Aircraft Development and Certification Challenges for New Technology Insertion

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Abstract

In recent years, the insertion of new and emerging technologies into aircraft systems and/or subsystems has changed the traditional architectures of aircraft in many ways. There has also been a trend towards having lighter, faster, more efficient and environmentally friendly aircraft. This shift in aircraft architectures requires a new process and approach to certification. The traditional approach was straightforward as most aircraft have been the same for many years with little changes in sub-level aircraft systems. However, the aircraft manufacturers and suppliers are now developing new concepts by implementing new technologies. Meanwhile, the requirements outlined by authorities also need to be taken into account to receive the certification. One example is single-pilot operations concept where many of the systems proposed for assisting the pilot by the use of artificial intelligence, augmented reality, synthetic displays and virtual cockpits will contain characteristics that make them non-deterministic, asynchronous and non-linear. Combined with non-deterministic software applications and data bus transfers in the system themselves where may result in total aircraft system tending toward unexpected behaviours which may affect flight safety. This may require a different approach to the obtaining of qualification evidence and may affect the parameters to be recorded to support accident investigation. In this paper, the most promising technologies are identified and their impact are defined to provide a trial and demonstration timeline for each as well as identifying risks. It further proposes a framework on how to approach certification of these new technologies. The proposed framework is then applied and analyzed based on the single-pilot operations.