

Emerging Aviation Entrants: Unmanned Aircraft System and Advanced Air Mobility

New Entrants: Analysis and Forecasts

Unmanned aircraft systems (UAS or drones) are relatively new entrants into the national airspace system (NAS) and are experiencing rapid diversification, both in terms of operations and aircraft. UAS have been experiencing healthy growth in the United States and around the world over the past decade. The last few years have been no exception despite the profound impact of COVID-19 on the overall economy. A drone consists of a remotely-piloted aircraft and its associated elements—including the ground control station and the associated communication links—that are required for safe and efficient operation in the NAS. The introduction of drones in the NAS has opened numerous possibilities, especially from a commercial perspective, e.g., package deliveries. That introduction has also brought operational challenges including safe and secure integration of drones into the NAS. Despite these challenges, the drone sector holds enormous promise; potential uses range from individuals flying solely for recreational purposes to small businesses carrying out focused missions to large companies delivering commercial packages, infrastructure inspections and delivering medical supplies. Public service

uses, such as conducting search and rescue support missions following natural disasters, are proving promising as well.

The other new entrant, Advanced Air Mobility (AAM), has seen rapid development of aircraft, and operations are expected to begin in the near future. AAM is an umbrella term for aircraft that are typically highly automated, utilize electrically powered propulsion, and have vertical take-off and landing capability. Many of these aircraft fall into the powered-lift category and are often referred to as air taxis. Urban Air Mobility (UAM) is a subset of the AAM concept which involves cooperative air transportation services in and around urban areas while Regional Air Mobility (RAM) are AAM operations that are highly automated and conducted outside of urban areas. Several proposed use cases for AAM/UAM aircraft include passenger and cargo transport and the provision of emergency services.

This section provides a broad overview covering recreational and commercial unmanned aircraft²⁶ and their recent trends, as

²⁶ These are also called, interchangeably, hobby or model and non-hobby or non-model UAS, respectively. On October 5, 2018, the President signed the FAA Reauthorization Act of 2018 (Pub. L. 115-254). Section 349 of that Act repealed the Special Rule for Model Aircraft (section 336 of Pub. L. 112-95; Feb. 14, 2012) and replaced it with new conditions to operate recreational sUAS without requirements for FAA certification or operating authority. The Exception for

Limited Recreational Operations of Unmanned Aircraft established by section 349 is codified at 49 U.S.C. 44809 [see <https://bit.ly/30tUf1Z> for more details]. Recreational flyers, under Section 349, are referred to as “recreational flyers or modeler community-based organizations” [see <https://bit.ly/2PUhMCI>]. In previous notes including other documents of the Agency, these terms are often interchanged.

gathered from trends in registrations, surveys, tracking the overall market, and operational information. Using these trends and insights from the industry, the FAA produces a number of forecasts. Forecasts reported in the following sections are driven primarily by assumptions of the continuing evolution of the regulatory environment, the commercial ingenuity of manufacturers and operators, persistent recreational uses, and underlying

demand for drone services. The forecasts for UAS and AAM are supported by analyses of recent survey findings, data on imported equipment, remote pilots, and waivers and exemptions of small UAS. The section also provides analysis and forecasts of large UAS. Finally, an analysis of AAM is provided together with some initial projections drawn from FAA-sponsored and other research, government and industry reports.

Trends in Recreational/Model Aircraft New Registration

The FAA's online registration system for recreational/model small drones went into effect on December 21, 2015. This required all drones weighing more than 0.55 pounds (or 250 grams) and fewer than 55 pounds (or 25 kilograms) to be registered using the online system or the existing (paper-driven) aircraft registry.²⁷ With the continuing registration, over 1.61 million (new) recreational drone owners had already registered cumulatively with the FAA by end of December of 2024.²⁸ On average, new owner registration stood at around 5,810 per month during January – December in 2024 with some expected peaks during the holiday seasons and summer. In comparison, the average new owner registration stood at around 6,053 per month during January – December in 2023. Prior to that, the average new owner registration per month stood at around 7,866 in 2022. Clearly, the average monthly registrations have been declining over the years.

As evident, the current pace of new registration (and, presumably, sales of drones requiring registration) has decreased compared to last year in the same period; average new monthly registration during 2024 stood at 243 less than the number observed in 2023. In 2023, the number stood at 1,813 less than in 2022 and this trend has been relatively consistent over the last few years. We expect this trend to continue over the five-year forecast horizon.

At present, recreational ownership registration does not correspond one-to-one with aircraft. Unlike their commercial non-model counterpart, the registration rules for recreational operators do not require owners of small recreational drones (sUAS) to register each individual aircraft; only operators are registered.²⁹ For each registration, therefore, one or more aircraft may be owned. In some instances, there is no equipment associated with registration. Free registration at the initial phase may have incentivized some to create a registration without any equipment

²⁷ See <https://bit.ly/2lfJ1cm>.

²⁸ For our estimate and projections using the registration database, applied to recreational, commercial/Part 107 and remote pilots, we use only those who are registered in the US and the territories for the period January – December, 2024.

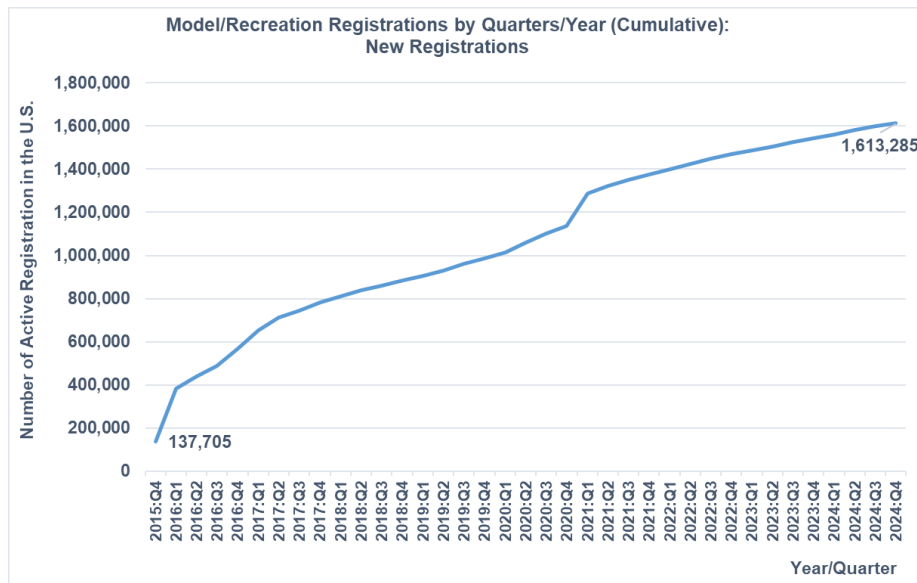
Furthermore, we draw a clear distinction between new registrations, cancellations, and renewals in this document that has been explained later on.

²⁹ <https://bit.ly/3WqlbNH>

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to report. Notwithstanding these challenges, there is information available, from industry and academia and surveys, allowing us to understand aircraft ownership. Furthermore, as a result of robust strategic drone research planning, the FAA has launched various research projects to understand the magnitude

of the sector, implications for aircraft that may be used for recreational flying, as well as potential safety impacts of drone integration into the NAS. Finally, the Agency has incorporated outside analysis and launched surveys³⁰ to understand the magnitude of the sector and improve forecasting efforts.



With over 1.61 million new recreational operators cumulatively registered as of December 2024, the FAA estimates that there are approximately 1.87 million sUAS in the fleet distinctly identified as recreational aircraft, i.e., equipment is 16 percent higher than the total new registrations. Comparing industry sales and other data, we conclude that the number of recreational aircraft is almost 16 percent higher than ownership registration. Applying cumulative net gain/loss calculations from the registry, the effective/active fleet is estimated to be around 455,106 as of December 2024. This provides us with the

lower bound of the effective/active fleet of recreational small drones in the NAS.

A comparison of last year's data (2023) with this year's (2024) shows the annual growth rate for new registrations to be a little over 4.5 percent, a slight drop from the 4.9 percent growth in the year before (2023) and continuing the trend from the year before (2022) of 6.7 percent. Nevertheless, it is still an increasing trend, albeit at a lower rate. This is possibly due to the continuation of drones playing a dominant role in recreation, facilitated by decreasing equipment prices,

³⁰ Survey and results have been reported below.

improved technology such as built-in cameras and higher capability sensors, and relatively easy maneuvering. Nevertheless, like all technologies fueling growth of hobby or recreational items, the trend in recreational small drone ownership registration has been slowing. It is likely to slow down further as the pace of falling prices diminishes and the early adopters begin to experience limits in their experiments, or simply because recreational eagerness plateaus.

Given trends in registration and market developments, the FAA forecasts that the recreational small drone market will saturate at around 1.93 million units over the next five years.^{31,32} However, there is still some upside uncertainty due to further changes in technology, faster regulatory integration, and the likely continued decreasing prices. This

leads to upside possibilities in the forecast of as many as 1.97 million units by 2029. If registration renewals are kept up over time, effective/active fleet would likely converge to base forecasts, i.e., derived from cumulative new registrations combined with multiplicity of craft ownership. In the presence of slower renewal tendency, as data presently indicates, it is likely that the effective/active fleet will be lower than that derived from base forecasts. This provides the FAA with an opportunity to derive low-side forecasts using effective/active fleet calculations. Nonetheless, the low-side uncertainty growth trajectory (i.e., annual growth rates) tracks closer to the base forecast in the outer years of 2027-2029. A forecast base (i.e., the most likely outcome), together with high and low scenarios, is provided in the table below:³³

Total Recreation/Model Fleet				
(Million sUAS units)				
	Calendar Year	Low*	Base**	High**
Historical	2024	0.4551	1.8670	1.8670
Forecast	2025	0.4600	1.8894	1.9043
	2026	0.4848	1.9110	1.9287
	2027	0.4978	1.9228	1.9452
	2028	0.5055	1.9258	1.9588
	2029	0.5072	1.9297	1.9725
**: effective/active fleet counts combined with multiplicity of craft ownership;				
***: new registration counts combined with multiplicity of craft ownership;				

The FAA forecasts that the recreational small drone fleet will likely maintain its peak with

average or trend growth over the next 5 years, from the present around 1.87 million units to approximately 1.93 million units by

³¹ These forecasts have two dimensions worth emphasizing. When looked at from the cumulative base, “total” captures the number of drones that are reported to be in the system (i.e., base and high); while “effective/active fleet” refers to aircraft that are presently operating in the system (i.e., low).

³² As we extend the forecast time period by a year from 2028 to 2029 for rolling 5-year projections, the sector is expected to expand by around 63,000 from what we forecasted last year:

1.8830 million in 2028 to 1.9297 million in 2029. This trend is likely to continue due to secular growth in the sector.

³³ As noted earlier, low scenario reports effective/active fleet using a net gain/loss calculation. By definition, low scenario differs from base and high scenarios, which are based on new registrations only. Hence, a low scenario counting of fleet for the year 2024 is markedly different than the baseline and high scenarios for the same year.

2029 thus attaining an average annual growth rate of 0.66 percent during 2024–2029. During the last year, it was reported to be 1.2 percent for 2023–2028.

Following somewhat different growth trajectory than the base or high growth, there will likely be approximately 507,237 active/effective small drones (or, 52,131 more than what was observed during 2024) over the next five years in 2029, which is now the low forecast for recreational/model small drones. This ensures an average annual growth rate of 2.2 percent during 2024–2029. Active/effective fleet count is determined and projected based on the net gain/loss calculation derived by using five underlying components from the registry. The high scenario, on the other hand, may reach as high as 1.97 million units (or 1.1 percent average annual growth rate).

Notice that eventual saturation is at somewhat higher levels in comparison to last year's projections, reflecting continued new registrations, albeit at a slower rate, by recreational flyers observed during 2024 and

extension of the forecast projection by a year. The increased new registration trend, in part driven by COVID-19, may or may not continue in the longer run.³⁴ In comparison, low side forecasts assume the present trend in renewals combined with new registration followed by similar expiry and cancellation trends. Nevertheless, the growth rates underlying these numbers are steady in the initial years but fade faster in the last two to three years. The gradual saturation that is projected in five years and beyond in the recreational small drone fleet parallels other consumer technology products and the Agency's projections from the last few years, particularly with respect to base and high forecasts. However, both the numbers and the growth trajectory for the low scenario (i.e., effective/active fleet) are fundamentally different from the past couple years for the reasons described above. Nevertheless, it provides a lower bound that is likely to be closer to reality in terms of small drones that are in use and operationally active in the NAS.

Trends in Commercial/Non-Model Aircraft and Forecasts Using Registrations vs. Effective/Active Fleet

Online registration for commercial/non-model small drones went into effect on April 1, 2016. Unlike recreational/model ownership, rules for commercial registration require owners to register each unmanned aircraft, thus creating a one-to-one correspondence between registration and aircraft. During the period of January – December 2024,

more than 124,000 commercial operators registered their equipment. In comparison, during the period of January – December 2023, more than 115,000 commercial operators registered their new equipment. The pace of monthly new registration in 2024, at around 10,370, is higher than monthly registrations of 9,627 during 2023 which was

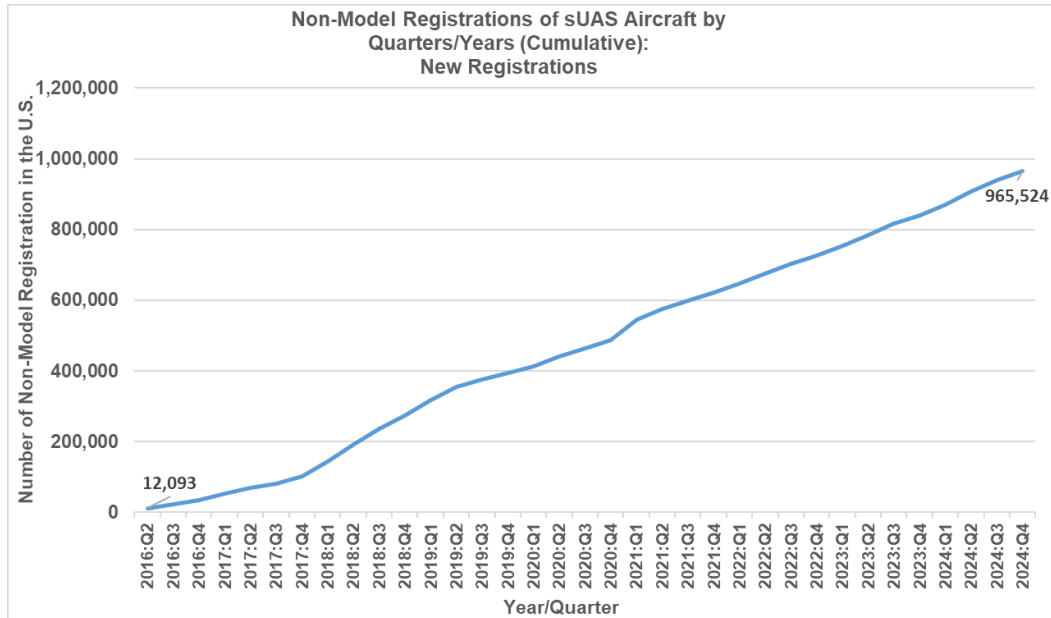
³⁴ It is quite likely that many users were buying and experimenting with recreational small drones given the COVID-19 public health emergency and

the substantial portion of the workers presently working from home. This trend may or may not continue once regular work patterns resume.

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higher than those observed during 2022 at 8,750. The number of new registrations is higher in comparison to earlier years. As the pace of recreational registration has slowed

somewhat, particularly last year, FAA expects new registrations for commercial sUAS to follow suit.



The commercial small drone sector is dynamic and appears to be at an inflection point, as is evident from the monthly registrations, demonstrating powerful stages of growth. Unlike the recreational small drone

sector, the FAA anticipates that the growth rate in this sector will remain high over the next few years. This is primarily driven by the regulatory clarity that Part 107 continues to provide for the industry.

Total Commercial/Non-Model Fleet

(Thousand sUAS units)				
Calendar Year		Low*	Base**	High**
Historical	2024	388	966	966
Forecast	2025	395	1030	1035
	2026	402	1089	1099
	2027	408	1135	1151
	2028	411	1165	1187
	2029	413	1180	1209
* *: effective/active fleet counts.				
** *: new registration counts based fleet counts.				

The FAA uses the trends observed in registration during previous years, calculation of net gain/loss, information from the annual survey, a review of available industry forecasts/workshops and past FAA Drone Symposiums, and FAA-sponsored research.³⁵ Using these and a time series model fitted onto the monthly data, the FAA forecasts that the commercial drone fleet will (i.e., base scenario) exceed the million mark in 2025 and total 1.118 million by 2029, 22 percent above the total as of the end of 2024.³⁶

Using the low or effective/active fleet, FAA forecasts an expansion of the small drone fleet by 25,000, or 7 percent of the currently calculated effective/active fleet of around 388,000 units.³⁷ As the present base (i.e., the cumulative total) increases, the FAA anticipates the growth rate of the sector will slow down over time, and the effective/active fleet will likely catch up with the growth trajectory of new registrations. Nevertheless, the sector will be much larger than what was understood only a few years earlier.

Unlike the small recreational drone segment, it is extremely difficult to put a floor on the growth of the commercial small drone sector due to its composition (i.e., consumer vs. professional grades) and the varying business opportunities and growth paths. As commercial small drones become operationally more efficient and safer, battery life expands, and integration continues (e.g., recent final rules involving operations over people; flying at night, remote ID, and future

Normalizing UAS Beyond Visual Line of Sight Operations rulemaking³⁸), new business models will begin to develop, thus enhancing robust supply-side responses. These responses, in turn, will create demand forces (e.g., consumer responses to receiving commercial delivery packages, routine blood delivery to hospitals, and search-and-rescue operations) that are latent and in the experimental stages at present. Unlike a developed sector of aviation such as passenger air transportation, it is impossible to put a marker on “intrinsic demand” (or core demand) primarily driven by the economic and demographic factors underlying this sector.

In this year’s forecast the FAA makes a provisional attempt to provide a “low” side for now, essentially capturing the intrinsic demand and making use of the calculation of effective/active fleet. In addition, FAA provides a likely or base scenario together with the enormous potential embodied in a “high” scenario, with average annual growth rates of 4.1 percent and 4.6 percent, respectively (lowered by a percentage point from last year). As noted earlier, the low scenario is driven by two positive factors (i.e., new registration and renew+) and two negative factors (i.e., cancellations and expiry). The average annual growth rate corresponding to the low scenario is thus determined by the combined effect of both positive and negative factors and is approximately 1.3 percent a year. This is much smaller than both the base and high scenarios because the effective/active count is driven to catch up with the

³⁵ See <https://bit.ly/432Gxn5>.

³⁶ Last year, the ratio of end-year forecast to base-year forecast was 1.33-times. That is, the FAA forecasted the end-year to be 1.33-times base-year (2023) numbers in 5-year (2028). Higher forecasts are often the result of improved regulatory environments, as noted below, and environments following the process of rule-making

evaluation (See fn. #30; and #33–#36 for these) in the face of new opportunities.

³⁷ This is driven by the combined effects of projected underlying growth rates of cancellations, expiry, new registrations, and renewals.

³⁸ See <https://tinyurl.com/3scmxzcu> for more details.

new registrations trend.^{39,40} Commercial small drones are currently used for numerous purposes. As the sector grows, the FAA anticipates there will be more uses for, and much more use of, small commercial drones. This is increasingly evident, for example,

from the work to begin implementing the UAS traffic management system (UTM) ecosystem,⁴¹ successful completion of the UAS Integration Pilot Program (IPP),⁴² and continuation in BEYOND,⁴³ and package delivery by Part 135 drones.⁴⁴

2024 Survey and Preliminary Results

The FAA requires an understanding of the flight characteristics and operations of UAS across the U.S. Unlike commercial aviation, which has statutory reporting requirements, UAS operate mostly outside of airports and are free to operate without reporting activities to aviation authorities while in uncontrolled space. As such, little is known about the general operations of UAS, which has hindered FAA efforts to effectively integrate UAS into the NAS.

To improve the FAA’s understanding of UAS activities, it has developed and conducted a survey of UAS operators. The survey design is a stratified random sample of UAS operators with type of operator, recreational or Part 107, and geography, U.S. County, as the strata. The survey frame is constructed from the recreational UAS and the Part 107 registries.⁴⁵ A total 97,857 invitations were sent to UAS registrants: 54,634 recreational registrants and 43,223 Part 107 registrants.⁴⁶

Recreational registrants had a 26% response rate while Part 107 registrants had a 22% response rate.

All respondents were asked about their total number of flights conducted in 2024, defined as a takeoff and a subsequent landing. Respondents from the Part 107 registry were asked to report their total number of non-recreational flights and their total number of recreational flights conducted in 2024 while respondents from the recreational registry were only asked about their recreational flights.

Respondents from the Part 107 registry reported an average of 75.4 nonrecreational flights (median of 2) and an average of 34.9 recreational flights (median of 5) in 2024. Respondents from the recreational registry reported an average of 46.2 recreational flights (median of 10).

³⁹ Findings from our survey, discussed last year and this year in a later section, also support this observation.

⁴⁰ See prior footnotes for a similar explanation pertaining to effective/active count for recreational registration.

⁴¹ See <https://bit.ly/3KucgX4>

⁴² See <https://bit.ly/2O4tzPP> for more details.

⁴³ See <https://bit.ly/3nKAQIK>. We provided a detailed analysis of the BEYOND program in last year’s document.

⁴⁴ See <https://bit.ly/3CnroEj> for more details.

⁴⁵ As noted earlier, 49 U.S. Code § 44809 requires recreational UAS aircraft systems operators to register with the FAA. In addition, 14 CFR

Part 107 requires non-recreational operators to register with the FAA. UAS operators must register with one of these registers at FAA’s <https://bit.ly/41328Kr> and paper forms are no longer available.

⁴⁶ The survey design is a stratified random sample of registered operators. The strata are the registries and the U.S. County in which the operator is domiciled. Each county had 30 registrants randomly selected to receive an invitation to the survey. If the number of registrants in the county were fewer than 30, all registrants in the county were sent an invitation. For more information, a survey supplement is available upon request.

The number of active FAA-Recognized Identification Areas (FRIAs) in the United States reached 2,481⁴⁷ at the end of 2024, and the extent of their use has not been quantitatively measured. As such, respondents from the recreational registry were also asked how many of their recreational flights were conducted in FRIAs.⁴⁸ Respondents reported an average of 18.0 of their flights were conducted in a FRIA (median of 0). Moreover, the question revealed that recreational operators are either all-in on FRIAs or not at all, operating nearly entirely within or outside their boundaries. In addition, 17 percent of recreational registrants are High FRIA operators who, when compared to Low FRIA operators, conduct 2.8 times as many annual flights with different airframes, in particular more fixed wing.

Respondents from the recreational registry were differentiated into groups based on their percentage of activity in a FRIA. First, Low FRIA activity recreational respondents (77.8%; n=8391) who conducted 10 percent or less of their operations in a FRIA. Second, Mixed FRIA activity recreational respondents (5.4%; n=582) who conducted greater than 10 and less than 90 percent of their operations in a FRIA. Third, High FRIA activity recreational respondents (16.8%; n=1812) who conducted 90 percent or more of their operations in a FRIA. Low FRIA operators conducted an average of 38.2 annual flights with 0.2 of those flights in a FRIA. Mixed FRIA operators conducted an average of 98.6 annual

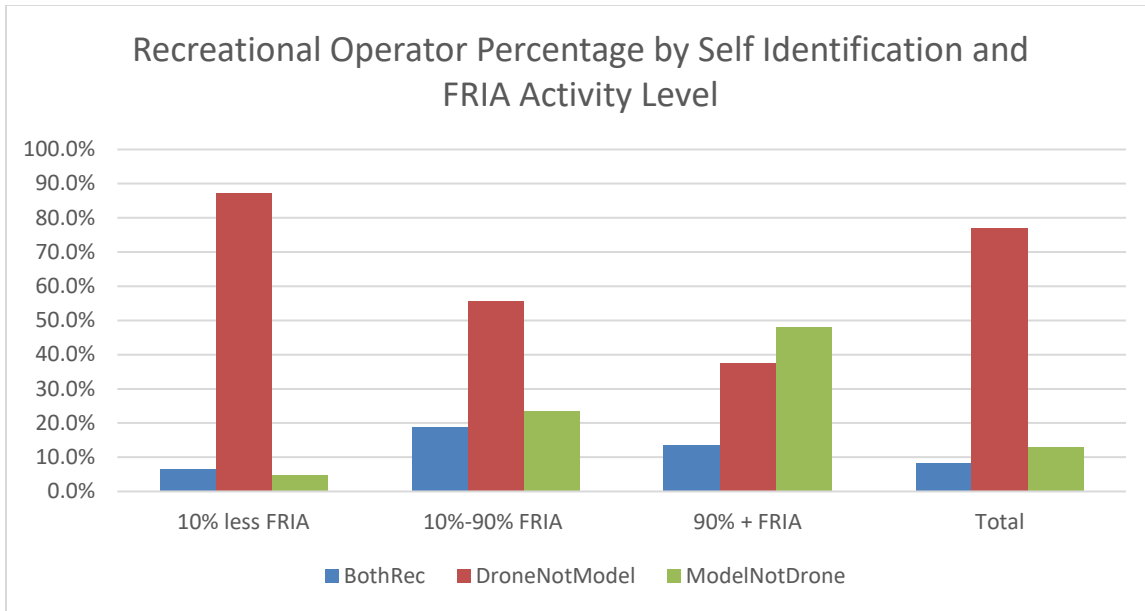
flights with 49.1 of those flights in a FRIA. High FRIA operators conducted an average of 107.2 annual flights with 106.3 of those flights in a FRIA.

The survey also contained a self-report question on the type of UAS operator the respondent considered themselves. This question contained two possible categories of recreational operators: drone operator and model aircraft operator. As such, three types of recreational operator emerged: those who identified as a drone but not model aircraft operator (Drone not Model), those who identified as a model aircraft but not drone operator (Model not Drone), and those who identified as both drone and model aircraft operators (Both Rec). The FRIA activity categories tended to vary with the three categories of recreational operators from the self-identification question. The Low FRIA group was dominated with Drone not Model operators (87.1 percent). The Mixed FRIA group was more balanced with 55.6 percent Drone not Model operators, 18.9 percent Drone and Model operators, and 23.5 percent Model not Drone operators. The High FRIA group is 48.2 percent Model not Drone operators, 37.5 percent Drone not Model operators, and 8.3 percent Drone and Model operators. These data reveal a predictable trend, that model aircraft operators favor FRIAs while Drone operators favor operating outside FRIAs.

⁴⁷ See https://udds-faa.opendata.arcgis.com/datasets/c7ad6f733cce47b9a653e12010742361_0/explore?location=38.732240%2C-77.118017%2C8.28&showTable=true

⁴⁸ FAA-Recognized Identification Areas (FRIAs) are a defined geographic area where drones can

be flown if they don't have Remote ID equipment. FRIAs are often used by community organizations and educational intuitions. [see https://www.faa.gov/uas/getting_started/remote_id/fria]



These categories also revealed differences in the number of aircraft owned, number of aircraft operated, and airframe type operated in 2024. Low FRIA operators owned an average of 2.5 aircraft and operated 2.0, while High FRIA operators owned an average of 9.6 aircraft and operated 6.5. Additionally, Low FRIA operators operated 1.5 quadcopters and 0.4 fixed wing aircraft while High FRIA operators operated 0.8 quadcopters and 7.8 fixed wing aircraft on average.

This preliminary analysis of the survey reveals operating groups that are varied, unique, and more differentiable than previously believed. With these activities and groups identified, the FAA can better serve the public and make more informed decisions that improve the safety of the NAS.

Remote Pilot Forecast

An important final metric in commercial small drones is the trend in remote pilot (RP) certifications. RPs⁴⁹ are used primarily to facilitate commercial and public use (i.e., law enforcement and first responder) small drone flights, as discussed in the preceding section. As of December 2024, a total of 427,598

RP certifications had been issued, an increase of a little less than 59,000 from the same time last year (2023).

Approximately three-quarters (77 percent) of the RPs have only a Part 107 RP certificate, while the remainder (23 percent) have a Part 107 RP certificate along with a Part 61 pilot certificate. Over 90 percent of those who took

⁴⁹ In our accounting of RPs, we take pilots who passed the initial knowledge test (or Part 107),

plus current traditional pilots who took online training in lieu of the knowledge test (or Part 61).

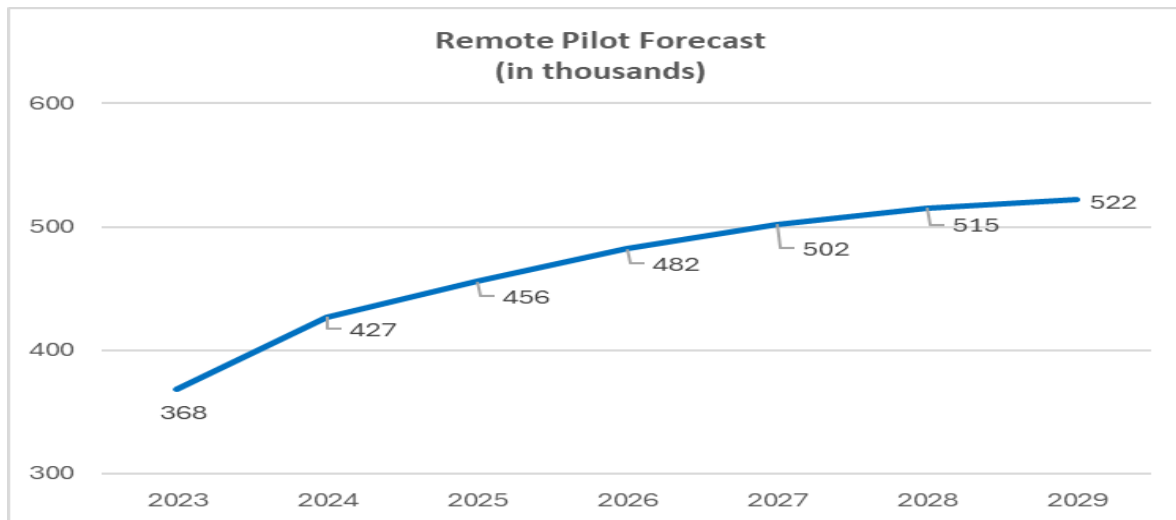
the exam passed and obtained RP certification.⁵⁰

The RP forecasts presented below are based on three primary data sources: (a) trends in total RPs; (b) renewal trends; and (c) trends in commercial small drone registration, or Part 107 and forecasts of fleet. In this context, it is important to note that the empirical relationship between trends in RP and commercial/Part 107 small drone registration, particularly new registration, has changed in the past few years with a decline in the ratio of units registered to RPs. Given the trends in registration and our forecast of the commercial small drone fleet (i.e., base forecasts), the FAA assumes that the trend in remote pilots to units of small commercial drones will remain at its 2024 level of 2.26.

Using these assumptions combined with the base scenario of the commercial/Part 107 small drone forecast, FAA projects RPs in

the graph below. Last year, the FAA projected RPs to be a little under 400,000 by the end of 2024. Actual registrations by the end of 2024 totaled 427,598 (or over 28,000 more than last year's projection) thus the number of actual RPs exceeded last year's projection by 7.0 percent for 2024.

Given the actual numbers at the end of 2024, RPs are set to experience tremendous growth following the growth trends of the commercial (or Part 107) small drone sector. Starting from the base of 427,598 RPs in 2024, the expected growth in commercial activities leads to a 22 percent increase in the total number of RPs by 2029 (522,325), showcasing tremendous opportunities for growth in employment—almost 95,000 new RP opportunities—associated with commercial and public use activities of small drones. The potential for RPs may increase even more if larger drones are used in commercial activities and advanced air mobility (AAM) becomes a reality in the near future, two topics discussed in the sections below.



⁵⁰ Comparing data from last year, we notice that RP numbers have been revised downwards, by around 4,000 (or around -2%), over the entire

program period. This is due to data clean up throwing out duplicate data and wrong data entry noticed during renewal.

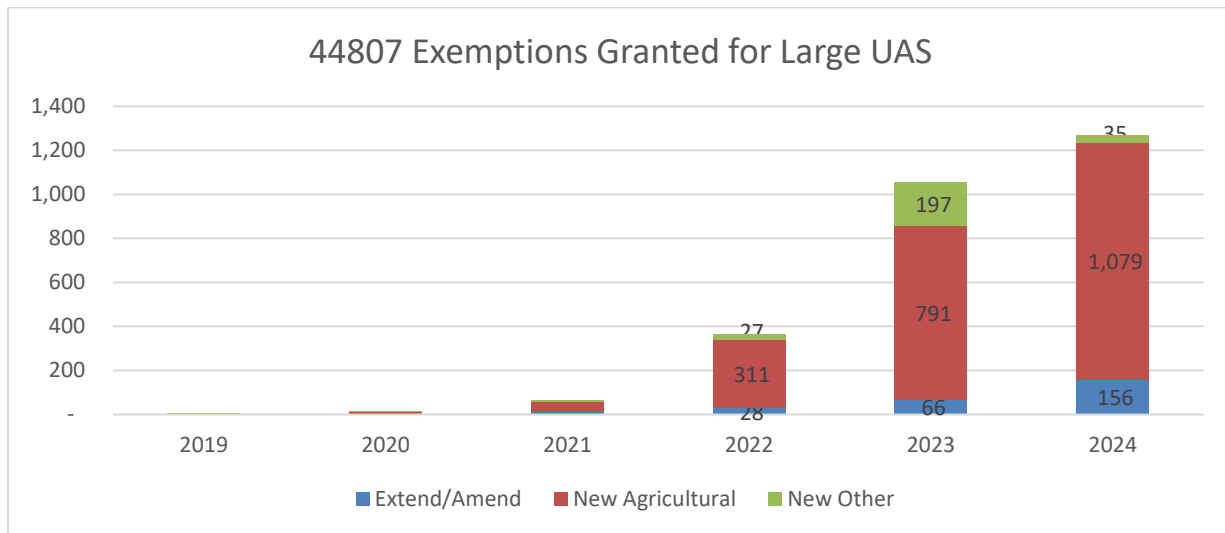
Large UAS

Part 107 limits the gross takeoff weight of unmanned aircraft (or sUAS) to below 55lbs. Thus, unmanned aircraft with gross takeoff weights above 55lbs must operate under separate rules and are considered a separate category of UAS, which we refer to as simply large UAS (IUAS) for this analysis. Since these IUAS are not type certified and do not fall under the Part 107 operating rules, operation of these aircraft requires a section 49 U.S.C § 44807 exemption or a public aircraft operator (PAO) certification.⁵¹ In addition, the FAA requires IUAS operating under a 44807 exemption or PAO to receive a tail number by registering the unmanned aircraft in the Part 47 aircraft registry.⁵²

The FAA has been granting 44807 exemptions since their introduction in the FAA

Reauthorization Act of 2018. Both applications for a 44807 exemption by individuals and organizations and the decisions by the FAA are publicly available.⁵³ Since 44807 exemptions are required to operate a IUAS for commercial purposes, these exemptions are a leading indicator of both the purchases, which increase the fleet, and the operations of civilian IUAS. The 44807 exemption was slated to sunset in May of 2024, but the FAA Reauthorization Act of 2024 extended the 44807 exemption's sunset to the end of September 2033.⁵⁴

The FAA has granted 1,114 new exemptions for IUAS in 2024, a 13 percent increase from 2023.⁵⁵ Almost 97 percent (1,079) of the new exemptions granted were for large agriculture unmanned aircraft. Just under 12 percent (156) of all exemptions granted (1,270) were extensions or amendments.



The increased number of exemptions granted in 2023 and 2024 suggests that

granting exemptions by regulators has become routine, particularly for IUAS used in

⁵¹ See bit.ly/3KxiuVX for more details.

⁵² See bit.ly/3ZlcCxJ.

⁵³ All 44807-exemption applications and decisions are available at regulations.gov in the "Other" category.

⁵⁴ See <http://tinyurl.com/mpkhhmzzd>

⁵⁵ Changes in count methodology.

agricultural operations. While agricultural exemptions granted continue to grow, exemptions for other IUAS operations, such as package delivery or long-range infrastructure inspection, have slowed. This suggests that, although agricultural IUAS exemptions are routine, the safety cases for other IUAS operations have not been sufficiently proven for these exemptions to become routine. Since 44807 exemptions are only valid for two years, the extensions and amendments should be a function of the new exemptions granted over the previous two years. The portion of the existing IUAS exemptions that were extended or amended has fallen each year from 66 percent in 2021 to 11 percent in 2024.

Since IUAS are required to register with the Part 47 Aircraft Registry (PAR), we can use the PAR to estimate the IUAS active fleet. Using the Aircraft Reference file from the publicly available PAR, FAA identifies the IUAS in the Aircraft Registration Master file and the Deregistered Aircraft file from which it can calculate the active fleet of IUAS.⁵⁶ In 2024, 2,800 new IUAS aircraft were added to the PAR, a 156 percent increase from 2023. Twenty one percent (409) of aircraft registered at the end of 2023 were delisted in 2024, producing an active fleet of 4,314 IUAS by the end of 2024.

The rapid growth of IUAS in the Part 47 registry is supported by the imports of IUAS into the United States. Imports of IUAS grew from 3,100 in 2023 to 5,145 in 2024, a two-thirds increase. Given that imported IUAS are likely to become new aircraft in the registry, this suggests that the fleet of IUAS is still growing exponentially.

With robust demand for IUAS operations indicated by 44807 exemptions and strong supply suggested from import data, FAA expects the growth of new IUAS over the next 5 years to keep pace with the growth observed in 2024. However, assuming 44807 exemptions remain the primary authority by which IUAS are operated, it is expected that an inflection point in 2027 or 2028 will occur after which the new IUAS added to the PAR are expected to decrease in the following years. As such, FAA projects 14,896 new IUAS will be added to the PAR in 2029, with a total active IUAS fleet of 44,740 aircraft by the end of 2029.

Although the active fleet can be observed from the PAR, the operations of IUAS are more difficult to observe. The majority of registered IUAS in the PAR are agricultural spraying aircraft from just three manufacturers.⁵⁷ Moreover, the majority of new IUAS registered in the PAR were agricultural spraying aircraft in both 2023 (67percent)

⁵⁶ The Public Aircraft Registry data for 2022 is available at <https://bit.ly/433iqET>. Unmanned aircraft are separated from crewed aircraft using the “NO-SEATS” field in the Aircraft Reference file. The “AC-WEIGHT” field is used to remove all small unmanned aircraft, and the “TYPE-ACFT” field is used to remove all lighter-than-air aircraft, including blimps and balloons. The remaining codes – held within the “CODE” field – are matched with the “MFR MDL CODE” in the Air-

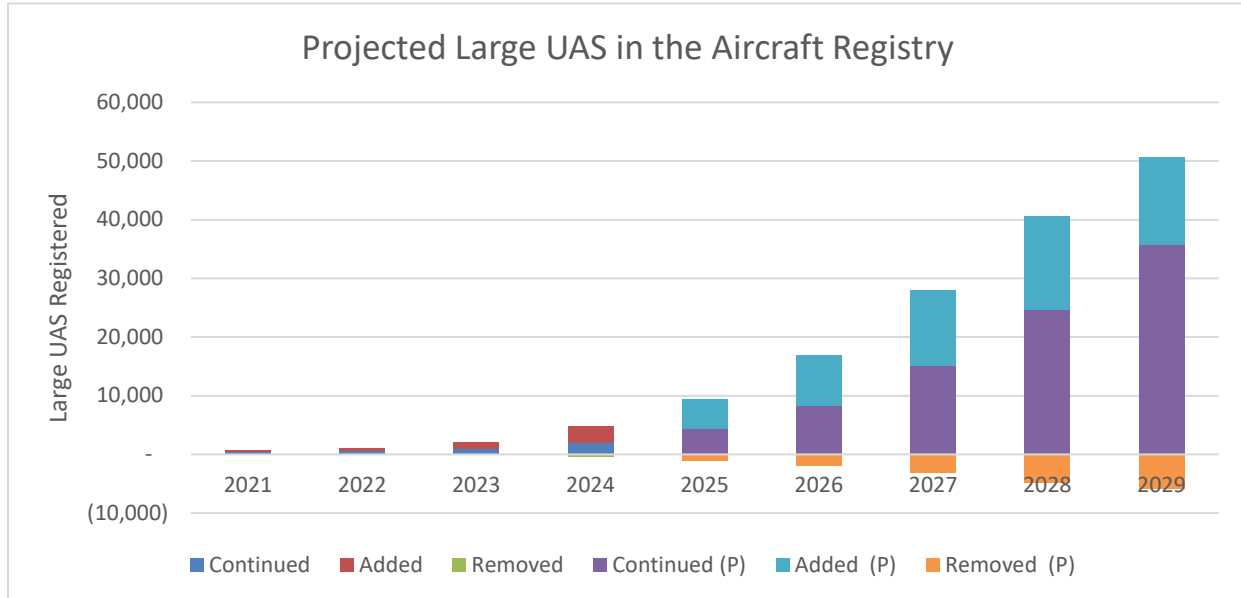
craft Registration Master file and the Deregistered Aircraft file and adjusted based on the “STATUS CODE” field. The remaining aircraft are sorted for the year they registered using the “CERT ISSUE DATE” or “LAST ACTION DATE”. The count of new registration, older registrations, and delisted registrations are used to construct the active IUAS fleet.

⁵⁷ DJI, Hyllo, and Yamaha’s agricultural-spraying UAS account for just over 50% of the registered large UAS in the Part 47 aircraft registry.

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and 2024 (51 percent). As such, the vast majority of IUAS operations will be conducted

close to the ground with only a few organizations operating IUAS in the NAS, let alone in the controlled airspace.



Advanced Air Mobility

Advanced Air Mobility (AAM) is an umbrella term for aircraft that are typically highly automated, utilize electrically powered propulsion, and have vertical take-off and landing capability. Many of these aircraft that fall into the powered-lift category are often referred to as air taxis. Urban Air Mobility (UAM) is a subset of the AAM concept which involves highly automated, cooperative air transportation services in and around urban areas. Several proposed use cases for AAM/UAM aircraft include passenger and cargo transport, and the provision of emergency services.

To prepare for the safe and efficient integration of AAM operations into the NAS, the FAA led several initiatives including the release of the FAA UAM CONOPS Version 2.0 in April 2023, as well as the publication of the FAA AAM Implementation Plan and the issuance of the final rule that adds the “powered-lift” definition to the regulations covering certain air carrier and commercial operations, both in July 2023. More recently, in November 2024 the FAA issued the final rule establishing the requirements for pilot certification and powered-lift operations and published an updated engineering brief for vertiport design standards in December 2024.

Despite a challenging environment from a wave of consolidations, several AAM Original Equipment Manufacturer (OEMs) including Joby Aviation, Archer Aviation, and Beta Technologies have made significant progress toward entry into service (EIS) and are planning to launch operations in the 2025-2026 timeframe. Archer Aviation plans to launch air taxi services in Abu Dhabi by late 2025, and Joby Aviation plans to launch air taxi services in Dubai by early 2026. In the U.S., these OEMs have either entered or are close to entering the final phases of aircraft certification. They have also established manufacturing facilities in the U.S., with initial aircraft production starting in 2025 followed by production ramp up over the next several years.

Considering the recent regulatory advancements and operator progress toward EIS, it is essential to incorporate the latest available information into AAM demand estimates. These estimates will aid in the development of vertiports and other infrastructure, airspace design and procedures, spectrum availability, workforce considerations, safety assessments and other analyses. Drawing from FAA-sponsored AAM demand research conducted by The MITRE Corporation (MITRE) in March 2025,⁵⁸ a NAS-wide AAM demand forecast starting from Year 1 (defined as the EIS year⁵⁹ for the first expected AAM use case in the U.S.) through Year 6 (five years after EIS) is shown in the table below:

NAS-wide AAM Demand Forecast						
	Year 1 (EIS)	Year 2	Year 3	Year 4	Year 5	Year 6
Annual trips	42,405	323,038	616,115	1,029,883	1,826,525	2,820,956
Daily trips	116	885	1,688	2,822	5,004	7,729

Unconstrained demand for AAM departures across the NAS is estimated to be 42,405 departures in its first full year, growing to over 600,000 departures annually by Year 3. As technology adoption and community acceptance continue to increase, the NAS-wide demand could continue to accelerate and could reach 2.8 million departures annually by the end of Year 6 (or around 7,700 daily flights).

Among the three most-likely AAM use cases, it is projected that initial operations in the U.S. will commence with airport shuttles in a few major cities, followed by air taxis, and

then air medical missions. This is because airport shuttles will have the most robust passenger demand traveling between fixed and concentrated points of interest (i.e., airports and downtown areas). Urban air taxi flights for commuters, on the other hand, will be spread across more routes depending on where commuters live and work. Lastly, air medical missions are expected to lag behind airport shuttle and air taxi services due to a lower level of operator interest currently, as well as potential requirements for retrofitting aircraft for medical-use, additional time

⁵⁸ “Advanced Air Mobility Demand Forecast for the National Airspace System”, The MITRE Corporation, MP250135, Mclean, VA, March 2025.

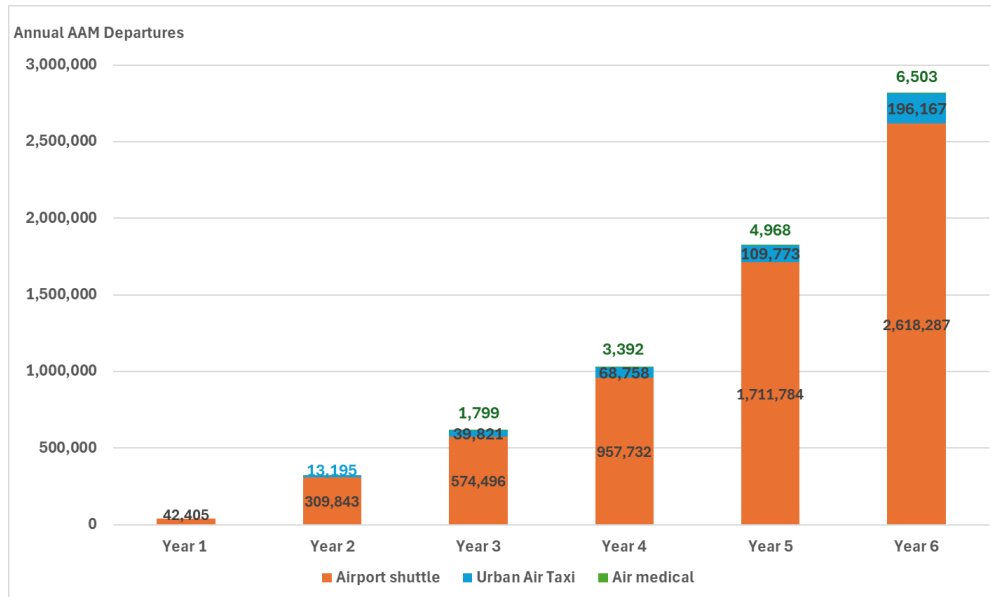
⁵⁹ Year 1 does not have a definitive calendar year assigned as the timing for AAM operations to be

granted EIS in the U.S. is still uncertain and is dependent on several external factors beyond the scope of the AAM demand research.

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needed for aircraft certification, and deployment of charging infrastructure to support air medical missions.

The figure below shows the anticipated AAM departures for each forecast year, by use case.



The Airport Shuttle projections constitute the largest portion of the overall AAM forecasts for a couple of reasons. First, the Airport Shuttle is anticipated to be the initial AAM use case to be implemented, with demand increasing annually in tandem with the rise in airline passengers from the growing number of MSAs that could adopt an AAM airport shuttle service. Secondly, the number and proportion of commuters likely to consider AAM are generally lower than the estimates for airline passengers.

were estimated by assuming each AAM aircraft would conduct 28 trips per day, on average (2 trips per hour over a 14-hour operating day) for the Airport Shuttle and Urban Air Taxi use cases and 2.5 trips a day for the Air Medical use case. The projected NAS-wide AAM daily trips and the estimated fleet sizes to support those trips are shown in the table below. Based on announcements of expected fleet production capacities from several AAM OEMs, the fleet sizes needed to support the number of trips should be attainable and not be a constraining factor.

The fleet sizes required to support the projected departures for the three use cases

NAS-wide AAM Demand Forecast						
	Year 1 (EIS)	Year 2	Year 3	Year 4	Year 5	Year 6
Daily trips	116	885	1,688	2,822	5,004	7,729
Fleet size	4	32	62	104	184	283