ELECTRIC AIR TAXIS AND THE ADAPTATION OF THE AIR SAFETY INVESTIGATOR

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With extraordinary design comes extraordinary risk—even with the most proclaimed foolproof and advanced of technology. When the results of these risks turn into incidents and accidents, the Air Safety Investigator (ASI) must be prepared for them. What was once merely just a concept is slowly becoming a reality and making its way into our airspace one successful test flight at a time; electric vertical takeoff and landing (VTOL) commuter aircraft also known as air taxis, or urban air transport. Large and small companies around the world have taken their fair shot at participating in the drone, helicopter, and airplane hybrid commercialization including Airbus and Volocopter. While some of these companies presume integrating their hybrid aircraft into the national airspace will take years, their progression is unyielding. For the Air Safety Investigator, there is no time to fall behind the curve when it comes to understanding how technological advancement can shape their role.

A study completed by the International Air Transport Association (IATA) in 2017 titled "Future of the Airline Industry 2035" states that change can be sudden and overwhelming, or gradual and unnoticed; in either case the result can be hard to manage – and sometimes fatal – for organizations not actively preparing for it. The qualities of being flexible and able to adapt to change are a must on all aspects of the trade for Air Safety Investigators, including the need to accommodate for any new genre of aircraft that may be introduced to the industry. In an ever-changing business, following the progression of up-and-coming companies as well as well-established companies' products can set one ahead of others. Volocopter, a small, privately owned German company established in 2012 with the goal of integrating air taxi services to the airspace has been contributing to recent innovations. In 2016, Volocopter received an ultralight aircraft flying permit from the German office of the European Aviation Safety Agency for their Volocopter 2X aircraft, and within the past few years has been performing over one hundred test flights—including tests within the United States (Mohr, 2016). Powered by nine “high capacity” batteries, eighteen drives, or rotors, are controlled by a simple joystick aimed to reduce the possibility of human error and maximize redundancy of aircraft systems (“Our High Flier: The Volocopter 2X”). Similar to Volocopter but rather a company on a much larger scale, Airbus’s company $A^3$ is in the midst of certifying its electric, self-piloted VTOL passenger aircraft, Vahana. Much like the Volocopter 2X, Vahana is fully powered by electricity, but with more of an emphasis on being fully autonomous and being equipped with sense-and-avoid technology to further prove its worthiness of being safe enough to double as urban transportation (“$A^3$ by Airbus Group”). With new technology comes new practices and processes of manufacture, operation, regulation, and maintenance, and this is bound to have an impact on the aviation industry, not to mention the role of the Air Safety Investigator.

For the Air Safety Investigator, the birth of these aircraft means understanding machines with an entirely new method of flying. Incorporating systems uncommon to manned aircraft such as automated sense-and-avoid technology currently found in ground vehicles and small unmanned aircraft systems (UAS) requires Air Safety Investigators to have an even better understanding of how they operate. Although ASIs will still reach out to subject matter experts (SME) and SMEs will still maintain their role and importance in an investigation, the areas of expertise among SMEs could expand—and possibly contract—in the future. For instance, with the rise of electricity powered aircraft, SMEs with a focus in high capacity batteries and software driven technologies could become much more prominent in investigations than SMEs on the “ins” and “outs” of weekender Cessna 172 Lycoming O-360 engines or any leisure aircraft engine.

More so in the near future rises an advancement of similar caliber; integration of UAS into airspace more populated than ever before. Given that we are years from incorporating manned car-sized aircraft into the airspace for urban transportation use, integrating small UAS through strict regulations is the first step towards making the prior a reality. In the Code of Federal Regulations Title 14, Federal Aviation Regulations Part 107.43 states “No person may operate a small unmanned aircraft in a manner that interferes with operations and traffic patterns at any airport, heliport, or seaplane base” (Code of Federal Regulations- Title 14 Part 107.43). Face-value of this regulation can be inferred to be of good intent, but it is only effective when followed by the target audience. On the second of July in 2017, a pilot in a Bombardier CRJ-900 on final approach into John F. Kennedy International Airport (JFK) in Queens, New York reported observing a three foot wide UAS directly off to the left side of the aircraft at the same altitude of 1200 feet (“Reported UAS Sightings (July 2017-September 2017),” 2017 ). The pilot reported the UAS sighting and proceeded to land uneventfully at JFK. The implementation of UAS regulations in the vicinity of airports did not prevent this incident from happening, and a matter of feet could have made the outcome of this occurrence much, much worse. The co-existence of piloted and pilotless aircraft has already proposed a risk within itself. Even with heavy regulations to further implement larger UAS/drone-like aircraft into the airspace, they may be broken whether intentional or not. This is the type of change that in worst case scenarios could be fatal with ever increasing numbers of manned drone-like vehicles entering the airspace with commercial jets, and the need for Air Safety Investigators will be crucial.

The responsibility of an ASI is to prevent similar incidents and accidents from happening again in the future by producing recommendations on how to improve current conditions, but when innovation drives change constantly in this new age, it is vital to adapt in order to make valuable recommendations. Air Safety Investigators could potentially be in high demand as the market for electric autonomous VTOL aircraft expands, imagining an era where pilot demand decreases and the demand for safety professionals increase. In the future that companies such as Volocopter and Airbus's A^3 are envisioning, these electric autonomous VTOL aircraft are entirely replacing the on-land commute to get to increasingly popular destinations. In translation, these autonomous aircraft could very well be flying over thousands of people in vehicles on highways hundreds of feet below. Although the intent is always to create the most failsafe of technology and operations, every new idea has kinks that need to be worked out, and they are not always worked out during the testing phase, further emphasizing the need for ASIs. The increase in automation in these electric aircraft with a goal to eventually become fully automated in order to reduce the chance of human error may not completely be the asset it is advertised to be. Flight controls in the form of a joystick, or eighteen propellers, or eight back up batteries can sound appealing and quite convincing to an audience, but consider the scenario where all eight innovative and new batteries of same make and model are recalled due to fire hazard unbeknown to the operator. The occupant behind the joystick in their automated air taxi has never had a day of flight training in their life and is now put into a position over a traffic jam on a four lane highway. Comparable to many new discoveries that occur with any technology, until something malfunctions, it can sometimes be close to impossible to predict it with the given resources. To illustrate, the year was 1944 and the British government requested airplane manufacturers to begin drafting designs for passenger jet airliners. Five years subsequently, the De Havilland Comet was constructed and test flights comprising long-distance trips ensued from the United Kingdom to Italy, South Africa, Singapore, and Egypt; all succeeding with flying colors ("De Havilland Comet," 2009). In the following years to come, three Comets crashed and all Comets were grounded as an investigation supervened. As the cause of each accident remained unknown, modifications were made to address any possible cause of failure including flutter of control surfaces, primary structural failure due to gusts, flying controls, explosive decompression, engine fire, failure of a turbine blade, and fatigue of the wing (Federal Aviation Administration). When yet another Comet crashed after these modifications, investigators resorted to performing over a thousand full-scale pressure tests on Comet fuselages by submerging them in water tanks until the pressure inside was equivalent to that in flight. The culprit was revealed to have been the fuselage failing at a corner of a square shaped escape hatch window, and the concept of structural fatigue was exposed. Although the point could be made that this accident occurred nearly eighty years ago and aircraft manufacturing and testing has come a long way, the main idea that not all imperfect components can be caught in the testing phase of a new design remains.

With time, money, and new technology, kinks will be worked out. Air Safety Investigators will be alongside the brains that created these innovative machineries to provide a safe atmosphere for an ever-changing industry, but until then, preparing for the expected is key. The electric VTOL commuter aircraft companies around the world, large and small, have demonstrated that they are taking no yield to sprint towards innovations of the future, and ASIs must be proactive and educate themselves with the vision of safe advancement alike.

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