



Innovation Hub
FLYLOGIX
North Sea Test Flights
BVLOS Sandbox Report



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Pioneering the next epoch of aviation requires relentless determination. The sandbox has provided an invaluable environment to rapidly test and learn and ultimately take forward a proven operating model for routine BVLOS operations throughout the North Sea.

August 2021

Introduction

This Sandbox Report is a summary of Flylogix's participation in the CAA Innovation Hub Regulatory Sandbox. It is designed to share what was learnt during the project, to assist industry with their future engagement with the CAA.

What is a Sandbox?

The Regulatory Sandbox enables innovators to increase the regulatory readiness of innovative solutions that do not fit within the scope of existing regulations, permissions and exemptions.

It provides a platform for innovators to discuss the CAA's potential requirements with regards to innovative solutions and to seek guidance on how the industry can:

- meet the highest safety standards;
- provide choice and value for money to consumers when they fly;
- effectively manage environmental impact; and
- effectively manage security risks.

It also enables innovators to trial their solutions with the guidance of the CAA in order to explore options, demonstrate how these solutions mitigate any risks introduced by an innovative concept, and gather the evidence necessary to maximise the chance of regulatory approval for operations.

What is a Sandbox Report?

The Sandbox Report is a joint publication between the CAA Innovation Hub and a Sandbox participant, covering topics including the regulatory challenges faced, how these were addressed through the Sandbox and the next steps for both the Sandbox participant and the CAA.

See further

[CAP 1827](#) contains more details on the Sandbox in which Flylogix participated, namely the Sandbox exploring Beyond Visual Line of Sight (BVLOS) operations of Remotely Piloted Aircraft Systems (RPAS) in non-segregated airspace.

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The Project

Flylogix, in partnership with NATS and TotalEnergies, joined the Sandbox to trial the use of RPAS flying BVLOS to inspect Offshore Oil and Gas installations within a Temporary Danger Area (TDA), in order to build an evidence base for an Operating Safety Case (OSC) for commercial operations in non-segregated airspace.

Flylogix

Flylogix is a Remotely Piloted Aircraft System (RPAS) operator using fixed wing aircraft to deliver routine operations, including:

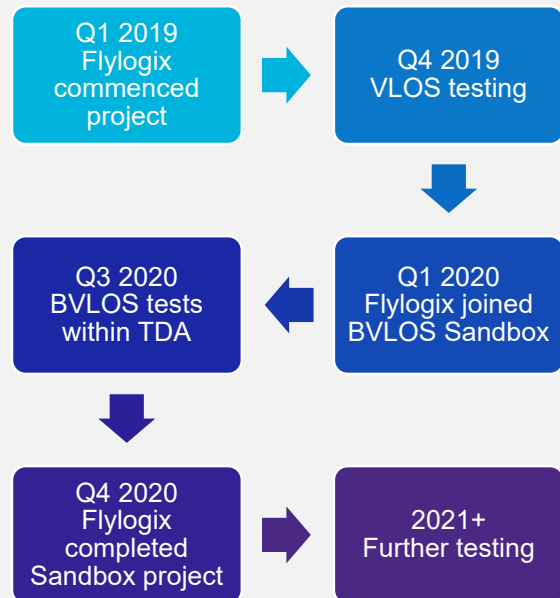
- Methane emissions surveys
- Cable laying surveillance
- Wildlife surveys for offshore energy
- High value logistics

NATS

NATS is the UK's en-route air navigation service provider and provides air traffic control services to 14 UK airports.

TotalEnergies

TotalEnergies is an energy company that produces and markets fuels, natural gas and electricity and is active in more than 130 countries.



Aircraft

Flylogix's FX2 aircraft is a fixed wing RPAS with the following specifications:

- Top speed: 140 kph / 86 mph
- Cruise speed: 100 kph / 68 mph
- Max flight duration: 5 hours
- Max flight distance: 500km
- Wingspan: 3.5m
- Length: 2.75m
- Weight (dry / fueled): 27 kg / 42 kg
- Payload: 5 kg



Regulatory Challenges

The key regulatory challenge that Flylogix faced is that the ruleset is not yet in place for the CAA to approve routine BVLOS operations in non-segregated airspace.

Current regulatory framework

BVLOS operations in the UK are not explicitly prohibited or restricted by regulation, but do require authorisation from the CAA.

As explained in section 2.1.2. of [CAP 722](#), unmanned aircraft intended for BVLOS operations will require either:

- A Detect and Avoid (DAA) capability, i.e. a technical capability which has been accepted as being at least equivalent to the ability of a pilot of a manned aircraft to 'see and avoid' potential conflicts;
- A block of airspace to operate in which the unmanned aircraft is 'segregated' from other aircraft, such as a TDA; or
- Clear evidence that the intended operation will pose 'no aviation threat' and that the safety of persons and objects on the ground has been properly addressed

DAA solutions matrix

[CAP 1861](#) describes a matrix of four categories of technology, which in some combination may form part of the safety case for BVLOS operations in non-segregated airspace:



Ground-Based Infrastructure

Supplementing the ability to detect cooperative and non-cooperative aircraft



Electronic Identification & Conspicuity

Identification, position, speed, heading and altitude



On-Board Detect & Avoid Equipment

Sensors for detect & flight controllers for avoid



Traffic Management

Data fusion, processing and presentation, traffic management services, plus ATM interaction



Example of Flylogix remote pilot detecting another aircraft (green icon) visible over ADS-B

Proposed Solutions

Flylogix tested a DAA solution comprising multiple technologies during flights within a TDA, to demonstrate their ability to operate safely in non-segregated airspace.

DAA Technologies

- FX2 aircraft equipped with ADS-B in and out, and Mode S transponder.
- Aberdeen ATC have land based radar that provides primary and secondary radar up to 80 miles offshore.
- Offshore Wide Area Multilateration (WAM) installations providing surveillance data and ADS-B receiver infrastructure installed offshore.
- Satellite Command and Control link (C2) using the Iridium low earth orbit satellite network.

Testing

Flylogix carried out its tests in a TDA east of Peterhead, Aberdeenshire in September and October 2020.

The flights involved flying from an airfield adjacent to (or near) the coast, to an area offshore, replicating routine customer operations, prior to returning to the same airfield.

There were multiple benefits of testing in this environment, including:

- Operating predominantly over the North Sea, where third party ground risk is low.
- It is an area with a known traffic environment of mainly professional aviation.
- There are only a limited number of air users, mostly taking a service from ATC.
- The majority of aircraft in the area are oil and gas helicopters which are fitted with ADS-B.

Testing the DAA solution in this type of environment is a stepping stone towards testing in more complex environments (e.g. with higher volumes of traffic).

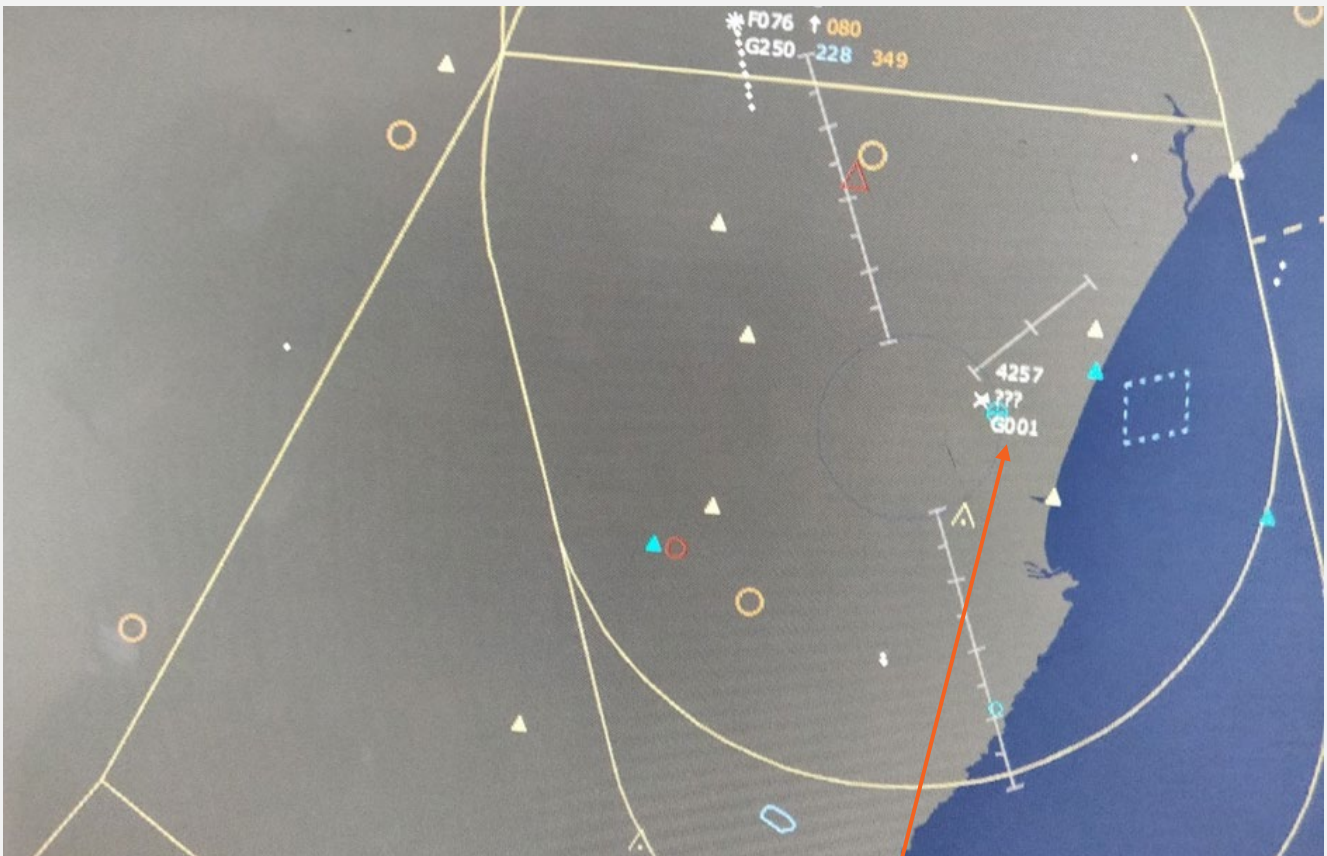


Image of ATC controller's screen in Aberdeen with FX2 aircraft shown (4257)

Outcomes and Next Steps



Through its test flights, Flylogix gathered evidence on the functionality and reliability of their proposed DAA solution, supporting their future plans for BVLOS operations in non-segregated airspace.

Outcomes

Flylogix tested its DAA solution against defined test criteria, including:

- visibility of the FX2 aircraft to ATC, the remote pilot and other airspace users;
- visibility of other aircraft to the remote pilot;
- the ability of the remote pilot to control the aircraft; and
- the ability of the aircraft and remote pilot to respond to an emergency.

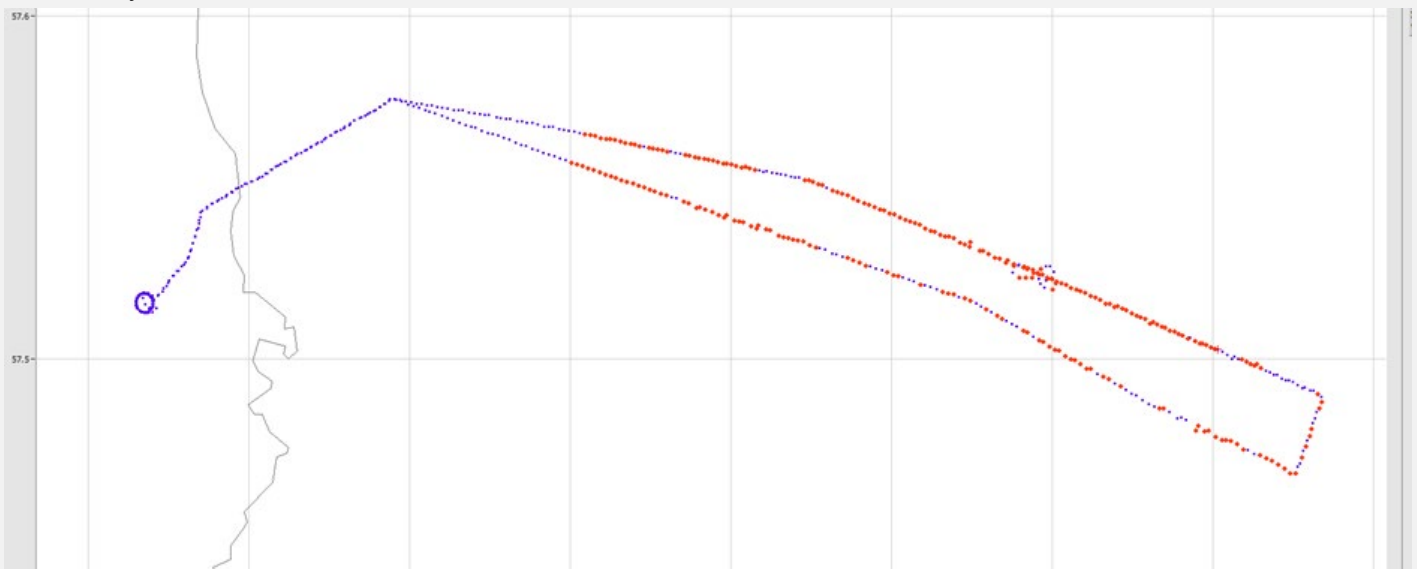
The testing demonstrated, for example, the visibility of the aircraft using ADS-B compared with using secondary radar.

Next Steps

Flylogix plans to progress towards routine BVLOS operations in phases.

Flylogix will use the evidence gathered through the Sandbox to support their Operating Safety Case for flights within a Transponder Mandatory Zone (TMZ).

The TMZs would initially be on a trial basis, and Flylogix is targeting the establishment of a permanent TMZ by 2023.



Plot of radar detections of FX2 aircraft during flight on 2nd October 2020. The blue dots are secondary returns only. The red dots are returns from primary and secondary radars.

Images: Flylogix



Visit the [CAA Innovation Hub](https://www.caa.co.uk/innovation) online for latest updates, guidance and challenges - [caa.co.uk/innovation](https://www.caa.co.uk/innovation)



For further information on Flylogix, visit: flylogix.co.uk

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