffic control.

186 See infra text accompanying notes 186–231.
188 Id. at 59652
189 Id. at 56960.
190 Id.
191 Id.
192 Poole, supra note 163; see also REPORT FROM THE ADS-B ARC, supra note 29, at 107–08 (there were thirty comments on the NPMR’s failure to mandate ADS-B In, with several arguing that in its absence “ADS-B provides insufficient benefits.”).
193 See Poole, supra note 163.
194 Id.
195 Id.
For this reason, the FAA put in a very generous timeline of 2020. Because ADS-B In will augment cockpit display systems, it is likely to be even more costly than ADS-B Out and, consequently, the Agency has not discussed when, if ever, ADS-B In will be mandated.

Yet, ADS-B In technology is where the general aviation community will experience direct benefits because it will allow pilots a cockpit view of the surrounding airspace that is on par with what air traffic controllers see. The more situational awareness a pilot enjoys, the more safely he or she can navigate crowded air space. Additionally, ADS-B In technology can support a variety of data feeds, including real-time weather and modeling of vertical aircraft position relative to topographic maps displayed inside the cockpit. With these types of benefits, resistance from the general aviation community would be substantially smaller and many would voluntarily adopt ADS-B Out and In well in advance of the 2020 deadline. The FAA must decide: does it want to minimize the required costs by only requiring ADS-B Out, while providing no direct benefits to pilots? If ADS-B Out is the first step towards modernization of the complete aviation infrastructure, this seems like a bare minimum step that the Agency must take, but it will be extremely unpopular. Does it want to leverage the benefits of ADS-B In to encourage ADS-B Out adoption? This seems like the more logical choice, but an unfeasible one. The specifications for ADS-B Out have not even been finalized, and therefore the final costs of the systems are unknown at this point. Additionally, the operational procedures to utilize many of the benefits, such as reduced minimum separation standards, have not been established. Consequently, the Agency does not really have

196 Aside from the collective benefits to the flying community of more safely and efficiently managed airspace.
197 Poole, supra note 163.
198 Id.
199 Peterson, supra note 6.
200 See id.
201 AOPA.org, Air Traffic Services Brief—Automatic Dependent Surveillance-Broadcast (ADS-B), http://www.aopa.org/whatsnew/air_traffic/ads-b.html (last visited Jan. 30, 2009); in its comments on the NPRM, UPS argued that the full promise of ADS-B for safety and increased capacity cannot be realized without utilizing ADS-B In. REPORT FROM THE ADS-B ARC, supra note 29, at 108.
202 See Kjelgaard, supra note 5.
203 See Feliz, supra note 33.
204 See REPORT FROM THE ADS-B ARC, supra note 29, at 42.
the option to use the benefits of ADS-B In to entice users to equip.\textsuperscript{205}

According to the ARC, "ADS-B In is not well enough defined" for the FAA to proceed with a related rule at this point in time.\textsuperscript{206} But the ARC still has several suggestions which address the buy-in problem among the general aviation and low-altitude flying communities and asks the FAA to improve the cost-benefit analysis for those groups.\textsuperscript{207} The ARC believes that the FAA should require a higher level of performance from the ADS-B Out equipment, which would lead to a number of improvements for the general aviation community. A sampling\textsuperscript{208} are:

1. allow general aviation aircraft to carry less equipment;
2. allow them to fly closer to other aircraft;
3. improve search and rescue services, since ADS-B will provide more accurate location information than is currently available using radar;
4. configure flight plans to be automatically closed at airports without radar coverage to save time and avoid accidentally triggering costly search and rescue when flight plans are not closed;\textsuperscript{212} and

\textsuperscript{205} Although it appears that the FAA is attempting to do just that. See generally FAA Proposed Rule on ADS-B Out Performance Requirements, supra note 4, at 56952–53. Some comments on the proposed rule argue that the FAA seems to be selling ADS-B Out on the basis of benefits only provided by ADS-B In. Report from the ADS-B ARC, supra note 29, at 34.

\textsuperscript{206} Report from the ADS-B ARC, supra note 29, at 111. The ARC did not believe that mandating ADS-B In at this time was realistic, given that the technology is still relatively immature. Id. However, the ARC did ask that the FAA define a strategy for ADS-B In implementation by 2012. Id. at 10.

\textsuperscript{207} ADS-B ARC Report with FAA, supra note 31; see Report from the ADS-B ARC, supra note 29, at Appendix P; see also Aleksandra L. Mozdzanoska, et al., Dynamics of Air Transportation System Transition and Implications for ADS-B Equipment, AIAA Aviation, Integration & Operations Conf. 11 (2007) available at http://dspace.mit.edu/bitstream/handle/1721.1/39093/ATIO-ADS-B-transition-2007.pdf?sequence=1. Professors at the Massachusetts Institute of Technology and the University of Stellenbosch, Matieland, South Africa have done a very nice study on ADS-B buy-in among general aviation consumers and came to the same general conclusion as the ARC panel. Id. at 11–12. "The benefits case for ADS-B can be accelerated by increasing high value applications to encourage early adoption, and by reducing uncertainty in the delivery of benefits through ensuring certification of new operational capabilities." Id.

\textsuperscript{208} The recommendations for technical improvements to ADS-B are substantial, see the ARC for more details. See generally Report from the ADS-B ARC, supra note 29.

\textsuperscript{209} General aviation planes would not need to carry emergency locator transmitters. See Report from the ADS-B ARC, supra note 29, at P-20.

\textsuperscript{210} Three nautical miles instead of five nautical miles. Report from the ADS-B ARC, supra note 29, at P-17.

\textsuperscript{211} Id. at P-16–P-17.

\textsuperscript{212} Id. at 4, P-17.
provide ADS-B surveillance coverage at current non-radar airports, giving general aviation fliers air traffic support in locations that they have never had before. The ARC further recommends that if the FAA cannot quantify a positive business case for the general aviation community, then it should not mandate ADS-B for that community.

What does this mean to the general aviation pilot and the attorney who counsels him? At this point, the most prudent advice is "wait and see." It is very likely that ADS-B Out will be required and clear that ADS-B In will not be. But it is not yet clear exactly what the technology will look like. Given the broad-range recommendations from the flying community—as codified by the ARC, particularly with respect to how they believe that ADS-B units should perform—there are simply too many balls in the air to say for certain what the technology will look like or even if ADS-B will be required for general aviation fliers. One thing is certain: aircraft owners can be counseled that they do not need to run out and purchase ADS-B just yet. They can safely wait until the final rule is released.

C. INCENTIVES ARE NEEDED TO ENCOURAGE EARLY ADOPTION

The ARC also asked the FAA to provide incentives to early adopters of ADS-B Out technology. Proposed incentives range from operational benefits such as offering preferred routes and optimal flight paths, to dollar-centric benefits such as tax breaks, subsidies, and interest free loans to aircraft owners who install ADS-B in advance of the 2020 deadline. Early adoption is good for everyone for a variety of reasons. First, and probably foremost, successful implementation by early adopters will help make the case for the wider aviation community. For example, an airline that is quick to adopt ADS-B technology, thus enabling the use of more efficient flight paths, will save time and money and enjoy a short term competitive advantage over non-equipped airlines. The benefit to the FAA will be a live demonstration to other airlines of just how much ADS-B can impact the bottom line.

213 Id. at P-5, P-17.
214 Id. at 4 (Recommendation No. 9).
215 Id. at 4 (Recommendation No. 7).
216 Id. at 4.
217 Id. at 48–49.
218 See id. at 49. The advantage is short-term because once all the airlines have ADS-B Out, the advantage over competitors will be lost.
The FAA has said little about most of the ARC's recommendations, but incentives for early adoption is one area where they have made promising comments. The concept of using ADS-B in advance of the 2020 mandate deadline to allow a reduction in aircraft separation will be presented to FAA senior staff for consideration in the final rule. It may be difficult to convince the FAA to employ tax breaks, loans, fee waivers, and other dollar-centric incentives. Given the recession and the uncertain state of FAA funding, it is unclear which, if any, of these types of recommendations the FAA might employ. It appears far more likely that operational advantages will be the primary incentive employed to encourage early adoption. However, operational advantages carry cost as well. If the FAA incorporates the ARC's recommendations to provide operational incentives to early adopters in the final rule (which is expected in 2009 or 2010 depending on the source), there will very likely be significant cost savings for airlines and air-freight companies in their ability to increase capacity by flying more direct routes and having tighter-spaced takeoffs and landings.

D. THE OBAMA UNCERTAINTY PRINCIPAL

In addition to an unknown impact on FAA funding, the new president's administration also casts uncertainty onto how the final ADS-B rule will be composed. On his first day in office, President Obama issued an executive order halting all pending regulations until they have been reviewed by the new administration. The purpose behind the directive seems to be to prevent some of President Bush's conservative agenda from being implemented, and it is unlikely that the administration would have some sort of doctrinal problem with ADS-B itself. Transportation Secretary Ray LaHood was sworn in on January 23,

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219 Hughes, supra note 176.
220 Id.
222 Feliz, supra note 33.
223 ADS-B: Frequently Asked Questions, supra note 175.
224 Hughes, supra note 105.
225 See supra Part II.
227 See id.
2009. Despite the fact that he is a Republican, he is not a “holdover” from the previous administration, and therefore there are few clues as to what his approach to ADS-B will be. In his confirmation hearings, Secretary LaHood said that resolving the long-running labor dispute between the FAA and air traffic controllers will be one of his top priorities. He also promised to find a new administrator for the FAA. Whoever the new FAA Administrator is will have a significant influence on the final ADS-B rule, and there have been few concrete indications of who that may be. When the Secretary was pressed specifically on air-traffic modernization, he talked about the expense of NextGen, but also said that it is an imperative. “I know this next-generation technology is not inexpensive, but we have to do it.” He testified about setting interim benchmarks for NextGen—five to eight year goals that fit into the long-term goal of completing NextGen—and said that “[t]here has to be a commitment from the Congress, from the FAA, from everybody, all the stakeholders, to get this done. The flying public deserves it.” News agencies suggest that a significant portion of President Obama’s economic stimulus plan will be focused on revitalizing the transportation infrastructure, which bodes well for ADS-B funding. However, with the new administration in its in-

228 Natter, supra note 34.
229 LaHood Becomes Transportation Secretary, supra note 152.
230 LaHood Confirmation Hearing, supra note 35.
232 Marni Pyke, Transportation Wonks Dish on Obama Cabinet, CHI. DAILY HERALD, Nov. 16, 2008, at 19 (discussing rumors and “gossip” that democratic congressman Peter DeFazio was a candidate for FAA Administrator). At the time that this comment was authored, the new FAA Administrator had not yet been chosen. As this issue was set for publication, the senate confirmation hearings for nominee J. Randolph Babbitt were in progress. Matthew L. Wald, Commuter Airline Safety Concerns F.A.A. Nominee, N.Y. TIMES, May 19, 2009, at A27.
233 LaHood Confirmation Hearing, supra note 35.
234 Id.
235 Id.; see also Barack Obama and Joe Biden: Strengthening America’s Transportation Infrastructure, supra note 158 (President Obama’s campaign platform centered on the revitalization of the transportation infrastructure, and specifically called for the modernization of air traffic control).
fancy, there is little to go on in evaluating the likelihood that ADS-B will still be implemented or what the final implementation rule will look like. Using the Secretary’s testimony as a guide, it seems likely that ADS-B implementation would be included in the short-term benchmarks that he speaks of, particularly given that installation of the ground system is already underway.\textsuperscript{237} The Secretary has been described as a pragmatist,\textsuperscript{238} and he may choose to focus on near-term goals that can be attained with relative confidence. ADS-B Out is certainly one of those accomplishable goals, but ADS-B In is almost certainly not\textsuperscript{239} and is unlikely to be included in the final rule. Also, given the Secretary’s practical approach, the ARC’s recommendations are likely to be a very good guide in anticipating how the final ADS-B rule will be structured. The more popular and practical recommendations, such as improving benefits for general aviation\textsuperscript{240} to encourage early adoption, are more likely to appear in the final rule.\textsuperscript{241}

\section*{IV. CONCLUSION}

This discussion has illustrated how the limitations of the current air traffic infrastructure simply cannot meet the demand expected over the next twenty years.\textsuperscript{242} Shortages of air traffic control staff,\textsuperscript{243} airports, and runways, coupled with gross inefficiencies in radar technology are driving the U.S. aviation capacity towards a brick wall.\textsuperscript{244} By utilizing GPS technology, a nationwide rollout of ADS-B promises to break through that wall. It will dramatically improve air traffic control monitoring capabilities, bring situational awareness in the cockpit into the twenty-first century, improve safety, and perhaps improve congestion, both in the sky and on the runway.\textsuperscript{245} In these days of increased awareness of global warming, the secondary benefit of reducing jet fuel waste and emissions are also important.\textsuperscript{246} Encouragingly, the benefits of ADS-B are not theoretical. The

\begin{footnotesize}
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\item \textsuperscript{237} \textit{ITT Achieves ADS-B in Service Decision Milestone by the FAA}, \textit{supra} note 36.
\item \textsuperscript{238} Hinton, \textit{supra} note 236.
\item \textsuperscript{239} \textit{See Report from the ADS-B ARC, supra} note 29, at 111.
\item \textsuperscript{240} \textit{See ADS-B: At What Price?}, \textit{supra} note 31.
\item \textsuperscript{241} That is, if funding can be found to support the operation changes necessary to make those benefits a reality.
\item \textsuperscript{242} \textit{See discussion supra} Part I.A.
\item \textsuperscript{243} Wald, \textit{supra} note 46.
\item \textsuperscript{244} Peterson, \textit{supra} note 6.
\item \textsuperscript{245} \textit{Id.; ADS-B Requirement by 2020, supra} note 99.
\item \textsuperscript{246} McKenna, \textit{supra} note 6.
\end{itemize}
\end{footnotesize}
FAA’s Capstone project in Alaska has firmly demonstrated dramatic safety improvements, particularly for areas where radar coverage is limited. Both Capstone and UPS have also shown the significant potential for cost savings by supporting more efficient flight management.

Implementation of ADS-B is part of the broader NextGen project to completely overhaul the nation’s aviation infrastructure. While there is skepticism that the larger NextGen project will succeed, ADS-B Out implementation, at a minimum, is very likely, given the understanding that radar is simply no longer practical or effective. Whatever funding problems other parts of NextGen may face, ADS-B is very likely to be funded in some fashion, particularly given the apparent commitment of President Obama’s administration to upgrade the deteriorating aviation infrastructure.

The FAA’s proposed regulation would require ADS-B equipment on most U.S. aircraft by 2020. The overwhelmingly strong reaction to the proposed rule from the aviation community was synthesized by an ARC panel of industry representatives into thirty-six recommendations on alterations to the rule and other actions for the FAA to take. There is concern that congestion on the 1090 MHz frequency, over which ADS-B broadcasts, will negatively impact functionality in the future. But it is unlikely that ADS-B will be altered in this regard. There has also been a strong reaction to the cost of complying with this rule, particularly in light of the perceived lack of benefits for the small and medium aircraft owners that make up the general aviation community. The proposed rule fails to embrace ADS-B In, despite the fact that that is where the most dramatic and direct benefits would be experienced from within the cockpit.

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247 Brewin, supra note 19; ADS-B Requirement by 2020, supra note 99.
248 Peterson, supra note 6; UPS Pressroom: Fuel Management and Conservation at the UPS Airlines, supra note 106.
249 NextGen Press Release, supra note 7.
251 See ADS-B: At What Price?, supra note 31; ADS-B ARC Report with FAA, supra note 31; Adams, supra note 112; Moorman, supra note 112; AOPA Wants WAAS and ADS-B, But with Some Qualifiers, supra note 112.
252 Barack Obama and Joe Biden: Strengthening America’s Transportation Infrastructure, supra note 158.
253 See REPORT FROM THE ADS-B ARC, supra note 29, at 1–11.
254 Id. at I-6.
255 Id. at I-6; ADS-B: At What Price?, supra note 31.
256 See supra text accompanying notes 186–231.
makes a compelling argument for the FAA to provide value-added services to general aviation pilots via ADS-B, such as a reduction in required on-board equipment, smaller minimum separation between ADS-B equipped aircraft, automatic flight plan closure, improved search and rescue operations, and ADS-B coverage at non-radar airports.\textsuperscript{257} It is clear that that ADS-B In equipage will not be mandatory, but it remains to be seen whether ADS-B Out will be required for general aviation aircraft.\textsuperscript{258} General aviation aircraft owners and the attorneys who counsel them are advised to take a "wait and see" attitude to the proposed rule. The ARC also asks the FAA to implement incentives to encourage early adoption.\textsuperscript{259} Given the uncertain state of FAA funding, it is likely that these incentives will be operational in nature, such as being able to follow more efficient flight paths.\textsuperscript{260} This is good news for airlines using commercial airports, where improvements to flight efficiency may have a significant improvement on the bottom line.\textsuperscript{261}

The impact of the new presidential administration remains to be seen. All activity on the proposed rule is currently halted,\textsuperscript{262} but a great deal of progress has already been made via the comment period and the ARC panel.\textsuperscript{263} President Obama's campaign platform included promises to modernize the air traffic control system,\textsuperscript{264} which may very well translate into support for ADS-B implementation. Through Secretary LaHood, the administration has signaled sensitivity to environmental concerns relative to its transportation agenda, which works in favor of ADS-B and its demonstrated ability to cut fuel emissions.\textsuperscript{265}

\begin{itemize}
  \item \textsuperscript{257} \textit{Report from the ADS-B ARC, supra} note 29, at 4, P-16–P-20.
  \item \textsuperscript{258} The ARC requests that if the FAA cannot provide enough value added services to general aviation such that it makes a compelling business case for ADS-B adoption, it make ADS-B optional for that community of fliers. \textit{Report from the ADS-B ARC, supra} note 28, at 4.
  \item \textsuperscript{259} \textit{Report from the ADS-B ARC, supra} note 29, at 4 (Recommendation No. 7).
  \item \textsuperscript{260} \textit{Report from the ADS-B ARC, supra} note 29, at 4. However, the author recognizes that new operational procedures must carry a cost as well, and it is probably quite expensive.
  \item \textsuperscript{261} All the time spent circling the airport while waiting to land is "pure cost and no benefit." Hughes, \textit{supra} note 105. "[I]f just 10\% of low-altitude maneuvers . . . were eliminated, most airlines would be making a profit." \textit{Id.}
  \item \textsuperscript{262} \textit{Obama Faces Hurdles in Reversing Bush Regulations, supra} note 226.
  \item \textsuperscript{263} \textit{Report from the ADS-B ARC, supra} note 29.
  \item \textsuperscript{264} Barack Obama and Joe Biden: Strengthening America's Transportation Infrastructure, \textit{supra} note 158.
  \item \textsuperscript{265} Lowy, \textit{supra} note 123.
\end{itemize}
Secretary LaHood has also indicated a commitment to NextGen, but with an eye towards breaking it up into more realistic, near-term goals.\textsuperscript{266} Although there has yet to be any direct discussion of ADS-B, there has also been no indication that ADS-B is in contradiction with the administration’s plans for aviation. Given the recent statement by the new transportation secretary that transportation initiatives must “acknowledge the new reality of climate change” and demonstrations by UPS and Alaska Airlines of the technology’s ability to help cut jet fuel consumption and emissions, ADS-B may be the perfect near-term goal to start with.\textsuperscript{267}

Many of these questions will be resolved, one way or the other, in the next two years. Permanent funding for the FAA is a top priority for both the new Congress,\textsuperscript{268} and identifying a new FAA Administrator is a top priority for the new transportation secretary.\textsuperscript{269} The final ADS-B rule from the FAA is expected in 2009 or 2010, which will set in stone the technical requirements for the technology, allow manufacturing of FAA compliant systems to begin, and allow economies of scale to start bringing equipment prices down and broaden access to a wider cross-section of pilots. At this point, aircraft owners and their counsel should understand ADS-B, how the technology works, and the potential costs as well as the potential benefits.

This is an exciting time for the aviation community, but also a time fraught with uncertainty. ADS-B could bring practical, day-to-day improvements to flight efficiency, safety, and the environment in the next ten to fifteen years. Yet, it all hinges on the manner in which ADS-B will be implemented, and that remains to be seen. Some in the industry are already reaping ADS-B’s benefits,\textsuperscript{270} while a broad section of others may not find added value for several years to come.\textsuperscript{271}

\textsuperscript{266} LaHood Confirmation Hearing, supra note 35.
\textsuperscript{267} Lowy, supra note 123; Peterson, supra note 6; UPS Pressroom: Fuel Management and Conservation at the UPS Airlines, supra note 106.
\textsuperscript{268} T&I Committee Sets Priorities, TRAFFIC WORLD, Jan. 26, 2009, at 11.
\textsuperscript{269} Pyke, supra note 231.
\textsuperscript{270} Hughes, supra note 105.
\textsuperscript{271} Morningstar, supra note 184.