



December 2019

UNMANNED AIRCRAFT SYSTEMS

FAA Should Improve Drone-Related Cost Information and Consider Options to Recover Costs

GAO Highlights

Highlights of [GAO-20-136](#), a report to congressional committees

Why GAO Did This Study

UAS have the potential to provide significant social and economic benefits in the United States. FAA is tasked with safely integrating UAS into the national airspace. As the UAS sector grows, so do demands on FAA's staffing and other resources to develop, oversee, and enforce rules and systems needed to safely integrate UAS into the national airspace.

The FAA Reauthorization Act of 2018 provides for GAO to review issues related to establishing fee mechanisms for FAA to recover its costs related to UAS. This report discusses, among other things, 1) FAA efforts to track the costs of current and planned activities related to UAS and 2) key considerations and options for designing user fee mechanisms that could recover FAA's costs. GAO reviewed FAA documents and financial data for fiscal years 2017 through 2019 and industry reports on drone integration funding. GAO interviewed a non-generalizable sample of 22 UAS industry stakeholders, selected based on participation in FAA advisory groups or prior GAO knowledge to achieve a range of perspectives. GAO reviewed its guidance on designing effective fee mechanisms and OMB instructions to agencies about implementing user fees.

What GAO Recommends

GAO is recommending that FAA (1) implement a process to ensure UAS-related cost information is complete and (2) use available guidance on effective fee design to incorporate steps, as part of UAS integration planning, that will inform future fee design considerations. FAA concurred with the recommendations.

View [GAO-20-136](#). For more information, contact Heather Krause at (202) 512-2834 or krauseh@gao.gov.

December 2019

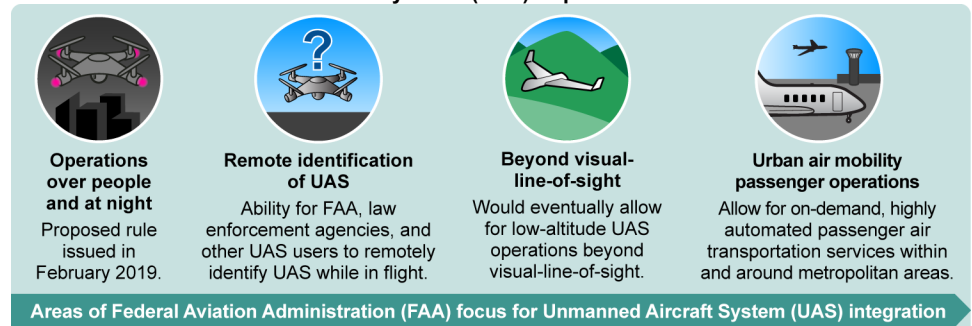
UNMANNED AIRCRAFT SYSTEMS

FAA Should Improve Drone-Related Cost Information and Consider Options to Recover Costs

What GAO Found

The Federal Aviation Administration (FAA) has undertaken actions to integrate unmanned aircraft systems (UAS or "drones") into the national airspace and has developed plans to allow for increasingly complex operations, including operations over people and beyond visual-line-of-sight and—eventually—passenger operations (see figure). However, FAA efforts to track related costs may result in incomplete information. FAA established a means of tracking the costs associated with some UAS-activities in certain offices, but many, if not all, FAA offices are doing work related to both manned aviation and UAS. FAA officials stated that they do not know or plan to assess the extent to which staff who split their time between UAS-activities and other responsibilities are tracking those costs. Furthermore, FAA's future costs to conduct oversight and provide air navigation services are largely unknown due to the changing nature of the industry and its early stage of development. Ensuring that information on UAS-related costs is complete and reliable now could put FAA in a better position to identify those costs as they evolve and possibly expand in the future.

Potential Future Unmanned Aircraft Systems (UAS) Capabilities



Source: GAO analysis of Federal Aviation Administration Fiscal Year 2019 Implementation Plan. | [GAO-20-136](#)

The extent to which FAA should recover costs for its UAS-related activities, and what fees are appropriate, are policy decisions for the administration and Congress. Accordingly, this report does not recommend any specific fee mechanism. Nonetheless, planning and consideration of policy goals, using available guidance on user fee design, could better position FAA to inform future decision-making on these issues as it proceeds with UAS integration. Since 2015, FAA has collected a registration fee from UAS operators, but most of FAA's UAS costs are not related to registration or covered by this fee. A stakeholder group established by FAA identified potential fee mechanisms and concluded in 2018 that the aviation industry, FAA, and Congress should identify revenue streams to help fund FAA's UAS activities. Further, GAO guidance and Office of Management and Budget instructions provide a framework, including information requirements, for designing effective user fees. FAA officials said that they have not considered user fee mechanisms as part of their planning because they have been awaiting this report to inform their decision-making. By using available guidance as part of its planning, FAA could incorporate steps, such as identifying costs and beneficiaries, which would benefit future fee design considerations.

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Abbreviations

| | |
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| DAC | Drone Advisory Committee |
| FAA | Federal Aviation Administration |
| FY | fiscal year |
| LAANC | Low Altitude Authorization and Notification Capability |
| NAS | National Airspace System |
| NASA | National Aeronautics and Space Administration |
| NextGen | Next Generation Air Transportation System |
| OMB | Office of Management and Budget |
| UAS | unmanned aircraft system |
| UTM | Unmanned Aircraft System Traffic Management |

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December 17, 2019

The Honorable Roger F. Wicker
Chairman
The Honorable Maria Cantwell
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate

The Honorable Peter A. DeFazio
Chairman
The Honorable Sam Graves
Ranking Member
Committee on Transportation and Infrastructure
House of Representatives

The emergence of unmanned aircraft systems (UAS)—commonly referred to as “drones”—has potential to provide significant social and economic benefits in the United States. In 2019, the Federal Aviation Administration (FAA) forecasted that by 2023, the commercial small UAS fleet (those UAS operated in connection with a business) will nearly triple from 277,000 to 835,000 and the recreational fleet (those UAS operated for personal interest and enjoyment) will increase from 1.25 million to 1.39 million.¹ Beginning with the FAA Modernization and Reform Act of 2012, FAA has been required to take actions to safely integrate UAS into the national airspace.² As the UAS sector grows, so could demands on FAA’s staffing and other resources required to develop, oversee, and implement the rules and systems needed for safe integration, such as air navigation services to manage UAS traffic. There is concern from aviation industry groups, however, that current funding levels for UAS integration efforts could (1) impede the swift integration of UAS into the national airspace and (2) erode resources available for FAA’s activities related to manned aviation. FAA’s operations are funded, in large part, by the Airport and Airway Trust Fund, which receives revenues from taxes and fees on airline tickets, aviation fuel, and cargo shipments paid by manned aircraft

¹Federal Aviation Administration, *FAA Aerospace Forecast Fiscal Years 2019-2039* (May 2019).

²See FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 332, 126 Stat. 11 (2012); FAA Extension, Safety, and Security Act of 2016, Pub. L. No. 114-190, 130 Stat. 615 (2016).

users. Currently, there is no comparable mechanism, other than a \$5 registration fee, to collect revenue from UAS users to cover FAA's UAS-related activities.³

The FAA Reauthorization Act of 2018 included a provision for us to review, among other things, issues related to establishing fee mechanisms for FAA to recover the costs of the regulation and safety oversight of UAS and the provision of air navigation services to UAS. We briefed your staff on our interim findings in April 2019 and subsequently provided a correspondence on these issues in May 2019. This report discusses:

- regulatory and oversight activities and air navigation services FAA has undertaken or planned for the safe integration of UAS into the national airspace;
- FAA's efforts to track the costs of its current and planned activities related to UAS; and
- key considerations and options for designing user fees that could recover FAA's costs for UAS regulation, oversight, and air navigation services.

In prior work, we have focused on small UAS (those weighing less than 55 pounds). The scope of this report, however, is broader and includes FAA activities and costs related to all civilian UAS, regardless of size. While other federal agencies, including the National Aeronautics and Space Administration (NASA) and the Departments of Defense and Homeland Security, have roles in integrating UAS into the national airspace, this report focuses only on FAA's role in UAS integration. Further, state and local governments and industry stakeholders have a role in developing and managing systems related to UAS and incur related costs, but these costs were beyond the scope of this review. Additionally, as the Congressional Research Service has reported, the issue of aviation user fees, including questions of the extent to which fees should be based on FAA's costs for specific services and who should pay for FAA aviation services, is a complex and contentious one.⁴ The scope

³According to FAA officials, since fiscal year 1998, Congress has included an appropriations act restriction expressly prohibiting the FAA from imposing any "new aviation user fees" without specific statutory authority. See e.g., Consolidated Appropriations Act, 2018, Pub. L. No. 115-141, 132 Stat. 348, 977 (2018).

⁴Congressional Research Service, *Aviation Finance: Federal Aviation Administration (FAA) Reauthorization and Related Issues*, Updated (Washington, D.C.: Apr. 21, 2008).

of this report is focused on potential mechanisms to recover the costs of FAA's activities related to UAS only; we have previously reported on proposals to alter the existing funding structure for manned aviation.⁵

To describe regulatory and oversight activities and air navigation services FAA has undertaken or planned for the safe integration of UAS into the national airspace, we reviewed FAA documents and plans for UAS integration including the Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap,⁶ Implementation Plan for Integration of Unmanned Aircraft Systems into the National Airspace System,⁷ and Unmanned Aircraft System (UAS) Traffic Management (UTM) Concept of Operations,⁸ among others. In addition, we consulted prior GAO work on UAS integration.

To examine FAA's efforts to track the costs of its current and planned activities related to UAS, we analyzed FAA financial data on obligations related to UAS for fiscal years 2017 through 2019. To determine the reliability of these data, we reviewed the data to identify obvious errors and missing data and interviewed appropriate FAA officials about related internal controls and procedures and the limitations of the data. We found these data sufficiently reliable for the purpose of providing information about what is known about FAA's current costs related to UAS activities. We also reviewed FAA appropriations and related conference reports, FAA budget justification documents, and FAA cost-accounting methods and supporting documents. To assess FAA's efforts to track the costs of current and planned activities for UAS, including the costs for specific UAS activities and services, we reviewed FAA's method for tracking the costs of UAS activities in the context of federal financial-accounting

⁵See, for example: GAO, *Aviation Finance: Observations on Potential FAA Funding Options*, [GAO-06-973](#) (Washington, D.C.: Sept. 29, 2006) and GAO, *Air Traffic Control: Experts' and Stakeholders' Views on Key Issues to Consider in a Potential Restructuring*, [GAO-17-131](#) (Washington, D.C.: Oct. 13, 2016).

⁶Federal Aviation Administration, *Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap, Second Edition*, (Washington, D.C.: July 30, 2018).

⁷Federal Aviation Administration, *Implementation Plan for Integration of Unmanned Aircraft Systems into the National Airspace System: FY2019 Implementation Plan* (Washington, D.C.: March 2019).

⁸Federal Aviation Administration, *Unmanned Aircraft System (UAS) Traffic Management (UTM) Concept of Operations, version 1.0* (Washington, D.C.: May 18, 2018).

standards,⁹ and Office of Management and Budget (OMB) instructions to agencies for financial reporting.¹⁰

To identify key considerations and options for designing fee mechanisms that could recover FAA's costs for UAS regulation, oversight, and air navigation services, we interviewed FAA officials and industry stakeholders to get their opinions on key UAS integration activities, FAA's costs related to UAS integration, and potential funding mechanisms. More specifically, we interviewed representatives from a non-generalizable sample of 22 UAS industry stakeholder groups selected based on their participation in a task group of FAA's Drone Advisory Committee that was tasked with making recommendations related to funding FAA's UAS drone integration efforts (Task Group 3), or based on recommendations from industry stakeholders, or UAS and aviation stakeholders who were previously identified in GAO work. More information about stakeholder selection and a full list of the stakeholders we interviewed is included in appendix I. We also reviewed the interim and final reports of FAA's Drone Advisory Committee's Task Group 3, which was tasked with making recommendations related to funding the integration of UAS into the National Airspace System.¹¹ We compared FAA's efforts to identify key considerations and options for developing fee mechanisms to GAO's guidance on user fee design,¹² OMB's instructions to agencies on user fees,¹³ and standards for internal control in the federal government related to identifying and responding to change.¹⁴

⁹Federal Accounting Standards Advisory Board, *Statement of Federal Financial Accounting Standards 4: Managerial Cost Accounting Standards and Concepts* (Washington, D.C.: June 2018).

¹⁰Office of Management and Budget, *OMB Circular A-136 Financial Reporting Requirements* (Washington, D.C.: July 30, 2018).

¹¹Drone Advisory Committee, *Drone Integration Funding- Interim Report*, a report prepared at the request of the Federal Aviation Administration, Federal Aviation Administration, June 2017 and Drone Advisory Committee, *Drone Integration Funding-Final Report*, a report prepared at the request of the Federal Aviation Administration, Federal Aviation Administration, March 2018.

¹²GAO, *Federal User Fees: A Design Guide*, [GAO-08-386SP](#) (Washington, D.C.: May 29, 2008).

¹³Office of Management and Budget, *Circular No. A-25 Revised: User Charges* (Washington, D.C.: July 8, 1993).

¹⁴GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 2014).

We conducted this performance audit from December 2018 to December 2019 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

Historically, unmanned aircraft have been known by many names including: “drones,” remotely piloted vehicles, unmanned aerial vehicles, and models. Today, the term UAS is generally used to emphasize the fact that separate system components are required to support airborne operations without a pilot onboard the aircraft.

UAS Users and Uses

Recreational users have flown UAS—largely model aircraft—for years with minimal FAA interaction. Increasingly though, more technically advanced UAS are being used in a variety of ways by different types of users. Certain industries are interested in expanding the allowable uses for UAS, such as expanding use of UAS in controlled airspace.¹⁵ Expanding allowable uses would likely require more FAA involvement and regulatory action. UAS operators generally fall into the following categories:

- Recreational users operate UAS primarily for recreational or educational purposes, such as operating UAS to take photographs or video for personal use. To operate UAS recreationally, a user must obtain a certificate of registration from the FAA. The certification constitutes registration for all unmanned aircraft owned by the individual and operated recreationally.
- Commercial users operate UAS in connection with a business. Examples of commercial uses include: selling photos or videos taken from UAS (such as wedding or real estate photography); conducting mapping or land surveys; or conducting factory or equipment

¹⁵Controlled airspace is found around some airports and at certain altitudes where air traffic controllers are actively communicating with, directing, and separating all air traffic. Other airspace is considered uncontrolled in the sense that air traffic controllers are not directing air traffic within its limits. In general, drone operators can only fly in uncontrolled airspace below 400 feet above the ground. Commercial drone operators are required to get permission from the FAA before flying in controlled airspace.

inspections. Commercial users must register each UAS used for commercial purposes with the FAA.

- Public safety/government users operate UAS in a variety of ways to support key activities of their mission. For example, firefighters use UAS to help put out fires and the Department of the Interior uses UAS to survey national parks. Public safety and government users must either register each UAS or receive an FAA certificate of authorization to function as a public aircraft operator.

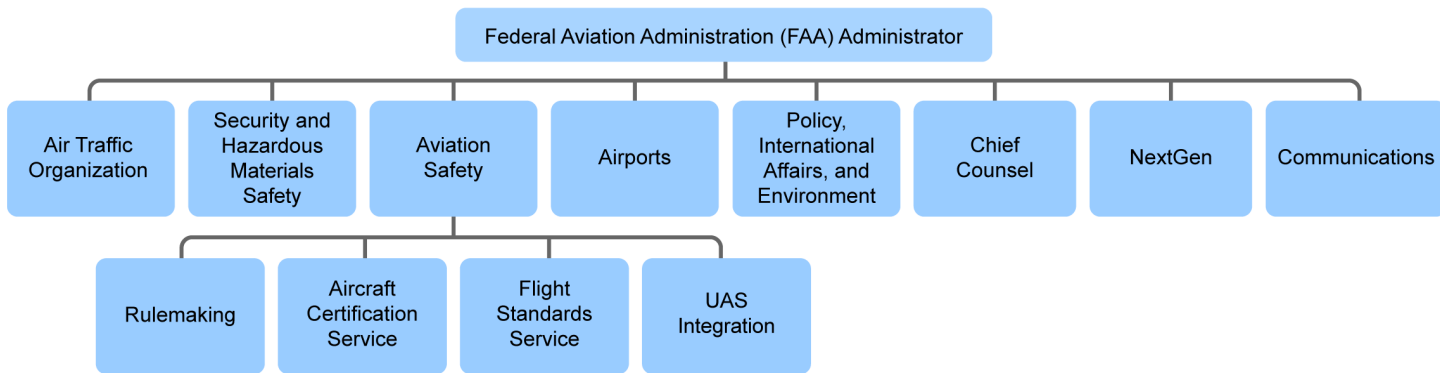
FAA Roles and Responsibilities Related to UAS

FAA is the primary agency responsible for facilitating the safe integration of UAS into the national airspace. All airspace is regulated, and FAA's rules regarding access to the airspace apply to the entire national-airspace system, from the ground up, though there are different rules for different types of airspace. As UAS increasingly enter and operate within the national airspace system—a complex network of airports, aircraft, air-traffic-control facilities, employees, and pilots—it is FAA's responsibility to plan for and oversee the integration of UAS into both low-altitude airspace (below 400 feet) and, eventually, higher altitude airspace that will be shared with other aircraft. According to FAA's Fiscal Year 2019 Implementation Plan, the ultimate goal of integration is for UAS to operate harmoniously with manned aircraft, in the same airspace, while ensuring the safety of people and property both in the air and on the ground.

Within FAA's Office of Aviation Safety, the UAS Integration Office is responsible for facilitating the safe, efficient, and timely integration of UAS into the national airspace system; aligning UAS international activities with foreign civil-aviation authorities; supporting standards and policy development related to UAS projects; and providing strategic planning and support for continuous UAS research and development. The Office was established in fiscal year 2017 and, in fiscal year 2018, had 39 full-time equivalent employees. Other offices within FAA coordinate with the UAS Integration Office on UAS-related activities. For example, FAA's Office of Rulemaking (also under the Office of Aviation Safety) oversees the rulemaking process, including issuing notices of proposed rulemaking and administering the public comment process, in addition to providing general rule information on published regulatory documents. Other offices are also involved in the development of proposed rules, certification of aircraft, compliance and enforcement, and other activities related to UAS integration according to their subject-matter expertise. For example, the Flight Standards Service is responsible for setting standards for unmanned aircraft, and the Aircraft Certification Service is responsible for certifying new UAS designs and approving UAS for advanced operations.

Additionally, the Air Traffic Organization is responsible for providing data and information to facilitate the operation of approved UAS near airports. Figure 1 shows FAA offices that are involved in UAS integration efforts.

Figure 1: Federal Aviation Administration Offices Involved in Unmanned Aircraft Systems (UAS) Integration Efforts



Source: GAO analysis of FAA information. | GAO-20-136

FAA Funding Structure

FAA’s activities are primarily funded through revenues to the Airport and Airway Trust Fund (Trust Fund), which is funded through a variety of excise taxes paid by users of manned aircraft as well as interest revenue accrued on the balance of the Trust Fund.¹⁶ These excise taxes are levied on the purchase of airline tickets and aviation fuel, as well as the shipment of cargo, though, as we have previously found, they are generally not closely linked to FAA’s costs for the services received. Trust fund revenues are available to FAA subject to appropriations. In addition to these revenues, a portion of FAA’s funding is often appropriated from general revenues.

The Trust Fund provides funding for FAA’s three capital accounts:

1. the Facilities and Equipment account, which funds technological improvements to the air-traffic-control system, including the modernization of the air-traffic-control system called the Next Generation Air Transportation System (NextGen);

¹⁶The Trust Fund earns interest on its balances that are invested in U.S. Treasury Securities.

-
2. the Research, Engineering, and Development account, which funds research on issues related to aviation safety, mobility, and NextGen technologies; and
 3. the Airport Improvement Program, which provides grants for airport planning and development.

The Trust Fund also provides much of the funding for FAA's Operations account, which funds the operation of the air traffic control system and the UAS Integration Office, among other activities.

User Fees

In general, a user fee is related to some voluntary transaction or request for government goods or services above and beyond what is normally available to the public, such as entrance into national parks, a request that a public agency permit an applicant to practice law or run a broadcast station, or the purchase of maps or other government publications.¹⁷ User fees are normally related to the cost of the goods or services provided. User fees' designs can vary widely. We have previously reported that the way user fees are set and collected can affect the extent to which the goals of implementing user fees—equity, efficiency, revenue adequacy, and minimal administrative burden—are achieved.¹⁸

In 2017 the Drone Advisory Committee (DAC)—an industry stakeholder group established by FAA to provide advice on key UAS integration issues—created Task Group 3 to make recommendations related to funding the integration of UAS into the national airspace system.¹⁹ The group completed an interim report on short-term funding options in July 2017 and a final report on longer-term funding options in March 2018.²⁰ The final report identifies various funding mechanisms for further study

¹⁷*National Cable Television Association, Inc. v. U. S.*, 415 U.S. 336, 341-42 (1974).

¹⁸GAO, *Federal User Fees: A Design Guide*, [GAO-08-386SP](#) (Washington D.C.: May 29, 2008).

¹⁹ According to the DAC, membership is comprised of representatives from a cross-section of stakeholders representing the wide variety of UAS interests, including manned and unmanned aviation, research and academia, manufacturers, and state and local governments.

²⁰See RTCA (originally founded as the Radio Technical Commission for Aeronautics), *Drone Integration Funding: Report of the Drone Advisory Committee, Interim Report* (Washington, D.C.: June 2017) and RTCA, *Drone Integration Funding: Report of the Drone Advisory Committee, Final Report*, RTCA Paper No. 047-18/DAC-011 (Washington, D.C.: March 2018).

and recommends that industry, the FAA, and Congress work together to identify long-term funding sources for FAA's UAS activities. In 2019, the FAA reconvened the DAC and plans to continue to form task groups to study emerging issues in the UAS industry, though no new task groups have been formed related to UAS funding.

FAA Has Undertaken and Planned Activities to Incrementally Expand the Use and Types of UAS in the National Airspace System

FAA has leveraged its existing regulatory and oversight framework for UAS integration, with the goal of allowing UAS operators to achieve increasingly complex operational capabilities. For example, FAA is applying existing regulations and standards developed for manned aviation to allow for more complex UAS operations. FAA has also initiated rulemaking efforts to allow operations of small UAS at night and over people in certain conditions and has identified additional areas for potential future UAS integration activities. For some capabilities, FAA has also identified a need for research and development, including for systems that would enable UAS to detect and avoid other aircraft and hazards. To help address these needs, FAA has established programs to draw on private industry's resources and state and local governments, including the provision of air navigation services. Longer term, however, the extent of activities needed to carry out FAA's statutory role in the operation, oversight, and enforcement of established rules and systems related to UAS is still unclear.

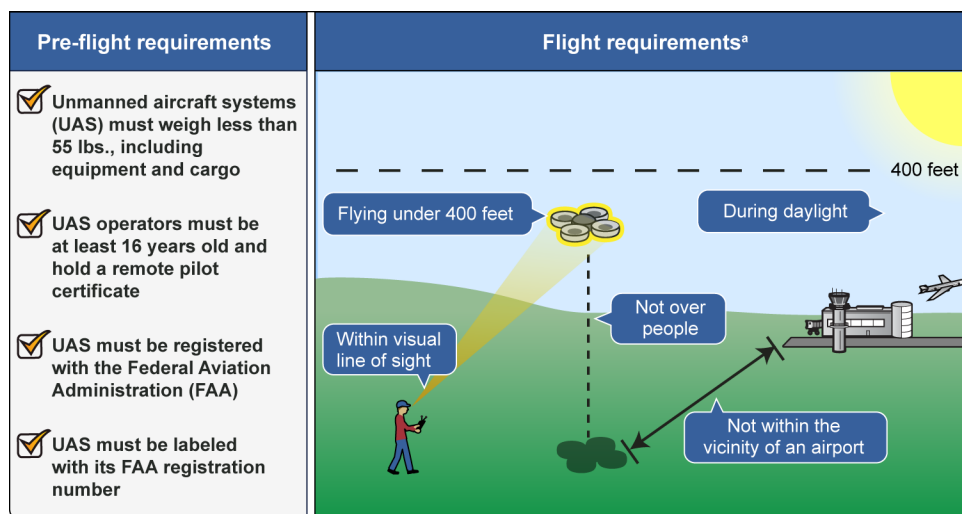
FAA Has Leveraged Existing Manned Aviation Regulatory and Oversight Framework for UAS Integration

According to FAA officials, just as the ultimate vision for UAS integration is for manned and unmanned aircraft to operate in the same airspace, FAA's overarching strategy is to integrate UAS into its existing regulatory structure. This strategy is based in an incremental, risk-based approach to developing rules, policies, and procedures for UAS and leverages standards and regulations established for manned aviation as well as existing FAA resources such as rulemaking, flight standards, and aircraft certification personnel.

To organize and track UAS integration activities across the agency, FAA has published internal annual-implementation plans for fiscal years 2017–2019. FAA adjusts the plans annually to reflect changes in policy. These plans describe the range of objectives related to expanding the use and types of UAS in the national airspace that FAA has identified and its plan for achieving these objectives. For instance, the implementation plan includes identification of the steps needed to achieve each operational capability, including development of related regulations, policies, and standards.

In recent years, FAA has implemented regulations that allow for routine UAS operations of gradually increasing risk and complexity. To date, FAA has established requirements for aircraft and operator registration as well as regulations to allow for limited operations of small UAS, including the June 2016 Small UAS rulemaking (commonly called Part 107), which established conditions under which small UAS operators are allowed to routinely fly for largely commercial purposes (see fig. 2).²¹

Figure 2: Selected Pre-Flight and Flight Requirements for Small UAS Operating under Part 107 of the Federal Aviation Administration’s (FAA) Regulations



Source: GAO. | GAO-20-136

^aSmall UAS operators can apply to FAA for approval to deviate from these requirements.

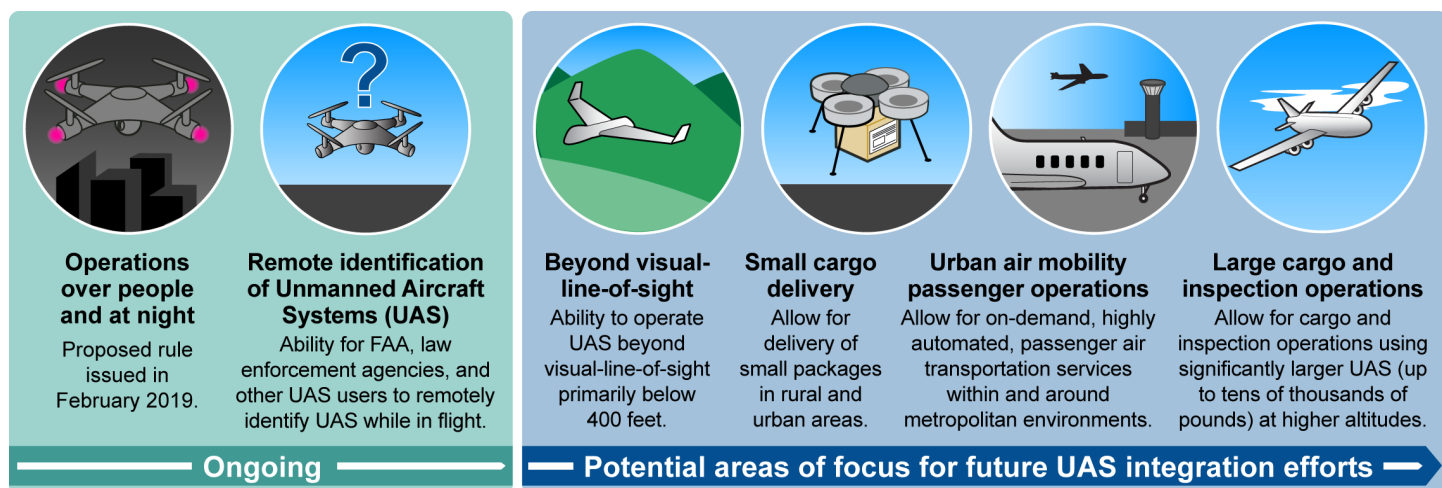
Additionally, for those operations not allowed under established regulations, FAA may grant waivers on a case-by-case basis. According to FAA, nearly 14,000 requests for waivers were received as of December 2018, with just over 2,000 of those requests approved. The Flight Standards Service has issued waivers for some UAS operators—including commercial and government users—to operate beyond-visual-line-of-sight or at night for purposes including inspection of hurricane damage and aerial photography. As FAA develops and implements

²¹These regulations are codified at 14 C.F.R. §§ 107.1-107.205. UAS operating under “Part 107” include those for commercial use, as well as for recreational use that does not operate in accordance with 49 U.S.C. § 44809, “Exception for limited recreational operations of unmanned aircraft” (i.e., for non-hobby and non-recreational purposes).

regulations for more and more complex operations, fewer types of operations will require these waivers.

Since issuance of the Part 107 rule, FAA has continued its efforts to increasingly allow for routine operations (that is, operations within established regulations that do not require waivers) of more types of UAS (including large UAS) under more conditions, as well as more complex UAS operations. Figure 3 illustrates some of the ongoing and potential future operational capabilities included in FAA’s phased approach for UAS integration, which are detailed below.

Figure 3: The Federal Aviation Administration’s Current and Potential Areas of Focus for Integrating Unmanned Aircraft Systems (UAS)



Source: GAO analysis of Federal Aviation Administration Fiscal Year 2019 Implementation Plan. | GAO-20-136

FAA’s current efforts to allow for more complex UAS operations include the following ongoing rulemaking efforts:

- Operation of small unmanned aircraft systems over people:** FAA issued a proposed rule in February 2019 to expand the operations permitted under the Part 107 rulemaking to allow operations over people and at night in certain conditions.²²

²²Operation of Small Unmanned Aircraft Systems over People, 84 Fed. Reg. 3856 (Feb. 13, 2019) (to be codified at 14 C.F.R. pt. 107). The comment period for this notice of proposed rulemaking closed in April of 2019, but FAA is waiting to finalize the rule until issuance of a final rule on remote identification of small UAS.

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- **Safe and secure operations of UAS advance notice of proposed rulemaking:** FAA released this advance notice in February 2019 to seek public comment on whether FAA should promulgate new rulemaking related to, for instance, additional operating and performance requirements for UAS.²³
 - **Remote identification of unmanned aircraft systems (UAS):** Both FAA and stakeholders have identified the ability for FAA, law enforcement agencies, and other UAS users to remotely identify UAS while in flight as foundational to most other rules and system development. FAA currently expects to issue a proposed rulemaking on remote identification in December 2019. With respect to the operation of UAS over people rulemaking, FAA expressly stated that it does not intend to finalize proposed rules in that area until it has issued a final rule on remote identification.

In its internal Fiscal Year 2019 Implementation Plan, FAA identified a variety of new types of operations that could be enabled in the next few years. Examples include:

- **Beyond visual-line-of-sight operations:** Future integration efforts in this area could allow for low-altitude UAS operations beyond-visual-line-of-sight, such as infrastructure and agricultural inspections primarily below 400 feet.
- **Small-cargo delivery operations:** Future integration efforts in this area could allow for delivery of small cargo by networks of small UAS flying at low altitudes in rural and urban areas predominantly below 400 feet. Currently, FAA certifies some UAS operators to enable them to conduct cargo delivery operations under existing air carrier certification regulations.²⁴
- **Urban air-mobility passenger operations:** Future integration efforts in this area could allow for on-demand, highly automated, passenger air transportation services within and around a metropolitan environment with no pilot physically in the cockpit of the aircraft. These operations are expected to use UAS weighing thousands of pounds that would fly at higher altitudes (500-5,000 feet). UAS

²³*Safe and Secure Operations of Small Unmanned Aircraft Systems*, 84 Fed. Reg. 3732 (Feb. 13, 2019) (to be codified at 14 C.F.R. pt. 107). The comment period for this advance notice of proposed rulemaking closed in April of 2019.

²⁴14 C.F.R. pt. 135 establishes requirements for certification of aircraft operators to conduct passenger and cargo transportation operations.

operators are currently developing UAS for future passenger transport operations both in the United States and abroad.

- **Large cargo and inspection operations:** Future integration efforts in this area could allow for cargo and inspection operations using significantly larger UAS (up to tens of thousands of pounds) operating in controlled airspace at higher altitudes. These UAS are expected to operate similarly to large commercial manned aircraft. These larger UAS may allow the transportation of larger volumes of cargo or execution of inspections over a longer range. Currently, FAA has approved—on a case-by-case basis—limited experimental operation of large UAS to conduct inspections by waiver.

FAA's annual UAS implementation plans reflect the ever-changing nature of the UAS industry, the regulatory environment, and concerns identified by stakeholders from within and outside of government related to public safety and national security. According to FAA, as UAS technology and the industry continue to evolve, additional operational capabilities and associated integration needs will be identified. FAA expects efforts to allow increasingly complex operations to build on lessons learned and technology improvements gained from preceding integration efforts. Until new regulations can be issued for these operations, FAA plans to extend and adjust existing safety standards and requirements—originally designed for manned aircraft—to UAS through waivers and exemptions. For example, in April 2019, FAA awarded the first air carrier certification to a UAS delivery company, Wing Aviation. This certification—under existing regulations for manned air carriers—allows the company to begin commercial package delivery in Blacksburg, Virginia.

FAA Aims To Leverage Both Federal and Non-Federal Resources for the Research and Development of UAS Systems and Technologies

As discussed in its internal implementation plan, FAA has identified research and development needed to inform the safe expansion of UAS operational capabilities. According to FAA officials, this research focuses on the assessment of risks that UAS integration poses to the national airspace as well as the characteristics required for technology and systems to sufficiently mitigate these risks to achieve the safe implementation of more complex UAS operations. Such systems and technology would enable, for example, detection and avoidance of other aircraft and hazards, reliable navigation capability, and reliable data linkage between the UAS aircraft and the operator for controlling the flight.

To that end, FAA coordinates UAS-related research activities being conducted by FAA, other government agencies, and FAA's partners in

industry and academia. For example, FAA has coordinated with NASA to develop a traffic management concept for UAS. Additionally, FAA has implemented two programs—the Test Sites program and Integration Pilot Program—to leverage private industry resources and state and local governments to conduct research and development activities needed to achieve full UAS integration.

- **Test Sites Program:** FAA authorized seven test site locations between 2013 and 2016 as directed by statute, at which industry stakeholders can test UAS technologies to further UAS integration.²⁵ According to a test site participant, these sites have been used, for example, to test technologies such as vertical take-off and landing technology for large UAS, which may be relevant for large-cargo and passenger operations.
- **Integration Pilot Program:** This pilot was established in 2017 to enable testing of UAS integration technologies in state, local, and tribal jurisdictions.²⁶ Through this program, for example, the North Carolina Department of Transportation has partnered with private industry to provide UAS medical-package delivery services (such as the transport of medical test samples). The program's objectives include:
 - testing and evaluating models of state, local, and tribal government involvement in the development and enforcement of federal UAS regulations,
 - encouraging the development and testing of new UAS concepts of operations, and
 - informing further FAA regulation of UAS.

²⁵The FAA Modernization and Reform Act of 2012 required that FAA establish test sites at which UAS operations could be safely tested. See Pub. L. No. 112-95, § 332(c), 126 Stat. 74. UAS test sites are operated by: the North Dakota Department of Commerce, the State of Nevada, New Mexico State University, University of Alaska-Fairbanks, Texas A&M University-Corpus Christi, Virginia Polytechnic Institute and State University, and Griffiss International Airport in New York.

²⁶The UAS Integration Pilot Program currently includes nine lead participants: Choctaw Nation of Oklahoma, Durant, Oklahoma; City of San Diego, California; Innovation and Entrepreneurship Investment Authority, Herndon, Virginia; Kansas Department of Transportation, Topeka, Kansas; Memphis-Shelby County Airport Authority, Memphis, Tennessee; North Carolina Department of Transportation, Raleigh, North Carolina; North Dakota Department of Transportation, Bismarck, North Dakota; The City of Reno, Nevada; and University of Alaska-Fairbanks, Fairbanks, Alaska.

As these research efforts make headway, FAA plans to leverage the results to develop a system to provide UAS traffic management services. As stated in FAA's Fiscal Year 2019 Implementation Plan, on any given day, 60,000 commercial aircraft fly through the national airspace into the 30 biggest airports in the United States and—given current trends—the same number of UAS flights could originate from just one delivery fulfillment center in a major city in a single day. According to FAA, in order to fully integrate commercial UAS into the national airspace, a traffic-management ecosystem complementary to—but separate from—FAA's air-traffic-management system for manned aviation will likely be needed to control access and flight operations in low-altitude airspace. FAA has identified capabilities required for low-altitude UAS air navigation. One system—the Low Altitude Authorization and Notification Capability (LAANC)—has been implemented, while a UAS traffic management system is still under development. According to FAA and stakeholders we spoke to, LAANC was the first step towards a UAS traffic management system.

- **LAANC:** Through 2017 and 2018, FAA established technical and regulatory requirements for private partners to provide LAANC services, which enable UAS to access controlled airspace near approved airports. After deploying a system prototype in November 2017, FAA launched LAANC in April 2018 and then expanded the program to include additional partners in October 2018. Under LAANC, FAA provides data on temporary flight restrictions, notices, and airspace maps of participating facilities through a UAS data exchange. Private companies that have been approved by FAA to provide UAS air navigation services (called UAS service suppliers) develop and maintain—with private funding—automated applications or portals. Approved service suppliers provide differing services, with varying infrastructure and associated costs to provide the service. For example, some suppliers provide LAANC services to UAS operators among the general public, while others process applications for airspace access only for certain UAS operators. Prior to operating in controlled airspace near airports, UAS operators use these applications or portals to apply for airspace authorizations. These requests are checked against the data provided through the UAS data exchange, and if approved, UAS operators receive authorization to fly

in the area—within minutes, in some cases.²⁷ LAANC services were previously available only to commercial operators, but in July 2019, LAANC access was extended to recreational operators.

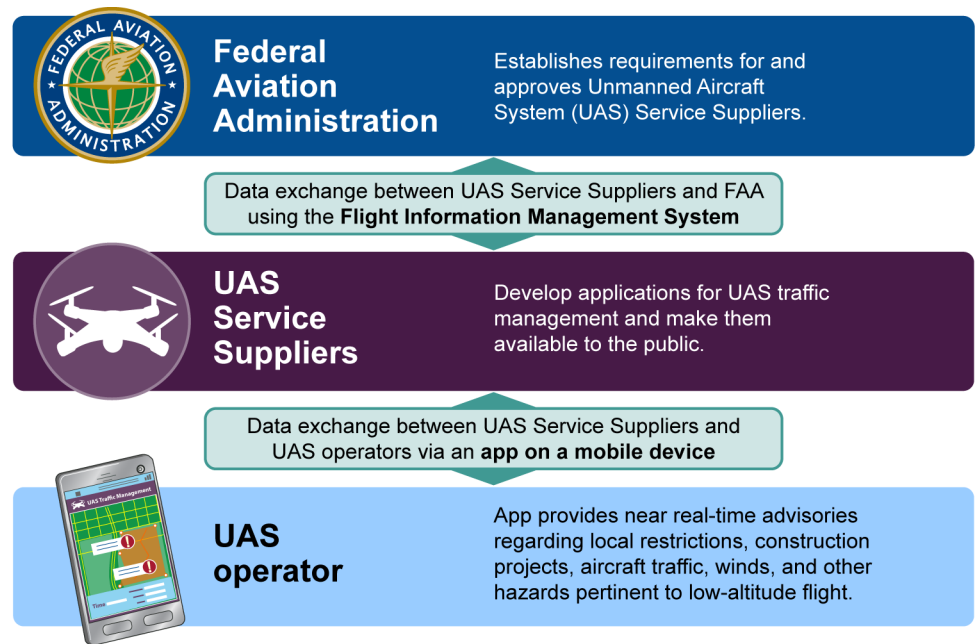
- **UAS traffic management capability:** In 2013, NASA began developing a concept of operations for a UAS traffic management system, which is the proposed system for providing UAS air navigation services in low-altitude airspace. As envisioned by FAA, these services will be separate, but complementary, to those provided by the Air Traffic Control system used for manned aviation. FAA established a pilot program in 2017 to develop and demonstrate early versions of UAS traffic management operations. Much like LAANC, the component applications and infrastructure supporting the traffic management system would be almost entirely developed, owned, and operated by private UAS service suppliers; only the Flight Information Management System—a data exchange gateway—is planned to be built and operated by FAA. The current UAS Traffic Management Concept of Operations envisions that UAS operators will share the timing and destination of a planned flight through a UAS service supplier.²⁸ FAA envisions that these service suppliers will provide near real-time advisories to affected UAS operators regarding traffic (aircraft in the area), weather and winds, and other hazards pertinent to low-altitude flight (such as cranes or power-line construction or local UAS restrictions). Figure 4 illustrates the UAS traffic management system as outlined in the concept of operations. FAA has not identified an implementation date for the traffic management system. Rather, FAA proposes a “spiral development,” in which low complexity operations would be implemented first, with higher complexity operations and requirements built in incrementally. FAA intends to allow each new development to gradually mature the UAS traffic management system to ultimately support the full range of UAS

²⁷Depending on the location and planned flight altitude, UAS operators may receive near-real time authorization (that is, authorization within minutes of application) or may require “further coordination,” in which case more than 24 hours’ notice is required to receive authorization. For example, planned flights below an established altitude—which varies based on location—may be eligible for near-real time authorization, while flights at higher altitudes require further coordination. See Federal Aviation Administration Air Traffic Organization, *Low Altitude Authorization and Notification Capability (LAANC) USS Operating Rules, Version 1.3* (Washington, D.C.: December 14, 2018).

²⁸Federal Aviation Administration, *Unmanned Aircraft System (UAS) Traffic Management (UTM) Concept of Operations, V1.0* (Washington, D.C.; May 18, 2018).

operations at low altitude.²⁹ Among other FAA activities, remote identification rules will be key to implementation of traffic management capabilities.

Figure 4: Federal Aviation Administration Vision of Unmanned Aircraft System (UAS) Traffic Management System



Source: GAO analysis of Federal Aviation Administration information. | GAO-20-136

FAA's Role Will Likely Evolve as UAS Integration Progresses

Once FAA has developed the foundational UAS rules and systems such that operational capabilities of UAS integration have been substantially achieved, the specific nature of FAA's role in the operation, oversight, and enforcement of established rules and systems depends on the nature of the established regulations and systems. FAA's mission to ensure the safety of the national airspace, however, makes it clear that FAA will continue to play a role in each of these areas, given its responsibility for maintaining the safety of the national airspace. For example, FAA will need to continue conducting oversight to ensure compliance with established regulations, policies, and standards to maintain the safety of

²⁹We are currently conducting a review of FAA's efforts to develop a UAS traffic management system and associated challenges.

the national airspace, but the precise nature of the oversight needed in the future will depend on the regulations and systems established.

We recently found that local law enforcement agencies may be unclear about their role in UAS enforcement and that most FAA inspectors and local law enforcement agencies GAO met with said that officers may not know how to respond to UAS incidents or what information to share with FAA.³⁰ Similarly, a recent industry task force commissioned to address the issue of unauthorized UAS near airports found that the role of state and local law enforcement in addressing that threat is unclear, and recommended that federal agencies clearly define related roles, responsibilities, and authorities.³¹ As such, FAA's activities related to enforcement for UAS will likely evolve as UAS become more integrated in the national airspace. Further, according to our interviews with stakeholders, facilities designated for the take-off and landing of UAS for the transport of passengers and cargo as well as other infrastructure to support UAS air navigation services may be needed. FAA's role in operating or overseeing this infrastructure will likely hinge on the nature of the infrastructure. For example, while FAA's Office of Airports has responsibility for airport safety and inspections as well as establishing standards for airport design, construction, and operation, the extent to which this type of oversight will be needed for infrastructure to facilitate drone operations is not yet known.

³⁰GAO, *Unmanned Aircraft Systems: FAA's Compliance and Enforcement Approach for Drones Could Benefit from Improved Communication and Data*, [GAO-20-29](#) (Washington, D.C.: Oct. 17, 2019).

³¹Blue Ribbon Task Force on UAS Mitigation at Airports, *Final Report (October 2019)*.

FAA Tracks Some Current UAS-Related Costs but Does Not Have a Process to Ensure Cost Information Is Complete

FAA Allocates Appropriated Funds for UAS Activities Based on Congressional Direction

FAA receives annual appropriations in four accounts, and since 2016, conference reports accompanying appropriations have directed FAA to allocate some funding from these accounts specifically for UAS-related activities. Table 1 depicts appropriations FAA has allocated to UAS-related activities from these four accounts since 2016 at the direction of Congress. FAA allocates portions of its appropriations for the UAS Integration Office and some other UAS-specific activities based on congressional direction, but FAA may obligate funding that has not specifically been allocated for UAS activities to support UAS activities as well. The vast majority of FAA's appropriation comes from the Airport and Airway Trust Fund (which is funded through revenues of taxes and fees on manned aviation airline tickets, aviation fuel, and cargo shipments), including all of the appropriations for the facilities and equipment; research, engineering, and development; and grants-in-aid for airports accounts. In fiscal year 2018, about 92 percent of FAA's approximately \$17 billion in total funding was appropriated from the Trust Fund. The remainder of FAA's funding is appropriated from general revenues.³²

³²When accounts receive funding from multiple sources, FAA can use those dollars interchangeably within the direction provided by the appropriations acts and accompanying conference reports. For fiscal years 2016 through 2019, the operations account was funded partly from the Airport and Airway Trust Fund and partly from the general fund of the U.S. Treasury.

Table 1: Annual Appropriations Allocated for Federal Aviation Administration’s Unmanned Aircraft Systems (UAS) Related Activities, Fiscal Years (FY) 2016–2019

Dollars in Millions

| Account/Office | FY16 | FY17 | FY18 | FY19 |
|--|---------------|---------------|----------------|----------------|
| Operations | \$18.0 | \$51.1 | \$51.1 | \$56 |
| Office of Aviation Safety | \$13.1 | \$25.9 | \$25.9 | \$27.4 |
| Air Traffic Organization | \$4.9 | \$24.9 | \$24.9 | \$27.4 |
| Office of Finance and Management | \$0 | \$0 | \$0 | \$0 |
| NextGen and Operations Planning | \$0 | \$0 | \$0 | \$0 |
| Staff Offices | \$0 | \$0.3 | \$0.3 | \$1.25 |
| Facilities and Equipment | \$12.5 | \$15.9 | \$29 | \$29 |
| Research, Engineering, and Development | \$17.6 | \$20 | \$24 | \$24 |
| Grants-in-aid for airports | \$0 | \$0.2 | \$0.7 | \$1.2 |
| Total | \$48.1 | \$87.2 | \$104.8 | \$110.2 |

Source: FAA Financial Data for fiscal years 2016 through 2019. | GAO-20-136

Notes: Because some of FAA’s appropriations are authorized to be obligated beyond the current fiscal year, the amounts allocated in a given year may not be obligated in that year.

Staff Offices include the Office of the Chief Counsel; Office of Communications, Policy, International Affairs and Environment; and Security and Hazardous Materials Safety Office

For fiscal year 2018, in accordance with congressional direction, FAA allocated a total of \$104.8 million for UAS-related activities and, according to FAA financial data, obligated approximately \$69.7 million for these activities.³³ Table 2 provides an overview of the UAS-related activities for which FAA determined it had obligated funds in fiscal year 2018; a more detailed list of UAS-related activities for which FAA identified fiscal year 2018 obligations is provided in appendix 2. Individual activities may be funded through more than one account, depending on their scope. According to officials, and as discussed below, FAA staff outside of the Office of Aviation Safety and Air Traffic Organization may not consistently track their UAS-related obligations. As such, the obligation amounts identified in table 2 may be incomplete and may not represent FAA’s total fiscal year 2018 UAS costs.

³³Because some of FAA’s appropriations are authorized to be obligated beyond the current fiscal year, the amounts obligated may differ from FAA’s annual allocations.

Table 2: Activities Supporting the Integration of Unmanned Aircraft Systems (UAS) into the National Airspace and Associated Obligations for Fiscal Year 2018

Dollars in Millions

| Obligating office and activity description | Fiscal year 2018 obligations |
|--|------------------------------|
| Office of Aviation Safety (Operations account): includes costs related to the UAS Integration Office, planning, flight standards, aircraft certification, quality and integration, and rulemaking. | \$33.4 |
| Air Traffic Organization (Operations account): includes efforts on the part of the Mission Support Office to review aeronautical charts and maps in support of Low Altitude Authorization and Notification Capability (LAANC) and changing Unmanned Aircraft Systems (UAS) requirements. | \$7.0 |
| Office of Finance and Management (Operations account): includes efforts on the part of the Information and Technology Services Office to maintain the UAS registration system and the delivery of information technology tools and capabilities to support UAS programs. | \$0.73 |
| NextGen and Operations Planning (Operations account): includes day-to-day management and oversight of FAA's UAS testing facilities. | \$0.16 |
| Staff offices (Operations account): includes efforts related to public communications regarding FAA's UAS activities, legal advice and reviews related to UAS, and safety and enforcement activities conducted by the Office of Security and Hazardous Materials Safety. | \$2.2 |
| Facilities and equipment account: includes efforts related to the development of a UAS Traffic Management system, which is a separate, but complementary system to the Air Traffic Management system as well as systems engineering activities for LAANC. | \$13.5 |
| Research, engineering, and development account: includes the UAS research, engineering, and development program, which focuses on new technology assessments, methodology development, data collection and generation, laboratory and field validation, and technology transfer. | \$12.7 |
| Total | \$69.7 |

Source: GAO analysis of Federal Aviation Administration financial data for fiscal year 2018. | GAO-20-136

Notes: These obligations reflect costs that FAA has identified but may be incomplete.

Because some of FAA's appropriations are authorized to be obligated beyond the current fiscal year, the amounts obligated may differ from FAA's annual allocations.

Staff Offices include the Office of the Chief Counsel; Office of Communications, Policy, International Affairs and Environment; and Security and Hazardous Materials Safety Office

Within the categories above, specific examples of activities funded in fiscal year 2018 include:

- About \$3.7 million from both the Operations (\$2.07 million) and Facilities and Equipment (\$1.65 million) accounts for the development of LAANC systems and requirements.
- Of the about \$33 million obligated by the Office of Aviation Safety in fiscal year 2018 for UAS-related activities, about \$28 million was obligated by the UAS Integration Office and \$166,000 by the Office of Rulemaking.

-
- \$4.5 million obligated under facilities and equipment for the development of a UAS traffic management system and the associated Flight Information Management System.

FAA Efforts to Track UAS Costs May Result in Incomplete Data

Since 2017, FAA has been tracking costs associated with many of its UAS activities including time spent by staff as well as other costs, as shown in table 2. A December 2017 internal memorandum instructed FAA offices to track UAS-related activities and costs using project codes. According to FAA officials, the codes are used to identify travel, procurement, time and attendance, and costs related to special events, among other UAS-related activities. The effort was intended to address the administration's and Congress' interest in greater cost visibility. According to FAA officials, the project codes to track UAS costs have been implemented in the Office of Aviation Safety—including the UAS Integration Office, Flight Standards Service, and Office of Rulemaking—and staff within the Air Traffic Organization (not including air traffic controllers).³⁴ According to FAA officials and as demonstrated by the obligations shown in Table 2, the Office of Aviation Safety and the Air Traffic Organization represent the majority of UAS costs for fiscal year 2018 within the Operations account. In addition, according to FAA, because Conference Reports have outlined how activities in the Research, Engineering and Development and Facilities and Equipment accounts should be funded by line item, FAA is able to track these costs without using the project code method.

While FAA has started tracking UAS-related costs for some offices, FAA does not know the extent to which UAS costs are tracked throughout the agency, resulting in data that may be incomplete. Many—if not all—FAA offices are doing work related to both manned aviation and UAS, but FAA officials stated that they do not know or plan to assess the extent to which staff in other offices—such as the Office of the Chief Counsel—that spend time on both UAS-activities and other responsibilities are using the project codes to track their UAS-activities. FAA officials stated that, because the bulk of the UAS-related work is being conducted within the Office of Aviation Safety and the Air Traffic Organization, it is not a priority to try to

³⁴According to FAA, the FAA workforce captures its time based on the predominant work they are performing within a given day. For example, if air traffic controllers are involved in program implementation or a program working group (for instance, related to UAS integration), they would likely specify the program and its associated project code in time and attendance; beyond that, they would likely use general time and attendance codes. As such, air traffic controllers may not account for all of their work related to UAS.

identify the time spent by other offices working on UAS-related activities, which they believe would be time consuming. However, with no way to assess the extent to which the project codes have been implemented, FAA is unable to tell whether it has met the intent of using the codes: greater visibility into UAS-related costs. For instance, FAA does not currently have visibility via the project codes into time spent on UAS activities outside of the Office of Aviation Safety and the Air Traffic Organization.

According to OMB instructions to agencies on financial-reporting requirements and standards for federal financial accounting, agencies should report the full cost of each program—to include both direct and indirect costs and the costs of identifiable supporting services provided by other offices within the agency.³⁵ Further, federal standards for internal control note that agencies should use quality information—that is, data that are complete and accurate—to achieve objectives, make informed decisions, and manage risks.³⁶ With no assurance that the project codes are resulting in information that is complete, FAA risks making decisions based on information that is unreliable for the purpose of understanding the full costs of its UAS activities. Efforts to track costs need not be overly complex: federal financial-accounting standards note that agencies should consider the precision desired and needed in cost information and the practicality of data collection and processing, among other considerations, when designing cost-accounting processes. For example, FAA could build on its existing project codes for UAS-related activities by monitoring the extent to which the project codes have been used agency-wide. Alternatively, FAA may identify other methods of accounting for UAS-related costs, if there are some costs not easily tracked using the project codes. Further, indirect costs associated with FAA management and facilities could be assigned to the UAS mission based on more complete information on the direct costs identified through use of the project codes.

Additionally, as discussed below, many of FAA's future costs related to UAS are unknown. Ensuring the project code information is complete and

³⁵See Office of Management and Budget, *OMB Circular A-136 Financial Reporting Requirements* (Washington, D.C.: July 2018) and Federal Accounting Standards Advisory Board, *Statement of Federal Financial Accounting Standards 4: Managerial Cost Accounting Standards and Concepts* (Washington, D.C.: July 1995)

³⁶GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 2014).

accurate now could put FAA in a better position to identify those costs as they are realized in the future. Further, federal standards for internal control state that management should identify, analyze, and respond to significant changes that could affect an agency's ability to report reliable information and achieve objectives—such as a change in mission that influences costs. Without reliable information on FAA's UAS-related costs, the administration and FAA may be less equipped to make informed policy decisions regarding resources needed as UAS become further integrated into the national airspace and as UAS oversight becomes an increasing part of FAA's mission.

FAA's Future Costs Are Unknown Due to the Evolving Nature of the Industry

Because the UAS industry, as well as key systems and technological developments, continue to evolve, it is too early to know what costs related to UAS that FAA is likely to incur in the future. This holds true for future operational costs as well as the costs to develop future systems and regulations and indirect costs.³⁷ According to FAA and stakeholders we spoke to, in addition to costs to continue regulatory activities and safety oversight, FAA's future costs will depend on the extent of FAA's involvement in the everyday operation and oversight of systems, such as those related to UAS traffic management, and the extent to which FAA becomes a provider of UAS-related services. Examples of how FAA's costs could evolve and possibly expand in each of these areas include:

- **Regulatory development costs:** Current costs for activities such as the development of new UAS regulations by the UAS Integration Office could change as UAS become more integrated into the national airspace. As previously discussed, the industry is changing rapidly and new uses for UAS are being developed, uses that will require additional FAA regulation and oversight. FAA cannot know the extent to which additional rulemaking activities will be required for UAS technologies and uses that the industry has not yet contemplated or developed. Costs to develop regulations involve input from offices across FAA, such as the Office of the Chief Counsel, where FAA officials are unsure if staff are consistently using the project codes to track their costs for UAS-related activities. As such, FAA may not

³⁷Indirect costs are defined as costs or resources that are jointly or commonly used to produce two or more types of outputs but are not specifically identifiable with any of the outputs. For example, costs for personnel working in the office of the FAA Administrator would be indirect costs, because those personnel work across FAA's various mission areas.

have visibility into the extent to which these UAS-related costs may change over time.

- **Safety oversight costs:** As part of its safety mandate, FAA is responsible for enforcing compliance with established regulations for both manned aircraft and UAS. Several offices within FAA have a role in UAS compliance and enforcement, including the Flight Standards Service and the Office of Security and Hazardous Materials Safety. As we have recently reported, while FAA has sole responsibility for enforcement of UAS regulations, the agency has focused on engaging and educating law enforcement and public safety agencies at all levels—federal, state, and local—and, to a lesser extent, conducting surveillance to ensure compliance with UAS regulations.³⁸ While local law enforcement agencies may often be in the best position to deter or respond to UAS incidents, they may not have information on how to respond or what information to share with FAA. According to FAA officials, the Office of Security and Hazardous Materials Safety is one of the offices in which FAA officials do not know if staff are tracking their activities and costs related to UAS through use of the project codes discussed above. Given the uncertainty about the division of responsibilities between federal, state, and local law enforcement, it is unclear how costs for safety oversight and enforcement will evolve and possibly expand in the future.
- **Provision and oversight of UAS services and facilities:** FAA will eventually incur costs related to providing air navigation and other services to UAS operators, oversight of UAS service providers, and potential infrastructure, but the extent of FAA's eventual role in the provision of these services and related oversight is not yet understood, in part, because the industry is still evolving and it is unclear what FAA services will be provided in the future. Some stakeholders believe that an increased industry role in providing air navigation services could keep FAA's costs for these activities relatively low. For example, the UAS Traffic Management Concept of Operations envisions that leveraging private entities to provide a variety of UAS traffic management services will reduce the

³⁸For additional information, see GAO, *Unmanned Aircraft Systems: FAA's Compliance and Enforcement Approach for Drones Could Benefit from Improved Communication and Data*, [GAO-20-29](#) (Washington, D.C.: Oct. 17, 2019).

infrastructure and manpower burden on FAA and, thus, reduce associated costs.³⁹

FAA envisions that the Flight Information Management System—a system through which FAA can provide directives and enable information exchange between UAS service suppliers, UAS operators, and FAA—is the component of the UAS traffic management system that FAA will build and manage. FAA has not yet estimated the costs of developing or implementing this system because, according to FAA officials, the agency is still many steps away from developing the core infrastructure and regulatory requirements. As UAS integration progresses and as more UAS are operating in the same airspace as manned aircraft, additional solutions may be needed to manage UAS traffic at higher altitudes, which will also incur costs. For instance, FAA anticipates that air traffic controllers will have a role in de-conflicting manned aircraft and unmanned aircraft and could provide air-traffic-control services to UAS in controlled airspace. FAA officials stated it will be necessary to collect data on the direct and indirect costs of UAS for air-traffic-control services in the future. According to FAA, a new air-traffic-control-cost-allocation study is underway, but FAA does not currently have the information on UAS operations that would be necessary to assign air traffic control costs to UAS users.

Beyond system development, once traffic management systems are designed and operational, FAA will incur costs related to its role in overseeing providers of UAS traffic management services as well as operating and maintaining the Flight Information Management System. FAA currently provides UAS operators with services related to registration, aircraft certification, and waivers for operation that fall outside existing regulations, but those services may change depending on future rulemaking. When it becomes clearer what services FAA will likely provide and how it will provide those services, FAA will be better positioned to estimate its costs to inform its budget requests and plan for the future, as it has done for systems that have already been implemented. For example, FAA has estimated future costs associated with the LAANC program, which was implemented in 2018. FAA anticipates obligating approximately \$35.64 million from the facilities and equipment account and \$26.6 million from the

³⁹Stakeholders we spoke to said that state and local governments, as well as industry partners, will have future costs related to UAS; however, those costs are beyond the scope of this review.

operations account to further develop and operate the LAANC system from fiscal years 2019 through 2023, as shown in table 3.

Table 3: Estimated Federal Aviation Administration Costs Related to Low-Altitude Authorization and Notification Capability, Fiscal Years 2019–2023

Dollars in Millions

| Fiscal Year | 2019 | 2020 | 2021 | 2022 | 2023 | Total |
|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Facilities & equipment | \$6.26 | \$6.94 | \$7.11 | \$7.45 | \$7.88 | \$35.64 |
| Operations | \$4.13 | \$5.11 | \$5.69 | \$5.79 | \$5.89 | \$26.60 |
| Annual Total | \$10.38 | \$12.05 | \$12.80 | \$13.24 | \$13.77 | \$62.24 |

Source: FAA estimates. | GAO-20-136

- Indirect Costs:** In addition to direct costs related to rulemaking, oversight, and provision of services, FAA will continue to incur indirect costs such as those associated with the operation and maintenance of FAA facilities and systems. FAA officials said they do not plan to conduct analysis through which they could allocate indirect costs for UAS, because FAA’s appropriations and funding structure do not require them to track costs in this way. However, as previously discussed, OMB instructions to agencies on financial-reporting requirements state that agencies should report the full cost of each program including indirect costs.⁴⁰

As discussed, FAA’s efforts to track costs related to UAS activities may result in incomplete data, and as the UAS industry evolves and becomes more integrated, tracking costs may become even more complex. Generally, FAA officials stated that differentiating between costs related to UAS and manned aviation will not be necessary as UAS become further integrated into the national airspace and FAA’s mission because the agency does not track costs in this way for any other mission areas. However, as discussed later in this report, there is widespread consensus among manned and unmanned aviation industry stakeholders that UAS costs should be borne by the UAS industry rather than the manned aviation industry, and policy makers may opt to recover these costs through user fees or some other mechanism in the future. As discussed below, should FAA and Congress decide that certain fee mechanisms should be pursued, a reliable accounting of total program cost—including

⁴⁰See Office of Management and Budget, *OMB Circular A-136 Financial Reporting Requirements* (Washington, D.C.: July 2018)

indirect costs—is important to setting effective fees, as our prior work related to designing user fees has shown.⁴¹

Planning and Consideration of Policy Goals Are Key to Designing UAS Fee Mechanisms

Considerations for Determining How to Set and Collect Fees

In the tasking statement to the Drone Advisory Committee’s Task Group 3, FAA asked the committee to recommend options for funding the activities and services required by both government and industry to safely integrate UAS into the national airspace system. The Task Group concluded in its final report that the aviation industry, FAA, and Congress should coordinate to identify one or more revenue streams that are separate and segregated from the Airport and Airway Trust Fund to help fund FAA’s UAS-related activities.⁴² The Task Group also identified five different fee mechanisms through which FAA could recover some of the costs of its activities from UAS users, a topic we discuss in this section.⁴³

The extent to which costs are recovered from UAS users and the methods by which costs are recovered are policy decisions for the administration and Congress. Since 2015, FAA has used one fee mechanism—a \$5 registration fee, the same as the fee to register a manned aircraft—to recover some of the costs associated with

⁴¹[GAO-08-386SP](#).

⁴²RTCA, *Drone Integration Funding: Report of the Drone Advisory Committee, Final Report*, RTCA Paper No. 047-18/DAC-011 (Washington, D.C.; March 2018).

⁴³For the purpose of this report, we use the term “fee mechanism” to include methods for recovering FAA’s costs related to UAS in which particular users or beneficiaries of FAA activities or services pay for their use.

administering the UAS registration requirement.⁴⁴ Most of FAA's UAS-related costs are in areas unrelated to UAS registration. As such, policy makers may, at some point, consider additional ways to recover the costs of UAS activities, including implementing user fees for additional services and activities, subject to congressional authority to implement fees and use resulting revenue.⁴⁵

Our prior work on designing user fees, combined with policies established by the Office of Management and Budget, can provide a framework for designing user fees that reduce the burden on taxpayers to finance FAA's UAS activities, which benefit specific users.⁴⁶ The goals of establishing user fees—efficiency, equity, revenue adequacy, and reducing administrative burden—can be in conflict with each other and necessitate trade-offs depending on policy priorities. Table 4 describes these goals.

⁴⁴49 U.S.C. § 45302 provides that revenue from UAS registration fees is available to the FAA for expenses related to administering those fees without congressional action. According to agency financial data, FAA collected an average of about \$1.4 million annually in registration fees from fiscal year 2016 through 2018. According to FAA, a portion of this revenue—about \$520,000—has been obligated toward an effort to estimate compliance with the registration requirement, in accordance with the FAA Reauthorization Act of 2018. FAA's costs to administer the registration requirement are unclear, because the system used for UAS registration—FAA's DroneZone application—is also used for other purposes.

⁴⁵According to FAA, through annual Department of Transportation appropriations acts since fiscal year 1998, Congress has prohibited FAA from promulgating new aviation user fees not specifically authorized by law. As a result, absent further authorization from Congress, FAA would generally be limited to implementing fees that are already being collected—that is, fees that would not constitute a "new" aviation user fee.

⁴⁶For additional information on user fee design, see GAO, *Federal User Fees: A Design Guide*, [GAO-08-386SP](#) (Washington, D.C.; May 2008) and Office of Management and Budget, *Circular No. A-25 Revised: User Charges* (Washington, D.C.: July 8, 1993).

Table 4: Goals of User Fee Design

| | |
|-----------------------|---|
| Efficiency | When identifiable beneficiaries of a government-provided service are required to pay for the service, it will influence their decision-making so that users only use—and pay for—services that they value by more than the cost of the service. In this way, user fees can enhance economic efficiency by ensuring that resources are allocated to the most highly valued activities, increasing awareness of the costs of publicly provided services, and increasing incentives to reduce costs. |
| Equity | Fees should be set in such a way that everyone pays their fair share, but the definition of fair share can have multiple facets, including ability to pay. |
| Revenue Adequacy | Fees should be set and periodically adjusted in a way that fee collections cover the intended share of costs and provide revenue stability. |
| Administrative Burden | Fees should be set so that the cost of administering a fee—including the cost of collection and enforcement—and the burden of complying with the fee (that is, the costs imposed on those paying the fee) are as low as possible. |

Source: [GAO-08-386SP](#) | [GAO-20-136](#)

Our prior work illustrates that four key design elements—namely how fees are (1) set, (2) collected, (3) used, and (4) reviewed—require careful consideration and planning to achieve the desired goals. Based on the prospective nature of user fees to recover FAA’s UAS-related costs, we will focus on how user fees are set and collected. It is important to note that given the tradeoffs involved in establishing user fees, different users and stakeholders may have varying perspectives and opinions on what would be an appropriate fee structure. As these are policy decisions, this report does not recommend any specific fee mechanism. Instead, the considerations and examples we present are intended to inform decision-making by laying out issues to take into account when designing user fees. As discussed in our User Fee Design Guide, determining how UAS user fees should be set and collected involves a number of steps. These steps include:

- identifying the costs associated with each activity and which costs should be recovered,
- identifying the beneficiaries of each activity,
- determining how to set fees for various types of beneficiaries,
- determining how fees should be collected, and
- determining when it is appropriate to begin collecting fees.

Identify Costs and Which to Recover

OMB instructions on designing user fees state that user fees should be sufficient to recover the full cost of providing each service or resource, including indirect costs, except to the extent that agencies determine that exceptions should be made. Identifying the full costs of providing a UAS service or resource—such as providing access to maps and air-traffic management services like LAANC—could enable policy makers to determine, consistent with their policy goals, which of those costs should be recovered through user fees.

- **Identify the costs of each activity:** Our prior work has found that, to set fees so that total collections cover the intended share of program costs, a reliable accounting of total program cost is important.⁴⁷ As previously discussed, while the costs of some current regulatory and operational activities related to UAS are known, some current and most future costs are unclear. Recognizing that generating and maintaining reliable cost data can be expensive, OMB instructions note that program cost should be determined or estimated from the best available records of the agency. Accordingly, policy makers could opt to implement fees to recover the estimated costs of each activity as regulations, services, and systems are established, and adjust fees periodically based on actual costs.
- **Determine which costs to recover:** The next step is to determine the extent of the costs for each activity that should be recovered through user fees based on policy goals. For example, as discussed, many of FAA's current costs relate to the "setup" or integration of UAS into the national airspace, including the costs to develop and promulgate UAS operational rules. Policy makers may or may not decide to recover these current costs from future users. For example, policy makers may decide not to recover these costs based on the idea that the goal of promulgating UAS-related regulations may be related to the general safety of the airspace, rather than providing benefits to specific users. Additionally, some stakeholders we interviewed stated that the costs of startup activities (like rulemaking) and safety oversight activities (like enforcing existing regulations) should not be recovered through user fees because these activities are core government functions. Rather, these stakeholders advocated funding such activities through appropriations from general revenues. However, as we have discussed in prior work, fees have frequently

⁴⁷[GAO-08-386SP](#).

been used to support agencies' regulatory programs.⁴⁸ For example, fees assessed by financial regulatory agencies and the Nuclear Regulatory Commission on their respective regulated industries are used to support those agencies' regulatory activities.

Identify Beneficiaries

Our prior work has found that the extent to which a program is funded by user fees should generally be guided by who primarily benefits from the program, though the extent to which a program benefits specific users or the general public is not usually clear cut.⁴⁹ The beneficiaries of FAA's UAS-related activities will include both direct users (UAS operators) as well as indirect beneficiaries such as the general public. Direct beneficiaries will accrue benefits from their use of UAS, whether recreational, governmental, or commercial. In contrast, indirect beneficiaries would benefit from maintaining a safe national airspace system and preventing disruption of commercial flights and other manned aviation. Policy makers may decide that, to account for benefits to those who don't directly engage in UAS activities, a percentage of FAA's UAS-related costs should be funded with general revenues. For instance, as the Congressional Research Service has reported, there has been general acceptance that appropriations to the FAA from general revenues account for the public benefits of FAA's regulation of the national airspace.⁵⁰ Additionally, while the manned aviation industry will benefit from regulations and oversight that reduce the potential for disruption in the airspace caused by UAS, UAS operators benefit from the regulation and safety oversight of the manned aviation industry as well. Policy makers may choose to account for these benefits in any number of different ways, depending on the perceived extent of the benefit enjoyed by each group.

Direct beneficiaries—including recreational, commercial, and governmental UAS operators—will benefit in different ways based on both the type of user and the type of use or activities they engage in. For example, recreational users may experience the joy and excitement of flying UAS, but are not authorized to accrue any economic benefits. In contrast, commercial users are operating UAS with the explicit goal of

⁴⁸GAO, *Federal User Fees: Key Considerations for Designing and Implementing Regulatory Fees*, [GAO-15-718](#) (Washington, D.C.: Sept. 16, 2015).

⁴⁹[GAO-08-386SP](#).

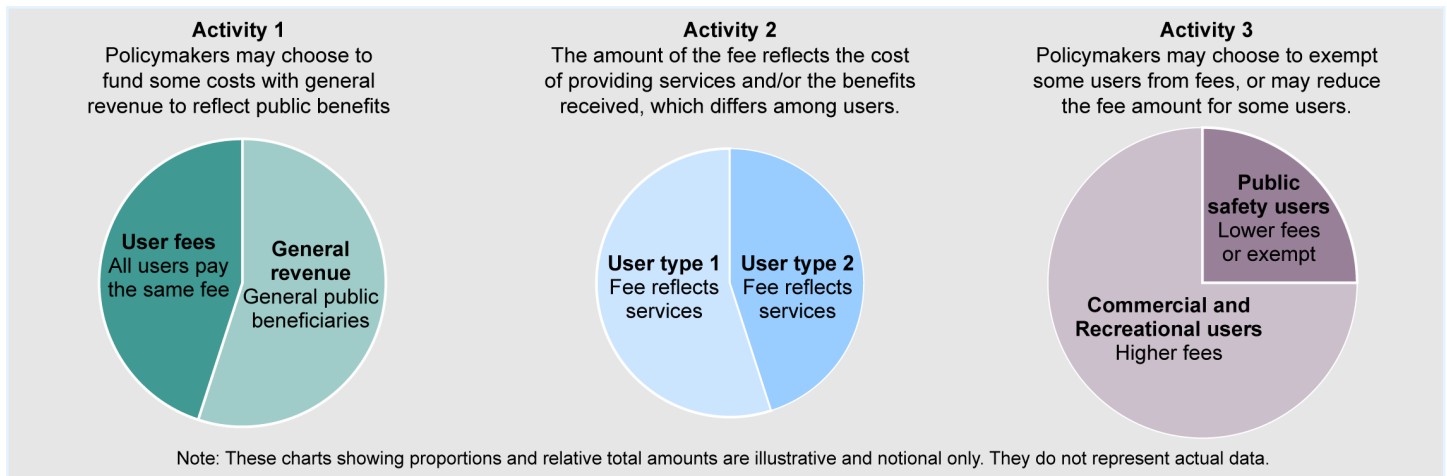
⁵⁰Congressional Research Service, *Aviation Finance: Federal Aviation Administration (FAA) Reauthorization and Related Issues* (Washington, D.C.: Apr. 21, 2008).

earning revenue or benefiting business interests in some other way as a result of their UAS operations.

Determine How to Set Fees for Beneficiaries/Users

As outlined in our prior work, policy makers may set fees for different types of users and activities based on a variety of factors including (1) costs imposed on the system by each user or type of use, (2) the extent of benefits received by different types of users, (3) the ability of each user to pay, and (4) identified policy goals. Figure 5 presents a simplified, hypothetical example of setting fees for various activities and users.

Figure 5: Hypothetical Examples of How UAS Fee Mechanisms Could be Set



Source: GAO analysis. | GAO-20-136

The following examples illustrate how these various factors could play out:

- Considering costs imposed:
 - Policy makers may set fees to recover the costs imposed by UAS users requiring air navigation services—for example, those operating in controlled airspace (such as around airports) or in high traffic areas.
 - Policy makers may set fees to account for the different costs imposed by providing different UAS users access to air traffic services, such as charging per flight for air navigation services or basing the fee on distance traveled in controlled airspace.

-
- Policy makers may decide that recreational UAS users should pay lower fees than commercial users because they may generally impose fewer costs on FAA.
 - Considering Benefits Received:
 - Policy makers may set fees for some services that account for the extent of the benefit received, such as charging for air navigation services based on value of cargo or number of passengers transported.
 - Considering ability to pay:
 - Policy makers may decide to allocate a larger share of FAA's UAS-related indirect costs to commercial users, based on their ability to pay and the monetary benefits they receive.
 - Considering policy goals:
 - Policy makers may decide that public safety agencies (government users), such as local police departments, should be exempt from fees or pay reduced fees because their use of UAS may provide a public benefit.
 - Policy makers may seek to increase safety by reducing or eliminating fees for certain services in order to reduce the probability that users may not comply with requirements to avoid paying an associated fee. This determination would require balancing the potential revenue associated with the fee against (1) the potential costs of ensuring compliance with operational requirements and fees through enforcement activities and (2) the safety risks associated with the portion of operators who may try to avoid fees through not complying with operational requirements.

Most stakeholders we spoke to agreed that UAS users should pay a fee when they receive a service from FAA but that fees should be related to the costs incurred by use. In discussing whether distinctions should be made in setting fees based on factors like commercial or recreational status, cargo or passenger flights, size and weight of the aircraft, and intended use of airspace, most stakeholders agreed that fees should be charged based on these distinctions only insofar as they are associated with different costs imposed on UAS-related systems or FAA. Based on the evolving nature of the industry, it is unclear whether distinctions like those above would be related to differences in costs imposed on FAA.

Some other countries have implemented user fees to recover the costs associated with UAS-integration and air navigation services, though

integration is still in progress. For example, Transport Canada (the Canadian agency responsible for developing transportation regulations, policies, and programs) has established a regulatory structure requiring UAS pilot certification and UAS registration. It set fees to recover Transport Canada's costs for administering those requirements: \$5 Canadian dollars (CAD) for registration (similar to FAA's registration requirement), \$10 CAD for a basic pilot certification, and \$25 CAD for certification to perform advanced operations, such as flying in controlled airspace.⁵¹ NAV CANADA (Canada's private, non-profit air navigation service provider) is in the process of establishing a LAANC-like service through a third-party but has not yet determined whether or how NAV CANADA may seek to recover these costs. In another example, officials told us that the Swiss Federal Office of Civil Aviation is required to recover its costs, so their general philosophy will be to charge a fee whenever costs are incurred. The regulatory structure is still under development, but the office currently charges UAS users for the time required to issue waivers for UAS operations. For example:

- For certain operations, such as those within visual-line-of-sight and not over people, no authorization is required, and thus no fee is required.
- For advanced operations—such as those beyond visual line of sight or over people—fees are charged based on the time required to conduct analysis and risk assessment up to a maximum of 5000 Swiss Francs.⁵²

Determine How Fees Should Be Collected

Policy makers can identify opportunities to collect fees based on the characteristics and requirements of relevant aviation navigation and other systems as these systems are developed. OMB instructions to agencies related to user fees state that fees should be collected prior to or at the time a service is provided unless agencies are legally authorized to collect fees after the service has been provided.⁵³ Our prior work has found that collecting fees at the time a service is provided may reduce the

⁵¹As of October 18, 2019, the exchange rate between the U.S. and Canadian dollars was 1 to 1.31. As such, these Canadian fees would be equivalent to somewhat lower amounts in U.S. dollars.

⁵²Over the last several years, the Swiss Franc and the U.S. dollar have traded at roughly one to one, meaning the 5000 Swiss Franc fee has been roughly equivalent to \$5000.

⁵³Office of Management and Budget, *Circular No. A-25 Revised: User Charges* (Washington, D.C.: July 8, 1993).

administrative burden.⁵⁴ Here, for example, the UAS traffic management system may include points in the process when users are required to obtain an FAA authorization or notify FAA or UAS traffic-management service providers of operation requirements. Those points may provide an opportunity for fee collection. Similarly, as FAA does for current UAS registration fees, online systems for other services could provide an opportunity for FAA to collect fees associated with those activities. Alternatively, fees could be collected through a third party to reduce the administrative burden on FAA. For example, if UAS passengers are subject to fees, flight operators could collect those fees on behalf of FAA, as occurs with current passenger excise taxes for manned aviation. Similarly, UAS service suppliers could collect fees from UAS operators on behalf of FAA for air navigation services.

Decide When to Begin Collecting Fees

Decisions about when to implement user fees depend on both practical and policy considerations. For example, user fees could be put in place as soon as FAA implements each UAS-related regulation, service, or system—that is, once FAA’s costs related to a given activity can be estimated and beneficiaries identified. Alternatively, policy makers may decide not to implement user fees, or to implement some fees but not others, for a period of time in order to allow the nascent UAS industry to develop and to increase commercial viability. FAA’s tasking statement for Task Group 3 noted that one option is to consider the UAS industry an “infant industry” in need of special protections, in which case FAA could need to ask Congress for additional appropriations from the general fund to support UAS-related activities in the interim. Our prior work notes that while it may advance a particular policy goal to, for example, waive fees for a nascent industry for a period of time, such provisions might create unfair competitive advantages among users or industries.⁵⁵

In discussing what level of system development should be achieved prior to imposing fees, stakeholders we spoke to had a wide range of divergent opinions, including the following:

- Some fees, like the existing registration fee, can be imposed now—as users are receiving value and FAA is incurring costs—and adjusted as the industry develops.

⁵⁴[GAO-08-386SP](#).

⁵⁵[GAO-08-386SP](#).

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- Designing fees for UAS should take place only after the infrastructure and regulatory environments have been established.
 - FAA and other policy makers should start considering user fees and an accompanying cost accounting and allocation system as soon as possible, but implementation should wait until a UAS traffic management system has been implemented.
 - Fees for FAA services should be implemented when commercial operations over people and beyond-visual-line-of-sight are routine (that is, when advanced, revenue-generating UAS operations are being conducted without need for a waiver).

Industry Stakeholders Have Identified Options for Fee Mechanisms to Recover FAA's Costs

The Drone Advisory Committee's Task Group 3 concluded that funding for integration efforts would be shared across government and industry and that user fee mechanisms should be considered to recover FAA's costs related to a range of activities including rulemaking, development of policies and standards, and research and development. While the task group did not make a specific recommendation on a particular fee mechanism, its final report identified five possible fee mechanisms with the intention of providing policy makers with ideas:⁵⁶

- **Filing and licensing fees:**⁵⁷ Similar to the already-implemented UAS registration fee, FAA could impose fees to recover the costs of other FAA services such as reviewing applications for waivers and certifications.
- **Point-of-sale-tax:** Legislation could be passed to impose a federal tax on UAS and ensure that the proceeds are used to offset the costs of FAA's UAS-related activities.
- **Business use fee or tax:**⁵⁸ A business use or transaction tax could be imposed on the purchase of a UAS-related service: Commercial businesses that use UAS on behalf of a customer or as part of their customer service could be responsible for a "pay as you go" model fee for use of the airspace, which would be added to the invoice. This

⁵⁶RTCA, *Drone Integration Funding: Report of the Drone Advisory Committee, Final Report*, RTCA Paper No. 047-18/DAC-011 (Washington, D.C.: March 2018).

⁵⁷The Task Group 3 report referred to this mechanism as "user fees;" we have referred to this as "filing and licensing fees" to avoid confusion with other fee mechanisms.

⁵⁸The Task Group 3 report referred to this mechanism as "Transaction taxes;" we have referred to this as "business use fee or tax" to avoid confusion with other fee mechanisms.

concept could include, for example, fees for passengers using urban air-mobility services or fees for the transport of cargo by UAS, similar to the existing excise taxes that fund the Airport and Airway Trust Fund for manned aviation.

- **Airspace access fee:** FAA could recover some or all of the costs associated with UAS traffic management services by requiring that UAS operators filing flight plans or other requests to operate UAS pay a fee to FAA. For instance, the report proposes that operators could remit a fee online when they request access to airspace near airports using LAANC.
- **Auction or lease of airspace:** FAA could recover costs or receive revenue for use of a public resource (navigable airspace) by conducting auctions to grant a license to UAS traffic management service suppliers, similar to granting radio spectrum licenses, which have been used or proposed to address overcrowding of spectrum and have resulted in significant revenue. Stakeholders noted that there is not currently a problem with capacity of the national airspace with respect to the operation of UAS and that there is no need for auctions of airspace on the basis of scarcity.

According to FAA, each of these options would generally require additional authority from Congress to enable FAA to collect and use revenue. The Task Group 3 report and most stakeholders we spoke to (many of whom participated in the Task Group) agreed that the fee mechanisms identified generally covered the range of potential options and stated that it is too early to know which fee mechanisms would be appropriate to recover the costs of any one activity. Nonetheless, stakeholders described their overall impressions of how each mechanism could work, including the following considerations:

- If fees are burdensome for casual users, fees could lead to non-compliance with requirements.
- Fees that rely on self-reporting by users might be difficult to enforce or might create a disincentive for users to operate within the system (that is, operators might find ways to operate without FAA's knowledge to avoid paying a fee), an outcome that could decrease compliance with rules meant to increase safety.
- A point-of-sale tax (generally a percentage of the cost of the products) on UAS would not necessarily be in proportion to the cost of services or benefits being provided by FAA and might be complicated to implement and administer. For example, stakeholders noted that a point-of-sale tax would not apply to home-built or second-hand UAS

users and the tax would not be linked to actual use of the UAS (that is, the UAS activities that might impose costs on FAA).

FAA's Lack of Planning to Consider Possible Fee Mechanisms Could Impede Future Design of UAS User Fees

FAA officials told us that they have not yet identified or studied potential UAS fee mechanisms or analyzed the findings included in the Task Group 3 report because they have been waiting for the results of our work to inform their decision-making and planning. OMB instructions to agencies related to user fees establish that—to increase efficiency of resource allocation and reduce burden on taxpayers—agencies should recover costs when special benefits are delivered to specific users and that agencies must review all agency programs on a biennial basis to determine whether fees should be assessed.⁵⁹ Similarly, federal internal control standards note that management should identify, analyze, and respond to significant change—such as increasing costs related to a change in mission like the integration of UAS to the national airspace—using a forward-looking process.⁶⁰

Given the evolving nature of the UAS industry, it is unclear how UAS users and associated government activities and services fit into FAA's existing funding structure. As the balance of FAA's activities gradually shifts to include increased focus on UAS-related activities, those activities continue to be funded by a combination of manned aviation users (through revenue to the Airport and Airway Trust Fund) and taxpayers (through general revenues). The revenues to the Airport and Airway Trust Fund are from taxes on airline tickets, cargo, and fuel, but are not closely linked to the costs to FAA of providing specific services. In 2007, FAA and the administration proposed a new funding system that would rely more on cost-based fees for specific manned aviation activities. This proposal, however, was never implemented. We previously testified regarding this proposal, noting that such fees could allow FAA to better identify funding options that link revenues and costs and improve transparency by showing how much is being spent on specific FAA activities, but that achieving these goals would depend on the soundness of FAA's cost

⁵⁹Office of Management and Budget, *Circular No. A-25 Revised: User Charges* (Washington, D.C.: July, 8, 1993).

⁶⁰GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 2014).

allocation methodology and extent to which revenues are linked to costs.⁶¹

The provision in the FAA Reauthorization Act of 2018 for GAO to conduct this review, FAA's tasking statement for Task Group 3, and statements made by Task Group 3 in its final report suggest an interest among Congress, FAA, and industry stakeholders, respectively, in considering user fees as an option for recovering the costs of FAA's UAS activities. Implementation of cost-based user fees for UAS would be different from FAA's longstanding funding structure for manned aviation, but may not necessitate a change in that existing structure for areas of FAA's mission other than UAS.⁶² Indeed, the Task Group 3 report expresses a consensus that options for UAS funding should not be constrained by the current traditional aviation funding structure, and any recommended funding structure should not alter the current structure of funding for traditional, manned aviation. As UAS integration continues to evolve, FAA may identify ways that the current aviation funding structure can be adjusted to recover costs related to UAS operations. For instance, FAA officials noted that, once large UAS cargo and passenger operations have been established, those operations could become subject to the same excise taxes on fuel, cargo, and passengers as are manned operations.

As we have discussed, fees to recover FAA's costs for its UAS activities need not be assessed on a program-wide basis. That is, fees to recover the costs of individual UAS activities can be implemented separately either as new rules or systems are developed or as FAA reviews its activities and identifies areas in which services to UAS users are incurring costs that could be recovered. Further, fees based on costs to FAA estimated as each rule or system is developed can be periodically adjusted as needed. As explained in our User Fee Design Guide, periodic reviews of user fees can help ensure that Congress, stakeholders, and agencies have complete information about changing program costs and that fees remain aligned with program costs. As UAS integration continues, ongoing conversations between Congress, FAA, and

⁶¹GAO, *Federal Aviation Administration: Observations on Selected Changes to FAA's Funding and Budget Structure in the Administration's Reauthorization Proposal*, [GAO-07-625T](#) (Washington, D.C.: March 21, 2007).

⁶²In the course of our review, we did not explore the implications of implementing cost-based user fees for FAA activities aside from those related to UAS, though GAO has previously reported on various proposals to make changes to the funding structure for FAA's manned aviation activities; see, for example, [GAO-06-973](#) and [GAO-17-131](#).

stakeholders may provide additional insight into how fees can be implemented to accomplish goals.

To date, FAA has not incorporated steps into its existing UAS planning efforts to identify potential fee mechanisms. Considering potential user fees as part of these efforts—such as FAA’s annual UAS implementation planning—could better position FAA to design effective user fees should policy makers task FAA with implementing them. For instance, collecting information on costs and beneficiaries as new UAS-related services are developed and implemented could ensure that data needed to design effective user fees are available. Similarly, considering ways to collect revenue—such as through third parties or online systems—as services and systems are being developed or adapted for UAS users, could facilitate future implementation of fees. As an example of the type of planning that may be needed, FAA officials said that identifying the costs of UAS traffic management services for the purpose of setting fees would involve (1) tracking which UAS are using the national airspace and (2) tracking and categorizing the type of operations conducted. Incorporating a means of collecting these data during the planning and development of traffic management systems would be useful to future fee-design considerations in this area. This is not to say that cost recovery considerations should drive the development of regulations or systems at the expense of mission goals. Rather, such planning would offer opportunities for FAA to examine systems, policies, and regulations that have been designed to accomplish the goals of UAS integration in order to assess (1) how each system, policy, or regulation will affect FAA’s costs; (2) the need for additional resources; and (3) potential options for collecting revenue.

Conclusions

FAA is tasked with managing the integration of UAS into the national airspace within the context of many competing priorities and limited resources. Without a process to ensure information on UAS-related costs is complete for either current or future efforts, neither FAA, nor the administration, or Congress have reliable information about the total costs of FAA’s UAS-related activities and therefore may lack the information needed to effectively prioritize resources. Further, this information could inform the design of effective user fees, should policy makers decide that such fees are appropriate. FAA’s UAS integration-planning efforts offer an opportunity for FAA to build the collection of relevant data, and consideration of user fee options, into ongoing activities.

Recommendations for Executive Action

We are making the following two recommendations to the FAA:

The Administrator of the Federal Aviation Administration should develop and implement a process to ensure that information on UAS-related costs is complete and reliable as capabilities and related regulations evolve. (Recommendation 1)

The Administrator of the Federal Aviation Administration, as part of UAS integration-planning efforts, should use available guidance on effective fee design to incorporate steps that will inform future fee-design considerations. For example, FAA may choose to incorporate these additional steps into its annual UAS implementation plan so that—as existing activities are adapted for UAS users or new regulations, services, or systems are introduced—costs and fee design options are considered. (Recommendation 2)

Agency Comments

We provided a draft of this report to the Department of Transportation (DOT) for comment. In its comments, reproduced in appendix III, DOT agreed that there are likely opportunities to better track and recover UAS-related costs and concurred with our recommendations.

We will be sending copies of this report to appropriate congressional committees and the Secretary of Transportation. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or KrauseH@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this report are listed in appendix IV.



Heather Krause
Director, Physical Infrastructure Issues

Appendix I: Stakeholders Contacted During the Course of This Review

We interviewed representatives from a non-generalizable sample of 22 UAS industry stakeholder groups selected based on participation in FAA’s Drone Advisory Committee Task Group 3, recommendations from industry stakeholders, or UAS and aviation stakeholders who were previously identified in GAO work. Stakeholders were selected to achieve a range of perspectives including UAS manufacturers, air-navigation service providers, recreational and commercial UAS operators of various sizes, manned aviation stakeholders, and international stakeholders. We interviewed stakeholders on specific fee options that were identified by Task Group 3 as well as factors that should be considered when contemplating the design and implementation of potential UAS fee mechanisms. Additionally, we interviewed the co-chairs of Task Group 3 about the process of developing the Task Group’s reports. Due to the relatively early stage of UAS integration, some stakeholders generally felt it was too early to know how fees could be appropriately implemented, and likewise, not all stakeholders had opinions on all options. Accordingly, we do not enumerate stakeholder responses in the report. Instead, we analyzed the responses and reported on common themes that arose during the stakeholder interviews. Because we selected a non-generalizable sample of stakeholders, their responses should not be used to make inferences about a population. To characterize stakeholders’ views in some cases, we defined modifiers (e.g., “some”) to quantify stakeholders as follows:

- “some” stakeholders represents stakeholders in 3 to 11 of the interviews
- “many” stakeholders represents stakeholders in 12 or more of the interviews

Table 5: Stakeholders Contacted During the Course of This Review

| Entity | Description |
|--|--|
| Academy of Model Aeronautics (AMA) | AMA is a model aviation association, representing a membership of more than 195,000 recreational model aircraft operators. Their purpose is to promote the development of model aviation. |
| Aerospace Industries Association (AIA) | AIA works as an advocate for nearly 340 member companies to strengthen the industry’s ability to effectively support America’s national security and economy, with focus on global competitiveness and innovation, the future of regulation, aerospace and defense investment, and the 21st century workforce. |
| Airlines for America (A4A) | A4A advocates on behalf of its members to shape policies to promote safety and security and a healthy U.S. airline industry. |
| AirMap | AirMap is an airspace management platform for UAS. Industry developers, UAS operators, and airspace managers use AirMap’s airspace intelligence and services to fly and communicate in low-altitude airspace. AirMap is developing technology solutions for UAS traffic management to enable safe and responsible UAS operations at scale. |

Appendix I: Stakeholders Contacted During the Course of This Review

| Entity | Description |
|--|---|
| Alliance for Drone Innovation | The Alliance for Drone Innovation advocates for manufacturers, suppliers, and software developers of professional and personal drones. |
| Amazon Prime Air | Amazon Prime Air is working to develop a future delivery system that is safe, environmentally sound, and enhances Amazons' existing delivery services. |
| American Airlines | American Airlines is a U.S. based airline that operates both domestically and internationally. An American Airlines representative served as a co-chair of the Drone Advisory Committee Task Group 3. |
| American Association of Airport Executives (AAAE) | AAAE is a professional organization for airport executives, representing thousands of airport management personnel at public-use commercial and general aviation efforts. |
| Association for Unmanned Vehicle Systems International (AUVSI) | AUVSI advocates for the advancement of unmanned systems and robotics and represents corporations and professionals from more than 60 countries involved in industry, government and academia. |
| Commercial Drone Alliance | The Commercial Drone Alliance advocates for the commercial use of drones by reducing barriers to enable this new technology and including educating users on the benefits of drone technology. |
| DJI Technology | DJI is a manufacturer of UAS for both recreational and commercial use. |
| Helicopter Association International | The Helicopter Association International advances the international helicopter community by providing programs to enhance safety and economic viability and encourage professionalism. |
| International Air Transport Association (IATA) | According to the organization's website, IATA is a trade association representing 290 airlines. |
| MITRE Center for Advanced Aviation System Development | MITRE is a non-governmental, not-for-profit entity that operates multiple federally funded research and development centers and conducts work with the FAA to meet the evolving needs of the nation's airspace. |
| National Council of State Legislators (NCSL) | NCSL is an advocate for state legislatures and provides tools, information, and resources to craft solutions to difficult problems. |
| National League of Cities | National League of Cities is a resource and advocate for the nation's cities and their leaders. |
| NAV CANADA | NAV CANADA is the company that owns and operates Canada's civil air navigation service. |
| Project Wing | Project Wing is an autonomous delivery UAS service and is developing an unmanned traffic management platform that will allow unmanned aircraft to navigate around other UAS, manned aircraft, and other obstacles. |
| Small UAV Coalition | According to the organization's website, the Small UAV Coalition is a partnership of leading consumer technology companies that believe that U.S. leadership in the research, development, production, and application of UAVs will benefit consumers. |
| Swiss Federal Office of Civil Aviation | The Federal Office of Civil Aviation (FOCA) is responsible for aviation development and the supervision of civil aviation activities in Switzerland. The FOCA is part of the Federal Department of the Environment, Transport, Energy and Communications and is charged with ensuring high safety standards in civil aviation in Switzerland. |
| Transport Canada | Transport Canada is a federal institution in Canada responsible for transportation policies and programs. They promote safe, secure, efficient and environmentally responsible transportation. |
| United Kingdom National Air Traffic Services (UK NATS) | UK NATS is a public-private partnership that provides air traffic navigation services to aircraft flying through United Kingdom-controlled airspace and at numerous United Kingdom and international airports. |

Source: GAO. | GAO-20-136

Appendix II: Federal Aviation Administration Unmanned Aircraft Systems Activities and Associated Fiscal Year 2018 Obligations

Table 6: Federal Aviation Administration Activities Related to Unmanned Aircraft Systems and Associated Fiscal Year 2018 Obligations

| Federal Aviation Administration (FAA) Office | Obligations category and description | Fiscal Year 2018 obligations (rounded to the nearest thousand) |
|--|--|--|
| Office of Aviation Safety-Operations | Unmanned Aircraft Systems (UAS) Integration Office: activities related to the safe, efficient, and timely integration of UAS into the national airspace. | \$28,024,000 |
| | Flight Standards Service: setting of safety standards for certification, enforcement, and oversight of airmen, air operators, air agencies, UAS, and designees. | \$944,000 |
| | Aircraft Certification: development and administration of safety standards and procedures governing the design, production and airworthiness of UAS. | \$2,589,000 |
| | Office of Rulemaking: management of FAA’s rulemaking program, processes, and timelines; development of proposed and final rules; management of responses to petitions for rulemaking and for exemption from regulatory requirements; and oversight of rulemaking advisory committees that provide advice and recommendations on aviation-related issues. Recent activities include notices of proposed rulemaking related to operations over people and safe and secure operations of small UAS. | \$166,000 |
| | Quality and Integration: executive oversight and direction of consolidated management support services, including support for UAS-related activities, for all of Aviation Safety, including planning, financial management, information-technology liaison services, and administrative activities for the immediate office of the Associate Administrator. | \$1,718,000 |
| Office of Finance and Management-Operations | Information and Technology Services: activities related to maintaining the UAS registration system and the delivery of information technology tools and capabilities to support UAS programs. | \$725,000 |
| NextGen and Operations Planning-Operations | NextGen: includes day-to-day management and oversight of FAA’s UAS testing facilities | \$158,000 |
| Air Traffic Organization-Operations | Technical Training & Safety: activities related to ensuring the safety of the national airspace system through reporting, mitigating, and monitoring risks related to UAS integration. | \$1000 |
| | Program Management Organization: The Program Management Organization provides full life-cycle program management capability across all of the Air Traffic Organization from initial definition, through design, development, and effective deployment of national airspace system sustainment, UAS integration, and NextGen modernization systems. | \$480,000 |
| | System Operations: activities related to the operational oversight of all national airspace system security issues, including those related to UAS | \$438,000 |
| | Terminal: activities related to the safety of operations near or at an airport specifically related to UAS. | (\$97) ^a |
| | Mission Support: aeronautical chart and data revisions, and development and maintenance of Radar Video Maps in response to increasing requirements of UAS integration. Updating of UAS Facility Maps, National Security maps, maps required under the FAA Extension, Safety, and Security Act of 2016, and all related data in support of Low Altitude Authorization and Notification Capability and changing UAS requirements. | \$6,027,000 |
| | Technical Operations: activities related to the delivery of flight services to UAS users and customers through maintenance of air traffic control facilities, systems, and equipment, and by providing operational oversight of leased services. | \$7,000 |

**Appendix II: Federal Aviation Administration
Unmanned Aircraft Systems Activities and
Associated Fiscal Year 2018 Obligations**

| Federal Aviation Administration (FAA) Office | Obligations category and description | Fiscal Year 2018 obligations (rounded to the nearest thousand) |
|---|---|---|
| Staff Offices-Operations | Policy, International Affairs, and Environment: activities related to increasing the safety and capacity of the global aerospace system in an environmentally sound manner, including FAA's international coordination efforts related to UAS. | \$509,000 |
| | Security and Hazardous Materials Safety: development and enforcement of UAS safety and security policies and programs intended to ensure aviation safety, support national and homeland security, and promote an efficient airspace system. | \$873,000 |
| | Office of the Chief Counsel: provides mission critical legal services for the FAA and provides legal advice and reviews agency action for legal sufficiency stemming from new authorities related to UAS | \$454,000 |
| | Office of Communications: coordination with other FAA offices to provide information about FAA's UAS activities and initiatives to the media, the aviation community, and the public. | \$349,000 |
| Facilities and Equipment | UAS Concept Validation and Requirements Development: identification and refinement of requirements for FAA automation and other support systems to integrate UAS into the national airspace including air-traffic management automation, airspace management, policies, and procedures. | \$6,587,000 |
| | UAS Flight Information Management and Drone Zone: development of a proposed UAS traffic-management system, including development of the concepts, use cases, and requirements associated with UAS traffic management and the associated Flight Information Management System (a gateway for data exchange between FAA and UAS traffic management service suppliers) to manage UAS operations. | \$4,526,000 |
| | Next Generation Air Transportation System (NextGen): activities to support the integration of UAS into planning and implementation of the Next Generation Air Transportation System—an ongoing modernization of the U.S. air transportation system. | \$43,000 |
| | Program Management: program management activities supporting the integration of UAS into NextGen design and deployment. | \$9,000 |
| | Technical Operations: facilities and equipment related to the delivery of flight services to UAS users and customers through maintenance of air-traffic control facilities, systems, and equipment, and by providing operational oversight of leased services. | \$6,000 |
| | Aviation Safety: activities supporting the integration of UAS into NextGen design and deployment. | \$2,350,000 |
| Research, Engineering, and Development | UAS Research, Engineering, and Development: research and development activities supporting the integration of UAS into NextGen design and deployment, including research on the safety implications of new aircraft operational concepts and technology and the development of new and modified regulatory standards. | \$12,737,000 |
| Total | | \$69,276,000 |

Source: GAO analysis of Federal Aviation Administration financial data for fiscal year 2018. | GAO-20-136

^aNegative obligations reflect a correction of obligations in previous fiscal years.

Appendix III: Comments from the Department of Transportation



U.S. Department
of Transportation
**Office of the Secretary
of Transportation**

Assistant Secretary
for Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

NOV 26 2019

Heather Krause
Director, Physical Infrastructure Issues
U.S. Government Accountability Office (GAO)
441 G Street NW
Washington, DC 20548

The Federal Aviation Administration (FAA) is moving judiciously to safely integrate unmanned aircraft systems (UAS) into the National Airspace System. The FAA has established mechanisms for identifying and tracking costs associated with a number of UAS related activities including, UAS rulemaking and research, and development of a UAS traffic management system. The Agency recognizes that as the UAS industry evolves, costs related to UAS activities may increase and additional mechanisms for tracking costs related to UAS activity may be needed. The FAA established a stakeholder group, the Drone Advisory Committee (DAC), which identified a number of potential fee mechanisms that could be implemented to recover Agency costs related to a range of UAS related activities.

The FAA offers the following comments in response to issues raised in GAO's draft report:

- The FAA has established mechanisms for identifying and tracking costs associated with a number of UAS related activities, especially in Agency organizations where the vast majority of current UAS related activities are taking place (Office of Aviation Safety and the Air Traffic Organization). However, the FAA agrees there may be an opportunity to better track UAS-related costs for offices involved in UAS related activities outside the primary FAA organizations.
- While the Agency has not incorporated any specific steps into its existing UAS planning efforts to identify potential fee mechanisms, the FAA has received recommendations on potential fee mechanisms that could be used to recover the FAA's costs for UAS related activities. Given the rapid expansion of the UAS industry, as well as the likelihood that the FAA's role will grow in kind, there will likely be future opportunities to determine which of the proposed fee-based structures are agreeable to both Congress and industry and would allow the Agency to more fully recover UAS related costs. However, additional authority from Congress is required to enable the FAA to collect and use revenue over and above the current UAS registration fee.

The FAA concurs with both recommendations and will provide a detailed response to each recommendation within 180 days of the final report's issuance.

We appreciate the opportunity to offer the Agency's perspective on the GAO draft report. Please contact Madeline Chulumovich, Audit Relations and Program Improvement, at (202) 366-6512 to obtain additional details.

Sincerely,

Keith Washington
Deputy Assistant Secretary for Administration

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Heather Krause, (202) 512-2834 or KrauseH@gao.gov.

Staff Acknowledgments

In addition to the contact named above, the following individuals made important contributions to this report: David Sausville, Assistant Director; Katie Hamer, Analyst-In-Charge; Alexandra Jeszeck; Amy Abramowitz; Camilo Flores; Richard Hung; Delwen Jones; Heather Keister; Hannah Laufe; Susan Murphy; Joshua Ormond; Pamela Snedden; and Elizabeth Wood.

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