

## **Optically Detecting Aircraft for In-Sky Safety in Daylight Conditions**

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Emitting high-power, non-eyesafe laser pulses in to the atmosphere requires safety precautions to avoid illuminating any aircraft approaching the direction of the beam. The SGF, Herstmonceux ensures in-sky safety by the means of an active radar, an ADS-B system called 'listen2planes' and an observer located beside the telescope with a view of the sky. Each can quickly shut off the laser beam if an aircraft approaches.

An investigation is underway in to the reliability and capability of an optical in-sky safety system, designed at the SGF and called 'watch4planes'. It is comprised of a telescope-mounted, colour USB-3 uEye UI-3270LE-C-HQ camera from IDS, a wide lens with a field-of-view of 20° and a software application built in C++ and Qt using the camera's extensive control software suite. Each captured frame is broken in to a grid and each element is assessed for its RMS, edge and colour and consequently if it contains an aircraft. Watch4planes operates at a rate of >10Hz and connects to the listen2planes server to inhibit the laser.

The benefits, successes and limitations as experienced from operational testing will be presented. Sky conditions are a limiting factor and some level of false positives are to be expected. Adapting this system for night operations will be considered. A reliable optical detection camera would potentially improve in-sky safety for all aircraft, but particularly for small planes, gliders and balloons.