ASRS for Unmanned Aviation Systems

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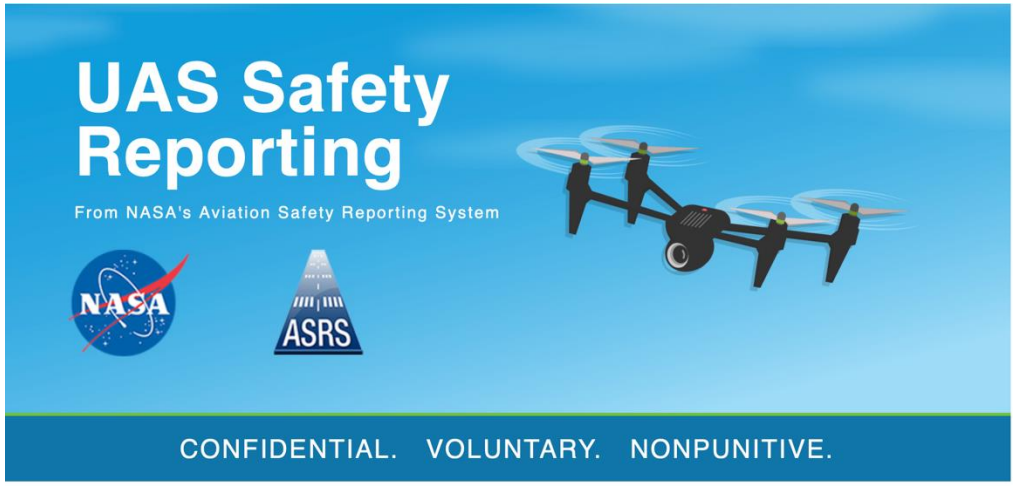
Aviation Safety Reporting System

ASRS for UAS – Launched in 2021

Anyone involved in **UAS Operations** can file a NASA Aviation Safety Reporting System (ASRS) **incident report**.



Anyone involved in UAS operations can file a NASA ASRS report to describe *close calls*, *hazards*, *violations*, and *safety related incidents*

FAA Drones by the Numbers

Drones Registered* - 791,597
- Commercial Drones - 396,746
- Recreational Drones - 387,7746

Certificates Issued *
Remote Pilots – 415,635
TRUST Certificates – 883,094

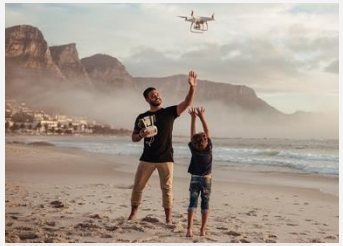
* As of 10/28/2024

ASRS UAS Safety Reporting

ASRS welcomes reports about close calls, hazards, violations, and safety related incidents such as

- Near Mid-Air Collisions and Crashes
- Lost Link/ Fly Aways
- Procedural and Regulation Confusion
- Equipment Issues
- Human-System Interaction Issues
- Communication Breakdown
- Human Error / Slips / Lapses
- Lessons Learned and Best Practices

Anyone involved in UAS / Drone operations can file a NASA ASRS report including:



Recreational Flyers

Part 107 Operators

Part 135 Operators

Public Operators

Remote Pilot in Command | Person Manipulating Controls
Visual Observer | Safety Team | Mission Planning Team

UAS Metrics: April 2021 – June 2024

Report Intake:
- 692 UAS-related reports
- 340 reports were from UAS operators
- Approximately 18 reports per month

Reporter Characteristics*:
- 51% Commercial, 25% Recreational, 17% Government
- 58% are single person crews, 38% multi-crew
- 80% have Part 107 certification

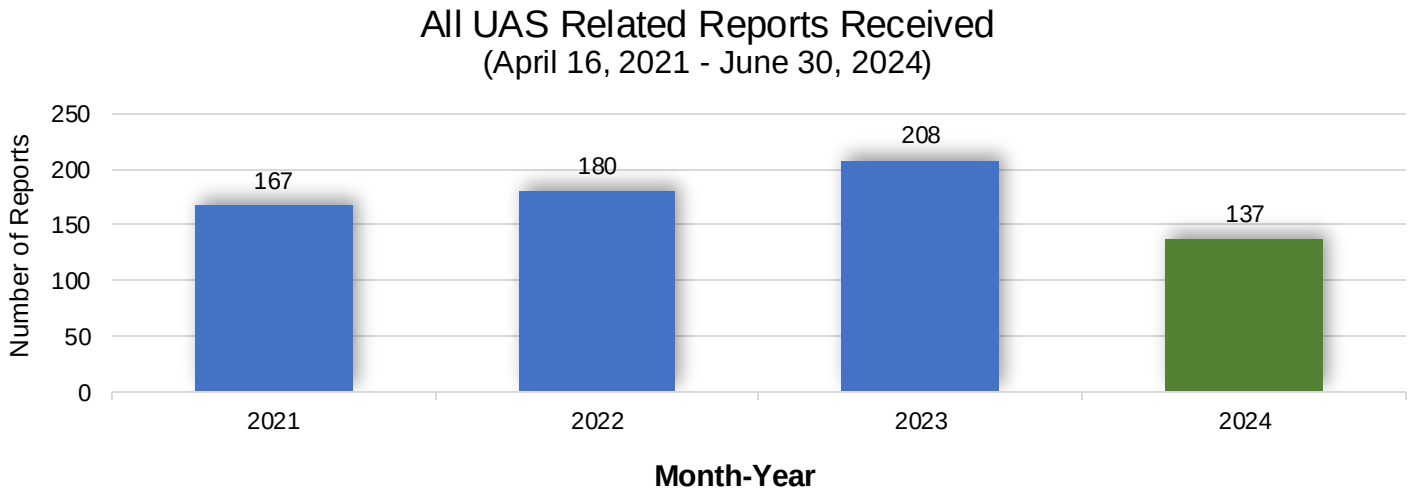
UAS Characteristics*:
- 59 different make/models represented (Intake Data)
- 78% of reports were about Small UAS (.55 up to 55 pounds)
- 85% were multirotor, 9% fixed wing, 3% hybrid

UAS Operations*:
- 25 were operating Beyond Visual Line of Sight (BVLOS)
- 217 were operating Visual Line of Sight (VLOS) operations, 30 of which had a Visual Observer
- 71% were operating under Manual Control at time of event

* Based on 265 fully processed records at time of analysis

UAS Metrics: April 2021 – June 2024

UAS Report Intake (n = 692)

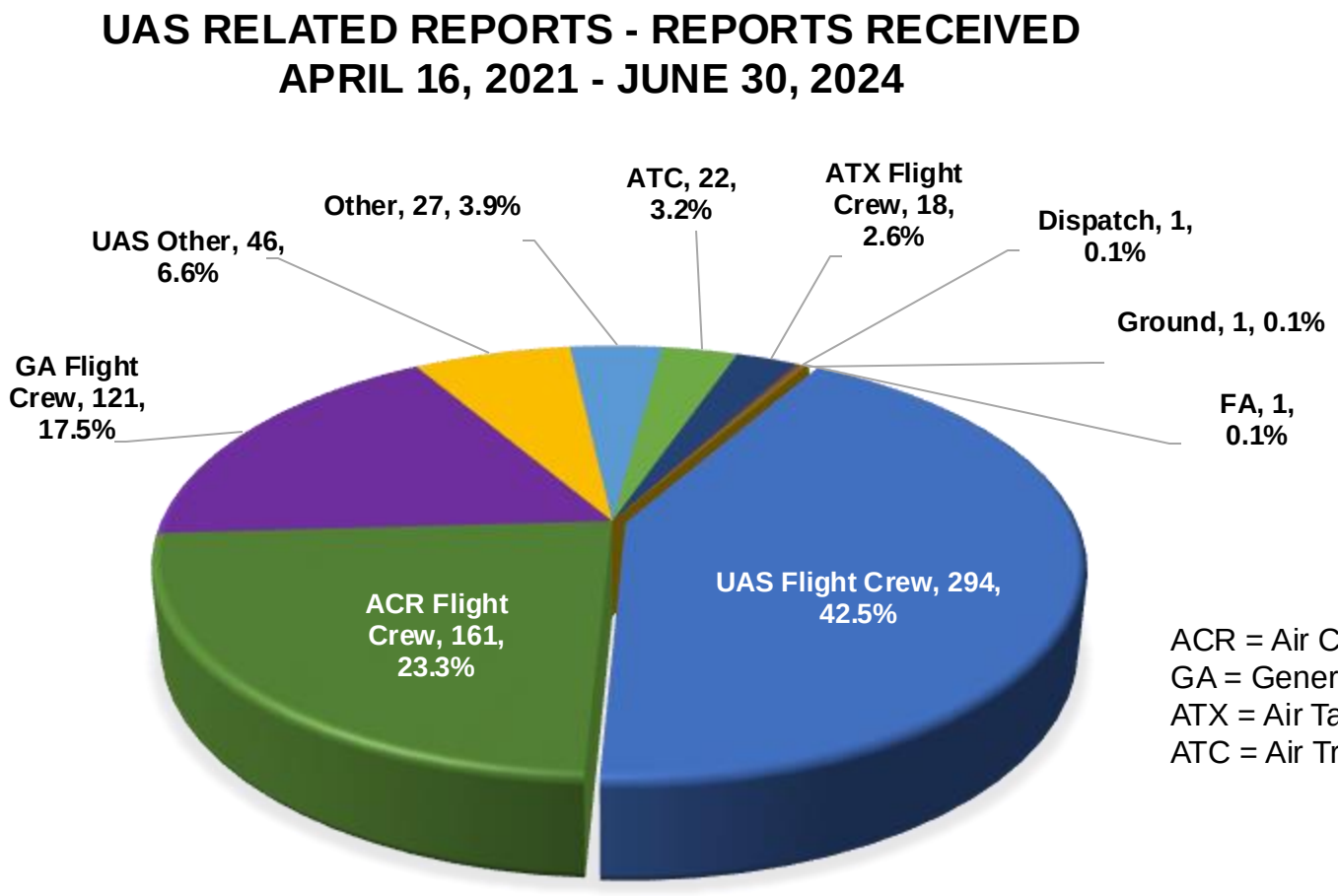


59 UAS Make / Models Reported (Sample from n = 340)
10 Examples of Make Models Below

- Autel Robotics
- Censys Sentaero BVLOS
- DJI models
- Gray Eagle
- Elistair Orion
- MQ-9A Reaper
- Lockheed Martin Stalker
- Parrot Anafi
- Skydio 2
- Teal Golden Eagle

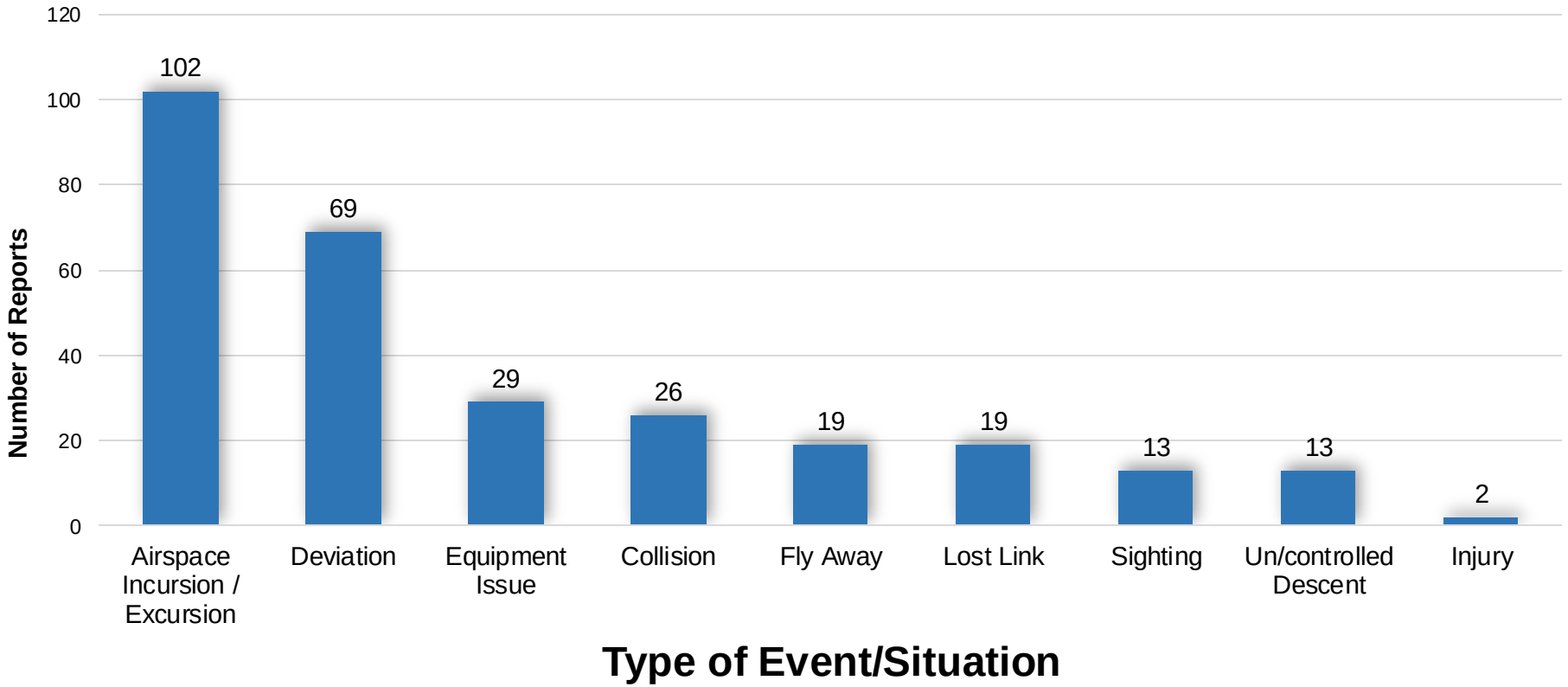
UAS Metrics: April 2021 – June 2024

UAS Reporter Types (n = 692)



ACR = Air Carrier
GA = General Aviation
ATX = Air Taxi
ATC = Air Traffic Control

UAS Event Type (Self-Report)
April 2021 – June 2024



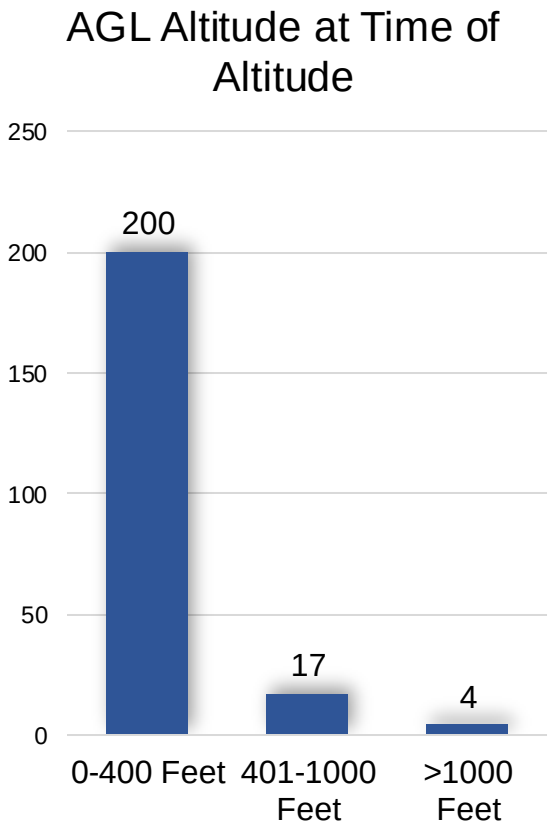
*Counts taken from reports submitted by UAS fight crews and UAS other via UAS form.
**Categories are not mutually exclusive.

n = 259 of 321 Reports

Sixty-two reporters did not select a type of event.
Twenty-one reporters selected more than one event type.

Was the UAS flying In, Near or Over, and Altitude April 2021 – June 2024

**Was the UAS flying in, near or over:	Count
Aircraft / UAS	27
Airport / Aerodrome / Heliport	87
Crowds	10
Moving Vehicles	17
People / Populated Areas	34
Open Space / Field	81
Private Property	60
Recreational Club / Fixed Flying Site	6
Critical Infrastructure	21
Emergency Services	15
Natural Disaster	6
Aerial Show / Event	7
No Drone Zone	24
Indoor / Confined Spaces	2
Other	10



44 records did not provide an AGL altitude

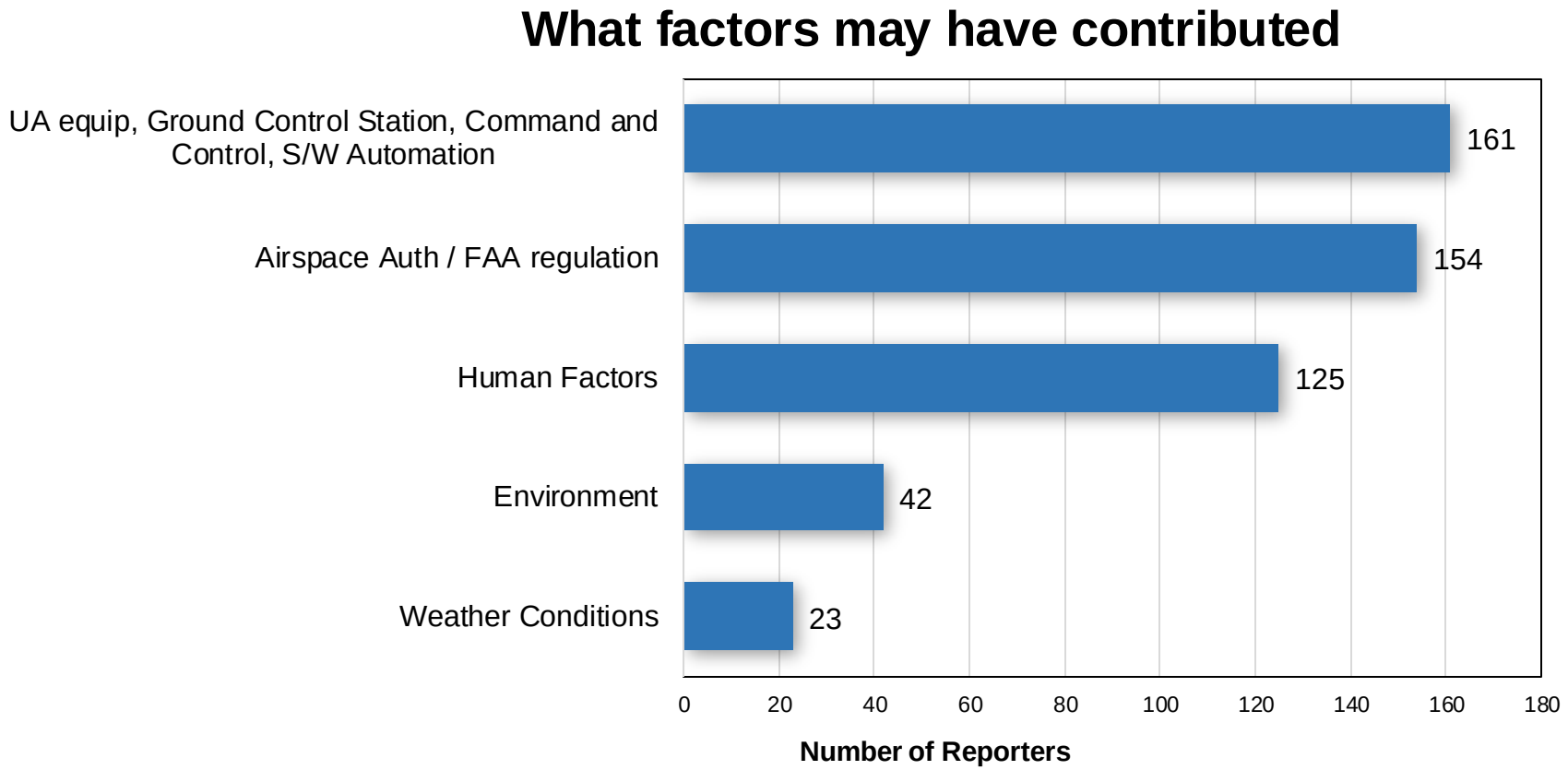
One record did not contain the type of area being flown over

*Counts taken from reports submitted by UAS flight crews or UAS other and are in DBOL.

**Categories are not mutually exclusive.

n = 265 Records

Contributing Factors (Self-Report)
April 2021 – June 2024



*Counts taken from reports submitted by UAS fight crews and UAS other via UAS form only. Self Reported. Forty-six reporters did not select a contributing factor.

**Categories are not mutually exclusive.

n = 275 of 321

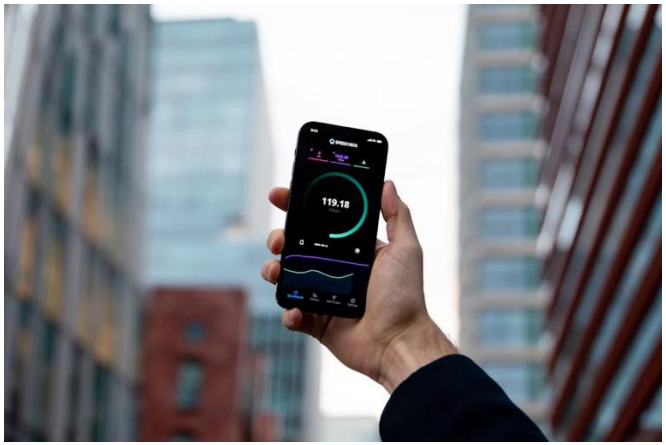
Collisions, Near Misses, and Crashes

Near Mid-Air Collision. Part 107 UAS pilot reported a "near mid-air collision .. **with a low flying fixed wing aircraft.** The UAS pilot took manual control to avoid the aircraft and safely returned to base"...
ACN 2024171

Drone Crash on Interstate. Part 107 UAS pilot reported "...I tried pressing the return home option, but the drone was out of range. **The drone proceeded to land on the interstate and was struck**. The vehicle in question did not stop and the drone was destroyed..." ACN 2017145

Reports submitted to ASRS

Lost Link and Fly Away Events



Autel EVO II lost link: … Drone…crashed into a nearby wall, not responding to inputs from the pilot. Flight log showed near continuous downward input but aircraft would not descend or regain control. **Disguised cell tower discovered to be less than 50 feet from location (non-traditional tower).** It is unknown if this caused interference, or if there was some type of equipment/IMU (Inertial Measurement Unit) failure. ACN 1860770

RC fixed-wing loss of control: Lost my new airplane due to a system failure, this is the **second Carbon Cub 1300mm RTF** from Horizon. **One crashed shortly after take off after total failure… the other flew several flights, and then lost it's mind.** It would veer to the right extremely hard, could not correct in any of the panic modes. It crashed in a huge bean field and I could not find it. Had to let it crash to avoid the highway. **This is a potential fly away issue**. ACN 2028887

Procedural and Regulation Confusions

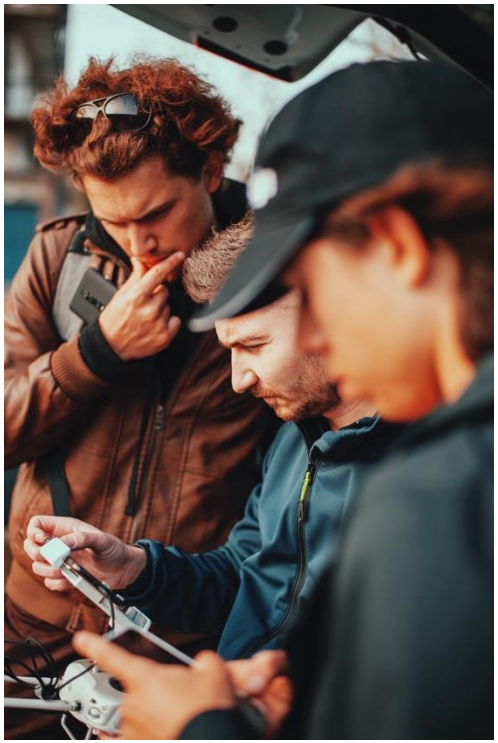
LAANC Authorization. I mistakenly believed since the drone was under 250g it was exempt from needing to file a LAANC authorization. I have since learned that drones under 250g are only exempt from the regulation around registration and that I still need to file a LAANC request ACN 2056389

SGI Waiver I ..received an airspace authorization .. with a maximum operating altitude of 500 ft. AGL. The area was subject to a TFR … and **I received a Special Governmental Interest (SGI) waiver. … I did not recognize that the maximum altitude was reduced to 400 ft. AGL** ACN 2054051

Database, Charts, and App Discrepancies

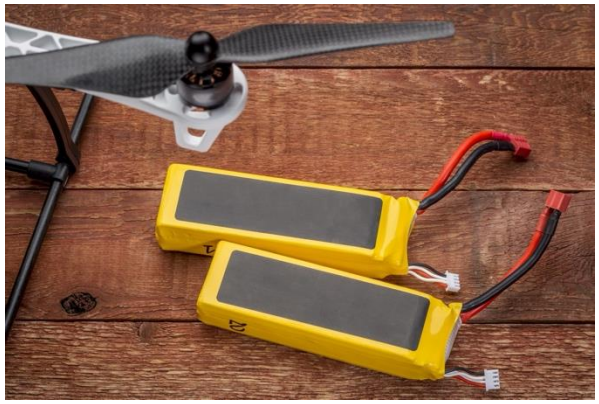
Chart Precision: The RPIC … checked sectional prior which made it appear as if the area was in Class G (since sectionals have less detail and are not as precise as the UAS Facility Map). ACN 2053721

App Discrepancy: I am a Part 107 Commercial Pilot working for Company X. **I checked AirMap** ..for a TFR the morning of.. **There was no TFR** indicated so I flew.. [I later learned of a] TFR being in effect; I was surprised .. **I then opened a second app, and there it was.** ACN 1980433



Drone Hardware Issues

Part 107 UAS pilot reported **a battery failure** which caused the UAS to crash. … It is my belief that the gusty wind conditions required the UAS to utilize increased rate of battery power draw, the battery expanded causing the UAS to lose power resulting in an uncontrolled descent/fall from the sky into the field. ACN 2045331



Human-System Interface Issues

Mismatched Expectations.. the DJI software allows the drones to fly in Class B airspace even when it starts at the surface. This oversight in the software will continue to contribute to drones flying in close proximity of airfields/airports when drone **pilots assume the software takes Class B airspace into account**. ACN 2043838

Feet or Meters?? ..I flew above 400 ft AGL in Class G Airspace. **Since my drone is set in meters, it didn't translate to me [that] I was flying above 400 ft AGL.** … I have written down the metric to feet conversion and memorized it for future endeavors….
ACN 2036454

UAS/Drone NMAC Threat in Agriculture Operations

- ASRS has received several reports from manned aircraft agriculture pilots and drone pilots describing Near Mid-Air Collisions while performing crop-spraying operations

UAS/Drone NMAC Threat in Agriculture Operations

- UAS/Drone NMAC Threat in Agriculture Operations – Reported Issues
  - See and Avoid Challenges
  - Interface between established and emerging sectors of aerial application industry
  - Visual Line of Sight (VLOS) operations

UAS/Drone NMAC Threat in Agriculture Operations

- See and Avoid Challenges
  - Drones' small size makes them harder to visually identify and therefore avoid
  - Drones that exceed maximum altitude limits can pose a threat to Ag aircraft maneuvering at higher altitudes
  - UAS are required under CFR 14 Part 107.37 to yield the right of way but may not always comply
  - Fixed-wing aircraft may maneuver over adjacent fields resulting in potential airborne conflict with drones operating in those fields
  - Consequences of collision can be severe

UAS/Drone NMAC Threat in Agriculture Operations

- Interface between established and emerging sectors of aerial application industry
  - Drone use in ag operations is relatively new and awareness among crewed (fixed/rotor-wing) ag operators is evolving
  - Individual drone operators, e.g., farmers, are learning / establishing best practices and may not be aware of risks and responsibilities of sharing airspace with crewed (fixed/rotor-wing) operators

UAS/Drone NMAC Threat in Agriculture Operations

- Visual Line of Sight (VLOS) operations
  - Part 137 / 107 UAS pilots must maintain visual contact with the drone during flight
  - Loss of visual contact can lead to failure to yield right-of-way, airborne conflicts, and aircraft/drone collision

UAS/Drone NMAC Threat in Agriculture Operations

Case Study #1

- Agriculture [fixed-wing] pilot reported a near midair collision with a UAS; both were crop-spraying adjacent fields
- Pilot took evasive action to avoid a collision while also trying to fly under the power lines; contacted ground *and .."managed to regain flight with a large amount of corn on the leading edge of the wing and booms."*
- Reporter noted there was no visible personnel or vehicle in the vicinity involved with the drone's operation (ACN 2149772)

UAS/Drone NMAC Threat in Agriculture Operations

Case Study #2

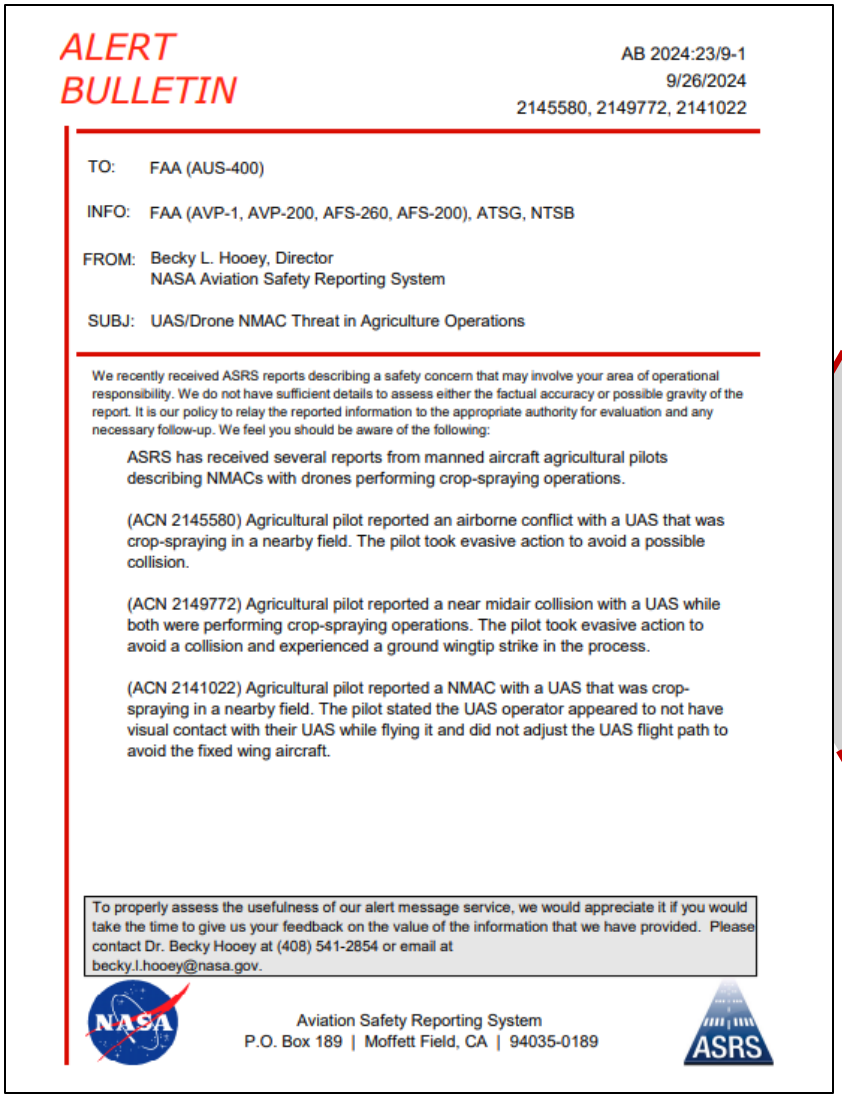
- UAS pilot was performing a mapping mission when they received a warning from the drone controller to descend immediately due to an aircraft at similar altitude
- UAS Pilot enabled manual control of the drone, descended, and initiated a return to take off point; Landed and cancelled mission

- During return, pilot saw a crop-dusting aircraft fly nearby about 50 ft. AGL, which was lower than the drone pilot's operation altitude
- Reporter added that "When they are transiting low (sub 500 ft.) you cannot hear them or see them until they are very close. … If the Crop Sprayer [had] not had a transponder…then I would not have been alerted by my system…with distinct possibility of him flying…into my UAS." (ACN 2055879)

UAS/Drone NMAC Threat in Agriculture Operations

- Education and outreach efforts to support this quickly-evolving sector of UAS operations
  - FAASTeam webinars on Part 137 UAS Operations
  - Professional trade organizations, such as NAAA (National Agricultural Aviation Association)
  - Universities, schools, and training organizations

UAS Alert Bulletin



ALERT BULLETIN

AB 2024:23/9-1
9/26/2024
2145580, 2149772, 2141022

TO: FAA (AUS-400)

INFO: FAA (AVP-1, AVP-200, AFS-260, AFS-200), ATSG, NTSB

FROM: Becky L. Hooey, Director
NASA Aviation Safety Reporting System

SUBJ: UAS/Drone NMAC Threat in Agriculture Operations

We recently received ASRS reports describing a safety concern that may involve your area of operational responsibility. We do not have sufficient details to assess either the factual accuracy or possible gravity of the report. It is our policy to relay the reported information to the appropriate authority for evaluation and any necessary follow-up. We feel you should be aware of the following:

ASRS has received several reports from manned aircraft agricultural pilots describing NMACs with drones performing crop-spraying operations.

(ACN 2145580) Agricultural pilot reported an airborne conflict with a UAS that was crop-spraying in a nearby field. The pilot took evasive action to avoid a possible collision.

(ACN 2149772) Agricultural pilot reported a near midair collision with a UAS while both were performing crop-spraying operations. The pilot took evasive action to avoid a collision and experienced a ground wingtip strike in the process.

(ACN 2141022) Agricultural pilot reported a NMAC with a UAS that was crop-spraying in a nearby field. The pilot stated the UAS operator appeared to not have visual contact with their UAS while flying it and did not adjust the UAS flight path to avoid the fixed wing aircraft.

To properly assess the usefulness of our alert message service, we would appreciate it if you would take the time to give us your feedback on the value of the information that we have provided. Please contact Dr. Becky Hooey at (408) 541-2854 or email at becky.l.hooey@nasa.gov.

Aviation Safety Reporting System
P.O. Box 189 | Moffett Field, CA | 94035-0189

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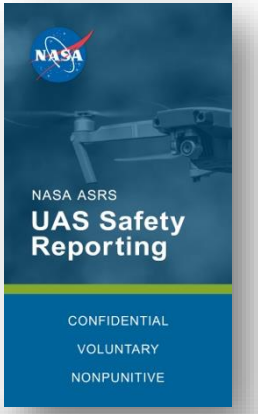
(ACN 2141022) Agricultural pilot reported a NMAC with a UAS that was cropspraying in a nearby field. The pilot stated the UAS operator appeared to not have visual contact with their UAS while flying it and did not adjust the UAS flight path to avoid the fixed wing aircraft.

UAS Outreach

Social Media Kit



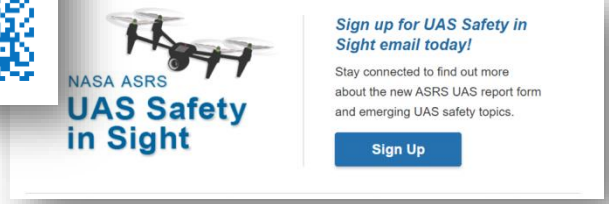
ASRS-at-a-Glance Fact Sheet

ASRS *CALLBACK* Newsletter
UAS Edition

UAS Safety in Sight subscriptions as of Oct 2024	**1,102**
CALLBACK UAS Edition views & downloads in 2023	**1,000**
UAS Landing Page hits in 2023*	**14,486**

* This is an approximately 45% increase over 2022

QR Code



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https://asrs.arc.nasa.gov/uassafety

UAS Safety In Sight Newsletter

1,100+
Total number of email subscribers as of 2024

11 Issues
Published to date


NASA Aviation Safety Reporting System (ASRS)

UAS Safety In Sight

October 2024

In the Field – Drones in Agriculture

One of the goals of UAS Safety Reporting is to share lessons learned with the UAS / drone community. When reporters describe their insights and reflect on their experiences, they contribute to UAS safety by offering valuable tips that others in the UAS community may be able to apply to their operations.

In this issue we offer two reports with similar events, one from a drone pilot perspective and one from an agriculture (ag) aircraft pilot perspective, both operating in adjacent fields and both experiencing near misses. The emerging use of drones in agricultural operations presents some unique safety concerns. A drone's small size can make it difficult for ag pilots to see them in flight, while an ag aircraft flying low to the ground might go unseen and unheard by a drone pilot until it is very close. These and other factors can increase the likelihood of conflict or collision when drones and ag aircraft are operating nearby each other.

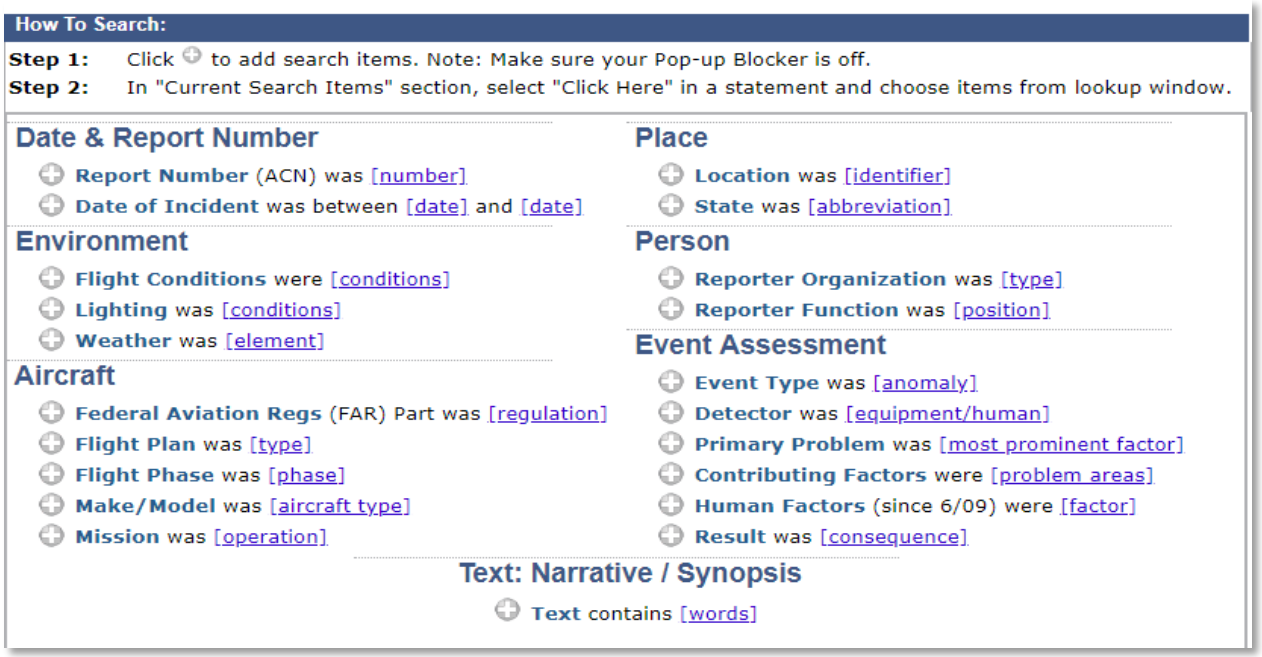
These reporters (one drone pilot and one ag pilot) explain the unique factors that led to their incidents and emphasize the value of increased vigilance and see and avoid efforts when working around low flying agriculture aircraft.

Scan to Sign Up

NASA ASRS
UAS Safety in Sight

Mining the ASRS Database

Direct access to search de-identified reports in the ASRS database is available through **ASRS Database Online (DBOL)**



https://asrs.arc.nasa.gov/search/database.html

Sample Searches:

FAR Part:
- Part 107, 44809/Rec, Public Ops

Reporter Function:
- Remote Pilot in Command
- Person Manipulating Controls
- Visual Observer

Mission:
- Agriculture
- Photography / Video
- Surveying/Mapping
- Recreational/Hobby
- Public Safety

Event:
- Unauthorized Flight Ops
- Fly Away
- Loss of VLOS

Visit our UAS Safety Website
https://asrs.arc.nasa.gov/uassafety

Visit the NASA ASRS UAS Safety Reporting page.

Find:

- FAQ's
- Reporting Resources
- Tips for Excellent Reporting
- Submit a UAS Report
- Contact Us
- Download the UAS Report Set
- Sign up for our UAS "***Safety in Sight***" email list

UAS Report Set Downloads in 2023	**2,843**
UAS PDF Report Form Downloads in 2023	**837**

More Information at ASRS Website