RQ20-21

1. **Research Title:** Enhanced Optical Flow Diagnostics / Minimization of Particle Seeding

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** Aerospace Engineering, Optical Flow Diagnostics (MS or Ph.D. Level)

4. **Objectives:** Research and develop an enhanced velocimetry system that minimizes the use of non-desirable flow seeding particles, or uses a new type of particle which is more benign. Assemble the necessary velocimetry equipment, establish a baseline measurement to be improved upon, calibrate and test under a variety of environmental conditions within one of several wind tunnel facilities located at AFRL/RQVX. Minimum objective desired is to attempt to capture instantaneous two-dimensional sheet of data – sweeping that sheet in space would give some insight into unsteady 3D flowfields of interest.

5. **Description:** One of the greatest challenges in implementing particle-based velocimetry techniques in air involves satisfactory flow seeding. Problems such as uniformity, density, particle size, satisfying Stokes' criterion, matching characteristic time, tunnel access, and getting the seed to entrain into reverse flow regions are all considerable challenges. All of these challenges are highly facility, condition, and model dependent. Clearly a flow seeding technique that doesn't require the use of Roscoe fluid, glycerine based seed, olive oil, DEHS, talc, coated glass balloons, phenolic resin and other materials (which clog ports, foul pressure sensitive paint, and obscure optical windows) would be highly desirable. Specific aerodynamic wind tunnel models of interest to test along with the optical velocity measuring technique will be specified based upon availability.

6. **Research Classification/Restrictions:** This research is unclassified and unrestricted.

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