



U.S. Department of the Interior
Unmanned Aircraft Systems (UAS)
Program
2020 Use Report



Cover Photo:

A Department of Interior remote pilot launches to engage the Bush fire outside of Phoenix, AZ during fire-fighting operations in June of 2020.

Table of Contents

Table of Contents.....	3
Table of Figures.....	4
Table of Tables.....	4
Background.....	5
2020 Program Highlights.....	6
Notable 2020 Accomplishments and Reports.....	7
Report Structure and Content.....	9
Reporting DOI UAS Adoption, Application and Integration.....	10
Measuring DOI UAS Program Success.....	10
Elements of DOI’s UAS Data Management and Risk Mitigation Strategy.....	12
An Overview of DOI’s UAS Program Activities.....	14
Fiscal Year 2020 Flight Use Review.....	14
UAS Program Since Electronic Record-keeping.....	19
UAS Program Two Year Comparison.....	21
UAS Support in Wildland Fire Operations.....	25
DOI Remote Pilots: The Program’s Core.....	28
2021 Outlook.....	30

Table of Figures

Figure 1. Annual flight counts since the Department’s UAS program inception.....	6
Figure 2. The “Four Outcome S’s” of DOI’s “Drones for Good” UAS Program.	11
Figure 3. Department of Interior’s data management security plan.....	12
Figure 4. Department of Interior pilots flew UAS in 36 states in Fiscal Year 2020.	14
Figure 5. This area plot by state illustrates the count and location of UAS flights as they occurred in FY20.....	15
Figure 6. Fiscal Year 2020 UAS flights by bureau (pie chart).	16
Figure 7. Fiscal Year 2020 UAS flights by primary flight use category.	16
Figure 8. FY20 UAS flights by aircraft and bureau.	17
Figure 9. Fiscal Year 2020 UAS flights by primary flight use category.	18
Figure 10. Fiscal Year 2020 monthly flight use by bureau and primary flight use.....	19
Figure 11. Overall flight trends among DOI bureaus since 2017	20
Figure 12. A four-year summary of DOI’s UAS program flights with primary flight use category.....	21
Figure 13. A comparison flight count and percent by major bureau fiscal years 2019 vs. 2020.....	23
Figure 14. A comparison of flights by aircraft Fiscal Years 2019 and 2020.	24
Figure 15. Monthly flight trends by bureau and primary flight use for Fiscal Years 2019 and 2020.	25
Figure 16. Call When Needed support for FY20 wildland fire summary (Credit: J. Murgoitio).....	27
Figure 17. Current Interior remote pilots by bureau (as of January 2021).....	28
Figure 18. Department of the Interior UAS Training trends between Fiscal Years 2015 – 2020.....	30

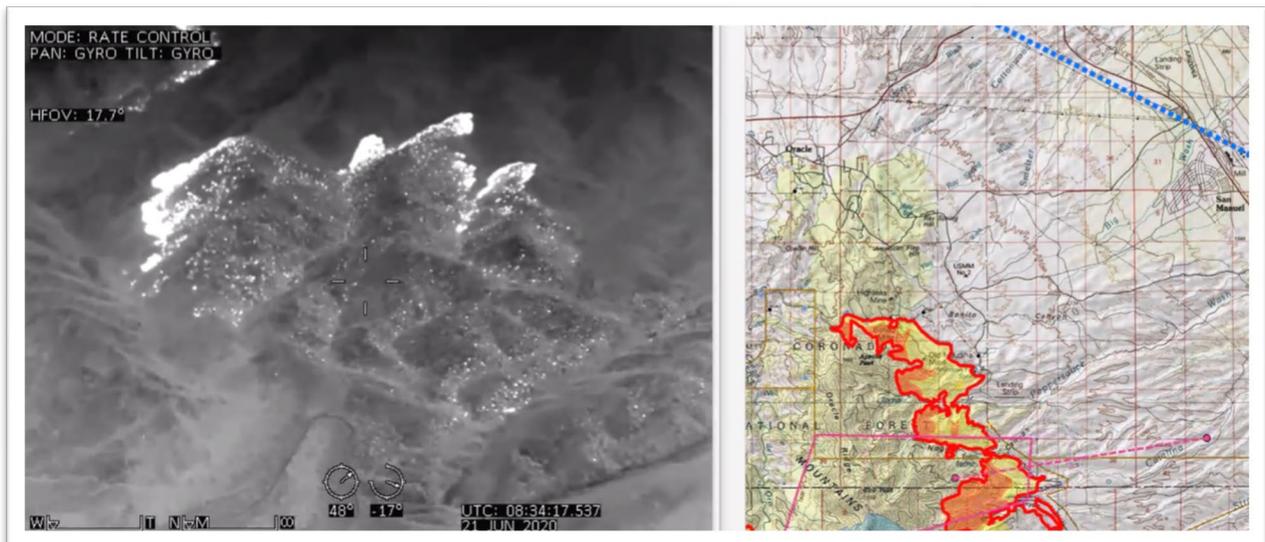
Table of Tables

Table 1. Overview of DOI small UAS flight statistics for fiscal years 2017-2020.	20
Table 2. Interior UAS program involved agency composition and fiscal year 2020 activity. Values in red indicate a decrease from FY19 to FY20 (see also Figure 13).	22
Table 3. Call When Needed (CWN) contractor flights for fiscal year 2020.....	26

Background

The U.S. Department of the Interior (DOI) is the largest land steward in the United States, responsible for management of 500M acres (~1 in 5) across the U.S and its territories and 1.7B acres on the Outer Continental Shelf (see [DOI Strategic Plan](#)). DOI manages resources that supply 30 percent of the Nation's energy supplies, manages water in 17 Western States and supplies 15 percent of the Nation's hydropower energy. The "people's land," which DOI manages on behalf of the American Taxpayer, annually hosts more than (see [the DOI Economic Report](#)).

In carrying out its extensive responsibilities on behalf of the American public, DOI utilizes a wide variety of aircraft ([Office of Aviation Services website](#)), including unmanned aircraft systems (UAS, aka drones). DOI missions, often conducted in remote areas, severe terrain, and weather conditions, can be hazardous to personnel. These missions often require persistent presence and responsive deployment to address emergent events (e.g. wildfires, earthquakes, volcanos, floods, search and rescues, etc.). Mission goals include conducting them with no/minimal disturbance to native species and visitors to the lands that DOI stewards, while making the best use of appropriated funds to fulfill DOI's chartered obligations for managing the "people's land." Since the initiation of DOI's current UAS program in 2006 the Department has realized significant benefits from the safe and responsible integration of drone technology. In Fiscal Years 2017 (FY17), 2018 (FY18) and FY19 respectively DOI UAS flew 4,976, 10,342 and 11,442 flights. While writing the FY19 report, it was predicted that in FY20 DOI UAS would have conducted over 13,000 flights in support of the missions of the bureaus. However, in January 2020 the Secretary issued Order 3379 grounding the entire fleet of DOI UAS for all non-emergency missions. This Order led to sharp reduction in DOI UAS flights, with the bureaus conducting only 3,621 flights, a 75% reduction from what was projected.



Unmanned aircraft systems provided essential services for DOI's wildland firefighting operations in 2020 including information on location, heat, and rates of spread. In this image a thermal camera from a UAS identifies fire location (left; white = hot) while the map (right) shows firefighters the view's location.

2020 Program Highlights

In 2020, the DOI UAS program continued its tradition of innovation, collaboration, and leadership until the grounding of the fleet due to Secretarial Order 3379. As a result, FY20 was the first contraction of DOI activities after three consecutive years of extraordinary growth.

Figure 1 illustrates ten years of programmatic growth signified by annual expansion in the number of flights. Future projections are involve a high level of uncertainty due to transitioning political and geo-political circumstances (see the [DOI UAS news page](#)).

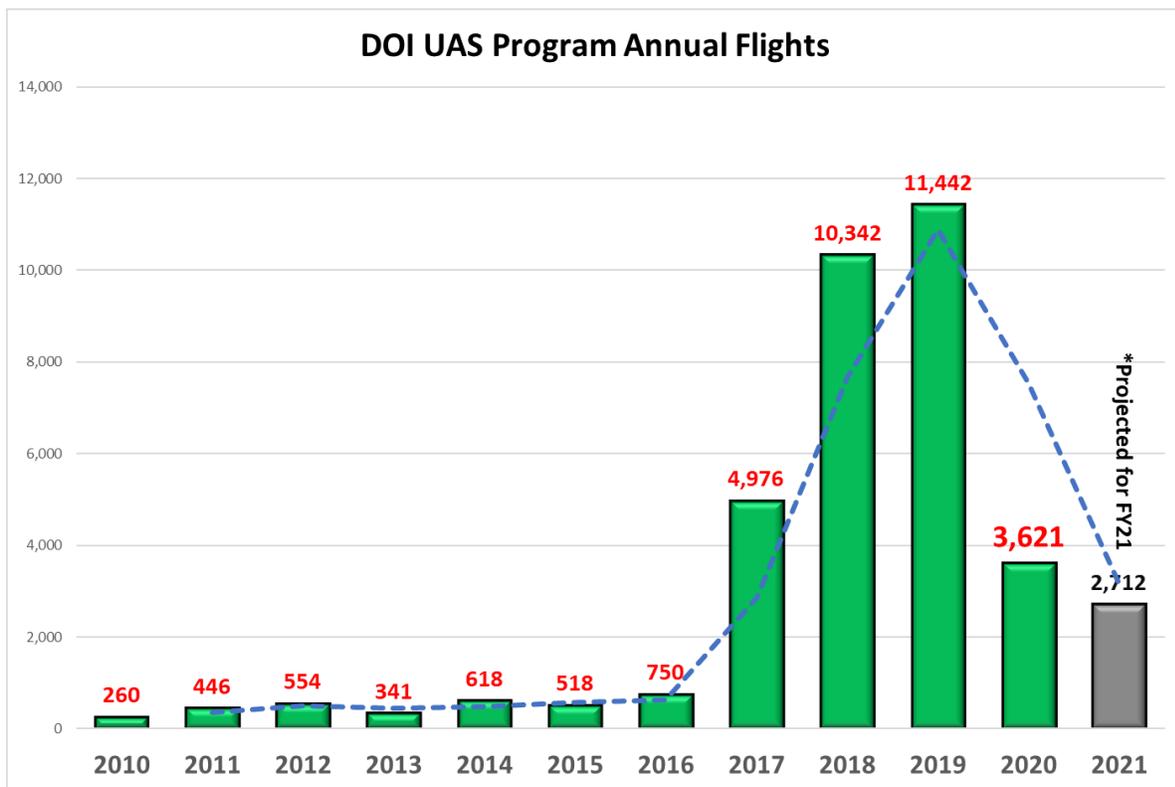


Figure 1. Annual flight counts since the Department’s UAS program inception have demonstrated consistent growth through FY19. Secretarial Order 3379 forced most Interior bureaus to abandon planned UAS missions and equipment acquisitions starting in Quarter 1 of FY20; *Projected flights in FY21 calculated based on current flight activity (FY20 minus Quarter 1 non-fire flights) are expected to result in a 25% decrease in UAS flights over FY20.

Notable 2020 Accomplishments and Reports

Wildland Fire Management

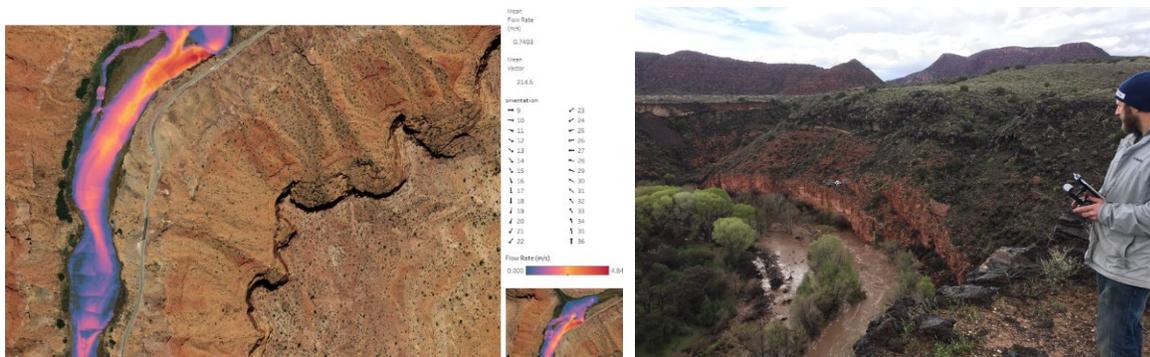
Wildland fire support by UAS continued in 2020 for DOI and interagency partners. More specifically, the DOI UAS program supported wildland fire management by providing tactical operations with enhanced situational awareness, mapping products, and aerial ignition (for more information see *UAS Support in Wildland Operations*, page 25).



UAS continued to play a consequential role for DOI in fighting wildfires in 2020.

Inland Oil Spill Response Research

The DOI UAS program is supporting an on-going USGS inland oil spill response research effort aimed at calculating oil dispersion downstream following a theoretical, accidental release of oil into a river system. Researchers are utilizing UAS to collect particle tracking data on the Colorado River near Moab, Utah, with these data providing a critical input to USGS river flow velocity models. These models in turn provide insights into the downstream behavior of any oil which might be inadvertently released into an ecologically vulnerable waterway.



U.S. Geological Survey hydrologists employ UAS and tracer chemicals in the Colorado River outside Moab, UT to test new methods for battling the destructive impacts of oil spills (Joe Affinati pilots his UAS in 2020; Credit: Schonauer).

Kilauea Volcano Monitoring

Following the eruption of Kilauea in 2018 a rare water lake formed in the bottom of the volcano’s Halema’uma’u crater within Hawaii Volcanoes National Park. With the lake’s water holding much information about what to expect from Kilauea, scientists needed a safe and repeatable method to extract water samples from the extremely remote lake. Responding to a request from USGS, members of the Office of Aviation Services (OAS) UAS Division worked with industry and USGS scientists to develop a UAS-borne water sampling capability. [OAS conducted multiple developmental flight tests of this new capability at FAA-approved UAS flight areas adjacent to its Boise, Idaho headquarters](#) before fielding this capability for USGS in September 2019. In FY20 [two water extraction missions were conducted](#), providing key scientific information regarding the lake’s chemical composition.



U.S. Geological Survey (USGS) volcanologists observe Kilauea’s remote water lake (left), while (right) Office of Aviation Services remote pilot Rich Thurau and USGS scientists prepare for flight. [See a short video regarding the mission.](#)



The Department’s unmanned aircraft program activities were dominated by Secretary Bernhardt’s Secretarial Order 3379 which grounded much of the program in December 2019 (Credit: LA Times).

Report Structure and Content

This report is structured to provide insight for the public, high-ranking government officials, internal managers, pilots, and employees alike. Following this introduction, methods of data collection (Reporting DOI UAS Adoption, Application and Integration) and analysis of the FY20 flight use data (An Overview of DOI's UAS Program Activities) are provided, followed by interpretations, and a look to the future.



Program success is built upon the drive and passion of Interior's remote pilots (Credit: M. Dutton).

Reporting DOI UAS Adoption, Application and Integration

The Department's ability to quantify annual program activity stands on the thousands of flight use reports provided by DOI remote pilots. The "2U" (form OAS-2U) entries are required after every flight and capture information about the pilot, aircraft, payloads and mission objectives, and provide a snapshot of flights as they occur throughout the year. At the end of the fiscal year, 2U entries are formatted for entry into Geographic Information Systems (GIS) and statistical analysis software. Flight information is then summarized according to metrics of interest to inform DOI senior leadership, managers, and field personnel through summaries such as this report. The 2U data provide an incredibly powerful set of metrics to examine how the department is using drones.

Measuring DOI UAS Program Success

Program success is best measured by measurable, **relevant outcomes**. For UAS, these outcomes can be "bucketed" into the "Four S's" of DOI's drone program success metrics: "**Science, Safety, Savings, Service**."

Science is critical to fulfilling the Department's commitment to base its decisions on the best available science. UAS offer incredible enhancement opportunities relative to the amount, resolution, persistence, and analytics applied to collected scientific data. Drones can be less disruptive to sensitive animal species than manned aircraft. They can carry sophisticated, high resolution sensors and possess the ability to securely transmit real-time data that can be recorded for future analysis or shared with the public for increased transparency. Drone borne sensors currently operated by DOI have provided image resolution improvements of **1,200%** over Landsat 8 satellite and **400%** better than manned aircraft acquired data. These unique sensing characteristics enable drones to gather repeatable, scientifically valid observations leading to better policy decisions, benefiting all Americans.

Safety is a priority in all DOI operations. DOI missions often expose personnel to significant safety hazards including severe terrain, adverse weather conditions, and hazards **inherent** to many of these missions (fire, flood, earthquake, landslide, etc.). **From 1937 to 2000, 66% of all field biologist fatalities in DOI were aviation-related.** Drones offer multiple opportunities to enhance employee and public safety by reducing requirements for manned aircraft flight in particularly hazardous mission situations. Additionally, drones have also been used to replace ground personnel in certain missions, reducing their risk to injury. Use of drones can increase the level of safety for personnel both on the ground and in the air by reducing their exposure to hazardous situations. DOI has also employed UAS to save lives, notable initiating the evacuation of a neighborhood threatened by a fast-moving lava flow and then assisting in the rescue of a stranded resident during the Kilauea eruption of 2018.

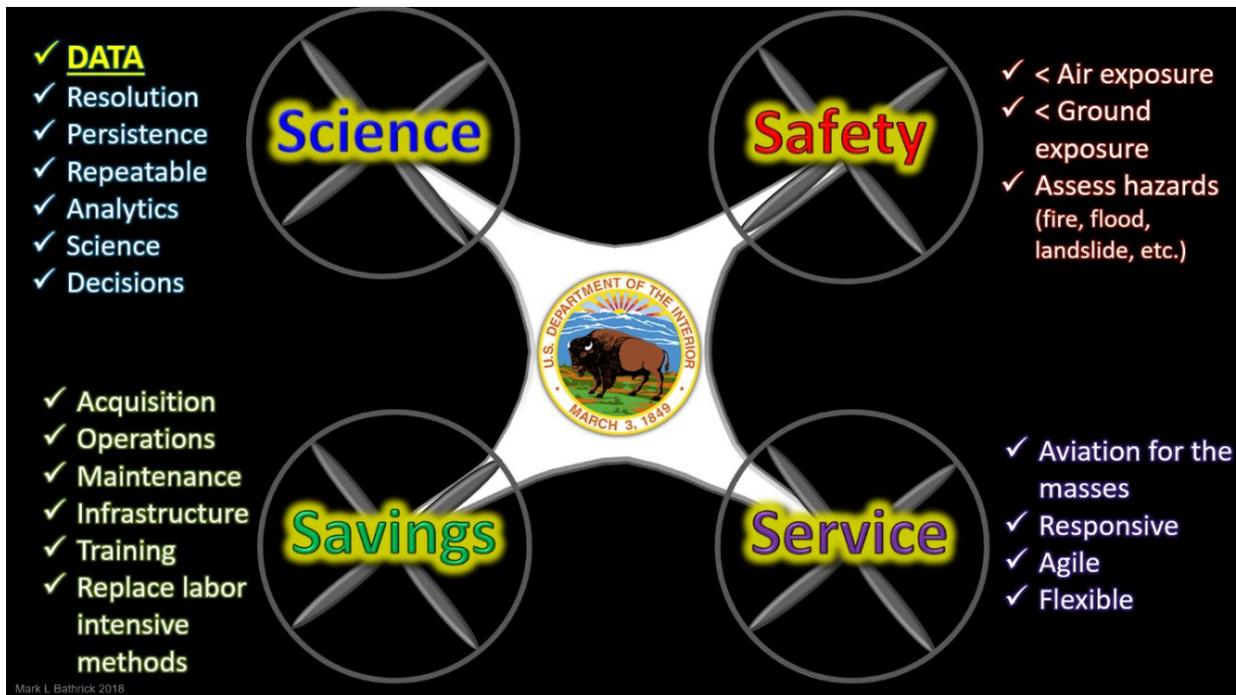


Figure 2. The “Four Outcome S’s” of DOI’s “Drones for Good” UAS Program.

Savings achieved by DOI through the integration of drones has included the cost to procure, train to, operate, support, and maintain these aircraft. As an example, the total acquisition cost of DOI’s current fleet of 853 UAS was less than the cost many of the individual DOI manned fleet aircraft. Where drones can adequately replace manned aircraft or significantly reduce other costs (i.e. replacing many man hours on the ground to perform the same mission), the savings to the Department and the American taxpayer is significant. Across nearly 30,000 UAS flights flown to date, DOI has observed a rule of thumb that a drone can complete a given task in 1/7th the time and at 1/10th the cost of traditional means of accomplishing the same task. Savings also come from reduced loss. **DOI UAS have been credited with saving \$50M in property and infrastructure when one discovered an undetected spot fire and directed firefighters to extinguish it.** Additionally, as documented in DOI’s [2018](#) and [2019 Annual UAS Summary Reports](#), Interior’s use of UAS resulted in **annual operational savings of \$14.8M and \$15.7M respectively** versus the cost of traditional methods of accomplishing these same missions.

Responsive, agile, and flexible **Service** is critical to aviation’s ability to support DOI bureau missions. Wildfire, floods, earthquakes, wildlife migrations, injured or lost hikers, etc. don’t occur on fixed or predictable schedules or locations. Drones provide service enhancements over traditional manned aviation. Small drones can easily be integrated with field personnel, enabling them to quickly react to emergent DOI/Bureau mission needs. They can often be deployed more quickly than traditional manned aircraft and their lower acquisition cost and operator training requirements provides the opportunity to deploy them more widely than is possible with traditional manned aircraft.

Elements of DOI’s UAS Data Management and Risk Mitigation Strategy

DOI’s UAS data management and risk mitigation strategy is founded, like the rest of its program in solid, mission-focused requirements determination and adherence. From 2010-2014, DOI’s Office of Aviation Services (OAS) leveraged a diverse array of excess Department of Defense (DOD) small UAS (valued at \$25M, but acquired at no cost) to conduct hundreds of operational test and evaluation (OT&E) flights across dozens of Interior mission applications. Based on experience and data collected during this OT&E program, over 300 DOI bureau and OAS subject matter experts came together to develop a series of Master UAS Requirements that continue to guide DOI fleet and contract UAS acquisitions. Common across DOI’s Master UAS Requirements were three data management and risk mitigation requirements: (1) encrypted control link, (2) encrypted payload link, and (3) enterprise level data sharing control. Subsequent market research indicated that outside the military UAS market, there were few consumer/professional UAS that met all three of these requirements. Unfortunately, tested military UAS did not meet other critical Interior mission requirements (e.g. sensor resolution, versatility) and were cost prohibitive for Interior bureaus’ available funding levels (military drones are up to 20X the price of similarly capable consumer models). Interior identified and acquired an initial inventory UAS that met the three data management and risk mitigation requirements, but for only two of the UAS types identified in the Interior master UAS requirement.

DOI Unmanned Aircraft Systems (UAS) Layered Data Management Assurance / Security Approach

DOI’s layered approach to data management assurance/security parallels the same construct used in the operational risk management of aviation safety:

1. Identify the hazard.
2. Analyze the hazard.
3. Make risk decisions.
4. Implement independent controls that together as a layered defense, greatly reduce the probability of the hazard occurring.
5. Monitor and adjust based on documented results.

The illustration to the right depicts some of the layered security measures DOI employs. Others include policy, training, top-to-bottom personnel accountability, regular external audits, etc.

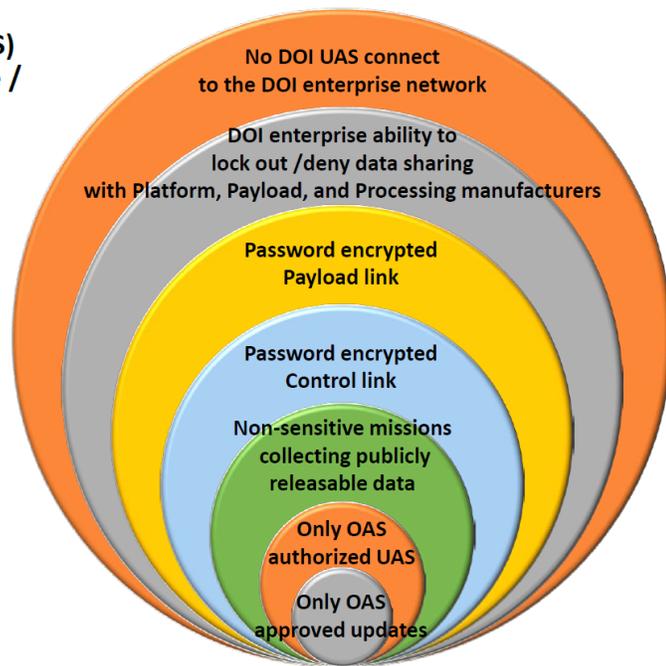


Figure 3. Department of Interior’s data management security plan.

In 2015, OAS began working with federal partners and the drone industry to develop solutions that met Interior’s three data management and risk mitigation requirements for other small UAS types listed in DOI’s Master UAS Requirement. OAS has also engaged relevant industry and government partners to assess the security of UAS that claimed to meet these three requirements. The layered approach to UAS security has proven to be successful within DOI. In over 30,000 flights conducted since 2010 no data has been transmitted or leaked to any location other than where it was intended to reside (Figure 3).



A Bureau of Reclamation 3DR Solo is deployed to inspect parts of the Hoover Dam in Nevada/Arizona. Interior UAS program managers have made cybersecurity a central part of the overall risk management strategy due to the sensitivity of critical infrastructure and other protected environments (Credit: M. Klein).

An Overview of DOI's UAS Program Activities

The role of unmanned aircraft in managing the lands of the United States has expanded over time as aircraft and pilot capabilities are cultivated by program managers. This section provides a summary of the role of UAS this past year and over time among bureaus, aircraft, and primary flight use. Program activity is tracked by recording more than 20 elements of information regarding each flight conducted.

Fiscal Year 2020 Flight Use Review

The following section provides an overview of FY20 UAS program flights. The Interior's UAS program flight operations in FY20 were dominated by Secretarial Order 3379 which limited acceptable uses for civilian federal agencies.

Flights by State / Territory

Overall, the number locations accessed by DOI remote pilots was reduced in FY20. Figure 4 highlights in red all states where at least one UAS flight was conducted in FY20. In total, DOI operated in 10 fewer states than 2019. Figure 5 also illustrates states where UAS flights were conducted by graduated size. The size of each box corresponds with the number of flights in the represented state. States where there were fewer than 50 flights are reported in the adjoining table.

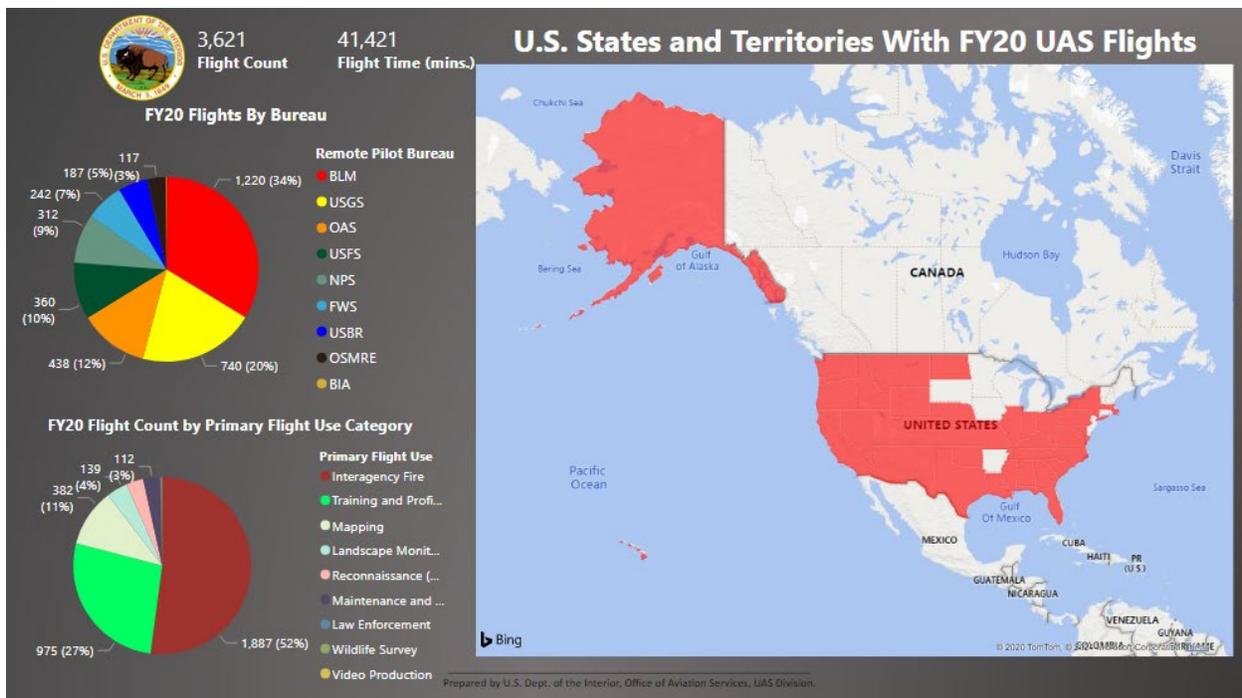


Figure 4. Department of Interior pilots flew UAS in 36 states in Fiscal Year 2020.

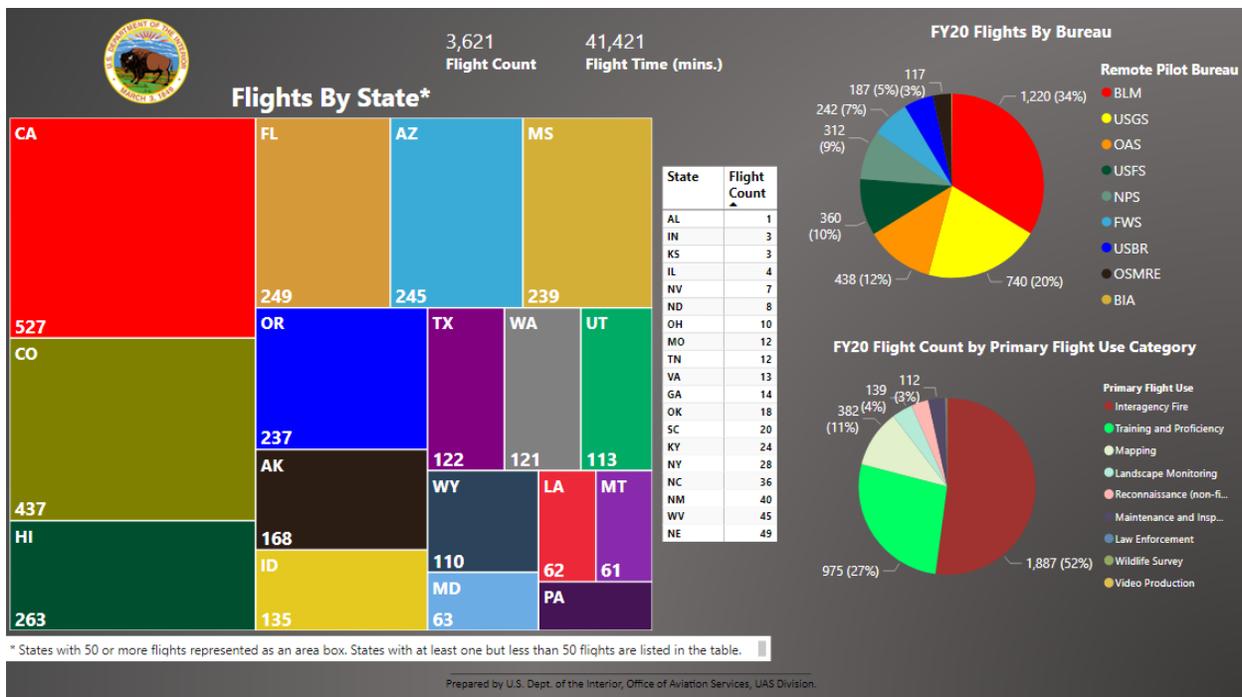


Figure 5. This area plot by state illustrates the count and location of UAS flights as they occurred in FY20. The larger the box the more flights occurred.

DOI UAS Flights by Bureau, Flight Use Category and Aircraft

Figure 6 illustrates all FY20 flights by bureau. Percentages tell a familiar story, with the Bureau of Land Management (BLM) leading DOI with the greatest number of flights, followed by USGS. Figure 7 illustrates interagency fire was the dominant primary flight use in FY20 with 1,887 flights (52% of total) followed by training and proficiency flights. Scientific missions such as mapping and landscape monitoring were relegated to smaller portions of the overall flight count and, post-Secretarial Order 3379, only permitted where the science conducted was in support of emergency operations.

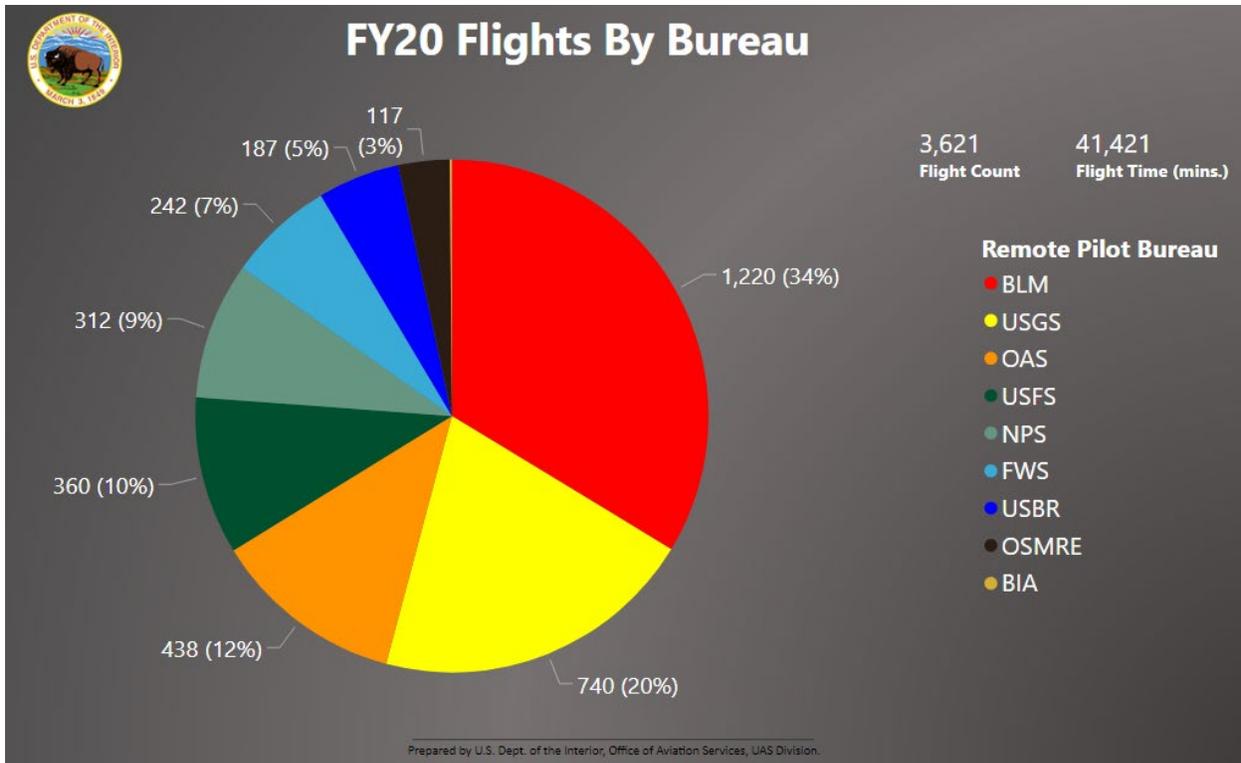


Figure 6. Fiscal Year 2020 UAS flights by bureau (pie chart).

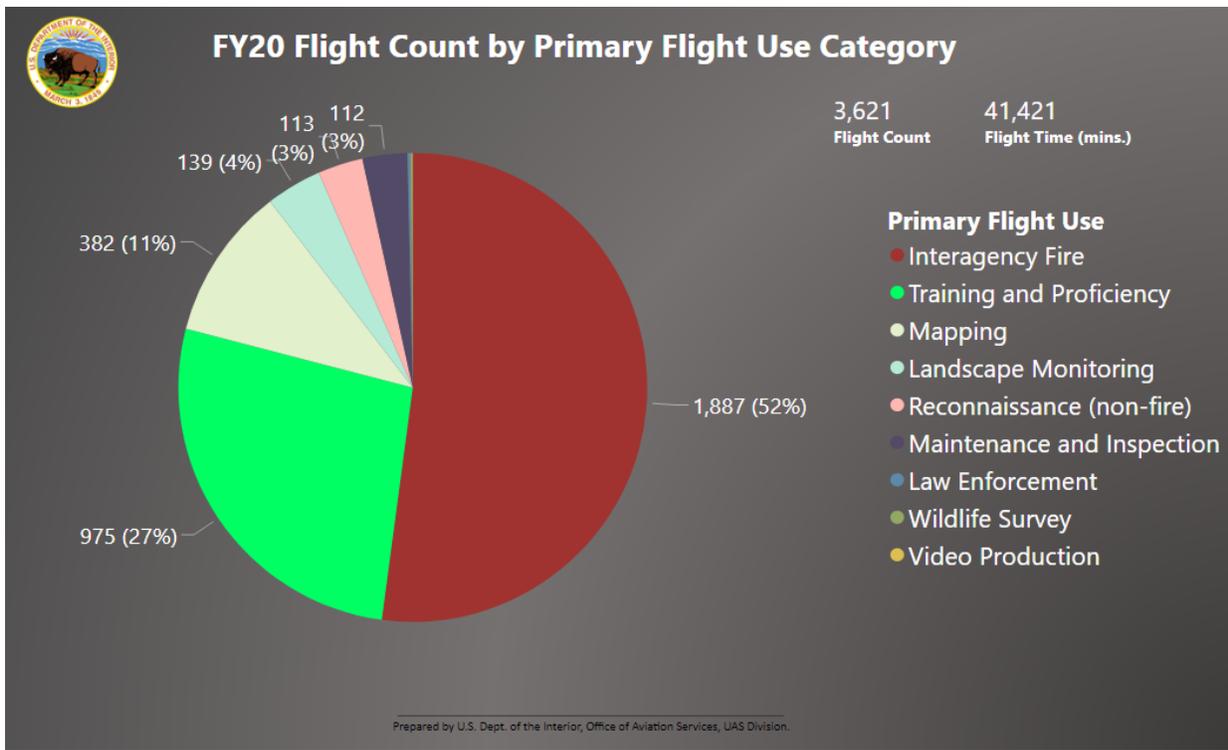


Figure 7. Fiscal Year 2020 UAS flights by primary flight use category.

Figure 8 breaks out FY20 UAS program flights by aircraft (bars) and bureau (color). Flight count was dominated by the DJI Matrice 600 Pro Government Edition driven by the aircraft’s performance and capability in wildland fire applications. Matrice 600 Government Edition flights were conducted mainly by BLM followed by OAS, the USDA’s Forest Service and USGS. The 3D Robotics Solo remains an important fleet aircraft, accounting for the second-greatest number of total flights (843).

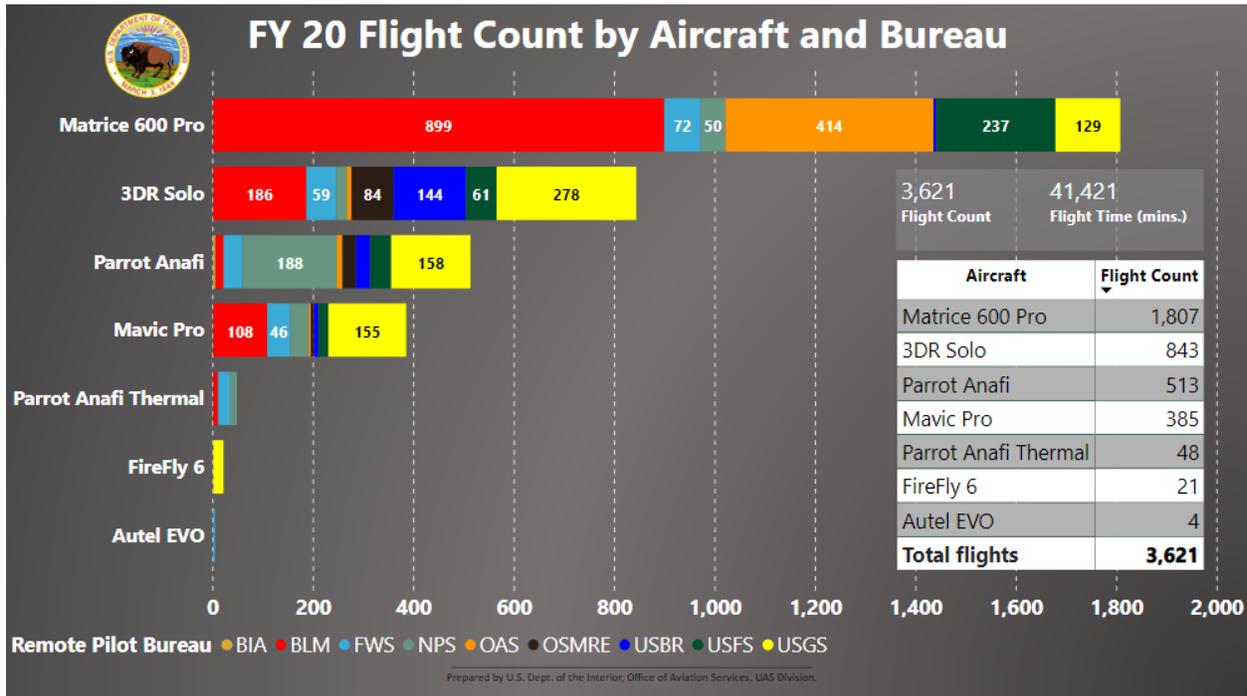


Figure 8. FY20 UAS flights by aircraft and bureau.



U.S. Geological Survey remote pilot Joe Adams prepares a 3DR Solo UAS for mapping, a mission dominated by this aircraft (Credit: M. Bauer).

Figure 9 breaks out FY20 UAS flights by primary flight use category (bars) and aircraft (colors). Figure 9 illustrates the program was dominated by interagency flights conducted using the Matrice 600 Pro Government Edition.

Training and Proficiency flights in FY20 were distributed across multiple aircraft as remote pilots train to familiarize across all certified platforms. Figure 9 also illustrates the importance of the 3D Robotics Solo for mapping as this aircraft continues to provide an affordable and effective platform for collecting quality data with good camera technology.

Figure 10 illustrates a monthly break down of UAS program flights by both bureau (left) and primary flight use (right). Due to Secretarial Order 3379, no flights were conducted in December 2019. Program flights in October (prior to the Executive Order signing) indicated a strong trend for the year, with more October flights recorded than in any previous year. Following the Order, most months are dominated by interagency fire flights.

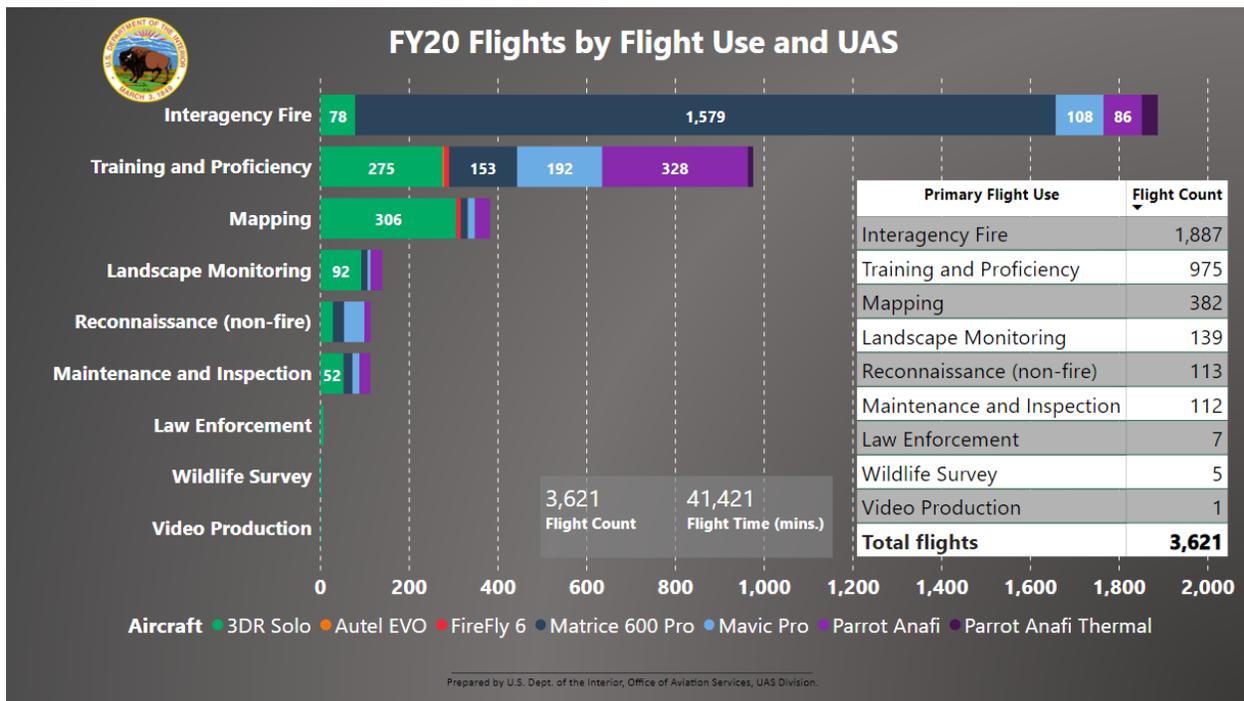


Figure 9. Fiscal Year 2020 UAS flights by primary flight use category.

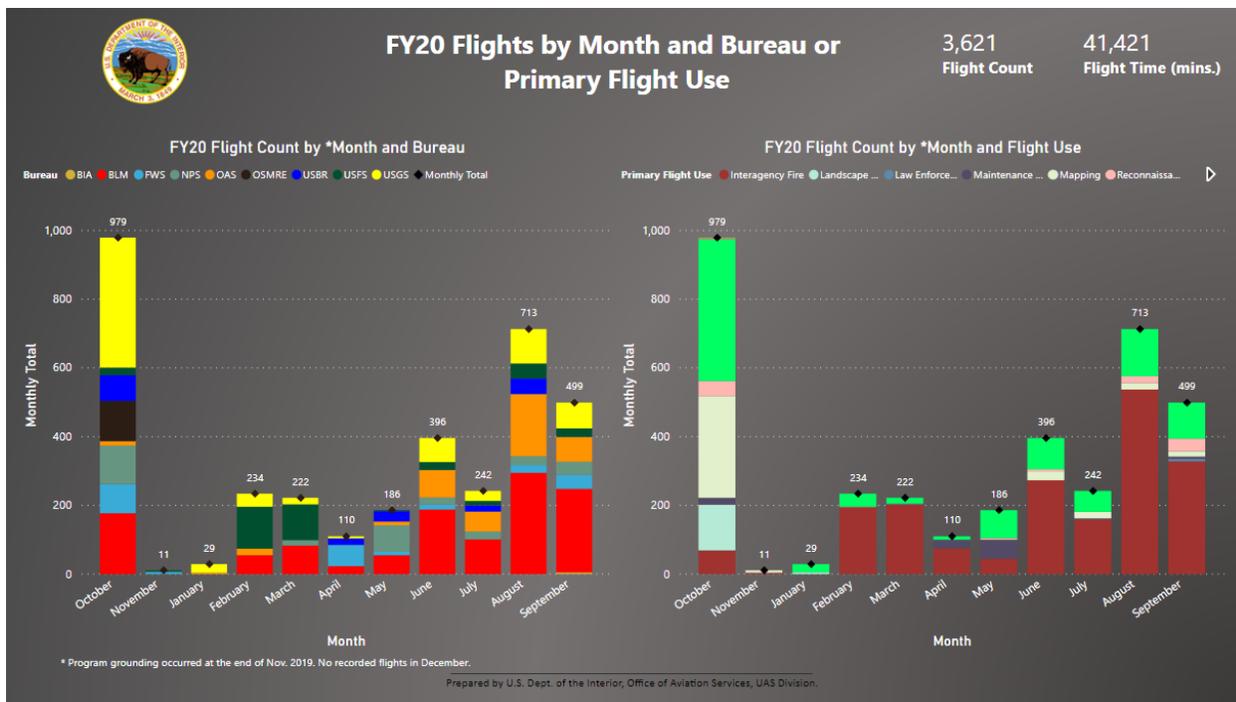


Figure 10. Fiscal Year 2020 monthly flight use by bureau and primary flight use.

UAS Program Since Electronic Record-keeping

With more than thirty thousand flights since 2017, DOI's UAS program has expanded the Department's ability to do its job for the American people. Overall, the utilization of UAS grew in just about every metric between FY17 and FY19. This trajectory of growth was abruptly ended in FY20 with Secretarial Order 3379. As Figure 11 illustrates, the impacts of Secretarial Order 3379 are first apparent in FY19 Quarter 4 when the order was released. More than 4,300 flights occurred in FY18 Q4 but just over 4,200 in FY19 Q4, a reduction that bucks the trend of the previous three years.

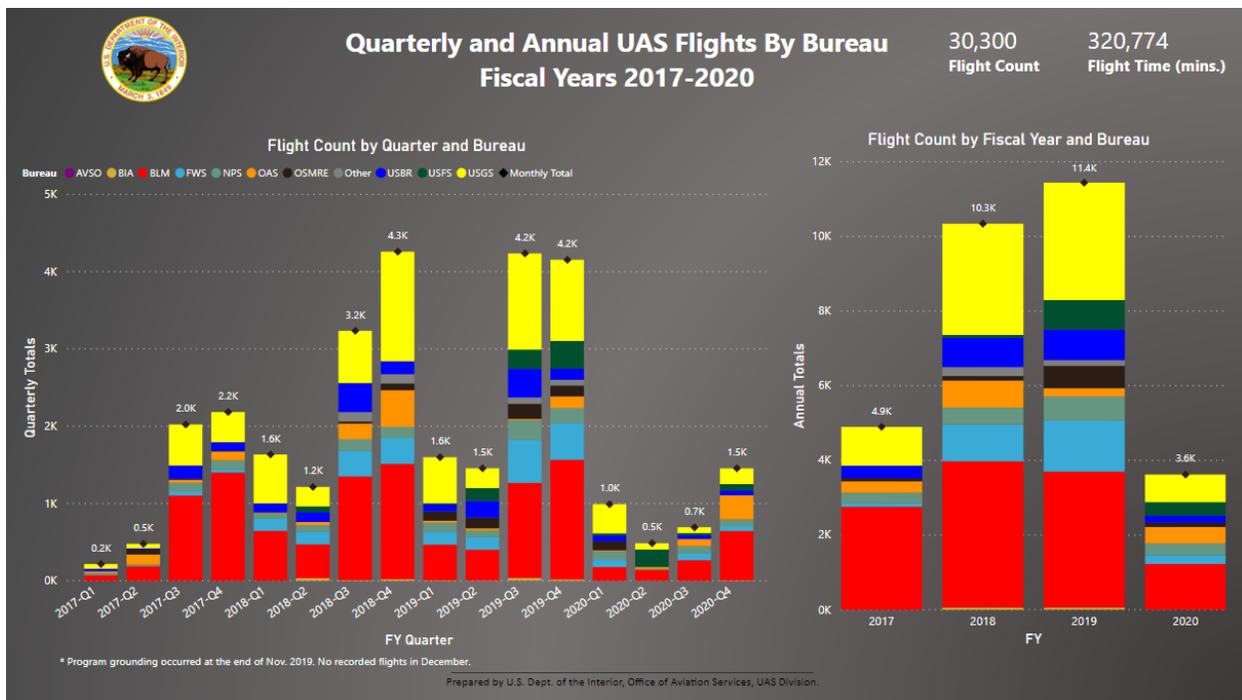


Figure 11. Overall flight trends among DOI bureaus since 2017 (the start of electronic record-keeping).

Table 1 provides a summary of key flight statistics over the past four years with annual increases in black and annual reductions in red. Fiscal Year 2020 saw a reduction in every major program metric as a result of Secretarial Order 3379, most notably the program saw a reduction of more than 7,500 flights from FY19 to FY20.

Table 1. Overview of DOI small UAS flight statistics for fiscal years 2017-2020.

	Total UAS Flights	*Incident Flights	Non-Incident Flights	Training Flights	Total Flight Hours	States /Territories Flown In
FY 2017	4,976	783	2,271	1,922	803	33
FY 2018	10,342	1,454	3,793	5,095	1,785	42
FY 2019	11,441	2,517	5,200	3,725	2,036	48
FY 2020	3,621	2,051	1,570	975	690	36
4-Year Total	30,300	6,805	12,883	11,717	5,346	All 50 States

* "Incident" flights include emergency management missions supporting interagency fire, hurricanes and flooding. Red indicates values reduced from the previous year.

Figure 12 provides an overview of all program flights since 2017. More than one third of all flights conducted since 2017 (30,300) were for training and proficiency (11,700) with scientific mapping missions taking second place (7,489) followed by flights conducted in support of interagency fire (6,174).

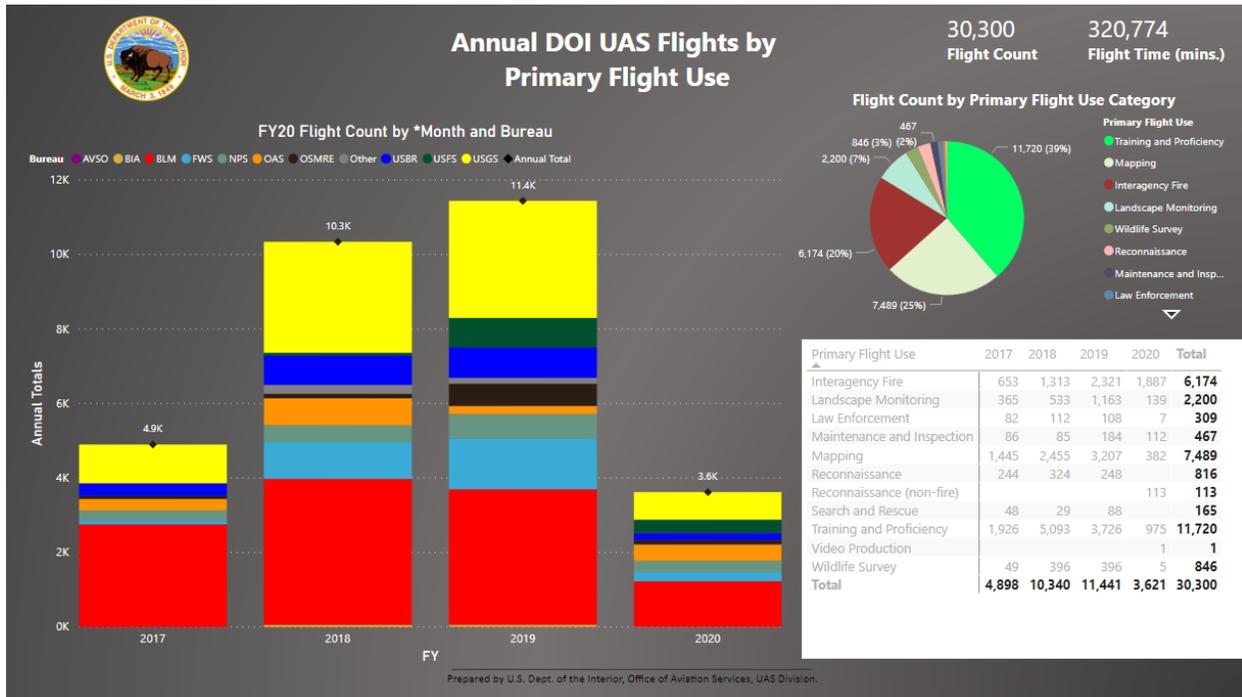


Figure 12. A four-year summary of DOI’s UAS program flights with primary flight use category.

UAS Program Two Year Comparison

Changes in program activity between years provides insights into how current policy is impacting the overall effectiveness of DOI’s bureaus in completing their missions with the aid of UAS. Table 2 and Figures 13 – 15 illustrate FY19-FY20 comparisons. Table 2 introduces major DOI bureaus and partners represented in this report. Every bureau and office involved with the UAS program were limited by the Secretarial Order, and therefore conducted fewer flights in FY20 compared to FY19, except for the Office of Aviation Services (OAS) remote pilots. Due to the program’s change in focus for wildland firefighting, OAS expertise was burdened to stand up related personnel and equipment. Table 2 also indicates that several Interior bureaus have not flown or used UAS equipment since the signing of Secretarial Order 3379.

Figure 13 breaks down UAS flights by bureau for FY19 and FY20. Minor shifts in the percent of overall flights by bureau were driven by an increased role by OAS and the drop of minor bureaus from conducting any flights in FY20. However, major changes are evident when looking at the flight count for each bureau with only about 32% of FY19 flights completed in FY20.

Interior Bureaus, Offices and Interagency Partners

Interior’s UAS program includes pilots from seven major bureaus and Offices, as well as minor involvement from other Interior offices. United States Department of Agriculture’s Forest Service (USFS) also shares resources and information regarding their program development. Call When Needed (CWN) commercial contractors provide essential services beyond the program’s capabilities and are also reported.

Secretarial Order 3379 prohibited many bureaus from conducting UAS flights in FY20 which left some organizations without the ability to fulfill mission requirements (illustrated as a 100% reduction in flights).

Table 2. Interior UAS program involved agency composition and fiscal year 2020 activity. Values in red indicate a decrease from FY19 to FY20 (see also Figure 13).

Agency	Acronym	FY20 Flight Count	FY19 Flight Count*	Pilots Trained in FY20**	Pilots Trained in FY19
Bureau of Land Management	BLM	1,220	3,636	0	14
U.S. Geological Survey	USGS	740	3,146	10	37
U.S. Fish and Wildlife Service	FWS	242	1,367	1	26
National Park Service	NPS	312	650	11	17
U.S. Dept. of Ag. Forest Service	USFS	360	791	4	23
Office of Surface Mining Reclamation and Enforcement	OSMRE	117	600	0	5
U.S. Bureau of Reclamation	USBR	187	815	0	10
Office of Aviation Services	OAS	438	219	0	4
Bureau of Indian Affairs	BIA	5	59	1	1

* Overall number of flights was reduced between FY19 and FY20 for all DOI agencies except OAS. This was mostly attributed to Secretarial Order 3379.

** The current number of pilots trained during FY20 dropped substantially for all bureaus. This was attributed to both Secretarial Order 3379 and Covid-19 safety restrictions.

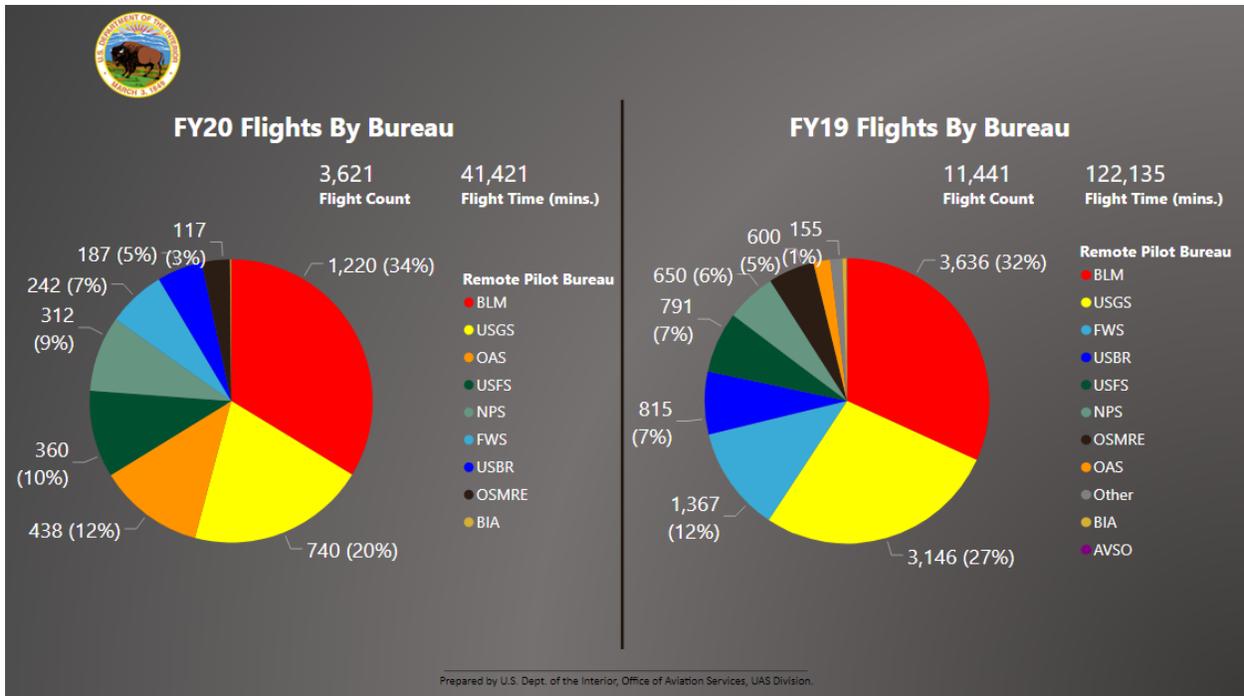


Figure 13. A comparison flight count and percent by major bureau fiscal years 2019 vs. 2020.

Aircraft Trends

Figure 14 illustrates trends in aircraft utilization between FY19 and FY20. The comparison illustrates the importance of DJI Government Edition aircraft for the purpose of supporting wildland fire operations. Flights in FY20 were dominated by the Matrice 600 Pro Government Edition with almost 50% of all flights. Also notable is the nearly 10-fold decrease in flights using 3D Robotics Solo between FY19 and FY20 as the Department’s science missions were largely sidelined.

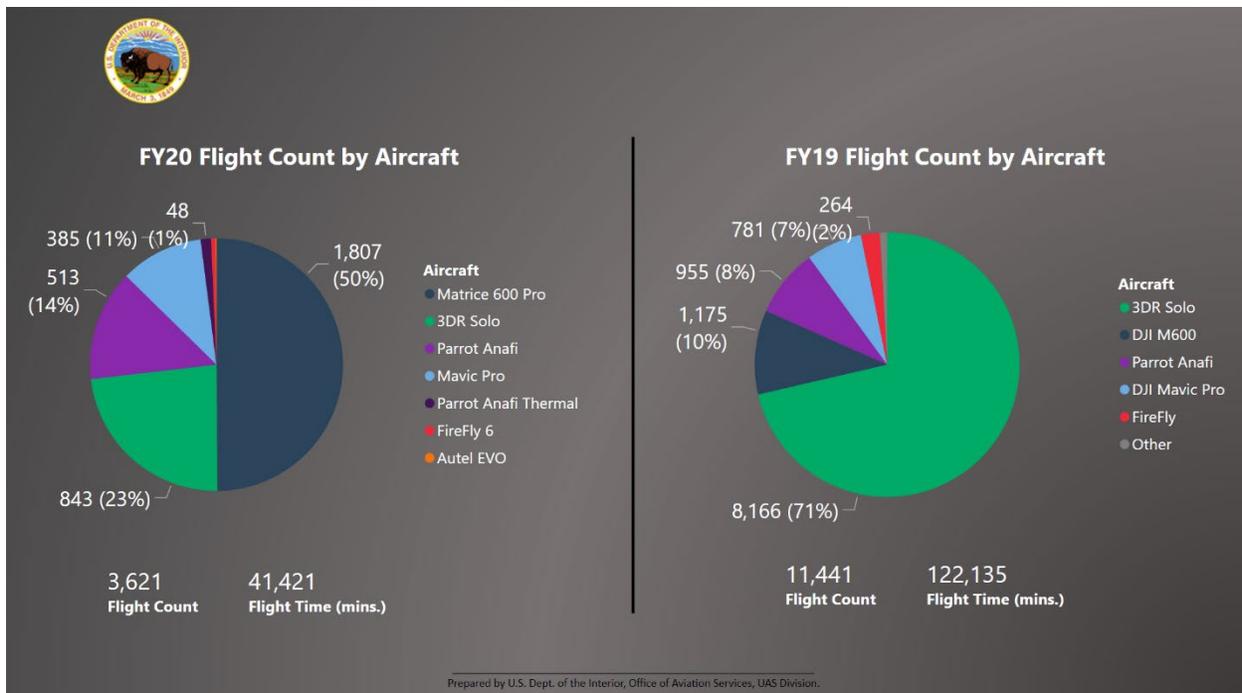


Figure 14. A comparison of flights by aircraft Fiscal Years 2019 and 2020.

Monthly Trends Over Two Years

Figure 15 provides four visuals describing monthly UAS program flights conducted in FY19 and FY20. Fiscal year 2019 flights are illustrated on top with monthly flights by bureau (left) and monthly flights by primary use code (right). Trends illustrate beginnings of FY20 (October) were on track for another record-breaking year for the program. However, the signing of Secretarial Order 3379 in November of 2019 diminished the number of flights conducted in each subsequent month. Additionally, Figure 15 also illustrates Interagency Fire as the dominant flight use in FY20 as most training, mapping and other science-based missions were banned following the order.

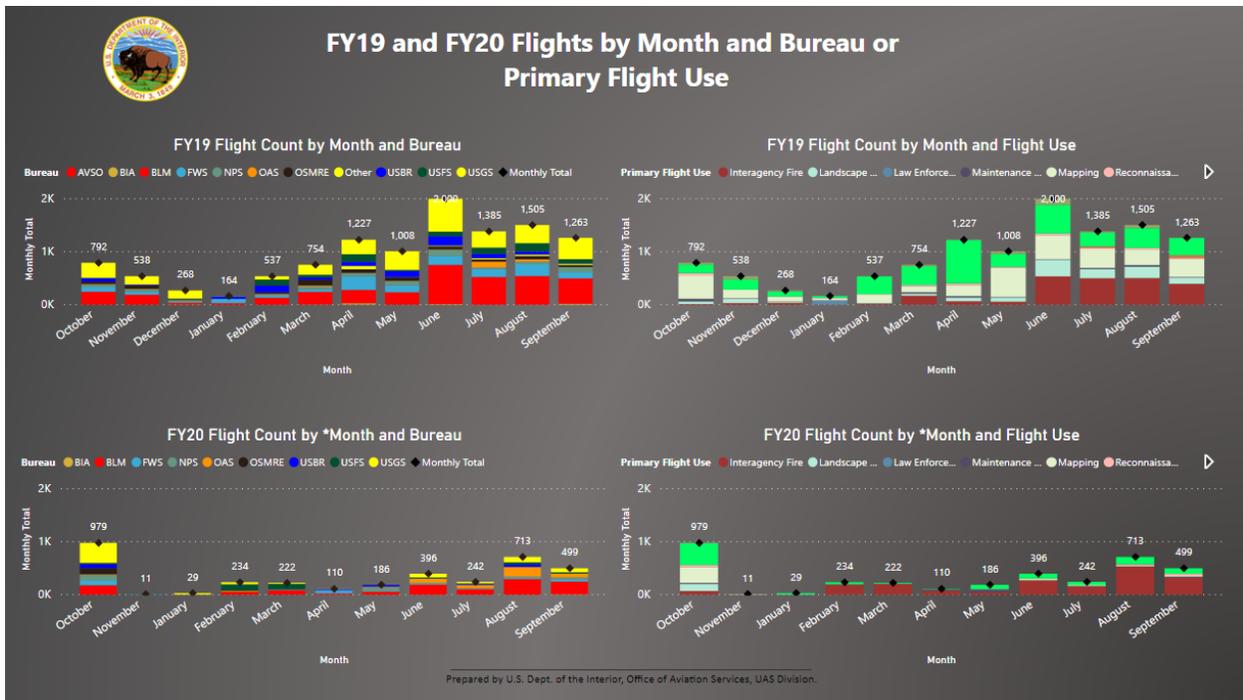


Figure 15. Monthly flight trends by bureau and primary flight use for Fiscal Years 2019 and 2020.

UAS Support in Wildland Fire Operations

The DOI UAS program supported wildland fire management for FY20 efforts providing tactical operations with enhanced situational awareness, mapping products and aerial ignition. These operational missions were conducted with payloads to perform missions that include live thermal/infrared data, mapping, plastic sphere dispenser (PSD) and terrain modeling.



The Drone Amplified Ignis payload has ignited DOI's utility for fighting wildfire with UAS. This Plastic Sphere Dispenser (PSD; shown here mounted to the Matrice 600 Pro Government Edition) provides firefighters the ability to build miles of fire-containing backfires in a short time, an activity previously conducted slowly on foot, or dangerously with a manned helicopter.

In FY20 Interior bureaus conducted 1,887 flights, totaling more than 400 flight hours in 21 states for support of wildland fire and prescribed fire. These numbers represent the allowance of the Secretarial Order 3379 to support emergencies or maintain pilot proficiency for emergency support. In comparison, in FY19 Interior remote pilots conducted 2,389 flights in support of wildland fire operations.

Table 3. Call When Needed (CWN) contractor flights for fiscal year 2020.

	Total Incident Flights	Fires Supported	Total Flight Hours	States with Flights	Aircraft Types Flown
FY 2018	86	16	382	6	4
FY 2019	43	7	77	4	3
FY 2020	72	8	285	4	4
3-Year Total	201	31	744	14	11

Additionally, Interior personnel managed a Call When Needed Contract (CWN) giving access to larger UAS for long duration surveillance, providing enhanced situational awareness during wildland firefighting operations (Table 3). The CWN vendors mobilized to eight fires in FY20 totaling 285 flight hours over 72 flights. CWN UAS collected video with advanced payloads that provided a live stream for fire managers. This information was used to monitor fire perimeter growth and to check progression of suppression efforts.



Bridger Aerospace’s Latitude FVR-90 “Type 2” unmanned aircraft conducted more than 60 flights in support of wildland fire operations in Fiscal Year 2020 as part of Interior’s CWN contract.

DOI bureaus including BLM, National Park Service (NPS), Fish and Wildlife Service (FWS), and OAS, as well as the USFS worked to support wildland firefighting operations and land management agencies with UAS in support. The UAS PSD operations specifically were used to supplement manned flight hours that traditionally relied on high risk flight profiles and ground efforts in challenging terrain. The UAS personnel and equipment not only supplemented manned operations but proved to hold a viable niche when traditional aviation efforts were not utilized which included night and low visibility smoke inversions. For example, on the Pine Gulch Fire in Colorado, BLM UAS/PSD efforts helped contain what was then the largest fire in Colorado history by conducting UAS/PSD night operations, dropping over 58,000 balls with 161 flights. Another example of the benefits accomplished were the prescribed fire operations in the southeast. UAS/PSD operations treated approximately 15,500 acres throughout FL, TX, NC, SC, MS, and GA. UAS/PSD operations were highly beneficial in southern fuel types, limiting exposure and fatigue for ground personnel due to heat and thick vegetation. Although hard to quantify, the safety and cost efficiency of UAS have been highlighted throughout FY20 with the high demand of requests for UAS personnel and equipment.



Figure 16. Call When Needed support for FY20 wildland fire summary (Credit: J. Murgoitio).

DOI Remote Pilots: The Program's Core

At the core of Department of Interior's UAS program are the dedicated pilots, most who have accepted the challenges of learning the requirements of becoming a remote pilot as collateral duties in their official Interior roles. The Interior's remote pilots are highly experienced specialists in their respective fields who have been taught a new skill and given a new and powerful tool with which to conduct science, address climate change, respond to wildfire and other natural disasters, and more. Figure 17 illustrates the number of active DOI remote pilots as of January 2021. For the first time in many years, the number of active remote pilots has decreased from 468 in FY19 to 457 in FY20. This is primarily due to Secretarial Order 3379 preventing pilots from training to meet policy requirements.

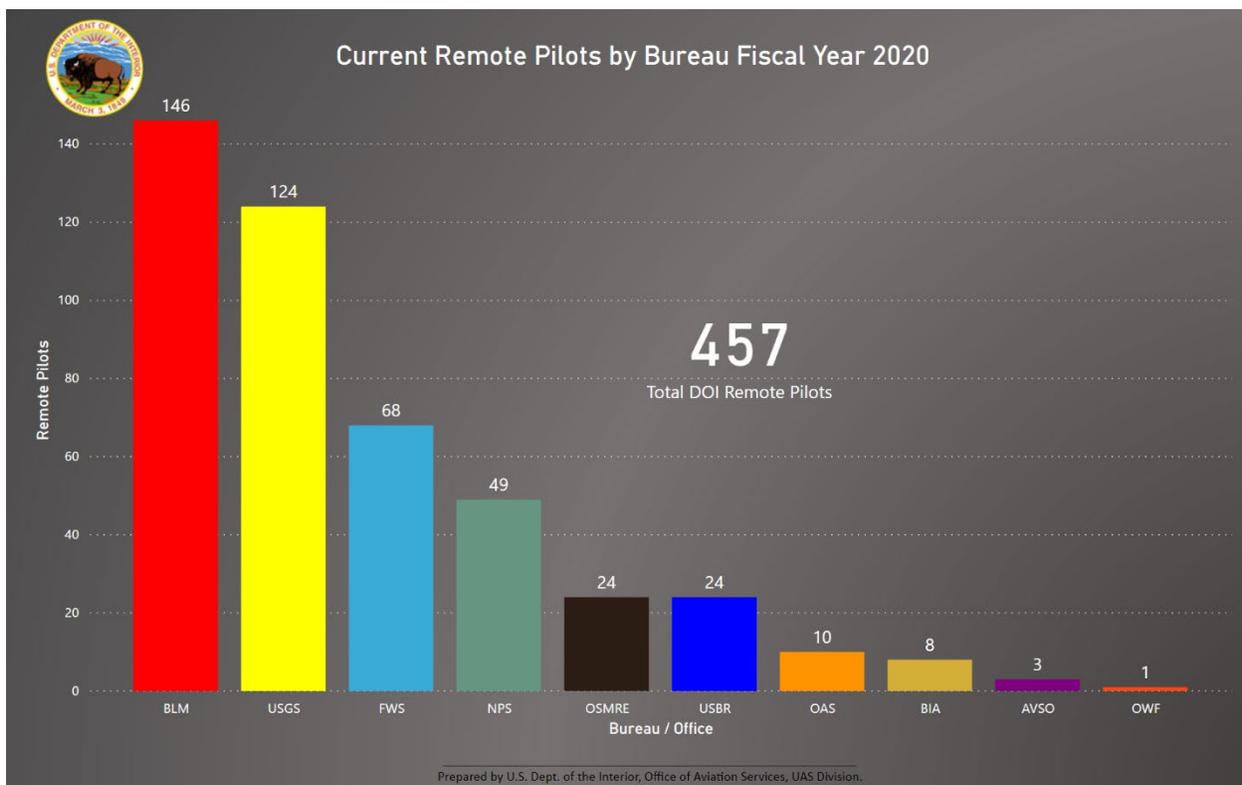


Figure 17. Current Interior remote pilots by bureau (as of January 2021).

Remote Pilot Training

Training is the cornerstone of any safe and successful aviation program. Training provides the background allowing students to gain the experiences necessary to become professional remote pilots. Concepts of safety, efficiency and Departmental goals are learned, debated and practiced. The OAS UAS Division, responsible for training all the Department's remote pilots, has proudly established a thoughtful, inclusive and effective UAS training program. The DOI UAS Training Program is recognized as being highly professional and is often replicated by other federal and state organizations starting their own UAS training programs. Fellow Agencies such as NOAA have asked

for assistance when setting up their own training programs. The Federal Aviation Administration (FAA) has allowed the Department of the Interior flight authorities that are second only to the Department of Defense, largely because of DOI's professional training program.

Through training, DOI is able to vigorously conduct complex interagency missions such as wildland firefighting, search and rescue, volcano response, law enforcement, and data acquisition in support of DOI research science. However, before DOI remote pilots can conduct any of these missions, they must have an opportunity to learn the universal basic skills expected of all DOI UAS remote pilots.

Students get these skills by attending the A-450 Basic remote pilot course. During A-450 students are taught how to communicate and conduct missions in a standardized manner. They are taught policy, privacy rights and applicable aviation rules and regulations. These lessons are taught so students are able to work with any other Interagency remote pilots, regardless of Agency, to successfully accomplish DOI, Interagency and National UAS missions.

Sadly, due to the challenges of FY20, the training trajectory of the DOI UAS program sharply declined. The A-450 course, so important because it is *the* fundamental course for all Interagency advanced training, was all but cancelled.

The Department of the Interior experienced a 90% decline in delivery of the A-450 Basic Remote Pilot Course in FY20. Nineteen of the 21 scheduled A-450 courses had to be cancelled as a result of the Secretarial Order 3379. The course cancellations were not related to COVID-19 and occurred prior to mass lock down. Ironically, as the Departmental COVID-19 safety mitigations were put in place, flight training waivers were approved from the Secretary's office. As a result, several classes were conducted in early FY21.

On average, the number of A-450 courses offered between FY17 and FY20 was 16. The average number of Remote Pilots that graduated between FY17 and FY19 from A-450 were 160 students per year. The projected number of new DOI Remote Pilots to graduate from A-450 in FY20 was estimated to be around 248. As a result of the course cancellations, the number of students graduating from the 2 courses in FY20 was 24.

Why are these trends significant? The A-450 Basic Remote Pilot course is the fundamental DOI course and the requirement for advanced UAS skill development and course work. As a result of the cancelled classes, scientists and resource managers could not pursue advanced UAS data collection techniques. First responders could not be trained in emergency response, search and rescue or firefighting advanced courses. In an additional disturbing training trend, some trained DOI remote pilots that have completed both basic and advanced training are not following up on their currency requirements.¹ This is due to a combination of the Secretarial Order 3379 and COVID-19 protective protocols, with over a hundred DOI remote pilots unable to execute their job responsibilities with UAS because they are out of compliance with policy requirements.

DOI remote pilots are required to practice take-off and landing as well as employing emergency procedures for each certified aircraft type within 90 days (proficiency) and 365 days (currency).

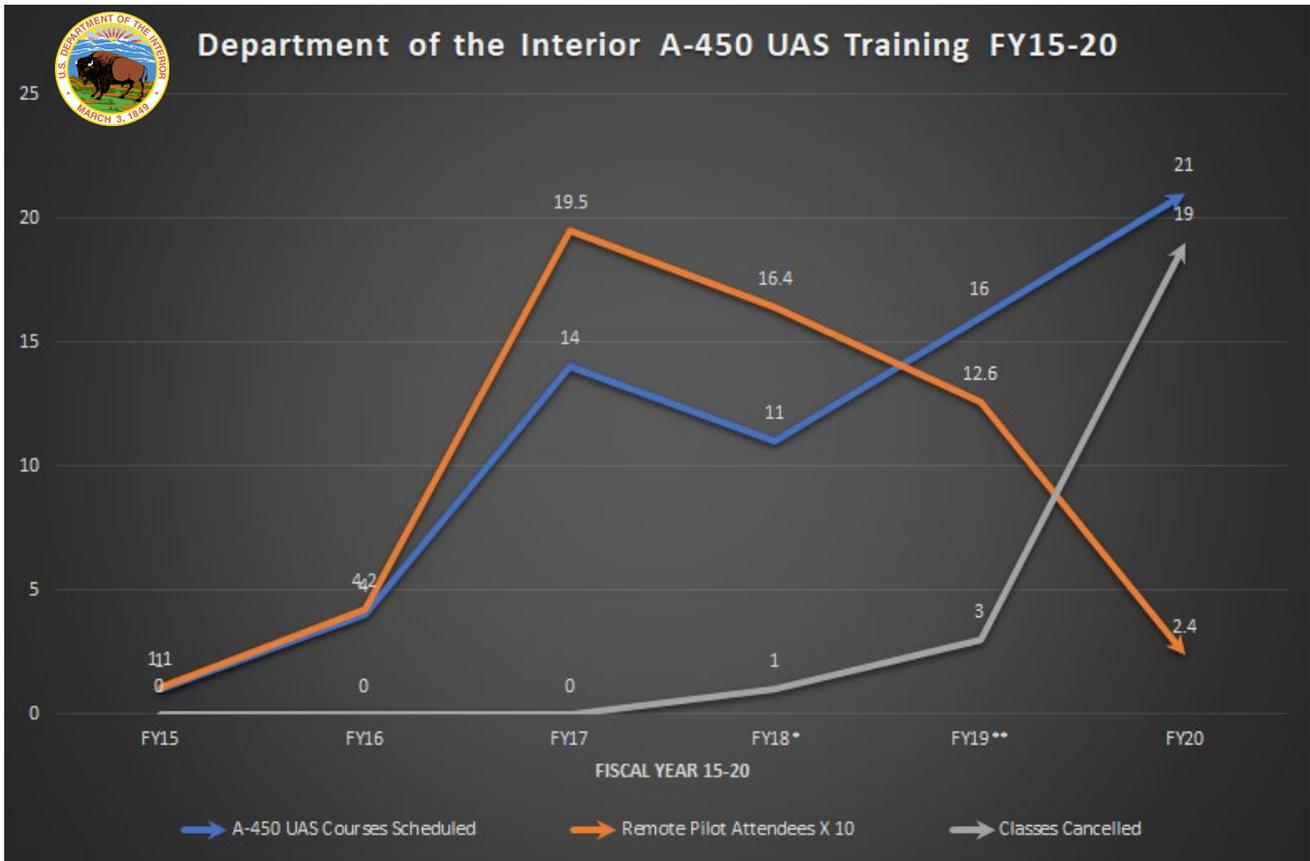


Figure 18. Department of the Interior UAS Training trends between Fiscal Years 2015 – 2020. *FY18 experienced a 3 day government shutdown. **FY19 experienced a 35 day government shutdown.

2021 Outlook

The outlook for 2021 largely depends upon the priorities of the incoming administration. Should there be a change to the policy issued in the Secretarial Order 3379 then it is possible we could see use of UAS in DOI return to a level of use like 2018 and 2019. However, the grounding order is not modified or lifted then we would expect to see a very modest use of UAS and limited to no acquisition of new UAS for the Department.