Integrating RPAS into air operations

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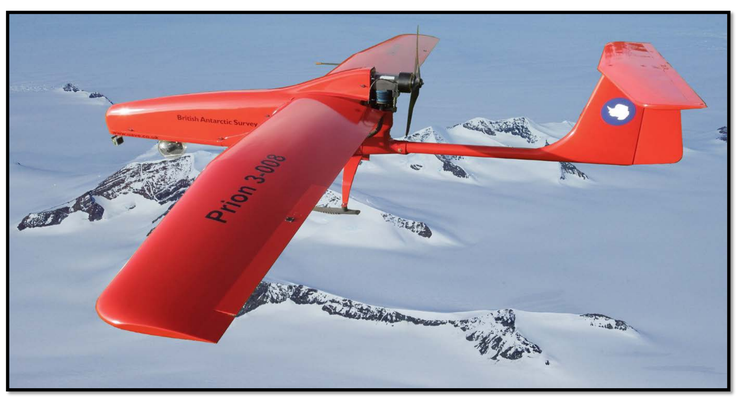
ABSTRACT

The use of Remotely Piloted Aerial Systems (RPAS) is increasing worldwide, particularly in Antarctica where both Visual Line of Sight (VLOS) and Beyond Visual Line Of Sight (BVLOS) RPAS are routinely used. BAS recently deployed a 3-metre wingspan PRION3 to conduct airspace integration at Rothera, with plans for a 10-metre wingspan Ultra next season. Use of RPAS, particularly BVLOS, to improve science mission availability year-round, achieve fuel savings, improve utilisation of manned aircraft, and to reach NetZero mean RPAS will become routine. Therefor RPAS need suitable Concept of Operations (CON-OPS) to allow safe and responsible use of RPAS in the Antarctic airspace and on the ground that are compatible with crewed aviation. A combination of CON-OPS and technology, such as ADS-B, air traffic awareness, NOTAM and emerging detect and avoid technology are needed to maintain RPAS and crewed aviation separation and interoperability. Antarctica has a vastly different and challenging environment to where manufacturers of RPAS would normally fly and test their RPAS. Including Antarctica's sparse or limited infrastructure and data, creates potentially added operational risks or system limitations for RPAS to overcome.

Large BVLOS RPAS Integration

BAS has been flying RPAS for two decades. The use of multi-rotor and small fixed-wing RPAS in VLOS has become routine, which is managed by BAS RPAS regulations, and is conducted in segregated airspace.

During the 2022/23 Antarctic season, BAS started airspace integration for larger, more capable RPAS with a 3-meter PRION3 platform.



UAVE Prion3 RPAS

Four key lessons learned :

1) **Pilot experience is the most important factor.**
2) **Platform flight performance must be fully understood and proven.**
3) **Aircraft systems must be robustly and completely tested.**
4) **Weather and environment must be fully considered and respected.**

A 10-metre wingspan Ultra RPAS will continue airspace integration.

Windracers Ultra RPAS

Science missions up to 400 NM including aerial photography, radar, hyperspectral, gravity and magnetics will be flown.

Objectives for the flying are :

1) **Airspace integration with crewed aviation.**
2) **Demonstration science can be delivered by RPAS.**
3) **Bought in RPAS service is a viable delivery method.**
4) **Transferable CON-OPS for future BVLOS RPAS flying.**

Developing Safe RPAS Operations

Regulations and guidelines are required to achieve safe and responsibly RPAS flying that protects crewed aviation and the environment, these should align with crewed aviation key flying principles.

Aviate	**Navigate**
• RPAS performance to match environment • Robust aircraft systems • Experienced pilot • Rigorous flight procedures / CON-OPS	• Verified flight plan • Hold, rendezvous and emergency points • Monitoring and reporting RPAS position • Maintaining separation
Communicate	**Mitigate**
• Aircraft telemetry • Communication plan for pilots and operations • Aircraft transponder – ADSB, Mode S etc. • Reporting and reviewing	• NOTAMS • Segregated airspace • Plan, prepare, practice • Reserve flight time to hold for traffic or situation to clear

Aviation Key Flying Principles

CON-OPS

Well-developed procedures that cover all elements of RPAS planning, preparation, flight, review and reporting are crucial for the safe operation of RPAS.

Holding and rendezvous points are essential for controlling the location of RPAS and maintaining aircraft separation when it approaches crewed aviation. This integration into the airspace eliminates the need for segregated airspace.

Checklists, like those used in crewed aviation, should cover all phases of flight and any situation to ensure that flying is well controlled and managed.

Pilots will be experienced in the platform flown and capable of managing flying incidents beyond routine flying.

Use of National Aviation Authorities pilot qualifications to verify pilots are competent to fly. For BVLOS further training is required this could be manufacturer or further Aviation Authority approved training.

Piloting will be the primary job role of pilots flying large and complex platforms. Hours flown will be reflective of the flying missions to be delivered.

Current crewed aviation processes and operators knowledge is key to verifying and provide due-diligence for safe and responsible RPAS flying.

Technology

Airworthiness of RPAS will deliver robust and reliable operations.

Climb rate, airspeed, crosswind robustness, and environmental ratings performance, will meet requirements for Antarctica.

Validation and verification of aircraft systems will be complete prior to deployment.

ADS-B and Mode S will enhance the visibility of RPAS. Suggested that this is mandatory on large platforms.

SUMMARY/CONCLUSION

Preparation for the increased use of RPAS is essential to enable National Programs to operate the most suitable RPAS to deliver science and operational missions for meeting NetZero goals and program delivery. This includes: robust CON-OPS, setting minimum RPAS pilot experience, controlling platform airworthiness, minimum platform equipment requirements and clear understanding of RPAS performance. By having an RPAS-Handbook and regulations that detail the operational framework, RPAS operators can then develop and use an efficient CON-OPS to deliver the mission and research aims.