On-Line Safe Flight Envelope Determination for Impaired Aircraft

The design and simulation of an on-line algorithm which estimates the safe maneuvering envelope of aircraft is discussed in this paper. The trim envelope is estimated using probabilistic methods and efficient high-fidelity model based computations of attainable equilibrium sets. From this trim envelope, a robust reachability analysis provides the maneuverability limitations of the aircraft through an optimal control formulation. Both envelope limits are presented to the flight crew on the primary flight display. In the results section, scenarios are considered where this adaptive algorithm is capable of computing online changes to the maneuvering envelope due to impairment. Furthermore, corresponding updates to display features on the primary flight display are provided to potentially inform the flight crew of safety critical envelope alterations caused by the impairment.