A View to the Future of Civil UAS

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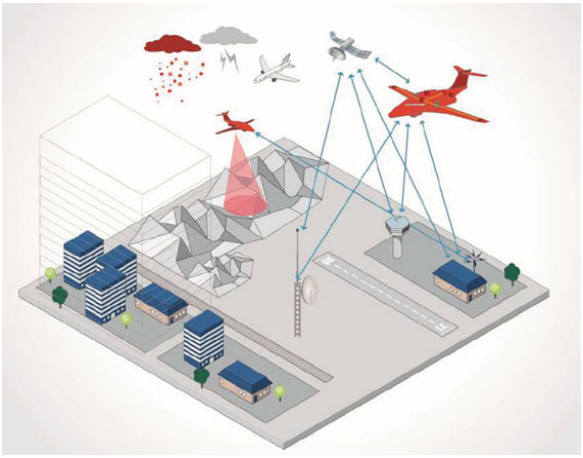
ASTRAEA (Autonomous Systems Technology Related Airborne Evaluation & Assessment) was described in terms of its aims, why it is important, what has been achieved, and what challenges remain. The programme has been running for 6 years during which it has addressed the safe and routine operation of autonomous vehicles in UK civil airspace. It has been a £62 million programme to which seven companies: AOS, BAE Systems, Cassidian, Cobham, QinetiQ, Rolls-Royce and Thales, have contributed resources.

The programme was conceived when industry realised that an Unmanned Aircraft System (UAS) - an acronym that combines the airborne, Unmanned Air Vehicle (UAV), component and the ground-based workstation/pilot (or 'operator') component – will play a growing role in future peacetime air operations. Examples quoted included search and rescue, environmental monitoring, forest fire fighting and the monitoring of natural activities, such a volcanoes, and the dispersion and composition of volcanic ash clouds.

In Britain, the Civil Aviation Authority (CAA) provided guidance through its publication (CAP 722 - Unmanned Aircraft System Operations in UK Airspace) in 2002, but as was explained, this was a 'catch 22' situation with the regulator able to describe certification expectations, but to be looking towards industry for the description of specific requirements. Much of the ASTRAEA programme outcomes have strengthened and extended the scope of the emerging regulations through research that has provided evidence for specific requirements.



This illustration was sub-divided into components, each associated with the four main research aims presented in the lecture. Noteworthy is the wide-range of airborne operations implied, the mixture of ground-level obstacles, and the communication links implied between airborne elements of the complete system.

The lecture provided descriptions of four major areas of research:

1. Autonomy and decision-making

The project faced the question 'should autonomy mean not keeping the human-in-the-loop?' In UAS concepts, the operator (ground-based 'pilot') is vested with the ultimate authority, so there will be a human interface, but as airspace management complexity introduces more automation of its prime functions, research attention was devotes to operational interfaces. These were not always as simple as might be supposed, as is the case when an air-to-air

refuelling of a vehicle to offer non-stop surveillance is considered. There has been trialling with two or more UAVs sharing airspace during operational trials at Aberporth, West Wales.

2. Ground Operations and Human Systems Interaction (GOSHI)

The research had concentrated on the study of latency issues of collecting and forwarding data, and involving the operator in addressing operational issues.

3. Communications – Security and Spectrum

Useful radio frequencies in the electro-magnetic spectrum are in great demand from expanding radio/mobile phone operations, as nothing was pre-supposed for UAS operations. Communication was highlighted as one of the major issues to address, and novel trials had been conducted using a small fleet of Mini cars (redundant from use in the Olympics), operating in demanding radio-reception conditions in the Brecon beacons.

4. Detect and Avoid

The UAS has to be able to cope with a wide range of potential threats – weather, commercial aircraft, fast jets, general aviation (light aircraft, helicopters and sailplanes), specialist airspace users (such as parachutists), terrain and man-made obstacles (such as masts). The speaker presented film of 'see and avoid' trails conducted with aircraft-mounted cameras in its dedicated Jetstream 31 laboratory. This was operated on trials with a two-man crew, but they performed only monitoring duties during much of each mission's duration.

The BAE Systems Jetstream 31 demonstrator is an aircraft equipped with an extensive range of sensors and on-board processing that can be used on UAVs. In trails the aircraft is manned by pilots (monitoring) and ASTRAEA system flight-test engineers

The aim of the ASTRAEA programme is to enable the routine use of a UAS in all classes of airspace, from fully controlled to free-flight, without the need for restrictive or specialised conditions of operation, and the speaker presented a strong case for continuing to conduct research that will assist in maintaining the pre-ordained safety requirements and separation standards applied throughout all airspace worldwide.

This was a well structure presentation that provided a wide-ranging description. It focussed on the major elements of the programme, and provided a very complete coverage, with descriptions to a depth that were within the grasp of a general audience.

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