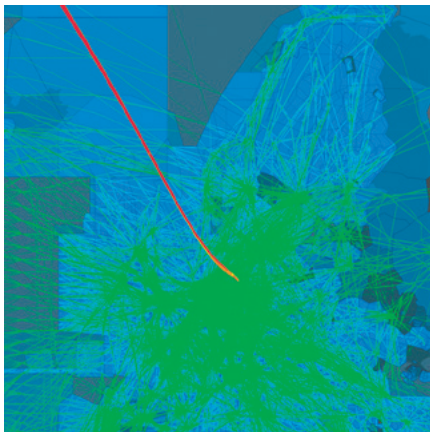


# Satellite Based ADS-B for Commercial Space Flight Operations

**The steadily increasing air traffic and commercial space traffic in particular on trans-continental routes or suborbital operations requires extending controlled airspace to those regions not yet covered by ground based surveillance. An ADS-B system with a strong focus on space-based ADS-B can provide global and continuous air and space surveillance to enhance the operation of spacecraft and spaceplanes in transit through the US National Airspace System (NAS) and Single European Sky (SESAR) and above. Such a system can overcome the prevailing surveillance constraints in non-radar airspace (NRA).**



DLR's SpaceLiner trajectory to Spaceport Nordholz, Germany.



SpaceLiner trajectory passing through North European air traffic.

Since 2008 the German Aerospace Center (DLR) started to prove that 1090ES ADS-B signals broadcasted by aircraft can be received on board of low earth orbiting (LEO) satellites. This was validated in 2013 by world's first in-orbit demonstration of a space based ADS-B system, hosted on the ESA satellite PROBA-V. ADS-B uses two data links: 1090 Extended Squitter (ES) which is operating at 1090 MHz, and Universal Access Transceiver (UAT), which is operating at 978 MHz. The latter is used within the US NAS only. The limitations of the different ADS-B systems are to be analyzed within the requirements for international operations. They have an influence on the performance requirements for Sat based ADS-B to allow minimized separation in NRA together with an impact on prevailing processes and flight safety standards for the integration of commercial space flight operations in the Air Traffic Management (ATM). Further, integration of the data to the information exchange concept of the System Wide Information System (SWIM) is possible. Using a SWIM based service, spacecraft and spaceplanes can be integrated safely in the NAS/SESAR and in the worldwide system. Also applications for spacecraft tracking close to low earth orbits (LEO) during launch and reentry operation will be possible.

