

Series on Program Management Success in Government

Transforming Air Traffic within the US
National Airspace System

KEY FINDINGS

The Transformation of the U.S. Air Traffic Control System

The Next Generation Air Transportation System – or NextGen – and its component programs are designed to overhaul air traffic control as we know it and transform the National Airspace System (NAS).¹ Of the four components of NextGen, ADS-B² (Automatic Dependent Surveillance-Broadcast) is the “cornerstone” that will transform the United States’ air traffic control system from a ground-based surveillance system, which has been in place for the last six decades, to a satellite-based surveillance system using GPS technology. This system will reduce traffic delays, save time and fuel, permit controllers to monitor and manage aircraft with more efficiency and increase capacity. For this report, capacity refers to the number of aircraft managed within the system that keeps pace with the increased demand for flights by users.

“ADS-B is the enabling technology for NextGen. It’s the cornerstone, the first out of the box.”

The NextGen program is managed within the U.S. Department of Transportation, Federal Aviation Administration (FAA), Air Traffic Organization (ATO). Within this operational component exists a permanent program management organization (henceforth referred to as the Program Office) responsible for acquisitions, services, and products. The Program Office buys, develops and sustains systems and develops standards

for avionics. In the case of ADS-B, the Program Office was tasked with the introduction of a new layer of surveillance into the NAS and figuring out a plan to execute it. It was granted a US\$1.7 billion program baseline for 2007-2014.

ADS-B was awarded official program status in 2007, to undertake activities to deploy the new capability, but also to publish a federal mandate requiring aircraft operating in specified airspace to be equipped with ADS-B by 2020. This system improves air traffic control by updating air traffic controllers of the whereabouts of an airplane once every second, as opposed to as much as every 12 seconds under the old system. One interviewee suggests the following analogy: “Imagine driving home tonight in your car and you only get to open your eyes every 12 seconds.” ADS-B not only allows for more frequent updates, but more data and more accurate data, “allowing controllers to safely meet increased traffic demands and enable more efficient flight operations.”

Success despite size and scope. The largest public works project in U.S. aviation history, the ADS-B program is one of unprecedented magnitude (budget, scope and duration) for both the FAA and its numerous non-government partners (airlines, pilots, aircraft manufacturers, etc.). With a budget that has surpassed US\$1 billion, and a timeline of over 13 years from program initiation to the mandate compliance date, it could have encountered myriad hiccups, even failures, as it progressed through its various lifecycles.

“Why should a ground-based system ask a plane who it is? Why can’t the plane just tell me? And I’ll listen on the ground. And that’s what ADS-B does.”

¹ The airspace structure is a complex environment that requires the use of highly technical air traffic control (ATC) procedures. The Federal Aviation Act of 1958 established the FAA and made it responsible for the control and use of navigable airspace within the United States. The FAA created the National Airspace System (NAS) to protect persons and property on the ground, and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS is made up of a network of air navigation facilities, ATC facilities, airports, technology, and appropriate rules and regulations that are needed to operate the system. Source: www.faa.gov.

² Automatic Dependent Surveillance-Broadcast, more commonly referred to as ADS-B.

Instead, it has managed to persevere through both the development and implementation phases to enter the operational phase with the future looking extremely bright. More specifically, ADS-B has accomplished the following:³

- Initiated efficiencies to meet baseline cost and schedule expectations with project expenditures coming in lower than planned. Earned Value Management (EVM) shows the program meets baseline cost and schedule expectations, and project expenditures are lower than the current plan, also due to efficiencies. Furthermore, these results are shown consistently across EVM, the Simplified Program Information Reporting and Evaluation (SPIRE) tool⁴, the Federal IT Dashboard, and the Exhibit 300 Program Baseline.
- Awarded additional funding or “plus-ups” from U.S. Congress two years in a row and immunized from budget cuts that affected other NextGen programs. Congress was impressed with the solid performance of the program in its first two years – meeting milestones, developing traction and engaging industry – and felt it was critical to investigate future applications and continue to stimulate equiptage.⁵
- Achieved all benefits and service objectives at its various target sites, which resulted in increased safety (lower accident rates) in remote regions, fuel savings, capacity, distance savings and decreased search-and-rescue and flight-delay times, among other positive outcomes.
- Accelerated equiptage of ADS-B technology through incentivizing early adopters which would not have happened had the program not offered to offset airline costs around certification, and non-recurring costs around engineering and testing.
- Achieved 15 of 16 technical performance goals, including interval and latency requirements.

Key building blocks to success. The numerous industry accolades and considerable press attention make the ADS-B program worthy of additional attention.

With that goal in mind, this study examines the key “building blocks” of program success, including but not limited to the following:

- Strong leadership and management skills. These were essential to meet the aggressive schedule and other goals set by executives.
- A history of project/program management practices. These were in place long before the ADS-B contract was awarded in 2007, and the belief in the value of these practices grew stronger and spread more widely across the FAA as each milestone was achieved.
- Effective and transparent communication. Utilized both internally and externally with industry and other stakeholders, effective and transparent communication kept everyone highly engaged and motivated, and feeling part of the same winning team.
- Proven project/program management processes and metrics, such as EVM, rolling-wave planning, post-implementation review (PIR) and risk management were relied upon as needed.

The program sheds light on the discipline of project and program management that has yet to take root with equal fervor across other federal agencies.

³ “Surveillance and Broadcast Services (SBS) Phase 1 Post-Implementation Review (PIR) Report,” March 7, 2013.

⁴ The FAA uses an acquisition tracking database, known as the Simplified Program Information Reporting and Evaluation (SPIRE) tool to track and report the progress of all approved acquisitions toward schedule and cost performance targets. GAO-10-629, July 2010.

⁵ Equiptage refers to the process of equipping aircraft with “communications, surveillance, navigation, and other NextGen avionics equipment, such as ADS-B, either in the form of an equipment or software upgrade depending on the age and type of the aircraft.

- Deliberate and sometimes unorthodox strategies around the use of the business case. The program opted for a service-provider approach, and engagement of stakeholders led to outcomes that otherwise may not have been achieved.

The road to success has been paved with many challenges. The program struggles with external challenges, such as achieving harmonization of requirements across North America and the European Union; aircraft manufacturers who worry about impending budget cuts, and losing momentum for future projects as the program begins to “twilight,” were just a few of the challenges. The size and scope of ADS-B means coordination and integration of EVM across its many programs and projects has also been difficult.

Best Practices and Lessons Learned are equally plentiful. Notably, some of the challenges, once overcome, also managed to become best practices. These practices included setting program milestones on an aggressive schedule, integrating multiple performance measures and, in general, relying more on standardized processes. Interviewees also point to communication that encouraged openness and honesty and highly collaborative stakeholder relationships. As a result, problems were identified and solved in a more timely fashion. Other federal government agencies would benefit from instituting these practices and lessons learned in the spirit of growing the project/program management discipline and increasing adoption of organizational project management activities.

DETAILED FINDINGS

Measuring Success

Immune from Budget Cuts

An early indicator of program success was the granting of federal funds or “plus-ups” two years in a row. Because the program has consistently come in on time and within budget, it has never taken a budget cut (outside of universal sequestration). Congress granted additional funding as the program gained traction, hitting necessary targets and engaging and impressing the industry. This allowed the program to investigate future applications that would continue to stimulate equipage of aircraft to meet the 2020 mandate. The program was granted two plus-ups, one in 2008 for US\$9.4 million and another in 2009 for US\$6.8 million. “These were not huge sums,” recalls one interviewee, “but these plus-ups from Congress to investigate other opportunities to leverage this investment would [ultimately provide] additional benefits. ADS-B was a real building block for the future.”

Post-Implementation Review

What is more impressive is the consistent way in which the program met the majority of its baseline goals throughout Phase 1, which resulted in the conclusion that the “business case is still valid.” The 2013 PIR Report assessed several key areas, each of which is detailed below with specific metrics.

Business Results. According to this report, EVM shows the program meets baseline cost and schedule expectations, and project expenditures are lower than the current plan due to efficiencies. The SPIRE database illustrates this point, indicating a Cost Variance at Completion of US\$-16.1M (-0.95%) as of February 2014 (see Exhibit 1). Note: this variance

is associated with the two congressional plus-ups referenced above, which added scope outside of the original baseline. Otherwise, the program is estimating completion within the baseline cost.

Furthermore, these results are shown consistently across EVM, SPIRE, the Federal IT Dashboard and the Exhibit 300 Program Baseline. Although slightly behind with one delay in Service Volume Design Approvals, all variances are within 5% of the program baseline.⁶ The Federal IT Dashboard in particular reports the overall status of the ADS-B program rated as “green.” Exhibit 2 demonstrates that 11 of 16 key milestones were achieved on time, with September 14, 2014 representing the completion date for the final milestone.

First Year:	<input type="text" value="2007"/>	Last Year:	<input type="text" value="2014"/>	<input type="button" value="Set Years"/>
The hardcopy can display a matrix of 6 years or fewer (plus Prior, Beyond and Total).				
Baseline Cost at Completion (BCAC)	<input type="text" value="\$1695.1M"/>			
Estimated Cost at Completion (ECAC)	<input type="text" value="\$1711.2M"/>			
Cost Variance at Completion (BCAC-ECAC)	<input type="text" value="s-16.1M (-0.95%)"/>			

Exhibit 1

⁶ All measures of success detailed in this section can be found in “Surveillance and Broadcast Services (SBS) Phase 1 Post Implementation Review (PIR) Report,” March 7, 2013.

APB Milestone	Planned Date	Actual Date
Investment Decision (Segment 1 only)	Jun-06	Jun-06
Investment Decision (Segment 2 only)	Feb-07	Feb-07
Segment 1 Contract Award	Aug-07	Aug-07
Segment 1/2 Investment Decision	Aug-07	Aug-07
Segment 1 Preliminary Design Review (PDR) Completed	Nov-07	Nov-07
Segment 1 Critical Design Review (CDR) Completed	Feb-08	Feb-08
Segment 1 Key Site IOC of Broadcast Services	Aug-08	Aug-08
Segment 1 In-Service Decision (ISD) of Broadcast Services	Nov-08	Nov-08
Final Rule Published in Federal Register	Apr-10	Apr-10
Segment 1 Surveillance and Broadcast Services ISD for ADS-B	Sep-10	Sep-10
IOC ADS-B Capability on CARTS IIIIE at New York TRACON	Jun-11	Jul-11
IOC ADS-B Capability on STARS at Houston TRACON	Jun-11	Mar-12
IOC ERAM Release 3 with ADS-B Capability at Houston Center	Sep-11	Apr-12
IOC at Colorado WAM Key Site	Sep-12	Sep-12
Achievement of Critical Services ISAT at all 306 Service Volumes	Dec-13	Apr-14
Complete IOC Surface Advisory Services at all 35 ASDE-X Sites	Sep-14	Open

Exhibit 2

Another indicator of success, the SPIRE dashboard suggests that, as recently as February 2014,⁷ the program rates “green” in four of six critical measures during the current deployment phase (financial, schedule, resources and program manager) and “yellow” in the other two (technical and external interest). (See Exhibit 3.)

Program Assessment					
Program Phase: <input type="text" value="Deployment"/>					
February 2014 <input type="button" value="Return"/>					
Financial	Schedule	Technical	Resources	External Interest	Program Manager
G	G	Y	G	Y	G

Exhibit 3

The OMB (Office of Management and Budget) dashboard⁸ variances suggest similar results (note: the OMB cites yellow ratings when variances are plus or minus 10% to 20% of planned values, so both overruns and underruns are flagged). (See Exhibit 4).

⁷ FAA, SBS Measurement & Analysis, Performance Control Board, March 27, 2014.

⁸ Ibid

Number of Projects:		Cost Variance		Schedule Variance	
13					
Project Name	Project Life Cycle Costs	Cost Variance	Schedule Variance		
Subscription Fees	\$590.25 M				
Service Volumes ISAT	\$183.68 M				
Air Traffic Control (ATC) Surface Advisory Services	\$138.04 M				
Ground Based Interval Management (GIM)	\$100.35 M				
Automation Upgrades	\$91.82 M				
Terminal ATC Separation Services	\$23.03 M				
In Trail Procedures	\$13.66 M				
Colorado Wide Area Multilateration (WAM Phase 2)	\$9.44 M				
Avionics Upgrades	\$8.72 M				
Traffic Situational Awareness with Alerts (TSAA)	\$6.26 M				
EN Route ATC Separation Services	\$5.94 M				
3 Nautical Mile Separation	\$3.49 M				
Flight Deck Based Internal Management	\$3.36 M				

Exhibit 4

Performance. In general, the system meets availability, latency and update interval technical performance measures (or TPMs) for all services. There are occasional (<1%) TPMs that do not meet requirements for a given month, but for >99% of the TPMs, the system meets or exceeds requirements. Insiders insist that context is important: it is natural, often expected for systems to go through continuous improvement once fielded, as operators find innovative ways to use the system and issues continue to be debugged.

Benefits and Service Objectives. Benefits and services represent additional areas of success for the program. According to the 2013 PIR Report:

- Gulf of Mexico (or GoMex) has seen efficiency improvements on the following counts:
 - Fuel savings (98 lbs. of fuel saved per equipped Instrument Flight Rules⁹ on direct routes)
 - Increased capacity (a four-fold increase in low-altitude airspace usage)
 - Distance savings (a weighted average of 5.62 nautical miles), predictability and effectiveness (on-time crew changes)
 - Safety Instrument Flight Rules operations allow helicopter pilots to avoid “scud running” during bad weather; implementation of real-time weather systems allows for more informed decision-making and fewer flights that have to be aborted due to weather)
- Alaska has shown an increase in safety measures, namely:
 - Lower accident rate (for 2005-2009, the accident rate per million operations was 30.1% lower for ADS-B-equipped aircraft than non-equipped aircraft)
 - Decreased search-and-rescue time (ADS-B data allowed for a flight to be located quickly and to save the life of a pilot)
- Colorado Wide Area Multilateration¹⁰ (WAM) has reduced delays and spacing:
 - Fewer delays (average airborne delay during all weather conditions shows a trend toward fewer delays)
 - Reduced spacing between flights (average spacing between arrivals and departures was reduced at two airports for three one-year periods in a row)

Strategic Impact and Effectiveness. Although the program did not achieve the expected equipage rates, the PIR report stated that “incentives to early adopters were effective in accelerating equipage with rule-compliant avionics.” The program lead explains the failure to meet expectations around equipage in this way:

“When the program baseline was set in 2007, the FAA was not aware that the ADS-B avionics standards would need to be modified. Through international coordination, the FAA determined that the standards needed to be changed to provide better quality data. These changes were completed in time to support the rulemaking, but it then took about two years for manufacturers to start developing avionics that met these new standards.” In other words, “this was a complex endeavor that was facing many challenges and, no matter how much estimating on cost and schedule (risk adjusted) there will always be some ‘unknown unknowns’ that can wrinkle the plans.” “Fortunately,” the program lead continues, “the strong application of program management techniques like risk management, communication management, stakeholder management, requirements management and so forth, afforded this program with the ability to succeed in spite of the complexity.”

⁹ A rule sets out new or revised requirements and their effective date. It also may remove requirements.

¹⁰ Wide Area Multilateration is another NextGen surveillance system being deployed by the Program Office using the same management techniques as ADS-B.

NextGen: Snapshots of Success

In addition, the FAA “NextGen” website illustrates performance in a series of “snapshots” that further attest to the success of that program.¹¹ Specific to ADS-B, however, is a story highlighting “new paths” created over the Gulf of Mexico. It traces the path of a JetBlue flight that would have had to reroute due to bad weather, costing both time and money, had it not been equipped with ADS-B technology. It reads:

As passengers dozed on a JetBlue redeye from Los Angeles to Fort Lauderdale, a 200-mile line of thunderstorms loomed along the Florida coast. The flight would normally require a long reroute to the north and around the severe weather, delaying the expected pre-dawn landing. But with NextGen technology on board, all that was needed was a slight diversion to the south and the passengers landed on time.

Re-routing around the thunderstorms would have added about 15 minutes to the trip and caused the airliner to burn an extra 60 gallons of jet fuel. This would have pumped an additional 1,200 pounds of exhaust emissions into the atmosphere.

Project/Program Management and ADS-B in Hindsight

Groundwork for Success Had Been Laid Pre-Award

There is agreement among those involved that the FAA, and the Surveillance and Broadcast Services (SBS) Program Office in particular, had been building a solid project/program management foundation even prior to the ADS-B contract being awarded. Ultimately, this facilitated a smooth transition from research through implementation and provided the underpinning for a successful program. The establishment of clear objectives, schedules and milestones early on was supported by a pace and tone that drove individuals to succeed.

The Program Office also incorporated industry input from the beginning. Prior to awarding the contract for ADS-B services, the SBS Program Office made an effort to explain its objectives to various bidders on what were coined “industry days.” On these days, bidders were given an opportunity to meet one-on-one with representatives of the program and give feedback on building and performance specifications. The result was an improvement in the overall baseline of the program. Subsequently, the Program Office introduced the Request for Proposal (RFP) process in two separate phases as opposed to the standard one. The first stage solicited technical input, which was then critiqued by the FAA, allowing vendors to address any shortcomings and resubmit during the second stage. “That allowed us,” explains one interviewee whose firm was ultimately awarded a contract, “to take their feedback and submit a better proposal... which made for simple, streamlined negotiations [in the end]. We were able to hit the ground running.” The two-phase RFP process also proved very conducive to meeting schedules.

Consistent, Bold Leadership was Essential

Another area in which agreement exists is the pivotal role leadership played in the success of this program, especially at the development and early implementation stages. For starters, the lead program manager on ADS-B provided his internal workforce, as well as external partners and stakeholders, with a clear roadmap that would not accept anything short of success. The lead program manager had established a reputation for

“As much as there was sound program management going on [at the FAA], leadership was still the main factor leading to the success of this program.”

¹¹ <http://www.faa.gov/nextgen/snapshots>

taking programs from concept to deployment successfully, and ADS-B was no exception. His leadership effectively managed expectations and identified key documents and control mechanisms that were necessary “to take the program from beginning to end, so we stayed focused on the work we needed to do,” says one interviewee.

Success Spreads Easily

Over the years, the success of the ADS-B program, both individual components as well as overall culture, has found its way into other programs and taken on wider breadth within programs. This is due in part to the typical movement of key individuals around the FAA who “lived it and now own it,” and ultimately grew the culture, says one interviewee. ADS-B encouraged everyone to be intentional in their decision-making. It has become much more common to challenge oneself to doing things differently than in the past, to do everything with regard to the baseline or to consider the service-provider approach or, more generally, to find cheaper alternatives. These represent just a few examples of the change in mindset. One interviewee explains it more eloquently: “It’s about being intentional in all your decisions...you didn’t see that back in the day, and you don’t see it across all programs. We are branching this culture, expanding it – it’s taking root, but there is still room to grow.”

Standardization represents mature project management practices.

The strong reliance on project/program management principles, activities and tool sets allowed this culture to spread easily throughout the administration. Team members concur that project/program management was valued, if not always perfectly understood (applying EVM, for example), from day one, as external partners worked very closely with the lead

program manager. As one interviewee explains, it was organic: “We weren’t told to do it and check a box. We knew it was integral to the daily execution of the program.” They describe an environment, in vivid contrast to other federal agencies and offices, where project/program management success may be dependent on the experience of one individual, usually a program manager brought in from elsewhere to manage a single program. More often than not, that individual “burns himself out, and if he goes away, the program fails. We have a succession of things, a structure, that ensures a continuity, that we can repeat this.”

“We not only embrace it, but we live it... we come from varying backgrounds – military, industry or vice versa – others are lifelong federal employees, and yet the skill sets and shared knowledge have been crucial. It helps ensure that we cross-train, cross-pollinate, and not revisit mistakes we made last time,” he continues.

Leadership Firmly Rooted in Mature Project/Program Management Principles

According to one interviewee, the Program Office applied aggressive timelines and strict management discipline to this endeavor from the beginning, to the awe of other programs in the portfolio. The Program Office also established an objective statement for the program, instituted a governance process, and identified the internal and external mechanisms critical to success early on. The project/program management plan created was based on core project/program management principles. Explains one interviewee, “A lot of those esoteric program management products that they say you’re supposed to do, well, we actually did from day one.” Following project/program management processes and structure while tailoring it to the specific needs

“ADS-B is a shining example of successful program management. I am proud to say I have been part of the team since day one.”

of the program, these strategies worked to help everyone involved stay focused while being pulled in many different directions. As a result, an already mature project/program management culture advanced even further.

Skilled Management Style

The Lead Program Manager was able to successfully manage the many disparate areas of risk that were encountered, whether they were technical, programmatic or political risks, while allowing his workforce to not only stay focused but also to remain highly motivated throughout. He expected a lot from his team and in turn, they expected a lot of themselves. “[The lead program manager] is a straight shooter,” says one interviewee. “If he says he is going to do something, he does it with complete transparency.” An additional outcome: the people that work for him felt like he always had their backs – or “like they have top cover” which, in turn, allowed them to take the considered risks that led to success. “Everyone was very results-oriented and driven,” this interviewee continues. Many point to this emphasis on complete transparency as a factor that helped motivate the workforce and keep level of mutual respect high.

Surmountable Challenges

Although deemed an overall success to-date, ADS-B was not without its challenges. To keep these in perspective, comments one interviewee, “We were building something that’s never been built before.” Its size (portfolio and stakeholders involved), timeline and complexity alone were unprecedented and required additional work and innovative problem solving. Some hurdles were larger than others, but none of these hurdles were insurmountable. The following section highlights both the hurdle and the solution, where applicable.

- **Coordination and integration was difficult, as was applying EVM, across multiple programs, some without any reporting requirements, let alone experience with EVM.** Experienced managers set up systems using EVM techniques and scheduling, and demanded regular reporting. “The cultural change from beginning to now was amazing – they really embraced it and adopted it,” says one interviewee.
- **While attempting to build the business case, one airline in particular felt the main advantage to ADS-B was limited to flying over water,** whereas “traditional coverage still works fine over Des Moines,” thus producing limited benefits to his airline. “We need to make more things happen,” says one interviewee, speaking specifically about multiplying the number of antennas deployed for increased surveillance and ultimately better service over land, as well as water.
- **Bringing Europe up to speed.** The necessary harmonization between the domestic FAA requirement and the European version has not been figured out. While the United States has one governing air traffic control body in the FAA, the European Union has to coordinate among 20 countries and that takes more time. Fortunately, the solution is in the form of a software update which, once agreed upon, will be relatively simple to implement. The FAA created a committee charged with moving this issue forward.
- **External stakeholders express concern as the program enters “twilight” mode.** Having achieved most of its implementation and many of its operational goals, a program will naturally begin to ramp down and identify resource areas where cuts can be made.

“The big picture hurdles are behind us. Production mode, rolling it out nationwide, that is going well...in some cases we are just waiting for the automation platforms to catch up.”

- **The twilight phase introduces additional concerns for external stakeholders.** The business case was designed to be a foundation on which to develop future applications to improve safety and efficiency. A large return on investment would not materialize until later phases. The second wave of investments is set to hit the FAA in 2015 and stakeholders worry that momentum is dwindling. One interviewee expresses concern: “There is now an opportunity to make much smaller investments, but get much larger returns since we’ve laid that infrastructure. We need to continue that momentum and ensure people finish the story in terms of getting more ADS-B applications into the NAS.” Another interviewee attempts to explain: “It’s not lost, I just think it’s competing with other priorities.”
- **Air traffic controllers expressed initial dismay at the decision to take the service- provider approach,** since they interpreted the thinning and decommissioning of some of the legacy radar systems to mean job loss. Other internal stakeholders worried the approach was less cost effective than owning it inside. While support for the acquisition strategy was eventually won, both internally through discussions with the labor unions and externally with airlines, pilots and aircraft manufacturers, it was not an easy task since it was not business as usual for the FAA. In the end, the controllers and others understood that ADS-B was not taking away jobs, but rather adding jobs through an additional layer of surveillance.
- **Initial support from the airlines could be described as “adequate” at best.** Like other stakeholders, the airlines came to the table with their own agendas. Although they believed in the future of the program, they were not necessarily excited about “publishing a rule that would force them to spend money and put things on their aircraft on a timeline we desired, not theirs...” explains one interviewee. The Program Office worked diligently to gain the support of this community by asking for its input; the rule was eventually approved and published within one month of its due date.
- **Benefits can be slow to materialize.** Although ADS-B gives controllers and pilots extended coverage and increased surveillance, benefits have been slower to realize than had been hoped for, due to delays in aircraft equipage. On the manufacturing side, the decision to extend the rollout, compounded by an economic recession, meant that resources had to be spent before knowing the depth of consumer demand. Further complicating execution, explains one interviewee, is that “the rollout is being done in the context of Europe and the rest of the world. Most manufacturers don’t do anything until both the United States and Europe have decided what they are doing. Although the United States had locked in all requirements by 2010, Europe... was still debating, and this resulted in a delay in engineering” that hampered sales.
- **Too many initiatives at one time may challenge implementation.** Due to rapidly changing technology, new initiatives are always being introduced. “We rush to get something done. We miss things,” says one interviewee. “We end up delaying programs... at times it would be better to identify four or five and do them correctly instead of having 15 tentacles going out there.” The Program Office, they say, exerts effective management of its initiatives and works hard to achieve collaboration among all of its programs.

- **Overall there appears to be a decline in general communication with stakeholders.** As a program begins to twilight, it naturally loses visibility, and communication with stakeholders correlates with that. “During the key phase, it was very active, there were frequent articles in the trade journals... execution mode is less interesting to write about,” admits one interviewee. Furthermore, there is no longer a strong, consistent message from the FAA to the broader community, especially that of “second-tier” stakeholders such as operators, suppliers and installers. Their hope is the Program Office will “re-up” communication as they approach 2020, re-engage stakeholders and keep interest levels where they need to be. After all, the ADS-B equipment will have to be put on more than 100,000 airplanes, which will take time and effort and will require input and cooperation from manufacturers. “We are trying to go out there as [avionics] manufacturers and say, ‘Hey we’ve built the equipment, it’s available, you have six years to buy it.’” Notably, since these interviews were conducted, the FAA has organized a “Call to Action” for October 2014 to engage these stakeholders in an effort to equip.
- **Constant changes in management personnel, while not unusual – promotions, retirements, etc. – create a revolving door.** This means newcomers have to be brought up to speed with the way things were done previously, processes that worked in the past, and general expectations, expending valuable time and energy. “It’s nothing intentional,” says one interviewee, “It’s just a fact of life.” In an ideal world you create a process that results in a learning organization that captures lessons learned.

LESSONS LEARNED/BEST PRACTICES

Given their overall positive experiences building the ADS-B program, study participants were eager to share feedback on best practices, as well as lessons learned. Participants provided feedback on project and program activities, principles and processes, including performance measures, risk identification, stakeholder engagement and other practices.

- **Program milestones and an aggressive schedule.** Interviewees concur that, as “wild” and “crazy” as the schedule was, it drove people to succeed. It could have backfired, overwhelmed the team, but fortunately it did the opposite. It enabled people to take pride in their work and not settle for less than accomplishing what they set out to do. A final rule was published less than a month after it was promised (May vs. April 2010), a time-consuming process that normally takes much longer to complete.¹² According to one interviewee, “It was absolutely crazy. No one imagined we would [publish that quickly]. To miss by less than a month was pretty impressive.”
- **Multiple, coordinated performance measures.** Inherent in the milestones were objective measures of performance that encompassed finance, scheduling and other goals. As one interviewee says, “Prior to this program we had not had as much religion around objective measures of performance... we’ve grown to really believe in measuring performance.”
- **Greater reliance on standardization of processes.** As internal staff experienced first-hand, the value of certain processes (EVM, in particular, but many others as well), an assumption that processes could and should be relied upon, became more commonplace. Again, it was about finding the right balance between process and flexibility. “We were never process-encumbered,” points out one interviewee, “but now people are asking, as they do things regularly or repetitively in other projects and programs, ‘What is the process for doing this?’ It’s been an amazing transformation.”
- **Have a Plan B.** Setting milestones has proven essential to success. But trying to meet those milestones required some degree of flexibility and foresight. Government, for example, with its infinite number of rules and requirements concerning zoning, permits, environmental concerns and so on, often requires that there be a backup plan to stay true to cost and schedule. A new mindset developed among those involved, both in government and private industry, of, “What’s Plan B? What’s the workaround when you come to a barrier?”
- **Risk identification.** Described by one interviewee as a “brutal, introspective and transparent” approach, the Program Office encouraged the admittance of risk and problems early on. As a result, it was able to efficiently allocate and manage those resources and to pre-empt and solve problems. “I’ve not come across that elsewhere,” he continues. “It should be brought, not only elsewhere in the FAA, but also in the federal government. I’m glad they did it.”
- **Strategic engagement of all stakeholders.** As a result of the decision by the Program Office to engage both internal and external stakeholders and keep them engaged, the program has managed to avoid many of the usual pitfalls, such as lack of continuity of congressional or FAA funding or

“You can’t control what you don’t measure.”

¹² A final rule required all aircraft flying in a specified airspace would have to have the equipment for ADS-B “out” by 2020.

“Any time you want to put anything into the NAS – not that we agree all the time - but the more input you get from the controllers, the better the chances of success at implementation. Controllers by nature are stubborn and highly motivated, it’s got to be done correctly and work correctly before they will even entertain change.”

resistance (internal or external), that creates delays. “The lack of engagement has created problems elsewhere while ADS-B hasn’t had those problems,” says one interviewee. By encouraging frank, open and regular dialogue among the various parties, ADS-B was able to circumvent some problems and fix others in a timely, cost-efficient manner.

■ **Collaboration was vital.** The hallmark of stakeholder engagement was collaboration. The Program Office encouraged parties to work and problem-solve together. “There were no closed-door policies,” says one interviewee. “Management was very open to change. They listened to the operational side, to the controllers, and were willing to change as needed.”

■ **Hiring like-minded contractors.** An emphasis on transparency helped to ensure a productive working relationship with ITT Exelis, the manufacturer of the ADS-B ground infrastructure and service provider. It did not hurt that the contractors also believed in the same overriding principle of transparency, not just transparency, but also early identification of risk and joint problem-solving. “It was interesting to see the leadership of the program managers complemented by the same type of behavior on the contractor side,” recalls one interviewee. “It was a fantastic fit.”

In addition to these top-of-mind recommendations that resulted in program success, interviewees placed a lot of emphasis on the following factors:

- **Executive sponsorship was critical in the case of ADS-B.** Not only was executive level support forthcoming, but the ADS-B program was prioritized by top-level executives who involved themselves heavily in the planning stages, helping to set aggressive goals and timelines. “At the time, the FAA Administrator really wanted this, she drew aggressive lines in the sand, ‘These are dates I want it to meet,’ and so forth,” recalls one interviewee. “That gave us the extra impetus” to perform well.”
- **Regulatory support** was identified as necessary and the regulatory side of the FAA was brought in early. The Program Office understood the value of including the avionics side of the FAA in the building of ADS-B; its inclusion, in turn, helped bolster executive-level support. “I’m going to have the people who influence the avionics right there with me, on board as part of the process,” explains one interviewee, denoting the strategic mindset that encouraged teamwork and collaboration.
- **Intentional communication**, meaning all communication that flowed from the Program Office was strategic in nature, designed to convey clear and consistent direction and maintain a high level of morale. One interviewee describes the communication plan put out by the Program Office as “impressive.” “The necessary processes [were built up], a communications lead was assigned to ensure consistency (communicating status, benefits, capabilities, etc.) depending on what inquiry needed a response to and where. The data flow was, and is, controlled to ensure the right people are getting a consistent message.”

CONCLUSION: THE FUTURE OF ADS-B

A tremendous amount has been accomplished since the program launched in 2006, with tangible gains in increased, modernized and improved surveillance and, subsequently, air safety. Systems such as ADS-B are helping to guide and track aircraft more precisely and identifying more direct routes. The shift to smarter technologies is making air travel safer, more convenient, and more environmentally friendly. "That is a pretty big accomplishment. I look forward to [the future]," says one interviewee. Beyond ADS-B, the long-range potential of its parent program, NextGen, has yet to be realized and, according to both public and private sector experts, that potential is limitless.

But there is more work left to do and milestones to achieve in order to fulfill the mandate to equip more American aircraft with the requisite avionics by 2020. Currently, there are over 3,800 aircraft with rule-driven ADS-B avionics, leaving approximately 7,500 air transport aircraft, 13,500 Department of Defense aircraft, and 200,000 general aviation/air taxi aircraft remaining to be equipped.¹³

From a project management perspective, it does not appear likely that program management behavior will undergo major changes, either around ADS-B or future programs or projects. The practices established by the Program Office at the outset, ones that would enable the program to meet lofty goals, remain entrenched: strong leadership and management skills, effective, transparent communication (internal and external), use of proven processes and performance measures, and a strategic, collaborative relationship with stakeholders. As the ADS-B program gained traction early on, and then proceeded to meet every milestone on time and within budget, respect for project/program management escalated, and a culture was transformed. Looking back, says one interviewee, the use of project/program management proved very effective. "We accomplished a lot. We changed the way air traffic is done in the NAS."

¹³ Equipage data provided by the ATO, September 2014.

ABOUT THE STUDY

The goal of this study is to highlight the management (principles, practices and activities) of the Automatic Dependent Surveillance-Broadcast (ADS-B) program to better understand and learn from its success in order to share insights with others in the FAA, as well as those in other agencies. The study examines ADS-B from the perspective of project/program management and pays specific attention to areas of success – how it is defined and measured, as well as leadership, governance, processes, communication and other formal aspects of project and program management. The perspectives of those deemed essential to the success of this program were sought and incorporated: leadership (program manager/program office), contractors (airline manufacturers), stakeholders (airlines, airline industry experts, lobbyists) and workforce (labor union representatives).

A note to the reader: Agencies within the federal government often use “program” and “project” interchangeably. Where possible both terms are used to avoid confusion.

Methodology

The Project Management Institute (PMI®) hired M/A/R/C® Research Inc. to design and conduct a series of in-depth telephone interviews with individuals deemed responsible and relevant to project/program management success within the Federal Aviation Administration (FAA). ADS-B illustrated many successful components of project/program management over the course of many years and, as such, was selected as the subject of this study by a joint effort between PMI and the qualitative research team at M/A/R/C®.

- A total of seven (7) in-depth telephone interviews were conducted between March 3 and 17, 2014, and incorporated the following roles:
 - Lead Program Manager (ADS-B), Director of Surveillance & Broadcast Services, Air Traffic Organization, Federal Aviation Administration
 - Lead Business Case Analyst (ADS-B), Senior Director of Civil Programs, MCR, LLC
 - Lead Implementation Manager (ADS-B), Surveillance & Broadcast Services Group Manager, Air Traffic Organization, Federal Aviation Administration
 - National Operations Manager (ADS-B), Director of Strategic Airspace Programs, JetBlue
 - Program Manager (ADS-B), Program Director, Exelis, Inc.
 - Vice President, Operations, General Aviation Manufacturers Association (GAMA)
 - Former National Air Traffic Controllers Association (NATCA) representative, Senior Air Traffic System Specialist, Regulus Group, LLC

PMI recognizes all those who agreed to be interviewed for this study but, having promised anonymity, those names shall not be revealed.

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