

Revisiting Aircraft Flight Simulator Acceptance Criteria

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Abstract: The cost and risk associated with flight operations using complex air vehicles in adverse environments demonstrate the importance of virtual flight test and training options. Pilots have used simulators for learning to fly and for proficiency training ever since Ed Link's "Blue Box" flight trainer was introduced in the mid 1930's. It was not until the 1970's that operational flight trainers (OFT) and weapon systems trainers (WST) were evaluated quantitatively by developmental flight test teams using standard aircraft evaluation techniques taught at the US Naval Test Pilot School. This process involved comparing aircraft data for a specified flight test condition to the simulator data for the same test condition. The simulator data are required to match flight test data for each specified maneuver within a certain specified percentage. Automatic flight fidelity evaluation options are built into most flight trainers, but the automatic options are based on matching flight test data within an arbitrary specified percentage or margin. The FAA evaluates their flight simulators in terms of levels B-D as a function of training requirements, where the model data are also compared to test data. Several studies have been performed that focused on simulator fidelity, including discussions of visual system, motion system, and aircraft model cues. Previous studies have demonstrated a difference in handling qualities and visual cue ratings when comparing actual aircraft maneuver task results to the same simulated task using the same pilots. Advanced aircraft simulator flight fidelity measures are needed to help better quantify the criteria required for Navy/Marine Corps operational flight trainer acceptance. It is important to relate the aircraft simulator flight fidelity measures to the increased emphasis on military flight operations quality assurance that focuses on improved readiness. It is also time to revisit aircraft flight simulator acceptance criteria taking advantage of available technology options. The US Navy has initiated a small business program that focuses on developing advanced aircraft simulator flight fidelity measures. The advanced simulator flight fidelity measures can be applied to different aircraft mission applications, including helicopter shipboard analysis. This paper reviews selected background information and discusses ongoing initiatives, focusing on rotorcraft, to improve simulator acceptance criteria.