RQ20-27

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, or Computer Science, with emphasis in the fields of Autonomous Vehicle Guidance, Navigation, and Control, Machine Learning, Robotics, or Formal Methods for Computer Science (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; scalable planning for heterogeneous systems of systems; and provably correct algorithms and architectures to support verification & validation.
6. **Research Classification/Restrictions:** Unclassified
7. **Eligible Research Institutions:** All DAGSI