

PART C - PATHFINDER PROGRAMME - APPLICATION GUIDANCE

To participate in the Programme and be nominated as a Pathfinder Project (“Project”), organisations will be assessed against the criteria detailed in this document and must agree to the requirements set out which cover their responsibilities in terms of communications and the sharing of outputs.

PATHFINDER PROGRAMME CHALLENGES

The Programme aims to understand the major technical, operational and regulatory opportunities and barriers that exist for the adoption of drone technology. We are especially interested in the challenges set out below, although ideas outside of these might be considered as long as they push the boundaries of the current state of play.

The challenges are presented in a matrix format, with four categories of **Operational Challenge**, namely:

- Long linear operations in rural/remote locations/low population
- Large area operations in rural/remote locations/low population
- Urban operations
- One-to-many drone operations.

The need for robust, resilient and redundant operations spans across all the Operational Challenges.

In addition, several **Safety Challenges** are grouped into three areas:

- Communication
- Navigation
- Surveillance

Operational and Safety Challenges are then mapped to form the overarching Pathfinder Challenges (“**Pathfinder Challenges**”).

The figures below show the Operational Challenges (Figure 1) and the Safety Challenges (Figure 2). The combined Pathfinder Challenges matrix is then shown (Figure 3).

The purpose of representing the Operational and Safety Challenges in a matrix format is to describe how different types of operation are likely to share similar safety challenges. Conversely, it can also help describe where solving a safety challenge could unlock multiple types of operation. In this way, this matrix should perform comparing, contrasting and gap analysis exercises across the Programme.

At each intersection of the matrix, there is expected to be a repository of evidence, lessons learnt, best practice, standards and regulatory guidance.

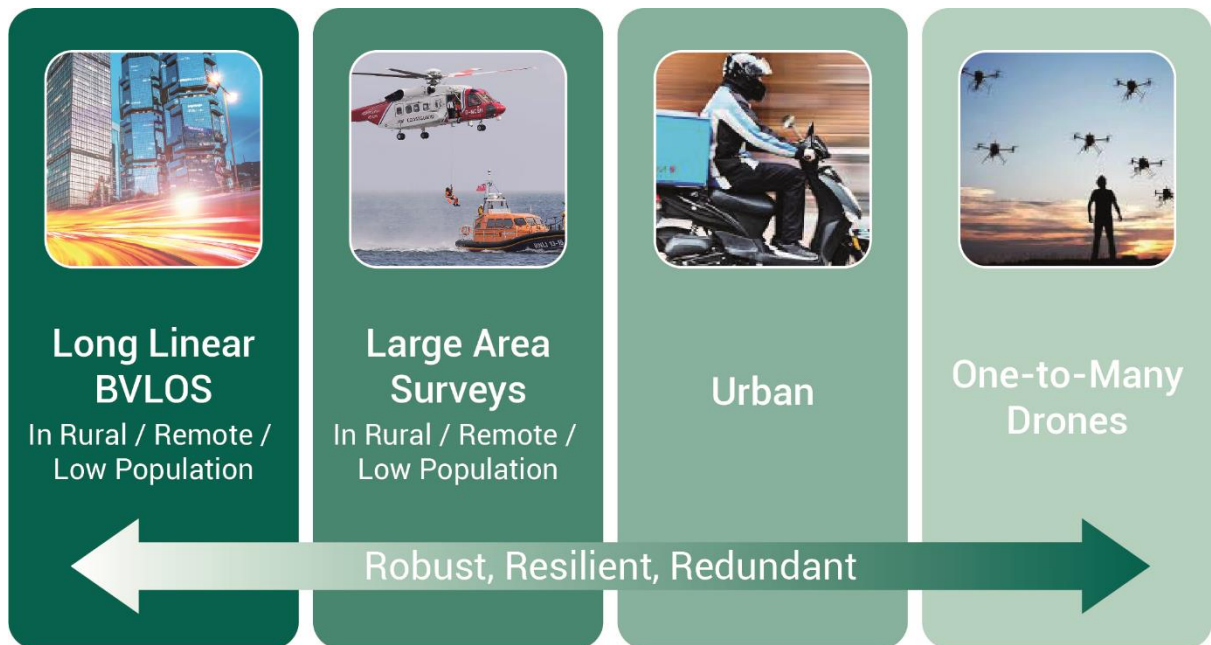


Figure 1. Operational Challenges

COMMUNICATION	RF spectrum access & risks	<i>Access to/requirements for robust RF spectrum - Is there a case for establishing the threats to command and control link performance on ISM bands? Do these threats justify seeking alternative spectrum or alternative methods for improving robustness?</i>
	Command and control range capabilities	<i>Is there a case for establishing control link performance and limitations for systems based on COTS devices? Do practical, economical methods exist for extending command and control link range for BVLOS operations?</i>
	Understanding of the BVLOS operating environment not visible to the remote pilot	<i>How should this information be presented to the remote pilot/autonomous sUAS? Is there a case for setting minimum requirements in terms of the information presented to and used by the remote pilot? terrain, weather, other airspace users, airspace restrictions, etc</i>
	Robustness of the Comms link	<i>Is there a case for establishing interference level thresholds for command and control link performance on ISM bands? Do these threats justify seeking alternative spectrum or alternative methods for improving interference tolerance?</i>
	External limiting factors	<i>If RF spectrum proves to be a limiting factor to sUAS functionality, what is the trajectory needed to build in appropriate levels of automation onboard the sUAS?</i>
NAVIGATION	Reliance on GNSS	<i>GPS/GNSS is heavily relied upon for positioning, but is susceptible to service interruption through jamming, spoofing and interference. Is there scope for exploring alternative methods of navigation capability such as radio positioning services (cellular communications), signals of opportunity (cell towers, radio/TV broadcast signals) etc?</i>
	Radio positioning service capabilities	<i>Are current networks sufficiently resilient and have appropriate levels of performance and what are the risks and barriers to implementation?</i>
	Geofencing and geo-awareness capabilities	<i>What is acceptable in terms of positioning performance and availability? Can it be met by current COTS GNSS receivers and are back-up solutions capable of achieving it? Enhancements to the GNSS capabilities - Is there a case for requiring multi-constellation or augmented GNSS systems for BVLOS operations to maintain system availability? How can current GNSS be made more robust and less susceptible to jamming, spoofing and interference?</i>
SURVEILLANCE	Non-cooperative surveillance	<i>This has advantages in terms of sUAS operator burden and cost and impact on the current aviation system but has operational disadvantages in terms of UA visibility. Can Non-cooperative surveillance provide an effective safety net for BVLOS operations?</i>
	Management of unmanned traffic	<i>How can other airspace users be detected and information on them be presented to remote pilots in a manner that does not require cooperative surveillance or impact the current aviation system?</i>
	Providing the airspace picture	<i>How can this be made available to a number of airspace participants to provide a useful level of situational awareness and in which environments should this be considered a requirement? What information needs to be displayed by the drone to enable target depiction? How can interoperability of different information gathering tools be assured?</i>
	Topographic Intelligence	<i>How can topographic features such as hazardous terrain be added to produce a 3D airspace picture? How can this information be integrated with the communication and navigation aspects?</i>

Figure 2. Safety Challenges

		SAFETY CHALLENGES										
		Communication					Navigation			Surveillance		
		RF spectrum access & risks	Command and control range capabilities	Understanding of the BVLOS operating environment not visible to the remote	Robustness of the Comms link	External limiting factors/pilot	Reliance on GNSS	Radio positioning service capabilities	Geofencing and geo-awareness capabilities	Non-cooperative surveillance	Management of unmanned traffic	Providing the airspace picture
OPERATIONAL CHALLENGES	Long, Linear BVLOS Operations in Rural / Remote Locations / Low Population											
	Large Area Surveys in Rural / Remote Locations / Low Population											
	Urban BVLOS Operations											
	One-to-Many Drone Operations											
	Robust, Resilient, Redundant Drone Operations											

Figure 3. Pathfinder Challenges

When completing the Application, please describe which Pathfinder Challenge(s) the proposed Project is targeting and how the project intends to do so.

The Application should make clear to the Steering Committee how it is unique to other Projects currently under the Programme and/or it is proposing to tackle a new challenge that should be considered for inclusion in the Programme.

HOW TO PARTICIPATE IN THE PATHFINDER PROGRAMME

Who can Apply

To make an Application under the Programme, the applicants must be:

- A registered company and/or charity and
- Part of a consortium

One of the members of the Consortium must be named as the Lead Applicant in the application form. To lead a Project you can be:

- An organisation of any size
- Work alone or with others as subcontractors

The Programme requires that Consortiums primarily include the service provider(s) and the end-user(s). In addition, they can include organisations in the Public, Academic, and Not for Profit organisations who have an interest or stake in the proposed operation.

The Application must demonstrate that the end-user(s) represented in the Consortium belong to a part of the organisation with a clear commercial or societal interest in the proposed operation or have direct influence on this.

How to Apply

This document is designed to assist with the completion of the Application. Please ensure before completing the Application that Part A - Pathfinder Framework and Part E - Terms of Engagement have been read and understood.

To be considered as a Participant in the Project (“**Project Participants**”), please request an application from via drones@ts.catapult.org.uk (“**Application**”). The Consortium must provide evidence against the following assessment criteria to prove that the Project is:

- 1) Within scope
- 2) Deliverable
- 3) Beneficial

Application Assessment

The Application will be assessed on evidence provided to support against the three required criteria:

1. SCOPE OF THE PROJECT

The Project is intending to tackle one of the Pathfinder Challenges listed in this Guidance Document. The Application should make clear that it is unique to the Programme or it is proposing to tackle a new challenge that should be considered for inclusion in the Programme.

Note: Questions under sections ‘Strategic Alignment’, ‘Project Summary’ and ‘Technical Challenges’ seek evidence of the strategic alignment with the Pathfinder Challenges listed in this Application Guidance document and a clear overview of the specific Project objectives, end user and current state of development.

2. DELIVERABLE

The Project's stated goals, timeline and milestones are feasible and can deliver the operations safely.

Note: Questions under sections 'Project Plan and Methodology' and 'Team Expertise' seek a description of the Project plan, key project milestones, main risks, the methodology that the Project will follow to deliver the operations safely and team expertise.

3. BENEFICIAL

The Project intends to make a significant contribution to the benefits specified at Part A – Pathfinder Framework. The market potential addressed by the project must be significant in value or in its societal benefits.

Note: Questions under section 'Benefits' seek evidence of the proposed Pathfinder's applicability to both the identified market and other sectors, and the economic, social, environmental and wider benefits that it will enable for the UK.

Application Process

Stage one

After the Application is submitted the Steering Committee will review and assess the application against the assessment criteria as detailed above. If the Steering Committee determines that the Application may be suitable for the Programme it will be pursued. Unsuccessful Applications will be notified within one month of submission.

Acceptance onto the Programme will be determined by how satisfied the Steering Committee are that the proposed Project meets the assessment criteria. During the evaluation period, the Steering Committee may seek further information from the Lead Applicant to assist in its consideration; this may take the form of post-submission clarification meetings or written clarifications.

Stage two

The prospective Project Participants may be invited to present their Application to the Steering Committee. In advance of the presentation, the Steering Committee may provide some guidance and advise what areas of the presentation should be focused on. The Project Lead who would be responsible for the Project is required to attend the presentations.

Stage three

Following the presentation, the Steering Committee shall consider the information and decide whether or not to nominate the Application as a Project under the Programme. The Programme Manager shall notify the Lead Party to discuss commencement under the Programme. Unsuccessful Applications will be notified within ten working days of the presentation.

It is important that the Programme remains focused on aggressively tackling the Pathfinder Challenges and any others facing the UK for drone implementation. The Steering Committee therefore reserves the right to reassess the Programme and the scope of each Project at its discretion.

Activities which are not in support of the challenges identified in the Application Guidance, or a new challenge accepted by the Steering Committee, will not be accepted onto the Programme.

PERMANENCE ON THE PROGRAMME

Permanence on the Programme will be subject to evidence of progress towards the Project objectives. This will be demonstrated by the achievement of Project milestones and assessed for efficacy by the Steering Committee on a quarterly basis.

OUTPUTS/REPORTING REQUIREMENTS

At appropriate review and learning points the Steering Committee will require evidence of:

- Progress against milestones
- Where milestones haven't been met, explanation as to why
- Any requests from the Project Participants to help progress (input from other parties, additional facilities required etc)
- Lessons learnt and recommendations report at the end of the Project

Of particular value to regulatory evolution and future regulatory processes would be specific details learnt through the Programme (such as a particular platform showing weakness in an area, anything that is a regulatory flag provided in sufficient level of granularity for the regulators to act upon).

COMMUNICATIONS

The Projects will be required to communicate progress in support of the aims of each Project to the public. The Programme Steering Committee is looking to promote more widely the activities being undertaken by the Programme and the participating organisations, through dedicated webpages, attendance at events and workshops and increased presence on professional social media channels.