Developing an Adaptable NextGen Interface for the UAS Ground Control Station

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Abstract:
NextGen air traffic data services are currently provided to Air Traffic Control (ATC) and aircraft using the Automatic Dependent Surveillance Broadcast (ADS-B), ADS-B Re-broadcast (ADS-R), and traffic information services-broadcast (TIS-B) through ground stations and existing infrastructure installed under FAA contract by Exelis, Inc. The NextGen system is designed to provide services for general aviation and commercial manned aircraft. Our proposed innovation will adapt the existing Commercial NextGen data service to provide enhanced traffic situational awareness to unmanned aircraft system (UAS) operators who will eventually operate in the same environment as their manned counterparts.

Federal Aviation Regulations (FAR) are expected to require UAS operators to maintain a similar level of traffic awareness as manned air craft pilots in order to ensure safe and effective operations in the National Airspace System (NAS). The NextGen traffic data service infrastructure is already in place to support manned aircraft operations. The UAS ground control station (GCS) command and control element, however, adds a new data interface requirement that is not yet fully accounted for in the NextGen data service architecture. The existing NextGen data service delivery point is focused on aircraft, not the GCS. This requires unmanned aircraft to carry transponders and/or ADS-B equipment onboard. Larger UAS may be able to comply with such requirements, but small and very small UAS may not have the payload or power capacity to support the additional equipment. Data links supporting UAS command and control functions may also lack the bandwidth required to send traffic information from ADS-B equipped UAS to the operator at the GCS. An additional challenge for UAS, especially small vehicles with low radar cross-sections, and no on-board transponder equipment, is making the unmanned aircraft location known to the NAS air traffic controllers and other users (pilots). So how does a UAS, regardless of size, payload, bandwidth, and power capacity, gain access to NextGen data-sourced traffic information in real-time? How can a small or non-equipped UAS effectively "participate" in the NAS? The ongoing research performed by the NASA UAS-NAS Project does not address the answers to these questions.

This proposal addresses these research questions by developing a new, real-time NextGen air traffic data delivery method, which would be available to any UAS operator at the GCS, regardless of aircraft size, weight, payload, and power capacity. Additionally, a capability will be developed to allow a small non-equipped UAS to insert its own-state (position and velocity) information into the NextGen data system via its GCS. The proposed capability is designed to allow the GCS to directly receive air traffic information via a web interface with the Commercial 2 NextGen data source. This capability will primarily benefit small and very small UAS, which lack bandwidth, power and/or payload capacity to install surveillance equipment on their aircraft in order to

effectively “participate” in the national airspace system (NAS). The capability will also benefit larger UAS by adding redundancy to existing traffic situational awareness capabilities. The team will leverage NASA’s UAS Live-Virtual-Constructive (LVC) Distributed Test Environment (DTE), developed by NASA’s UAS-NAS Project, and the Commercial NextGen data solutions achieved during the ARMD Seedling Phase I project. This Phase II project will create a path for air-traffic data and unmanned aircraft state data between the UAS GCS and Exelis’ Commercial NextGen surveillance data source.