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by

Flight Automation and Flight Management Systems

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Abstract

New technology is needed for public transportation systems to address future environmental issues, efficiency, and safety regulations. Primary drivers are innovations involving automated and independent mobility technological solutions. The primary goal of implementing airplane technology tools is to reduce errors occasioned by human factors. However, some solutions and empirical results have shown that technology causes new types of failures. Nevertheless, technological advancements have drastically decreased the rate of accidents in air transport by enhancing safety and efficiency. Other players in the transport sector can learn from the aviation industry and adopt similar technology to enhance safety. Nevertheless, additional research is needed to determine the extent of human authority over these technologies and the safety-critical obstacles when these systems interact.

Flight Automation and Flight Management Systems

Introduction

Air travel is a significant industry that is influenced by multiple worldwide changes and technological advancements. At the same time, it is a global aim of the aviation industry's decision-makers to offer safe, effective, convenient, and ecologically friendly transportation systems – systems that must be fully secure to evade accidents and fatalities. When looking at advancements in aviation fatality rates after WWII, there is massive safety progress from the early 1960s onwards, which can be understood partly by the emergence of new technologies such as flight automation and flight management infrastructures. As per IATA (2021), aviation accidents and fatalities declined from 52 cases in 2019 to 38 in 2020. Amankwah-Amoah (2020) demonstrates that technology and innovation have lowered the accident rate and fatalities to 0.01 per million flight time. This paper aims to research the latest in-flight automation and flight management systems and determine whether these technologies have introduced a new set of risks to the aviation industry. The paper is organized into different sections. The introduction touches on a brief overview of the topic and its importance. The research focuses on the background of the issue, the literature review is conducted, and secondary data is considered for the research to obtain crucial information on the topic of interest. Data analysis and results will be conducted and communicated and based on the results. The results are interpreted in the context of the problem in question. Finally, based on the inferences from data analysis, recommendations are offered to address the problem.

Background

Before the advent of flight control systems and the automation of flights, safe operation reasoning in air transport was reactionary. Despite the reality that airline safety is higher than that of other methods of travel, this approach was inadequate given the nature of the sector. Because systems have become even more intricate in the last 70 years, safety practices have become similarly tricky, as pilots and airline personnel must comprehend how these rapid technologies work, necessitating progressive training for the airline staff.

Since the beginning of commercial airlines, design faults and concerns have hindered early airline technology development. The rate of crashes has decreased since the emergence of aircraft engines in the mid-twentieth century. The average distance between them has risen to one in 100,000 flying hours. In today's aircraft industry, automation and flight management systems are nothing unique. Varying forms of digitization have accompanied aviation since its humble origins over a century ago.

Literature review

As suggested earlier, automation and the adoption of technological systems like flight management technology is nothing new. Automation is the completion of a task mechanically or electronically. For most instances, automation performs tasks that individuals can perform; regrettably, in some instances, it delivers many tasks that exceed individuals' cognitive and physical boundaries. There has been a significant increase in automated systems in air transport and many other sectors. Particularly in flight decks, there has been a rapid shift toward electronic systems rather than mechanical equipment. These innovative technologies are adopted for different reasons, key among them the safety and security of the aircraft and crew once airborne. As per Harris (2016), one of the primary reasons for incorporating technology into aircraft flight decks was the attempt to end pilot stress and fatigue throughout trips and the need for pilot intervention. As a result, automation is meant to take over some or all of the operator's smaller tasks while flying a plane.

Amankwah-Amoah (2020) identifies two primary motivations for adopting automation and flight management systems in the industry: The urge to eliminate pilot error and economic gain. Structural, power systems and digital aircraft control systems are the three major types of technologies in the industry. The latter referred to the mid-80s digital advancement. Electronic liquid crystal screens replaced rotary round-dial instruments, allowing for a more interpretive outlook of various parameters inside a restricted line of vision. In modern jets, examples of this type of automated system include autopilots (automatic landing capability), auto-throttle (controlling turbine variables during distinct stages of flight), and flight management technologies, which store flight routes and aircraft performance characteristics.

According to Wendel (2019), aside from the intent of improving cockpit mechanization, reducing crew volume of work, and making the system perform better and more reliably, the main goal of automated systems is to reduce errors due to human variables as well as aerospace problems caused by these discrepancies. As per studies, nearly 73 percent of aircraft accidents are caused by human elements (Johari, 2018). The primary goal of implementing these innovations is to reduce errors caused by human factors. However, some implementations and empirical evidence have shown that mechanization causes new errors in the flight deck. Notwithstanding, as flight systems adoption increases, there are fears that pilots will be left in the dark due to the multiple flight management and automation systems. Gilliland and Dunnavant (2021) refer to the Airbus A320, which has approximately 190 devices located throughout the fuselage and engage in aspects that the flight crews might be uninformed of. As a result, some elements of automation may result in higher system complexity. As a result, aviation possesses a wealth of expertise that can potentially enhance transportation systems over and above aviation. One of the previous recommendations by experts is to allow flight crew and airport staff in charge of manning and operating flight management systems to be part of the process when these systems are being sourced and adopted. On most occasions, people are notified that new systems are being brought, and they are expected to be the custodians of these systems. Nevertheless, they had minimal input in their development, but they are expected to operate and maintain these technologies.

Data analysis and results

The data collection method involved secondary sources of data. They included publications, research findings, and reports from aviation agencies, governments, research bodies, and academic institutions. One of the significant findings is that a flight management system provides pilots with an on-board multi-purpose journey, success, and aircraft activities. Such a machine provides virtual information and operational tranquility between open and closed aspects of an aircraft, from well before onset and take-off to touch-down and engine switch-off. It enables flight crews to plan routes using a vast data ground and feed them into the system using a data launcher. In one research, Evjemo and Johnsen (2019) show that an increased technological adoption made it difficult for a pilot to regain control of an aircraft once the automated system took charge. However, the safety of the crew is guaranteed.

The diversity and complexity distinguish the research data on flight automated systems, flight management frameworks, and safety. Technology can enhance safety and lower it based on documented cases of loss of flight control during take-off. For instance, the pace of a plane ordinarily rises during take-off; nevertheless, if the speed decreases, the entire situation becomes unsafe if countermeasures are not implemented fully. The task for the flight crews is significant during take-off, which is due to retaining control of the plane, constantly monitoring devices, and managing information exchange with air traffic management. The same is true when trying to land. On the same note, the increased adoption of automated systems, including flight management systems, has created a paradox. It is evident that, on the one hand, these technologies have increased errors that can endanger the lives of the flight crew, while on the other hand, it can prevent accidents. One primary concern is the ability of the pilot to regain control of an aircraft if the automated systems like the auto-pilot fail to relinquish their control over the aircraft.

Conclusion

Numerous examples are presented in the published research where technology is used to improve airline safety. The research results demonstrate how innovative automation can avert faults by aiding flight crews or acting in tandem with the aircrews' control authority option usurping if required. The principal area of commitment for flight controllers to maximize the use of airbases while avoiding collisions between planes is bolstered by the use of flight management systems. Human conduct in contemporary air transport indicates that the system is not operating at peak efficiency; the goal is to reduce human involvement via technology and automation. The next step towards enhancing flight safety is to re-evaluate the component distribution between pilot and technology. Today's proportion is not inherently optimized - improving pilot effectiveness is mainly about identifying the pilot's function and asking why one would need a pilot in the first instance. The reasoning is that activities should be defined depending on the requirement of the pilot contribution. Then technology should be used to support individual limitations concerning the pilot role.

Besides that, the data analysis indicates that automation can enhance decision support, improving flight safety. For example, technology could have aided the pilots of US Airways Flight 1549 in making a hasty choice about potential landing zones following the crash with birds shortly after take-off. On the other hand, the pilots' talent contributed considerably to a prolific crisis landing on the Hudson River. Such technology can help pilots to return to safe landing zones even if the engines stall after colliding with birds during take-off or during the duration of a flight. Automation and flight management systems can also improve information exchange between air traffic controls and pilots. The shift from utterance to data transmission between air traffic units and aircrews means lower costs while increasing safety. For instance, the adoption of satellite technology like Iridium in the aviation sector enhances safety. As premised on the planned route posted, data from the ground can be sent to the airplane, such as extreme weather patterns. Second, location statistics from an aircraft can be downloaded, enhancing turnaround time if rescue operation is required. One can also conclude that text-based data transmission to pilots has serious safety prospects if an automatic speech element support messages.

Transferring expertise from aviation to other areas of the economy can also be advantageous to safety. For example, in medical advancements, anesthetic agents in medical procedures are not done automatically. The attentiveness of the medical professional is essential for safe operation. There are clear parallels with aviation, where the human factor can have severe repercussions, and industrial automation protocols have been implemented to minimize risk and enhance performance levels. Technologically, a highly autonomous, closed-loop system for injecting drugs can be created to handle and supervise multiple concurrent drug injections on different patients.

Nevertheless, when designing flight automation technologies and management systems, the operators of these systems must be part of the process because they are tasked with operating them once adopted. Actions "in" a system's limits may often contradict its aim by limiting operators' right to review and challenge defined revelations, thereby impacting the grasp of the situation (situational awareness). When subjected to unfamiliar and unforeseen scenarios, one will first notice such a deterioration of competence.

Recommendations

Based on the results and conclusions of this research, there is a need for further human-centered research on the following elements to avert the risks associated with flight automation and flight management systems. More research is necessary to confirm the limits of human and technology qualities to help people recognize the prerequisites for rational decision power over automated systems - both human constraints and capabilities when socializing with greater degrees of technological applications.

Second, a more research-based understanding of the contribution of such technology drivers in future automated transportation systems by determining the type of competence required. Furthermore, more research is necessary to investigate the safety-critical obstacles when these systems interact with one another. Also, input from pilots and other stakeholders of these technologies must be considered during their design stage to limit the time wasted training people after their adoption.

References

Amankwah-Amoah, J. (2020). Stepping up and stepping out of COVID-19: New challenges for environmental sustainability policies in the global airline industry. *Journal of Cleaner Production*, *271*, 123000.

Evjemo, T. E., & Johnsen, S. O. (2019). Lessons learned from increased automation in aviation: The paradox related to the high degree of safety and implications for future research. In *29th European Safety and Reliability Conference, October* (pp. 2889-2896).

Gilliland, B., & Dunnavant, K. (2021). *Speed: The Life of a Test Pilot and Birth of an American Icon*. U of Nebraska Press.

Johari, M. K. (2018). Preventing human error at an approved training organization using Dirty Dozen. *International Journal of Engineering & Technology*, *7*(4.13), 71-73.

Harris, D. (2016). *Human performance on the flight deck*. CRC Press.

IATA. (2021, March 25). *IATA releases a 2020 safety report, details airline safety performance*. https://www.iata.org/en/pressroom/pr/2021-03-25-01/

Wendel, W. B. (2019). Technological solutions to human error and how they can kill you: Understanding the Boeing 737 max products liability litigation. *J. Air L. & Com.*, *84*, 379.

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