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Search and Rescue: The Importance of Using Tracking Systems in Rural 135 Operations

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The Importance of Using Tracking Systems in Rural 135 Operations

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Abstract

In January 2020, under the NextGen initiative put in place by the Federal Aviation Administration (FAA), all aircraft flying in controlled airspace, both general aviation and commercial operations, will be required to have an Automatic Dependent Surveillance – Broadcast (ADS–B) system installed and operational. However, this is not required for Title 14 Code of Federal Regulations (CFR) Part 135 operations taking place outside of controlled airspace. Part 135 of the Federal Aviation Regulations (FAR) refers to aircraft operating as on-demand or air taxi services. A substantial amount of these operator's bases, as well as flights, are conducted outside of controlled airspace.

It is the intention of this research to lay a foundation for policy change regarding the legalities of the instillation and required use of tracking devices for 135 operations taking place outside of controlled airspace. Through a mixed methods approach, data will be gathered to suggest regulatory change will aid in improved safety, less lives lost, financial benefits of expedited search and rescue operations, and psychological aspects of both families, and rescue workers.

Introduction

On August 21, 2010, a pilot departed a remote area on the coast of the Alaska Peninsula, in reduced visibility and heavy rain. The float-equipped de Havilland Beaver had three passengers aboard and was operating as an on-demand air taxi flight. The aircraft failed to reach its destination and was subsequently reported overdue. Extensive search-and-rescue efforts along the coast and inland ensued (National Transportation Safety, 2013).

After 21 days the large search effort was called off. Nearly two weeks after the search was terminated, small portions of the fragmented airplane were discovered washed ashore 28 miles northeast of the departure lagoon. The 121Mhz Emergency Locator Transmitter (ELT) onboard never transmitted a traceable signal. The deceased and the remainder of wreckage, including the engine, wings, and floats were never located despite extensive sonar searches near the wreckage site (National Transportation Safety, 2013). This accident was a culmination of unfortunate decision making, deteriorating weather conditions and eventual collision with the water. If this aircraft would have been equipped with current monitoring and tracking technology, could this accident have been prevented? At the least, could the wreckage have been found earlier, preventing undue emotional anguish and thousands of dollars on search and recovery operations?

In 1943 the Coast Guard began using their Aviation branch for search and rescue operations (SAR). One of the first known airborne SAR’s took place on November 29, 1945, with a Sikorsky R-5 Helicopter, to rescue a group of men on a sinking oil barge. Today, many search and rescue operators are assisting people in need throughout the country and the world (The Early Years, 2017). The United States Airforce Rescue Coordination Center (AFRCC), the

Civil Air Patrol (CAP), the National Park Service Inland Search and Rescue, and the Rescue Coordination Center in the United States Defense Department (RCC) are just a few. SAR is a high stress environment, both physically and mentally. The SAR teams are burdened with the task of locating the aircraft, giving valuable medical attention to survivors, and retrieving the deceased.

According to the National Transportation Safety Board (NTSB) database, aircraft operating under Title 14 Code of Federal Regulations (FAR) Part 135 have experienced 6,079 reportable aircraft accidents and incidents since 1989. Of those, 64 have resulted in search and rescue operations, where all but 17 were located in Alaska. Only two of them were not located in remote areas, the other 62 required extensive SAR operations, nearly all in mountainous or rugged terrain. There were 115 fatalities involved in the 64 SAR operations, 105 of them occurred in Alaska (Aviation Accident Database, 2002). Statistically, which will be discussed in the method section, aircraft accidents occurring in remote locations, decrease the likelihood of survival exponentially. So why not require the same tracking systems that are being required in controlled airspace to increase the likelihood of finding these aircraft more quickly?

Automatic Dependent Surveillance – Broadcast (ADS–B), is one tracking system that utilizes surveillance technology in which an aircraft determines its position via satellite navigation and periodically broadcasts it, enabling it to be tracked. The information can be received by air traffic control, company ops, as well as SAR teams. Depending on the equipment in the aircraft, this technology can also offer aids to increase situational awareness such as, Traffic Collision Avoidance System (TCAS), a Ground Proximity Warning System (GPWS), even Terrain Awareness and Warning System (TAWS) (Croft, 2018).

The capstone project in Alaska, created in 1999, installed ADS-B technology in several aircraft. Under the program, the regions that implemented this technology saw a substantial decrease in accidents. The project was a joint industry and FAA research and development effort to improve aviation safety and efficiency in Alaska. Under Capstone, the FAA provided avionics equipment for aircraft and the supporting ground infrastructure. The Capstone Project operated from 1999 to 2006, and its success in Alaska laid the groundwork for the nationwide deployment of the current ADS-B system. It was in 2006 when the FAA announced that it would integrate Capstone into the FAA's Surveillance and Broadcast Services (SBS) program office tasked with implementing ADS-B across the national airspace system (Bergman, Brian, Daniels, 2003).

As part of the Federal Aviation Administration's (FAA) NextGen initiative, on January 1, 2020, Automatic Dependence Surveillance – Broadcast Out (ADS-B out) system will be required to fly in controlled airspace, or into any airport that requires a transponder. According to the FAA it will lead to better situational awareness, more efficient search and rescue, and surveillance at low altitudes not covered by radar. The FAA estimates full deployment of ADS-B will reduce aviation fatalities by 80% and save $3.5 billion a year in fuel costs (What is NextGen, 2018).

This research will address why the FAA NextGen initiative should require operators outside of controlled airspace to use Satellite based equipment including ADS-B. This will be an in-depth look into the search and rescue process, including the psychological effects, and financial obligations on both the SAR teams and the families of the missing. Accident survival rates, accident rates in rural 135 operations, methods for tracking aircraft, existing technology, and future technology will also be discussed.

Literature Review

Aviation search and rescue can be a long process with many repercussions for everyone involved, especially when the operations take place in remote wilderness areas. Timely identification of the aircrafts' location is of the utmost importance. It can be the difference between life and death for the crew and passengers, prevent undue emotional anguish for the families and friends of the victims, and save thousands of dollars on search and recovery efforts. It can also reduce the stress of rescue personnel, as they can experience severe stress due to the brief window of opportunity for saving lives. Correlations between psychosocial factors and psychological trauma including dissociation and post-traumatic stress disorder (PTSD) symptoms, have shown to negatively affect rescue personnel over time (Ben-Ezra, Col, Soffer & Wolf, 2011).

This proposal asks why not include, Title 14 of the Code of Federal Regulations (CFR) Part 135 operators in rural and wilderness areas not in controlled airspace, in the government mandate to obtain current tracking abilities. The Federal Aviation Administration (FAA), clearly states, 'With ADS-B operational across the country, pilots in equipped aircraft have access to air traffic services that provide a new level of safety, better situational awareness, and more efficient search and rescue' (What is NextGen, 2018). So why then would the most vulnerable operators not be included?

In 2003, the FAA initiated the Aviation Rulemaking Committee (ARC). This committee was to present to the FAA and a United States Congress subcommittee. The ARC was tasked with making suggested updates to part 135 FAR's, as they had not been updated since 1978 when they were created. The regulations lacked in the areas of flight crew requirements, maintenance, and technology requirements. According to the ARC, the FAA's oversight was based on compliance with 'outdated' regulations. They were to provide suggestions to increase safety and applicability standards that reflect the current industry trends and emerging technologies and operations (Subcommittee on Aviation, 2010).

In the proceeding transcripts, it was stated, '135 operators, particularly in Alaska, typically fly in inherently risky environments, have shorter flights with more takeoffs and landings, and fly to and from small airports that are not controlled'. They also operate at altitudes 'vulnerable' to weather and terrain hazards. It also found that most on-demand flights, unlike Part 121 carriers, 'operate without dispatchers that utilize flight-following systems to monitor progress of airborne flights and to advise pilots of hazardous weather or other operational hazards'. Part 135 operators are not required to follow the progress of flights, although they are required to have a 'flight-locating system', such as an ELT, to locate missing or overdue aircraft (Subcommittee on Aviation, 2010). The ARC sent 124 recommendations to the FAA in 2005, to date the FAA has not issued any final rules based on the ARC's recommendations (Subcommittee on Aviation, 2010).

According to the NTSB, "most of the organizations that conduct Part 135 operations do not have—and are not required to have—a safety management system (SMS), flight data monitoring (FDM), or controlled flight into terrain (CFIT)-avoidance training programs" (Improve the Safety, 2019). They don't know 'how many operators have SMS or FDM programs because the FAA doesn't require operators to implement and report on them'. "CFIT-avoidance training programs are required for Part 135 helicopter operations, but not for Part 135 fixed-wing operations. We have investigated several fatal CFIT accidents involving flights operated under visual flight rules at low altitudes. Despite the availability of SMS, FDM, and CFIT-avoidance programs, preventable crashes involving Part 135 aircraft are occurring all too frequently" (Improve the Safety, 2019). This is why the safety of Part 135 operations is number three on the NTSB's most wanted list for 2019-2020 (NTSB Most Wanted, 2019).

Current ADS-B technology has the ability to generate and transmit data, including aircraft position (latitude, longitude, and altitude), velocity, and additional elements depending on the type of equipment onboard. This data is transmitted, once every second, to satellite or ground based receivers, which then relay it to Air Traffic Control (ATC), operators, or other aircraft (ADS-B Technologies, LLC., 2019). Alaska, where the ADS-B technology was first launched, currently is only capable of using ground-based receivers in certain areas and is only able to be used when in range and without mountainous obstructions. "Existing aircraft tracking capability is also lacking when encountered with water, in the event that aircraft crashes into the ocean" (Ong, Wei, 2015). Current technology is limiting, as it does not have the capability to track aircraft over remote oceans or sparsely populated regions, which make up nearly the entire state. This creates a 'search and rescue bottleneck' (Gerhardt, Nag, Pham and Rios, 2016).

Research by Gerhardt, et. all., has shown if just sixteen satellites were launched and connected to the current Automatic Dependent Surveillance Broadcast system (ADS-B), more than 99% of Alaska would have the same coverage as the lower portion of the United States. This technology can guarantee just a six-minute maximum time gap, where any airplane in Alaska would not be covered, which translates to the location of any aircraft would be known within the last 6 minutes of flight time. This far exceeds the International Civil Aviation Organization (ICAO) standard of fifteen minutes (Gerhardt, Nag, Pham and Rios, 2016). Nevertheless, even with the current system in place, lives would still be protected in Alaska and other remote areas if 135 operators would be required to use the available equipment.

Methodology

Eventually this research seeks to lay a foundation for policy change. Several approaches to mixed method research will be used to prove why it is instrumental to create policy reform and include Part 135 operations in the NexGen initiative. Regulatory data collection will be done through government websites and Federal Aviation Regulations. NTSB "recommendations" will be examined through archival data, as well as the NTSB database. This information will provide necessary background on the possible lack of oversite by the FAA in Part 135 operations. NTSB and FAA accident report data will be collected and used to gather information on timelines, settings, factual information, and to facilitate the building of a quantitative statistical data set. This data, both qualitative and quantitative will show how regulatory change will aid in improved safety, less lives lost (both rescuers during missions and survivability of occupants), financial benefits of quicker "search" operations, and psychological aspects of closure for the families.

Archival research will involve spending time in the Embry-Riddle Aeronautical University Safety and Security Archives searching for official accident reports, interviews, and news clippings. Information about rescue operators themselves, and more detailed events of their missions, psychological traumas, and any physical harm that they may have incurred, will be included in the research process. Case studies and scholarly research will be used to find psychological aspects affecting search and rescue personnel, and issues relating to family dynamics as it pertains to missing kin.

Government databases will be used to research monetary data regarding extended search and rescue operations. Legal research, including current policies and regulations, will be accomplished through existing information on the Federal Aviation Administration databases and the resources they provide. This research will include statistics on ADS-B technology. This will include what is involved in the actual technology as well as what needs to be done to the aircraft to install it.

Current issues with data collection include a lack of research into actual search and rescue operations. Instead, most available research just details the what, when, where and why of the mission. Research into the psychological tole, physical loads, financial issues, and tireless hours spent on these missions will show yet another reason this policy reform research is necessary.

Recommends for Further Research

This research must provide unequivocal evidence of the necessity to include all Part 135 Operators in current regulatory changes. Including the use of tracking devices. In order to create change it will be necessary to not only complete this research through the methods listed above, but to present it to the aviation community in a clear and concise manner that shows it is an absolute necessity. It may also be beneficial to take this research even further. The NTSB's most wanted list includes the "Safety of Part 135 Operations", a generalized subject, but it might be valuable to not only include regulatory changes for tracking devices, but to also include other safety concerns. Part 135 operations have far less regulatory oversite then Part 121 commercial operators. Past aircraft accidents and incidents give a lot of insight into the safety culture in these operations. Further study of this instances could help prove that it is time for change.

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