R018-7

1. **Research Title:** Advanced Flight Control

2. **Individual Sponsor:**
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3. **Academic Area/Field and Education Level:** Aerospace Engineering; Electrical Engineering; Mechanical Engineering, Flight Vehicle Dynamics, Guidance, and Control (M.S., Ph.D. level)

4. **Objectives:** Research and develop a theoretical framework for control law design and analysis for linear and nonlinear systems that addresses any of the following: enforcement of input, state, output, and/or path constraints; verifiable stability margins; output tracking performance under plant uncertainty; accommodation of un-modelled plant dynamics; fault tolerance; and operation across a wide range of operating points.

5. **Description:** As the Air Force moves to aircraft designed using multi-disciplinary optimization to meet more demanding missions and requirements, aircraft designs will continue to become more complex. More complex vehicle designs mean that the flight dynamics of these systems are not as well understood, in part because they may be very difficult to accurately model. For example, a future design may have a highly aeroelastic airframe that has low frequency flexible modes that strongly interact with the control system and the rigid body modes. Hypersonic vehicles are another example because limitations in ground test facilities means that more uncertainty is in the aerodynamic and propulsion data that are used for control design and analysis when compared to current systems. These new systems require fundamental research into new flight control laws and the underlying theory to ensure their stability and to provide robustness to uncertain dynamics

6. **Research Classification/Restrictions:** Unclassified

7. **Eligible Research Institutions:** All DAGSI

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