

DEVELOPMENT OF REAL TIME HELICOPTER HANDLING QUALITIES SIMULATOR

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Abstract

This paper documents the design and development of real time helicopter handling qualities simulator. Simulator architecture consists of a graphics generator, flight dynamics computer and flight controls. Mathematical model has been indigenously designed and developed for a conventional configuration helicopter with single main rotor and a tail rotor. The model has twelve degrees of freedom, six rigid body, three main rotor flapping and three tail rotor flapping. Main rotor model includes second order tip path dynamics and rotor design parameters like flapping hinge restraint, flapping hinge offset, blade lock number and pitch flap coupling. Tail rotor modelling is similar to main rotor however with quasi-static tip path plane dynamics. The lift and drag forces on the vertical fin, horizontal tail and end plates are computed for all angle of attack and sideslip, including rearward flight. Fuselage dynamics modelled based on modified wind tunnel data. Effect of various helicopter design parameters on stability and control response has been presented.

Keywords: Handling qualities; Real time simulator; Helicopter; Flight dynamics