

Technical Question Set

OFFICIAL SENSITIVE COMMERCIAL when completed



Technical Question Set
Guidance and Checklist

Applicant Name	
Licence Reference	

The following pages, once completed, should be submitted to the UK Civil Aviation Authority (CAA) as part of the licence application.

The questions have been developed for applicants to build a baseline set of information upon which a technical risk assessment covering safety, sustainability and security can be performed in accordance with the provisions of the Outer Space Act 1986 and the Space Industry Act 2018.

Please attempt to complete ALL questions on each of the sections, providing your answer in the 'Response' field.

If a question is not applicable to the mission, then please state that it is not applicable and reasons why.

If you have provided information in a separate document, you need include this in your submission. Please provide references and details as to where, within the document, the information can be found in the 'relevant documentation/links' column.

Once completed, please return along with the Orbital Operator Licence application form, as well as any additional technical documentation referenced in this questionnaire to commercialspaceflight@caa.co.uk

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Question Guidance

0) General	Answer ALL questions	To determine a high-level overview of the type of mission, the services it will provide, the organisations involved and what the goals or intended impact of the mission are.
1) Safety - Launch	Answer ALL questions	To provide an overview of launch system, identify risks from use of novel or non-standard systems and understand system heritage To ascertain whether the launch approach, including vehicle and operation, minimises the risk to safety and impact on the orbital environmental To assess the 1) ground safety from re-entry of rocket bodies and associated objects and 2) safety impact from the LV upper stages in orbit over the de-orbit time-scale
2) Safety - Space Segment	Answer ALL questions	To provide an overview of space segment, identifying risks from use novel or non-standard systems and production techniques, and understand system heritage To determine how likely the spacecraft is to fail during the mission from random failures and environmental effects, as well as mitigations against anomalies and on-board recovery processes To assess measures taken to minimise reliability issues prior to launch through appropriate qualification and testing
3) Safety - Operations	Answer ALL questions	To provide an overview of the mission CONOPS to determine the scope of the mission operations and identify risks from use of novel or non-standard operations. To ascertain whether the operational staff are appropriately trained and experienced to safely and securely oversee the mission To assess of the approach to establishing safe orbital operations (from launch to service operations) To determine the safety impact from all relevant spacecraft over the duration of the mission lifetime, including, establishment, remaining in orbit over the de-orbit time-scale To assess the approach to disposal operations and ground safety from re-entry of spacecraft and associated objects
4) Safety - Bespoke Operations	Answer appropriate questions depending on the mission category (see below)	Some missions consist of very specific and bespoke operations. If this is the case, the purpose of these questions to determine whether these operations are performed in a safe and well thought out manner, adhering to the most appropriate and relevant best practices
5) Safety - Ground Segment	Answer ALL questions	To provide an overview of the ground segment, to identify risks from use novel or non-standard systems, as well as the scope of the system and its capability To determine resilience in the ground control segment and identify failure risks and mitigations To review measures taken to ensure functionality of the ground segment
6) Sustainability	Answer ALL questions	To assess approaches to prevent on-orbit break-ups (collision/fragmentation), object release and removal of spacecraft and orbital stages over duration of the mission To assess long-term impact of break-ups (collision/fragmentation), object release and removal of spacecraft and orbital stages to the long-term environment

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Mission categories Table

Missions are loosely categorised in the following way, as **standard** missions, **constellations** (e.g. coordinated spacecraft groups) and **Rendezvous and Proximity Missions (RPO)**.

Note: this is not exhaustive and is merely meant as a guide to help clarify the mission type.

‘Standard’ mission				Coordinated Spacecraft Group				In-Orbit Servicing										In-Orbit Manufacturing				Active Debris Removal					
LEO		GEO		Complete coverage		Partial coverage		Inspect	Transport		Host	Re-supply		Re-work		End-of-Life		Use In-Space		Use on Earth		Clear					
Pico/Nano (Cube) -sat	Small—sat	Single Comm-sat	Restricted Constellation	Low density constellation	High density constellation	Restricted constellation	Formation	Inspect & Monitor	Station-keep	Relocate	Return to Earth	Orbital Hub / Spaceport	Orbital Depot	Refuel	Re-stock	Swap Modular Component	Repair	Upgrade	De-orbit	Graveyard	Recycle	Assemble	Fabricate	Fabricate & Repatriate	De-orbit	Graveyard	Recycle

‘Standard’

‘Constellations’

‘RPO’

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0) General

Answer ALL questions

To determine a high-level overview of the type of mission, the services it will provide, the organisations involved and what the goals or intended impact of the mission are.

Mission Overview				
ID	Question	Guidance	Relevant Document Link	CAA Comment
0-1	What is the name of the mission?			
Response				
0-2	Who will be overseeing the mission and who will be operating the spacecraft(s)?			
Response				
0-3	Who is the customer for the services provided by the spacecraft or system?			
Response				
0-4	Please identify the key organisations involved in the mission and their role in the delivery of the mission, including those responsible for design and manufacture of the spacecraft	<i>The description should provide details on the key organisations and interfaces/relationships between the partners e.g. prime, sub-contractor, operator, customer etc</i>		
Response				
0-5	What is the purpose of the mission in terms of technology maturity? Please provide sufficient background to help support the classification.	<i>Technology demonstrator: Defined as a mission whose function is to test new technology in a relevant environment funded either by internal R&D funding or external contract to a commercial entity, Government or Institutional body</i> <i>Path-finder mission: Defined as a prototype mission designed to test the CONOPS of a future, more complex mission (for example, a large constellation).</i> <i>Commercial service: Defined as a mission providing a commercial service to a commercial entity, Government or Institutional body</i>		

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		<i>Follow-on mission: Defined as a mission with previous flight heritage either as a technology demonstrator or a repeat mission</i> <i>Other: Another type of mission that does not fall into these categories</i>		
Response				
0-6	What mission type is being proposed?	<i>Please refer to Mission Categories table (page 3) for a description of different mission types, or, if not appropriate for this mission please provide a description</i>		
Response				
0-7	Please provide a mission summary and overview of the concept of operations.	<i>The summary should provide sufficient insight into the nature of the mission being proposed (e.g. life extension, relocation, de-orbiting, removal, orbit modification (altitude, eccentricity, inclination), formations, constellations, other, or combinations thereof). The concept of operations should identify key details on the mission phases from launch to disposal (duration, orbit), expected interactions and interfaces with ground</i>		
Response				
0-8	What is the mission scenario and schedule?	<i>Please provide details on the timeline and orbit characteristics through the mission. Details of the expected duration of key mission phases is expected alongside the orbit parameters for the parking, operational and disposal orbits etc</i>		
Response				
0-9	Will the spacecraft(s) be stored on ground for an extended period prior to launch?	<i>Please provide details on the maximum storage duration and storage facilities prior to launch</i>		
Response				
0-10	What is the nominal lifetime of the mission(s)?	<i>Please provide details on the mission lifetime and if mission extensions are provisionally envisaged. Mission extensions are subject to the decision of the operator</i>		

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		<i>and consideration of the spacecraft and satisfaction of key mission objectives but awareness by the CAA is critical to ensure approval.</i>		
Response				
0-11	Please provide details on any planned follow-on missions which will incorporate technologies used on this mission to perform similar functions, or coordinate with existing spacecraft			
Response				

1) Safety – Launch

Answer ALL questions

To provide an overview of launch system, identify risks from use of novel or non-standard systems and understand system heritage

To ascertain whether the launch approach, including vehicle and operation, minimises the risk to safety and impact on the orbital environmental

To assess the 1) ground safety from re-entry of rocket bodies and associated objects and 2) safety impact from the LV upper stages in orbit over the de-orbit time-scale

A Launch System Overview				
ID	Question	Guidance	Relevant Document Link	CAA Comment
1-A-01	Please identify the organisation responsible for procuring the launch			
Response				
1-A-02	Has a specific launch opportunity been agreed (e.g. Letter of Intent, Launch Service Agreement etc)?			
Response				
1-A-03	What is the targeted launch window for the mission?			
Response				
1-A-04	What is the primary launch opportunity?			
Response				
1-A-05	What is the back-up launch opportunity?			
Response				

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1-A-06	Please identify the proposed launch vehicle indicating manufacturer, country of origin and flight history			
Response				
1-A-07	Please identify the launch window (daily window and number of consecutive days for the launch slot) and baseline launch day (start of launch window)			
Response				
1-A-08	Please indicate the flight number for the first procured launch (the flight number refers to the number of flights since the first successful orbital launch of the vehicle)			
Response				
1-A-09	Please indicate whether the launch is shared with other satellites. If so, please provide details of the other passengers on the manifest, the payload configuration in the launch vehicle and indicate the deployment order from the launch vehicle			
Response				
1-A-10	Please provide an overview description of the launch site / launch point indicating location, range authority and flight path. Please identify who is responsible for identification and notification of hazard areas.			
Response				
1-A-11	Please describe any known guarantees relating to liabilities of launch procuring states.			
Response				

B Reliability, resilience and failure

ID	Question	Guidance	Relevant Document Link	CAA Comment
1-B-01	If the selected launch vehicle has experienced a recent launch failure (within the previous 5 launches), please indicate what corrective action has been taken to ensure that a similar failure will not occur again?			
Response				

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1-B-02	If the vehicle is new, please indicate the development status, the approach to test of the major subsystems, the approach to test flights, the date of the first orbital launch, the date of the first commercial launch and whether the vehicle is derived from any other vehicles or programmes			
Response				
1-B-03	Please summarise the means by which the specific launch event in question has been approved by the national administration(s) responsible for assuring public safety in the domain of the launch site. Please provide the document reference, references to supporting evidence (safety plans, risk assessments, risk mitigation plans) and identify the originating and approval organizations.			
Response				
1-B-04	Please briefly describe the approach to launch safety and refer to any public standards that have been applied (identification & notification of exclusion zones/hazard area, flight safety systems, emergency service provision)			
Response				
1-B-05	Please identify the flow of responsibilities between the relevant organisations in the safety process, specifically addressing the preparation for launch, range definition control and flight path.			
Response				
1-B-06	If the originator of the supporting evidence is not the applicant, please identify whether the document has been approved by the applicant.			

C Disposal				
ID	Question	Guidance	Relevant Document Link	CAA Comment
1-C-01	Please identify the final orbit of any final stage, including expected margins (+/-) and explain how this will be confirmed			
Response				
1-C-02	Please identify any additional items that will be released and injected into orbit as part of the launch event or separation process (circularisation stages, secondary structures, pyrotechnic materials). In doing so, please cite mechanisms such as pyrotechnic devices (if included, are they fail-safe devices), and expected maximum size of debris particles if greater than 1mm.			
Response				

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1-C-03	Please identify the passivation of any upper stage, e.g. venting of remaining propellant to prevent possible explosion or release of debris			
Response				
1-C-04	Please identify the how the launch operator intends to comply with international space debris mitigation guidelines (lifetime, reducing probability of accidental breakup, minimisation of debris)			
Response				

2) Safety – Space Segment

Answer ALL questions

To provide an overview of space segment, identifying risks from use novel or non-standard systems and production techniques, and understand system heritage

To determine how likely the spacecraft is to fail during the mission from random failures and environmental effects, as well as mitigations against anomalies and on-board recovery processes

To assess measures taken to minimise reliability issues prior to launch through appropriate qualification and testing

A Subsystems and integrated spacecraft overview				
ID	Question	Guidance	Relevant Document Link	CAA Comment
2-A-01	Please provide an overview of the spacecraft	<i>Spacecraft design overview should include; Geometry, budget summaries (mass, power), key subsystem characteristics (type, supplier, heritage), payload/mission specific technology (type, supplier, heritage) e.g. rendezvous sensors, robotic arms etc, software (supplier, heritage). Please provide a brief summary on how the subsystems or subsystem components (e.g. sensors) will be used during the various mission phases</i>		
Response				
2-A-02	Please provide details on any key or novel technologies proposed for the mission	<i>Details should include supplier name, supplier background summary, technology readiness level, flight heritage or associated development plan (including alternative flight opportunities for the technology on other missions).</i>		
Response				
2-A-03	Please provide a summary implementation plan for the integrated spacecraft	<i>Implementation plan should provide key programme dates and reviews towards launch</i>		
Response				

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2-A-04	Please provide an overview of the Attitude and Orbit Control System (AOCS)	<i>For the reaction/momentum wheels, please indicate the following information:</i> <i>1. The name of the supplier;</i> <i>2. The orientation of the wheels with respect to pitch, yaw, and roll axes;</i> <i>3. Specification and sample frequency of the sensors that are used to monitor /control the wheel speed;</i> <i>4. The design failure rpm and the maximum expected operating rpm;</i> <i>5. Details of how wheels desaturated (e.g. autonomously/manual commanding through thrusters or magnetorquers);</i> <i>6. Redundancy in the sensors or hardware (including wheel drive electronics);</i> <i>7. Capability of the software to override the wheel torque/momentum limit;</i> <i>8. Description of process should wheels become disconnected from the wheel drive electronics, and redundant attitude control recourse (e.g. through manual commanding of the thrusters or magnetorquers);</i>		
Response				
2-A-05	Please provide an overview of the Electric Power System (EPS)	<i>For the battery system, please indicate the following information:</i> <i>The battery type (e.g. Lithium ion) and name of supplier;</i> <i>Battery parameters are monitored (e.g. voltage, temperature) and at what frequency;</i> <i>Redundancy in the sensors or hardware (including charge regulation);</i> <i>Operational temperature limits, and how are they maintained (e.g. via radiators or heaters); Heater specification and redundancy, as well as predicted temperature excursions for passive/active temperature controlled systems;</i> <i>Approach to prevention of overcharging of the batteries, and protection that exists to prevent explosion of the batteries.</i>		
Response				
2-A-06	Please provide an overview of the Telemetry, Tracking and Control (TT&C) system			
Response				