1. **Research Title:** "SimCUNE-Simulated Characterization of UAV Network Environments"
2. **Individual Sponsor:** Dr. David L. Hench, AFRL/IFGC

Information Directorate/IFGC
525 Brooks Road
Rome, NY 13441-4505
david.hench@rl.af.mil

3. **Academic Area/Field and Education Level:** Electrical Engineering and Computer Science, Network modeling, UAV networking (M.S. or Ph.D. level)
4. **Objectives:** Research and Develop a verified network model of Small Unmanned Aerial System (SUAS) networks that produce a simulation/emulation of a network composed of a collection of SUAS resources in flight. This model should be verifiable by data collected in actual SUAS environment. Ideally, this model will be written in a combination of MATLAB, NS2, and C/C++ or Java but this is up to the preference of the student. SUAS flight characteristics will be modeled along with resulting network throughput and packet loss as a function of range, attitude, and altitude of the Unmanned Aircraft (UA).
5. **Description:** This program will result in a model that could be directly compared with the results of field data collection. This comparison will result in the creation of a verified model. Many existing network modeling programs suffer from a lack of this verification. The SimCUNE effort will simulate SUAS flights and result in a comparison that can be compared to data from actual flight tests. or, after verification, used instead of flights tests.

   The simulation should account for roll, pitch, and yaw of the UA. It should consider antenna patterns, radio frequency (RF) propagation (free space and multipath), noise and interference, and standard communication protocols. The simulation should accurately predict the network throughput, packet loss, and latency. The simulation should be scalable to a large number of UAs (at least 100s) and allow for multihop communications and study of swarms of UAs. The simulation should build on standard models. The study can assume characteristics of small UAs such as Pointer and Raven. Communications links similar to IEEE 802.11 , or other inexpensive COTS technologies can be assumed.

6. **Research Classification/Restrictions*:*** None
7. **Interest in Summer USAFA Cadet**

   We are interested in sponsoring a USAF Cadet in Summer of 2008

   Eligible Research Institutions:

   X Universities (DAGSI) AFIT (only) X USAFA