National Airspace System Safety Review Team

Discussion and Recommendations
To Address Risk in the National Airspace System

Submitted to the U.S. Federal Aviation Administration
November 2023

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Letter from the NAS Safety Review Team

November 15, 2023

The Honorable Michael G. Whitaker
FAA Administrator
Federal Aviation Administration
800 Independence Avenue, SW
Washington, DC 20591

Dear Administrator Whitaker,

The National Airspace System (NAS) Safety Review Team (SRT)[1] is honored to present you with our review of the Air Traffic Organization's (ATO) internal structure, culture, processes, systems, and integration of safety efforts with respect to aviation safety, the actions needed to reinforce FAA's current approach of collaborative, data-driven safety culture, and the opportunities to strengthen the connection between ATO and the FAA Aviation Safety (AVS) organization to monitor and address aviation safety risks.

We would like to first acknowledge the valuable assistance and cooperation we received from a variety of stakeholders.[2] The FAA liaisons to the SRT assisted our investigation and analysis of the serious events and incidents that occurred in early 2023,[3] coordinated briefings, responded to our inquiries, and managed logistics. Their expertise and support proved essential. We also visited several facilities and met with devoted, passionate air traffic controllers, technicians, facility managers, and other aviation safety professionals. They are the linchpins of this safest era in aviation history and contribute daily to maintaining and improving aviation safety and efficiency. To ensure an accurate assessment of challenges, we also spoke with representatives of labor groups, passenger and cargo carriers, the business and general aviation community, and industry groups. Their insights, perspectives, and contributions were extremely valuable and facilitated a comprehensive analysis.

Through this intensive process, the SRT identified several significant challenges that inject risk into the NAS, and we are making recommendations to address the areas of process integrity; staffing; and facilities, equipment, and technology. Recommendations are also made regarding inadequate, inconsistent funding because of its criticality to affecting meaningful change in the other areas.

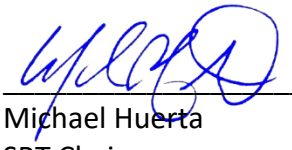
Stakeholders in the FAA and across the aviation industry are dedicated to the shared responsibility of maintaining the safety of the NAS. To continue to do so depends on multiple factors and layers of safety mitgiations. The confluence of the issues we identified results in an erosion of safety margins that must be urgently addressed.

[1] See Appendix A for listing of SRT members and their biographies.
[2] See Appendix B for additional detail about the SRT's process and stakeholder engagements.
[3] See Appendix C for list of 2023 incidents leading up to the formation of the SRT.

Thank you for this opportunity to serve aviation safety as independent, objective members of the SRT. We are a diverse group of leaders, safety experts, and aviation professionals, all with several decades of experience in the industry. Our combined perspectives allowed us to examine concerns about increasing risk in the NAS and the potential for future serious incidents or accidents in a holistic manner. While our engagement with each other and with stakeholders was collaborative in nature, we challenged each other, worked through differing viewpoints, and ultimately reached consensus on the challenges and recommendations in this report.

The SRT looks forward to the FAA's actions as well as strong support from the Administration and Congress in response to these recommendations. We are confident that implementation, while difficult, will ensure a healthy, sustainable NAS and continue to deliver the level of safety that the flying public deserves and has come to expect from the U.S. aviation system.

Respectfully,



Michael Huerta
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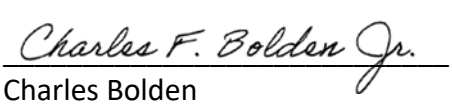

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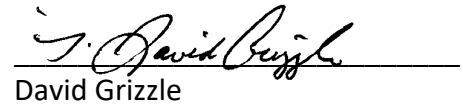

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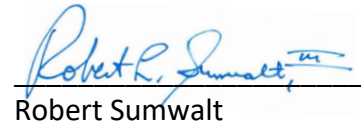

Robert Sumwalt
SRT Member

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Executive Summary

Each day in the United States, the Federal Aviation Administration (FAA) facilitates the travel of more than 2.9 million airline passengers across more than 29 million square miles of airspace. The Air Traffic Organization (ATO) provides air navigation services to over 45,000 flights a day in the National Airspace System (NAS), employing over 35,000 air traffic controllers, technicians, engineers, and support personnel to keep aircraft moving safely and efficiently through the system, 24 hours a day, 7 days a week, 365 days a year.[4]

> *"Safety is the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management."*
>
> - International Civil Aviation Organization (ICAO)[5]

The NAS is complex, and as defined by ICAO, safety depends on the management of risk. While the incidents at the beginning of 2023 that prompted the FAA to charter an independent NAS Safety Review Team (SRT)[6] do not represent an overall increase in incidents over the last five years, they do illustrate an increase in the most serious type of runway incursions. Generally, the ATO operates robust policies, procedures, and programs to manage safety risk and enjoys a just safety culture. However, these serious incidents illuminate significant challenges to the provision of air traffic services by the ATO.

These challenges, in the areas of process integrity, staffing, and facilities, equipment, and technology, all have ties to inadequate, inconsistent funding. Together, these challenges contribute to increased safety risk and should be regarded as incident precursors. Although stakeholders in the aviation system continue to exercise heightened vigilance and utilize available voluntary safety reporting programs following the incidents in 2023, the current erosion in the margin of safety in the NAS caused by the confluence of these challenges is rendering the current level of safety unsustainable.

This report includes a discussion of challenges identified by the SRT along with recommendations for the FAA to address each major area. A summary listing of all recommendations follows the conclusion. SRT recommendations are focused on:

- **Process Integrity**: Strengthening FAA organizational structures, institutionalizing roles and responsibilities, and advancing a proactive, data-driven safety culture.
- **Staffing**: Accurately projecting and investing in hiring, training, and certification of the workforce.
- **Facilities, Equipment, and Technology**: Sustaining and modernizing NAS infrastructure and investing in technology to maximize safety and efficiency.
- **Funding**: Adequately and consistently funding and authorizing the FAA to facilitate the provision and safety oversight of 24/7, 365 days/year operations.

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[4] Federal Aviation Administration. (2023, April 10). *Air Traffic by the Numbers*. https://www.faa.gov/air_traffic/by_the_numbers.
[5] International Civil Aviation Organization. (2012). *Doc 9859 Safety Management Manual (SMM)*, (3rd ed.). https://www.icao.int/SAM/Documents/2017-SSP-GUY/Doc%209859%20SMM%20Third%20edition%20en.pdf.
[6] See Appendix A for a list of SRT members and their biographies.

NAS safety is a shared responsibility. While implementing the recommendations may be difficult, addressing risk in the NAS requires urgent action. The SRT strongly urges policymakers and industry to begin the process of change necessary; to work collaboratively with the FAA to ensure a healthy, sustainable NAS; and to continue to deliver the level of safety that the flying public deserves and has come to expect from the U.S. aviation system.

Discussion and Recommendations

Process Integrity

ATO Internal Processes, Systems, and Integration with Respect to Aviation Safety

As part of its tasking, the SRT reviewed the ATO's internal processes, systems, and operational integration with respect to aviation safety, specifically examining the ATO's Quality Control, Quality Assurance, and Mandatory Occurrence Reporting processes, corresponding safety assurance tools and systems, and voluntary safety reporting programs.[7] Generally, the SRT found that the ATO operates a robust and well-functioning Safety Management System (SMS), an integrated collection of policies, procedures, and programs used to manage safety risk in the provision of air traffic management, navigation, and surveillance services. The ATO also enjoys a just safety culture where employees feel free to report safety issues without fear of reprisal or discipline, and voluntary safety reporting programs are in use and providing valuable insight into the operation. Incident investigation is normally expeditious and comprehensive, and corrective actions, where appropriate, are generally applied in a timely manner.

Maintenance and sustainment of the ATO's internal processes and systems are challenged by a lack of adequate staffing and funding. Limited organizational capacity is devoted overwhelmingly to air traffic management. While this is an appropriate prioritization of resources, it detracts from other, sometimes longer-term, safety-critical areas, such as safety system deployment and maintenance, training oversight, and the monitoring of process integrity. This generates an accumulation of deficits and can ultimately affect the management of risk in the system. Some illustrative examples:

- Inconsistent Pilot Reports (PIREP) solicitation and dissemination to stakeholders, which remains a safety-critical issue due to insufficient funding.
- Slowed or incomplete data collection, processing, and dissemination across the FAA. This includes:
    - Event validation and safety barrier analysis lags of up to 60 days.
    - Reduced local filing and tracking of near mid-air collisions, pilot and vehicle/pedestrian deviations, Area Navigation (RNAV) anomalies, and incident forms.
    - Delayed pilot deviation reporting, resulting in non-compliance with requirements that events be forwarded within 10 days.

[7] This review included but was not limited to Order JO 7210.634 *Air Traffic Organization (ATO) Quality Control (QC),* Order JO 7210.633 *Air Traffic Organization (ATO) Quality Assurance (QA)*, and Order JO 7210.632 *Air Traffic Organization (ATO) Occurrence Reporting*, along with corresponding safety assurance tools (e.g., replay tools, the Comprehensive Electronic Data Analysis and Reporting (CEDAR) program, safety assurance dashboards). The SRT also assessed employee acceptance and the effectiveness of the ATO Air Traffic Safety Action Program (ATSAP).

    - Delayed analysis of Runway Safety Action Team data and implementation of mitigations due to funding constraints.
- Reduced program effectiveness (inability to identify trends or mitigate local facility safety issues), resulting from operational staffing constraints and budget limitations that prevent operational personnel from participating in or executing program activities.
- Consistently underdeveloped, unexpanded programs, including a safety assurance program to analyze and assess air traffic services in oceanic airspace and adequate Systemic Issue Reviews (SYSIR)[8] to comprehensively and collaboratively review all potential systemic issues.

The effective management of system risk requires sufficient staffing and funding to execute the policies and processes proven to be effective. Further detail and specific recommendations on staffing and funding challenges can be found in those respective sections of this report.

Relationship between the ATO and the Air Traffic Safety Oversight Service

The SRT also examined opportunities to strengthen the connection between the ATO, the air navigation service provider, and the safety oversight entity, the Air Traffic Safety Oversight Service (AOV), which resides within the Aviation Safety (AVS) organization.[9] To make determinations about sufficient oversight and evaluate effectiveness, the SRT reviewed the FAA's organizational structure as well as the roles and responsibilities of the ATO and AOV.

In 2004, the FAA established AOV under the AVS line of business to provide independent safety oversight of the ATO's provision of air traffic services. The AOV mission is to provide independent, risk based, data driven safety oversight of air navigation services. The specific duties and responsibilities of AOV are broad in nature, as denoted in FAA Order 1100.161 *Air Traffic Safety Oversight.*[10] Figure 1 provides a visual depiction of the roles of AOV.

[8] SYSIRs are a method for Service Delivery Point (SDP) personnel to identify areas with potential system impact, whether at the SDP, service area, or service unit level.

[9] Federal Aviation Administration. (Signed 2023, April). *NAS Safety Review Team (SRT) Memorandum of Understanding*.

[10] See Appendix D for an excerpt of FAA Order 1100.161 describing AOV's roles and responsibilities.

Figure 1: AOV Roles and Responsibilities

ICAO provides guidance for oversight of Air Navigations Services in Document 9734:

> *3.3.4 Establishment of service providers*
>
> *3.3.4.1 Whether or not the provision of ANS and/or the operation of aerodromes is vested outside the Civil Aviation Authority (CAA), States have to ensure effective and independent safety oversight by the CAA in its role as the regulator. A clear separation of functions and responsibilities between the regulatory authority and the service provider needs to be established, including mechanisms to avoid perceived, potential or actual conflicts of interest.*
>
> *3.3.4.2 The regulatory authority and service providers should not overlap in structure, responsibility or function. In particular, for the regulatory authority to be able to take effective and independent actions, including enforcement action, if necessary, the regulatory authority and service provider should not report to the same higher level management, unless the State can demonstrate that a "functional" separation has robust checks and balances, and there is no possibility of conflict of interest, including when enforcement action is taken.*

Both the air navigation service provider and the regulatory authority reside within the FAA. In order to comply with ICAO's guidance, the FAA established an organizational separation, whereby the operation resides in one part of the Agency and the oversight organization resides in another. The current reporting structure is compliant with ICAO guidance, but creates an organizational imbalance, with the

ATO's Chief Operating Officer reporting directly to the FAA Administrator while AOV, one level lower in the organization, reports to the Associate Administrator for Aviation Safety who, in turn, reports to the FAA Administrator (see Figure 2). This organizational imbalance impedes both effectiveness and clarity with regard to AOV's role, responsibilities, and authority.

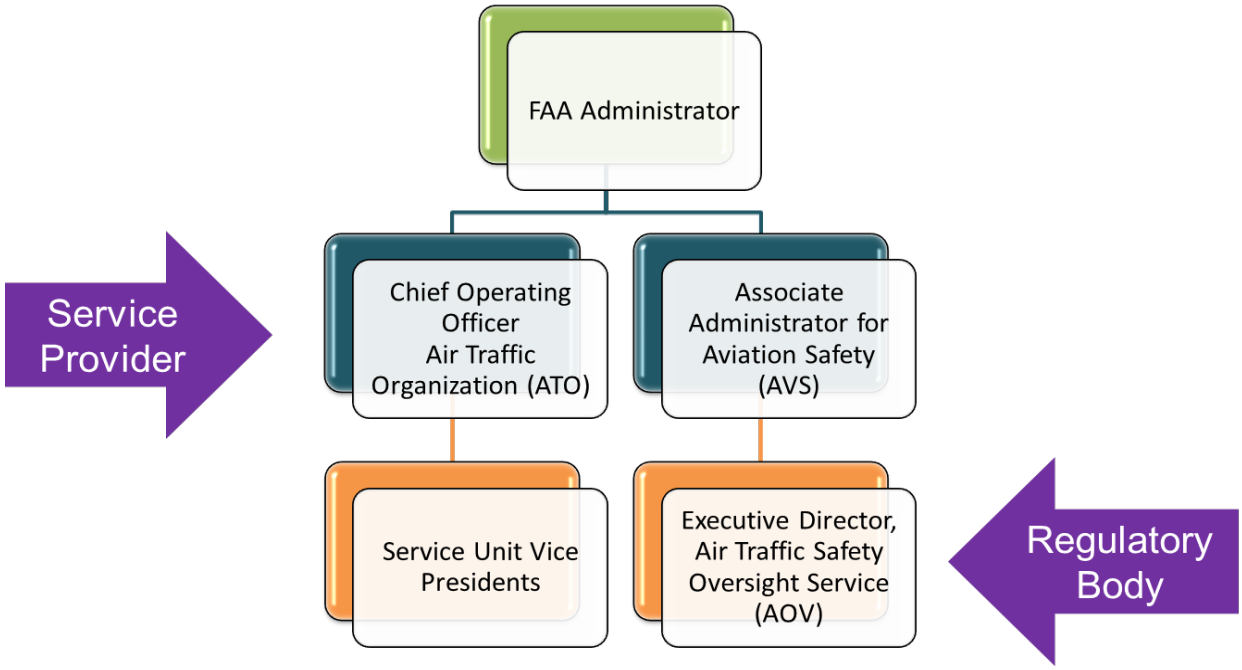

Figure 2: ATO and AOV Reporting Structure within the FAA

While professionalism and dedication to the mission by both AOV and ATO personnel have generally permitted the parties to work collaboratively despite the organizational imbalance, there remains disagreement over AOV's authority and responsibilities that delay proper oversight and absorb resources. Separate parts of the FAA interpret FAA Order 1100.161 differently.[11] For example, the ATO has invited AOV to participate in safety reviews, audits, and assessments, yet AOV requires the ATO's concurrence to gather information. In other words, the ATO and AOV's placement in separate lines of business and the resulting organizational imbalance impede AOV's responsibility and authority to provide independent oversight of the ATO.

Safety oversight is the specific responsibility and duty of AOV. As such, it must be accomplished at the discretion of AOV and through coordination with the ATO. There should be no question as to AOV's authority to gather information without delay. AOV's authority must be strengthened and clarified to ensure proper independent oversight of the ATO's management of risk.

Within the FAA's structure, oversight can be exercised through the application of best practices found in safety-critical organizations throughout industry. Airlines often connect the internal safety structure directly to their board of directors through the board's safety committee[12] to ensure the highest level of accountability.

[11] Appendix D outlines responsibilities of AOV, as extracted from FAA Order 1100.161A.
[12] Different airlines have different names for this committee.

Recommendation PI.1: Establish AOV as dual reporting entity, with accountability to both the FAA Administrator and the AVS Associate Administrator. This direct connectivity will resolve any organizational imbalance, while retaining AOV within AVS ensures the application of best practices and standardized administration throughout all FAA safety oversight organizations.

Creating a direct reporting relationship from AOV to the Administrator serves two safety-critical functions when it comes to oversight: 1) Some deficiencies may require resources that can only be allocated from the Administrator's level, and involving the Administrator gives greater efficacy to AOV oversight determinations. 2) Some AOV oversight findings could rise to the level where, because of severity or the potential impact to the public's confidence, the Administrator is the only appropriate executive to act upon AOV findings as the owner of that risk.

Recommendation PI.2: In furtherance of PI.1 above, clarify, update, and communicate AOV's authority, roles, and responsibilities, and update all applicable orders, including FAA Order 1100.161 *Air Traffic Safety Oversight*.

Data-Driven Safety Culture

The SRT was tasked to explore actions needed to reinforce FAA's current collaborative, data-driven safety culture. For example, in 1997, FAA, in conjunction with industry, created the Commercial Aviation Safety Team (CAST). CAST safety enhancements, along with technology improvements, enhanced training techniques, regulations, expanded voluntary reporting programs, and other activities, have virtually eliminated the many common causes of commercial accidents. In fact, since the formation of CAST until now, the fatality risk in commercial aviation has dropped 94 percent.[13]

CAST's prognostic safety analysis requires acquiring, sharing, and analyzing massive amounts of safety data, primarily obtained from the Aviation Safety Information Analysis and Sharing (ASIAS)[14] program. Continuing to improve safety necessitates an evolution of CAST beyond the historic approach of examining past accident data to a proactive, predictive approach that focuses on detecting risk and implementing mitigation strategies before accidents or serious incidents occur.

The SRT applauds recent FAA and industry collaborative efforts to analyze existing CAST and ASIAS processes and evolve the data-driven approach to aviation safety. Teams exploring improvements to SMS, data/metrics, governance, and communications are on track to complete short-term goals, while setting the stage for mid- and long-term efforts through 2025.

Recommendation PI.3: Considering the criticality of predictive methods to the reduction of risk in the NAS and the important role of government-industry collaboration in maintaining and improving safety, CAST stakeholders must expedite the evolution to a proactive, predictive approach to detect and manage risk before serious incidents or accidents occur.

[13] Federal Aviation Administration. (2021, September 3). *Commercial Aviation Safety Team*. https://www.faa.gov/newsroom/commercial-aviation-safety-team.

[14] The voluntarily reported safety data in ASIAS comes from operators that represent 99 percent of U.S. air carrier operations. ASIAS data comes from several programs, including the Aviation Safety Action Program (ASAP), Flight Operational Quality Assurance (FOQA) program, and Air Traffic Safety Action Program (ATSAP).

Line Operations Safety Assessments (LOSA) are routinely used by airlines as a tool to help assess ramp, maintenance, and flight deck policy/procedure adherence and to provide predictive, rather than reactive, risk management. The development and success of LOSA-themed programs are based on ten essential characteristics: peer-to-peer observations during normal operations; anonymous, confidential, and non-punitive data collection; voluntary participation; trusted and trained observers; joint management/union sponsorship; Threat and Error Management (TEM)-based observation instrument; secure data collection repository; data verification roundtables; data-derived targets for enhancement; and feedback of results to the workforce.[15] An ATO-wide LOSA-themed program, focused on a proactive, predictive approach to risk management is missing from the ATO's current suite of safety data programs.

> **Recommendation PI.4**: Establish and maintain an ATO-wide, LOSA-themed program, to facilitate a proactive, predictive approach to risk management. Creating such a program requires time and significant resource investments to evolve processes and the safety culture.

Successful voluntary, non-punitive reporting programs are critical to ensure a data-driven safety culture. Pilots and air traffic controllers participate in two successful and robust safety reporting programs, the Aviation Safety Action Program (ASAP) and Air Traffic Safety Action Program (ATSAP), respectively. These programs provide enormous value and insight into the operation in ways not accessible through other data collection programs.

A large percentage of operations in the NAS involve General Aviation (GA), and in FY 2023, GA accounted for more than 73 percent of total accidents. However, current GA voluntary, non-punitive reporting (such as the Aviation Safety Reporting System[16]) is not as well-developed as that found in commercial aviation. The lack of a robust, well-subscribed, voluntary, non-punitive reporting program for GA presents a lost opportunity to gather, analyze, and address many safety-critical issues.

> **Recommendation PI.5**: Work with General Aviation (GA) stakeholders to 1) explore current reporting and data collection programs and 2) enhance and strengthen or supplement the existing voluntary, non-punitive safety reporting program for GA to facilitate robust data analysis and a proactive, predictive approach for detecting and managing risk before serious incidents or accidents occur. Key elements of the program should align with other voluntary, non-punitive safety reporting programs currently in use in other aviation sectors.

[15] Federal Aviation Administration (2023, June 13). Line Operations Safety Assessments (LOSA). Faa.gov. Retrieved from https://www.faa.gov/about/initiatives/maintenance_hf/losa.

[16] NASA's Aviation Safety Reporting System (ASRS) captures confidential reports, analyzes the resulting aviation safety data, and disseminates vital information to the aviation community.

Staffing

Adequate staffing and training of air traffic controllers, technicians, and other aviation safety professionals are essential to maintain the safety and efficiency of the NAS. For the ATO to continue providing the level of service the flying public deserves and has come to expect, resources must be available to meet the mission. Primary contributors to the ATO's staffing challenges include inadequate air traffic controller and technical operations staffing models and significant budget constraints. If unaddressed, the ATO will be unable to maintain current capacity, let alone expand and modernize the system. The understaffing that currently exists within the ATO places additional strain on the system, further eroding the margin of safety and increasing risk.

Air Traffic Control Specialists

Overtime[17] is at a historically high level and increasing. High rates of overtime for extended periods introduces risk into the NAS. Several associated issues include absenteeism, lower productivity and fatigue.

The operational impact of air traffic controller staff shortages is experienced principally as diminished air traffic capacity and inefficient operations. When there is a lack of sufficient air traffic controllers to staff all positions to maximize throughput, traffic management initiatives are put in place to ensure safe operations. The recently negotiated airline schedule reductions in the New York area during the summer of 2023 illustrate such a loss in capacity and efficiency.

There are multiple other effects of an air traffic controller staffing shortage. Sectors or positions are combined, with a fewer number of air traffic controllers working the combined area than would be used working separated sectors and positions. To maintain safety, air traffic is slowed or metered in the combined airspace so that each air traffic controller has fewer airplanes to manage. Inclement weather, combined with staffing shortages, prompts traffic management initiatives like ground stops and adjustments to the number of miles required between aircraft, significantly reducing capacity and causing considerable delays.

When areas are combined, there are fewer eyes on the airspace, which requires in-the-moment capacity changes to be made in order to handle short staffing. These in-the-moment changes inject risk into the system. When air traffic is rerouted, put into holding, or space is increased between aircraft to accommodate understaffed adjacent areas, the opportunity for mistakes in instruction is multiplied due to the abrupt change in the operation and the increased communications required to facilitate the irregular operation. While each element of risk may not be material, the combined effect of irregular operations necessitated by staff shortages erodes the margin of safety in the NAS.

Too few air traffic controllers results in operations supervisors working an air traffic control position while they should be overseeing the operation and assisting with coordinating between positions and other facilities, dividing attention between multiple responsibilities. When the supervisors are

[17] Overtime means work in excess of 40 hours in an administrative workweek, when the 6th or 7th working day is within the same administrative workweek as the first 5 days. Additionally air traffic controllers on 8 hour shifts are entitled to up to 2 hours of overtime pay if called in before or held over past their regularly assigned shift.

obligated to work traffic instead of performing the oversight duties, critical redundancy is lost. Furthermore, too few operations supervisors requires an increased use of controllers-in-charge (CICs) to provide operations oversight, utilizing an already stretched workforce for these duties.

Although total operations in the NAS have increased over the past several years, the ratio of aviation operations to air traffic controllers actually decreased between 2001 and 2019 (see Figure 3). However, demands on the workforce due to increased complexity of the airspace have grown significantly over the past several years. The content of service provided to users is much richer today than 20 years ago. Some examples include fuel-saving flight paths which can be more labor intensive, airspace constraints introduced by emerging entrants,[18] more frequent inclement weather, increases in airspace redesigns, and changes in aircraft performance characteristics. The implementation of new systems, procedures, and technologies can initially increase workload and introduce greater complexity and unfamiliarity for an already stretched workforce. All of these operational elements require subject matter experts from the air traffic controller workforce for training, testing, and implementation, and additional training and training resources are required for the workforce as a whole. Yet, a constant state of training in the context of severe staff shortages and persistent use of overtime leads to greater fatigue and possibly mental health concerns, which reduces proficiency and increases system risk.

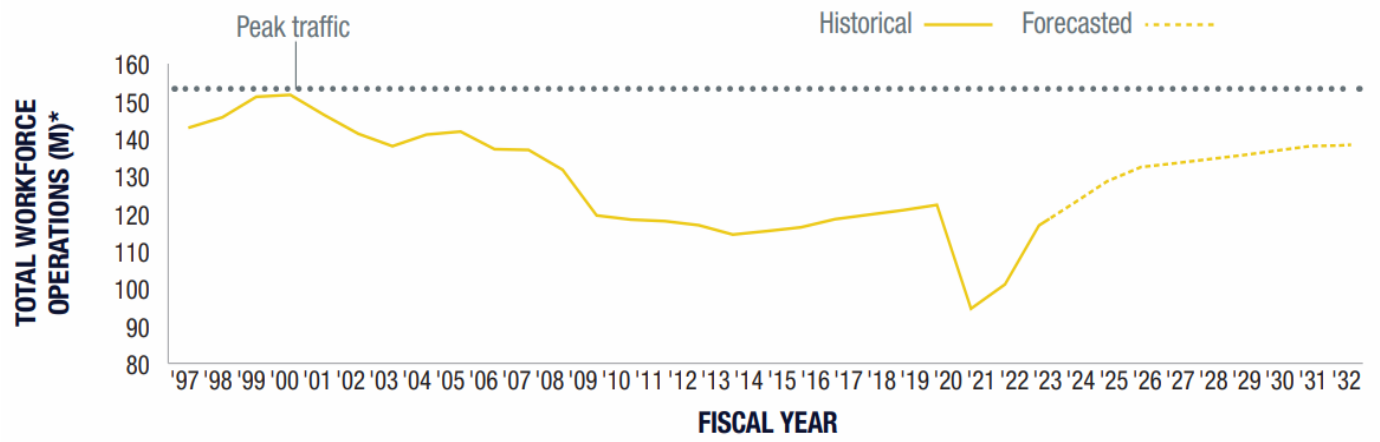

Figure 3: Traffic Trends[19]

A predictable, repeatable, and defensible air traffic controller staffing model is critical to achieving a sustainable level of staffing as well as efficient and effective training. There continues to be disagreement among the FAA Office of Labor Analysis, the ATO, and the National Air Traffic Controllers Association (NATCA) on a facility-level air traffic controller staffing model, which hinders the distribution of the operational workforce and effective placement of FAA Academy graduates. Recently, however, the ATO and NATCA conducted facility-level surveys to validate or support changes to Certified Professional Controllers (CPC) staffing targets previously determined in 2015.[20] As part of this effort, the ATO and NATCA created a model focused on CPC staffing to meet facility operational,

[18] Examples: Vertical Takeoff and Landing (VTOL) Aircraft, Short Takeoff and Landing (STOL) Aircraft, UAS, Commercial Spacecraft, Supersonic Aircraft (see https://www.airporttech.tc.faa.gov/Emerging-Entrants).

[19] Federal Aviation Administration. (2023). *The Air Traffic Controller Workforce Plan, 2023-2032*. https://www.faa.gov/sites/faa.gov/files/20230503-afn-cwp.pdf.

[20] Interim numbers agreed to by the ATO and NATCA (the parties), with facility level input, while the Parties continued to pursue an agreement on a sufficent staffing model.

contractual, and statutory requirements. The MITRE Corporation, an independent, third-party, supported this validation work.[21]

The validation effort commenced because the staffing standard utilized and reported to Congress in the annual Controller Workforce Plan is based on an outdated methodology and does not conform to ATO's operational reality, practices, policies, and expectations, such as training for technological/procedural changes; refresher, recurrent, and on-the-job training; or work on safety reporting, analysis, and corrective actions. Additionally, the plan does not use assumptions and factors that conform to actual contractual, statutory, and other agreements. Some other factors not sufficiently taken into account in the Controller Workforce Plan are:

- The career trajectory of previously experienced air traffic control hires and FAA Academy graduate facility placements. Normally terminal option hiring and graduate placements are assigned into level 7 or below air traffic facilities and upon certification will seek movement (3 to 5 years of service) into level 8 and above facilities where they will return to training as a CPC in training. Rarely does an air traffic controller spend their career in the same facility location.
- Lateral moves into (permanent and temporary) traffic management roles, staff support positions, and promotions to first-level supervisor and above.
- Unique characteristics in some air traffic facilities, such as combined tower and Terminal Radar Approach Control (TRACON) facilities and multiple towers or multiple areas of specialization as in consolidated TRACONs and en route centers, which require more robust modeling.
- Traffic development in the NAS due to emerging entrants.
- Rapid recovery of air traffic after the global pandemic in many geographic areas.
- Air traffic complexity.

According to the 2023-2032 FAA Controller Workforce Plan, "[The ATO and NATCA] are in agreement on staffing and hiring levels for the next four years and are continuing to collaborate to better understand differences in how the availability factor is applied and calculated and to determine additional adjustments needed to the staffing standards availability factor."[22] This means the ATO and NATCA are in agreement on the recently developed Collaborative Resource Workgroup[23] staffing model, not the Controller Workforce Plan, but will continue to collaborate on the availability factors. The agreement on hiring is aligned primarily on FAA Academy throughput versus the actual needs of the system. For example, only hiring 1,500 air traffic trainees in 2023 and 1,800 in 2024, as intended by the noted agreement in the annual Controller Workforce Plan provided to Congress, does not adequately satisfy system needs with regard to complexity, growth, and trajectory. The FAA Academy is a bottleneck, which hinders the ATO's ability to provide a sufficient pool of candidates into the pipeline to become air traffic controllers.

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[21] Federal Aviation Administration. (2023). *The Air Traffic Controller Workforce Plan, 2023-2032*. https://www.faa.gov/sites/faa.gov/files/20230503-afn-cwp.pdf. The MITRE Corporation served as a third party entity and supported ATO and NATCA in the validation of the model focsed on CPC staffing to meet facility operational , contractual and statutory requirements.

[22] The Availabity Factor (AF) is an important part of the FAA's staffing standards models. It accounts for time air traffic controllers can't cover traffic demand at their assigned facility either due to 1) they are not at the facility due to scheduled regular day off (RDO), leave, offsite training, offsite workgroup activities, etc. or 2) while at the facility, they are unable to perform a typical day's on-position work due to special projects, substantial (often group) training activities, local union activities, etc. The FAA has used an AF multiplier of 1.76 for over thirty years. The AF is applied to the daily staffing requirement on the facility's 37th busiest traffic day to determine overall facility staffing levels required (staffing standards). The AF is periodically reviewed to look for trends in leave usage and other duties. In 2022, the AF was changed to 1.82.

[23] A reconstituted Collaborative Resource Workgroup made up of representatives from ATO and NATCA.

Furthermore, as indicated in Figure 4, when retirements and other attrition is accounted for, the hiring plan produces a negligible improvement over today's understaffed levels, resulting in a net increase of fewer than 200 air traffic controllers by 2032. The ATO must determine staffing needs based on actual system needs rather than on Academy throughput and budgetary constraints.

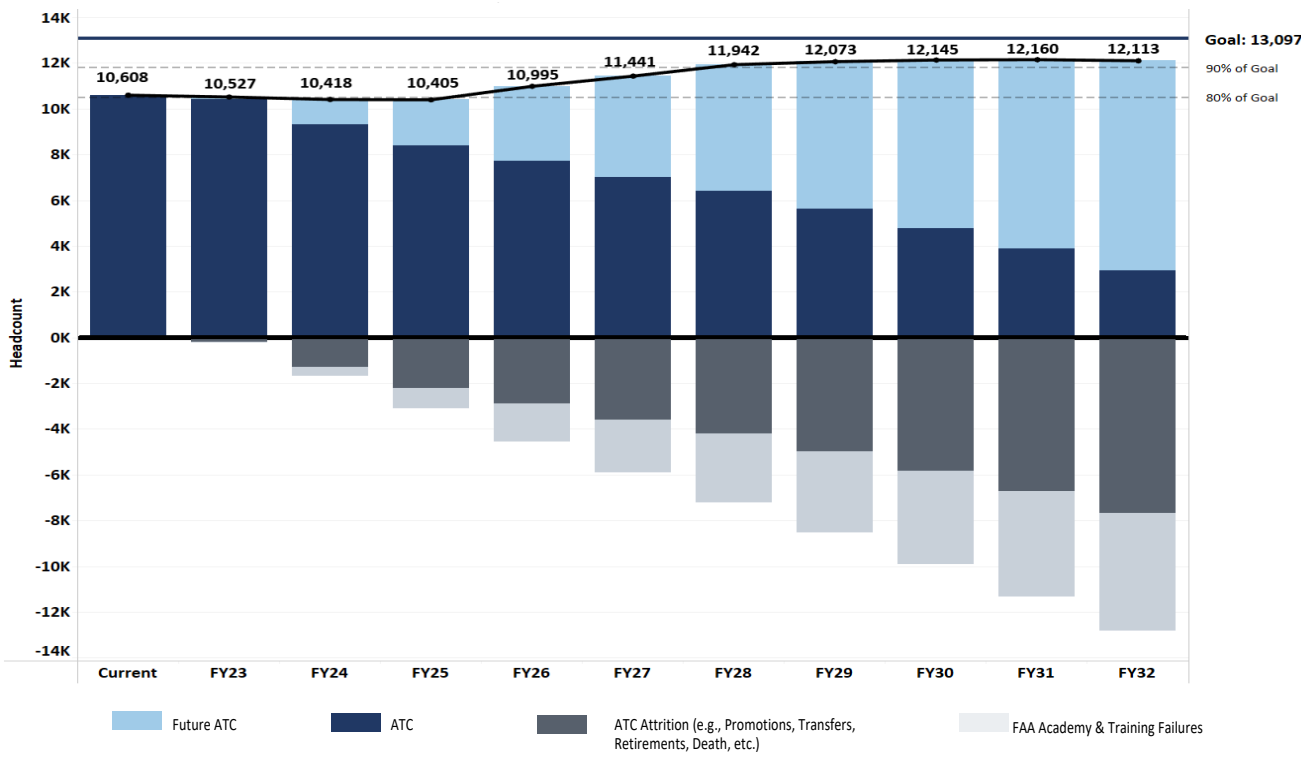


Figure 4: 10-Year Projection of Air Traffic Controller Workforce[24]

Recommendation S.1: Develop a defensible, flexible, predictive air traffic controller staffing model that determines system and individual facility needs. The model will assist in the appropriate distribution of the workforce, especially as it relates to internal movement by air traffic controllers to higher level facilities as well as into traffic management, staff support, and supervisory promotions. It should also take into account the efficient placement of Academy graduates.

[24] This chart shows at a high level how anticipated hiring and attrition impacts the air traffic controller outlook. Source: Federal Aviation Admininistration. (2023, August 15). *10-Year Projection of Air Traffic Controller Workforce* [Chart].

How Did Air Traffic Controller Staffing Get Here?

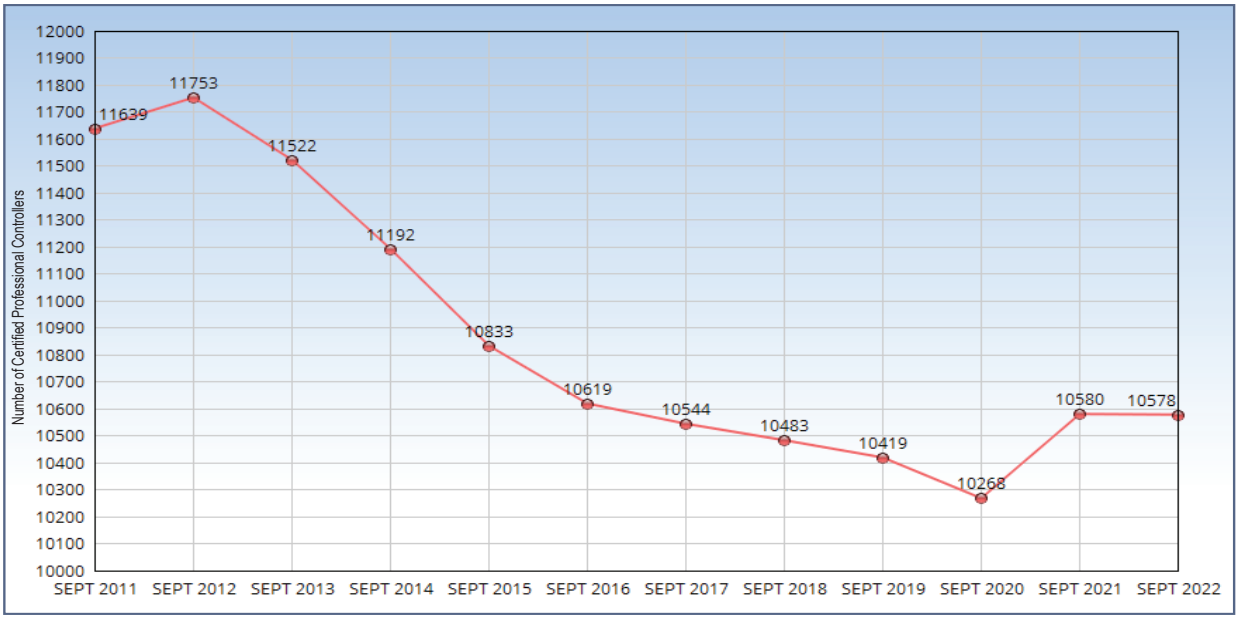
The current state of air traffic controller staffing is the result of a number of factors spanning four decades. First, a surge in hiring occured during several years following the air traffic controller strike in 1981. That, in turn, led to a wave of retirements from 2005-2007. To adequately compensate for these losses, new hires, trainees, and ultimately fully certified air traffic controllers needed to already be in the training pipeline.

According to the FAA's Controller Workforce Plan published in 2011, "The FAA's current hiring plan has been designed to phase in new hires as needed over time. This will avoid creating another major spike in retirement eligibility in future years like the current one resulting from the 1981 air traffic controller strike. In 2005, the agency began hiring more air traffic controllers than the number who retired each year to make sure enough trained air traffic controllers were on board when the retirement wave began to swell."[25]

The FAA admittedly struggled to keep pace with hiring before the mid-2000s and subsequently ineffectively staffed the air traffic controller ranks (see Figure 5). As an illustrative example, there are 1,002 fewer fully certified air traffic controllers in August 2023 than in August 2012, despite increasing complexity of operations within the NAS. The FAA has made limited efforts to ensure adequate air traffic controller staffing at critical air traffic control facilities.[26]

[25] Federal Aviation Administration. (2011). *A Plan for the Future, 10-Year Strategy for the Air Traffic Control Workforce 2011 – 2021*.

[26] Office of Inspector General, U.S. Department of Transportation. (2023, June 21). *FAA Faces Controller Staffing Challenges as Air Traffic Operations Return to Pre-Pandemic Levels at Critical Facilities* [Report]. https://www.oig.dot.gov/sites/default/files/FAA%20Controller%20Staffing%20and%20Training%20at%20Critical%20Facilities%20Final%20Report-06-21-23.pdf.



FISCAL YEAR	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
On-Board	15,236	15,063	14,461	14,059	14,010	14,050	14,009	14,285	14,193	13,830	13,715	13,418
CPC	11,639	11,753	11,522	11,192	10,833	10,619	10,544	10,483	10,419	10,268	10,580	10,578
CPC-IT	965	1,143	1,187	1,200	1,218	1,259	1,205	1,320	1,414	1,309	1,031	943
DEV (Including AG)	2,632	2,167	1,741	1,667	1,959	2,172	2,260	2,482	2,360	2,253	2,104	1,897
AG	676	671	440	665	936	878	883	980	882	873	917	643
Retirement Eligible	3,064	3,224	3,077	2,982	3,355	2,915	2,410	1,842	1,004	1,143	≈1,000	631
FAA Planned To Hire	829	981	1,315	1,286	1,772	1,619	1,781	1,701	1,431*	910	910**	1,020
FAA Actually Hired	824	925	554	1,112	1,345	1,680	1,880	1,786	1,010	920	510	1,026

Source: FAA Finance Staffing Data Snapshot

FAA reduced its FY 2019 hiring target from 1,431 to 907 following the 35-day government shutdown.

***FAA reduced its FY 2021 hiring target from 910 to 500 due to the COVID-19 pandemic and increased its hiring targets for FY 2022 – 2024.*

These data are prior to the Collaborative Resource Workgroup's recommendation to establish new CPC staffing targets for FAA's 313 air traffic control facilities.

CPC: Certified Professional Controller
CPC-IT: Certified Professional Controller in Training (fully certified elsewhere, transferred to a new facility and began training there)
DEV: Developmental (trainee)
AG: Graduate of the FAA Initial Classroom Training Academy in Oklahoma City, newly hired, and started at their first facility as a trainee

Figure 5: Air Traffic Controller Staffing, 2011-2022[27]

[27] Subcommittee on Aviation, Committee on Transportation and Infrastructure, United States House of Representatives. (2023, March 23). *Written Testimony of Rich Santa, President, National Air Traffic Controllers Association, AFL-CIO (NATCA).* https://www.natca.org/wp-content/uploads/2023/03/3-23-23-House-Aviation-Subcommittee-Written-Testimony-of-NATCA-President-Rich-Santa-FINAL100.pdf.

Several events significantly impacted the successful hiring, training, and certification of air traffic controllers:

- The 2013 sequestration cuts and 16-day government shutdown suspended hiring for 10 months.[28] Training was also suspended during the shutdown.
- The 2018-2019 35-day partial government shutdown, affecting nine agencies including the Department of Transportation, suspended hiring and training. [29]
- The unprecedented 2020 global public health emergency forced the FAA to close the training Academy for four months and to pause training for eight months at all facilities to reduce exposure to the virus and keep the airspace open.[30]

Together, the 2013 sequestration cuts and the 2013 and 2018-2019 shutdowns accompanied by the effects of the pandemic halted hiring for over a year and training for approximately two of the last 10 years. These hiring slots and positions cannot be recaptured and are, in effect, lost due to several hiring and training challenges. At the FAA Academy, where initial training occurs for most new air traffic controller hires, classroom size, lab simulation availability, and an overreliance on contract instructors constrain throughput. Additional challenges are posed by insufficient testing, medical, and security clearance resources necessary to process applicants.

Movement of air traffic controllers to higher-level tower and terminal facilities as well as other FAA organizations exacerbates staffing challenges. These movements include ATO positions (e.g., traffic management coordinators in facilities and at the FAA Command Center, staff support specialists, and operations supervisors) as well as those in other parts of the FAA (e.g., positions in AOV, Commercial Space, Uncrewed Aircraft Systems (UAS), and the FAA Academy). Notably, many of these other FAA Lines of Business are also inadequately staffed, as they too suffer from large numbers of retirements and delays in training and hiring due to lapses in appropriations/authorizations and the COVID-19 pandemic. The instability of the air traffic controller workforce in the FAA is also leading to increased instability in the FAA Contract Tower Program,[31] which results in both greater churn and higher costs in these towers.

The FAA highlighted higher than expected attrition in the air traffic management workforce in 2021 and 2022, indicating that the ATO plans to increase the air traffic management and support workforce (including operations supervisors, staff support specialists, and traffic management coordinators) by approximately 550 positions over the next 3-5 years.[32]

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[28] Sequestration is the process of automatic, across-the-board spending cuts mandated in the Budget Control Act (BCA) of 2011. The threat of sequestration was intended to motivate Congress to reach a compromise on $1.3 trillion in savings over the next 10 years (until 2021). Congress failed to compromise on a budget that was less than the amount dictated by the BCA, thus triggering sequestration cuts beginning in FY 2013.

[29] Ogrysko, Nicole. (2018, December 21). *Partial government shutdown begins after Congress, White House fail to reach spending deal* [Article]. Federal News Network. Retrieved from https://federalnewsnetwork.com/government-shutdown/2018/12/agencies-make-last-minute-updates-to-shutdown-contingency-plans/.

[30] Nolen, Billy. (2023, May 5). *Acting Administrator's Letter to Congress on the Controller Workforce Plan*. Federal Aviation Administration. https://www.faa.gov/about/office_org/headquarters_offices/afn/offices/finance/offices/office-financial-labor-analysis/plans/controller-workforce.

[31] Federal Aviation Administration. (2023, March 15). *FAA Contract Tower Program*. https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/mission_support/faa_contract_tower_program.

[32] Federal Aviation Administration. (2023). *The Air Traffic Controller Workforce Plan, 2023-2032*. https://www.faa.gov/sites/faa.gov/files/20230503-afn-cwp.pdf.

Reassignments, internal movements, and promotions are an expected and necessary part of the management of the air traffic workforce (see Figure 6).[33] However, these extraordinary circumstances require sacrifice by the entire organization.

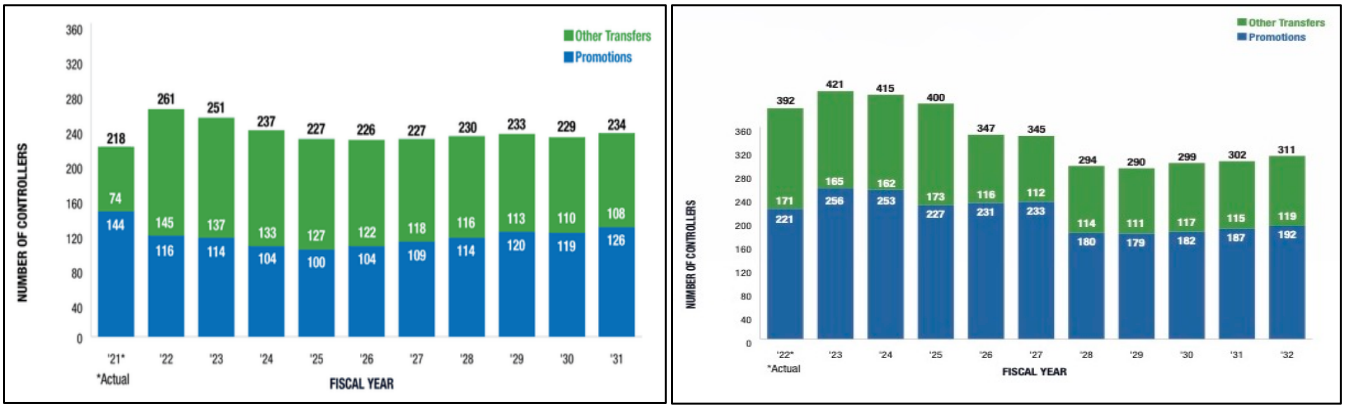

Figure 6: Controller Losses and Projected Losses Due to Promotions and Other Transfers, FY 2022[34] vs. FY 2023[35]

> **Recommendation S.2**: Consider a moratorium for a defined period of time aimed at reducing internal movements and promotions to evaluate the net effect on CPC numbers and overtime usage.

The following set of SRT recommendations are aimed at increasing the size of the hiring pool, expanding Academy throughput, and improving the success rate of the candidates. With respect to the size of the pool, the FAA should take steps to increase throughput at the Academy.

FAA Academy throughput is a bottleneck that limits the ATO's ability to supply a sufficient pool of candidates into the pipeline to become air traffic controllers. Academy failure rates for air traffic controllers is just over 30 percent (see Figure 7), which may be introducing a level of inefficiency and cost into the system. Standards of quality, either with regard to admission to the FAA Academy or in air traffic controller certification, must not be lowered. At the same time, changes must be made in order to improve the percentage of original enrollees in the Academy who become fully certified air traffic controllers. For example, track assignment (terminal or enroute) for new hires is randomly selected. Assignment based on data or testing could increase success rates and reduce training times to certification, without lowering quality standards.

[33] Federal Aviation Administration. (2023). *The Air Traffic Controller Workforce Plan, 2023-2032*. https://www.faa.gov/sites/faa.gov/files/20230503-afn-cwp.pdf.
[34] Federal Aviation Administration. (2021). *The Air Traffic Controller Workforce Plan, 2022-2031*. https://www.documentcloud.org/documents/23991593-2022-afn-cwp.
[35] Federal Aviation Administration. (2023). *The Air Traffic Controller Workforce Plan, 2023-2032*. https://www.faa.gov/sites/faa.gov/files/20230503-afn-cwp.pdf.

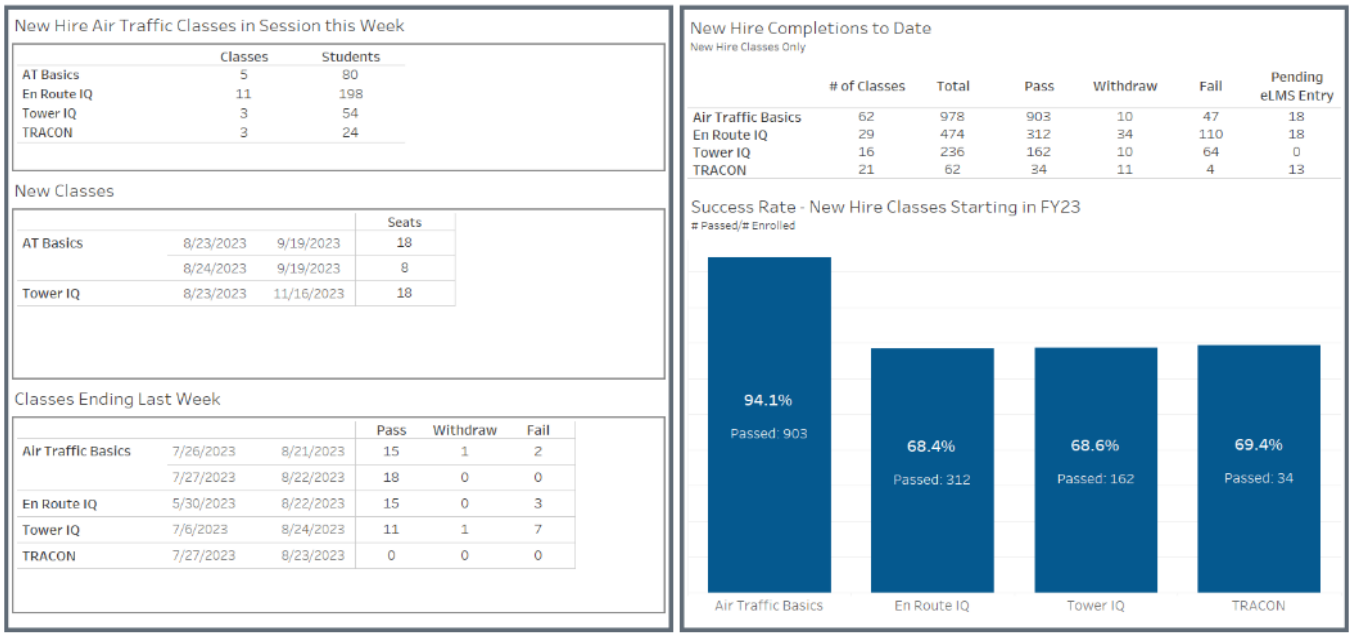

Figure 7: Class Statistics for Academy Air Traffic Basics and Initial Qualification as of August 28, 2023

Recommendation S.3: Examine the air traffic controller trainee hiring, selection, and placement process as well as withdrawals/failures to determine whether the processes and tools used are appropriately screening and determining the candidates best suited for the air traffic controller profession.

Recommendation S.4: Launch a supplemental preparatory program with a goal of preparing selectees for success in air traffic controller training. Demographic and economic implications must be considered in the development of the preparatory program to ensure diversity.

Recommendation S.5: Use available non-randomized means (e.g., Air Traffic Skills Assessment (ATSA) testing data) to identify candidates with skillsets better suited for enroute or terminal air traffic controller duties.

Recommendation S.6: Examine the FAA Academy culture, training atmosphere, and teaching methods to determine if these factors contributed to the loss of candidates that might otherwise be successful at an air traffic facility. If deficiencies are found, implement corrective actions.

Recommendation S.7: Improve the capacity at the FAA Academy through increased hours of operation and a larger contingent of instructors, a reduction in unnecessary and outdated curriculum, and the offering of courses or training at other suitable FAA facilities or through virtual platforms.

With respect to increasing capacity at the FAA Academy, the SRT recommendation focuses on shorter-term solutions for the immediate mitigation of the current air traffic controller staffing crisis.

According to the current FAA Controller Workforce Plan, air traffic controllers are expected to certify in one and a half to three years.[36] The training time to certification can and has been impacted by:

- A shortage of and overreliance on contract instructors.
- Inefficient scheduling of training.
- Overutilization of developmentals (trainees) to staff operational positions where they are certified versus training on the next position or progressing to the next stage of training.
- A lack of CPCs to open positions for on-the-job training.
- A lack of decision support tools for operations supervisors to alert them about overdue training.
- The COVID-19 pandemic.
- Multiple lapses in government funding.[37]

The FAA recently reinstituted the National Training Initiative (NTI),[38] which is critical to continued efforts to build a stable trainee pipeline and develop the workforce. The NTI establishes expectations for the number of hours that a trainee should be training per week. If those expected hours are not met, then the impediments, such as a lack of consistent traffic, simulation lab availability, or On-the-Job-Training-Instructors, are reported. Air traffic controller training progress is monitored at several levels in the ATO to ensure each facility is focused and prioritizing training and certifications. However, the SRT review revealed underutilization of training opportunities at all levels. The FAA/ATO must significantly transform its air traffic controller training process to expand throughput, ensure the operational competence of air traffic controllers, and shorten the time from initial hire to certification as a CPC, without lowering quality standards.

> **Recommendation S.8**: Continue the National Training Initiative and ensure the impediments to training identified in the associated reports are evaluated and robust mitigation strategies are developed.

Increased use of high-fidelity Tower Simulator Systems (TSS) can reduce the time required to certify an air traffic controller by 27 percent according to the ATO. However, the systems require hardware and software upgrades to reflect all current air traffic operations (e.g., Consolidated Wake Turbulence) and produce quality training that contributes to the safe and efficient use of airspace. The TSS program budget has remained flat for more than half a decade despite nearly doubling the number of simulators during that same period.[39] No upgrades have occurred since 2016 due to the lack of both funding and an active TSS software contract.

> **Recommendation S.9:** Acquire and implement state-of-the-art training systems, including high-fidelity simulators of similar capability as airline industry simulators, with a goal of reducing the CPC certification time by 30 percent. The FAA should complete the acquisition and installation of the TSS upgrades as quickly as possible, leveraging its existing, unique acquisition authority.[40]

[36] Federal Aviation Administration. (2023). *The Air Traffic Controller Workforce Plan, 2023-2032*. https://www.faa.gov/sites/faa.gov/files/20230503-afn-cwp.pdf.
[37] This list is not exhaustive.
[38] The National Training Initiative (NTI) was originally implemented in 2019, but experienced an 18-month hiatus due to the COVID-19 pandemic.
[39] Federal Aviation Administration. (2023, June 13). *Training Data* [Presentation].
[40] Federal Aviation Administration Personnel Management System and Procurement Flexibility Act of 1995.

In June of 2023, the FAA and NATCA launched a monthly "Stand Up for Safety" campaign to provide mandatory special emphasis training for its air traffic controller workforce.[41] In discussions with stakeholder groups, including representatives from air carriers and business and general aviation, the SRT learned of disconnects in air traffic controller awareness of operations in aircraft with advanced flight decks and an opportunity to improve safety by better educating air traffic controllers. There have been programs aimed at increasing awareness of flight deck workload in the past, but these programs are no longer active and workforce turnover has exacerbated this lack of awareness.

> **Recommendation S.10**: Increase air traffic controller workforce awareness about what occurs on flight deck (e.g., the impact of frequent, complex or late clearances on workload), single pilot operations, and aircraft performance characteristics.

Current operational work practices are dependent on the facility scheduler or operations supervisors to ensure the air traffic controller has completed mandatory training before assuming an operational position. However, the ATO lacks a robust system to ensure the CPC, CPC-in-training, or partially qualified trainee has completed required training or is proficient. In one of the serious events analyzed, the involved air traffic controller was delinquent in completing over 24 training items.

> **Recommendation S.11**: Develop a tool (expanding Terminal Enterprise Application and Management) to assist facility schedulers in automatically identifying CPCs, CPCs-in-training, and partially qualified developmentals (trainees) with outstanding required training prior to their placement on the schedule. Information should be pushed to (not pulled by) operations supervisors regarding non-compliance of refresher and recurrent training, mandatory briefing items, and sector/position proficiency.

Technicians

ATO airway transportation systems specialists ensure the functionality of communications systems, computer systems, navigational aids, and power systems vital to safe air travel and the mission of pilots and air traffic controllers. In addition, flight inspection and aeronautical professionals in ATO's Mission Support Services support pilots, air traffic administrative professionals, and aviation planners through the development and maintenance of all public instrument flight procedures and airways.

Staffing challenges in these areas of technical operations include increased workload without additional resources and extended hiring and training periods. During the COVID-19 pandemic, training slowed considerably, delaying technical education for staff. The breadth and age of the NAS infrastructure significantly complicates workforce training and currency needs. An over-reliance on third-party contractors to install and maintain equipment and technology is also challenging. A well-trained and sufficiently staffed technical workforce could, in many cases, conduct more efficient, flexible, and less expensive system support.

[41] Federal Aviation Administration. (2023, June 21). *FAA Launches Controller 'Stand Up for Safety' Campaign*. Retrieved from https://www.faa.gov/newsroom/faa-launches-controller-stand-safety-campaign.

One strategy the FAA has used is “bubble staffing” or advanced hiring, where the acquisition and transitioning of new hires to replace retirement-eligible employees occurs prior to the employee’s retirement.

> **Recommendation S.12**: Advance a flexible technical operations staffing model to accurately determine system needs by accounting for a workforce that maintains and installs systems and equipment as well as performs other duties. This model should enable robust training, fatigue mitigation, and “bubble” staffing (advanced hiring).

The Future of Staffing

The SRT acknowledges that implementing these recommendations may be difficult. However, these issues are eroding the margin of safety and injecting risk into the system, and the ATO must take action to urgently address this staffing crisis.

Facilities, Equipment, and Technology

The facilities and equipment utilized by the FAA to conduct air traffic control in the NAS have a replacement value measured in the billions of dollars. The facilities, equipment, and underlying technology are intended to sustain as well as continually increase safety and efficiency. Federal budget processes and constraints have led to inadequate, inconsistent reinvestment in legacy systems, and new systems have failed to deliver significant new capabilities/efficiencies or replace older systems. Consequently, the FAA has not gained significant efficiencies from innovation and continues to utilize facilities and equipment far beyond their planned service life without regular updates or maintenance, all of which injects risk into the system.

Safety is preserved at the expense of efficiency. However, as seen with staffing, there is a limit to how far the challenges of inadequate, obsolete, and unreliable facilities, equipment, and technology can be managed to preserve safety by sacrificing efficiency. Each unscheduled equipment outage injects risk into the system. In the time that it takes to activate available redundant equipment or alternative procedures, situational awareness and coordination are compromised. As the January 2023 Notice to Air Missions (NOTAM) system outage vividly demonstrated, some outages can only be managed by shutting down the system altogether. Even a full shutdown involves increased risk because of rerouting and the irregular operations required to effect the shutdown. The age and condition of FAA facilities and equipment are elevating system risk to unsustainable levels, even before considering losses in efficiency from outdated technology.

Aging Infrastructure

The age of the FAA's critical air traffic control systems is so advanced, it makes any private sector comparison difficult. Some of these critical systems include:

- Surface surveillance: Useful to prevent runway incursions. Deployment of these systems began in the 1980s. Airport Surface Detection Equipment, Model X (ASDE-X) was first deployed in the early 2000s. For many components, spare parts are extremely limited and may require expensive special engineering.
- Enroute surveillance: Beacons used to determine the location of aircraft with working transponders. Includes 124 units with an average age of 20 years, and replacement antennas are no longer available.
- Terminal primary surveillance: Radars used to identify aircraft without operating transponders. Includes 280 units that are 25–50 years old. Some of these systems are pre-digital technology, even though all of them have been upgraded to digital ouputs. For all of them, replacement parts are scarce and repair expertise is declining.
- Terminal secondary surveillance: Beacons used to determine the location of aircraft with working transponders. Includes 331 units that are 28–46 years old. Many of these systems are pre-digital, and many parts are unavailable because the manufacturers no longer exist or no longer support these systems.
- Instrument Landing Systems: Used to guide aircraft on final approach. Includes 1,257 units, most of which are more than 25 years old. Manufacturer support is no longer available for the most common equipment, and there is no strategy for replacement or upgrade.

• Federal Telecommunications Infrastructure (FTI): The communication backbone among all facilities. FTI is based on time-division multiplex (TDM) technology that is no longer supported by the telephone companies' lines on which the signals are actually carried.

The obsolete FTI system is illustrative of the challenges the FAA faces. When Verizon was awarded a new contract for the FAA Enterprise Network Services (FENS) program in March 2023, for the purpose of completely replacing the FTI with an internet protocol (IP)-based system, the FTI system had been outdated for years. For budgetary reasons, the FAA has found it necessary to continue to rely on TDM systems while private sector enterprises, similar in size and criticality to the FAA, have long since moved beyond them.

The FENS system is a 15-year program and, until it is fully built out, individual facilities (an individual navigation aid or possibly a whole enroute center) are at risk of losing communication with the rest of the NAS due to an unplanned failure of one of the TDM-based facilities. A solution to provide interim compatibility between the FTI and FENS technologies has been developed by the former FTI contractor, but the solution is very expensive and will strain the already limited Operations and Facilities & Equipment budgets. In the July 2023 NAS Operational Risk Assessment, the FAA identified the risk associated with the FTI system at the highest level. The FAA has managed this risk by first addressing those sites with TDM circuits most likely to lose support.

For many of its systems, the FAA is no longer able to obtain spare parts. Product lines have been discontinued, manufacturers no longer exist, and the FAA lacks the intellectual property rights to make its own parts. The technology is so old that the FAA is losing workforce technical expertise as senior workers retire and younger workers have little incentive to learn outmoded technology. Configuration complexity continues to grow as new procedures and equipment are implemented, and training is difficult and protracted because every facility has a different equipment configuration. The lack of a national equipage standard poses another risk to be managed.

In many respects, the obsolescence of the FAA's critical operational facilities, in which air traffic controllers and technicians do their work, is even more extreme. The FAA's 21 Air Route Traffic Control Centers (ARTCCs), which largely control enroute aircraft, are located in buildings that are 56-64 years old, with no current plan or budget to replace any of them. If one ARTCC were replaced every other year starting in 2025, some facilities would be over 100 years old before being replaced. The FAA's TRACONs, where air traffic controllers guide airplanes from between 40 to 100 miles from an airport until they are turned over to the air traffic controllers at the airport tower, have an average age of 36 years, with some around 60 years old. No replacement plan exists for TRACONs either. The FAA estimates that there is currently a $5.3 billion backlog of facility components past their service lives contained across more than 12,500 equipment-only installations and 500 staffed air traffic control facilities.

Building age manifests itself as leaking roofs and broken HVAC and other life-support systems that are more difficult to repair because of unavailable parts and repair expertise. Equipment outages caused by water leaks can cause facilities to go "ATC-0," meaning that aircraft management must be shifted suddenly to air traffic controllers in other air traffic facilities who have less familiarity with the airspace,

and thus, possibly less situational awareness. Air traffic controllers who must climb stairs to the top of a 200-foot air traffic control tower because of an elevator outage may find functioning equipment when they finally arrive, but they are not in the best physical or mental condition to perform their duties. These challenges inject risk into the system.

Outages are more likely as the NAS ages and the number of modifications needed for each operational system increases. Risks compound as multiple NAS systems experience failures. Failures of independent but operationally interdependent systems will multiply into even larger service and safety risks. For example, with interrupted surveillance coverage in the airspace due to radar failures, the work of the air traffic controllers becomes significantly more burdensome and complex as they route traffic around these outages or reduce the number of aircraft flying through the airspace, causing delays due to traffic management initiatives[42] to manage risk.

Outages in surveillance, communications, and navigation systems cause disruptions, along with already strained aeronautical information distribution technologies, challenging the FAA's ability to manage small disruptions without resorting to wide, sweeping delays and traffic stoppages. When compounded by a predicted increase in telecommunications outages due to an underfunded migration to IP-based telecommunications and without additional tools to mitigate these impacts and respond to system effects, system risk could quickly reach unacceptable levels.

Modernization Challenges

In some respects, the challenge of aging equipment was worsened by the FAA's NextGen initiative, which was announced in 2007 and included seven key programs.[43]

All of the NextGen programs, except NAS Voice Switch, which was terminated, enabled the system to grow in capacity. However, while the FAA estimates that the aviation community has received $10.6 billion in benefits, these programs collectively have not produced the kind of efficiency gains intended when the programs were launched. This shortfall resulted both from a slower funding stream than anticipated and slower equipage among aviation users. Looking at some of the programs individually illuminates the challenges the FAA has in modernizing facilities and equipment and mitigating risk in the system.

New air traffic control automation systems, the Standard Terminal Automation Replacement System (STARS) and En Route Automation Modernization (ERAM), were enablers, intended to facilitate the new capabilities of other NextGen programs. They created an essential foundation for systems such as Automatic Dependent Surveillance – Broadcast (ADS-B), a digital airplane position identification and broadcast system, which could never have been implemented without STARS and ERAM. Both replaced multiple older systems, and as replacements, they were successful. Neither ERAM nor STARS were intended or scoped for extension to four offshore automation facilities, specifically in Anchorage, Guam, Honolulu, and San Juan. Those facilities continue to utilize a much older enroute automation system, MicroEARTS, which is operating significantly beyond its intended life.

[42] Federal Aviation Administration. (2023, April 20). Order JO 7210.3DD *Facility Operation and Administration*. https://www.faa.gov/air_traffic/publications/atpubs/foa_html/chap18_section_7.html.

[43] See Appendix E, which lists each of the NextGen programs along with a description.

Furthermore, when ERAM acquisition began, the FAA was required to budget and schedule the entire development and implementation of the 10-year program. This, in turn, forced the contractor to develop specifications in 2004 for a system that would be delivered a decade later. As a result, ERAM contained 10-year-old technology when it was fully implemented, required re-baselining twice during rollout, and necessitated a "tech refresh" within five years of implementation.

New technology and financial investments like ADS-B and GPS Performance Based Navigation (PBN) enabled less dependence on and use of legacy navigation and surveillance, but the FAA has not been able to capitalize significantly on the potential of these technologies because politically powerful users have not obtained the equipment or modified their operations to enable them to stop relying on legacy navigation systems. The FAA has consistently been prohibited from restricting the airspace, or even parts of it, to users equipped to utilize the FAA's most efficient technologies.

ADS-B provides a superior surveillance technology over secondary radar (beacons), and although not mandated in the benefit case, industry participants expected that ADS-B would substantially replace radar antecedents and lead to massive cost reductions. Currently, only two full systems from terminal areas (primary and secondary radars) have been decommissioned to date. Part of the explanation for this is that some airspace users, the military in particular, did not equip all of their aircraft with the technology, which prevented ADS-B from being a uniform surveillance solution. Another significant source of value from ADS-B was the "ADS-B In" element of the technology, which would have ushered in a new world of flight deck information and situational awareness. "ADS-B Out" technology, which broadcast airplane position, was mandated and equipage for GA aircraft was subsidized, but limited support was given to ADS-B In, especially with regard to advancing future application technologies like "Interval Management,"[44] which uses ADS-B In capabilities to precisely manage spacing between aircraft, and "In Trail Procedures," which allow aircraft to achieve flight level changes in procedural airspace more frequently. While many GA users have employed ADS-B In equipment more widely and have derived more benefit generally from ADS-B, airlines have gotten little benefit from their large avionics' investments. ADS-B, which cost the FAA $700 million to build and now costs $174 million to operate each year, has made tens of thousands of square miles of airspace, mainly in the Gulf of Mexico and Alaska, effectively surveillance controlled airspace and eliminated the need for air traffic controllers in these areas to rely on procedural separation. Beyond that benefit, it did not provide additional services to users outside of Alaska and the Gulf of Mexico. It also did not materially reduce any other expenses for the FAA.

Data Communications[45] and System Wide Information Management (SWIM)[46] were both technologies with enormous transformational potential, with the capability to provide more accurate, digital predeparture and enroute clearances to operators and supply the flight deck with a wide array of operational information to heighten situational awareness. Their gradual rollouts also offered the opportunity for incremental learning and development. In both cases, implementation has been

[44] Federal Aviation Administration. (2023, February 7). *ADS-B Interval Management*. https://www.faa.gov/air_traffic/technology/adsb/pilot/ima.
[45] Data Communications: The application of a 20-year-old flight deck communication technology to enable controllers to communicate digital departure and enroute routing information directly to the flight deck without risk of oral miscommunication.
[46] SWIM: Technology to aggregate and disseminate aviation information, such as weather, to aviation participants in all sectors.

inconsistent and unpredictable due to budget constraints, government shutdowns, and the impact of COVID.

Reducing dependency on legacy systems and services and enabling the FAA to decommission old systems and shed the associated costs was a key expectation, though not necessarily a requirement, of the NextGen vision. The most burdensome aspect of the NextGen programs to the FAA, though, is not their operational underperformance, but the additional expense of creating and maintaining those systems with little incremental efficiency; rarely did the costs of the older systems they were intended to replace ever go away. Few legacy systems or obsolete equipment have been eliminated, so NextGen thus far is an additional burden on an already inadequate and stretched FAA budget.

The largest portions of the FAA's limited modernization budget has been spent on NextGen technologies, while the bulk of the FAA's inventory and assets, both by number of items and locations as well as asset value, have been left in a sustainment mode. In other words, only enough funds are expended on these assets to keep them running, with no updates or replacements. From FY 2018 to FY 2022, of an aggregate Facilities & Equipment Budget of $16.407 billion, $5.202 billion was spent on new technology and $7.275 billion was spent on basic sustainment.

As a result, most of the legacy NAS systems continue to age and become more costly and difficult to maintain due to lack of investment in holistic change-out or modernization. These systems compete for a very limited capital budget to remain operational. The resulting complexity and recurring partial sustainment alone are extremely costly.

Four long-term realities explain the large-scale failure of new technology replacement and equipment obsolescence:

1. Inadequate and unpredictable funding: This is discussed further in the funding section, however, in real terms, the FAA's budget for new technology has shrunk since the NextGen program was initially announced in 2007. Further, with interruptions in funding caused by government shutdowns and continuing resolutions, even the dollars appropriated do not go as far in completing programs as when originally approved. Interruptions in funding cause stand-downs and re-starts, introducing uncertainty, inefficiency, and additional costs. The efficient use of tax dollars and the preservation of benchmarked schedules are nearly impossible when the budgetary appropriation for a program is not known until mid-way through the budget year.
2. User resistance to decommissioning old technology or consolidating facilities: Congressional intervention has consistently prevented the decommissioning of outmoded and rarely used navigational aids. Few air traffic facility consolidations contemplated by Section 804 of the FAA Modernization and Reform Act of 2012 brought to Congress were allowed to move forward. Multiple FAA air traffic facilities, especially enroute centers which are among the oldest of the FAA's operational facilities, can only be replaced by consolidating facilities at a vastly lower cost than attempting to individually replicate them.
3. Governmental processes that discourage iterative modernization: Most technology companies modernize their technical platforms through constant, iterative improvements. New technologies are implemented gradually, with regular recalibration and continuous backward

compatibility so that programs can begin before every element of the final plan is resolved, leading to faster time to market and the opportunity to make changes as lessons are learned during the process. The rollout of 5G by the cellular operators is a good example of this process. Because the FAA is not allowed to renew iteratively, its technology becomes obsolete before a significantly over-sized project is approved and funded. This results in built-in obsolescence due to the time required to design the comprehensive program.

4. Inflexible acquisition culture: In a world of fewer fatalities, the greatest safety gains come from addressing precursors to events. Due to severely constrained budgets, only the riskiest situations are addressed. Experts who have examined surface risk agree that wider deployment of surface detection and surveillance technology is needed. Surface surveillance systems are installed in only 44 of approximately 500 commercial airports that could benefit from this technology. Despite the consensus, the FAA has been unable to move forward with any enhancement because of internal FAA insistence on the "perfect" solution and the inability of such a solution to satisfy conventional cost-benefit tests. Much needed technology at the FAA falls victim to the adage that, "the perfect is the enemy of the good." Programs are so heavily engineered that they then fail cost-benefit tests or cannot secure comprehensive funding.

Recommendation FET.1: Create a structure to provide independent, expert counsel to the Secretary of Transportation and Congress regarding the decommissioning or consolidation of installations and staffed facilities[47] to facilitate system safety and efficiency, similar to the Base Realignment and Closure (BRAC) Commission.[48] This can be accomplished either through amendment of Section 804[49] of the FAA Modernization and Reform Act of 2012 or otherwise by another statute. To ensure that decisions serve the national interest (versus user or local interests), include a provision whereby the Secretary and Congress can only disapprove an entire list of proposed changes, not object to individual recommendations.

Recommendation FET.2: Using independent experts, compile a list of staffed facilities that, because of age and functionality, represent the greatest safety and efficiency risk to the NAS. Presented to Congress within two years, this list will facilitate a risk-based decision regarding which NAS improvements to fund by providing: 1) a clear explanation of the risk presented by each facility, 2) the probable cost of replacing or substantially renewing each facility, 3) an analysis of opportunities to combine similar facilities in order to increase efficiency with substantially the same quality of service, and 4) a delineation of the initial steps required to begin an incremental approach to addressing each facility.

Recommendation FET.3: Using independent experts, compile a list of technical installations and systems that, because of age or other status (e.g., incomplete deployment, inability to maintain, or obsolescence), represent the greatest safety risk to the NAS. Presented to

[47] This includes air traffic control facilities, navigational aids, and other fixed equipment.

[48] BRAC is the congressionally authorized process DoD has used to reorganize its base structure to more efficiently and effectively support U.S. forces, increase operational readiness, and facilitate new ways of doing business. The BRAC Commission was established by the Defense Base Realignment and Closure Act of 1990.

[49] Section 804 of the FAA Modernization and Reform Act of 2012 (P.L. 112-95), as amended by section 510 of the FAA Reauthorization Act of 2018 (P.L. 115-254), requires the FAA to develop a plan for realigning and consolidating facilities and services in an effort to reduce capital, operating, maintenance, and administrative costs, where such cost reductions can be implemented without adversely affecting safety.

Congress within two years, this list will facilitate a risk-based decision regarding which NAS improvements to fund by providing: 1) a clear explanation of the risk presented by each item, 2) the probable cost of addressing each item, and 3) a delineation of the initial steps required to begin an incremental approach to addressing each item.

Recommendation FET.4: Alter the FAA's budgetary process (including requirements of the Office of Management and Budget and the FAA's Joint Resource Council), to authorize and fund technology renewal and replacement that adopts private industry's practice of iteration to the best solution. This recommendation will allow the FAA to delineate a technology end-state, and then budget, schedule, contract, and be funded by Congress in "useful segments,"[50] enabling iterative, multi-year system modernization that accommodates and incorporates technological advancements.[51]

All of these recommendations address managing risk in the system as it relates to staffed facilities, equipment installations, and technology systems. Authority exists under the Federal Aviation Administration Personnel Management System and Procurement Flexibility Act of 1995 to make acquisitions radically differently than today, yet this authority is rarely used. The FAA has the managerial capacity to identify new, appropriate facilities, equipment, and technology investments necessary to reduce risk in the NAS; the Agency simply needs to be adequately funded and unencumbered in its execution.

[50] Office of Management and Budget (OMB). (2023). Circular No. A-11 Principles of Budgeting for Capital Asset Acquisition. https://www.whitehouse.gov/wp-content/uploads/2018/06/app_j.pdf.

[51] In contract with current processes, which requires a complete budget and schedule benchmarking up front for the entire facility, technical installation, or system.

Funding

The FAA faces several interrelated funding challenges that negatively affect its ability to deliver critical air traffic services in an efficient and timely manner to the aviation industry and the flying public. Funding for air traffic services has essentially remained flat for the last five years, while demand for these safety-critical services has rebounded significantly from the lower air traffic levels seen during the pandemic. In addition, the proliferation of emerging entrants continues to add complexity in the air traffic system. This is *not* to say that the system is unsafe; however, system efficiency is suffering and funding challenges are eroding the margin of safety and increasing risk in the system, which is unsustainable over the long-term.

The FAA is funded primarily through the Airport and Airway Trust Fund (AATF), which was established in 1970 pursuant to the Airport and Airway Revenue Act of 1970. The AATF receives revenues from a variety of excise taxes paid by NAS users. The excise taxes are imposed on domestic passenger tickets, domestic flight segments, and international passenger arrivals and departures, and on purchases of air travel miles for frequent flyer and similar programs. In addition, taxes are imposed on air cargo waybills and aviation fuel purchases. The largest source of excise tax revenues is related to transportation of passengers. Revenues deposited in the AATF are subject to congressional appropriations annually and are included in the federal budget.

The AATF provides funds for four major FAA accounts.

1. Operations: The Operations account funds the administration, operation (including air traffic controller and technician staffing), maintenance, and repair of the NAS. The operations account also funds aviation safety oversight.
2. Facilities & Equipment: The Facilities & Equipment account provides for current infrastructure and the advancement of NextGen Air Traffic Control systems.
3. Research, Engineering, and Development: The Research, Engineering, and Development (RE&D) account funds the research and services that ensure a safe, efficient, and environmentally compatible air transportation system.
4. Grants-in-Aid for Airports: This account funds the FAA's Airport Improvement Program (AIP), which supports the development of a nationwide system of public-use airports to meet the current needs and the projected growth of civil aviation.

Currently, the AATF may cover both capital and operating costs. Since 1985, and likely well before then, it has provided all of the funding for two of FAA's four accounts, including the Facilities & Equipment account and the RE&D account.

The majority of the Operations account is also covered by the AATF, with some additional support from the General Fund.[52] General Fund support has ranged from 6 percent in FY 2019 to 16 percent in FY 2023. Largely as the result of lower AATF revenues due to the COVID-19 pandemic, General Fund

[52] The General Fund of the Government consists of assets and liabilities used to finance the daily and long term operations of the U.S. Government as a whole. Details on the composition of the General Fund can be found at fiscal.treasury.gov/general-fund/.

support for the Operations account reached a high of 44 percent in FY 2022. The entire Operations budget, whether funded from AATF or the General Fund, is subject to discretionary budget caps.

Starting in FY 2020, the FAA also received support from the Coronavirus Aid, Relief and Economic Security (CARES) Act, the American Rescue Plan, and the Infrastructure Investment and Jobs Act. Figure 8 below depicts FAA accounts and funding sources from FY 2019 to FY 2023.

ACCOUNT NAME	FY 2019 ACTUAL	FY 2020 ACTUAL	FY 2021 ACTUAL	FY 2022 ACTUAL	FY 2023 ENACTED
Operations	**$10,410,800**	**$10,630,000**	**$11,001,500**	**$11,414,100**	**$11,915,000**
General	$577,400	$111,000	$482,500	$5,000,000	$1,921,179
AATF	$9,833,400	$10,519,000	$10,519,000	$6,414,100	$9,993,821
Facilities & Equipment	**$3,000,000**	**$3,045,000**	**$3,015,000**	**$2,892,888**	**$2,945,000**
AATF	$3,000,000	$3,045,000	$3,015,000	$2,892,888	$2,945,000
Research, Engineering, & Development	**$191,100**	**$192,665**	**$198,000**	**$248,500**	**$255,000**
AATF	$191,100	$192,665	$198,000	$248,500	$255,000
Grants in Aid for Airports	**$3,850,000**	**$3,750,000**	**$3,750,000**	**$3,904,180**	**$3,908,555**
Contract Authority (AATF)	$3,350,000	$3,350,000	$3,350,000	$3,350,000	$3,350,000
General Fund Appropriation	$500,000	$400,000	$400,000	$554,180	$558,555
Supplemental	$0	**$10,000,000**	**$10,009,000**	**$100,000**	$0
CARES Act	$0	$10,000,000	$0	$0	$0
CRSSA	$0	$0	$2,000,000	$0	$0
American Rescue Plan	$0	$0	$8,000,000	$0	$0
Employee Leave Fund	$0	$0	$9,000	$0	$0
Hurricane Relief	$0	$0	$0	$100,000	$0
IIJA Authority	$0	$0	$0	**$ 5,000,000**	**$ 5,000,000**
Facilities and Equipment	$0	$0	$0	$ 1,000,000	$ 1,000,000
Airport Infrastructure Grants	$0	$0	$0	$ 3,000,000	$ 3,000,000
Airport Terminal Program	$0	$0	$0	$ 1,000,000	$ 1,000,000
AATF	*$16,374,500*	*$17,106,665*	*$17,082,000*	*$12,905,488*	$16,543,821
GF	*$1,077,400*	*$511,000*	*$882,500*	*$5,554,180*	$2,479,734
FAA Account Total	**$17,451,900**	**$17,617,665**	**$17,964,500**	**$18,459,668**	**$19,023,555**
Supplemental Total	**$0**	**$10,000,000**	**$10,009,000**	**$100,000**	$0
IIJA Authority Total	**$0**	**$0**	**$0**	**$5,000,000**	**$5,000,000**
GRAND TOTAL	**$17,451,900**	**$27,617,665**	**$27,973,500**	**$23,559,668**	**$24,023,555**

Figure 8: FAA Accounts & AATF Funding from FY 2019 to FY 2023 (in thousands of dollars)

Insufficient Funding Levels

At current funding levels, the FAA has insufficient resources to carry out its portfolio of responsibilities. While it is true that the FAA has seen significantly increased funding overall in recent years, the vast majority of that funding has been directed toward airport infrastructure, which does not contribute directly to the safety of air traffic operations. While these airport infrastructure investments may be needed, they do not address the critical funding needs for operation of the air traffic system through the ATO and the AOV, both of which are dependent on the Operations account and the Facilities & Equipment account.

Operations: The FAA Operations account is the largest part of the FAA annual budget. This account includes funding for FAA staff, contracts, utilities, and other operating expenses.

Funding for the operations account has grown modestly from a level of $10.4 billion in FY 2019 to $11.9 billion in FY 2023, averaging 3.5 percent growth per year. Ninety-three percent of the Operations account covers expenses related to pay and benefits, contracts, and other operating expenses.

Pay and benefits account for 70 percent of total Operations account expenditures. Since 2019, FAA staffing onboard has grown from 38,346 at the end of FY 2019 to 39,436 at the end of FY 2023. However, this growth in staff has been primarily in the Aircraft Certification Service, the Flight Standards Service, and a new office to oversee Organization Designation Authorizations[53] granted to manufacturers. During the same period, air traffic personnel staffing declined slightly from 28,712 at the end of FY 2019 to 28,209 at the end of FY 2023, but ATO staffing is well below the FY 2017 level of 29,571.

Contracts account for 23 percent of Operations account expenditures. These are, for the most part, fixed costs covering telecommunications, contract towers, flight service stations, utilities, controller training contracts, spare parts, and technology license and operations costs.

While funding levels have covered cost increases in pay and benefits, funding for contracts has been under pressure. This leaves no margin for unpredictable and extraordinary costs, such as those associated with the implementation of cleaning protocols during the COVID-19 pandemic, the increased training necessitated by the rapid air traffic recovery since the pandemic, or the rising costs of telecommunication and utility services.

Facilities & Equipment: This account pays for investments in facilities, technology modernization, radar and surveillance systems, and safety-critical warning systems at airports. Funding for the Facilities & Equipment account has been flat to declining, from a level of $3.0 billion in FY 2019 to $2.95 billion in FY 2023 in nominal terms, which means that in real terms, the Facilities & Equipment budget has been declining significantly.

For over 15 years, the funding level for the Facilities & Equipment account has hovered around $3 billion, and consequently has not kept up with inflation. It fell as low as $2.5 billion when the constraints of sequestration required the FAA to work with stakeholders to prioritize the FAA's operations at the expense of its capital funding and reached a high of $3.25 billion in FY 2018.

The Infrastructure Investment and Jobs Act, referred to as the Bipartisan Infrastructure Law (BIL), included $5 billion for the improvement of air traffic facilities. This will help fund the much-needed replacement of some FAA facilities (such as towers), infrastructure systems, and subsystems and benefit hundreds of FAA equipment buildings. For example, the FAA is planning to replace 30 air traffic

[53] Federal Aviation Administration. (2023, January 9). Organization Designation Authorization (ODA) Office. https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/oda#:~:text=The%20FAA%20established%20the%20Organization,on%20behalf%20of%20the%20agency.

control towers by 2030 with the BIL. The funding can also narrowly be used for replacement of some older ground navigation aids at airports with newer ones.

This much-needed funding was a boost to the FAA to begin addressing years of NAS facility neglect and a growing maintenance backlog. However, the funding is limited, restricted to areas such as building structures, heating/cooling, water, and power. The surge is not able to be used, by law, for modernizing the tens of thousands NAS equipment technologies, such as radars, weather, automation, communications, and many navigation aids. These technologies, which underpin air traffic operations, must be funded from the base Facilities & Equipment account, where they compete with dozens of other priorities.

BIL can be used to replace ARTCCs and TRACON facilities, but due to a number of factors, the replacement of these larger sites is much more complex than replacing a tower. To replace a ARTCC or TRACON, the FAA would have to ensure seamless operations by building a mirror facility to support continued air traffic operations during the transition. This involves building new, large scale systems and installing them in a newer building to avoid extended outages in the large and busy airspace these facilities serve. Replacement of these larger ARTCCs and TRACONs would also require contracts, that do not currently exist, for the development of additional parts for major systems like ERAM, STARS, etc.

The tradeoffs required to fund most of the FAA's capital needs within a $3 billion budget has undermined the FAA's sustainment efforts, as well as investments in the replacement and modernization of NAS systems. As noted in the Facilities, Equipment, and Technology section, the current NAS contains aging legacy systems that have far exceeded their planned service life, resulting in soaring sustainment costs, increased vulnerabilities, and a diminished ability to meet the demands of modern aviation. While the FAA has introduced a number of NextGen programs that are nearing completion, these investments have come at the expense of adequate funding for core NAS sustainment. From FY 2010 to FY 2020, there was on average $397 million per year allocated for NAS sustainment. While from FY 2021 to FY 2024 the average increased to $703 million, that amount still left significant unfunded requirements. Years of underinvestment means that even at the $3.5 billion level requested by the Administration for FY 2024, there remains over $450 million of unfunded requirements in FY 2025 for sustaining or replacing legacy systems.

Underfunding the sustainment of the NAS introduces risk into the system. Less than a year ago, an outage of the NOTAM System forced the FAA to stop all domestic departures temporarily, causing delays for 32,578 flights. This incident is an example of the risk and disruption that can result from the FAA being forced to reactively respond to a problem with a NAS system, rather than take a proactive approach to resilience and reliability.

The difficulty of funding NAS sustainment is tied to the challenge of funding NextGen. The FAA introduced NextGen in 2007 as a pivotal step toward modernization, but it quickly became evident that the cost of implementing this forward-looking system was substantial. NextGen was funded at $138 million in FY 2007 and increased to a high of just over $1 billion in FY 2020. This growth in the NextGen budget occurred under a Facilities & Equipment funding level that still hovered at $3 billion.

Furthermore, as legacy systems continued to age and their performance declined, the FAA faced dual pressures to fund the increasing cost of an aging infrastructure while simultaneously developing the new systems.

Finally, the FAA needs to plan for future investments in the NAS that cannot be accommodated under current funding levels without further undermining existing programs. For example, the need to replace over 500 surveillance radars operating at airports and enroute locations across the country represents a huge capital liability for the FAA. The average age of these systems is greater than 30 years. It is currently estimated to cost at least $3.2 billion for terminal radar replacements for 226 systems, which is less than half of the overall inventory of radars. Without more funding, the FAA will be unable to address these needs.

Funding Instability

Recent Congresses have been plagued by recurring gridlock, which undermines the FAA's ability to effectively perform its mission. There were 23 short-term extensions to FAA's authorizing legislation between 2007 and 2012, including a two-week lapse in 2011. In the Spring of 2013, budget sequestration resulted in the "save money" furloughs[54] of FAA air traffic employees, including air traffic controllers and technicians. Due to significant delays in the NAS, Congress passed the Reducing Flight Delays Act, which allowed the transfer of funds from other FAA accounts to the operations budget to prevent more furloughs or the closing of FAA and contract air traffic control towers.[55] FAA employees did not receive compensation for days while furloughed. Later that year, an impasse in Congressional budget negotiations shut down the FAA for 16 days. In late 2018 and 2019, the FAA was affected by a partial government shutdown lasting 35 days, the longest shutdown in history. On September 30, 2023, the FAA's authorization lapsed, and the Agency continues to operate under a short-term extension set to expire on December 31, 2023. Finally, the FAA, along with the rest of the Federal government narrowly avoided yet another shutdown on September 30, 2023, and is operating under a continuing resolution set to expire on November 17, 2023.

This stop-and-start process in Congress has resulted in the disruption of critical activities, notably including the hiring and training of air traffic controllers. It has also slowed down the implementation of key technology modernization programs, delayed thousands of flights, and held up billions of dollars of airport infrastructure investments. This situation makes it extremely difficult for the FAA to effectively conduct long-term business planning and execution.

Limited Management Discretion Over Funding Priorities

Congress has exercised authority over the FAA in a manner that often reflects competing interests of multiple stakeholders and limits the FAA's ability to prioritize its responsibilities and fulfill the safety mission under constrained budgets. For example, as previously discussed, the FAA has found it difficult to consolidate facilities under Section 804 as well as to decommission certain legacy systems due to

[54] A "save money" furlough is typically a "non-emergency" furlough in that the agency has sufficient time to reduce spending and therefore give adequate notice of its specific furlough plan and how many furlough days will be required.

[55] During the week of April 21-27, 2013, when the furloughs were first implemented, they caused flight delays to nearly triple (compared to the same weeks in 2012 and 2014), before Congress passed the Reducing Flight Delays Act of 2013, which authorized the transfer funds from other FAA budget lines to its Operations (OPS) budget in order to prevent reduced operations and controller staffing for the rest of the fiscal year.

objections raised and Congressional direction to do otherwise. Unless the FAA has the ability to decommission old systems and consolidate installations and facilities, the Agency remains unable to achieve savings and efficiencies enabled by modernization.

AATF Revenue Sources Do Not Account for All Aviation Business Models

As described above, the AATF receives revenues from a variety of excise taxes including domestic passenger tickets, domestic flight segments, and international passenger arrivals and departures, and on purchases of air travel miles for frequent flyer and similar programs. In addition, taxes are imposed on air cargo waybills and aviation fuel purchases. These differently-calculated taxes do not fall proportionately on all airspace users. The AATF tax rates were last updated in 1990,[56] but the underlying structure has been in place much longer. Since then, a significant evolution in the aviation and aerospace industry has occurred, both in users and industry revenue models.

At present, NAS users such as commercial space companies and UAS operators, as well as planned advanced air mobility providers do not pay into the AATF nor are there any plans for them to do so. With these operations expected to be a growing share of future NAS operations, the imbalance of those contributing versus those benefitting from FAA services will continue to grow. In addition, airline revenue models have evolved, resulting in a diminishing share of passenger revenues subject to the airline ticket tax. For example, ancillary fees, such as those charged for checked baggage, ticket changes, and food are not subject to the ticket tax.

While the FAA and the air traffic system have experienced chronic underfunding of needed technology investments, facility maintenance, and operational needs, the underlying cause is structural. Therefore, SRT recommendations are focused on structural changes needed to provide the FAA with the resources and flexibility needed to carry out its important safety mission.

At present, while the majority of FAA funding is covered by the AATF, expenditures are still subject to appropriations *and* subject to federal budgetary caps on government expenditures. In effect, the AATF is not fully used for aviation purposes and AATF balances are often carried over from year to year. Instead of supporting aviation, these balances offset expenditures elsewhere in the federal budget and appear to reduce budget deficits overall.

> **Recommendation F.1:** Exempt appropriations funded by the AATF for the FAA Facilities & Equipment and Operations accounts from federal budgetary caps up to the amount of revenue received into the AATF the previous fiscal year.

This recommendation would not force Congress to fully use AATF revenues, but would remove the constraint imposed by discretionary budget caps. There is precedent for this budgetary treatment for trust fund expenditures for capital programs. In 2020, the CARES Act included a provision which enabled this treatment for the Harbor Maintenance Trust Fund.[57]

[56] The Trust Fund tax rates were last updated in 1990 as part of the Omnibus Budget Reconciliation Act of 1990, but the underlying structure has been in place much longer.

[57] Harbor Maintenance Trust Fund, 26 U.S. Code § 9505 (2020). https://www.law.cornell.edu/uscode/text/26/9505.

The SRT recommends extending this budgetary treatment to the FAA Operations account as well. As part of this, the General Fund support for the Operations Account should be eliminated. The effect would be an Operations account fully funded by user fees, a self-sustaining government service. This further supports the argument that these expenditures should not be subject to the same budgetary treatment as programs supported by the General Fund.

Under current AATF formulas and collections, these changes would ensure that maximum funding from the AATF is made available to the FAA annually. It will, however, also be necessary to rethink the sources of revenue that contribute to the AATF as well as the tax rates and funding levels overall to ensure sufficient and sustainable funding levels for the FAA's safety-critical systems and operations.

As described earlier, the current structure of excise taxes and formulas for the AATF have been in existence for over 30 years. During that time, there have been significant changes in the aviation and aerospace industry and the use of the NAS. Commercial space launch activity has expanded exponentially, UAS service providers represent a growing segment of aviation, and the nascent advanced air mobility industry is poised to launch in the coming years. None of these user groups currently contribute to the AATF.

Currently, most of the receipts into the AATF are from taxes on commercial air transportation. A review of how best to fund the AATF should be commissioned to make recommendations to the Administration and to Congress regarding options for how the AATF should be funded in the future. This review should consider the needs of the FAA and levels of funding required to support them as well as the appropriate mix of revenue sources.

> **Recommendation F.2:** Update Airport and Airway Trust Fund funding sources to account for FAA funding needs and changes in the aviation and aerospace use of the NAS.

Following a 35-day government shutdown from December 2018 to January 2019, both the U.S. House of Representatives and the U.S. Senate introduced identical bills.[58] These bills, which were not signed into law, would have ensured a stable, predictable funding stream for the FAA to continue its mission during a future government shutdown, protecting all four FAA budget lines[59] and preventing hiring and training stoppages and suspensions. Although the bills were ultimately not approved, the widespread bipartisan support they received demonstrates broad Congressional interest in ensuring the continuity of FAA services.

> **Recommendation F.3:** Based on recommendations F.1 and F.2, exempt the FAA from the operational effect of federal government shutdowns.

These recommendations are essential to address needed funding levels and to avoid disruption of FAA operations. In addition, the FAA also requires stable authorizations to meet its safety-critical mission. The SRT urges Congress to complete work to reauthorize the FAA and to ensure long-term

[58] Aviation Funding Stability Act of 2019, U.S. H.R. 1108, 116th Cong. (2019-2020).
[59] Operations; Facilities & Equipment; Research, Engineering, and Development; and Grants-in-Aid to airports (Airport Improvement Program), AIP.

authorizations are completed in a timely manner in the future. A 24/7, 365 days/year safety-critical operation, which supports 5.2 percent of national Gross Domestic Product, should never experience a lapse in appropriations or authorization.

Conclusion

The NAS is complex, and as defined by ICAO, safety depends on the management of risk. A healthy, sustainable NAS must be fully funded, staffed, and equipped with the proper processes, infrastructure, and technologies.

Generally, the ATO employs robust policies, procedures, and programs to manage safety risk and enjoys a just safety culture. However, the FAA continues to be asked to do more with less in an already strained system, and the series of serious incidents in early 2023 illuminate significant challenges to the provision and safety oversight of air traffic services. These challenges, in the areas of process integrity, staffing, and facilities, equipment, and technology, all have ties to inadequate, inconsistent funding.

NAS safety is a shared responsibility. While there are no easy, short-term fixes to the challenges in the system, addressing risk in the NAS requires urgent action by all stakeholders. The FAA must work collaboratively with policymakers and industry to immediately begin:

- Strengthening FAA organizational structures, institutionalizing roles and responsibilities, and advancing a proactive, data-driven safety culture
- Accurately projecting and investing in hiring, training, and certification of the workforce.
- Sustaining and modernizing NAS infrastructure and investing in technology to maximize safety and efficiency.
- Adequately and consistently funding and authorizing the FAA to facilitate the provision and safety oversight of 24/7, 365 days/year operations.

Implementing these recommendations will ensure a healthy, sustainable NAS and enable delivery of the level of safety that the flying public deserves and has come to expect from the U.S. aviation system.

Summary of Recommendations

Process Integrity

PI.1: Establish AOV as dual reporting entity, with accountability to both the FAA Administrator and the AVS Associate Administrator. This direct connectivity will resolve any organizational imbalance, while retaining AOV within AVS ensures the application of best practices and standardized administration throughout all FAA safety oversight organizations.

PI.2: In furtherance of PI.1 above, clarify, update, and communicate AOV's authority, roles, and responsibilities, and update all applicable orders, including FAA Order 1100.161 *Air Traffic Safety Oversight*.

PI.3: Considering the criticality of predictive methods to the reduction of risk in the NAS and the important role of government-industry collaboration in maintaining and improving safety, CAST stakeholders must expedite the evolution to a proactive, predictive approach to detect and manage risk before serious incidents or accidents occur.

PI.4: Establish and maintain an ATO-wide, LOSA-themed program, to facilitate a proactive, predictive approach to risk management. Creating such a program requires time and significant resource investments to evolve processes and the safety culture.

PI.5: Work with General Aviation (GA) stakeholders to 1) explore current reporting and data collection programs and 2) enhance and strengthen or supplement the existing voluntary, non-punitive safety reporting program for GA to facilitate robust data analysis and a proactive, predictive approach for detecting and managing risk before serious incidents or accidents occur. Key elements of the program should align with other voluntary, non-punitive safety reporting programs currently in use in other aviation sectors.

Staffing

S.1: Develop a defensible, flexible, predictive air traffic controller staffing model that determines system and individual facility needs. The model will assist in the appropriate distribution of the workforce, especially as it relates to internal movement by air traffic controllers to higher level facilities as well as into traffic management, staff support, and supervisory promotions. It should also take into account the efficient placement of Academy graduates.

S.2: Consider a moratorium for a defined period of time aimed at reducing internal movements and promotions to evaluate the net effect on CPC numbers and overtime usage.

S.3: Examine the air traffic controller trainee hiring, selection, and placement process as well as withdrawals/failures to determine whether the processes and tools used are appropriately screening and determining the candidates best suited for the air traffic controller profession.

S.4: Launch a supplemental preparatory program with a goal of preparing selectees for success in air traffic controller training. Demographic and economic implications must be considered in the development of the prepatory program to ensure diversity.

S.5: Use available non-randomized means (e.g., Air Traffic Skills Assessment (ATSA) testing data) to identify candidates with skillsets better suited for enroute or terminal air traffic controller duties.

S.6: Examine the FAA Academy culture, training atmosphere, and teaching methods to determine if these factors contributed to the loss of candidates that might otherwise be successful at an air traffic facility. If deficiencies are found, implement corrective actions.

S.7: Improve the capacity at the Academy through increased hours of operation and a larger contingent of instructors, a reduction in unnecessary and outdated curriculum, and the offering of courses or training at other suitable FAA facilities or through virtual platforms.

S.8: Continue the National Training Initiative and ensure the impediments to training identified in the associated reports are evaluated and robust mitigation strategies are developed.

S.9: Acquire and implement state-of-the-art training systems, including high-fidelity simulators of similar capability as airline industry simulators, with a goal of reducing the CPC certification time by 30 percent. The FAA should complete the acquisition and installation of the TSS upgrades as quickly as possible, leveraging its existing, unique acquisition authority.[60]

S.10: Increase air traffic controller workforce awareness about what occurs on the flight deck (e.g., the impact of frequent, complex or late clearances on workload), single pilot operations, and aircraft performance characteristics.

S.11: Develop a tool (expanding the Terminal Enterprise Application and Management capabilities) to assist facility schedulers in automatically identifying CPCs, CPCs-in-training, and partially qualified developmentals (trainees) with outstanding required training prior to their placement on the schedule. Information should be pushed to (not pulled by) operations supervisors regarding non-compliance of refresher and recurrent training, mandatory briefing items, and sector/position proficiency.

S.12: Advance a flexible technical operations staffing model to accurately determine system needs by accounting for a workforce that maintains and installs systems and equipment as well

[60] Federal Aviation Administration Personnel Management System and Procurement Flexibility Act of 1995.

as performs other duties. This model should enable robust training, fatigue mitigation, and "bubble" staffing (advanced hiring).

Facilities, Equipment, and Technology

FET.1: Create a structure to provide independent, expert counsel to the Secretary of Transportation and Congress regarding the decommissioning or consolidation of installations and staffed facilities[61] to facilitate system safety and efficiency, similar to the Base Realignment and Closure (BRAC) Commission.[62] This can be accomplished either through amendment of Section 804[63] of the FAA Modernization and Reform Act of 2012 or otherwise by another statute. To ensure that decisions serve the national interest (versus user or local interests), include a provision whereby the Secretary and Congress can only disapprove an entire list of proposed changes, not object to individual recommendations.

FET.2: Using independent experts, compile a list of staffed facilities that, because of age and functionality, represent the greatest safety and efficiency risk to the NAS. Presented to Congress within two years, this list will facilitate a risk-based decision regarding which NAS improvements to fund by providing: 1) a clear explanation of the risk presented by each facility, 2) the probable cost of replacing or substantially renewing each facility, 3) an analysis of opportunities to combine similar facilities in order to increase efficiency with substantially the same quality of service, and 4) a delineation of the initial steps required to begin an incremental approach to addressing each facility.

FET.3: Using independent experts, compile a list of technical installations and systems that, because of age or other status (e.g., incomplete deployment, inability to maintain, or obsolescence), represent the greatest safety risk to the NAS. Presented to Congress within two years, this list will facilitate a risk-based decision regarding which NAS improvements to fund by providing: 1) a clear explanation of the risk presented by each item, 2) the probable cost of addressing each item, and 3) a delineation of the initial steps required to begin an incremental approach to addressing each item.

FET.4: Alter the FAA's budgetary process (including requirements of the Office of Management and Budget and the FAA's Joint Resource Council), to authorize and fund technology renewal and replacement that adopts private industry's practice of iteration to the best solution. This recommendation will allow the FAA to delineate a technology end-state, and then budget, schedule, contract, and be funded by Congress in "useful segments,"[64] enabling iterative, multi-

[61] This includes air traffic control facilities, navigational aids, and other fixed equipment.
[62] BRAC is the congressionally authorized process DoD has used to reorganize its base structure to more efficiently and effectively support U.S. forces, increase operational readiness, and facilitate new ways of doing business. The BRAC Commission was established by the Defense Base Realignment and Closure Act of 1990.
[63] Section 804 of the FAA Modernization and Reform Act of 2012 (P.L. 112-95), as amended by section 510 of the FAA Reauthorization Act of 2018 (P.L. 115-254), requires the FAA to develop a plan for realigning and consolidating facilities and services in an effort to reduce capital, operating, maintenance, and administrative costs, where such cost reductions can be implemented without adversely affecting safety.
[64] Office of Management and Budget (OMB). (2023). Circular No. A-11 Principles of Budgeting for Capital Asset Acquisition. https://www.whitehouse.gov/wp-content/uploads/2018/06/app_j.pdf.

year system modernization that accommodates and incorporates technological advancements.[65]

Funding

F.1: Exempt appropriations funded by the AATF for the FAA Facilities & Equipment and Operations accounts from federal budgetary caps up to the amount of revenue received into the AATF the previous fiscal year.

F.2: Update Airport and Airway Trust Fund funding sources to account for FAA funding needs and changes in the aviation and aerospace use of the NAS.

F.3: Based on recommendations F.1 and F.2, exempt the FAA from the operational effect of federal government shutdowns.

[65] In contract with current processes, which requires a complete budget and schedule benchmarking up front for the entire facility, technical installation, or system.

Appendix A. SRT Membership and Biographies

Organization		Member
1	Former FAA Administrator (AOA)	Michael Huerta (SRT Chairperson)
2	Former National Aeronautics Space Administration (NASA) Administrator	Charles Bolden (SRT Member)
3	Former Air Line Pilots Association, Int'l (ALPA) President	Capt. Tim Canoll (SRT Member)
4	Former NATCA Executive Vice President	Patricia Gilbert (SRT Member)
5	Former FAA Chief Operating Officer	David Grizzle (SRT Member)
6	Former National Transportation Safety Board (NTSB) Chairperson	Robert Sumwalt (SRT Member)

MICHAEL HUERTA

Michael Huerta is an aviation and aerospace consultant who served as FAA Administrator from 2013 to 2018. He joined the agency in 2010 as Deputy Administrator.

During his tenure at the FAA, Huerta redefined the FAA's regulatory relationship with the aviation industry to achieve greater levels of safety through increased collaboration and widespread sharing of data. He led the agency's efforts to modernize the nation's air traffic control system while preparing the way for the safe integration of commercial space operations and small unmanned aircraft systems. Prior to joining the FAA, Michael served as Group President of the Transportation Solutions Group of Affiliated Computer Services, Inc. (ACS).

Huerta also served in executive positions at the Salt Lake Organizing Committee for the Olympic Winter Games of 2002, the U.S. Department of Transportation, the Port of San Francisco and the New York City Department of Ports, International Trade and Commerce.

He holds a BA from the University of California, Riverside and an MPA from the Princeton School of Public and International Affairs.

CHARLES BOLDEN JR.

Charles F. Bolden Jr. is a retired Marine Corps Major General and former NASA Administrator who has dedicated his life in service to the United States, working to secure our Nation's security, prosperity, and guiding efforts to explore our universe and better understand our fragile planet.

In 2009, President Barack Obama appointed Bolden to be the 12th NASA Administrator, making him only the second astronaut to hold that position. Bolden oversaw the transition from the Space Shuttle system to a new era of exploration, fully focused on the International Space Station and aeronautics technology development.

During his career as a NASA astronaut, Bolden flew on four Shuttle missions, logging more than 680 hours in space.

A graduate of the U.S. Naval Academy, Bolden flew more than 100 combat missions during the Vietnam War. He later served as a test pilot for the Naval Air Test Center's Systems Engineering and Strike Aircraft Test Directorates. After completing his service as an astronaut in 1994, he served as the Assistant Commandant of Midshipmen at the Naval Academy, and in 1998 as the Commanding General of the Marine Expeditionary Force attached to Operation Desert Thunder in Kuwait.

Bolden holds a Master of Science Degree in Systems Management from the University of Southern California.

TIM CANOLL

Capt. Tim Canoll has an expansive background in aviation as a U.S. Navy pilot for more than 24 years and a Delta Air Lines pilot for more than 30 years. He also served as president of the Air Line Pilots Association, International (ALPA), which represents more than 69,000 professional airline pilots in the United States and Canada and is the largest non-governmental aviation safety organization in the world.

As ALPA's chief executive and administrative officer, Canoll was responsible for overseeing the daily operations of the Association and as the chief spokesman for the union, advancing pilots' views in the airline industry before Congress, Parliament, government agencies, airline and other business executives and in media interviews. Canoll was a strong advocate for aviation safety, security and fair labor practices.

Canoll has served on numerous committees and councils including the FAA's Drone Advisory Committee, Next Gen Advisory Committee, the AFL/CIO Executive Council and the Federal Reserve Bank of Atlanta Organized Labor Advisory Council.

He has flown numerous military and civilian aircraft and holds Airline Transport Pilot, Commercial Pilot, and Remote Pilot certificates. He is a 1982 graduate of the U.S. Naval Academy and a former Navy Reserve F/A-18 Strike Fighter Squadron commanding officer. He retired from the U.S. Navy Reserve as a captain in 2008.

PATRICIA GILBERT

Trish Gilbert serves as the International Federation of Air Traffic Controllers' Association (IFATCA) Executive Vice President Americas. She previously served 12 years as the National Air Traffic Controllers Association's (NATCA) Executive Vice President, where she helped lead and oversee NATCA's comprehensive efforts to build successful working relationships with government and industry.

She has served on numerous boards and committees, including the FAA's Drone Advisory Committee, the FAA/NATCA Collaborative Steering Committee, the Aero Club of Washington Board of Governors,

the National Aeronautic Association Board of Directors, Director of the NATCA Charitable Foundation, the Vice Chair of the International Transport Workers' Federation (ITF) Air Traffic Services Committee and IFATCA's representative to the Remotely Piloted Aircraft Systems panel (RPASP) at the International Civil Aviation Organization (ICAO).

In May 2020, U.S. Transportation Secretary Elaine Chao appointed Gilbert to the new Women in Aviation Advisory Board (WIAAB). In March 2022, the WIAAB transmitted the Report "Breaking Barriers for Women in Aviation: Flight Plan for The Future" to the FAA Administrator and the U.S. Congress.

Gilbert worked 21 years at the FAA's Houston Air Route Traffic Control Center prior to taking on her Washington, DC role at NATCA.

DAVID GRIZZLE

David Grizzle is an aerospace industry veteran who has served as an airline executive and several key roles at the FAA, including Chief Operating Officer of the Air Traffic Organization.
Grizzle spent 23 years at Continental Airlines, where he ran the airline's marketing, strategic planning and international alliances divisions.

In 2004, Grizzle served the State Department for 14 months as part of the U.S. Government's reconstruction efforts in Afghanistan, overseeing aviation, roads, power and communication reconstruction projects. After his time with the State Department, Grizzle returned to Continental where he founded the Customer Experience division.

In 2009, Grizzle was appointed by President Obama to serve as Chief Counsel for the FAA. Until his departure in 2013, Grizzle's roles within the FAA included Acting Deputy Administrator and Chief Operating Officer.

He earned a bachelor's degree in government and a law degree from Harvard University.

ROBERT L. SUMWALT

Robert L. Sumwalt is Executive Director of the Boeing Center for Aviation and Aerospace Safety at Embry-Riddle Aeronautical University, where he also serves as Distinguished Fellow in Aviation Safety. In that role, he oversees research and development of the Center, and sets the overall strategy.

Previously, Sumwalt served as Chairman, Vice Chairman, and Member of the U.S. National Transportation Safety Board (NTSB), where he served from August 2006 to June 2021.
Sumwalt was a pilot for 32 years, including 24 years with a major U.S.-based international airline.

He earned an undergraduate degree from the University of South Carolina and a Master of Aeronautical Science (with Distinction) from Embry-Riddle Aeronautical University, with concentrations in aviation/aerospace safety systems and human factors aviation systems.

Appendix B. SRT Process and Stakeholder Engagement

- **May 5, 2023**: SRT virtual kickoff meeting
- **May 2023:** Virtual briefings from the FAA regarding ATO and AVS roles, responsibilities, and processes and deep-dives into aviation incidents and events
- **June 20-21, 2023:** In-person meeting and site visit at ATCSCC and Potomac TRACON in Warrenton, VA
- **July 17-19, 2023:** In-person meeting at FAA Flight Standards District Office in Orlando, FL
- **Aug 21-23, 2023:** In-person meeting at the ARTCC in Fort Worth, TX
- **August 11-18, 2023:** Virtual meetings with stakeholders including representatives of labor groups, passenger and cargo carriers, the business and general aviation community, and industry groups
- **Sept 18-20, 2023:** In-person meeting during the 2023 NATCA Communicating for Safety (CFS) conference in Las Vegas, NV
- **October 2023:** Virtual SRT meetings to draft and discuss the report
- **November 2023:** Presentation and discussion of identified challenges and recommendations with FAA leadership followed by delivery of the final SRT report

Appendix C. Incidents Leading to the Formation of the SRT

- Philadelphia (PHL) ATCT – October 15, 2022, at 5:17 p.m. EDT – Philadelphia (PHL) ATCT
- North Las Vegas (VGT) ATCT – November 18, 2022, at 10:27 a.m. PST
- Kennedy (JFK) ATCT – January 13, 2023, at 8:44 p.m. EST
- Chicago ARTCC (ZAU) – January 25, 2023, at 11:33 p.m. CST
- Chicago ARTCC (ZAU) – January 25, 2023, at 11:56 p.m. CST
- Austin (AUS) ATCT – February 4, 2023, at 6:40 a.m. CST
- Miami (MIA) ATCT – February 14, 2023, at 7:09 a.m. EST
- Dallas Fort-Worth (DFW) ATCT – February 16, 2023, at 11:01 p.m. CST
- Sarasota (SRQ) ATCT – February 16, 2023, at 8:59 p.m. EST
- Burbank (BUR) ATCT – February 22, 2023, at 6:55 p.m. PST

Appendix D. Responsibilities of AOV

Extracted from FAA Order 1100.161A Air Traffic Safety Oversight, dated February 28, 2020.

1. AOV. AOV has the following responsibilities for safety oversight of the ATO:

a. Establish, approve, and/or accept the safety standards as outlined in Chapter 4 of this order.

b. Establish, implement, and maintain a Credentialing Program to issue, amend, and remove credentials of ATO Safety Personnel, examiners, and others, as appropriate.

c. Manage the Control Tower Operator Certificate Program.

d. Establish requirements for the ATO Safety Management System (SMS) in accordance with International Civil Aviation Organization (ICAO) Annex 11; Annex 19 to the Convention on International Civil Aviation, Air Traffic Services; and ICAO Document 4444, *Procedures for Air Navigation Services, Air Traffic Management*.

e. Approve the ATO SMS Manual and any changes to the SMS Manual.

f. Monitor ATO compliance with the safety standards and the SMS. AOV will:

(1) Require ATO to provide reporting, as requested, of the status of the SMS, including information on safety occurrences/data;

(2) Primarily use audit techniques to monitor ATO compliance with the safety standards and the SMS, but is free to use direct sampling (e.g., inspections) or other methods to determine the level of compliance;

(3) Have access to any and all records in ATO that AOV believes are useful in determining ATO compliance with the safety standards and the SMS;

(4) Monitor corrective actions taken by ATO to assure resolution of identified safety hazards. AOV's and ATO's focus is on continuous improvement and zero accidents, incidents, and near misses; and

(5) Through AVS, provide the FAA Administrator with essential information about ATO compliance with safety standards and the SMS.

g. Approve the following actions prior to implementation by ATO:

(1) Controls that are defined to mitigate or eliminate initial or current high-risk hazards.

(2) Changes or waivers to provisions of handbooks, orders, and documents, including Order 7110.65, *Air Traffic Control*, current edition, that pertain to separation minima.

(3) NAS equipment availability program and any changes to the program.

h. Authority to issue Letters of Correction, Warning Notices, and Safety Directives requiring ATO to make a change, stop a procedure, or alter a practice where there is a safety concern that warrants such an action.

i. Review for concurrence any proposed responses to safety recommendations involving ATO from the National Transportation Safety Board, the Office of the Inspector General or the General Accounting Office.

j. Review for concurrence any notifications of differences ATO proposes to file with ICAO.

k. Serve as the primary interface with ATO on safety issues, integrating the input from other AVS components and providing ATO with the official AVS position on those issues.

l. Share safety data with ATO.

Appendix E. NextGen Programs

- En Route Automation Modernization (ERAM): A replacement of an automation system for enroute air traffic control that was intended to be the platform on which new capability technology could be developed, but which contained ten-year old technology when it was declared fully implemented).
- Standard Terminal Automation Replacement System (STARS): An updating of the automation system in TRACON facilities.
- Automatic Dependent Surveillance – Broadcast (ADS-B): A digital position identification and broadcast system based on hundreds of ground stations and cockpit transmitters that can provide airplane position to FAA surveillance control facilities with a fraction of the latency of conventional radar.
- Data Communications (DataComm): Application of a 20-year-old flight deck communication technology to enable controllers to communicate digital departure and enroute routing information directly to the flight deck without risk of oral miscommunication.
- System Wide Information Management (SWIM): Technology to aggregate and disseminate aviation information, such as weather, to aviation participants in all sectors.
- NAS Voice Switch: A system intended to enable every facility to communicate instantaneously with every other facility.
- Time-Based Flow Management: A system developed by NASA to enable controllers to space aircraft by time, enabling air traffic control more nimbly to manage congestion and irregular operations through departure control processes rather than having aircraft enter holding patterns while airborne.
- Metroplex Performance-Based Navigation: A massive process to redesign terminal airspace to utilize Required Navigational Performance technology to compress approach and departure routings to utilize the airspace more efficiently, increase capacity and reduce flight times.

Appendix F. Acronyms

AATF	Airport and Airway Trust Fund
ADS-B	Automatic Dependent Surveillance - Broadcast
AF	Availability Factors
AIP	Airport Improvement Program
AOV	Air Traffic Safety Oversight Service
ANSP	Air Navigation Service Provider
ARTCC	Air Route Traffic Control Center
ASIAS	Aviation Safety Information Analysis and Sharing
ASDE-X	Airport Surface Detection Equipment, Model X
ASRS	Aviation Safety Reporting System
ATC	Air Traffic Control
ATO	Air Traffic Organization
ATSA	Air Traffic Skills Assessment
AVS	Aviation Safety Organization
CAA	Civil Aviation Authority
CARES	Coronavirus Aid, Relief and Economic Security
CAST	Commercial Aviation Safety Team
CEDAR	Comprehensive Electronic Data Analysis and Reporting
CIC	Controller-in-Charge
CPC	Certified Professional Controller
ERAM	En Route Automation Modernization
FAA	Federal Aviation Administration
FENS	FAA Enterprise Network Services
FTI	Federal Telecommunications Infrastructure
GA	General Aviation
ICAO	International Civil Aviation Organization
IP	Internet Protocol
NAS	National Airspace System
NATCA	National Air Traffic Controllers Association
NEXGEN	Next Generation
NOTAM	Notice to Air Missions
NTI	National Training Initiative
ODA	Organization Designation Authorization
PBN	Performance Based Navigation
PIREP	Pilot Report
RE&D	Research, Engineering, and Development
RNAV	Area Navigation
SDR	Service Delivery Point
SMS	System Management System
SRT	Safety Review Team
STARS	Standard Terminal Automation Replacement System

STOL	Short Takeoff and Landing
SWIM	System Wide Information Management
SYSIR	Systemic Issue Review
TEAM	Terminal Enterprise Application and Management
TEM	Threat and Error Management
TRACON	Terminal Radar Approach Control
TSS	Tower Simulator System
UAS	Uncrewed Aircraft System