



Testimony

Before the Subcommittee on Aviation,
Committee on Transportation and
Infrastructure, House of Representatives

For Release on Delivery
Expected at 10:00 a.m. ET
Tuesday, March 4, 2025

AIR TRAFFIC CONTROL

FAA Actions Urgently Needed to Modernize Systems

Statement of Heather Krause, Managing Director,
Physical Infrastructure

GAO Highlights

Highlights of [GAO-25-108162](#), a testimony before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives

Why GAO Did This Study

FAA is responsible for the safety and efficiency of more than 45,000 flights daily. Critical to that effort are numerous ATC systems that enable air traffic controllers to monitor weather, conduct navigation and surveillance, manage communications, and more. However, ATC systems have been aging, and GAO has long reported that FAA has faced challenges upgrading those systems and implementing its multi-billion-dollar modernization of air traffic management, referred to as NextGen. Addressing these challenges is particularly important given that FAA expects to manage an increasingly congested and complex airspace in the future.

This testimony discusses (1) the sustainability of FAA’s air traffic control systems, and FAA’s efforts to manage and oversee system modernization; (2) FAA’s efforts to implement NextGen; and (3) actions needed for improvement. It draws primarily from GAO’s September 2024 [report](#) on unsustainable ATC systems and November 2023 [report](#) on NextGen.

What GAO Recommends

GAO made nine recommendations to FAA that remain open. These include actions to improve oversight, project baselining, and adherence to program management leading practices. Urgent attention is needed to fully address these and the other remaining recommendations.

View [GAO-25-108162](#). For more information, contact Heather Krause at (202) 512-2834 or krauseh@gao.gov, or Kevin Walsh at (202) 512-6151 or walshk@gao.gov.

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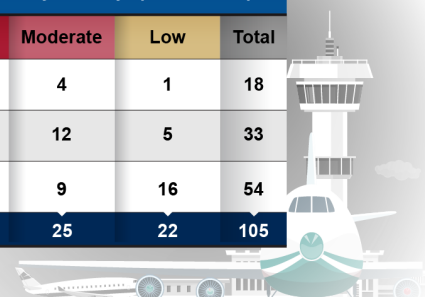
FAA Actions Urgently Needed to Modernize Systems

What GAO Found

A shutdown of the national airspace in 2023 due to the outage of an aging air traffic control (ATC) system prompted the Federal Aviation Administration (FAA) to conduct an operational risk assessment to evaluate the sustainability of all ATC systems. Of the 138 systems, 51 (37 percent) were deemed unsustainable by FAA and 54 (39 percent) were potentially unsustainable. Many unsustainable and potentially unsustainable systems have critical operational impacts on the safety and efficiency of the national airspace. In September 2024, GAO found several weaknesses in how FAA manages investments to modernize these systems. FAA’s progress has also been slow, taking years to establish cost, schedule, and performance baselines for investments that GAO selected for its review. As of May 2024, completion dates for planned investments for systems that GAO deemed especially concerning were at least 6 to 10 years away. Four such systems did not have associated investments.

Air Traffic Control (ATC) System Sustainability and Operational Impact Ratings

Sustainability rating		Number of FAA systems by operational impact			
		Critical	Moderate	Low	Total
A	Unsustainable due to shortages in spares and shortfalls in funding.	13	4	1	18
B	Unsustainable due to shortfalls in funding or capability.	16	12	5	33
C	Potentially unsustainable due to possible shortfalls in funding or capability.	29	9	16	54
Total		58	25	22	105



Sources: FAA 2023 operational risk assessment; serz72/stock.adobe.com (illustration). | GAO-25-108162

A November 2023 GAO report found that since 2018, FAA had made mixed progress on its multi-decade effort to modernize air traffic management (i.e., the Next Generation Air Transportation System (NextGen)). Across four critical program areas GAO assessed (e.g., navigation and communications), FAA met some milestones for deploying systems but missed others, some by several years. The COVID-19 pandemic, which delayed system testing and other activities, contributed to those missed milestones. GAO found that closer adherence to five of nine program management leading practices, such as those related to life-cycle cost estimates and risk mitigation strategies, could better position FAA to manage the program and realize safety and efficiency benefits.

GAO’s 2023 and 2024 reports made recommendations to FAA to help address shortcomings in the agency’s management of NextGen and ATC system investments. For example, weaknesses exist in FAA’s risk mitigation approach. GAO recommended FAA develop a risk mitigation plan for NextGen and report to Congress on its risk mitigation efforts for all unsustainable and critical systems. Doing so would help FAA systematically examine risk mitigation options and increase transparency. FAA has fully addressed two GAO recommendations: conducting root cause analysis on programs that exceed baselines and managing investments in segments. However, critical risk mitigation recommendations and others remain open.

Chairman Nehls, Ranking Member Cohen, and Members of the Subcommittee:

I am pleased to participate in today’s hearing on the Federal Aviation Administration’s (FAA) efforts to modernize the air traffic control system. The U.S. national airspace system (NAS) handles more than 45,000 flights per day, and FAA’s mission is to promote the safe, orderly, and expeditious flow of traffic in the national airspace.¹ In addition to FAA, key aviation stakeholders—airlines, airports, general aviation, business aviation, aircraft manufacturers, and aviation professionals—work together to help ensure these results. FAA anticipates continued growth in airspace demand, forecasting that air travel will increase annually on average by 6.2 percent.

Over the past several decades, FAA has experienced challenges with maintaining aging air traffic control systems and implementing its modernization program, known as the Next Generation Air Transportation System (NextGen). Such challenges have included unavailability of parts, reduced technical expertise in outdated technologies, unanticipated system requirements, and growth in airspace demand.

My statement today discusses the results of our recent reports examining FAA’s maintenance and modernization of the U.S. air traffic control system. Specifically, this statement describes (1) the sustainability of FAA’s air traffic control systems, and FAA’s efforts to manage and oversee system modernization; (2) FAA’s status and challenges implementing NextGen;² and (3) actions needed to improve FAA’s modernization efforts. It draws primarily from our September 2024 report on the condition of numerous IT systems that FAA uses for air traffic control (ATC) and our November 2023 report on FAA’s NextGen

¹The national airspace system is a shared network of U.S. airspace; air navigation facilities, equipment, and services; airports or landing areas; aeronautical charts, information, and services; rules, regulations, and procedures; technical information; and manpower and material.

²In our 2023 report on NextGen, we compared FAA NextGen program management actions with nine leading practices based on the Project Management Institute’s (PMI) standards related to a program’s management of scope, cost, and schedule performance, and to independent review of performance. GAO, *Nuclear Waste Cleanup: DOE Could Improve Program and Project Management by Better Classifying Work and Following Leading Practices*, [GAO-19-223](#) (Washington, D.C.: Feb. 19, 2019). PMI, *The Standard for Program Management*®, Fourth Edition (Newtown Square, PA: 2018). The Program Management Improvement Accountability Act of 2016 required the Office of Management and Budget to adopt and oversee implementation of government-wide standards, policies, and guidelines for program and project management in executive branch agencies.

program. Detailed information on the objectives, scope, and methodology for this work can be found in the issued reports.³

We conducted the work on which this statement is based in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

To ensure FAA meets its mission, air traffic controllers rely on numerous complex systems that support a variety of air traffic control operations, including navigation, weather, surveillance, communications, and air traffic optimization. Figure 1 provides a simplified view of air traffic control within the national airspace.

³GAO, *Air Traffic Control: FAA Actions Are Urgently Needed to Modernize Aging Systems*, [GAO-24-107001](#) (Washington, D.C.: Sept. 23, 2024) and *Air Traffic Control Modernization: Program Management Improvements Could Help FAA Address NextGen Delays and Challenges*, [GAO-24-105254](#) (Washington, D.C.: Nov. 9, 2023).

Figure 1: Simplified Overview of Air Traffic Control within the National Airspace



Sources: GAO based on Federal Aviation Administration information; GAO (airplane, background); AlexZel/stock.adobe.com (buildings); TarikVision/stock.adobe.com (towers). | GAO-25-108162

FAA has had long-standing challenges with maintaining aging ATC systems.⁴ FAA officials have cited various reasons for the challenges, including the unavailability of parts and retirement of technicians with expertise in maintaining the aging systems. In addition, there has been

⁴See examples of reports we have previously issued on NextGen and air traffic control modernization: GAO, *Air Traffic Control Modernization: Progress and Challenges in Implementing NextGen*, [GAO-17-450](#) (Washington, D.C.: Aug. 31, 2017); *Air Traffic Control Modernization: Management Challenges Associated with Program Costs Hinder NextGen Implementation*, [GAO-12-223](#) (Washington, D.C.: Feb. 16, 2012); and *Next Generation Air Transportation System: Progress and Challenges Associated with the Transformation of the National Airspace System*, [GAO-07-25](#) (Washington, D.C.: Nov. 13, 2006).

dramatic growth in airspace demand since the older systems were initially implemented.

These challenges can impact FAA's ability to meet its mission. For example, the Notice to Airmen system, which enables air traffic controllers to provide real-time updates to aircraft crew about critical flying situations relating to weather, air traffic congestion, and safety, is over 30 years old. On January 11, 2023, the system became temporarily unavailable to users. To ensure safety, FAA grounded all departing aircraft for about 2 hours to fix the system. The outage caused over 1,300 flight cancellations and almost 10,000 flight delays throughout the day. Some airlines took several days to fully recover.

FAA's efforts to improve and modernize air traffic management are not new. In February 1982, FAA released its first comprehensive plan for improving ATC services. FAA faced challenges with modernization efforts and, in 2003, Congress required FAA to begin planning for and coordinating the transformation to NextGen. In November 2023, we reported that FAA had spent over \$14 billion on NextGen from fiscal years 2007 through 2022.⁵ FAA had projected in 2018 that, in total, NextGen would cost the federal government and industry at least \$35 billion through 2030.

FAA's ultimate goal for NextGen has been to improve air traffic management and decrease aviation congestion by strategically planning, managing, and optimizing flights from departure gate through arrival gate (what FAA refers to as trajectory-based operations). Trajectory-based operations expand air traffic controllers' ability to manage aircraft based on their altitude, latitude, and longitude by incorporating a fourth element of time. By incorporating time in air traffic management, controllers will be able to know where and at what time an aircraft will be at key points along its route before the aircraft takes off, factoring in conditions and operator inputs. According to FAA, transitioning to trajectory-based operations will help controllers sequence aircraft from departure through arrival; improve

⁵Our review of FAA's congressional budget justifications for fiscal years 2012 through 2023 showed that the agency's budget requests and actual budget for NextGen—including system deployment—have remained relatively constant at about \$1 billion annually. We used the actual budget amount FAA reflected in its congressional budget justification for each fiscal year, however for fiscal year 2022, we used the continuing resolution budget amount FAA reported, because the actual budget was not yet available at the time the congressional budget justification was developed.

efficiency, especially during times when the national airspace is congested; and provide economic savings to aircraft operators.

Despite the expected benefits, we have reported since the early days of NextGen that FAA has experienced a range of challenges with NextGen implementation. Those challenges include (1) software development complexity, (2) unanticipated system requirements, (3) insufficient stakeholder involvement during system development, and (4) unanticipated events, such as government shutdowns.⁶ These challenges have contributed to significant schedule delays for implementing new NextGen programs and system enhancements. Consequently, while FAA initially planned to complete NextGen by 2025, as of November 2023, it did not anticipate doing so until at least 2030.

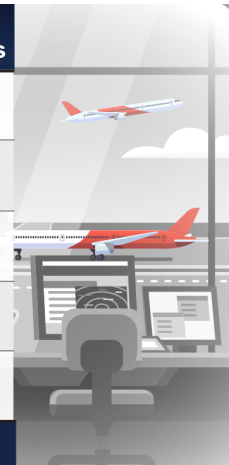
About One-Third of ATC Systems Are Unsustainable, and Gaps Exist in FAA Accountability and Oversight

FAA's reliance on a large percentage of aging and unsustainable or potentially unsustainable collection of ATC systems introduces risks to FAA's ability to ensure the safe, orderly, and expeditious flow of air traffic. After the 2023 outage of its Notice to Airmen system, FAA conducted an operational risk assessment to evaluate the sustainability of all its ATC systems. The assessment determined that of its 138 systems, 51 (37 percent) were unsustainable, and 54 (39 percent) were potentially unsustainable (see fig. 2). Of the 105 unsustainable or potentially unsustainable systems, 73 were deployed over 20 years ago, with 40 being deployed over 30 years ago, and six of those deployed over 60 years ago.

⁶[GAO-12-223](#).

Figure 2: Federal Aviation Administration (FAA) Air Traffic Control (ATC) System Sustainment Ratings

Rating	Definition of sustainment rating	Number of ATC systems
A	System is considered unsustainable because it has significant shortages in spares, shortfalls in sustainment funding, and little or no technology refresh funding is available.	18
B	System is considered unsustainable because it has significant shortfalls in sustainment funding or capability.	33
C	System is considered potentially unsustainable because it has possible shortfalls in sustainment funding or capability, but technology refresh funding is available.	54
D	System has no sustainment issues, has adequate spares, and sustainment funding.	19
E	System has no sustainment issues; too early for technology refresh.	14
		Total 138

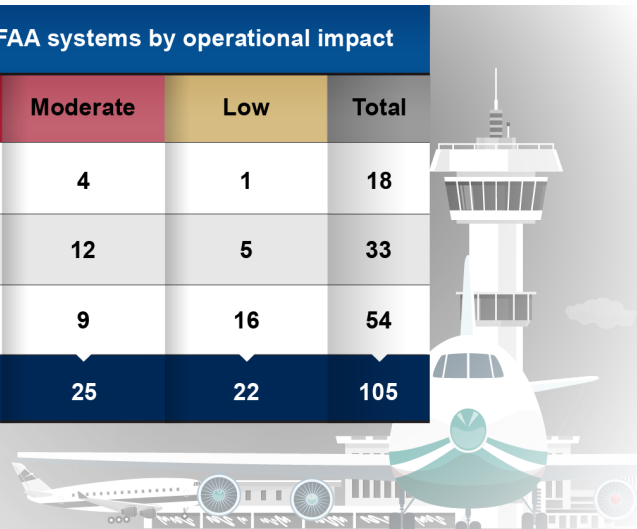


Sources: GAO analysis of FAA 2023 operational risk assessment; iconicbestiary/stock.adobe.com (illustration). | GAO-25-108162

Also, of the 105 unsustainable and potentially unsustainable systems, 58 had critical operational impacts on the safety and efficiency of the national airspace (see fig. 3). These 58 systems are comprised equally of unsustainable and potentially unsustainable systems (29 each). FAA also reported that of the 105 unsustainable and potentially unsustainable systems, 74 systems (70 percent) face one or more challenges that are historically problematic of aging systems. These challenges include no longer meeting mission needs, difficulty finding spare parts for the systems, and limited technical staff with expertise in repairing the aging system.

Figure 3: Federal Aviation Administration (FAA) Air Traffic Control (ATC) System Criticality by Sustainment Rating

Sustainability rating		Number of FAA systems by operational impact			
		Critical	Moderate	Low	Total
A	Unsustainable due to shortages in spares and shortfalls in funding.	13	4	1	18
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Sources: FAA 2023 operational risk assessment; serz72/stock.adobe.com (illustration). | GAO-25-108162

We reported that FAA had 64 ongoing investments to modernize 90 of the 105 unsustainable and potentially unsustainable systems; however, the agency has been slow to modernize the most critical and at-risk systems.⁷ Specifically, when considering age, sustainability ratings, operational impact level, and expected date of modernization for each system, we determined that as of May 2024, FAA had 17 systems that were especially concerning. Of these 17 systems, the investments for 13 were not planned to be completed for at least 6 years, and in some cases were not to be completed for at least 10 years. In addition, because FAA did not have ongoing investments associated with the remaining four systems, it is unknown when those systems will be modernized or replaced.

While the results of FAA's 2023 operational risk assessment were intended to prioritize investment decisions, FAA did not prioritize or establish near-term plans to modernize the most critical and at-risk systems identified in the assessment. In addition, 11 of the 20 investments that we selected for review in our September 2024, report

⁷The investments varied significantly in the extent to which they will modernize each of the 90 systems. For example, 18 investments were considered new investments or software enhancements that will provide new systems or capabilities, whereas 42 investments were intended to provide technology refreshes, additional quantities, or maintenance services, but would not provide new systems or capabilities.

were required (by FAA policy) to establish a cost, schedule, and performance baseline.⁸ However, our review showed that while FAA policy indicates that pre-baselined investments receive limited oversight, FAA had been slow to establish baselines for those applicable investments. Specifically, for the 11 investments, FAA took an average of 4 years and 7 months to establish baselines. In addition, for one investment, the agency took 6 years and 8 months. As of May 2024, two other investments that FAA initiated over 6 years ago did not have baselines.

FAA officials acknowledged the gaps in accountability of investments that have not been baselined and stated that they were in the initial phase of planning an improvement. As a result, the agency will continue to experience protracted lengths of time in establishing investment baselines. In addition, the agency will be unable to diligently track the execution of plans or mitigate risks.

In our September 2024 report, we also found that FAA had not provided oversight of ATC modernization investments consistent with the agency's acquisition management policy. Specifically, FAA's acquisition oversight council had not ensured that investments delivered functionality in manageable development and implementation segments, as it is charged to do by policy. Doing so has the potential to reduce risk and deliver capabilities more quickly. In addition, while the council held quarterly reviews for investments, it did not consistently monitor high risks associated with those investments. Moreover, for three selected investments, we found that the council reviewed some, but not all, required documentation prior to approving investments to proceed to the next life-cycle phase. FAA oversight officials also did not annually approve the business cases for the three investments, before submitting them to the Office of Management and Budget and the federal IT investment transparency website (IT Dashboard). Collectively, these oversight gaps limited FAA's ability to mitigate cost and schedule overruns, increased the risk of system failures, and may have led to less informed decision-making.

⁸The 20 investments were selected for our September 2024 report because they were among the most critical to ATC operations.

FAA Has Faced a Range of Challenges Implementing NextGen and Achieving Projected Benefits

In addition to supporting legacy systems that FAA eventually plans to replace, FAA's IT investments support systems that are part of its NextGen air traffic modernization efforts. In 2023, we assessed FAA's progress in implementing new and enhanced systems in four critical NextGen program areas: navigation, communications, surveillance, and automation.

We found that since 2018, FAA had made mixed progress meeting its implementation milestones across the four critical program areas, slowing the agency's efforts to improve the safety and efficiency of air travel and address growing congestion in the national airspace. For example, our November 2023 report found that FAA beat its milestone for deploying more reliable digital communication services at air traffic control towers by more than 2 years. However, FAA missed its September 2021 milestone for deploying initial digital communication services to all 20 facilities serving en route flights, and officials told us they anticipated completing deployment by May 2025. FAA also extended its milestones for deploying systems to improve flight spacing and sequencing. FAA reported that the COVID-19 pandemic—particularly travel and facility restrictions—played a large part in missed milestones, delaying, for example, system testing and air traffic controller training.

We also reported in 2023 that FAA faces challenges to NextGen implementation as the national airspace system continues to evolve. FAA and stakeholders we interviewed cited a range of challenges that likely will continue to affect the program, including the following.

- **Unanticipated events.** FAA and stakeholders recognized the need for the agency to be agile in responding to unanticipated events, like COVID-19, moving forward. FAA's experience during and after the pandemic showed, more broadly, that revising NextGen plans and implementation schedules in the wake of such events can be particularly challenging due to the interdependencies of many NextGen systems (e.g., schedule delays for one system cause delays for other systems).
- **Funding concerns.** FAA and stakeholders have raised concerns about funding for air traffic modernization efforts. Industry stakeholders have recently called for additional funds to expedite the modernization of the NAS and to exempt FAA from government

shutdowns to ensure a predictable funding stream.⁹ One stakeholder told us that FAA’s budget requests for implementing NextGen have not kept up with the growing costs of materials and labor over time. In addition, FAA and stakeholders told us that funding disruptions—due to sequestration, continuing resolutions, and government shutdowns—have led FAA to adjust numerous NextGen milestones.¹⁰ As discussed below, our recommendation to FAA to improve NextGen’s life-cycle costing efforts could help the agency navigate some of these funding issues.

- **Varying aircraft equipage.** NextGen capabilities depend on aircraft operators to install new avionics to realize benefits, such as flying more precise, fuel-efficient routes. FAA officials told us that, as of various points from September 2022 to April 2023, operators had achieved mixed levels of equipage for certain navigation, communications, and surveillance avionics. Mixed equipage can lead to operational inefficiencies. For example, aircraft not equipped with advanced avionics for navigation can cause slowdowns at certain airport hubs, even for aircraft that are equipped, since controllers must use procedures that align with each aircraft’s equipage.
- **Changing national airspace.** FAA faces several other challenges, such as cybersecurity risks, posed by a more internet-based, interconnected NAS; the integration of new airspace entrants (such as drones and commercial spacecraft); and potential spectrum interference from wider use of the fifth generation of mobile communication networks (5G), which could potentially interfere with aircraft navigation systems.

Finally, our assessment of FAA’s adherence to nine leading practices in program management—which is important to the success and effectiveness of major efforts such as NextGen—also found mixed results. Specifically, we found that the agency fully or substantially met four leading practices. For example, in line with two leading practices, FAA developed a lessons-learned database and a program roadmap with

⁹Airlines for America, letter to congressional committees regarding modernization of National Airspace System, February 19, 2025, accessed February 26, 2025, <https://www.airlines.org/news-update/industry-coalition-calls-for-additional-funding-to-improve-air-traffic-control-staffing-and-faa-modernization/>.

¹⁰For instance, FAA reported that the 2018-2019 government shutdown required it to adjust and replan approximately 81 of 186 government and industry NextGen milestones.

detailed plans and schedules for implementing NextGen and other acquisitions.

However, FAA partially met the remaining five leading practices. For example, while it had developed NextGen life-cycle cost estimates, it had not regularly updated those estimates. FAA officials said the pandemic prevented them from doing so, but the last update occurred in 2017, which preceded the pandemic by several years. FAA also conducts a number of risk mitigation activities, but it did not develop a NextGen risk mitigation plan that identified and prioritized the highest programmatic risks or contained detailed risk alternatives analyses to mitigate identified risks.

FAA Actions Needed to Address Aging Systems and Improve Air Traffic Control Modernization

Our recent work on the condition of IT legacy systems and FAA's overall efforts to modernize the air traffic control system yielded 11 recommendations to FAA for improvement. Detailed descriptions of the recommendations are contained in those reports.¹¹ Implementing these recommendations is critical to helping the agency manage risks and modernize the air traffic control while it addresses unsustainable systems.

We assessed FAA's program management practices and management of aging IT systems and found they both had shortcomings in risk mitigation. We recommended FAA develop and document a detailed risk mitigation plan that outlines how FAA identifies and prioritizes high-level risks to the NextGen program; provides alternatives for mitigation; and provides a rationale for the selected mitigation approaches. Relatedly, we recommended that FAA report to Congress on how it is mitigating risks of all unsustainable and critical systems that it identifies in annual operational risk assessments.

FAA agreed with both recommendations but has not yet taken action to address them. Action on these two recommendations would help FAA take a holistic look at the risks facing airspace modernization, and would better position FAA to systematically identify and assess a range of risk response options guided by the level of risk it is willing to accept. It would also better position FAA to explain the highest programmatic risks it is facing to Congress and other decision-makers and why its selected risk mitigation was the best approach. These actions would also promote

¹¹[GAO-24-107001](#) and [GAO-24-105254](#).

transparency, ensuring Congress has information on how FAA is mitigating risks related to critical ATC systems.

In addition, airspace modernization requires multi-year funds to sustain, modernize, and deploy the ATC systems and upgrades. While FAA's operational risk assessment was intended to help prioritize investment and funding decisions associated with ATC systems, our 2024 report found that FAA did not use it to do so. In addition, our 2023 report found that FAA had not consistently tracked overall NextGen programmatic life-cycle costs or such costs for individual NextGen programs. We recommended that FAA update its life-cycle cost estimates for NextGen overall, as well as measure performance against these estimates. This could help the agency assess its budget needs and better inform decision-makers about its long-term funding needs, key for the effective allocation of resources. Doing so could be particularly useful given that FAA and stakeholders have told us that funding uncertainty and budget concerns have been an ongoing challenge that has affected NextGen implementation and planning. FAA agreed with this recommendation but has not yet taken action to address it.

Other recommendations from these reports generally related to improvements needed in FAA's oversight of its acquisition process and its adherence to other program management leading practices. These included the need for root cause analysis on individual programs that exceed a specific threshold of cost, schedule, or performance variance and improved accountability in FAA's reporting on the status of program implementation.

Of the 11 recommendations we made, FAA concurred with 10 and partially concurred with one. FAA has since fully addressed two of the recommendations—one to update its Acquisition Management System policy to include a requirement to conduct root cause analyses, and another to develop guidance on organizing investments into manageable segments. FAA has also partially addressed one recommendation to ensure documentation is finalized prior to the acquisition oversight council approving investments to proceed. In total, nine of the 11 recommendations have not yet been fully addressed.

Implementation of a number of these recommendations will occur in a changing environment. The FAA Reauthorization Act of 2024 requires FAA to operationalize key NextGen programs and sunset its Office of NextGen by the end of 2025. The act also requires FAA to establish an office within FAA responsible for the modernization of the NAS, including

the developing an information-centric NAS, improving the interoperability of NAS systems and certain third-party systems, and developing an integrated plan for the future of the NAS. Additionally, it requires FAA to review all NAS legacy systems to determine the level of operational risk, functionality, and security, as well as the compatibility of those systems with current and future technology. As FAA moves in this direction, we believe that fully implementing our recommendations will target critical improvements needed for the new office to ensure the safe, orderly, and expeditious flow of air traffic.

Chairman Nehls, Ranking Member Cohen, and Members of the Subcommittee, this concludes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

GAO Contacts and Staff Acknowledgments

If you or your staff have any questions about this testimony, please contact Heather Krause, Managing Director of Physical Infrastructure at (202) 512-2834 or krauseh@gao.gov or Kevin C. Walsh, Director of Information Technology and Cybersecurity, at (202) 512-6151 or walshk@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement.

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