

Description of Research Project

Aircraft derived observations (ADOs) of the atmosphere have been shown to be the highest value inputs to improve temperature and wind forecasts from numerical weather prediction models. These models are used extensively by society for a multitude of decision-making purposes affecting safety, economic performance, and efficiency of the nation. Current ADO systems based on Meteorological Data Collection and Reporting System (MDCRS) avionics packages installed on select commercial aircraft are limited by low equipage rate, low spatial and temporal resolution, and significant latency, which limits their value to the weather forecasting community.

This project, funded by NOAA, and is being conducted in coordination with the FAA Spectrum Engineering Office. The intent of the effort is the maturation of a system coined the Portable Aircraft Derived Weather Observation System (PADWOS) which is being developed to periodically interrogate aircraft of opportunity to extract a small amount of data if their transponder supports such a capability. With data reported from just two interrogations, the current winds and temperature where an aircraft is flying can be estimated. For reference, greater than 90% of commercial aircraft support this capability as do a meaningful percent of non-commercial aircraft (greater than 50% as measured on the East coast of the US).

PADWOS uses a series of directional antennas for communicating with aircraft. Only one antenna is used at any time, selecting the most appropriate antenna when communicating with an aircraft of interest. In agreement with the FAA, the range of the system will be limited to 60 NM and a series of transmission (interrogations) rate limits have been placed on the system.

If an aircraft is determined that it is capable to report the data of interest, it is periodically interrogated for such data. For reference, an interrogation message sent to the aircraft has a duration of 19 μ s. How often an aircraft is interrogated typically depends on its state of flight. Slow moving or aircraft flying straight and level are typically interrogated (for two data registers) once every minute. An aircraft ascending or descending through the atmosphere may be sampled as often as once every 10 seconds.

As relating specifically to this particular filing, the FAA SEO is indicating an area of operation radius of operation (*RAD) of 15 NM though the plan is to keep the antenna at a fixed roof mounted location on the Woods Hole campus. That location is specified in the Form 422 application.