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Leadership and Next Generation Unmanned System Integration

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Abstract

The purpose of this study is to explore the challenges and successes aerospace industry leaders face regarding the safe integration of unmanned aerial vehicles (UAVs) that weigh over 55 lbs. (Tier II) into the national airspace system (NAS). How will Industry leaders respond to a rogue UAV flying in the National Airspace due to a hardware or software failure. A qualitative intrinsic case study was used for this study. Using snowball sampling, 15 participants responded to 12 open-ended survey questions. The findings presented challenges the aerospace industry must overcome for larger UAVs to fly in the national airspace. Perception from industry leaders is there are more challenges than progress being made towards integration. The COA process should be redesigned for an easier to transition flying from one area to another and not region-specific. The major themes identified were: 1) issues with integration efforts between the FAA and the aerospace industry, 2) Safety in the national airspace for all aircraft, and 3) Progress and Challenges. The study recommends that the aerospace industry consider implementing industry 4.0 technology, examine the UAV flight management system, and the COA process.

Keywords: leadership, management, integration, next gen, national airspace system, unmanned aircraft vehicle.

I. INTRODUCTION

The military has used unmanned technology since the civil war. While unmanned technology was met with skepticism, the military realized one of the benefits of UAVs technology is that it could perform the less-desirable jobs to help minimize the loss of life (Mirza et al., 2016). With an increase in air travel in 1955, the Federal Aviation Administration (FAA) was created to manage and provide safety in the national airspace; it was not until 1995, the department of transportation (DOT) made the FAA responsible for all commercial space operations (Federal Aviation Administration, 2017).

With advances in technology and an increase in air traffic, in 2017, the FAA created a 20-year national airspace system (NAS) plans to modernize the existing airspace and implement the next generation air transportation system (NextGen, 2012). NextGen is designed to improve and modernize airports with funding and technology insertion throughout the entire FAA system (Borener et al., 2016, Federal Aviation Administration 2017). The FAA modernization act, passed by Congress, stipulated that unmanned aerial vehicles would be integrated into the NAS (Federal Aviation Administration, 2018).

Currently, there are approximately 14,000 air traffic controllers nationwide responsible for the safety of aircraft and their passengers (Federal Aviation Administration, 2021a). If communication is lost with a UAV, it creates a safety hazard

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increasing the air traffic controller workload and mental stress leading to fatigue, sleep deprivation, and loss of concentration (Schwarz et al., 2016; Zhou & Kwan, 2018).

1.1. Problem of the Study

An incident occurred in 2017 when communication was lost with a military UAV during a routine training mission. Immediately after the UAV launched, it left restricted airspace and flew undetected in the NAS for over 630 miles without being noticed on air traffic control radar (Roeder, 2017; The Associated Press, 2017; Thomson, 2017; and Department of the Army, 2019). Currently, there are rules that small drone operators must abide by, and FAA leadership has not developed rules for UAVs that weigh more than 55 lbs. to fly in the airspace above 500 feet AGL (Federal Aviation Administration, 2018). Military UAVs are not restricted by size or weight but follow guidelines set forth by the Department of defense (DoD) (U.S. Department of Defense, n.d.).

The problem is how will aerospace industry leaders respond when communication is lost with a UAV due to hardware or software failure, creating a scenario of a rogue UAV flying in the NAS. The study's problem is presented through the following questions:

1) What are the aerospace industry leaders' perceptions of the challenges and successes encountered during the process of the safe integration of UAVs into the NAS?
2) What progress or challenges exist with NextGen integration of UAVs into the NAS?

II. LITERATURE REVIEW

NextGen is about upgrading airports and, more importantly, how the FAA can get more airplanes safely in the existing airspace both horizontally and vertically (Corver et al., 2016; Federal Aviation Administration, 2018; Sandor, 2019; and Vu et al., 2020). Facing scrutiny from both the civilian and public sectors, the FAA updates its UAS integration process every five years.

With military assets returning, the DOD does not want their assets sitting idle and want access to the NAS to fly their UAVs. The DOD, local, and state government entities must file a Certificate of Authorization (COA) with the FAA (Marshall, 2016; Kailey, 2018; and Federal Aviation Administration, 2019b). However, before the FAA can insert new technology into the NAS, it must undergo rigorous testing, so the UAS test sites were established (Committee on Rules (2012).

2.1. UAS Test Sites

To address the situation, the FAA leadership decided to create six UAS test sites based on their geographical location, climate, infrastructure, and research objectives to aid in the integration process, as shown in Table 1 (Federal Aviation Administration, 2013, 2019a; and Marshall, 2016).

Table 1
UAS Test Sites

Test Sites	Research/data collection
University of Alaska	Safety standards for UAVs
State of Nevada	Air traffic control procedures
New York Griffiss International Airport	Test and evaluation procedures and sense and avoid technology
North Dakota Department of Commerce	Human factors
Texas A&M University	Safety for airworthiness testing
Virginia Polytechnic Institute	UAS failure mode testing

The test sites were designed for small businesses to test their unmanned technology that weighs over 55 lbs. This class of UAVs are prohibited from flying in the NAS due to weight restrictions (Dillingham, 2015). However, the system backfired for several reasons. First, for a business to fly their UAV at a test site, FAA required the test ranges to collect information on the company, their UAV, equipment, and their test data; businesses objected, citing an infringement of their IP. Secondly, since the FAA provided no funding to establish the test sites, the test sites were not legally obligated to collect any information for the FAA (Dillingham, 2015).

2.2. Leadership Challenges

In 2018, the FAA estimated the number of commercial aircraft flying in and out of airports with an FAA control tower at 51.8 million; this number is expected to increase to 62.0 million by 2039. Since the FAA is in charge of all operations in the NAS, studies show there is a direct correlation with the rise in air traffic controller workload leading to fatigue, stress, and lack of concentration, putting the safety of the public at risk both in the air and on the ground (Edwards et al., 2017; Bommer & Fendley, 2018; Bongo et al., 2018; and Zhang et al., 2021). When asked, air traffic controllers expressed their lack of knowledge regarding the operational capability of the UAVs, relating to their size, weight, and power, and a lack of training on how to respond to lost link situations (Hampton, 2014).

While unmanned technology is not new, innovation does play an important factor across the industry (Hsieh et al., 2020; Mookerjee & Rao, 2021). UAV technology is disruptive because it is out of the norm and brings an amount of uncertainty (Du & Heldeweg, 2019; Mookerjee & Rao, 2021). Disruptive technology challenges both sides, one side pushing for regulatory changes while the other takes a restrictive stance (Du & Heldeweg, 2019). The U. S. Government Accountability Office (2020) noted that the FAA must overcome a challenge to see and avoid technology. A commercial airliner or a general aviation aircraft can look out the window to identify any potential hazards, which is not possible with a UAV (Vu et al., 2020). The FAA believes incorporating Automatic Dependent Surveillance-Broadcast (ADS-B) technology will help relieve the additional stress placed on air traffic controllers due to the increase in air traffic (Jiang et al., 2016). ADS-B is designed for aircraft to transmit their location to air traffic controllers and other aircraft in the vicinity via satellites; however, because this technology is wireless, it is vulnerable to third party hacking (Alvarez de Toledo et al., 2017; Manesh & Kaabouch, 2017; Kailey, 2018).

2.3. Conceptual Framework

Tidd and Bessant (2020) discussed the concept of organizational evolution as either external forces that pull the organization or internal forces that push the entity. Through this process, innovation, organizational change, and organizational learning emerge within the organization (Breslin, 2016). Smaller firms can more readily adapt to innovation to satisfy customers' needs; the customer will move from traditional sustaining technology to disruptive technology (Reinhardt & Gurtner, 2018; Han, 2019; Mookerjee & Rao, 2021). The DOD uses both sustaining and disruptive technology to help the government maintain an advantage (Christensen, 1997).

With the fast pace of technology, Industry 4.0 is a paradigm shift across industries involving the rapid exchange of information in real-time with suppliers and customers using cloud-based technology (Kasapoglu, 2018). Leadership should embrace Industry 4.0 to better understand and anticipate the client's needs. In the case of UAS integration into the NAS, leadership needs to implement a pull strategy to send data upstream and maximize efficiency so leadership can make timely decisions (Kasapoglu, 2018; Oberer & Erkollar, 2018; Xu et al., 2018).

III. RESEARCH METHODOLOGY

For this intrinsic case study, the researcher used snowball sampling to explore the challenges and successes aerospace industry leadership encountered with the safe integration of UAVs into the NAS. The event that inspired this single case study is the perfect storm of everything that could go wrong from a leadership perspective on a routine UAV flight. The literature review was based on primary data collected from the study population using 12 written open-ended survey questions designed for the study. In the study, the participants were geographically dispersed throughout the United States.

3.1. Sampling

A snowball sample was used to identify individuals recommended by others who met the qualifications needed to participate in the study and allowed the researcher to reach the desired population of 15 participants (Merriam & Tisdell, 2016; Ravitch & Carl, 2016; Loseke, 2017). The population for this study consisted of leaders in the aerospace industry, commercial rated pilots, general aviation pilots, military pilots, UAV operators, maintenance personnel, and UAV pilots familiar with NextGen and integration of UAVs into the NAS. An email was sent through a secure site through the university to a group of individuals with recruitment material outlining the requirements needed to participate in the study. Participants were provided a password to a secure website, Survey Monkey. When the participants logged into the website, they were informed their participation was voluntary, and the website would not collect any personal identifiable information (PII) or their internet protocol (IP). The minimum age to participate in the study was 18, and it required the participant's consent on the Informed Consent Form before they could participate in the study.

3.2. Data Collection

Data collection for this case study consisted of open-ended survey questions from leaders in the aerospace industry, commercial pilots, general aviation pilots, UAV pilots, UAV operators, and maintenance personnel. If the participant provided consent, they responded to Demographic Information: (a) participant age, (b) current job, (c) how many years they have been working at their job, and (d) how many years they have been working in their industry. It was anticipated that the promise of safeguarding their personal information and anonymity would inspire participants to answer the survey honestly. The files were encrypted, password-protected, and stored in a locked box for three years.

Researchers face challenges when collecting data from multiple participants, each with their own viewpoints when conducting a qualitative study. To ensure credibility, researchers should: (a) recognize any personal biases and remove them from the study, (b) create a clear audit trail, (c) thick descriptions are documented, (d) verify transcribed data, and (e) clarity in the data analysis (Korstjens & Moser, 2018). For this research study, credibility is through the experience of the participants. While the research participants work in various areas within the aerospace industry, all depend on information or data received through multiple communication channels to be credible and trustworthy. Feedback from the participants and public archival data used in data analysis for triangulation provided credibility to the study (Merriam & Tisdell, 2016).

3.3. Data Analysis

Using a copy of the data from the questionnaire responses, the researcher reviewed the raw data, hi-lighted phrases, and words used by the participants. The researcher uploaded the raw data and archival documents to NVivo 13® for the initial coding of the data. The researcher reviewed the data to identify keywords from the questionnaires against the FAA documents and the Government Accountability Office (GAO) to triangulate the data. Additional data used included the FAA Roadmap (2018) from the FAA website; the Department of Transportation's Unmanned Aircraft System (UAS) Comprehensive Plan created by the FAA Joint Planning and Development Office; Guidance for the Domestic Use of Unmanned Aircraft Systems issued by the Deputy Secretary of Defense (Shah, 2013), the GAO Unmanned Aerial Systems: Status of Test Sites and International Developments (Dillingham, 2015), the FAA unmanned aerospace vehicle operations working group (1996), and the office of inspector general report: FAA faces significant barriers to safely integrate unmanned aircraft systems into the national airspace system (Hampton, 2014).

Because of the large amount of data collected, the researcher used NVivo 13® to handle the data and create a researchable database and organization (Jackson & Bazeley, 2019). The researcher used a thematic approach to identify keywords from the questionnaires against the various archival documents. The researcher identified the primary codes; the secondary archival data were uploaded into NVivo 13®, where codes were manually created from the raw data and a word frequency query from the documents. The researcher looked for any commonalities in the codes from the coding that could be combined or used as a sub-set of another code. Using NVivo 13®, the researcher ran queries on each data set for content analysis which showed the number of times a word was found in the document with its weighted average. The data from the word frequency and the coding reports allowed the researcher to identify themes and sub-themes in the results section.

IV. RESULTS AND DISCUSSIONS

Using snowball sampling generated a pool of individuals who shared an interest in the research study (Frey, 2018a). Analyzing the themes and sub-themes allowed the researcher to compare and contrast the primary data with the secondary data to understand the differences between governmental leadership, aerospace industry leaders, pilots, operators, and maintenance personnel experienced in the unmanned community. The secondary data from the differing agencies had their own opinions relating to each theme. The two research questions identified three major themes and eight sub-themes that emerged from the data collected from the open-ended questions, as shown in Table 2.

Table 2
Themes and Sub-themes

Themes	Sub-themes
Issues with integration efforts between the FAA and the aerospace industry	Lack of communication See and avoid technology Lost link procedures
Safety in the national airspace system for manned and unmanned Aircraft	Air traffic controllers Lack of training and education
Progress and challenges in the aerospace industry	Leadership challenges Technological challenges Regulatory framework

4.1. Theme 1 - Integration

Data analysis showed integration efforts between the FAA and the aerospace industry as a major concern. According to the FAA roadmap, the path to UAS integration is a step-by-step process that addresses each area starting with the operations of the least complexity. The OIG report noted that the FAA is years behind schedule to meet its original milestones. The report identified a memorandum of agreement (MOA) between the FAA and the department of defense (DOD) to work together to solve the integration issue; however, the FAA's office of Accident Investigation and Prevention accused the DOD of purposefully withholding information that could help with the integration process. The JPDO cites the FAA's integration roadmap as a five-year plan but is typically limited to this horizon. The GAO noted the FAA should provide a better plan outlining when integration will occur and the resources needed.

Participant (PS04) noted that some large businesses have government sponsored COAs allowing them to fly in the NAS and do not want other UAVs in the NAS, which will take years to resolve. PS06 and PS10 noted UAV industry leadership efforts are disjointed, and more political pressure should be applied to the FAA to meet the needs of the industry. A sub-theme was the lack of communication between the aerospace industry and the various government agencies. The OIG noted a lack of open communication between various agencies. The FAA roadmap stated there should be better coordination, rulemaking, and agreements between all agencies. Participants 02 and PS14 said all agencies need to keep an open mind and work on a long-range plan for the greater good to resolve issues that are hindering UAV integration into the NAS.

Lost link/communication was another sub-theme regarding command and control of a UAV. The FAA Roadmap addresses contingency and emergency scenarios of how a UAS responds when communication is lost with the UAV. The OIG noted a lost link increased air traffic controller workload, affecting the manageability of traffic in the airspace and posing a significant safety risk. Participants PS01, PS03, and PS10 noted that it should be considered a threat if a UAV is not communicating. Participant PS02 commented it's the worst nightmare a pilot can have, and PS07 stated the UAV should be equipped with technology that recognizes an issue with the UAV. PS13 said the owner should have emergency procedures at the local, regional and national levels based on worst-case scenarios. The rest of the participants agree there should be pre-planned routes for the UAV to fly and enhance navigation systems.

Another sub-theme is see and avoid technology or detect and avoid (DAA). As of January 1, 2020, the FAA required all aircraft to have ADS-B out on all manned and unmanned aircraft. The OIG report states Detect and Avoid a technical challenge to integration. All participants agreed UAVs should be equipped with ADS-B technology, while PS04 stated that ADS-B could help, but it is not a silver bullet.

4.2. Theme 2 - Safety in the NAS

All governmental agencies agree that safety is a priority. FAA noted that a drone colliding with a manned aircraft would cause more structural damage than a flock of birds of the same weight and speed on impact. Participant PS02 stated the FAA is risk-averse, were caught unprepared, and has spent years flailing around trying to figure out how to execute. PS10 and PS12 noted UAVs flying in the same airspace is risky, and it is only a matter of time until there is a mid-air collision between a UAV and a manned airplane carrying passengers. PS03 and PS08 stated that UAV technology is advancing at a faster rate than regulations; controlling a UAV from the ground is somewhat effective but latency issues create safety hazards. PS15 said in an emergency, the ground station operator should implement emergency procedures. All other participants believe UAVs should fly to the same standards as manned aircraft.

A sub-theme to safety is air traffic controllers. The OIG report noted that airports and air traffic controllers are not equipped to handle UAVs flying in the NAS, while the FAA continues to develop air traffic procedures. Participant PS04 stated pilots should not have to monitor for UAVs as they are already busy in the cockpit, and PS14 believes current control tower equipment is not up to the challenge of providing safety.

Another sub-theme is Training and Education. All participants and government agencies agree there is a lack of education. Leadership needs to create one overall plan, policy, procedures, and training for all companies and agencies to follow.

4.3. Theme 3 - Progress and Challenges in the Aerospace Industry

Participant PS08 stated that the GAO identified several FAA management failures that need to be addressed. The GAO report addressed the challenges with the test sites and the integration process since the FAA cannot direct the research process. PS09, PS12, and PS14 noted Industry leaders should take a more proactive role with DOT/FAA to resolve issues keeping Tier II class UAVs from operating in the NAS. The GAO and OIG identified ongoing challenges with the UAS test sites and FAA's ill-defined regulatory and certification standards to integrate UAVs into the NAS.

A sub-theme is aerospace industry Leadership Challenges. All participants agree that FAA leadership needs to take a more proactive role in addressing issues regarding the integration process. The FAA Roadmap acknowledges additional testing, research and development are ongoing, the need to upgrade technology at major airports, air traffic control towers and training of air traffic controllers on how to respond to emergencies involving UAVs. The GAO report noted FAA management failures since program inception. PS14 stated the FAA was years behind establishing the UAV test sites and poorly managed the data collected at the sites.

The OIG report noted that technological challenges are a major issue for the FAA to overcome. Lost communication with a UAV creates significant safety challenges for everyone. The participant PS14 stated after the Gulf War, UAV technology is no longer a tool for the warfighter but a true disruptive technology for the industry. Participants noted with the quick advancement in technology and lower costs could have an impact; however, with faster computing power, current regulations are lagging behind.

Regulatory Framework is the last sub-theme, with PS04 stating there are already too many rules to follow in the NAS, while PS08, PS12, PS13, and PS14 believe the airspace should be redesigned from scratch, and the COA process needs to be completely overhauled. The OIG report identified regulatory challenges that must be addressed and noted that the FAA is taking a risk-based approach to UAS integration. Even the Federal Aviation Administration (2018) recognizes regulatory challenges leadership must address relating to a scenario of a rogue UAV flying in the NAS.

4.4. Discussion

This qualitative intrinsic case study was to explore the challenges and successes aerospace industry leaders encounter regarding the safe integration of UAVs into the NAS. The purpose of this research study is to add knowledge to the existing literature regarding UAVs that weigh more than 55 lbs. and how leaders in the aerospace industry, UAV pilots, UAV operators, military, commercial, and general aviation pilots would respond in an emergency when communication is lost with a UAV flying in the NAS. While these incidents are rare, Industry leaders should take precautions to prevent a recurrence leading to a possible mid-air collision.

4.5. Integration

As part of the integration efforts, the FAA created six UAS test sites geographically dispersed to gather data from industry users (U. S. Government Accountability Office, 2015). The GAO report also noted that the FAA UAS test sites were years behind schedule to open and collect data. Several participants pointed out that the integration of UAVs into the NAS is a slow process, and the FAA is risk-averse with objectives focused on the near term. With a new roadmap published every five years, the FAA is currently five years behind schedule in integrating UAVs into the NAS.

A sub-theme to integration is the lack of communication between FAA leadership and the UAS test sites. It has left aerospace industry leaders apprehensive about using the test sites due to exposure to their IP. A second sub-theme to integration is see and avoid technology. Many of the participants are pilots and do not believe UAVs should be allowed in the NAS because UAVs cannot look out a window to avoid other aircraft; this is a major obstacle for aerospace industry leadership and the FAA.

The integration, UAV communication, and see and avoid technology all answer the research question, "what are the aerospace industry leaders' perceptions of the challenges and successes encountered during the process of safe integration of UAVs in the NAS?" Aerospace industry leaders acknowledge that the FAA has made slow progress.

4.6. Safety

The participants noted safety as a primary concern for commercial and aviation pilots and individuals on the ground. While efforts regarding see and avoid technology will help, it will not solve the safety issue with unmanned aircraft in the same airspace. In 2018, the FAA acknowledged that if a drone were to hit an airplane, it would cause significant damage to the airplane.

A sub-theme to safety regarded air traffic controller education and training on UAV technology. Participants acknowledge the role of air traffic controllers is vital to safety in the national airspace; they believe air traffic controllers should be more involved in the decision-making process relating to equipment and software in the control tower since they are responsible for relaying accurate information to pilots in the NAS. If air traffic controllers are overworked, it can lead to fatigue, stress, and public safety issues (Corver et al., 2016). The participants also noted that the FAA's lack of communication and guidance with its affiliated agencies hindered the integration process.

Air traffic controllers cannot manage expectations during critical situations without proper training and education. All private, commercial and military personnel, ground crews, pilots, and air traffic controllers, should be trained to the same standards to alleviate any potential mishaps that could potentially occur - human factors in an integral part of the training and education program. According to the participants, FAA leadership should provide proper equipment, implement guidelines, and up-to-date policy and procedures for all air traffic controllers, both civilian and military.

The central theme of safety and the sub-themes of education, training, and human factors answer research question 2 "what progress or challenges exist with NextGen integration of UAVs into the NAS?"

4.7. Leadership Progress and Challenges

The research participants believe there have been more challenges than progress with the integration of UAVs into the NAS. According to the participants, there is a lack of coordination between various entities and the UAS test sites overseeing the integration process. The FAA only seems willing to provide the smaller drones access to the airspace while overlooking the broader issue of larger UAVs access. The participants also commented on the lack of communication between the FAA, UAS Test Sites, and public awareness. These comments refer to the first research question, "what are the aerospace industry leaders' perceptions of the challenges and successes encountered during the safe integration of UAVs into the NAS?"

For the second research question regarding progress and challenges, D'Amato et al. (2020) noted that FAA leadership should consider creating a separate lane designated for UAVs in the NAS. While NASA has successfully flown their large UAV in the NAS without a chase plane as required by the FAA, there remain numerous challenges to overcome. FAA leadership acknowledges a major challenge to overcome is how air traffic controllers or UAV pilots respond if they cannot communicate with a UAV or how the UAV will respond (FAA, 2018). As a preventative measure, FAA and Industry leaders should train and educate UAV operators and air traffic controllers to plan for the worst-case scenario.

The findings from this research study are important to the aerospace industry and UAV community. This study identified challenges such as the lack of communication and transparency between the governmental agencies. A rogue UAV flying unattended in the NAS outlines all the things that could possibly go wrong. What if the UAV was used for malicious intent? This scenario puts air traffic controllers in a new role to identify if UAVs are friend or foe.

The study will benefit leadership, management, administrators, insurance companies, and the airline industry. The insurance industry for commercial and general aviation could lead to a rise in insurance costs, and health care providers could identify patterns relating to an increase in stress levels associated with the integration of unmanned systems.

V. CONCLUSION

For a business to succeed, they need to be prepared for any potential threat and maintain a competitive edge (Al Rahahleh, 2010). UAVs are a disruptive technology and no longer a tool for the warfighter (Hsieh et al., 2020; Mookerjee & Rao, 2021). Advances in technology, machine-to-machine communication, and robotics have led to the rapid exchange of information in real-time using cloud-based technology known as Industry 4.0 (Kasapoglu, 2018). This technology can transfer to various industry sectors for leadership to employ within their organization using data analytics. Instead of mass production of a product, Industry 4.0 is geared toward customer satisfaction. Transforming an entity to embrace Industry 4.0 technology involves leadership to employ critical thinking skills to deploy the program throughout the organization. In 1955 when the FAA became responsible for all commercial airspace operations, it was not designed for UAV technology, and unmanned technology is not designed for the existing NAS airspace structure (NextGen, 2012). According to Du and Heldeweg (2019), when it comes to technology, leadership needs to understand the risks involved when creating new regulations or modifying existing ones.

5.1. Limitations and Future Research

For this intrinsic case study, the researcher encountered two limitations. The first was the small number of diverse participants who participated in the study. The researcher anticipated air traffic controllers, aircraft manufacturers, operational test and evaluation personnel, ground station operators, and technical writers to join in the study. The second limitation realized was that some participants lacked knowledge of the difference between drones and Tier II and above UAV technology.

Leadership should examine why the flight management system did not operate as intended by following the preprogrammed settings causing the UAV to fly off course unattended in the NAS for 630 miles. In this situation, the UAV should have returned to base, loitered, or crash-landed, but instead, it created a new course heading. Also, Industry Leaders should implement a separate highway system or corridor for Tier II UAVs and above to fly in the NAS; this could alleviate any potential hazards encountered around airports and in the airspace (Sandor, 2019). The FAA should consider redesigning the COA application process. The redesign should consider expanding the region or territory of flight; currently, it is region-specific, unlike an automobile driven from county to county or state to state without filing a new plan with the local government. For UAV pilots and operators, this should be a seamless transition.

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