

## **Enabling Next Generation Airborne Communications and Networks**

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### **Position paper to be presented during the CPS Transportation Workshop**

The purpose of this position paper is to share the outcomes of workshop on “Airborne Networking and Communications” that was held during the Infotech@Aerospace conference sponsored by the National Science Foundation and The American Institute of Aeronautics and Astronautics (AIAA). The workshop was held on August 19, 2013 in Boston.

Airborne networks are mobile ad hoc networks consisting of manned and unmanned air vehicles as well as ground vehicles. The ability of air vehicles to communicate voice, video, and data with or without a fixed infrastructure offers enhanced safety and efficiency for Next Generation airborne networks. This workshop provided an opportunity for researchers engaged in airborne networking to discuss the state-of-art, share their research experiences with their peers, and develop directions for future research in this emerging field. Below is a brief summary of the panel discussion that was held as part of the workshop.

1. An airborne network is complex network that involves diverse and heterogeneous platforms with varied computation and communication capabilities. In order to guarantee information delivery to the right places at right times, the network needs to be designed with the following fundamental capabilities: (1) adaptive and flexible network design (2) system measurement and verification (3) risk assessment (4) analytical modeling and (5) information protection and guaranteed delivery.

2. Security as a major challenge in airborne networks. Authentication of platforms, protection of information infrastructure, and maintaining integrity of information is critical. When a system involves numerous nodes in the air and on the ground, it is difficult but important to protect information resources.

3. There is a need for developing disruption tolerant networking and routing protocols. Given that the nodes are highly mobile and the topology of the network is constantly changing, designing routing protocols that can effectively deal with the mobility is critical for the success of the mission.

4. Heterogeneity is a major challenge to deal with in airborne networks and communications. Communication links with variable data rates and protocol stacks make it difficult to make the individual systems work together as one unified system.

5. Physical layer communication schemes designed for airborne communications need to be adaptive in terms of power and transmission rates. There is a need to develop jam resistant communication schemes and error correction coding schemes to deal with partial loss of information over certain hops.

6. FAA regulations for integrating unmanned aerial vehicles into the national airspace and FCC guidelines for spectrum sharing are important before we build real-world civilian applications involving UAV/airborne networks.

These highlights will be elaborated during the CPS Transportation workshop.