A Future-Ready Framework For NAS Modernization

Blue Skies Initiative
Blue Skies Initiative Overview

Over the last few years, a variety of new and exciting operations have transformed the US National Aerospace System (NAS), seemingly “out of the blue.” ATCA’s Blue Skies Initiative (BSI) was born out of an emerging need to address the many fundamental questions of how to meet the challenges of this “new NAS Operational Environment.” Who pays? Who governs? Who maintains? With technology no longer a barrier to a future aviation vision, the challenges the larger air traffic management (ATM) community faces are identifying the business structure, developing the standards, exploring capabilities, and fostering a workforce with a culture of innovation that will best support this New NAS. Through conversations and debates, BSI will chart a dynamic and sustainable future for ATM.

What is ATCA’s Blue Skies Initiative?

ATCA’s Blue Skies Initiative (BSI) is an industry-government collaborative effort that will deliver a future-ready framework for modernizing the US NAS that:

• defines a short-, mid-, and long-term vision for aviation, while ensuring optimization of resources for all air traffic management (ATM) stakeholders and users;
• is economically sustainable and scalable;
• educates the aviation community, flying public, and new users; and
• provides a safe, secure framework for emerging concepts, operations and technologies for the short, medium and long-term.

Future NAS Vision

A US National Airspace System that promotes the continuous development of standards, capabilities, and culture to enable safe, secure, and efficient access to airspace for current, emerging, and future users.

Framing the Challenge

The NAS is facing an array of challenges to the aviation ecosystem, including:

• exponential growth of new and diverse aerospace users and business models;
• Innovative new technologies vs. traditional aviation;
• aging infrastructure;
• an increased focus on sustainability and reducing aviation’s carbon footprint;
• availability of critical assets;
• new and chronic NAS performance challenges; and
• the need for updated certification and acquisition processes to accommodate the rapid pace of technology.

These challenges are putting pressure on traditional NAS planning and infrastructure to maintain and evolve NAS safety and performance to support the modern aviation ecosystem.

To enable necessary evolution and growth, the NAS must become both more resilient and quicker to adapt to emerging concepts of operations and new entrants and their missions. We must re-imagine the NAS to create a model that ensures operational safety and security while providing access and services to the new NAS user population.
Charting the Future of Aviation

A number of initiatives underway are exploring how best to evolve the NAS to meet future needs in the 2035-2045 timeframe. Seamless integration of diverse users and operations hinges on the underlying assumptions that the business process and service delivery models will adapt to meet changing demand, while ensuring the safety and security of all.

## Current NAS vs Future NAS

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<thead>
<tr>
<th>Current NAS</th>
<th>Future NAS</th>
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<tbody>
<tr>
<td>• Operations optimized around civil and military aviation, and with non-traditional players (high altitude balloons, UAS, commercial space) managed by exception.</td>
<td>• Operations enable safe and efficient access to diverse users, with predominating automated transition between flight levels.</td>
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<td>• Airspace structure is relatively static: routes, waypoints, and procedures are well established for participating aircraft.</td>
<td>• Airspace management replaces air traffic management, with operational approvals based on performance requirements and risk levels.</td>
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<td>• Business model relies on tax structure for point-to-point and general/business aviation operations with focus on reducing risk to conduct safe and reliable operations.</td>
<td>• Business model reflects funding by all users, with focus on managing risk as part of delivering services and capabilities that are resilient and scalable to meet increases in capacity.</td>
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<td>• Communications, Navigation, and Surveillance (CNS) and Automation frameworks support existing operations.</td>
<td>• Capability framework grows to include Timing and Weather in order to meet user requirements and expanded flight environment.</td>
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<td>• Alternative analysis and investment decisions are constrained and driven by the acquisition management system processes.</td>
<td>• Evolution of the acquisition management system to support a flexible approach from exploratory to full-scale research that rewards innovation, and incentivizes implementation and service availability for wide-scale modernization.</td>
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### FUTURE INFRASTRUCTURE TO SUPPORT THE DYNAMIC NAS

In order to improve overall operational efficiency for users and air navigation service providers, current ATM infrastructure must be upgraded to take advantage of technology advancements. State-of-the-art capabilities such as, but not limited to, digitization, digital twins, data analytics, 5G, WIFI, internet of things, machine learning, and precision tracking will improve aviation safety and enhance predictability, efficiency, and sustainability. To encourage sustainable energy, emerging trends in electrification will require power and charging stations, requiring renovations at airports of all sizes. Infrastructure improvements related to airport modernization, ubiquitous connectivity, and ATM technologies will ensure US competitiveness and benefit the global economy.
A unique dichotomy exists between capabilities and services that are a part of today's NAS and the major advances in capabilities in the future NAS vision. There is a clear disconnect between current operations, capabilities, business processes, and workforce culture and the need to evolve and adapt. Significant, high-impact, unplanned events, such as COVID-19, have further stressed the NAS, as reduced traffic operations impact the system's business and financial models.

**Blue Skies – A Vision of the Future NAS**

BSI's future NAS requires more than just a new capabilities sets, business model, or expanded workforce. The future NAS must adapt dynamically in a manner that ensures safety and security while balancing efficiency for current and emerging users and the risks introduced with an increased level of airspace accessibility. The ATM community must focus its activities as much on changing the approach to delivering large-scale system change, which necessitates shifts in culture and process, as it does on the development of technologies and any concept of operations itself. This can’t happen in a bubble, so stakeholder engagement and collaboration is key.

**Here’s how we are engaging industry and implementing our plan.**

**Engage Stakeholders**

We continually develop focus areas across new and emerging users while including legacy users in all conversations.

**Concept Exploration**

Use rapid feedback mechanisms to inform new public / private ways of working

**Establish Framework**

The BSI Strategic House provides the scope and discreet focus areas

**Establish Framework**

The roadmap presents near, mid-, and long-term focus areas and key mechanisms to enable continual adaptation

BSI's approach is to develop a framework and vision that will be continually informed through engaging stakeholders on critical focus areas, investigating emerging concepts, and developing a plan that identifies mechanisms that guide an evolutionary process, rather than a portfolio of systems and services.
Establish Framework

BSI has established a “Strategic House” model to provide a framework for our mission. The Strategic House is supported by five key pillars that represent the vision, key focus areas, and specific strategic actions. Enablers represent the existing, emerging, and future operational stakeholders and NAS end-users that will participate in and benefit from the future aviation ecosystem. The strategic pillars exist to structure on-going discussion with the enablers.

### Strategic pillars

- **Vision**
  - A U.S. National Airspace System that promotes the continuous development of standards, capabilities, and culture to enable safe, secure, and efficient access to airspace for current, emerging, and future users.

#### Strategic actions

<table>
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<th>Enablers</th>
<th>Strategic actions</th>
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<tr>
<td>FAA (ATO and Regulator)</td>
<td>Operations: Create a blended NAS description to deliver future objectives</td>
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<tr>
<td>NASA</td>
<td>Operations: Identify critical CNS-ATM, Timing and Weather capabilities to support the traditional and Blended/Future NAS</td>
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<tr>
<td>Traditional Aviation Users (Airlines, DoD, Airports, Pilots, GA)</td>
<td>Technical: Conduct functional analysis of core NAS functions to meet evolving performance objectives</td>
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<td>New Entrants (UTM, UAM, High Altitude ATM, Commercial Space, Supersonic/Hypersonic, States/Municipalities, First Responders)</td>
<td>Business Processes: Establish a framework that promotes innovation and equity while enabling scalability, flexibility, and sustainability</td>
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<tr>
<td>Industry Groups (ATCA, AUVSI, RTCA, AOPA, NATCA, PASS, ALPA, IATA, NBAA, etc.)</td>
<td>Workforce: Enable a culture of continuous learning to expand needed skillsets and the role of human-automation teaming</td>
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<td>Academia and R&amp;D</td>
<td>Dynamic NAS: Enable and continuously monitor the safety, security, and resiliency of the changing Blended/Future NAS</td>
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<td>Policy / Business Case Developers</td>
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**Boost the basics**

- 1. Create a blended NAS description to deliver future objectives
- 2. Identify critical CNS-ATM, Timing and Weather capabilities to support the traditional and Blended/Future NAS
- 3. Conduct functional analysis of core NAS functions to meet evolving performance objectives
- 4. Create a matrix of existing FAA / DoD / DHS / NASA programs and capabilities

**Shape the future**

- 5. Create a ConOps for the Blended/Future NAS
- 6. Establish business models that promote equity and continuous innovation
Engagement Matters

Engaging stakeholders in the development of a future-ready framework is core to the BSI approach. Achieving the future NAS will require inputs from the full spectrum of NAS users (both new and existing), regulators, industry groups, and policy developers. BSI is a representative example of how a much broader cross-section of the aviation community needs to engage to achieve a truly holistic solution that will meet the needs of both our broad aviation community and the communities that depend on our NAS every single day.
BSI questions and polling are already helping to identify key trends that will drive innovation and investments in the ATC/ATM/Development/Operational communities, but the success of the endeavor will depend on ensuring that innovations and investments align with priorities to maximize and speed return on investments and enable industry to overcome future impacts to the aviation ecosystem, such as COVID-19.

Using one example of the strength of ubiquitous communications, we can quickly see how other, emerging capabilities will impact future operations in the NAS.

**How long will it be before we experience ubiquitous communication in the United States?**

- **29%** 5-7 Years
- **14%** 10-15 Years
- **20-30 Years** 29%

**“How will COVID-19 impact operations?”**

Using one example of the strength of ubiquitous communications, we can quickly see how other, emerging capabilities will impact future operations in the NAS.
Concept Evolution and Exploration

What will it take to achieve our Future NAS vision? Simply stated: collaboration and imagination. The essential near-term steps include identifying shortfalls and gaps and establishing a dynamic framework for evaluating new concepts and potential solutions. The tried-and-true systems engineering mechanisms for exploratory, advanced, full-scale development remain both useful and necessary at this critical juncture to ensure that the future NAS is built one solid brick at a time, taking full advantage of technology improvements to achieve a result that remains state-of-the-art throughout its operational life. The future NAS must be built to grow and improve over time, while reducing the risk of big and costly failures. The BSI Framework represents a rapid-development mechanism of concept exploration, implementation of drivers, and finally technology demonstrations to test how well a given concept supports near, mid-, and long-term NAS capabilities.

The BSI Framework

BSI’s approach to developing a future-ready plan, involves continually reviewing fundamental questions that support near, mid-, and long-term NAS timeframes. Feedback from enablers will be critical as BSI develops a future-ready NAS. The approach to developing the NAS planning document begins with the strategic action, outlined in the framework of the Strategic House. The long-term outcome is a plan that provides a series of critical steps to achieving harmonization and global interoperability, while ensuring continual innovation. The fundamental goal in the NAS Plan is to ensure that resiliency and adaptability become complimentary and supporting concepts in the aviation ecosystem.

The fundamental shift to the future NAS lies in no longer viewing resiliency and adaptability as competing, but rather two concepts that bolster one another within an evolutionary system to promote robust ATM community engagement.

Continually engaging enablers via industry challenges, gathering feedback, and initiating technology demonstrations will channel innovation and focus investments on key areas.
ATCA’s Blue Skies Initiative Leadership

**Executive Committee**
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Peter F. Dumont, ATCA President and CEO
Charles Keegan, Aviation Management Associates, Inc.
Dr. Parimal “PK” Kopardekar, NASA
Hon. Donna McLean, Donna McLean Associates, LLC
Jim Eck, L3Harris Technologies
Terry McVenes, RTCA

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Brett Easler, ATCSI, LLC
Nicholas Flom, University of North Dakota, Northern Plains UAS Test Site
Bob Lee, LS Technologies
Mitch Narins, CISSP, Strategic Synergies, LLC
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Richard Packard, CASS LLC
Naveen Rao, Atlas Air Worldwide
Christopher Rogers, Raytheon Technologies
Jacob Ruytenbeek, AirMap
Dennis Sawyer, The MITRE Corp.
Ariel Scheirer, The Scheirer Group
Al Secen, RTCA
Fred Wieland, Mosaic ATM

Abigail Glenn-Chase, ATCA Staff Liaison
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