





Figure 1: Viewing tower at Farnborough Airfield

# Improved situational awareness at Farnborough International Airshow 2018

#### Executive summary

Farnborough International Airshow (FIA) is the world's most distinguished show, attracting more than 100,000 trade visitors as well as 100,000 members of public at the weekend. At the show, QinetiQ uses its Hybrid Tracking Platform to provide real time tracking and video of aircraft for situational awareness and pilot de-brief following display routine validation.

In 2017, it was decided to upgrade the mapping solution with a modernised moving map display, situational awareness tools, and replay functions. We selected Borwell, an SME based in Worcestershire, to support us throughout the project because of its expertise with developing the Luciad platform and proven experience of creating secure software systems, Geographical Information Systems, and Situational Awareness solutions.

## The brief

The current system required upgrading to a modern situational awareness solution that would continue to meet baseline requirements, and at the same time provide a modern, 3D display of airshow operations. Additionally, playback recording was required to facilitate reviews of specific flights and pilot debriefs.





Figure 2: Live map mode showing KPIs, 3D polygons, video, alerts and AIXM data

# Our solution

The Borwell team built a situational awareness solution using the Luciad Lightspeed framework displaying all flight activities and topographic features in real time. At the end of the six-month project, the solution was end-to-end tested with the Hybrid Tracking Platform, communications links, and the airshow monitor front-end display terminals. Our solution has two aspects: live map mode and replay mode.

#### Live map mode

This is used during the event to monitor and record an aircraft's position in real time, and gain situational awareness of the surrounding area.

- Large information fields on the left-hand side of the screen, prominent on the user interface (UI), allow the user to quickly identify the core meta-data values with just a glance at the screen

- 3D Polygons are used to represent airspace zones, visible as 3D objects on the map with configurable positions, dimensions, and styles. This feature, in conjunction with relevant alerts, allows the user to quickly identify whether the aircraft is flying within the defined airspace

- AIXM is a standard format for storing aeronautical information. The AIXM data in Figure 2 gives a model of Farnborough airport. It shows all the buildings as 3D models and displays a dimensionally accurate representation of the airfield on the map.

The Hybrid Tracking Platform also has a PAL video capability, displaying real time video of the aircraft. The airshow monitor software converts this PAL video feed into a digital format that is then displayed to the user in a separate window. The live video stream adds an extra level of situational awareness to the user and a visual recording for pilot debrief.

The alerts overlay (top right of Fig 3) allows users to configure complex sets of rules based on a wide range of parameters, such as altitude, excluded airspace and speed limits. Once a rule's pre-defined parameter thresholds are met, the alert box overlay is displayed to warn the user of the infringement. This allows the user to be instantly made aware when a flight parameter is exceeded and can be used as part of a retrospective pilots' debrief to show them exactly where and when they may have flown outside of predetermined parameters.



Figure 3: Live video feed and alerts system

Other features of the live map mode include:

- A Local Map Server: open street map data running on a local map server allows the system to run standalone without the need for external servers or internet access

- Aircraft Track Display: The aircraft is displayed in real time showing a chasing trail of its previous positions. The size of the trail is configurable and allows the user to customize how they want to see the aircrafts position on the GUI, once again giving full control to the user to let them choose how they would like the information displayed to them.





Figure 4: Replay map view

#### **Replay map view**

This mode can be used after the airshow in order to debrief pilots and provide feedback about the air displays they performed.

In addition to the features mentioned above, the replay view also provides the following tools:

– A timeline, giving the user the option to play a flight recording back at an accelerated speed, or skip to the section of interest. As the timeline progresses, the tracking data on the display matches the data recorded live during the flight

 Frame-by-Frame video (right of Fig 4) for a breakdown of the live video recorded during a flight.
When the tracking timeline moves, the video panel displays the frame for the exact moment that the user is currently displaying data for. The effect is either a replay of the video as it would have been seen during the live flight or the ability to scrub frame-by-frame and pick a particular moment from the video feed to analyse alongside tracking data.

### Outcomes and benefits

The new situational awareness solution that will be in use at this year's FIA provides the following benefits:

 Rapid monitoring altitude, ground and vertical speed

Improved situational awareness to enhance decision making

 Display of authoritative data formats that preserve a consistent view of data from one system to another, minimising errors and improving accuracy  Comprehensive debriefing of pilots, ensuring improved communication between airshow staff and pilots, leading to safer routines

 Detailed analysis of live video, providing comprehensive mission review and transparency.



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