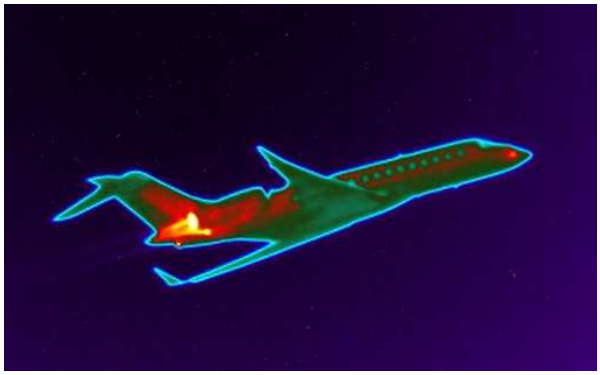
Application note

No. 15

Optical tracking of airborne aircraft / projectiles / drones



OVERVIEW

The purpose of these tests was to optically track an aircraft for several kilometres while simultaneously capturing the thermal signature of the aircraft over the same distance.

EXPERIMENTAL SET UP

Tracker Unit

The tracking pedestal unit was the **LOMA** (**L**ightweight **O**ptical **M**otion **A**nalysis) tracking mount located beside the runway threshold. The LOMA has 360 degree azimuth and -20 degree to +190 degree elevation movement. Two cameras were used – the visible wavelength tracking camera and IR payload camera.

Cameras

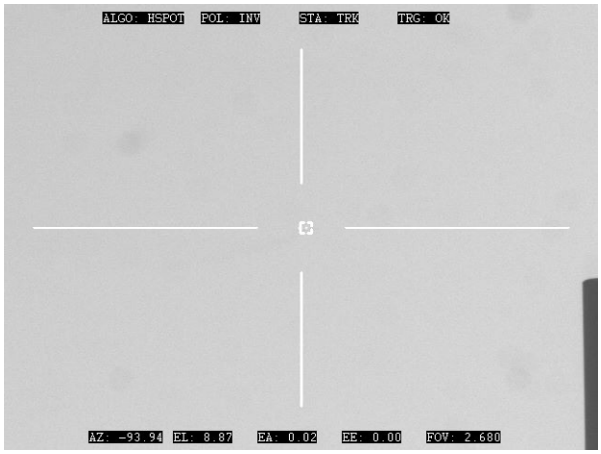
The tracking camera was a Basler acA1300-75gm 1280 x 1024 pixel resolution unit with a 50mm Nikon lens. The Payload IR camera was a FLIR X8500SC camera with 200mm lens.

Target Acquisition:

For this type of track, target acquisition and lock require the initial use of joystick control to move the tracking camera onto the target. When within the field-of-view the tracking, software is instructed what to track using the touch screen by manually tapping on the live image of the target. The tracking algorithm then follows the target according to the user pre-defined parameters. Once locked the tracking software takes control of the pedestal mount and tracks target.

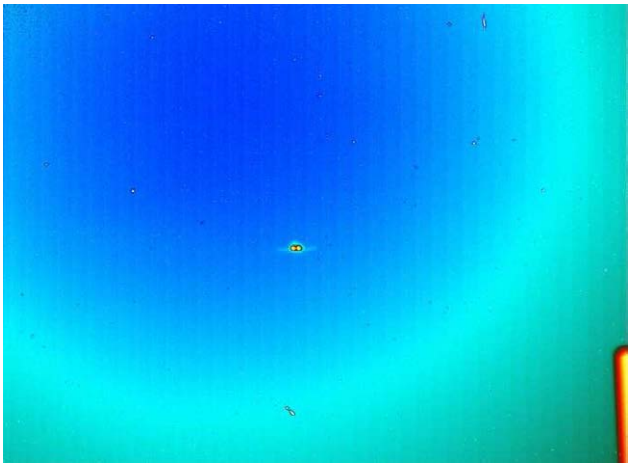
RESULTS

The LOMA system tracked for approximately 15Km of the plane flight using the visible spectrum Basler camera. The images below show the initial and final points of tracking.



The initial track image shows the “hot spot” algorithm tracking the highlight on the aircraft nose – shown by the marqued region. The software has an offset function that allows the centre of the field-of-view to be moved away from the specific area being tracked. Useful when looking at rocket plumes which are at the rear of the projectile but the area of interest is the front or mid section. Further along the track the offset can be reduced or removed as the tracking point changed from the front to the centre as the target changes orientation.

In poor weather or night time conditions the FLIR IR camera would have been used to track the target for the same distance. The corresponding IR image of the final track point shows the engine heat signatures as yellow against the blue against the cooler sky.



The initial part of the full 90 second sequences from both the the Basler and FLIR cameras can be seen at the Specialised Imaging YouTube channel at https://www.youtube.com/watch?v=5nfs4e2Rw6c

3D Positional data input and output

If the target or conditions prove hard to track optically, the LOMA pedestal azimuth and elevation positons can be slaved to radar data in real time using a translational algorythm, increasing the flexability of the system

Using two LOMA systems the accurately known azimuth and elevation positions corresponding to each synchronised image allows the 3 dimensional location in space of the target to be calculated in real time.

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