Development of an Active Flight Envelope Warning Method for General Aviation Aircraft

INTRODUCTION

General Aviation (GA) is any civilian flying other than scheduled passenger and cargo airlines. It accounts for nearly two-thirds of all flown hours. Personal flying (for travel or recreation) makes up about one-third of GA flights. However, in 2012, 66.4% of all GA accidents occurred during personal flying [1]. The figure below breaks down the “defining events” of Personal Flying accidents occurred during personal flying [1]. The figure below breaks down the “defining events” of Personal Flying accidents occurred during personal flying [1]. The figure below breaks down the “defining events” of Personal Flying accidents occurred during personal flying [1]. The figure below breaks down the “defining events” of Personal Flying accidents occurred during personal flying [1]. The figure below breaks down the “defining events” of Personal Flying accidents occurred during personal flying [1].

METHODS

Flight Model Comparison Methods

• The Cessna 172 was selected for test and development
• Stability and performance parameters were extracted from X-Plane via “Flight Tests”
• Geometry-based empirical data calculations [3] were completed for all parameters extracted from X-Plane

RESULTS

Flight Model / Empirical Data Comparison

Stability derivatives indicate how an aircraft responds to changes in airflow around its exterior surfaces. The figure below is an example of how the aircraft in X-Plane responds to a quick positive change in pitch (upward rotation). The aircraft’s time response is an indicator of its flight stability.

FUTURE WORK

• Apply stall warning concepts to other flight envelope excursions (overspeed, g-load exceedance, etc.)
• Thoroughly test warning system in many flight conditions and revise to compensate for the aircraft’s configuration (e.g. flaps up/down)
• A complete flight envelope warning system should be evaluated in a simulated environment to receive pilot feedback

REFERENCES


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