

AVOID

Airborne Volcanic Object Infrared Detector



NICARNICA AVIATION
REMOTE SENSING TECHNOLOGIES

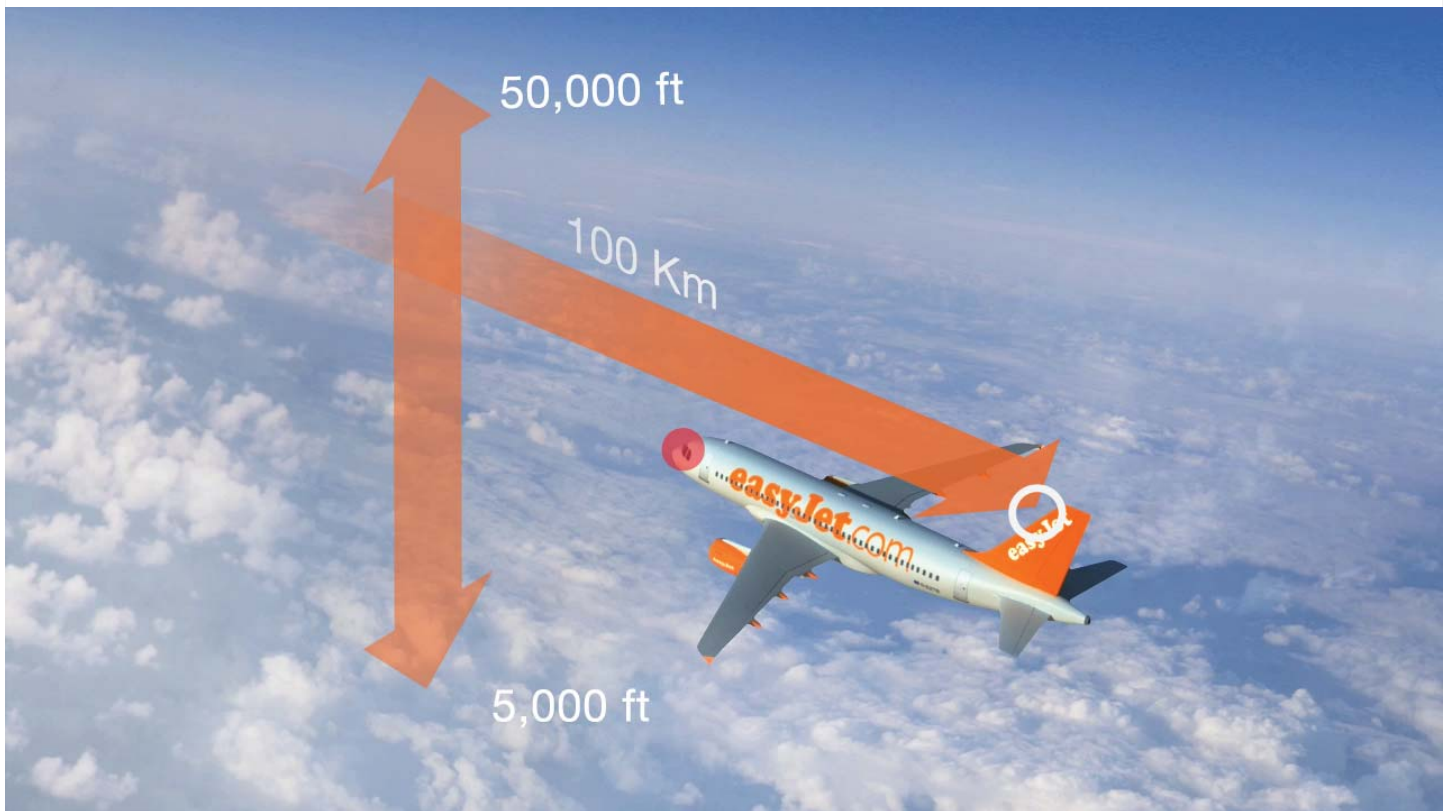


Figure 1. The AVOID system mounted in the tail-fin of an easyJet A320.

The AVOID system is a tactical awareness device for providing real-time imagery of hazards ahead of a jet aircraft. Information is supplied to the cockpit from two fast-sampling imaging infrared cameras that are tuned to detect hazardous volcanic ash particles in the airspace up to 100 km ahead of the aircraft day or night. At normal flight cruising altitudes and speeds this will give a pilot 7 - 10 minutes warning of a potential dangerous encounter with an ash cloud. The AVOID software is used to convert the image signal into ash concentrations, providing an indication of levels from less than 1 mg m^{-3} to over 50 mg m^{-3} . When coupled with GPS and airspeed data, “ash dosages” can be quickly determined and displayed in real-time. The information can also be relayed back to air-traffic control centres or to other aircraft not equipped with the AVOID system.

The AVOID technology uses two uncooled passive infrared imaging cameras to provide information on objects ahead of the aircraft. The wavelength range used is in the so-called atmospheric “window” between $8\text{-}13 \mu\text{m}$ and the system is sensitive to particles with radii in the range $1\text{-}32 \mu\text{m}$. By selecting a narrow range of wavelengths within this window, the camera can be tuned to detect volcanic ash or small ice particles (also a known hazard to jet aircraft). The use of passive infrared radiation allows the device to operate without the need for sunlight and without emitting any radiation. AVOID works equally well in day or night operation.

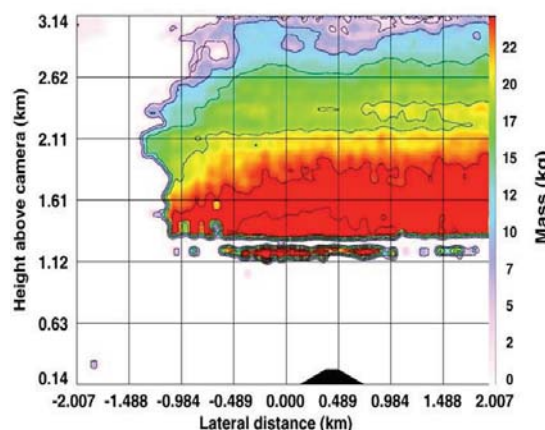


Figure 2. The AVOID system mounted at the wing-tip of an easyJet A320.

The technology has been tested from ground and on light aircraft at erupting volcanoes in Japan (Sakurajima and Unzen) and at Anatahan volcano (Northern Mariana Islands). The basic idea of the method, first proposed by Prata (1989), has been utilised from satellite instruments for many years. During the recent activity at Eyjafjallajokull infrared data from a geosynchronous satellite were used to determine the locations and mass loadings of ash over Europe. These data, ground-based, and satellite, can be combined with AVOID to provide aviation a complete picture of the locations and concentrations of volcanic ash over European airspace.

AVOID is currently being certified and installed on the Laboratory for Environmental Monitoring of the Fachhochschule Dusseldorf (FHD) aircraft (top two images at right) and will be trialled in Italy at Mt. Etna in November 2011. These trials will lead to the development of a system for mounting on commercial jets and assist the aviation industry in avoidance of hazardous atmospheric materials such as volcanic ash and small ice particles.

The bottom image shows a test of the technology at ground based level. More information on the ground based solution, NicAIR, can be found at www.nicarnica.com.



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