U.S. DEPARTMENT OF TRANSPORTATION
OFFICE OF INSPECTOR GENERAL
INSPECTOR GENERAL

September 12, 2019

The Honorable Peter A. DeFazio
Chairman
Committee on Transportation and Infrastructure
U.S. House of Representatives
Washington, DC 20515

The Honorable Sam Graves
Ranking Member
Committee on Transportation and Infrastructure
U.S. House of Representatives
Washington, DC 20515

The Honorable Rick Larsen
Chairman
Subcommittee on Aviation
Committee on Transportation and Infrastructure
U.S. House of Representatives
Washington, DC 20515

The Honorable Garret Graves
Ranking Member
Subcommittee on Aviation
Committee on Transportations and Infrastructure
U.S. House of Representatives
Washington, DC 20515

Dear Chairmen and Ranking Members:

The Federal Aviation Administration's (FAA) Next Generation Air Transportation System (NextGen) is a multibillion-dollar transportation infrastructure project intended to modernize our Nation's aging air traffic system and provide safer and more efficient air travel. Implementing NextGen is a complex undertaking and requires joint investments from FAA (new ground systems for controllers) and airspace users (new avionics and displays for pilots) to realize expected benefits.

There are several key NextGen technologies that require airspace users to purchase and install new avionics on their aircraft. This includes Automatic Dependent Surveillance–Broadcast (ADS-B), which uses satellite-based Global Position System technology intended to allow FAA to transition from ground-based radar to a satellite-based system for tracking aircraft and managing air traffic. FAA has mandated that aircraft operating in most controlled domestic airspace be equipped with ADS-B *Out*[1] technology by January 1, 2020.[2]

[1] ADS-B consists of two services: (1) *Out,* which broadcasts an aircraft's flight position data to the ADS-B ground system and controller displays; and (2) *In*, which displays flight information in the cockpit, including the location of other aircraft. ADS-B *In* is not currently mandated and requirements continue to evolve.
[2] 14 CFR § 91.225 and 14 CFR § 91.227 (May 2010).

Citing concerns about whether operators would meet the 2020 deadline, Chairmen Shuster and LoBiondo of the House Transportation and Infrastructure Committee and its Aviation Subcommittee requested that we provide information regarding equipage rates for ADS-B and other technologies on commercial and general aviation aircraft.[3] Accordingly, our audit objectives are to: (1) determine the equipage rates for ADS-B and other NextGen-enabling technologies[4] on commercial and general aviation aircraft, (2) ascertain the reasons behind aircraft operators' decisions to equip or not equip with these technologies, and (3) assess FAA and aircraft operators' plans to meet the 2020 ADS-B *Out* equipage deadline.

With the 2020 ADS-B *Out* deadline approaching, we are providing the preliminary results of our ongoing audit related to ADS-B *Out* equipage rates in the enclosed briefing, which we recently discussed with your staff. We reviewed monthly data collected by FAA and MITRE from May 1, 2018, through June 1, 2019, regarding ADS-B *Out* equipage rates of commercial and general aviation aircraft. We also conducted interviews with FAA representatives, MITRE, and industry stakeholders regarding the data, including its accuracy.

Overall, we found that ADS-B *Out* equipage is increasing—as of June 1, 2019, 73,421 commercial, international, and general aviation aircraft were in compliance with the ADS-B-*Out* mandate, an increase of nearly 69 percent since May 1, 2018. However, as we noted in our briefing, equipage rates vary by segment of the industry:

- **Commercial operators have higher equipage rates than general aviation.** While 76 percent of commercial operators have equipped their aircraft with ADS-B *Out*, only 44 percent of general aviation operators have equipped their aircraft with the technology.

- **Mainline and regional commercial carriers are equipping at a higher rate than smaller commercial carriers.** ADS-B *Out* equipage rates at mainline (81 percent) and regional (73 percent) carriers have more than doubled since May 1, 2018. However, equipage at smaller commercial operators is lagging, with only 44 percent of the fleet equipped.[5]

- **Equipage rates varied among general aviation operators.** While 63 percent of higher-end turbojet and turboprop operators estimated to equip with ADS-B *Out*

[3] *OIG Audit Announcement - Review of NextGen Equipage Rates*, Project No. 18A3004A000, May 17, 2018.
[4] For the purposes of this audit we are focusing on operator equipage of three NextGen-technologies: (1) ADS-B *Out*; (2) Data Communications (DataComm); and (3) Performance Based Navigation (PBN).
[5] According to FAA, mainline and regional commercial carriers make up 93 percent of the total commercial (Part 121) fleet it tracks for ADS-*Out* equipage, with smaller carriers making up the remaining approximately 7 percent.

have done so, only 40 percent of single- and multi-engine piston operators estimated to equip have done so.[6]

We provided FAA representatives with the briefing and incorporated their comments as necessary. In addition, we plan on completing our audit and issuing a final report addressing our three audit objectives this winter. If you have any questions or need further information, please contact me at (202) 366-1959 or Matthew E. Hampton, Assistant Inspector General for Aviation Audits, at (202) 366-0500.

Sincerely,

Calvin L. Scovel III
Inspector General

Enclosure

[6] According to FAA and industry officials, it is likely that not all general aviation operators will equip their aircraft with ADS-B *Out*. This is due to factors such as not regularly flying in ADS-B *Out* required airspace or waiting until after the 2020 mandate to equip their aircraft. However, there is not an exact estimate of how many operators will not equip.

U.S. DEPARTMENT OF TRANSPORTATION
Office of Inspector General

NextGen Equipage: Status of ADS-B *Out* Equipage on Commercial and General Aviation Aircraft

Briefing for the House Committee on Transportation & Infrastructure
July 24, 2019

Scope of OIG Review

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- **Congressional Request**
  - Chairmen Bill Shuster and Frank LoBiondo of the House Committee on Transportation and Infrastructure and its Aviation Subcommittee requested that the OIG examine equipage rates for NextGen technologies, including ADS-B; plans to ensure compliance with the 2020 ADS-B *Out* equipage deadline; and the extent that operators are equipping aircraft as a result of business decisions, regulatory mandates, or other considerations.
- **Objectives**
  - (1) Determine the equipage rates for ADS-B and other NextGen-enabling technologies on commercial and general aviation aircraft, (2) ascertain the reasons behind aircraft operators' decisions to equip or not equip with these technologies, and (3) assess FAA's and aircraft operators' plans to meet the 2020 ADS-B *Out* equipage deadline.
- **Scope**
  - The audit focuses on the installation of three NextGen technologies (ADS-B, DataComm, and Performance-Based Navigation (PBN)) on commercial and general aviation aircraft. **Due to the approaching 2020 ADS-B *Out* deadline, this briefing provides information regarding the current ADS-B *Out* equipage rates for commercial and general aviation aircraft as of June 1, 2019.**

Background – ADS-B and the Equipage Mandate

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ADS-B consists of two services:

- ***ADS-B Out*** broadcasts an aircraft's flight position data to the ADS-B ground system and controller displays. It is expected to provide more accurate information to track aircraft in the air and on the ground. With more accurate information, controllers will be able to position and separate aircraft with more precision, allowing them to fly closer together safely. Operators must install *Out* on their aircraft by January 1, 2020 to fly in most controlled airspace.
- ***ADS-B In*** displays flight information in the cockpit, including the location of other aircraft. It also provides pilots with weather and other critical information. ADS-B *In* is not mandated as part of the ADS-B rule, and requirements for ADS-B *In* continue to evolve.

Source: FAA

Background (cont.)

- In May 2010, FAA issued a final rule (14 CFR § 91.225 and 91.227) requiring all aircraft operators that fly in most controlled airspace install ADS-B *Out* by January 1, 2020. To meet the requirements, an operator must equip their aircraft with: (1) a qualified Global Navigation Satellite System position source, (2) an *Out*-capable transponder, and (3) an appropriate antenna.
- In August 2015, FAA granted a one-time waiver, known as a "12555 Exemption," that allows operators to delay updating their aircraft's position source until December 31, 2024. However, the exemption still requires airspace users to install a compliant transponder by 2020.
- If operators do not equip their aircraft, they would need to contact air traffic control at least an hour in advance for flight route approval and may be denied access to certain airspace.

Status of ADS-B *Out* Equipage

Total ADS-B *Out* Equipage Levels, as of June 1, 2019

- As the 2020 deadline approaches, overall ADS-B *Out* equipage rates are increasing. According to FAA data, 73,421 commercial, international, and general aviation aircraft were in compliance with the ADS-B *Out* mandate, an increase of nearly 69 percent since May 1, 2018.
- Of these, 76 percent of commercial aircraft, 60 percent of international aircraft, and 44 percent of general aviation aircraft were deemed compliant. The rates varied depending on the type of operation and engine type.

Table 1. ADS-B Out Equipage by Operator and Operation/Type as of June 1, 2019

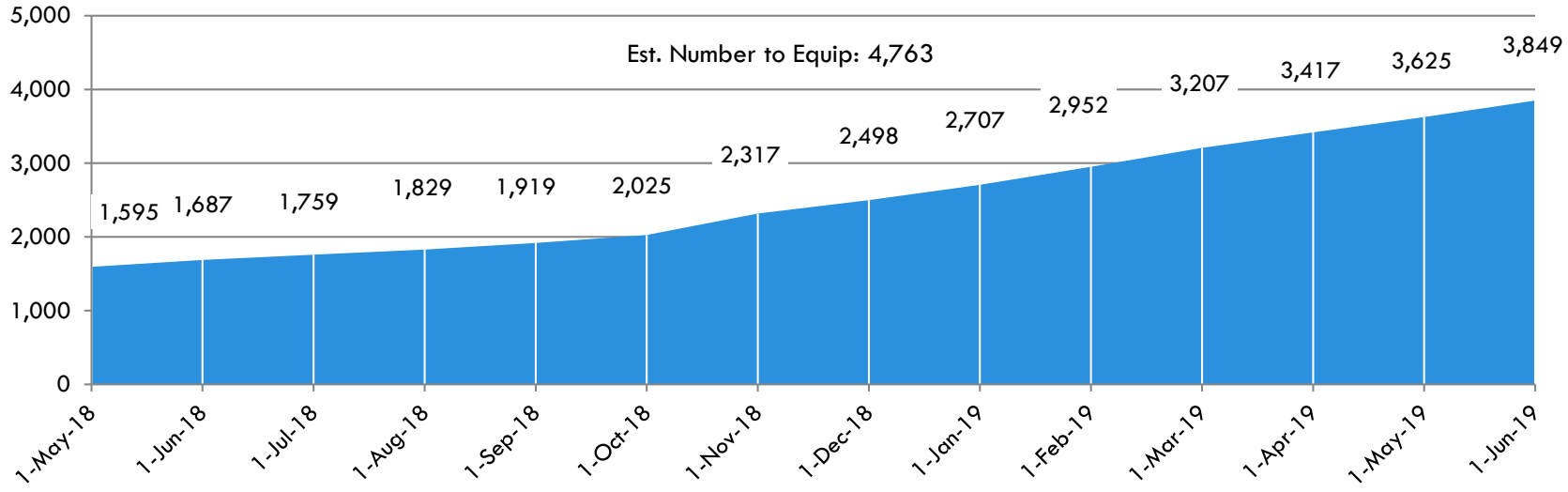
Operator	Operation/Engine Type	Number of Aircraft Observed Compliant	Total Number of Aircraft	Percentage of Aircraft Observed Compliant
Commercial (Domestic)	Mainline	3,849	4,763	81%
	Regional	1,290	1,777	73%
	Other	227	518	44%
	Subtotal	**5,366**	**7,058**	**76%**
International		**5,561**	**9,276**	**60%**
General Aviation	Turbojet/Turboprop	14,166	22,596	63%
	Single/Multi-Engine Piston	48,328	120,726	40%
	Subtotal	**62,494**	**143,322**	**44%**
Total		**73,421**	**159,656**	**46%**

Source: OIG Analysis of FAA/MITRE Data

ADS-B *Out* Equipage Levels: Commercial Mainline

- Mainline carriers consist of 11 commercial and cargo airlines that make up 68 percent of the Part 121 fleet. Their fleets cover a range of aircraft models from smaller, regional jets, such as ERJ-170s/190s, to larger aircraft, such as Boeing 767s and 787s.
- 81 percent of mainline carriers' aircraft (3,849 of 4,763) have successfully equipped with ADS-B *Out*. While initially slow to equip, the number of equipped aircraft has increased 141 percent since May 1, 2018.

Figure 1. ADS-B *Out* Equipped Commercial Mainline Aircraft

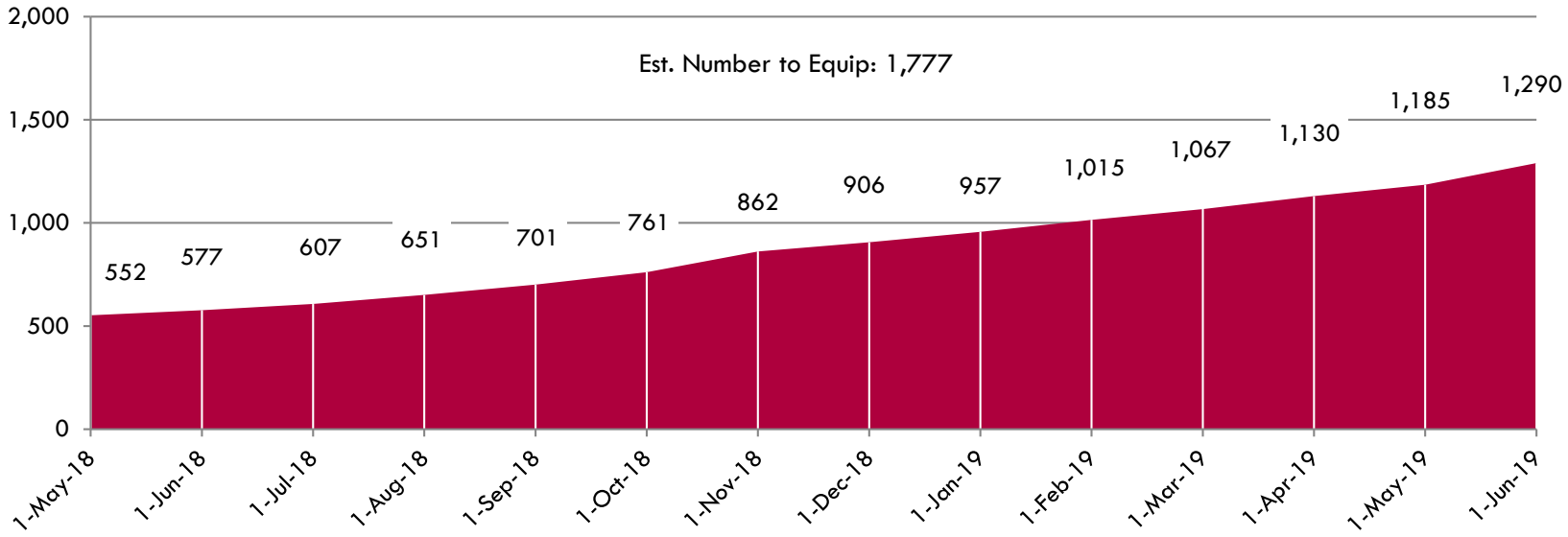


Source: FAA/MITRE

ADS-B *Out* Equipage Levels: Commercial Regional

- Regional carriers consist of 14 commercial and cargo airlines that make up 25 percent of the Part 121 fleet. Their fleets consist mainly of small jets, such as Embraer 170s/190s and Bombardier CRJ-2s/7s/9s, with some turboprop-powered Bombardier Dash 8s.
- 73 percent of regional carriers' aircraft (1,290 of 1,777) have successfully equipped with ADS-B *Out*. The number of equipped aircraft has increased by 134 percent since May 1, 2018.

Figure 2. ADS-B *Out* Equipped Commercial Regional Aircraft

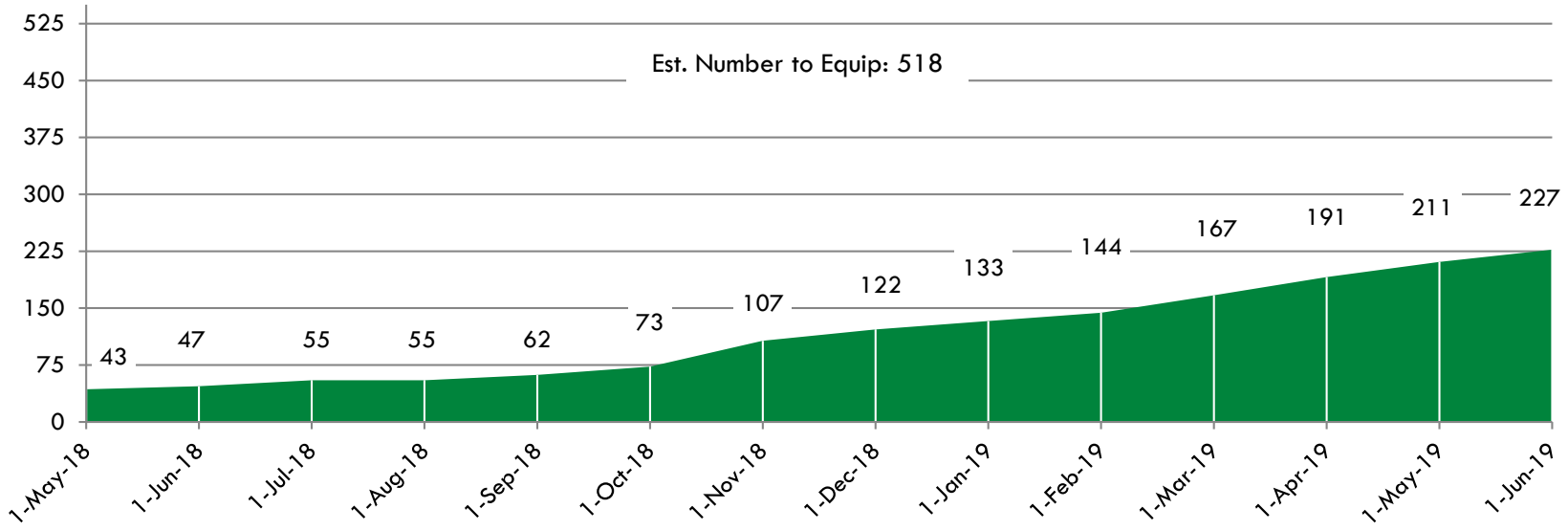


Source: FAA/MITRE

ADS-B *Out* Equipage Levels: Other Commercial

- Other carriers consist of 42 Part 121 commercial and cargo airlines that make up roughly 7 percent of the fleet. They are small operators, with 28 of them operating 12 aircraft or less.
- 44 percent of the other commercial carriers' aircraft (227 of 518 aircraft) have successfully equipped with ADS-B *Out*. While the number has significantly increased since May 1, 2018, it considerably lags behind the equipage rates for mainline and regional carriers.

Figure 3. ADS-B *Out* Equipped Other Commercial Aircraft

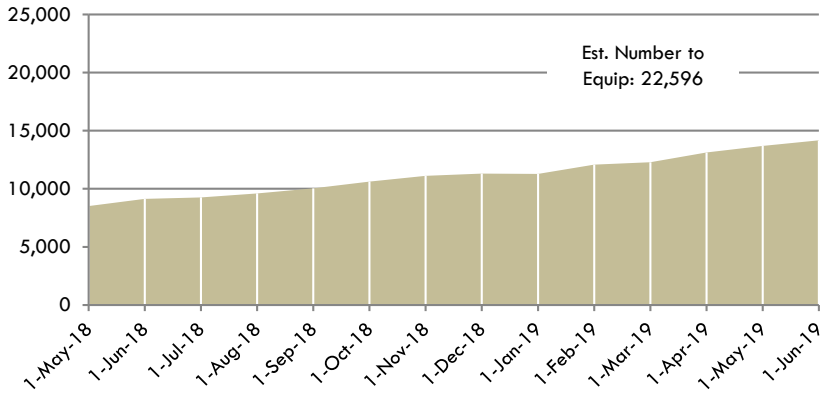


Source: FAA/MITRE

ADS-B *Out* Equipage Levels: General Aviation

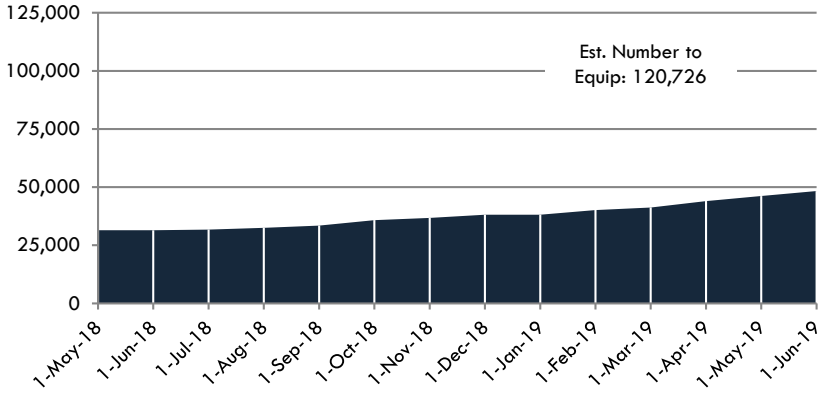
- 44 percent of general aviation aircraft (62,494 of 143,322) that are estimated to equip with ADS-B *Out* have done so. This segment of operators has been slow to equip and has seen only a 56 percent increase in equipage since May 1, 2018.
- 63 percent of higher-end turbojet and turboprop aircraft (14,166 of 22,596) estimated to equip have done so.
- Conversely, only 40 percent of the single- and multi-engine piston aircraft (48,328 of 120,726) estimated to equip have done so.

Figure 5. ADS-B *Out* Equipped Turbojet & Turboprop Aircraft



Source: FAA/ MITRE

Figure 6. ADS-B *Out* Equipped Single & Multi-Engine Piston Aircraft



Source: FAA/MITRE