AERONAUTICAL AND ASTRONAUTICAL ENGINEER

DESIGN AND INTEGRATION OF A FLIGHT MANAGEMENT SYSTEM FOR THE UNMANNED AIR VEHICLE FROG

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The purpose of this thesis is to design, integrate and flight test a Flight Management System (FMS) for the computer control of an unmanned air vehicle (UAV). By combining modern control design techniques and the capabilities of a Rapid Prototyping System (RPS), it was possible to safely go from concept to flight test in a relatively short amount of time without sacrificing thoroughness in computer simulation, code validation and verification, or hardware-in-the-loop ground testing. This ability to quickly field new or modified flight control systems for UAVs is of ever increasing importance as Department of Defense places greater emphasis on the use of UAVs in widely varying mission areas.

The primary focus of this thesis is on the design and testing of a heading controller. However, to fully integrate this into the FMS, the research and testing includes airspeed and altitude controllers designed by previous thesis students. Also included as part of the implementation process, is a thorough sensor evaluation to ensure the controller inputs are adequate to support the FMS.

The design and test equipment include a highly modified FROG UAV from the U.S. Army, the $MATRIX_X$ Product Family of software tools developed by Integrated Systems, Inc., and a Ground Station built at NPS from commercially available computer and communication equipment.

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