

RQ15-21

1. **Research Title:** Planning, Guidance, and Control for Multiple UAV Cooperative Operations

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** Aerospace Engineering, Electrical Engineering, and Computer Science / Autonomous Vehicle Guidance, Navigation, and Control, Machine Learning, Robotics (M.S. or Ph.D. level)

4. **Objectives:** Research and develop planning, guidance, and control methodologies for multiple UAV cooperative operations. The approach should address one or more of the following scenarios: combat intelligence, surveillance and reconnaissance, resource allocation, or cooperative operations in urban terrain.

5. **Description:** Increasingly, UAVs will need to operate in teams to semi-autonomously perform complex, cooperative tasks. For successful operations, a variety of basic issues need to be considered, including: task coupling; resource allocation; efficient distributed decision and control algorithms that account for global goals and mission objectives; algorithms for real-time multiple-task assignments with complex task constraints; decentralized decision and control algorithms to provide robustness and flexibility; effects of network communication delays on team assignment decisions; effects of uncertainty through information theory and game theory; cooperative control of micro air vehicles in urban environments, which needs to account for high uncertainty due to limited sensors, processing power, and communication links; mixed initiative control, in which the human operative interacts with automated decision systems to maximize mission effectiveness; and scalable planning for heterogeneous systems of systems.

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

7. **Interest in Summer USAFA Cadet:**

None

8. **Eligible Research Institutions:** Place an X in all that apply.

X Universities (DAGSI)

AFI only)

USAF