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DIGITAL TRAINING TO ANALOG FLYING: ASSESSING THE RISKS OF A STARK TRANSITION

Geoffrey Whitehurst and William Rantz

There are many advantages to train new pilots using the latest technically advanced aircraft (TAA). Most believe that the advanced avionic displays, autopilots, and moving maps, which emulate larger commercial aircraft flight decks, are required to give new student pilots a training advantage. Workload, situational awareness, and systems management and integration will all be enhanced by using TAA. Aircraft were once only equipped with analog instrumentation. Today's general aviation flight schools may have a variety of new generation, digital instrumentation and pilots take their first lesson in digitally equipped aircraft. Once a pilot earns a flight certificate, regardless of whether or not the training aircraft used digital or analog instrumentation, there is no regulation requiring any type of transition training between the different types of instrumentation. Lack of instrumentation display formalization and layout may lead to impaired skills and decreased situational awareness. A related situation maybe expressed using digital and analog clocks for an example. What if an individual learns to read time only based on digital clocks and having never seen another style clock. This individual is then asked to read the time from an analog clock. It is highly likely that the individual's response rate will be reduced and may even be in error from lack of familiarization and practice with the analog time piece. In the early 21st century analog aircraft far outnumber their TAA counterparts in general aviation and are still a significant proportion of the scheduled air transportation fleet a recently qualified commercial pilot could expect to fly. Given the large disproportionate number of analog aircraft, what transitional trap awaits those who lack transitional training?

Although a large number of aircraft accidents include situational awareness as a probable cause, information recorded by the National Transport Safety Board, in their accident data base (http://www.ntsb.gov/ntsb/query.asp), does not contain data of recent flight history. The lack of this data prevents analysis of flight instrumentation type flown prior to the accident. Inclusion of this data, with aircraft type and/or flight instrumentation type, would allow analysis of any recent transition between flight instrumentation types. A future requirement of accident investigation may be the inclusion of this data to provide the information for a deeper analysis of the probable cause – situational awareness.

A preliminary study of TAA trained, flight students showed situational awareness problems for 95% of these students when exposed to analog equipped instrument panels in a later stage of their flight training. Although 34% of these only had a slight initial struggle, 33% had a moderate struggle, 21% had a significant struggle and 7% were still struggling at the end of this flight phase. The 5% who did not experience any situational awareness problems were students who had previous experience flying with analog instrumentation.

Research into this potentially lethal problem is obviously required. Therefore a study is being developed to determine if there is flight performance degradation, and/or situational awareness degradation for pilots who have only experienced digital flight instrumentation when exposed to analog instrumentation for the first time. A further objective of the study will be to determine how many analog instrument practice sessions are required to re-establish the pilot's previous skill level, to provide data to aid in the

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development of a digital to analog transition course.

Review of Existing Literature

The transition of pilots from a traditional cockpit to a modern-glass cockpit has been a training challenge for the last two decades (Dahlstrom, Decker &Nahlinder, 2006) and many studies have been conducted on how this transition training should be carried out (Reigner & Decker, 1999; Casner, 2003a,b; Fanjoy & Young, 2003). However, a review of the literature has uncovered no empirical research examining the transition of pilots from a modern-glass cockpit to a traditional analog cockpit and the possible risks involved. TAA can be defined as those aircraft equipped with new-generation avionics that take full advantage of computing power and modern navigational aids to improve pilot awareness, system redundancy, and depending upon equipment, improve in-cockpit information about traffic, weather, and terrain (AOPA Air Safety Foundation, 2005). TAA have seen an increase in manufacturing within the last decade. The growing use of these aircraft will present unique challenges to the aviation infrastructure; as well as flight training. With the large number of analog aircraft remaining in the general aviation fleet, transitions between digital and analog will become more numerous. According to the Federal Aviation Administration regulations in Title 14 part 61.31 there is no mention of the need or requirement to obtain transition training between digital and analog cockpits aircraft. (FAR AIM, 2010) Therefore as the fleet of TAA continues to expand, the potential for transitional incidents and accidents is likely to increase.

Initial research has shown that student pilots can be trained in technically advanced aircraft that will meet or exceed current training standards (Craig P. A., Bertrand J. E, Dornan W., Gosset S., Thorsby K. K., 2005). However, one study by Rantz W. G., Dickinson, A., Sinclair, G. & Van Houten R., 2009 found that using technically advanced aircraft as a primary trainer did nothing to improve student performance skills in checklist usage between the digital and paper checklists when flying technically advanced aircraft. Hamblin C. J., Gimore, C. & Chaparro A., 2006 asserts that pilots armed with new technology, without proper training or understanding, can actually decrease safety. Given this same preface, pilots transitioning from digital to a different technology, such as analog, will likely experience a decrease in safety as well.

Proposed Study

The challenge of the study is to tease out and isolate what causal factors are influencing this decrement in situational awareness. Perhaps two options are available to study this problem on the ground: flight simulators or a Personal Computer - Aviation Training Device (PC-ATD). For the flight simulator option, to switch between digital and analog flight instrumentation would require moving from a digitally equipped simulator to an analog equipped simulator. This move between simulators would bring in unwanted extraneous factors, which would increase the difficulty in isolating the factor to be studied – the change of instrumentation type. Whereas, the PC-ATD has the ability to emulate the same aircraft type configured for either digital, or analog flight instrumentation without change of location or environment. The use of the PC-ATD allows for the comparison of student situational awareness in an environment where only the type of flight instruments being display is changed.✈

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