

Detection of Atmospheric Hazards for Aviation

Hovemere has been involved in three EC-funded projects where it has had a responsibility for developing Lidar-based solutions for detection of atmospheric hazards to aircraft: FLYSAFE, DELICAT and GREEN-WAKE.

The FLYSAFE project was an FP7 Integrated Project involving some 37 partners throughout Europe, and dealing with the three major aviation hazards – Meteorological Hazards, Terrain Hazards and Traffic Hazards. Under worst-case conditions, it is essential to ensure that the solution to one aviation hazard does not inadvertently push the aircraft into further danger. Thus, the FLYSAFE Project considered in detail how the entire group of hazards within all three areas might be effectively analysed and treated.

FLYSAFE defined specific technical objectives regarding the meteorological hazards due to Clear Air Turbulence, Wake-Vortex, thunderstorms and Wind Shear, including novel ground-based and airborne systems for the immediate detection and visualisation of these hazards. Not surprisingly, Airborne Lidar Systems, operating at 355 nm, show great promise in terms of unique and unambiguous detection of these hazards.

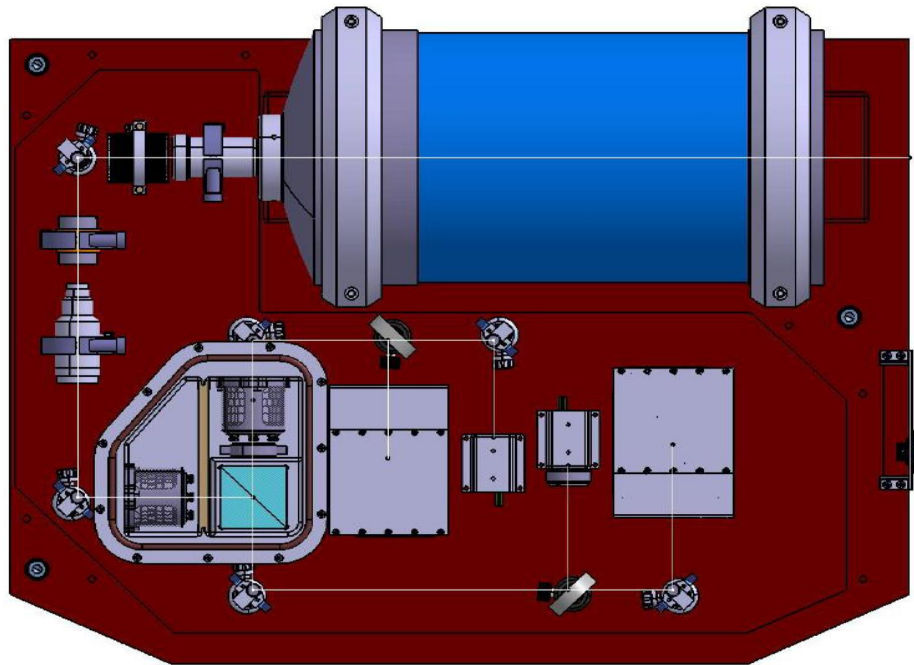


Figure 1: The DELICAT Receiver.

The prototype of one such airborne system defined during the FLYSAFE Project was built and successfully flight-tested during the project's flight test programme (part of the overall FLYSAFE Project). The achievable objective was to detect moderate to severe Clear Air Turbulence to a distance at least equal to 15 km and a Missed Alarm Rate lower than 10%, or at 30 km and a Missed Alarm Rate lower than 40%. This corresponds to a 1 or 2 minutes before encounter warning, allowing proper safety preparations in the cabin of a commercial air-liner. FLYSAFE proposed the future development of a number of systems over the full range of Hazard areas considered within the IP. Two such concepts (DELICAT and GREEN-WAKE) were developed into full Proposals for follow-on Projects to be performed with funding under FP-7. These are now in full operation, with Hovemere participating in the development of a Lidar Detection System for each.

The DELICAT and Green-Wake Projects both provide examples where technology developed in part through the successful completion of previous ESA Projects such as High Resolution Filter (HRF) and the ALFA development for the ATLID Lidar are now being exploited in closely-related R&D fields.

DELICAT will validate a new advanced technology for medium-range detection of Clear Air Turbulence at a sufficient distance ahead of the aircraft to allow efficient protection of passengers and crew by taking appropriate actions in the cabin (fasten seat belts, fixing objects, etc).

The airborne prototype Lidar will include all the basic functionalities of a medium-range CAT detection LIDAR equipment for use on future commercial aircraft.

The GREEN-WAKE project aims at developing and validating innovative technologies that will detect and mitigate meteorological hazards for aviation such as Wake-Vortex, Wind Shear and down-drafts etc and thus improve the operating efficiency of an airport and improve passenger safety.

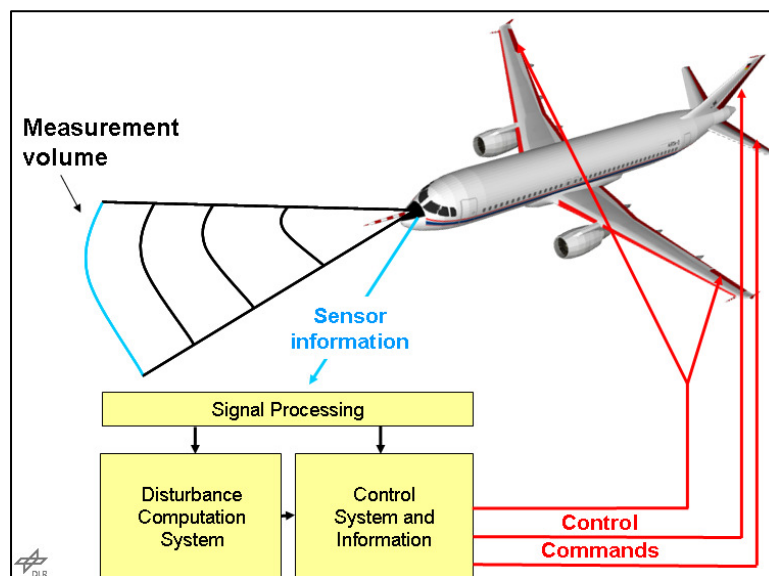


Figure 2: The operational concept of Green-Wake