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INTEGRATION OF EMERGING TECHNOLOGIES TO ENABLE FREQUENT, ROUTINE
OPERATIONS OF COMMERCIAL SPACE TRANSPORTATION VEHICLES IN THE NATIONAL
AIRSPACE

Abstract

Currently operations of Commercial Space Transportation (CST) Vehicles such as Expendable Launch Vehicles (ELVs), Reusable Launch Vehicles, Manned Stratospheric Balloons can be disruptive to other users of the National Airspace (NAS). These other users include commercial passenger aircraft, commercial transport aircraft and general aviation. CST operations are increasing in frequency from traditional locations (i.e.; Cape Canaveral in Florida) and they are projected to occur in an increasing variety of new locations in the NAS. However, CST operations are still treated as special, one-time events requiring both significant amounts of segregated airspace denied to other users as well as planning and coordination with Air Traffic Operations. The paper and presentation will first discuss emerging technologies that individually have shown potential to minimize impact on the NAS and their Technology Readiness Levels. It will then further discuss how these emerging technologies could be matured and integrated on vehicles and together with TBD separation standards and procedures supporting their use in the NAS, CST vehicle operations can become seamless and routine. These technologies include but are not limited to Automatic Dependent Surveillance-Broadcast (ADS-B) transmitters on vehicles and objects they deploy (such as fairings), display of telemetry on Air Traffic Operations platforms, inflatable heat-shields for ELV first stages and upper stages, Autonomous Flight Safety Systems (AFSSs) and Re-entry Break-up Recorders (REBRs). While some of these technologies have only been demonstrated in the US, they could be applied in other nations as well. In sum these emerging technologies integrated properly enable a desirable end state of operations of the vehicles mixed in airspace with other NAS users using separation standards and procedures, just as large commercial passenger aircraft and commercial transport aircraft are operated today.