EMS Annual Meeting Abstracts,
Vol. 6, EMS2009-304, 2009
9th EMS / 9th ECAM

9th EMS Annual Meeting
9th European Conference on Applications of Meteorology
High resolution meteorology
- applications and services

Environmental Information for the U.S. Next Generation Air Transportation System (NextGen)

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It is estimated that weather is responsible for approximately 70% of all air traffic delays and cancellations in the United States. Annually, this produces an overall economic loss of nearly $40B. The FAA and NASA have determined that weather impacts and other environmental constraints on the U.S. National Airspace System (NAS) will increase to the point of system unsustainability unless the NAS is radically transformed. A Next Generation Air Transportation System (NextGen) is planned to accommodate the anticipated demand for increased system capacity and the super-density operations that this transformation will entail. The heart of the environmental information component that is being developed for NextGen will be a 4-dimensional data cube which will include a single authoritative source comprising probabilistic weather information for NextGen Air Traffic Management (ATM) systems.

Aviation weather constraints and safety hazards typically comprise meso-scale, storm-scale and microscale observables that can significantly impact both terminal and enroute aviation operations. With these operational impacts in mind, functional and performance requirements for the NextGen weather system were established which require significant improvements in observation and forecasting capabilities. This will include satellite observations from geostationary and/or polar-orbiting hyperspectral sounders, multi-spectral imagers, lightning mappers, space weather monitors and other environmental observing systems. It will also require improved in situ and remotely sensed observations from ground-based and airborne systems. These observations will be used to better understand and to develop forecasting applications for convective weather, in-flight icing, turbulence, ceilings and visibility, volcanic ash, space weather and the environmental impacts of aviation. Cutting-edge collaborative research efforts and results from NASA, NOAA and the FAA which address these phenomena are summarized.

In 2003, a Joint Planning and Development Office (JPDO) was established by public law to meet the significant challenges that NextGen presents. JPDO partners were chartered which include, but are not limited to, the Federal Aviation Administration (FAA), the National Oceanic and Atmospheric Administration (NOAA), the National Aeronautics and Space Administration (NASA), the Department of Defense (DOD) and broad elements of academia and the aviation industry. This paper provides the aviation meteorology community with useful insight on salient NextGen environmental information requirements that have been developed by the JPDO Weather Working Group's Environmental Information Team. These efforts will help to define observation and forecast systems needed to support NextGen and to develop the operational applications for NextGen aviation weather information. Another major goal of this paper is to inform the international weather community of our research progress and plans for NextGen, to foster research collaboration with our colleagues, and to exchange information to maximize success of NextGen, SESAR and related initiatives world-wide.