ADDRESSING THE UNKNOWN:

GUIDANCE ON EFFECTIVE UAP REPORTING TO IMPROVE AVIATION SAFETY

An Opinion Paper of the AIAA UAP Integration & Outreach Committee

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Background

The 2021 Preliminary Assessment on Unidentified Anomalous Phenomena (UAP)[1] initiated an increase in public interest in aerospace safety issues associated with UAP. The Department of Defense (DOD) defines UAP as "anomalous detections in one or more domain (i.e., airborne, seaborne, spaceborne, and/or transmedium) that are not yet attributable to known actors and that demonstrate behaviors that are not readily understood by sensors or observers."[2] UAP are a potential safety of flight hazard, national security concern, and source of public curiosity. In the 2021 report, the DOD reported that the UAP Task Force had "11 reports of documented instances in which pilots reported near misses with a UAP."[1]

To date, inadequate reporting mechanisms and inadequate detection technologies have limited our ability to gather reliable data about UAP. While it is now known that civilians who live in the Western U.S. and upper Northeast are more likely to make UAP reports,[3] we still have a limited understanding of UAP characteristics, the frequencies by which they are observed, and risks that they may pose to aerospace (air or space) operations. However, the recent change in public awareness about UAP, along with the DOD's acknowledgement that UAP are a legitimate concern, has resulted in military and civil aerospace personnel being more willing to report UAP sightings and events.

Formal institutional processes within military and civil aerospace sectors for gathering and analyzing UAP reports are in development. The U.S. Government has made efforts to promote military reporting under the leadership of the All-Domain Anomaly Resolution Office (AARO).[4] AARO's ability to disseminate their knowledge gained about UAP to the public will be challenging, however, due to security classification concerns. In civil aviation, clearer guidance is needed to integrate federal and commercial institutional efforts to respond to increasing interest in UAP reporting.

Purpose

The aim of this opinion paper is to provide practical recommendations and policy recommendations that promote centralized, effective UAP reporting. Our recommendations are based on applying basic aerospace safety principles to issues associated with UAP.

Put simply, our goal is to describe the processes by which an aircrew member 1) observes a UAP, 2) responds appropriately to maintain safety of flight, 3) reports the event for further analysis, and 4) is encouraged to report without fear of reprisal or ridicule.

Because the U.S. Government has taken steps to improve military UAP reporting, our opinion paper prioritizes opportunities for UAP reporting improvements in civil aviation. International UAP reporting is outside of the scope of this paper. Our intended audience is pilots and aircrew personnel, as well as individuals within U.S. organizations that participate in flight safety reporting and process improvements, such as Federal Aviation Administration (FAA), National Transportation Safety Board (NTSB), NASA, commercial airlines, and pilot unions, among others.

Approach

For decades, stigma has been a barrier to professional discourse about UAP. However, in our view, efforts to advance knowledge about UAP readily fit within existing frameworks for aerospace safety.

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This paper describes how the aerospace industry can use existing safety principles to promote UAP reporting and data collection by reviewing five key considerations for effective UAP reporting.

Key Considerations for Effective UAP Reporting

We have identified five areas that possess unique considerations to advance knowledge of UAP:

- Distinguishing Between Observations, Hazards, and Flight Safety Incidents Involving UAP
- Aviation Team Responses to In-Flight UAP Reports
- Observation, Hazard, and Incident Reporting after Flight Operations
- Safety Culture and Aircrew Member Occupational Well-Being
- Centralized National Safety Data Collection

Distinguishing Between Observations, Hazards, and Flight Safety Incidents Involving UAP

UAP detections can be visually observed by aircrew as well as detections by instruments of objects or lights with perceived unusual movements or unfamiliar morphology. If a UAP is determined to be a potential flight safety risk, the emphasis should be "report what you observe" as soon as practical, regardless of whether the observer can definitively identify the object or light.

In our view, there are three different categories of UAP reports:

- **Observations:** Distant detections that seem to pose no immediate risk and should be unlikely to cause changes to flight operations. For example, distant lights in the upper atmosphere moving in "racetrack" patterns at altitudes perceived to be above the flight envelope.[5]
- **Hazards and Potential Hazards**: Detections in airspace that have foreseeable risk or conceivable potential to cause changes to flight operations or flight safety issues to either the observers' aircraft or nearby aircraft. Hazards may require a change in flight operations.
- **Incidents**: Detections that pose a clear and immediate risk to the safety of flight. A few specific examples include
    - Electrical failures – A bright light passing overhead that caused double Attitude Reference System failure and double autopilot failure.[6]
    - Injuries – A doughnut-like object observed 8,000 above Lake Ontario that caused the pilot to quickly descend the aircraft under the object, causing two flight attendants to receive minor injuries while securing the cabin for arrival.[7]
    - Trailing or shadowing behavior – In the most recent annual UAP report from AARO, "three reports described pilots being trailed or shadowed by UAP."[8]
    - Near misses – the UAP Task Force preliminary report included 11 near misses with UAP.[1]

In our view, even simple UAP observations – such as distant lights maneuvering in the sky – can be a distraction on the flight deck and thus have safety implications. Additionally, minor data points can be useful for national security or scientific purposes. Therefore, we encourage reporting on all UAP ranging from observations to serious incidents with immediate potential to compromise flight safety.

Aviation Team Responses to In-Flight UAP Reports

Given that UAP, by definition, demonstrate behaviors that are not readily understood by the observer(s), we expect that in-flight reports of UAP sightings may be incomplete, lack certainty, or be perplexing or confusing to the observer. Nonetheless, as with any team-based safety response, an

optimal outcome depends upon team members' trust in the observers' initial reporting and respect for the individuals making the report.

As with any other in-flight incident, we suggest the following standard aviation safety principles: Aviate, Navigate, and Communicate. If a UAP is determined to be a flight hazard with imminent risk, the flight crew's first responsibility is to safely maneuver their aircraft away from the UAP. Once this is safely completed and the imminent risk is no longer a concern, Air Traffic Control (ATC) should be notified as soon as possible. Hazards and potential hazards should be discussed with ATC so that nearby aircraft can be warned as appropriate; evasive maneuvers can be considered with ATC authorization should time allow, depending on the extent of a perceived risk of collision.

During the team's response, clear and open communication (which may include requests for repetition or clarifying questions about the observation) needs to be an area of emphasis as the aviation industry begins to integrate UAP reporting into nominal activities. UAP-specific in-flight responses can be developed if trends in safety reports suggest the need for changes to standard flight safety procedures.

Describing and possibly identifying UAP will require time and effort on the flight deck and radio. We trust that pilots will use their best judgment in discussing the UAP – ranging from distant observations to time critical flight hazards – with ATC depending on in-the-moment airspace traffic, phase of flight, perceived characteristics of the UAP, and perceived risks posed to safety of flight.

To promote proper education and training about UAP, the U.S. Government and commercial aviation industry should consider adding UAP awareness and response training for both Certified Flight Instructors (CFIs) and students of all levels of licenses and ratings. Furthermore, we encourage training on methods of reporting sightings and incidents, along with knowledge of reporting systems.

Observation, Hazard, and Incident Reporting after Flight Operations

After observing UAP, *FAA Order JO 7110.65AA - Air Traffic Control*[9] states: "Persons wanting to report Unidentified Flying Object (UFO)/unexplained phenomena activity should contact a UFO/unexplained phenomena reporting data collection center, such as the National UFO Reporting Center, etc." This guidance fails to include any means for report data to be provided to the FAA for further investigation, follow-up, or analysis. Note that military personnel should report through their command or service in accordance with GENADMIN Joint Staff J3 Washington DC 191452ZMAY23 "Unidentified Anomalous Phenomena Reporting and Material Disposition."[10]

As with current standards, we recommend voluntary UAP reporting in most circumstances. Instead of reporting to UFO data collection centers, we concur with the NASA UAP Independent Study Team's recommendation to use the anonymous Aviation Safety Reporting System (ASRS).[11] We encourage all personnel involved in a UAP observation and/or response (aircrew, ATC, etc.) to submit individual reports to provide multiple perspectives of the same UAP sighting. To best advance understanding of UAP, we encourage that all UAP be voluntarily reported to ASRS after flight operations have concluded.

High-risk safety events that involve UAP should follow existing reporting mandates: Mandatory Occurrence Reports (MOR) for in-flight hazards,[12] incident reporting (e.g., flight control malfunctions, inability of flight crew to perform their flight duties as a result of injury or illness, or aircraft accidents) to the NTSB,[13] and Near Midair Collision (NMAC) reporting to the FAA.[13] In these circumstances, UAP

should be described to the best of team members' ability, exactly as perceived, and without omissions or changes regardless of how unusual the UAP may appear.

Safety Culture and Aircrew Member Occupational Well-Being

Historically, "UFO" reports have included descriptions of unconventional morphologies, structures, and movement characteristics.[14] We note that scientifically rigorous data analysis that can confirm or refute the veracity of these historical UFO reports has not been performed. Nonetheless, aviators within the military and intelligence community describe disparagement associated with observing, reporting, or discussing UAP.[1] In our view, similar stigma exists for discussing UAP in civil aviation. Therefore, it is important for the aerospace community to foster a safety culture in which aviation personnel can report their accounts of UAP in full, and without disparagement or reprisal.

In the professional aerospace community, anecdotes suggest that conversations about UAP may be avoided because of perceived negative responses from others, organizational policies that discourage reporting, lack of trust that reports will be analyzed and safety changes made in response, and punitive actions taken against colleagues involved with UAP events. An historical example of punitive action comes from Japan Air Lines Cargo Flight 1628 in 1986.[15] The observer described a UAP located one mile in front of his aircraft as "two small ships and a mother ship."[16] He was then transferred to an office job for an extended period after reporting the potential hazard and discussing it with media.[17]

The World Health Organization describes occupational health as promoting the "highest degree of physical, mental and social well-being of workers."[18] In our view, anticipated occupational health-related consequences of observing a UAP could include feelings of social isolation, psychological uncertainty or distress, self-doubt (e.g., doubts about whether what was observed was accurate), and career-related anxiety (i.e., fear of losing one's license or other punitive actions).

Presently, aircrew medical certification can be revoked for any history of hallucinations, neurosis, or mental condition that, in the medical judgment of the aviation medical examiner, makes a person unable to safely perform their in-flight duties.[19] In the absence of clear guidance from the aviation medical community about UAP reporting, aviation personnel may think that there is professional risk in reporting UAP, especially if the UAP report includes strange or unusual visual details, and/or if observers' reports substantially differ from each other.

We expect that improvements in reporting of UAP will be an iterative process that ideally will involve institutional efforts to normalize UAP sightings in everyday operations. Safety culture around UAP can be improved through more rigorous study of UAP reporting, encouraging preliminary UAP reporting among aircrew members, affirming that no punitive actions will be taken upon those who furnish UAP reports, and by developing effective procedures to collect and analyze UAP reports.

Centralized National Safety Data Collection

To maximize the insights from UAP reports, data from as many disparate individual reporting agencies as possible would best be collected and integrated into a single central repository. A centralized repository can be used to collate UAP reports, which would aid in separating truly anomalous UAP sightings from misidentifications. Integrating the data into a single repository would

be enhanced if reporting centers agreed on standardized report data fields. To that end, we would recommend, for example, that NASA's ASRS (or similar reporting systems) use the same data fields as defined by AARO[20] to make it easier to compare civil aviation UAP data with the U.S. DOD.

Another benefit of centralizing UAP reports is the ability to establish standardized methodologies and protocols for reporting and investigating these phenomena, and to publish periodic (e.g., annual) reports of UAP sightings and events. Without centralization and standardization, different agencies may have their own unique criteria and procedures, which would likely lead to inconsistencies and hinder analysis.

While we believe ASRS is a gold-standard example of how UAP reports could be used and made available for analysis, we have identified three technical challenges that could limit its immediate readiness to analyze UAP reports:

1) Codifying reports – At present, ASRS cannot categorize a safety report as a UAP report. To facilitate future analyses, reporting forms should be categorizable as a UAP report. Additionally, if an aircrew member reports a flight safety hazard and, with low confidence, identifies that it might be an unmanned aerial vehicle, further discussion and training is needed about whether this would be filed as a UAP report.
2) Anonymity concerns – ASRS reports omit date and time information,[21] which can weaken analysts' ability to identify UAP during analysis. We propose that date, time, and reporter's contact information be voluntarily included in UAP reports made to ASRS.
3) Resource constraints – We advocate for reporting all UAP observations, hazards, and incidents. Processing a potentially high number of new reports will require additional resource investment.

We note that commercial airlines have internal safety reporting mechanisms, such as the Aviation Safety Action Program (ASAP), which could also be adapted to accommodate UAP reports. Most airlines, if not all by now, have their ASAP reports automatically generate and submit an ASRS report.

Conclusion

UAP are a potential flight safety risk, national security concern, and source of public curiosity. Currently, data collection is challenged by inadequate detection technologies and inadequate reporting mechanisms. In some instances, even if seemingly infrequent, UAP are a clear aviation safety risk. This opinion paper uses existing aviation safety principles to present a framework organized around five key considerations to improve UAP reporting among aerospace personnel. NASA's ASRS is currently best suited to receive new UAP reports, and additional resource investment in ASRS is needed to facilitate analyses of these reports. More frequent and more rigorous UAP reporting is necessary to increase knowledge of UAP to enhance flight safety operations.

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