“Real-time Aerodynamic Modeling and Control of Optimum Power-Off Glide Performance during Emergency Forced Landings”

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Abstract

This research proposes a method to use real-time aerodynamic performance modeling for optimization and control of power-off glide performance in the event of a loss of thrust emergency forced landing. Loss of thrust, resulting in a forced landing, is one of the leading causes of loss of aircraft and life in general aviation. Recent development of onboard computing has allowed for path planning and flight optimization for both normal and emergencies operations, utilizing existing aerodynamic and engine thrust models. However, actual aircraft performance capability is highly dependent on the nature of the engine emergency and the configuration of the aircraft. For these off nominal conditions, often a performance model is not available, and the reachability analysis used for emergency flight planning is not accurate. This research paper presents a method to use data driven methods, applying the stability axis equations of motion to a linear regression model to determine aerodynamic model coefficients. Additionally, fault detection with an extended Kalman filter is applied to estimate the change in performance following a change in the engine performance or configuration. Current research leverages real-world flight test data collected on the T-38 jet trainer at the United States Air Force Test Pilot School (USAF TPS), recently released for academic research.