Regulatory Sandbox for Rendezvous and Proximity Operations — Stage 1

Independent Public Report

August 2025

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Contents

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1 Executive Summary

This Independent Report presents the outputs of Stage 1 of the Regulatory Sandbox (hereafter, the Sandbox) for Rendezvous and Proximity Operations (RPO) – a project delivered by the RPO Operators Consortium (hereafter, the Consortium) composed of Astroscale, ClearSpace and D-Orbit, for the Department for Science, Innovation and Technology (DSIT), with the participation of the Civil Aviation Authority (CAA) and the United Kingdom Space Agency – between December 2024 and March 2025. The principal outputs are the Sandbox methodology, which can be used for other future sandboxes, and a set of identified challenges for RPO operators with recommendations to address them. The Independent Report also presents other findings of the Sandbox, including on spectrum challenges, insurance considerations, and the economic impact assessment of the Sandbox.

The Independent Report integrates Consortium analyses based on stakeholder workshops and an iterative simulation of the licensing of a hypothetical yet realistic RPO mission. The aim is to provide DSIT, the UK Space Agency and the CAA with a list of actionable recommendations to make the UK the place of choice for licensing RPO missions.

1.1 Project Overview

Stage 1 of the Sandbox was designed to assess and enhance the UK's legal and regulatory environment for in-orbit servicing (IOS), debris removal, and other space missions involving RPO. These so-called RPO missions, which can involve performing inspections, docking with another satellite, delivering orbital corrections, or removing debris, are expected to play a growing role in sustainable and commercially driven space operations.

- **Rationale**
  - The Sandbox responds to the UK government's Space Regulatory Review (2024)[1], which underscored the need for clearer, more effective licensing processes to accommodate emerging technology and mission types.
  - RPO missions involve distinctive technical and legal challenges, such as varying levels of spacecraft cooperation, indefinite mission scopes, cross-border involvement, and dynamic risk profiles, that necessitate closer scrutiny and potential regulatory adaptation.
- **Sandbox Approach**
  - Iterative Testing: A "sandbox" mechanism was used to simulate the end-to-end licensing process for a fictional RPO mission under the Space Industry Act 2018 (SIA 2018), the Space Industry Regulations 2021 (Regulations) and associated guidance.
  - Collaborative Engagement: Regulators, industry and government stakeholders, insurers, and technical experts convened in dedicated workshops and mock application exercises to explore gaps in the existing framework and to propose practical recommendations.

1.2 Objectives

Stage 1 sought to address four key objectives:

[1] UK government (2024) *Space Regulatory Review 2024*. Available at: https://www.gov.uk/government/publications/space-regulatory-review-2024

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1. **Develop and Test a Minimum Viable Product (MVP) for Licensing**
   - Create a robust, representative test case (a realistic yet fictitious mission concept) that would reveal current bottlenecks in licensing, legislation, policy and guidance, and enable stakeholders to propose realistic improvements through recommendations.
2. **Identify and Map UK Licensing Gaps**
   - Investigate points of confusion or conflict within legislation, regulations, and guidance, particularly regarding insurance, security, liability, safety, and sustainability requirements for multi-year RPO missions.
3. **Strengthen Stakeholder Confidence**
   - Offer a transparent, data-driven forum for government, regulators, operators, and insurers to exchange views, refine approaches, and build trust in the UK's capacity to regulate and license complex RPO activities.
4. **Lay Foundations for Future Policy and Regulatory Phases**
   - Produce immediate, actionable recommendations to better align current practices with industry needs, while forming the foundation for Stage 2 (more advanced simulations) and Stage 3 (final validation).

1.3 Methodology

An iterative delivery model was employed, combining simulated licensing exercises, targeted stakeholder workshops, and detailed technical assessments. Key steps in the methodology included:

1. **Regulatory Workshops**
   - Engaged with the CAA, the UK Space Agency, and DSIT to clarify the legislative framework and agree on focal points for the sandbox (e.g., liability caps, ALARP assessments, security checks, etc.).
2. **Target Mission Concept (TMC)**
   - Developed a fictitious RPO space activity within UK jurisdiction, performing up to three servicing tasks (life-extension, debris removal, controlled de-orbit) to simulate both cooperative and non-cooperative client objects.
   - Incorporated realistic mission parameters to reflect uncertainties, multi-year timelines, and indefinite client spacecraft identification.
3. **Iterative Licensing Simulations**
   - Conducted a mock licensing application using a tailored subset of the CAA's Technical Question Set (TQS), focusing on key topics (e.g., ALARP safety demonstration, in-orbit changes, client spacecraft not defined by the moment a licence is granted, etc.).
   - Captured regulator feedback to assess the completeness, clarity, and coherence of the existing Acts, Regulations, policy, and guidance.
4. **Expert Workshops**
   - Liability & Insurance: Explored the feasibility of third-party liability (TPL) insurance for novel RPO missions, the applicability of standard liability caps, and potential new paradigms that reward sustainability-enhancing activities.
   - Spectrum & Communications: Evaluated ITU processes, frequency allocations, and steps to ensure timely licensing of mission-critical communications and spectrum access for RPO missions.

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- Cross-Industry Perspectives (Catapult Sessions): Gathered direct feedback from prospective RPO operators and customers on commercial feasibility, technical readiness, and perceived legal and regulatory barriers.

1.4 Key Stage 1 Achievements

Aside from the key achievements related to the identification of challenges and development of recommendations summarised in section 1.5, the Sandbox Stage 1 has produced the following two key outputs:

1. **Successfully Piloted an RPO-Focussed MVP**
   - Designed a representative RPO mission (the TMC) to "stress-test" licensing complexities across multiple mission phases (rendezvous and docking with both cooperative and non-cooperative client objects, inclination correction, controlled re-entry).
   - Demonstrated how existing UK licensing processes can cover advanced RPO missions, while also highlighting key challenges.
2. **Established Productive Stakeholder Collaboration**
   - Brought together government, regulators, insurers, and industry for a structured exchange of ideas in a neutral or 'safe' forum.
   - Demonstrated that collaborative "sandbox" environments can bridge knowledge gaps and reduce uncertainty, thereby driving more predictable licensing timelines and better commercial outcomes.
   - Established foundational insights to guide subsequent project stages.

1.5 Stage 1 Challenges and Recommendations

Since singling out specific challenges and recommendations while summarising them concisely fails to acknowledge the breadth of work accomplished during Stage 1 and risks misinterpretation, the Consortium encourages the reader to explore the details in section 4 of this Report.

Based on extensive dialogues, licensing simulations, and expert workshops, Stage 1 has identified 61 challenges to the licensing of RPO missions. The common themes among the challenges identified in the current regulatory framework are primary legislation, regulation and guidance that (1) have gaps or are not clear enough for RPO operators to understand how to comply (i.e., knowing what is expected in terms of evidence and demonstration, what is required, and what is acceptable) or (2) are not targeted and proportionate. There is especially uncertainty for RPO operators regarding the regulator's approach to safety assessments, as well as requirements associated with sustainability and security.

Some of the identified bottlenecks and uncertainties include:

- Challenges related to the interpretation of "operating a space object" under the SIA 2018 when the RPO operator physically controls the client spacecraft.
- Uncertainties over the scope of ALARP demonstrations in orbit, the applicability and scope of sustainability requirements, as well as key challenges with security regulations.
- Lack of guidance on how to handle indefinite or multi-service missions, on the regulator's involvement in RPO missions' operational decisions, and on expected information on customers and the client space objects.

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Stage 1 has identified more than 61 targeted recommendations for HMG and the regulator to strengthen the UK regulatory environment for RPO missions. The recommendations proposed are all aimed at providing a clear, transparent, proportionate and predictable regulatory framework. Some examples of recommendations are summarized below:

1. **Improve Clarity and Predictability**
   - Issue guidance confirming that the UK's existing framework, particularly section 1(4) of the SIA 2018, covers RPO missions under "operating a space object," while clarifying who is legally considered the operator and who merely has technical control.
   - Align primary, secondary legislation and guidance to provide clear and coherent obligations and requirements (e.g., RPO-specific requirements and information, mission-specific environmental assessments).
2. **Optimise Licensing Pathways**
   - Envelope-Based Licensing: Create a mechanism for awarding a single orbital operator licence that covers multiple prospective client satellites, provided each fits within an approved envelope.
   - Efficient Variations Process: Clarify where minor mission modifications (e.g., additional station-keeping burns) only require notification rather than a formal licence variation.
3. **Tailor ALARP for Orbital Risks**
   - Develop a specialised risk assessment methodology for in-orbit safety assessment.
   - Provide additional guidance akin to CAP 2220 that clarifies how licensees can demonstrate ALARP for RPO missions.
4. **Update Liability and Insurance Requirements**
   - Formalise variable liability caps so that sustainability-enhancing activities may benefit from lower indemnification limit or even zero liability caps.
   - Ensure that all insurance obligations align with statutory authority in SIA 2018 or OSA 1986, avoiding confusion over when or how third-party liability coverage is mandated and that clear guidance outlines conditions and approach in respect of RPO missions.
5. **Streamline National Security and Sustainability Assessments**
   - Clearly define a consistent threshold for what constitutes "national security impairment" or "issues" under SIA 2018, limiting the need for security managers or additional screening to missions with identifiable risk.
   - Translate international space debris mitigation guidelines (e.g., IADC, LTS) into clear licensing requirements—while ensuring that non-binding guidelines or best practice documents are not applied as if they were mandatory regulations unless supported by formal legislation.

1.6 References

The Table 1-1**Error! Reference source not found.** provides a list of references, including relevant international treaties, national laws, regulations, policies and guidance documents, used throughout this Report.

Table 1-1 References List

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Ref	Title	Reference, Issue, Date
OST	Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty)	OST
LC	Convention on International Liability for Damage Caused by Space Objects (Liability Convention)	LC
SIA 2018	Space Industry Act 2018	2018
OSA 1986	Outer Space Act 1986	1986
Regulations	Space Industry Regulations 2021	2021
CAP 2209	Applying for a licence under the Space Industry Act 2018	CAP 2209, Second edition, May 2024
CAP 2210	Guidance for Orbital Operator licence applicants and licensees	CAP 2210, Second edition, May 2024
CAP 2214	Working with the regulator as a licensee under The Space Industry Act 2018	CAP 2214, Second edition, May 2024
CAP 2217	Guidance on security matters for applicants and licensees	CAP 2217, Second edition, May 2024
CAP 2218	Guidance on insurance requirements and liabilities under the Space Industry Act 2018	CAP 2218, July 2021
CAP 2220	Principles and guidelines for the spaceflight regulator in assessing ALARP and acceptable risk	CAP 2220, July 2021
CAP 2221	The Regulator's Licensing Rules	CAP 2221, Third edition, May 2024
CAP 2535	Guidance on Cyber Security Strategies for applicants and licensees	CAP 2535, Second edition, November 2024
TQS	Technical Question Set - orbital operators	SRG 2228, V2.1, 16.02.2024

Table 1-3 provides a list of acronyms used throughout this Report.

Table 1-2 Acronym List

Ref	Meaning/Definition
ADR	Active Debris Removal
ALARP	As Low As Reasonably Practicable
AOCS	Attitude and Orbit Control System
CAP	Civil Aviation Publication (issued by the UK CAA)
CBA	Cost-Benefit Analysis
DRAMA	Debris Risk Assessment and Mitigation Analysis (ESA tool suite)
DSIT	Department for Science, Innovation and Technology
EIR	Environmental Information Regulations (2004)
ESA	European Space Agency
EU	European Union
FCC	Federal Communications Commission (USA)
FCDO	Foreign, Commonwealth & Development Office (UK)
FDIR	Fault Detection, Isolation and Recovery
GEO	Geostationary Earth Orbit
HMG	His Majesty's Government (UK)
IADC	Inter-Agency Space Debris Coordination Committee

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Ref	Meaning/Definition
IOD	In-Orbit Demonstration
IOS	In-Orbit Servicing
IOSM	In-Orbit Servicing and Manufacturing
ISAM	In-Space Servicing, Assembly and Manufacturing
ITU	International Telecommunication Union
LEO	Low Earth Orbit
LEOP	Launch and Early Orbit Phase
LTS	Long-Term Sustainability (of outer space activities)
LTAN	Local Time of the Ascending Node (used in Sun-Synchronous orbits)
MVP	Minimum Viable Product
NAC	Narrow Angle Camera (part of an RPO sensor suite)
Ofcom	Office of Communications
PMD	Post-Mission Disposal
RAAN	Right Ascension of the Ascending Node
RPO	Rendezvous and Proximity Operations
RSO	Resident Space Object (in orbit)
SPOUA	South Pacific Ocean Uninhabited Area (common target region for re-entry)
SARG	Safety and Airspace Regulation Group (within the UK CAA)
SSA	Space Situational Awareness
SSO	Sun-Synchronous Orbit
TMC	Target Mission Concept (as used in the sandbox context)
TPL	Third Party Liability
TQS	Technical Question Set
TT&C	Telemetry, Tracking, and Control

Table 1-3 Participants List

RPO Operator Consortium
Astroscale Ltd
ClearSpace Today Ltd
D-Orbit UK, Ltd
Regulators and Government
DSIT
CAA
UK Space Agency
OFCOM
Auxiliary Stakeholders
River Advisers
Willis Towers Watson
Satellite Applications Catapult
know.space

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2 Introduction

This Independent Report is the final deliverable of the Stage 1 of the Regulatory Sandbox (hereafter, the Sandbox) for Rendezvous and Proximity Operations (RPO) – a project jointly delivered by the RPO Operators Consortium (hereafter, the Consortium) composed of Astroscale, ClearSpace and D-Orbit, for the Department for Science, Innovation and Technology (DSIT), with the participation of the Civil Aviation Authority (CAA) and the United Kingdom Space Agency.

The content of this Independent Report, the challenges and recommendations are in the words of the Consortium. The publication of this Independent Report does not signal Government agreement or the formulation of policy. The UK government intends to explore the challenges and recommendations further.

2.1 Background

The DSIT Space Regulatory Review (2024), alongside feedback from the UK space sector, resulted in three key recommendations for improving the regulatory framework: **clarity, certainty, and confidence**. These elements are essential to fostering a robust and effective regulatory environment that aligns with the UK's ambitions to lead in innovative space activities. Without addressing these recommendations, both planned and anticipated RPO missions in the UK could face significant challenges, including but not limited to uncertainty regarding the ability to license certain RPO missions altogether or significant delays in the licensing process. In advance of any specific legislative changes focused on RPO missions, there is a need to develop policy, and best practice regarding technical assessments for potential SIA 2018 licence applications involving RPO, and whenever appropriate and necessary, well-drafted and complete guidance documents.

These efforts aim to enhance safety, sustainability, and competitiveness while fostering innovation in novel space activities. Although legislative changes are considered in exceptional circumstances and only when deemed crucial to ensure legal certainty, current efforts focus on near term improvements through regulatory sandboxes and cross-sector collaboration.

2.2 Legal, Regulatory, and Policy Context

The legal, regulatory, and policy context for Stage 1 of the Sandbox is rooted, first, in the UK's established legislative framework for space activities, including existing Acts of Parliament and secondary legislation, and existing government policy ensuring the prioritisation of RPO. This framework has evolved over time to address the growing complexity and diversity of space operations, including RPO missions. This existing framework serves as the foundational, state-of-the-art understanding upon which the work done during Stage 1 is built.

The key government policies driving and informing the needs of RPO operators in the UK are summarised as follows:

- **National Space Strategy (2021):** This policy outlines the UK's vision for space, emphasizing the importance of sustainable practices and the development of advanced space capabilities. It makes specific reference to in-orbit servicing and manufacturing (IOSM), now referred to as in-orbit servicing, manufacturing, and assembly (ISAM), and general policy on laying the foundations for leadership in emerging sectors.

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- **Space Industrial Plan (2024):** Building upon the National Space Strategy, this plan identifies ISAM as one of five strategic priorities for the UK, aiming to secure leadership in innovative global markets related to manufacturing and servicing in space.
- **Plan for Space Sustainability (2022)**: this initiative focuses on addressing the growing volume of space debris and promoting sustainable operations. It includes actions such as ISAM to prolong satellite lifespans and mitigate debris.

The key pieces of legislative framework that form the backbone of this regulatory environment are:

- **Outer Space Act (1986):** This act was the UK's original legislation for regulating space activities. It primarily focused on licensing satellite operations and ensuring compliance with international space law obligations.
- **Space Industry Act (2018):** This more recent legislation expanded the UK's regulatory capabilities to encompass a wider range of space activities, including launch operations from UK soil. It was designed to be more adaptive to emerging technologies and mission types.
- **Space Industry Regulations (2021):** These regulations provide detailed implementation and legislative requirements for the Space Industry Act 2018, covering various aspects of space operations, including safety and security, but not addressing RPO activities directly.

This legislative framework aims to provide a foundation for regulating innovative space activities like RPO missions.

2.3 Objectives

The Sandbox Stage 1 aims to address key regulatory challenges identified in the UK Space Regulatory Review 2024, with a focus on developing a clear, effective and predictable framework for licensing RPO missions. The objectives align with the original tender's goals and reflect the government's commitment to enhancing regulatory clarity and efficiency:

1. **Develop a Minimum Viable Product (MVP) for regulatory testing:** Create a basic framework to test and evaluate the current regulatory approach for RPO missions.
2. **Identify gaps in the existing licensing framework:** Analyse the legislation and current licensing process to pinpoint areas that need improvement or clarification for RPO missions.
3. **Build stakeholder confidence:** Engage collaboratively with stakeholders and use iterative refinement to ensure the regulatory approach meets industry and regulatory needs and expectations.
4. **Derive desired outcomes:** Develop specific recommendations to address the gaps identified, enabling government to explore them further through a prioritised approach, to strengthen the regulatory environment

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3 RPO Sandbox Scope, Approach & Implementation

3.1 Scope

The aim of Stage 1 of the RPO Sandbox is to produce a Minimum Viable Product (MVP), where the product is the Sandbox. The MVP consists of (1) a Target Mission Concept (TMC) (i.e., CONOPs, technical design, commercial and organisational parameters), (2) tailoring of TQS / licensing process (i.e., areas of interest and granularity), (3) an iterative simulation.

Stage 1 of the RPO Sandbox focused on:

- Agreeing the Minimum Viable Product (MVP) for the Sandbox and Defining a Target Mission Concept (TMC).
- Evaluating licensing requirements and identifying gaps and challenges in the current regulatory framework.
- Conducting initial risk assessments for safety, security, and sustainability and undertaking an iterative simulation of licensing process using the TMC.
- Using outputs from the regulatory and technical reviews, making recommendations for ways to improve the regulatory framework, addressing areas of uncertainty and streamline current challenges identified.

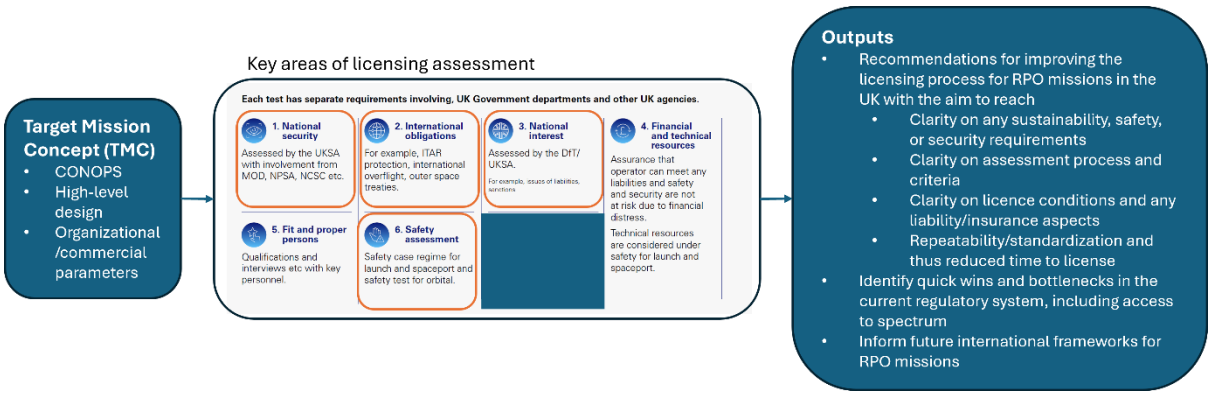

Figure 1: Overview of the scope and high-level methodology of the RPO Regulatory Sandbox

3.2 Methodology

The methodology applied during Stage 1 of the Sandbox is grounded in an iterative delivery model. This model involves continuous refinement and improvement through cycles of development and feedback, allowing for high flexibility and adaptability throughout the project lifecycle.

The iterative approach was structured around initial assessment periods, which evaluated both technical mission aspects and regulatory challenges to be addressed. This was complemented by a series of stakeholder engagement workshops focused on various thematic areas, designed to gather feedback and insights. Key milestones included the development and delivery of critical documents that defined project scope and objectives, culminating in a comprehensive final Report.

Building on this framework, the methodology incorporated several key activities. These included:

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- Collaboration with DSIT, CAA, and the UK Space Agency to define and test regulatory concepts.
- Simulations conducted by the Consortium to evaluate the applicability of the MVP.
- Stakeholder engagement to refine findings and validate approaches.
- Consultation with industry stakeholders to ensure relevance and buy-in of the MVP.

The methodology is visually represented in the figure below and is further detailed in this section.

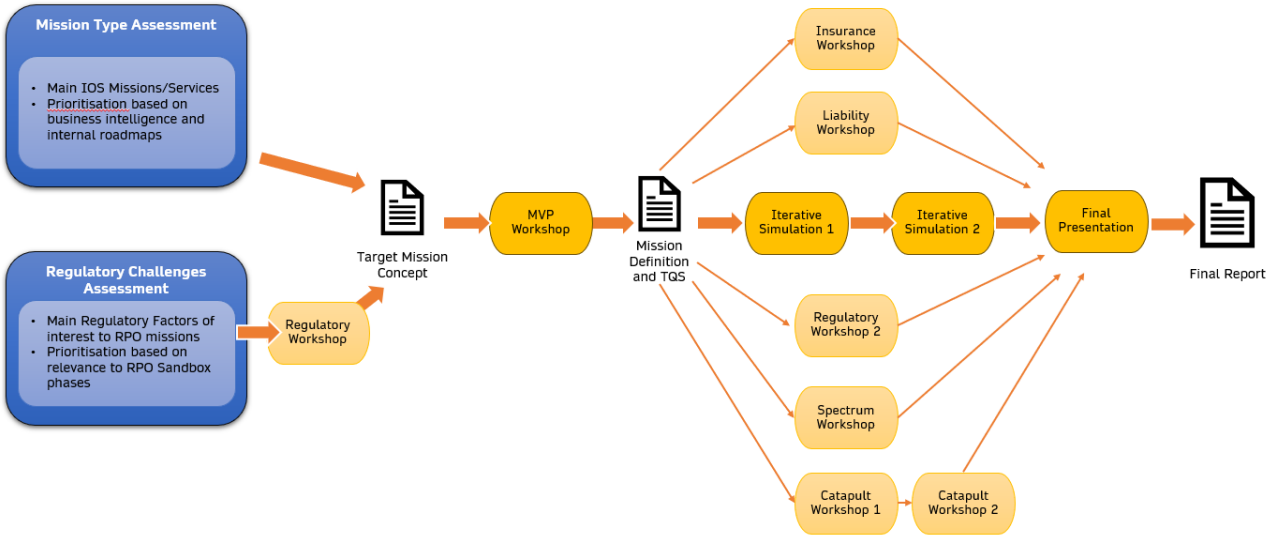

Figure 2: Detailed methodology of the RPO Regulatory Sandbox

To provide a vehicle for simulating the regulatory process for an RPO mission, a Target Mission Concept (TMC) was first developed. The selection of the features of the TMC was informed by two main assessments by the Consortium:

- **Mission Type Assessment** — This assessment examined the features and activities of RPO missions and considered technical feasibility, business focus and current opportunities. It formed an assessment of what the Consortium foresees as operations likely to be licensed and conducted by UK-based RPO operators in the medium term (5-10 years). The mission types were ranked and prioritised by the Consortium for inclusion in Stage 1.
- **Regulatory Challenges Assessment** — Concurrently, the Consortium examined Regulatory Challenges, i.e., challenges and uncertainties already identified by the Consortium, the Landscape Study, and stakeholders. These challenges were also prioritised based on relative relevance to the Stage 1. The Consortium selected factors to be focused on that were likely to become regulatory challenges in the medium term but could be feasibly addressed within the scope of Stage 1.

3.2.1 Regulatory Workshop 1

The Regulatory Challenges identified by the assessment were presented and discussed at the Regulatory Workshop 1, which brought together key stakeholders from the CAA, the UK Space Agency, and DSIT. This collaborative forum facilitated dialogue, gathered feedback on the selected challenges to address, confirmed their alignment with project objectives, and

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provided an opportunity to explore potential solutions and strategies for addressing them effectively.

3.2.2 Target Mission Concept

A fictitious Target Mission Concept was developed by the Consortium, specifically designed to test the UK licensing process for RPO missions. This concept was built on the findings from the Mission Type Assessment and the Regulatory Challenges identified during the Regulatory Workshop, focusing on the highest-priority mission types and activities, as well as the most relevant regulatory factors. The purpose of this simulated mission was to undergo a mock licensing process, which helped identify gaps in the current licensing framework and informed future improvements. By doing so, this exercise aimed to create opportunities for learning and provided guidance, enabling both RPO operators and regulators to gain valuable insights and establish clear, actionable guidance. Further details on the Target Mission Concept can be found in the Appendix.

3.2.3 MVP Workshop

The candidate MVP was then presented at a high level, examined and assessed at the MVP Workshop, with representatives from the Consortium, CAA, the UK Space Agency and DSIT. During the workshop, the technical and regulatory choices underlying the TMC were thoroughly justified, explaining the rationale behind each decision and how these choices would enable specific regulatory challenges to be evaluated.

3.2.4 Mission Definition and TQS

The selected TMC was further elaborated on by the Consortium, following typical early-phase mission design steps such as definition of the mission orbital profile and timeline, preparation of system budgets and definition of the preliminary spacecraft functional architecture.

To reduce the time required for preparation of the Iterative Simulation inputs, the Consortium reviewed the content of the TQS and assessed which sections and questions were particularly pertinent in the context of RPO. Additionally, the Consortium filtered the TQS questions by those which were deemed feasible to prepare a representative response within the short period allocated for preparation of the Iterative Simulation inputs. Both of these steps resulted in a subset of the TQS and ensured that the content prepared for the simulation was focused in the key areas for RPO missions.

The TMC was then prepared, with the content directed at addressing the selected subset of the TQS questions, and several specific areas identified in the Regulatory Workshop. Focus was given to the preparation of a preliminary space debris mitigation plan, with a compliance matrix to the IADC Space Debris Mitigation Guidelines. Additionally, the subphases and zones of safety employed during the RPO and docking mission phases were defined, and the main TMC mission risks and hazards identified and categorised. Following on from the risk identification and assessment, an outline process for the assessment of ALARP was also included for one of the identified risks, to demonstrate qualitatively how ALARP could be applied to orbital risks in principle.

The resulting TMC was then used as a basis for further workshops and discussions in the Sandbox. Generally, these were carried out as several parallel threads:

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- To carry out an interactive simulation process, where the TMC is evaluated by the regulators as if it were a licensing application for a real mission.
- To support Regulatory, Liability, Insurance, Spectrum and Catapult (industry feedback) Workshops.

The figure below shows an overview of the Target Mission Concept, which is detailed further in the Appendix, section 7.1.

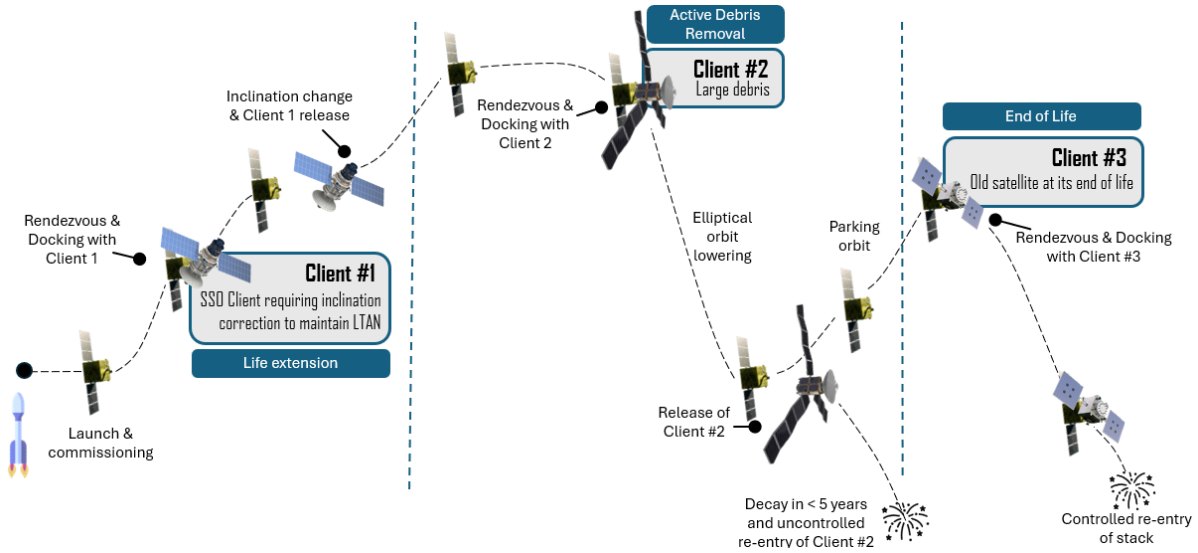

Figure 3: Target Mission Concept

3.2.5 Iterative Simulation Workshop 1

The purpose of the iterative simulation process was to simulate the licensing process applied to the TMC to highlight areas where the process, guidance and regulatory framework could be adapted or improved to streamline the licensing of RPO missions. The first Iterative Simulation Workshop focused on areas where the Consortium identified problems or potential improvements in the licence application process.

An overview of the TMC was presented at the Iterative Simulation Workshop 1, with representatives from the Consortium, CAA, the UK Space Agency and DSIT. Feedback from the CAA on the topics of safety, sustainability and responsibility with respect to the TMC mission definition was provided, with any key open questions or additional TMC design details identified and recorded as actions to be completed ahead of the second Iterative Simulation workshop. Overall, the CAA indicated that the TMC mission definition documentation provided as input to the workshop was largely sufficient in enabling an initial orbital operations licence application assessment to be made.

3.2.6 Iterative Simulation Workshop 2

The Second Iterative Simulation Workshop allowed a deeper examination of the key issues identified by the TMC and the preceding workshops. The regulator group presented their investigations and assessments of the several regulatory areas which were then discussed at the workshop. They provided more comprehensive feedback in the areas of national security, National Interest, and an example of the possible terms, conditions, monitoring and reporting

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requirements which could be placed on the TMC. This progressed the thinking and helped to formulate some of the recommendation outputs of the Sandbox.

3.2.7 Regulatory Workshop 2

The second Regulatory Workshop enabled conclusion on several requirements placed on the TMC, related to liability, safety, security, including national security, sustainability and third-party liability insurance licence conditions. The workshop also facilitated discussion of a selection of the Consortium's key recommendations from Stage 1 of the project, and to determine a path forward for addressing any remaining open points on these topics in Stages 2/3.

3.2.8 Liability Workshop

Liability implications of RPO missions were examined here, first with an overview of the current international liability framework to ensure a common understanding, then a presentation and discussion of the TMC to highlight potential transfers of liability and changes in risk during the mission. This included a discussion of the liability implications of non-nominal scenarios during RPO missions. The workshop also highlighted areas for further discussion, including but not limited to points of attachment and detachment of liability and responsibility, indemnities associated with different licensing frameworks and conditions applicable to the servicing spacecraft and client objects, and overlap or coexistence of commercial agreements between the RPO operators and customers, and State-to-State agreements/arrangements governing the international liability elements of an RPO mission.

3.2.9 Insurance Workshop

The Insurance Workshop examined liability and insurance considerations specific to RPO activities together with broker Willis Towers Watson (WTW) and a leading orbital-TPL underwriter. WTW provided an insurance perspective on insurability and key areas in the regulatory environment. WTW shared possible orbital TPL policy characteristics and common exclusions and provided its perspective on capacity in the market to insure such missions.

3.2.10 Spectrum Workshop

The Spectrum Workshop was led by River Advisers and highlighted some limitations of the ITU process, particularly with respect to RPO missions. It examined in particular the access to spectrum for RPO missions and considered the suitability of potential frequency band candidates for RPO.

3.2.11 Catapult Workshop 1: RPO Operators and Technology Manufacturers

The purpose of the Satellite Applications Catapult (Catapult) Workshops was to engage other industry stakeholders to discover their views on the UK space regulatory landscape. The first of these invited a group of providers or potential providers of systems, services or equipment to RPO missions, starting with a presentation of the TMC and then a focused set of discussions organised and moderated by Catapult. The suitability of the TMC was tested by asking participants to assess how well the TMC addressed their own RPO-related regulatory uncertainties and foreseen operational needs.

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3.2.12 Catapult Workshop 2: RPO Client Satellite Operators

The second Catapult workshop engaged operators interested in RPO servicing satellites. As before, the Consortium presented the TMC and the Catapult organised focused questions and discussions to understand the key issues and concerns facing RPO customers, and their expectations regarding being serviced in an RPO mission context. Feedback was sought from the participants on suitability of the TMC/MVP to address challenges from their perspective, particularly with regard to obtaining the necessary variation or approval to receive the services, particularly in the case of international missions.

3.2.13 Final Presentation and Report

The Final Presentation, and this Report, aimed to collate and summarise the discussions and findings developed in the preceding workshops. In particular, a set of recommendations was developed to clarify and streamline the licensing process for RPO missions.

3.3 Implementation

The Sandbox methodology outlined above was implemented in three main phases:

- **The Mission Concept Definition**:
  - This encompassed the All-Stakeholder Workshop, Regulatory Workshop 1, MVP Workshop, Liability Workshop 1 and the Spectrum Workshop. The main output of this stage was the preparation of all inputs delivered in preparation to start the iterative simulation.
- **Iterative Simulation:**
  - This part of the project included the Iterative simulation Workshops 1 and 2, and the Catapult 1 Workshop. The purpose of this phase was to continually develop the MVP and simulation inputs based on feedback from the stakeholders, including those in wider industry (outside of the Consortium).
- **Opportunities for Improvement:**
  - The final phase focused on clarifying and refining the discussions and outcomes of the earlier phases, to formulate the challenges and recommendations included later in Section 4. The phase included the Insurance Workshop, Regulatory Review Workshop 2, Catapult Workshop 2, and the Final Presentation.

The project was implemented between December 2024 and March 2025 with the timeline below:

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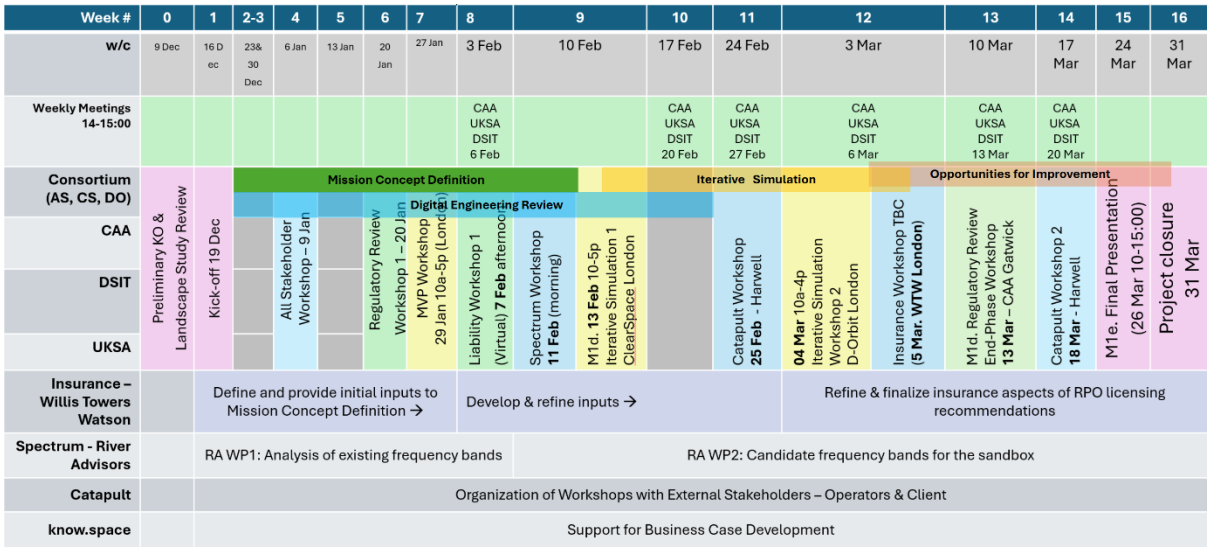

Figure 4: RPO Regulatory Sandbox Stage 1 timeline

3.4 Effective Sandbox Design and Execution

The activities performed during the Stage 1 of the Sandbox can be grouped into two related categories, each with its own lessons learned:

- **Sandbox design** — The first category of activities concerned the design of the Sandbox itself, which was essentially the design of the MVP, including the choice of a TMC and the tailoring of the licensing process to key areas of interest, and to agree this with all the stakeholder groups. The objective was to design an efficient tool to address regulatory challenges for RPO operators, which could be reused to address regulatory challenges faced by other novel space activities or innovative technologies (see Report section 3.4.1).
- **Sandbox execution** — The second category of activities concerned the execution of the Sandbox, with the aim of highlighting challenges faced by RPO operators and developing recommendations for improving the UK regulatory framework applicable to RPO missions (see Report section 4).

Because of the innovative nature of this first space Sandbox, the two groups of activities did happen sequentially, and the execution led to some refinement of the design. This agile approach enabled to cover newly identified challenges and ensure relevant areas of the regulatory framework were explored.

3.4.1 A Useful Tool to Address Innovative Space Technologies

During the Stage 1 of the Sandbox, a methodology and tools have been developed which have potential to be applied in other future space regulatory sandboxes. This section is intended to provide insight of how a process for a generic space regulatory sandbox could be defined and implemented, based on the lessons learned during the Sandbox.

Broadly, one of the key lessons learned which could be applied in future sandboxes in the space sector, is how multiple organisations which can be thought of as ‘competitors’, in terms of technology solutions, services and markets, can effectively collaborate within a consortium without infringement of their respective intellectual properties and commercially sensitive information. To achieve this, two main strategies were used: firstly, by creating a brand-new

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concept for the TMC, and not re-using any existing mission designs from any of the Consortium members, meant that any potential assumptions or company-specific solutions were not brought into the Sandbox unintentionally, and enabled the technical Consortium team members to collaborate without risk of compromise to their IP. Secondly, industry standard concepts and definitions were used where possible, e.g., the Consortium drew heavily from ESA documentation for the rendezvous and docking phase zone definitions and concept of operations, which avoided the TMC being more closely aligned with the actual mission designs of any one of the Consortium members vs. the others, and ensured the TMC would be broadly recognisable to wider industry stakeholders.

Another takeaway from the Sandbox process which could be applied in future sandboxes is the focus on prioritisation – due to the complex nature of the space legal and regulatory landscape, the number of regulatory factors which could have been addressed in the Sandbox MVP was boundless. Therefore, it was accepted that the Stage 1 TMC would only be able to address a sufficient, but not comprehensive number of these, and down-selection of the most pressing or potentially wide-ranging (in terms of applicability to several RPO mission types) regulatory factors was essential. This down-selection also meant that the TMC was largely defined with addressing these factors in mind and not driven by existing technology solutions or mission concepts.

A further recommendation for future sandboxes is to ensure the allocation of roles and responsibilities of all government stakeholders (and appropriate representatives with sufficient experience and authority) are understood and aligned before the sandbox activities commence.

In addition, the division of the Sandbox into different stages may well be a necessary approach for practical or budgetary reasons. That said, the acceleration of substantive activities like technical assessments and iterative simulations and the productions of recommendations within less than 3 months, as was the case in Stage 1, should not be the default model, with more time allocation an optimum. The timeframes allocated to the performance of any sandbox activities should be designed to allow consideration of subject matter and engagement from all stakeholders within the specified timeframes.

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4 Challenges and Recommendations

This section of the Report identifies a list of challenges identified in the current regulatory environment for RPO operators and presents the Consortium's recommendations for addressing those.

These are challenges and recommendations in the words of the Consortium. The publication of this Independent Report does not signal government agreement or the formulation of policy.

The common themes among the challenges identified in the current regulatory framework are primary legislation, regulation and guidance that (1) have gaps or are not clear enough for RPO operators to understand how to comply (i.e., knowing what is expected in terms of evidence and demonstration, what is required, and what is acceptable) or (2) are not targeted and proportionate. There is especially uncertainty for RPO operators regarding the regulator's approach to safety assessments, as well as requirements associated with sustainability and security.

The impact of these challenges to RPO operators is reflected in Section 6. However, to provide context for the list of challenges and recommendations, key impacts on RPO operators like those in the Consortium are summarised here. When terminology is unclear or when the scope of regulatory requirements or assessment principles are unclear, applicants spend resources interpreting or clarifying them with the regulator before or during the application process, adding unnecessary time and cost, and undermining confidence in compliance. These bespoke efforts impede the application of a transparent and consistent approach to assessment or compliance, hampering the development of competitive commercial markets.

Space missions have long development timelines and design choices made early need to take into account regulatory requirements. If those are unclear or new requirements are imposed later, this can have major consequences, leading to additional costs, delays, and potentially leading to the loss of business opportunities or even challenging an entire business case. This hampers the development of novel space activities, as it increases compliance risks and thus reduces the attractiveness for investment. The recommendations proposed are all aimed at providing a clear, transparent, proportionate and predictable regulatory framework for RPO missions in the UK.

The challenges identified here mirror those faced by regulators and operators in other industries, and the Consortium believe that its recommendations, if implemented, can help to achieve those regulatory policy aims identified in the recent government policy paper on *New approach to ensure regulators and regulation support growth* updated 31 March 2025.

For each challenge identified, the recommendations of the Consortium are presented in a table format categorising them along the following three dimensions:

1. Whether the recommendation involves changes in policy (POL), primary legislation (PRI), secondary legislation (SEC), or guidance (GUI).
2. Whether the recommendation would improve transparency, clarity and predictability mostly for RPO operators (RPO), or for all satellite operators (ALL).
3. Whether the Consortium considers the recommendation needs to be refined in future Sandbox stages (TBR), might be refined in future Sandbox stages (MBR), or is ready for implementation (RFI).

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As those categories are not clear cut, the Consortium has had to make categorisation choices and thus recommends the reader looks at the details of the challenge and recommendation to understand its exact implications.

4.1 Legislative Framework

The Space Industry Act 2018 (SIA 2018) is the primary legislation regulating all spaceflight activities carried out in the United Kingdom. This includes space activities, sub-orbital activities, and associated operations, according to section 1(1) of the Act.

Section 1(2), in its turn, states that "[f]or the purposes of this Act, a person carries out a space activity or sub-orbital activity if the person **causes it to occur** or is **responsible for its continuing**."

Under section 1(4) of the SIA 2018, a "space activity" is defined as: "(a) launching or procuring the launch or return to Earth of a space object or an aircraft carrying a space object, **(b) operating a space object**, or (c) any activity in outer space." Although the SIA 2018 defines "space activity" broadly, it does not distinguish IOS, ADR, or other RPO missions as separate categories of space activity.

Section 2(1) of the SIA 2018 is clear that the "regulator must exercise the regulator's functions (…) with a view to securing **public safety**." Ensuring public safety is a fundamental duty of the regulator and it has priority over the application of subsections (2) and (3) in section 2 of the Act. In addition, the regulator must consider several factors, including the safety and interests of persons involved in or affected by spaceflight, the requirements of those carrying out space activities, environmental objectives, national security, international obligations, and space debris mitigation guidelines. If conflicts arise between these considerations, the regulator must apply them in a reasonable manner, balancing all provisions, ensuring public safety has priority.

The Outer Space Act 1986 (OSA 1986), as an Act of Parliament and primary legislation, still applies to space activities carried out overseas by UK entities. That includes the procurement of the overseas launch of a space object, where the procurement takes place in the UK, and the operation of a space object in orbit from an overseas facility by a UK entity.

The SIA 2018 is supported by a statutory instrument in the form of the Space Industry Regulations 2021 (Regulations), that set out in more detail the requirements for each licence, and the Regulator's Licensing Rules (Licensing Rules), which specify which application form to use to apply for a licence and what information the regulator requires of an application.

The Consortium has identified several challenges directly related to legislation. The areas identified are presented in the table below together with recommendations from the Consortium.

Legislative framework			
	Challenge	**Recommendation**	**Cat.**
1.	**Characterisation of RPO missions within section 1(4) of the SIA 2018:** There is uncertainty regarding the characterisation of RPO missions within the existing scope of application of the primary legislation. While section	The Consortium recommends that: • **HMG** ensures that RPO missions fall under the scope of section 1(4)(b) of the SIA 2018, which relates to "operating a space object."	GUI RPO RFI

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Legislative framework			
	Challenge	**Recommendation**	**Cat.**
	1(4)(c) of the SIA 2018 broadly covers "any other activity in outer space," and section 1(4)(b) covers "operating a space object," which in principle could both include RPO missions, the Act and associated regulations do not explicitly address RPO mission types. This could create confusion about whether and how these activities are encompassed within the current licensing framework. The lack of clarity leaves operators uncertain about the appropriate licence category under which RPO missions would fall, as well as the specific regulatory obligations they must fulfil.	• **the regulator** clarifies in guidance that RPO missions are covered under the existing framework for operating space objects.	
2.	**The meaning of carrying out a space activity within section 1(2) and "operating a space object" within section 1(4)(b) of the SIA 2018**: There is uncertainty regarding the exact meaning of section 1(2) and its impact on the concept of "operator." It states that a person "carries out a space activity (…) if the person causes it to occur or is responsible for its continuing." A possible interpretation could be that customers procuring RPO services are seen as "causing the operation of the servicing spacecraft to occur," thereby potentially subjecting them to licensing requirements for the procurement of such services. This interpretation would be neither sensible nor reasonable, as it would imply that customers are responsible for the servicing spacecraft, even though they do not exercise control over the servicing spacecraft's operations. In addition, section 1(4)(b) could present a challenge for RPO missions as it is unclear what it means to "operate a space object." More specifically, how this applies to RPO operators when they obtain physical control over a customer's space object when the	The Consortium recommends that: • **HMG** and **the regulator** clarify in guidance the concept of "operating a space object" and who is deemed an "operator" according to the SIA 2018. • **the regulator** issues guidance with the precise meaning of the term "operating a space object" under section 1(4)(b) of the SIA 2018 confirming that RPO operators should not be deemed to be "operating" the client object. • **the regulator** adopts guidance clarifying the interpretation of section 1(2) that only the licensed RPO operator is considered to be "causing the space activity to occur" or "responsible for its continuation." • **the regulator** adopts guidance aligning interpretations of section 1(2) and section 1(4)(b), reinforcing that the entity subject to licensing is the one with the final decision-making authority over the space activity's operations.	GUI RPO RFI

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Legislative framework			
	Challenge	**Recommendation**	**Cat.**
	objects are stacked together. While an RPO operator may have physical control over the client spacecraft, it will not hold the ultimate decision-making authority and jurisdiction control over it which will always remain with the customer. This lack of clarity in sections 1(2) and 1(4)(b) could lead to confusion regarding the responsibilities and obligations of operators.		
3.	**"Orbital operator licence" not defined in the SIA 2018 and Regulations**: Throughout the SIA 2018 three core types of licence are identified: operator licence, spaceport licence, and range control licence. Following the commencement of the SIA 2018, it was recognised that different types of operators would require tailored licensing approaches. Five specific licences are now recognised: launch operator, return operator, orbital operator, spaceport licence, and range control licence. However, while legislation defines most of them, the "orbital operator licence" remains undefined in both the SIA 2018 and the Regulations. This omission, combined with the use of overlapping and sometimes conflicting terminology within the legislation, creates uncertainty for operators "operating a space object" (orbital operators) regarding the specific requirements they need to comply with.	The Consortium recommends that: • **the regulator** clarifies in guidance that RPO operators require an "operator licence," in accordance with the SIA 2018. • **the regulator** clarifies in guidance any requirements associated with an "operator licence" where the space activity being licensed is the operation of a space object (section 1(4)(b)).	GUI RPO RFI
		The Consortium recommends that: • **HMG** ensures that consistent terminology is used across legislation, eliminating overlaps or contradictory terms. • **HMG** considers the inclusion of the definition of an "orbital operator licence" in the Regulations, with clearly specified requirements applicable to the operation of a space object.	SEC ALL TBR
4.	**RPO customer information:** The law is silent on any requirements on the RPO operator to provide the regulator with any information regarding the customer and the client space object. In other words, the primary legislation and the Regulations do not establish any requirement for the operator to furnish the regulator with any information that,	The Consortium recommends that: • **HMG** develops RPO policy to clarify any specific information to be provided in respect of customers. • if any information on client and client object is essential for assessing the application, **HMG** considers amending the relevant legislation to include this requirement formally.	POL SEC RPO RFI

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Legislative framework			
	Challenge	**Recommendation**	**Cat.**
	at this stage, the regulator might deem important to its assessment. It is unclear from the regulatory framework the extent to which customer information will be relevant to the licensing assessments or required to be provided as part of the application process.		
		The Consortium recommends that: • **the regulator** recommends in guidance that RPO applicants provide it voluntarily.	GUI RPO RFI

4.2 The Licensing Process

A fundamental feature of the UK's legal framework for spaceflight activities is its outcome-based approach to authorisation and licensing. As a result, the UK regime is flexible, allowing prospective operators freedom in planning their missions. However, this flexibility also means that the responsibility falls largely on the operator to demonstrate compliance with the regulator's general principles and assessment criteria for licensing. Below, the Consortium provides an overview of this process and its requirements.

Section 8 of the SIA 2018 sets out several general matters that apply to all orbital operators, including RPO operators, to obtain a licence. Firstly, under sections 8(1) and 8(2), the regulator may grant a licence **if it thinks fit**, and only if satisfied that doing so:

- will not impair the **national security** of the United Kingdom,
- is consistent with the **international obligations** of the United Kingdom,
- is not contrary to the **national interest**.

In addition, according to section 8(3) of the SIA 2018, the regulator may not grant a licence unless it is satisfied that:

- the operator has the **financial and technical resources** to do the things authorised by the licence and is otherwise a **fit and proper person** to do them,
- the persons expected to do, on the applicant's behalf, any of the things authorised by the licence are fit and proper persons to do them.

If the regulator is not the Secretary of State, the regulator may grant a licence under the SIA 2018 **only with the consent of the Secretary of State**. In the context of section 8(4) of the SIA 2018, "Secretary of State" refers to a senior government minister responsible for the relevant department, that is, someone who holds overall responsibility for spaceflight policy.

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Pursuant to section 16(1) of the SIA 2018 and according to regulation 3 of the Regulations, the CAA has been appointed as the UK's spaceflight regulator. This means the CAA is responsible for assessing, granting, and licensing space activities. Although the appointed regulator, it is known that the CAA relies on inputs from other HMG stakeholders when performing the duties attributable to it by law.

Section 8(4) ensures that, even though the CAA acts as the regulator, it cannot issue a licence without the formal consent of the Secretary of State. This allows the government to intervene where broader topics, such as national interest, national security, or international obligations, are at stake.

Section 9 of the SIA 2018 sets out several core safety requirements that apply to all operators seeking a licence. These provisions are designed to ensure that licensed activities protect both individuals involved in spaceflight activities and the wider public. Firstly, under section 9(1), the regulator may only grant a licence if satisfied that the safety requirements in sections 9(2) to 9(4) have been met.

In addition, section 9(4) of the SIA 2018 requires the regulator to be satisfied that the applicant has taken all reasonable steps to ensure that risks to the health, safety, and property of members of the public (people not directly involved in the spaceflight activity) are as low as reasonably practicable. Furthermore, the level of any residual risk must still be acceptable to the regulator. National security, international obligations, national interest, financial and technical resources, fit and proper persons, and safety, which are generally referred to, including by the CAA, as the **legislative tests**[2], are considered during the assessment of the licence application by the regulator and will be elaborated further in following dedicated sections of this Report. In this context, "legislative tests" refer to the specific statutory requirements set out in the SIA 2018 that both the regulator and licence applicants must satisfy for a licence to be lawfully granted. These tests function as legal benchmarks, ensuring that any approved space activities align with the statutory requirements set out in the Act. For the regulator, legislative tests define the core criteria that must be carefully evaluated before a licence can be issued.

4.2.1 Applying for an Operator Licence

The general process for applying for a licence is outlined in Applying for a Licence under the Space Industry Act 2018 (Guidance document CAP 2209) and Guidance for Orbital Operator Licence Applicants and Orbital Operator Licensees (Guidance document CAP 2210). Various guidance documents are provided to support licensees throughout the application process.

Much of the information provided in the application is in response to the "assessment questions" in the Technical Question Set (TQS) contained in the application form for orbital operator licences.

The regulator will only grant a licence if it is satisfied that the operator possesses the necessary resources, skills, and capabilities to carry out the space activity safely and effectively. To determine this, the regulator will evaluate the operator's responses to the TQS against the

[2] Assessments of environmental effects is also a legislative test under the SIA 2018. However, Section 11 applies to a spaceport licence and/or an operator licence authorising launches of spacecraft or carrier aircraft, not the operation of a space object.

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assessment principles of **safety, security, responsibility**, and **sustainability**, detailed further in CAP 2210.

The assessment principles (also referred to as assessment criteria) in the guidance documents serve as a structured framework to guide both the prospective operator and the regulator in navigating the licence application process. They help establish a clear, reasoned approach to the assessment. However, these principles are not statutory or regulatory requirements themselves. Instead, they are derived from the legislative tests set out in the Acts and the requirements in the Regulations, which are largely shaped by the UK's international obligations.

In addition to the core application process for an orbital operator licence outlined above, RPO operators can use the Traffic Light System (TLS). The TLS is an optional, interactive, and non-binding pre-application process offered by the regulator free of charge. It consists of a series of questions about the applicant's business and proposed space activities. Based on the responses, the regulator provides prospective licensees with a pre-application red/amber/green rating and basic feedback.

The Consortium has identified several challenges related to the licensing process summarised above. The challenges identified are presented in the table below together with recommendations from the Consortium.

Licensing process and scope			
	Challenge	**Recommendation**	**Cat.**
5.	**Unclear role of different HMG stakeholders in the licensing process**: As some assessments are carried out by other HMG stakeholders rather than the CAA, this can lead to differing interpretations or additional requirements to be introduced by some stakeholders during the licensing process, causing unnecessary delay and complexity. The Consortium felt this was particularly apparent during the Sandbox in relation to the sustainability assessment and the liability risk assessment.	The Consortium recommends that: • **HMG** clearly defines and outlines the role of each government stakeholder supporting the licensing process. • **HMG** ensures that any non-regulatory involvement remains strictly advisory and proportionate, within the constraints of the applicable legislation. HMG stakeholders, other than the Secretary of State, should not impose additional requirements beyond what is explicitly authorised by law. • **the regulator** minimises its reliance on HMG stakeholders where they do not have direct legislative authority over the licensing process. • **the regulator** strengthens its internal expertise and personnel to effectively carry out its regulatory functions and assessments, for example in respect of sustainability	POL ALL RFI

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Licensing process and scope			
	Challenge	**Recommendation**	**Cat.**
		assessments and liability risk assessment.	
6.	**Understanding "national interest:"** Section 8(2)(c) of the SIA 2018 states that the regulator may only grant a licence if it is satisfied that doing so is "not contrary to the national interest." However, no guidance or policy defines what constitutes "national interest." While the regulator has discretion in deciding whether to grant a licence, with final approval subject to the Secretary of State's consent, the absence of a clear definition creates legal and regulatory uncertainty for operators. This uncertainty is particularly problematic for RPO missions, which often involve multiple parties across different jurisdictions.	The Consortium recommends that: • **HMG** and **the regulator** clarify internal policy on assessing whether a space activity is "contrary to the national interest" under section 8(2)(c). • **HMG** and **the regulator** recognise that space activities aligning with key national strategies, such as the UK's National Space Strategy and Space Industrial Plan, including ISAM, should not presumptively be regarded as contrary to the national interest.	POL RPO RFI
		The Consortium recommends that: • **the regulator** provides in guidance a general description and explanation of the purpose of section 8(2)(c) and the legislative test of "national interest." • **the regulator** ensures and provides in guidance that the assessment under section 8(2)(c) is evidence-based, rather than subjective or arbitrary.	GUI RPO RFI
7.	**Licensing space activities involving the servicing of client objects not identified at the time of licensing:** RPO missions are often designed to carry out repeated servicing of multiple client spacecraft over extended periods—10 years or more. It is likely that not all client spacecraft will be identified at the time of the initial licence application or when the licence is granted. There is no clear process or guidance for how the regulator would approach this scenario, nor is it clear what licence conditions might apply to	The Consortium recommends that: • **the regulator** recognises in guidance the need to provide RPO operators with the ability to service future client objects within the scope of an existing licence. • **the regulator** develops an 'envelope of acceptable parameters', such as mass, orbit, physical characteristics, and service type, within which the operation of the servicing space object can be carried out and would be reflected in the licence.	GUI RPO RFI

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Licensing process and scope			
	Challenge	**Recommendation**	**Cat.**
	allow to permit additional client spacecraft servicing after the licence is issued.	• **the regulator** recognises in guidance that new client objects falling within the pre-approved envelope could be serviced as part of the licensed space activity with no formal licence variation to be required. • **the regulator** recognises that the licensed RPO operator is only required to notify the regulator of new client objects through an appropriate monitoring mechanism.	
		The Consortium recommends that: • the envelope of parameters and notification process is explored in greater detail in **Stage 2**.	GUI RPO TBR
8.	**Uncertainty around licence variations for RPO missions:** RPO mission licences may require multiple changes over the lifetime of the mission, from changes in mission parameters to additional client spacecraft, or operational adjustments (see recommendation #7. However, it is unclear what types of change would trigger the need for a formal licence variation under section 15 of the SIA 2018. There is no clear guidance on the process, timeline, or criteria the regulator would apply to assess such variations. This uncertainty creates operational and commercial risks for RPO operators, who need flexibility to respond to in-orbit contingencies, adjust mission profiles as technology or market conditions evolve.	Subject to the implementation of recommendation #7, the Consortium recommends that: • **the regulator** clarifies in guidance that the variation process should not be triggered by minor operational adjustments or changes that do not significantly impact safety, security, or compliance with legislative requirements. • **the regulator** ensures that where a variation is deemed necessary, it adopts a streamlined, efficient process that minimises administrative burden and operational delays. This process should focus on flexibility to accommodate changes such as the addition of client spacecraft (if recommendation 6 is not adopted and section 15 is deemed necessary), changes to major operational parameters, or amendments to the mission CONOPS, provided these do not conflict with the core safety and regulatory requirements.	GUI RPO RFI

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Licensing process and scope			
	Challenge	**Recommendation**	**Cat.**
		The Consortium recommends that: • instances of potential changes to RPO mission parameters outside the licensed envelope are explored in Stage 2 and the applicability and suitability of the licence variation process is assessed.	GUI RPO TBR

4.2.2 High Level Structural Considerations

Most of the challenges and recommendations in this Report respond to the current legal and regulatory framework, but the Consortium has also identified several higher levels, structural issues that could be addressed to make the UK a more attractive place for licensing RPO missions. Those challenges and recommendations are presented in the following table.

Higher level structural approach			
	Challenge	**Recommendation**	**Cat.**
9.	**Fragmented regulatory framework:** The existence of two primary pieces of legislation, the OSA 1986 and the SIA 2018, alongside the Regulations, creates unnecessary legislative complexity. The legislation is not always fully aligned, particularly regarding defined terms and in some cases, scope. This patchwork approach presents certain challenges for operators to navigate, and interpret, particularly for operators of innovative missions, such as RPO, which do not neatly fit into the existing definitions, licences, and regulatory requirements.	The Consortium recommends that: • **HMG** considers consolidating[3] the statutes. • **HMG** and **the Secretary of State** use the opportunity arising from the Sandbox to assess whether the Regulations require significant changes or amendments, as highlighted in this Report. • **the Secretary of State** continues to work on a review process[4] for the provisions within the Regulations in line with regulation 287.	PRI SEC ALL MBR
10.	**Discretionary nature of licensing decisions:** Section 8(1) of the SIA 2018 grants the regulator broad discretion to issue licences "if it thinks	The Consortium recommends that: • **HMG** issue clear, publicly available policy and guidance focusing and outlining how the regulator will apply	GUI ALL RFI

[3] Consolidation in this context would involve re-enacting the laws currently contained within the OSA 1986 and SIA 2018 into a single, coherent statute, effectively tidying up the legal framework governing space activities in the UK. This consolidation would not materially alter the law but would provide clearer, more efficient legal structuring for spaceflight activities.
[4] If the amendments are substantial, the Regulations may be subject to a thorough affirmative procedure.

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Higher level structural approach			
	Challenge	**Recommendation**	**Cat.**
	fit." While this flexibility allows the regulator to make case-by-case decisions, it introduces a degree of legal uncertainty for space operators in the UK. Operators face challenges in planning and investing in their missions without a clear understanding of the criteria or conditions that might lead to approval or rejection.	the legislative tests under section 8(1). This guidance should ensure operators have as much information as possible to assess the likelihood of their proposed missions being successfully licensed. • the policy states that while the regulator's primary concern is public safety, the regulator will exercise its discretion taking into account the UK's commitment to fostering private space activities as a driver of economic growth and innovation.	
11.	**The dual-approval structure:** The dual-approval structure established in section 8(4) of the SIA 2018, which requires the Secretary of State's consent for the granting of space activity licences by the CAA, may create regulatory uncertainty and delays, especially for innovative space activities like RPO missions. This "dual approval" structure creates a scenario where even after satisfying the regulator's technical and safety requirements, an operator might see its application rejected due to a political or strategic veto from the Secretary of State. Although the CAA, as the appointed regulator under regulation 3, possesses the technical expertise necessary for assessing and granting licences, the requirement for additional consent from the Secretary of State introduces a layer of government oversight.	The Consortium recommends that: • **HMG** ensures that the CAA's role as the appointed regulator under regulation 3 is fully exercised and effectively carried out, so that the licensing process functions as intended and does not create unnecessary legal uncertainty. While the Secretary of State retains a consent function under section 8(4) of the SIA 2018, decisions made by the regulator, after thoroughly assessing the proposed space activity in line with its legal obligations, should not be subject to reversal in a way that undermines regulatory certainty for operators.	POL ALL RFI
12.	**Limited value of the Traffic Light System (TLS) for innovative missions**: While the TLS provides a red/amber/green rating and basic feedback, its value for innovative missions, such as RPO, is minimal. One of the key challenges with the TLS is that it does not allow for a meaningful	The Consortium recommends that: • **the regulator** reformulates the TLS to better serve the specific needs of RPO missions and provide the regulator with early insights into the most uncertain aspects of an RPO mission, helping to identify potential issues early in the process.	GUI ALL RFI

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Higher level structural approach			
	Challenge	**Recommendation**	**Cat.**
	or comprehensive discussion between the operator and the regulator. With its current structure, which limits responses to only 2000 characters per question and focuses on a narrow set of topics, the TLS does not seem to facilitate a detailed exploration of the complex issues likely to arise during the full licensing application process for RPO missions. The TLS does not provide the depth or clarity needed to inform future steps effectively, and although the TLS serves as an early engagement tool, it ultimately adds time to an already lengthy licensing process without contributing to a more streamlined or informative pathway to the full application. The disconnect between the TLS outcomes and the full application process creates inefficiencies, as operators and regulators may find themselves revisiting and readdressing the same issues.	• **the regulator** adapts the TLS to serve as a pre-assessment for key legislative tests, such as national security and national interest, which are critical for RPO missions licensing. • **the regulator** recognises and adopts the feedback from the TLS, which albeit non-binding, should, at the very least, inform the subsequent full application process[5].	

4.3 The Assessment Principles for Orbital Operator Licences

As briefly outlined above, when assessing applications for an orbital operator licence, the regulator will apply four core assessment principles: safety, security, sustainability, and responsibility. The assessment principles serve as a guide for both operators and the regulator in evaluating the licence application against legislative and regulatory requirements.

4.3.1 Safety

Section 9 of the SIA 2018 identifies the core principles relating to safety. According to section 9(1) of the SIA 2018, the regulator must not grant a licence unless satisfied that the requirements in subsections 9(2) and 9(4) are met.

Section 9(2) of the SIA 2018 requires an applicant to carry out an assessment of the risks to the health and safety of individuals who are to take part in a prescribed role or capacity in the

[5] If the answers provided during the TLS phase remain consistent in the full application, there should be no need for a full reassessment of those issues, reducing time and complexity in the overall licensing process. A new assessment of national security or national interest should only be necessary if there are substantial changes to the mission parameters, such as differences in the parties involved or changes to the client space objects.

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activities authorised by the licence (a “risk assessment”). This risk assessment must meet prescribed requirements.

Section 9(4) of the SIA 2018 states that, regarding the risks to the health, safety, and property of persons who are not acting in a prescribed role or capacity, the applicant must take all reasonable steps to ensure that those risks are as low as reasonably practicable (ALARP), and that the level of those risks is acceptable.

The ALARP principle is a core concept in UK health and safety law and is widely used across various industries as an approach to managing health and safety risks. In the context of orbital space activities, the regulator does not prescribe a specific method for demonstrating ALARP, leaving it to the applicant’s discretion. CAP 2220 (*Principles and guidelines for the spaceflight regulator in assessing ALARP and acceptable risk*) provides guidance to support consistent and transparent decision-making by the regulator’s staff by setting out the principles that underpin the regulator’s view on acceptable levels of residual risk and providing guidelines on whether a licence applicant has met the requirements to reduce risks ALARP.

When determining whether a risk level is acceptable, the regulator considers several key factors. These include policy goals, ensuring that the applicant has taken all reasonable measures to reduce operations risks to ALARP; legal principles, which prioritise safety in decision-making; comparisons with other sectors, aligning risk tolerance with other launching State and spacefaring nations; and an assessment of public concern regarding the risks involved.

According to CAP 2220, assessing whether risks have been reduced to ALARP requires evaluating the risk to be avoided, the sacrifice in terms of cost, time, and efforts involved in mitigating that risk, and a comparison of the two. It is understood this is typically measured against established “good practice.” In cases where no such standard exists, particularly for novel missions such as RPOs, the applicant is expected to implement risk reductions measures until the cost of further mitigation becomes grossly disproportionate to the additional reduction in risk. However, there is no definitive guidance on what constitutes “gross disproportion” or a specific algorithm for making this determination. There is also no expectation that applicants provide a detailed cost-benefit analysis as part of their licence application. Instead, the regulator bases its assessment on the severity of potential safety risks, with the principle that the higher the risk, especially when human health and safety are concerned, the greater the cost-benefit ratio can be before further mitigation is deemed grossly disproportionate.

The ALARP principle does not impose an absolute duty; rather, what is considered reasonably practicable depends on circumstances and requires a proportional approach to risk reductions. A control measure would not be deemed reasonably practicable if the risk it mitigates is insignificant compared to the cost of implementing the measure, as established in case law in England and Wales.

Based on guidance, ALARP is demonstrated through the responses to the TQS, a safety assessment, and any supporting evidence provided to the regulator.

Challenges identified with the legislation and applicable guidance are identified in the table below together with recommendations from the Consortium.

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Safety			
	Challenge	**Recommendation**	**Cat.**
13.	**Risks to the health and safety of individuals who are to take part in a prescribed role or capacity:** Section 9(2) of the SIA 2018 requires applicants to carry out an assessment of the risks to the health and safety of individuals who are to take part in a prescribed role. For orbital operators, this includes the accountable manager and, where national security issues are identified, the security manager. Although an obligation under the statute, the prescribed requirements of the risk assessment to be conducted are left to the Regulations. However, the Regulations focus on human occupants, crew members, and spaceflight participants (regulations 32 and 33), with no clear, tailored requirements for assessing risks to prescribed roles for orbital operations. It is unclear what is expected in terms of risk assessment for prescribed roles and what information must be submitted to the regulator.	The Consortium recommends that: • **the regulator** provides clear guidance acknowledging that, in the absence of clear secondary legislation establishing prescribed risk assessment requirements for prescribed roles in orbital operations, operators can comply with section 9(2) of the SIA 2018 with a simple statement that there are no particular risks to the health and safety of individuals who are to take part in a prescribed role.	GUI ALL RFI
14.	**Safety case requirement**: §3.3-4 of CAP 2210 introduce confusion regarding the requirement for a "full safety case" for "novel, complex or especially dangerous operations." The term "safety case" is defined in the Regulations, with specific requirements associated to it, and is only applicable to launch and return operations. According to regulation 29(1), "[o]n making an application **for launch operator licence or a return operator licence**, an applicant must provide the regulator with a safety case (…)." However, the SIA 2018 is silent on the concept of a safety case for orbital operations. Section 19(1) delegates the power to establish safety requirements to the Regulations, explicitly extending such safety regulations to mission	The Consortium recommends that: • **The regulator** updates CAP 2210 reflecting the distinct regulatory treatment of orbital operations compared to launch and return operations. The updated guidance should clarify that: • orbital operators are not required to submit a "full safety case" to satisfy the safety assessment in section 9 of the SIA 2018. • the legal requirement for a safety case, as defined in regulation 29(1) of the Regulations applies exclusively to launch and return operators.	GUI ALL RFI

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Safety			
	Challenge	**Recommendation**	**Cat.**
	management facilities. Despite this, the current Regulations do not set out any specific safety case requirements for orbital operations. Schedule 3 of the Act outlines what the Regulations should cover but stops short of creating obligations for orbital operators to submit a full safety case. This gap creates significant uncertainty for RPO operators, particularly given the language in CAP 2210, which implies that a full safety case might be expected for novel missions such as RPOs. The lack of legal clarity raises questions about whether orbital operators must prepare a formal safety case, even though the statutory framework does not require one.	• the safety assessment requirements for orbital operators are distinguished from the safety case.	
15.	**Definition of "novel, complex or dangerous"**: It is unclear whether all, or only certain, RPO missions are considered by the regulator as inherently "novel, complex or dangerous." This classification appears to trigger a heightened safety assessment that goes beyond the TQS (§3.3-4 of CAP 2210; see challenge #13). However, CAP 2210 lacks a clear, consistent definition of what constitutes "novel, complex, or dangerous" in the context of orbital operations. This ambiguity leaves operators uncertain about whether their missions will face additional regulatory requirements and, if so, what those requirements entail. Moreover, without a clear definition, the regulator's determination risks becoming subjective and inconsistent.	The Consortium recommends that: • **the regulator** maintains the position clarified during the Sandbox that the regulator's default position is not to assume all RPO activities are considered "novel, complex or dangerous," requiring a safety assessment that goes beyond the TQS. • **the regulator** explicitly defines in guidance what mission characteristics indicate an RPO mission is novel, complex or dangerous.	GUI RPO RFI
		The Consortium recommends that: • **the regulator** explores whether this classification should be abandoned entirely. Instead, the TQS could be revised to better align with the ALARP demonstration required under section 9(4) of the SIA 2018. A revised TQS could incorporate a more comprehensive safety assessment structure, that is, one that reflects legislative requirements	GUI RPO RFI

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Safety			
	Challenge	**Recommendation**	**Cat.**
		directly rather than relying on an ambiguous classification. • further work is carried out in Stage 2 to develop recommendations on revising the TQS, ensuring operators are equipped to meet legal safety obligations without unnecessary interpretation or extended negotiation with the regulator.	
16.	**Proportionality of using ALARP for orbital operations:** While the ALARP principle is a well-established feature of UK health and safety law, its application to orbital operations raises significant concerns about proportionality and practicality. Unlike terrestrial high-risk industries, where ALARP is supported by detailed, prescriptive requirements in legislation that streamline the demonstration of compliance, orbital operations face a regulatory landscape that lacks such clarity. This leaves operators often to interpret what "reasonably practicable" means for their specific missions, often resulting in prolonged discussions with the regulator and extensive, bespoke justifications that may not meaningfully improve safety outcomes. In addition, orbital operations do not present high risk to the health and safety of people in a similar way that risky industries on the ground like nuclear energy or offshore oil and gas do, where ALARP is more traditionally applied. The absence of physical human presence in most orbital missions, and the high degree of automation involved, further reduces the relevance of applying	The Consortium recommends that: • **HMG** considers legislative changes to the SIA 2018 to implement the exclusion of activities under section 1(4)(b) (operating a space object) from the scope of ALARP section 9(4)[6]. • **HMG** considers the adoption of clear, prescriptive requirements in secondary legislation to define how safety should be demonstrated for RPO missions.	PRI SEC ALL MBR
		The Consortium recommends that: • **the regulator** adopts clear guidance regarding the ALARP's application to orbital operations, tailored to ensure transparency and proportionality, if the exclusion of ALARP for activities under section 1(4)(b) (operating a space object) is not feasible or deemed inappropriate. This should include detailed guidance on how ALARP is to be demonstrated (for RPO missions) setting out specific, practical parameters that would be sufficient for the demonstration of what constitutes a "reasonable" safety measure.	GUI ALL RFI

[6] The Consortium recognises that the SIA 2018 encompasses all spaceflight activities, including both launch and orbital operations, and does not recommend the removal of ALARP from the legislative framework altogether. ALARP remains an appropriate and effective principle for higher-risk activities, particularly launch, where public safety considerations are paramount.

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Safety			
	Challenge	**Recommendation**	**Cat.**
	ALARP in the same manner. This disconnect creates an undue compliance burden on operators, one that may not be proportionate to the actual risks posed by orbital operations. The lack of prescriptive guidance tailored to orbital operators compounds this issue, making it harder for operators to demonstrate that risks have been reduced to ALARP without resorting to exhaustive and unnecessary safety measures and discussions with the regulator.		
17.	**Scope of ALARP demonstration for RPO**: The lack of clear guidance on applying the ALARP framework to orbital operations has created uncertainty for RPO activities, particularly in relation to the following: • **Risk scope**: section 9(4) of the SIA 2018 is clear about "risks to the health, safety and property of persons." However, it is unclear which specific risks to health, safety, and property of persons associated with RPO missions should be considered within the ALARP framework. RPO missions are fundamentally different from standard orbital operations because they involve interactions with space objects of other parties, such as rendezvous and docking. The risks associated with these interactions, particularly the potential risks to third-party space objects, would likely fall under the scope of section 9(4), which addresses risks to, for example, third-party property. However, the legislation was not designed with RPO missions in mind, and as a result, it is unclear where the ALARP framework applies and where its boundaries lie. For instance, while risks to third-	The Consortium recommends that: • **the regulator** clarifies in guidance how the ALARP framework applies to RPO missions, confirming that only first-order risks are considered, and non-safety risks are excluded. **First order risks**: These risks refer to the direct risks to health, safety, and property of persons, including the client space object. First-order risks primarily concern the first-party damage, which means the direct damage or harm caused to other operators' spacecraft or crew, or to the client spacecraft, or to persons or property on the ground during re-entry of the servicing spacecraft. These risks should form the core of any ALARP assessment, as they are directly linked to the licensed space activity. **Second order risks**: Second-order risks arise as a consequence or materialisation of first-order risks. These are indirect risks or damages that occur as a result of an incident or event but are not directly caused by the initial event (first order risk). For example, if damage to a spacecraft leads to a cascading effect resulting in a cloud of debris or further damage to	GUI RPO RFI

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Safety			
	Challenge	**Recommendation**	**Cat.**
	party property could be understood as risks of damage to client's spacecraft in orbit, what about damages to other parties arising from damage to the client spacecraft being serviced? It is uncertain whether such risks would fall under "risks to third-party property," and this ambiguity complicates the risk assessment for RPO operators. • **Risk acceptability**: It is unclear how the regulator will assess what level of risks is deemed acceptable for RPO missions under the ALARP framework. For instance, it is unclear what criteria will be used to evaluate whether risk mitigation efforts are adequate and proportionate to the risks involved. This lack of clarity creates challenges for RPO operators in demonstrating that they have met the necessary safety standards and mitigated risks appropriately for the specific nature of their missions.	other space objects, this would be considered a second-order risk. **"Non-safety" risks**: Non-safety-related risks, such as those concerning security or sustainability (e.g., space environmental risks), should be excluded from the ALARP assessment and instead addressed within their relevant assessment frameworks, where ALARP is not required. These considerations could be examined as part of a separate sustainability assessment, ensuring that operators are not required to apply the ALARP framework to risks that do not directly affect the health, safety, or property of individuals. These environmental and sustainability risks are often difficult to quantify and manage within the same parameters as safety-related risks, making their inclusion in the ALARP framework inappropriate Finally, the Consortium recommends that further work is undertaken in Stage 2 to provide specific recommendations for revising the TQS for RPO activity ALARP demonstration.	
18.	**ALARP demonstration when there are internationally agreed-upon quantitative thresholds of acceptability:** The ALARP principle is a key element of UK health and safety law, but its application to orbital operations, such as RPO missions, can be complex and burdensome due to the lack of prescriptive requirements or guidance. The reliance on subjective "good practice" for demonstrating compliance leads to uncertainty and additional costs for operators, especially when no internationally recognised standards exist for novel missions like RPOs. Where internationally accepted quantitative	The Consortium recommends that: • **the regulator** adopts guidance explicitly recognising internationally agreed-upon quantitative thresholds for safety of space operations are sufficient to satisfy the ALARP requirement under section 9(4) of the SIA 2018. These thresholds reflect the current state of the art in space safety and, if formally recognise, would significantly streamline the ALARP demonstration process, reducing regulatory burden. • **HMG** and **the regulator** engage with industry before adopting such thresholds.	GUI ALL RFI

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	Challenge	**Recommendation**	**Cat.**
	thresholds of acceptability already exist, particularly in spacefaring nations, these could simplify the ALARP process. By aligning the UK regulatory framework with these global standards, operators could more easily demonstrate compliance, reducing ambiguity and streamlining the licensing process. This approach would also ensure consistency with international best practices and help prevent competitive disadvantages for UK operators.	• **the regulator** adopts in guidance that if an operator's risk estimate exceeds these established thresholds in guidance, only then additional justification would be required (ALARP demonstration).[7] However, if the estimate is below these thresholds, no ALARP demonstration should be required. For example, the Consortium recommends that: • **the regulator** adopts guidance that explicitly recognises an internationally accepted threshold of 10^{-4} for the re-entry casualty risk of the servicing satellite.	
19.	**Scope of assessment of risk in Technical Questions Set**: The TQS contains several sections requiring an assessment of the risks, but there is a lack of clarity on the specific scope of these assessments. Based on discussions and current understanding, the intended scope is that within the provisions in section 9(4) of the SIA 2018, which focuses on risks to the health, safety, and property of persons (both in space and on the ground). However, this raises questions regarding the treatment of risks specific to the mission itself, such as operational or technical risks that do not	The Consortium recommends that: • **the regulator** updates the TQS to focus on questions around safety necessary to comply with section 9(4). • **the regulator** updates the TQS to solely to support the parties in providing the necessary information to fulfil the statutory and regulatory obligations, notably on safety of the space activity.	GUI ALL RFI

[7] The Consortium believes that making a hard requirement from thresholds in internationally agreed upon guidelines would go against the ALARP principle and would create legal uncertainty. While the CAA can deny a licence based on such a threshold, that decision would be open to challenge. In the context of casualty risk, for instance, the regulator must consider an ALARP demonstration rather than treating 10^{-4} as an absolute cutoff. It is reasonable for assessments to align with internationally accepted guidelines, but this should not override the ALARP approach and only facilitate ALARP demonstration. If a mission's casualty risk exceeds 10^{-4}, the regulator should not automatically reject the application. Instead, if the operator demonstrates that further mitigation would be grossly disproportionate, this should be taken into account. The interaction between ALARP and risk thresholds remains unclear, leading to regulatory uncertainty. While a threshold may serve as a useful benchmark, it does not replace ALARP. In some cases, a mission may slightly exceed the threshold, yet reducing risk further could require grossly disproportionate cost, time, and effort. Without a clear legal requirement, rigidly applying a threshold risk undermining ALARP demonstration.

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	Challenge	**Recommendation**	**Cat.**
	directly impact persons or property. It is currently unclear whether such mission-specific risks are to be included in the assessment, or whether they are considered out of scope unless they directly relate to the health, safety, or property of third parties as outlined in Section 9(4).		
20.	**Guidance for safety risk assessment and ALARP for in-orbit risks**: CAP 2220 provides guidance for risk assessment and ALARP for ground-based risks for assessing launch, return or spaceport applications. However, it explicitly excludes "risk assessment for human participants under section 9(2) of the Space Industry Act (the Act), or in-orbit risk (e.g. risk of collisions)".	The Consortium recommends that: • **the regulator** updates guidance on the ALARP demonstration for risks to health, safety and property of persons in orbit, in accordance with section 9(4).	GUI ALL RFI
21.	**Applicability of ALARP demonstration to safety risks associated with the client spacecraft after release**: Many RPO missions' concepts involve the release of the client spacecraft after servicing. It is not clear whether any safety risk materialising after this release should be considered.	The Consortium recommends that: • in line with recommendation #17, second-order risk is out of the scope of the ALARP demonstration.	GUI RPO RFI
22.	**Applicability of ALARP to second order effects:** Section 9(4) requires risks to third parties to be minimised to ALARP and deemed acceptable — but only for risks arising directly from the licensed space activity itself, such as the operation of the servicer spacecraft. It remains unclear whether ALARP extends to second-order effects, like debris generated from a collision causing further damage. Expanding ALARP to such indirect consequences risks creating an endless mitigation burden that is disproportionate and		

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Safety			
	Challenge	**Recommendation**	**Cat.**
	goes beyond the intent of the legislation.		
23.	**Timeframe for consequences of risks:** As hazards arising from risks in space mission can have an impact realised a significant time after the hazard condition arises, it is unclear for operators how to bound the assessment of risk.	The Consortium recommends that: • **the regulator** provides clear guidance specifying a defined timeframe for assessing risks associated with safety of space activities. • **the regulator** clarifies in guidance that assessment of risk should be time-bound, ensuring that operators are not required to evaluate consequences indefinitely but have to do so within a reasonable and proportionate period relevant to the nature of the hazard. • **the regulator** clarifies in guidance that the assessment of safety risk is intended to capture risks where the consequence of risk occurs in a defined timeframe after risk condition occurs, whereas longer term impacts are covered under the sustainability assessment.	
24.	**Recommended methodology, technique and tools for quantitative assessment of risk:** The assessment of safety risk requires the use of tools and techniques to quantify risk and support assessment of likelihood and impact. Operators will use their preferred tools and methods, which may not be acceptable to regulators.	The Consortium recommends that: • **the regulator** provides guidance on accepted tools and techniques in this respect.	GUI ALL RFI
25.	**Safety manager requirement**: §5.40 of CAP2210 notes that the regulator has “discretion to require a licensee to appoint someone to fulfil a particular role if [they] believe it is necessary for the operation(s)” and provides the example of a “safety manager”. However, there is **no** legislative requirement for orbital operators to have a safety manager. It is unclear	The Consortium recommends that: • **the regulator** acknowledges and clarifies in guidance the lack of legislative basis to require an orbital operator to have a safety manager.	GUI RPO RFI
		The Consortium recommends that: • if **the regulator** or **HMG** believe a role akin to a safety manager is required for RPO missions, that	SEC RPO MBR

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Safety			
	Challenge	**Recommendation**	**Cat.**
	whether the regulator would believe such role is necessary for RPO missions, and if that is the case, what the role of a safety manager for an RPO mission is.	such a role is created based within the powers granted to the regulator in primary legislation, and that such role, its tasks and responsibilities, are clearly outlined in secondary legislation and, subsequently, in supporting guidance.	
26.	**Meaning of Technical Questions Set terms for bespoke operations:** Some of the terms used in section 4 of the TQS, for examples mission categories, are unclear and have varying interpretations between operators and regulators. Moreover, there is no clear link between the mission categories and any regulatory requirements.	The Consortium recommends that: • **the regulator** updates the TQS to provide definitions of the terms used for the bespoke operations in section 4. • **the regulator** ensures that the TQS is structured and, if necessary, amended to clearly outline the information from operators to demonstrate compliance with legislative and regulatory obligations. Questions within the TQS should be explicitly linked, whenever possible, to the relevant legal or regulatory requirement.	GUI RPO RFI

4.3.2 Sustainability

Firstly, there are no international binding instruments on space debris mitigation or the sustainability of space activities. In the UK, according to §5.13 of CAP 2210, the primary goal of the sustainability principle is to ensure that any activities the regulator licenses today will not compromise the ability of subsequent generations to embark on activities to meet their own requirements in the future.

The Guidelines for the Long-Term Sustainability of Outer Space Activities (LTS Guidelines) of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) define the long-term sustainability of outer space activities as “(…) the ability to maintain the conduct of space activities indefinitely into the future in a manner that realises the objectives of equitable access to the benefits of the exploration and use of outer space for peaceful purposes, in order to meet the needs of the present generations while preserving the outer space environment for future generations.” The UK, as an endorsee of the LTS Guidelines, broadly adopts such interpretation when assessing sustainability for the licensing of space activities in the UK.

According to §5.14 of CAP 2210, the regulator views sustainability as inherently linked to safety and security: while safety and security focus on mitigating the impact of the space activity on the operations of existing spacecraft, sustainability aims to reduce its long-term impact on the space environment and as a result, future space operations.

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It is important to highlight that, although there are no specific legislative provisions or regulations focused solely on space debris mitigation (and remediation), similar to those on safety, the SIA 2018, in section 2(2)(h) states that the regulator must exercise its functions in a way that "**takes into account any space debris mitigation guidelines issued by an international organisation in which the government of the United Kingdom is represented.**"

Moreover, the section 8(2)(b) states that regulator may grant a licence "**only if satisfied that doing so is consistent with international obligations of the United Kingdom**" (see Section 4.3.5 of this Report). Such international obligations may require the UK to impose specific sustainability requirements onto its licensed operators in the future.

All in all, the primary legislation and applicable guidance associated with sustainability was found to be unclear in the areas identified in the table below together with recommendations from the Consortium.

Sustainability			
	Challenge	**Recommendation**	**Cat.**
27.	**Assessment based on space debris mitigation guidelines under SIA section 2(2)(h)**: Section 2(2)(h) of the SIA 2018 requires the regulator to "take into account" space debris mitigation guidelines issued by international organisations in which the government of the United Kingdom is represented. However, the meaning of "take into account" in this context is unclear. This phrase typically means that the decision-maker must "consider" the relevant factors, but it does not require them to necessarily follow or adopt them. This leaves ambiguity over how the regulator is expected to apply these guidelines and whether licensed operators must directly adhere to them. Moreover, the TQS suggests that applicants should describe how their mission has considered, implemented, and is adhering to guidelines, including some that are not published by international organisations in which the UK government is represented. This adds further confusion, as the law only imposes the obligation on the regulator to take into account the guidelines, not on the operators to adopt them. The challenge is compounded by	The Consortium recommends that: • **the regulator** clarifies in guidance that the IADC Guidelines is the only document presently considered under section 2(2)(h) and that no other space debris mitigation guidelines issued by international organisations in which the UK is represented are indirectly incorporated into the regulatory framework. • **the regulator** clarifies in guidance how it will "take into account"[8] the space debris mitigation guidelines, specifically outlining the legal status of the IADC Guidelines in the licensing framework and the consequences of non-adherence for applicants. • **if the regulator** intends to consider organisations other than the IADC as an "international organisation in which the government of the United Kingdom is represented" under section 2(2)(h), it should issue guidance clearly identifying those organisations and what space debris mitigation guidelines need to be considered.	GUI ALL RFI

[8] This wording, when interpreted in line with established legal principles of statutory construction, indicates an obligation to consider such guidelines, not to enforce them as binding requirements.

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Sustainability			
	Challenge	**Recommendation**	**Cat.**
	inconsistent approaches observed between the regulator and other government entities, such as the UK Space Agency, in terms of what is expected from operators in relation to space debris mitigation and sustainability. Additionally, there is uncertainty around what constitutes "an international organisation in which the government of the United Kingdom is represented," further complicating the interpretation of the section and the responsibilities of both the regulator and the operators.		
28.	**Schedule 1, 1(g) of the SIA 2018:** Section 2(2)(h) of the SIA 2018 requires the regulator to exercise its functions in a way that it considers best calculated to "take into account" space debris mitigation guidelines issued by an international organisation in which the government of the United Kingdom is represented. However, Schedule 1 of the Act, which outlines conditions that may be included **in licences**, contains a broader reference in 1(g), stating that conditions may be imposed regarding compliance with "space debris mitigation guidelines." The lack of alignment between these provisions creates uncertainty about which space debris mitigation guidelines the regulator is required to consider in its decision-making process, and which can be imposed as **binding conditions in a licence**. This ambiguity raises concerns for operators regarding regulatory expectations, the basis for compliance requirements, and the extent to which international guidelines may be treated as enforceable obligations rather than discretionary considerations.	The Consortium recommends that: • **the regulator** clarifies in guidance that the space debris mitigation guidelines that can be applied as conditions in the licence under Schedule 1, 1(g) of the SIA 2018 are the same as those considered under section 2(2)(h) of the SIA 2018. • **the regulator** clarifies in guidance that any compliance requirements related to space debris mitigation guidelines under Schedule 1, 1(g) of the SIA 2018 are intended to apply as ongoing requirements during the licensed activities, rather than conditions for obtaining a licence.	GUI ALL RFI
29.	**Sustainability requirements and assessment criteria**: The SIA 2018 does not include any explicit reference to sustainability, and §§5.13-17 of CAP 2210 provide only high-level guidance	The Consortium recommends that: • if **the regulator** or other **HMG** stakeholders wish to prioritise space debris mitigation and space sustainability as a matter of policy,	POL ALL RFI

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Sustainability			
	Challenge	**Recommendation**	**Cat.**
	on the expectation that licensed activities should be conducted sustainably. However, neither the primary nor secondary legislation establishes a legal basis for specific sustainability requirements or mandates. In this context, CAP 2210 and the TQS include several questions related to sustainability in the launch, operations, and sustainability sections, but it remains unclear: On what legal basis the regulator will assess whether an applicant's mission is sustainable, and whether any specific frameworks, standards, or minimum criteria will be applied. How applicants are expected to assess and quantify the impact of their mission on the orbital environment. The absence of clear legal requirements leaves significant uncertainty for operators. As the regulator must act within the bounds of its legislative mandate, the imposition of sustainability-related requirements, beyond those supported by the primary or secondary legislation, raises concerns about regulatory overreach and legal certainty.	this must be pursued through the appropriate statutory framework. This could include amending the SIA 2018 to introduce specific provisions on sustainability, akin to the safety provisions, or explicitly empowering the creation of statutory instruments that outline detailed sustainability requirements – none of which are enshrined in legislation at the moment. While it is acknowledged that the regulator and Secretary of State retain considerable discretion in assessing licence applications, this flexibility must be balanced with the need for legal and regulatory certainty. Without a clear legislative foundation, sustainability-related requirements risk undermining transparency, consistency, and the overall effectiveness of the UK's licensing framework for RPO activities. • **the regulator** clearly states in guidance that the sustainability assessment is based solely on information provided in response to the TQS and on the IADC Guidelines. • **the regulator** adopts guidance to explicitly reflect this, ensuring operators understand which sustainability frameworks are considered relevant, taken into account, and subject to being added as licence conditions, and that any additional expectations must derive from a clear legal mandate.	
30.	**Compliance with the LTS Guidelines:** The TQS suggests that applicants should describe how their mission has considered, implemented and is adhering to the LTS Guidelines. However, these international guidelines apply to States rather than operators, and operators cannot implement or demonstrate adherence to them.	The Consortium recommends that: • **the regulator** updates the TQS and any guidance it provides to operators to remove references to a need for operators to demonstrate implementation or adherence to the LTS Guidelines as these do not apply to operators.	GUI ALL RFI

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Sustainability			
	Challenge	**Recommendation**	**Cat.**
		The Consortium recommends that: • if **HMG** considers the UK commitments made under the LTS Guidelines as insufficiently implemented in the current regulatory regime, HMG develops policy for such implementation into requirements for UK-licensed operators by means of legislation, which can be demonstrated as part of the licensing process.	POL ALL RFI
31.	**Interpretation and verification of IADC guidelines:** The IADC guidelines have been developed to broadly cover typical space operations. Applying them to RPO missions, which involve interacting with space objects already in orbit, requires some interpretation. Moreover, as they are guidelines and not requirements, they typically use vaguer language, and no verification method is provided. This creates uncertainty as to the acceptable RPO missions' design and operations, and unnecessarily complexifies the licensing process.	The Consortium recommends that: • **the regulator** adopts in guidance interpretation and verification methods of the IADC Guidelines for RPO missions. • such interpretation and verification methods are developed in collaboration with the regulator in Stage 2 of the Sandbox.	GUI ALL TBR
32.	**Applicability of non-binding "sustainability instruments" based on SIA section 8(2)(b):** Section 8(2)(b) of the SIA 2018 requires the regulator to ensure that licensed activities "are consistent with the international obligations of the United Kingdom." However, it remains unclear what constitutes an "international obligation" for the purposes of this provision, particularly regarding sustainability. The obligation outlined in this section is for the regulator to be satisfied with, not a direct legislative requirement on the operator. There are concerns that **non-binding instruments**, such as the Zero	The Consortium recommends that: • **the regulator** and other **HMG** stakeholders recognise that any non-binding instrument the UK supports should first undergo policy development and legislative consideration before it informs regulatory requirements. This ensures that commitments arising from international engagements are translated into targeted, proportionate, and predictable requirements in statute for orbital operators, preserving legal certainty and preventing the imposition of *de facto* obligations beyond the regulator's statutory mandate. • **the regulator** adopts internal guidance to clarify which instruments are considered binding international obligations and which	POL ALL RFI

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Sustainability			
	Challenge	**Recommendation**	**Cat.**
	Debris Charter,[9] are being interpreted as international obligations and applied as though they carry binding legal force, resulting in unclear and inconsistent requirements for orbital operators. From a legal perspective, an "international obligation of the UK," properly interpreted, refers to obligations arising from treaties, conventions, and other formal agreements that have been ratified or otherwise accepted by the UK as legally binding. Non-binding instruments, such as guidelines, charters, international MOUs, or voluntary commitments, do not meet this threshold unless they are expressly incorporated into law or secondary legislation. The Consortium has observed disagreements with the regulator and other HMG stakeholders over what constitutes an international obligation. This creates significant legal uncertainty for operators, who may face expectations to comply with non-binding principles without a clear legal mandate. The challenge lies in ensuring that sustainability instruments not intended to create binding obligations, whether developed by international organisations, industry coalitions, or other states, are not misinterpreted as legally enforceable requirements within the UK licensing regime.	are non-binding, with the latter treated as best practice rather than regulatory requirements.	

[9] Although the UK is a signatory to the Zero Debris Charter, it is an aspirational, non-legally binding instrument. The Consortium firmly maintains that the UK's signature does not create an international obligation to adopt the Charter's provisions verbatim. Under international law and domestic legal principles, non-binding instruments, even when endorsed by the UK, do not, on their own, translate into binding obligations unless incorporated into UK law through the appropriate legislative processes.

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Sustainability			
	Challenge	**Recommendation**	**Cat.**
33.	**Lack of legislative mandate for environmental assessments for orbital operators**: Section 11(1) of the SIA 2018 explicitly limits the requirement for an assessment of environmental effects to spaceport licences and operator licences authorising launches of spacecraft or carrier aircraft. By extension, there is no legislative basis for mandating environmental assessments for orbital operations, including RPO missions. Any guidance suggesting otherwise lacks statutory authority and risks creating unnecessary confusion and complications in the licensing process. Moreover, §5.17 of CAP 2210 refers to the Secretary of State's Guidance to the regulator on environmental objectives, noting that this "may also have to be taken into account" for certain orbital missions. However, this guidance was specifically developed for spaceports and launches, leaving its relevance to RPO missions unclear. It remains ambiguous whether the regulator intends to apply this guidance to RPO missions, on what legal basis, and whether any specific UK policy exists to inform such decisions.	The Consortium recommends that: • **the regulator** updates CAP 2210 to reflect that the Secretary of State's guidance on environmental objectives applies only to spaceports and launch operations, thus eliminating the ambiguity for orbital operators. • **the regulator** avoids referencing government guidance intended for the regulator in its guidance aimed at applicants but instead reformulate it to clearly communicate what operators need to demonstrate.	GUI ALL RFI

4.3.3 Security

The security assessment principle contains three main components, according to §5.20-32 of CAP 2210. The first component is related to **national security,** in accordance with section 8(2)(a) of the SIA 2018. This involves assessing whether activities may give rise to issues of national security. Section 23(1)(a) of the SIA 2018 states that "Regulations (referred to in this Act as "security regulations") may make provision for the purpose of ensuring security in relation to spaceflight activities (…)." Regulation 10(2) of the Regulations states that if the activities to be licensed may give rise to any issues of national security the regulator must require the appointment of a security manager as a licence condition. This requirement triggers several further requirements including security risk assessments and a security programme.

The TQS and a security questionnaire are used to evaluate this, and CAP 2217 explains that, depending on the applicant's answers, further engagement with relevant HMG stakeholders and cross working between them will be required. The Consortium understands such stakeholders may include the UK Space Agency, the Department for Science, Innovation and

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Technology (DSIT), the Department for Transport (DfT), and the Foreign, Commonwealth and Development Office (FCDO).

The second component of the security assessment is the **physical security** requirements. According to §5.23-26 of CAP 2210, this ensures that licensed activities are secure from external interference that could affect safe performance, adhering to UK national security requirements and not actively interfering with peaceful use and exploration by others. CAP 2217 outlines that these security requirements are primarily covered in the Regulations Part 11, which sets out regulations focusing on space sites, role and requirements for security managers and space site operators.

The third component is **cyber security**, covered in more detail by Guidance document CAP 2535, which states that SIA 2018 requires all licensees to provide a cyber security strategy pursuant to Regulation 185.

Challenges identified with the security related legislation and applicable guidance are identified in the table below together with recommendations from the Consortium.

Security			
	Challenge	**Recommendation**	**Cat.**
34.	**Uncertainty around national security provisions in the SIA 2018:** A key challenge arises from the uncertainty in section 8(2)(a) of the SIA 2018, which states that the regulator may grant a licence only if satisfied that doing so "will not impair the national security of the United Kingdom." The criteria, indicators or characteristics of a mission or activity that impinges on national security are not provided. This uncertainty is compounded by the fact that section 23(1)(a) of the SIA 2018 allows for the creation of security regulations, which may provide additional provisions to ensure security in relation to spaceflight activities. However, there is no clear guidance on what specific national security issues the regulator will consider or what constitutes a sufficient demonstration of security compliance for operators. Further complicating the situation is the lack of transparency regarding the process by which the regulator evaluates national security risks, as security regulations have not been fully defined or implemented. This leads to potential inconsistencies in how national security is assessed across different space missions and could create barriers to the development of	The Consortium recommends that: • **the regulator** provides guidance giving an indication to RPO operators of criteria and indicators that will be used to assess whether a proposed mission or activity may **impair** national security. While the Consortium recognises that publishing such guidance may raise national security concerns, the need for clarity and predictability in the regulatory framework for non-governmental, commercial space activities is paramount. National security concerns should be addressed in a way that balances the need for confidentiality with the broader goal of enabling a thriving commercial space sector in the UK. • **the regulator** takes a flexible and pragmatic approach to achieve this balance, while adhering to the legal requirements under the SIA 2018.	GUI ALL RFI

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Security			
	Challenge	**Recommendation**	**Cat.**
	space activities in the UK. The Consortium acknowledges the challenges posed by the uncertainty surrounding section 8(2)(a) of the SIA 2018. As the threshold for this provision is high, referring to activities that could **impair** national security, it is essential to provide clarity on how the regulator interprets this provision. The legal definition of impair generally means to weaken or damage something in a significant way. Therefore, the activities in question would need to pose a genuine and substantial threat to national security to meet this standard.		
35.	**Scope and requirements of the cyber security strategy:** There is no mention or reference to cyber security in the statute. Chapter 3, regulation 185(1) establishes that "[a] licensee must draw up and maintain a cyber security strategy for the network and information systems ("the systems") used in relation to **spaceflight operations** for which it is responsible. However, it does not specify the content of the strategy or provide sufficient guidance on meeting these obligations. The Regulations define "spaceflight operations" as spaceflight activities, range control services, activities associated with spaceflight activities and range control services and activities associated with launch vehicles and their payloads. Also, Guidance CAP 2535 states that regulation 185 applies to all licensees under the SIA 2018. However, although defined in the SIA 2018 to encompass the operation of space objects, "spaceflight activities" does not seem to consider orbital operations in Regulations. This ambiguity creates significant challenges and confusion for the RPO operators during the licensing process, as it remains unclear whether any requirements in regulation 185 would apply to orbital operations, including RPOs.	The Consortium recommends that: • **the regulator** confirms the legal basis to request a cyber security strategy, in line with regulation 185, for orbital operations. • if a lack of legal basis is identified, **HMG** ensures that cyber security requirements in regulation 185 specifically apply to orbital operations. • **HMG** considers adding detail and specific requirements on cyber security strategy in regulation 185.	SEC ALL MBR
		The Consortium recommends that: • **the regulator** amends CAP 2535 to outline in more detail, the information required to be included in the cyber security strategy, including whenever possible, specific aspects associated with RPO missions and how RPO operators can demonstrate compliance with regulation 185.	GUI ALL RFI

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Security			
	Challenge	**Recommendation**	**Cat.**
36.	**Scope of cyber security risk assessment:** The operations of RPO missions may involve a link to the client spacecraft ground systems to coordinate operations efficiently, such as a sharing of telemetry or orbital data. It is unclear whether or to which extent the ground systems of the operator of the client spacecraft need to be assessed as part of the cyber security assessment.	The Consortium recommends that: • **the regulator** clarifies in guidance that, generally, provided that the interfaces with the ground systems of the operator of the client spacecraft are sufficiently protected, the client ground systems are out of scope of the cyber security risk assessment. However, such risk assessment would cover the above-mentioned interfaces.	GUI RPO RFI
37.	**Requirements associated with a space site:** The SIA 2018 defines a "space site" as encompassing "a mission management facility." As a result, a control centre from which an RPO mission, or any other mission, is operated is considered a space site, thus triggering the need to comply with numerous Part 11 regulations that were not designed to be applied to orbital operations. The Consortium does not consider Part 11 suitable, proportionate or effective to orbital operators due to the nature of the requirements set out therein, which, in many instances, far exceeds reasonable requirements and make the operation of space objects from the UK and compliance with the security regulations, particularly regarding regulations on space sites, extremely difficult. The Consortium believes to be unreasonable to expect the same security measures to apply to both spaceport and a mission management facility used for the operation of space objects.	The Consortium recommends that: • **HMG** promotes and ensures the Regulations explicitly exclude orbital operators, or mission management facilities used by orbital operators to operate space objects from the United Kingdom, from any Part 11 requirements that are disproportionate or unreasonable. This recommendation is deemed critical by the Consortium and should be addressed in secondary legislation as soon as possible. The Consortium believes that the amendments can be implemented through the negative procedure, as they are largely technical in nature and would not require extensive parliamentary debate. • **Stage 2** is used to identify all instances where Part 11 regulations are not appropriate for orbital operations.	SEC ALL RFI
38.	**Specific security requirements for RPO missions:** Security aspects of spaceflight activities are outlined in section 23 of the SIA 2018. Section 23(1) establishes that "[r]egulations	The Consortium recommends that: • **HMG** considers whether there should be any specific security requirements for RPO missions.	POL SEC RPO RFI

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Security			
	Challenge	**Recommendation**	**Cat.**
	(…) may make provisions for the purpose of ensuring security (…).” Part 11 of the Regulations set out general security requirements. However, it is unclear from Regulations or guidance whether there are any particular security standards applicable to RPO missions that the regulator will expect applicants to comply with, or if there are no specific requirements for RPO operators.	• **HMG** ensures that any identified security requirement is reflected in regulations.	
39.	**National security issues and requirement for a security manager:** Regulation 10(2) of the Regulations states that if the activities to be licensed may give rise to any issues of national security the regulator must require the appointment of a security manager as a licence condition. This, in conjunction with the definition of space site, leads to stringent security requirements. It is not clear if (1) the inherent characteristics of any recognised RPO mission types, or (2) the nationality of any Launching States, States from whose territory or facility an object is launched, States of Registry and States responsible for authorisation and supervision of a customer space object involved in a mission, or (3) any combination of those two, will trigger issues of national security.	The Consortium recommends that: • **HMG** develops policy on whether RPO mission types, or client objects associated jurisdictions, or a combination of the two, raises national security issues. • the policy reflects the presumption that RPO activities do not automatically trigger issues of national security. • the policy reflects the nationality of launch site, launch operator jurisdiction, and any other states with a specific role under the international treaties, if possible, do not automatically trigger issues of national security. • the policy reflects where proposed activities involving RPO missions where the client is a UK-licensed operator, it would not give rise to national security issues.	POL RPO MBR
		The Consortium recommends that: • **the regulator** clarifies in guidance the exact meaning of the obligations under regulation 169 if a security manager is to be appointed for orbital operations.	GUI ALL RFI
40.	**Need to know early if customer raises national security issues:** Without clear legal mandate and guidance requiring RPO operators to provide information on the customer and its spacecraft as part of the licensing process or as a licence	The Consortium recommends that: • **the regulator** adopts a voluntary pre-application security check mechanism to allow RPO operators to provide relevant information about prospective customers and client space objects before submitting a	POL GUI RPO MBR

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Security			
	Challenge	**Recommendation**	**Cat.**
	conditions, there is considerable uncertainty regarding how such factors impact regulatory approvals. Neither the SIA 2018 nor the Regulations explicitly outline any requirements for RPO operators to disclose details about customers, including the nationality of the customer, the jurisdiction responsible for authorisation and supervision of the client space object, or the relevant Launching State(s). Additionally, Schedule 1, which lists specific conditions that may be included in a licence, does not provide for such disclosures. The absence of clear regulatory requirements creates uncertainty for RPO operators in assessing the viability of prospective customers and markets, particularly in relation to potential national security concerns.	full licence application. This check could be a standalone form and should serve as a [non-binding] confirmation that there are no national security issues based on the information provided. If the information on the customer remains the same at the time of the full application, the national security assessment at that stage should be informed by the pre-application determination to accelerate and streamline the process, avoiding unnecessary duplication of assessments.	
		If **the regulator** determines that access to such information is necessary for national security assessments, either to comply with section 8(2)(a) of the SIA 2018 or to determinate whether an orbital operator must appoint a security manager under regulation 10(2), the Consortium recommends that: • **HMG** ensures that such requirements are explicitly outlined in legislation.	SEC RPO MBR
		The Consortium recommends that: • the TMC is used in **Stage 2** to test the feasibility of a new RPO customer questionnaire in a hypothetical commercial mission involving different types of customers representing different services and markets. • **Stage 2** is used to test scenarios where client information cannot be disclosed and the regulator's approach given the lack of legislative mandate to require additional information.	GUI RPO TBR

4.3.4 Responsibility

According to §5.18-19 of CAP 2210, "all activities licensed in orbit must be performed in a responsible manner throughout the duration of the mission", which requires operators "to act

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responsibly by attempting to minimise risks and taking accountability for the mission's activities and its impacts."

Responsibility is not explicitly addressed in the OSA 1986, the SIA 2018, or the Regulations. However, §5.19 of CAP 2210 states that applicants must demonstrate to the regulator how they will, inter alia, ensure compliance with the UK's international obligations, proactively ensure compliance with licence conditions and to identify and communicate any issues or necessary changes that require coordination with the regulator in a timely manner. The guidance therefore suggests that compliance with UK's international obligations (discussed in the next section) forms part of any assessment of 'Responsibility' and introduces other concepts such as proactive compliance.

Responsibility			
	Challenge	**Recommendation**	**Cat.**
41.	**Responsibility is a vaguely defined assessment principle without clear expectations:** In §5.18-19 of CAP 2210, responsibility is mentioned as an area of assessment without providing a clear link to the legislation, nor any clear definition of the requirements for the operators. It is unclear if this constitutes a separate assessment, and whether there are any expectations that go beyond the ones laid down by the legislation.	The Consortium recommends that: • **the regulator** updates guidance to reflect that responsibility does not constitute a specific additional assessment but is addressed through the legislative tests (safety, fit and proper persons, etc.) and that there are no additional expectations with regards to responsibility.	GUI ALL RFI
42.	**Unclear requirement to demonstrate proactive compliance with license conditions and improvement in orbital safety and sustainability**: In §5.19 of CAP 2210, the operator is asked to demonstrate how it will: (1) "be proactive in ensuring compliance with any conditions [the regulator] place[s] on [the operator's] licence, as well as identifying any issues or necessary changes that [the operator] need[s] to inform [the regulator] of, and communicating with [the regulator] in a timely manner" and (2) "work proactively to improve orbital safety and sustainability." However, it is unclear what such demonstration would entail, and the Consortium believes the language adopted in guidance is inadequate as it creates additional obligations and requirements on operator, which is unlawful.	The Consortium recommends that: • **the regulator** updates guidance to reflect that, while these two areas are important, they do not require any demonstration from the applicant during the licensing process.	GUI ALL RFI

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4.3.5 International Obligations

Section 2(2)(g) of the SIA 2018 requires the regulator to exercise its functions in a manner that is best calculated to consider any international obligations of the UK. Section 8(1) of the SIA 2018 states that regulator may grant a licence "only if satisfied that doing so is consistent with **international obligations** of the United Kingdom".

In addition, after a licence has been granted, under section 26 of the SIA 2018, the regulator is responsible for monitoring spaceflight activities to ensure compliance with (1) the SIA 2018 and related regulations, (2) the conditions of the licence, and (3) the international obligations of the UK.

Such international obligations are not binding on individuals directly, and the UK remains responsible for complying with these international obligations. One of the ways it does this is by ensuring its non-government entities conduct their space activities in accordance with the relevant obligations through licensing and monitoring of the space activity by the regulator.

The challenges and recommendations in this section focuses on the need for those obligations to be reflected in the licensing framework in the form of clear requirements that can be understood and demonstrated by operators.

International Obligations			
	Challenge	**Recommendation**	**Cat.**
43.	**Operator to demonstrate it will avoid breaching the UK's international obligations:** The regulator must consider and ensure compliance with the UK's international obligations when exercising its functions and granting licences under the SIA 2018. In §5.19 of CAP 2210, the operator is asked to demonstrate to the regulator how it will "avoid breaching the UK's international obligations, including but not limited to international registration and liability obligations." However, those obligations are on the UK and not the operator and it is not clear how those obligations translate into requirements on operators under the licensing framework. It is the role of the UK government to interpret such obligations and implement them into requirements for operators in an appropriate manner, such as by amending the relevant legislation or creating new statutes or statutory instruments to include such requirements formally.	The Consortium recommends that: • **HMG**, with support from the Foreign, Commonwealth and Development Office (FCDO) or the Attorney General's Office, establishes and standardises the meaning and interpretation of what constitutes the "international obligations of the United Kingdom" for the purposes of the SIA 2018, and the **regulator** adopts and applies this interpretation consistently throughout the licensing process. • the **regulator** and **HMG** map out all international obligations relevant for RPO operators, including those arising from the UN space treaties and any other relevant international obligations of the UK. • **HMG** analyses and confirms whether RPO missions (or certain aspects of an RPO mission) could breach the UK's international obligations. If this analysis reveals that for the UK to comply with certain international obligations new requirements need to be imposed on operators licensed in	POL RPO RFI

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International Obligations			
	Challenge	**Recommendation**	**Cat.**
		the UK, the Consortium recommends that: • **HMG** ensures such international obligations are implemented into the domestic legal system via the appropriate legislative process.	
44.	**UK policy on 'obtaining consent' as a regulatory requirement:** The legislative framework does not make provision for 'obtaining consent' from any State or entity to perform an RPO mission. However, it is possible the regulator will require some form of consent to be provided by the entity operating or owning or being authorised in respect of a client object. Which entity is relevant, the form of such consent and how that is reflected in the licensing process is unclear.	The Consortium recommends that • **HMG** and **the regulator** ensure and clarifies in guidance that any 'consent' required from RPO operators should be limited to consent from the operator of the client spacecraft, or the counterparty to the service agreement when such counterparty is the entity "having all necessary power and authority to modify the current state of the client object, or to dispose of it,[10] or the entity authorised in respect of an object that is not operational, depending on the characteristics of the client spacecraft. • **the regulator** clearly states in guidance the time by which such consent must be obtained. • **the regulator** defines in guidance the precise wording of such letter of consent, which should be limited to: ○ acknowledgment of the intended services in respect of the client spacecraft; ○ confirmation by the customer of notification to the State with responsibility for authorisation and supervision; and ○ confirmation by the customer of compliance with regulations applicable to operation of the client spacecraft.	POL GUI RPO RFI
45.	**Impact of State-to-State agreements or arrangements:** Recent UK Space Agency activities suggest the UK aims to establish a common approach to international considerations related to	The Consortium recommends that: • **HMG** ensures that State-to-State agreement or arrangements provide maximum flexibility regarding	POL RPO MBR

[10] This is taken from the unofficial translation of the Japanese Guidelines on a Licence to Operate a Spacecraft Performing On-Orbit Servicing of Japanese Cabinet Office.

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International Obligations			
	Challenge	**Recommendation**	**Cat.**
	RPO activities, including international liability. However, it is unclear: • what the UK intends to use as a baseline for such agreements or arrangements, • how such agreements or arrangements impact an RPO operator's obligations under the international obligations' test.	contractual liability agreed between the RPO operator and its customer. • **HMG** and **the regulator** confirm that a State-to-State agreement or arrangement is not a prerequisite for the granting of a licence.	
46.	**Priority list for State-to-State agreements:** Given that agreeing a memorandum of understanding (MoU) with other States in respect of international joint RPO missions, such as the one the UK has entered into with New Zealand, takes considerable resources and time, the UK should have a priority list reflecting markets most likely to drive growth in the RPO servicing market in the UK.	Subject to recommendation #45 above, State-to-State MoUs in respect of international joint RPO missions could help facilitate RPO licensing in the UK.	POL RPO MBR
47.	**Interpretation of Article IX and XI OST:** Under Article IX OST, a State that has reason to believe that an activity planned by its nationals would cause potentially harmful interference with activities of other States, shall undertake appropriate international consultations before proceeding with any such activity. Similarly, a State that has reason to believe that an activity planned by another State would cause potentially harmful interference with its activities may request consultation concerning the activity. It is unclear whether HMG considers it would need to undertake such consultation process for RPO missions and how it would respond to such process if triggered by another State. Notifications using the mechanism of Article XI OST have been discussed as a way to mitigate perceived risk of RPO activities on third party States. However, interaction between the Article XI notification process and the licensing process are not clear.	The Consortium recommends that: • **HMG** clarifies that RPO missions do not trigger a need for the UK to consult other States under Article IX beyond direct engagement with the relevant States involved in the mission. • **HMG** and **the regulator** clarify that any consultation requested by other States under Article IX does not impact the licensing process of RPO missions. • **HMG** consider the notification process under Article XI as a way to mitigate risk of consultation request by other States under Article IX and any perception that the UK might be breaching its international obligations under the OST by licensing an RPO mission. • **HMG** and **the regulator** ensure that the approach to the notification process: ○ does not impact the timeline to licence a mission; ○ involves sharing a reasonable amount of information on the	POL RPO RFI

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International Obligations			
	Challenge	**Recommendation**	**Cat.**
		mission, considering commercial sensitivity and national security; and ○ is clarified in guidance.	
48.	**'Other' Launching States as additional insureds:** Especially in the event there is no State-to-State agreement between the UK and the launching State(s) associated with the customer, covering matters such as liability and risk associated with RPO activities, the UK may consider there is additional risk arising due to the existence of other Launching States (co-Launching States) of the servicer satellite, as they are jointly and severally liable.	The Consortium recommends that: • any such risk should not be reflected in the liability risk assessment, and that any such risk can be mitigated by adding those other States as additional insured on the operator's TPL insurance policy.	POL RPO RFI

4.4 Conditions in the Licence

Section 13(1) of the SIA 2018 specifies that a licence may be granted subject to "(a) any conditions of the kinds described in Schedule 1, or (b) any other conditions, that the regulator thinks appropriate." Schedule 1 conditions serve to ensure regulatory oversight across various aspects of spaceflight activities, covering safety, security, environmental protection, liability, and international obligations. In the UK, schedules form an integral part of an Act of Parliament and should be read in conjunction with the main body of the Act. Schedule 1 provides additional details and specific conditions that support the primary legislative provisions.

The applicability of some conditions, particularly those originally drafted with launch activities in mind, to in-orbit servicing and RPO missions remains an area requiring further regulatory clarity.

Conditions in the licence			
	Challenge	**Recommendation**	**Cat.**
49.	**Scope of Schedule 1 of the SIA 2018:** Schedule 1 of the SIA 2018 contains a series of conditions that *may* be included in licences. It is not sufficiently clear whether there is a distinction between conditions **in a licence** and conditions **to obtain a licence**. The latter refers to the mandatory requirements an applicant must meet *before* a licence can be granted, often set out in the Act or Regulations. In contrast, conditions in a licence are obligations imposed *after* a licence is granted, regulating how licensed activities must be conducted. The	The Consortium recommends that: • **the regulator** adopts guidance confirming that the conditions in Schedule 1 of the SIA 2018 are conditions "in the licence" rather than "conditions to obtain a licence." • **the regulator** provides further clarification on how Schedule 1 conditions are applied in practice. This includes outlining which conditions are likely to be imposed depending on the nature of the licensed activity and how compliance with these conditions will be monitored post-licensing.	GUI ALL RFI

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Conditions in the licence			
	Challenge	**Recommendation**	**Cat.**
	Consortium believes Schedule 1 of the SIA 2018 falls into this latter category, that is, it does not impose pre-licensing requirements but instead provides a list of conditions that may be attached to an operator's licence. Understanding this difference is crucial for applicants navigating the regulatory process, particularly in emerging areas like RPO, where clarity on applicable requirements remains a challenge.	• **the regulator** ensures that guidance and application processes distinguish between pre-licensing requirements (which must be satisfied before a licence is granted) and post-licensing conditions (which regulate how licensed activities are conducted).	
50.	**Conditions in the licence related to advance approval for changes of orbital parameters:** Schedule 1, paragraph 6 of the SIA 2018 establishes that "[c]onditions requiring the licensee to obtain advance approval from the regulator for any intended deviation from notified orbital parameters (…)" may be included in the licence. However, it is unclear what types of change would trigger the need for "advance approval" from the regulator.	The Consortium recommends that: • **the regulator** clarifies in guidance that changes to orbital parameters encompassed within the proposed concept of operations and part of the nominal RPO operations will not require the licensee to obtain advance approval from the regulator.	GUI RPO RFI
51.	**Conditions in the licence related to data sharing:** Schedule 1, paragraph 25 of the SIA 2018 states that the regulator may impose conditions on the "use, processing, communication and distribution of data obtained in the course of spaceflight activities." Given the nature of RPO missions, data sharing may be a fundamental aspect of operations, both for the mission's success and to enhance space security, transparency, and cooperation in RPO activities conducted by non-governmental entities. This is particularly relevant when servicing an operational and cooperative client space object, where predictable and effective data sharing is crucial between the parties. It is currently unclear whether any standard conditions restricting data sharing during RPO missions will be included in licence conditions. The Consortium recognises that, due to the sensitive nature of RPO activities, the regulator	The Consortium recommends that: • if **the regulator** imposes conditions in the licence regarding the "use, processing, communication and distribution of data obtained in the course of spaceflight activities" involving an RPO space object, such conditions should be tailored to reflect the unique characteristics of RPO missions and the roles of the parties involved. Specifically, any conditions should ensure that entities identified during the licensing phase as requiring access to mission data are not subject to restrictions that would necessitate additional regulatory approval for routine or pre-identified data sharing. • **the regulator** establishes a clear and efficient process for assessing and responding to RPO operators' requests to share data with third parties. Given the operational	POL GUI RPO RFI

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Conditions in the licence			
	Challenge	**Recommendation**	**Cat.**
	(and, by extension, HMG) may wish to oversee how data is processed and shared by RPO operators. However, without clarity on how such conditions might be implemented, it is difficult to assess the potential impact on operators, particularly in situations where data may need to be urgently shared with third parties before the operator has an opportunity to obtain regulatory approval.	importance of timely data sharing, the regulator should provide prompt decisions in line with Schedule 1, paragraph 25, to prevent unnecessary delays that could impact mission success.	

4.4.1 Liability and Insurance

The UK's liability regime applies to spaceflight activities licensed under the OSA 1986 and the SIA 2018. The SIA 2018 provides that a person conducting such activities is liable to indemnify the UK government for any claims brought against the UK for loss or damage caused by those activities (Section 36 of the SIA 2018). An operator licence may specify a limit on the amount of liability (the liability cap) under the power in Section 12(2) of the Act. However, it is UK government policy that all operator licences issued under the Act include such a liability limit. Under Section 34 of the Act, an operator is strictly liable for any injury or damage caused within the UK as a result of spaceflight activity. This includes harm to individuals or property on land, in territorial waters, or in connection with an aircraft in flight – including persons and property onboard. Regulation 220(1) of the SIR states that "[a]n operator licence must specify a limit on the amount of the operator's liability (…)". Section 38(1) of the SIA 2018 states that regulations may require licence holders and others involved in spaceflight activities to have insurance covering specified risks and liabilities. The regulator's approach to implementing these legislative provisions is detailed in guidance (CAP 2210 and CAP 2218).

The challenges and recommendations on liability and insurance presented in the table below have been prepared in the absence of input on many key questions arising out of Stage 1 and it is the intention to develop these recommendations in light of inputs anticipated in Stage 2.

Liability			
	Challenge	**Recommendation**	**Cat.**
52.	**One application, two licences:** Although where multiple activities are being proposed and fall under different regimes (for instance, procuring an overseas launch of the space object (OSA 1986) to be operated from the UK (SIA 2018), a single application can be submitted by the operator to the regulator, covering all space activities falling under both Acts. However, it is unclear how or whether the obligations to indemnify HMG in the licence are distinguished.	The Consortium recommends that: • **the regulator** clarifies in guidance its approach to granting two licences for a single mission. • **the regulator** ensures that liability limits on any two licences falling under both Acts are clearly defined.	GUI RPO RFI

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Liability			
	Challenge	**Recommendation**	**Cat.**
53.	**Lack of clarity on liability cap**: Section 34(5) of the SIA 2018 states that "Regulations may make provisions for an operator licence to specify a limit on the amount of the licensee's liability (…)." Regulation 220(1) states that "[a]n operator licence must specify a limit on the amount of the operator's liability (…)" whereas regulation 220(3) states that liability limits in the licence do not apply if the operator commits gross negligence, wilful misconduct, or breaches licence conditions or legal requirements. However, the limit on the operator's liability is not defined in the primary nor the secondary legislation. Moreover, the specific references in regulation 220 to "spaceflight activities" create some confusion to the applicability of the liability limit to orbital operations. CAP 2210 ties the indemnity limit setting to a classification by the regulator of missions as 'standard' although this appears to be a weak proxy to the liability risk. Therefore, it is unclear how the regulator would assess liability risk in respect of different types of RPO mission and what the liability limit would be.	The Consortium recommends that: • **HMG** develops a clear policy establishing that RPO missions licensed in the UK will, at a minimum, be treated as standard space activities involving the operation of a space object for liability and indemnification purposes. Specifically, the current indemnification obligation as liability cap should be set at EUR 60 million, or its equivalent in pound sterling. • **HMG** develops a policy to continue encouraging RPO operations in the UK, considering lower liability caps, indemnities and matching third party liability cover for RPO operators, in line with the safety and sustainability approach.	POL RPO RFI
54.	**Impact of State-to-State agreement:** Unclear how this could impact assessment of liability risk, and any conditions relating to RPO service agreements between servicer and customer.	The Consortium recommends that: • **Stage 2** is used to consider the impact of State-to-State agreement on liability assessment upon receipt from the UK Space Agency of input following initial Liability Workshop.	POL RPO TBR
55.	**Incentivising risk reduction and more sustainable space activities:** RPO missions can have an important role to play in achieving HMG's policy objectives in space, notably with regards to the sustainability of space activities. Those missions can be incentivised by reducing their cost	The Consortium recommends that: • **HMG** adopts policy that, for missions fully aligned with HMG's policy objectives in space, such as those under the National Space Strategy and the Space Industrial Plan, the limit on the operator's liability should be set at **zero**,[11] and this limit should	POL RPO RFI

[11] This would result in no requirement for the RPO operator to hold TPL insurance.

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Liability			
	Challenge	**Recommendation**	**Cat.**
	through lower liability exposure and/or TPL insurance requirement.	be specified in the licence in accordance with the SIA 2018. This approach to liability should also extend to licences issued under the OSA 1986 for the procurement of the launch of an RPO mission from overseas. The circumstances can include: ○ where the RPO mission itself is deemed safe and sustainable; ○ where the RPO mission involves the removal of derelict objects improving the safety and sustainability of the space environment; and ○ where the RPO mission is in the public interest or the UK national interest.	
56.	**Cross-waivers:** While the legislation does not impose a general requirement for spaceflight activities licensed in the UK to adopt cross-waivers of liability, Schedule 1, paragraph 36 of the SIA 2018 allows licence conditions to require reciprocal waivers of liability between an operator and contractual counterparties involved in the licensed activities. However, the way such provisions would apply to RPO operations remains unclear. Although the application and approach to cross-waivers is clear for other space activities, that is not the case for RPO activities.	The Consortium recommends that: • **HMG** and **the regulator** ensure that the decision to adopt cross-waivers of liability, as well as the conditions and minimum requirements surrounding them, remain at the discretion of RPO operators. • should **HMG** develop policy involving the use of cross-waivers to facilitate the carrying out of RPO missions in the UK with respect to international liabilities, any necessary cross-waiver provisions and requirements be incorporated into the regulatory framework. • the topic is further explored in **Stage 2** as the Consortium may wish to support and make recommendations in respect of the application of cross waivers.	POL RPO RFI
57.	**Uncertainty of indemnification in cases of exceeding liability amount**: Section 35(2) of the SIA 2018 provides that, if the liability amount exceeds the insurance coverage, the Secretary of State *may* indemnify the licensee for the difference. The lack of certainty on any Secretary of State indemnity introduces challenges for RPO	The Consortium recommends that: • **HMG** adopts policy to exercise the Secretary of State's discretion under section 35(2) to indemnify an operator in respect of liability for direct TPL claims made against it in relation to licensed activities, should the liability amount exceed the insurance amount specified in the	POL ALL RFI

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Liability			
	Challenge	**Recommendation**	**Cat.**
	operators, who must navigate potential financial risk with no clear assurance of indemnification from the UK government. Furthermore, it complicates the liability framework, as the operator must plan for the possibility of not being indemnified, while also factoring in the unclear status of this provision in instances of claims exceeding the insurance amount.	operator's licence. The Consortium believes this would significantly benefit RPO operators. • **HMG** provides clear policy confirming that the UK will always indemnify the operator in such cases, even where insurance coverage does not fully cover the liability cap specified in the licence. • **HMG** clarifies that the reference to insurance coverage in section 35(2) is not intended to create a legislative requirement for mandatory insurance but rather is a condition within the licence that is subject to the terms of indemnification.	
58.	**Unclear insurance requirements in Regulations:** Section 38(1) of the SIA 2018 states that regulations may require licence holders and others involved in spaceflight activities to have insurance covering specified risks and liabilities, including what must be covered, what may be excluded, and the required coverage amounts. The primary legislation itself does not require licence holders to be insured and largely leaves any details on insurance requirements to the Regulations. The Regulation, in its turn, is silent on insurance requirements. There is a clear expectation on operators having to procure TPL insurance. However, there is uncertainty on the insurance requirements and validity of alternative means of demonstrating financial security to indemnify the UK.	The Consortium recommends that: • **HMG** and **the regulator** consider adopting clear guidance on insurance in the absence of insurance requirement in the Regulations. Right now, insurance can be included as a condition of the licence and there is no specific guidance, under section 38(1) of the SIA 2018. Such guidance would elaborate on insurance conditions in the licence and can address the particular characteristics of RPO missions licensed in the UK. • **HMG** allows alternative means of demonstrating financial security to indemnify the UK, such as by accepting a parent company guarantee or other appropriate forms of indemnity, especially considering the potential difficulty and cost in securing TPL insurance for RPO missions.	GUI ALL RFI

4.4.2 Reporting and Monitoring

Reporting and Monitoring			
	Challenge	**Recommendation**	**Cat.**
59.	**Involvement of the CAA during key operational phases of RPO missions:** It is unclear whether or to which level the regulator would want to	The Consortium recommends the **regulator** adopts guidance to reflect this approach to reporting and monitoring requirements in relation to	GUI RPO RFI

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Reporting and Monitoring			
	Challenge	**Recommendation**	**Cat.**
	be involved in any go/no-go decisions during the RPO operations.	go/no-go decisions and operations, which would: • be agreed in the monitoring and reporting plan attached to the licence; • be limited to written notifications to the regulator at agreed instances, as set out in the monitoring plan; and • only involve reporting after a service has been conducted, i.e., no involvement in go/no-go decisions. •	
60.	**Power to give directions**: Sections 26, 27, 28, and 29 of the SIA 2018 give the regulator and Secretary of State wide discretion to give direction on several topics, including breach of licence conditions, safety and security, and international obligations. For instance, section 29 states that the Secretary of State may issue a direction to a regulated person to carry out or refrain from specific actions related to spaceflight activities if deemed necessary to fulfil the UK's international obligations. It is unclear how this can affect RPO missions, which fundamentally require interactions with other space objects in orbit, which may be under the jurisdiction and control of other states. As it is currently unclear what exactly is to be considered "international obligations of the UK", it is a challenge to anticipate and understand what the instances in a standard RPO mission could be that would trigger this direction from the Secretary of State – and which RPO operators would need to consider and build into any commercial service.	The Consortium recommends that: • the **regulator** (and Secretary of State) considers guidance on the legislative tests as much as possible, to ensure regulatory certainty regarding the expectations on operators in the monitoring phase and circumstances where the regulator is expected to or allowed, by law, to give directions.	
61.	**Additional license monitoring conditions required for RPO missions beyond go/no-go** the Consortium understands that the regulator would likely impose additional monitoring conditions on an RPO mission licence.	The Consortium recommends that: • The **regulator** provides guidance on content and trigger points for likely additional, RPO specific monitoring pursuant to findings during Iterative Simulation workshops including: ○ Post launch separation confirmation notification	

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Reporting and Monitoring			
	Challenge	**Recommendation**	**Cat.**
		○ Completion of LEOP notification touchpoints (details in the monitoring plan) ○ Status report before and after each ‘service’ to be performed ○ Reporting against go-no go criteria set out in the application phase	

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5 Other Findings

5.1 Spectrum

The Spectrum Workstream featured input and engagement from a leading spectrum consultant, River Advisers. River Advisers, in collaboration with the Consortium, has conducted an in-depth spectrum assessment to evaluate the feasibility of frequency bands within the 1–30 GHz range for RPO missions. The analysis examined the operational spectrum requirements of RPO missions, focusing on telemetry, telecommand, and data transmission during navigation, orbit raising, proximity operations, and space object capture.

Based on service allocations, bandwidth requirements, and regulatory constraints, a set of recommended frequency bands has been identified, as summarized in Table 5-1. River Advisers provided the Consortium with detailed evaluation of each frequency band, including its constraints and the rationale for its inclusion or exclusion from the recommendations. Additionally, River Advisers offered an overview of the regulatory limitations for RPO missions related to filing procedures, suspension, and bringing-into-use (BIU).

Since the ITU Radio Regulations currently lack explicit provisions for RPO, only a limited number of frequency bands are immediately viable under existing service allocations. Even within those potential options, challenges remain in terms of regulatory constraints, existing users within the same band, equipment availability and existing ground station compatibility.

Table 5-1 Potential frequency bands for RPO (legend: P=possible)

Frequency band	Service	Application			Comments
		Comms	TT&C	Proximity sensors	
2025-2110 MHz (Earth-to-space)	Space Operation Service (SOS)		P		
2200-2290 MHz (space-to-Earth)	Space Operation Service (SOS)		P		
2483.5-2500 MHz	ISM (No. 5.150)			P	ISM use subject to No. 4.4
3400-3700 MHz (space-to-Earth)	Fixed- Satellite Service (FSS)	P	P		
7025-7075 MHz (Earth-to-space)	Fixed- Satellite Service (FSS)		P		Subject to coordination procedure under Section II of Article 9
8025-8400 MHz (space-to-Earth)	Earth-Exploration Satellite Service (EESS)	P	P		Recommended in the upper portion of the band
8450-8500 MHz (space-to-Earth)	Space Research Service (SRS)	P			

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24-24.25 GHz	ISM (No. 5.150)			P	ISM use subject to No. 4.4
25.5-27 GHz (space-to-Earth)	Earth-Exploration Satellite Service (EESS)	P			

Since the ITU Radio Regulations currently lack explicit provisions for RPO, only a limited number of frequency bands are immediately viable under existing service allocations. Even within those potential options, challenges remain in terms of regulatory constraints, existing users within the same band, equipment availability and existing ground station compatibility.

Although RPO is not explicitly defined in the ITU Radio Regulations, Article 5 of the ITU Radio Regulations categorises services such as fixed-satellite, space operations, space research, and Earth exploration-satellite, which may indirectly encompass RPO and IOS activities. The suitability of these services for RPO mission need to be considered further in Stage 2 of the Sandbox. While these existing services may provide a temporary framework for spectrum access, they do not offer the necessary regulatory clarity and certainty to fully support the long-term development of RPO missions.

To address these challenges, the establishment of a dedicated spectrum allocation for RPO missions within the ITU Radio Regulations would provide significant advantages, including:

- standardising operational procedures across various RPO missions and satellite systems,
- enhancing interoperability between satellite operators and service providers,
- promoting industry growth, investment, and innovation, and
- reducing regulatory uncertainty and improving coordination mechanisms.

Securing reliable spectrum access is essential to unlocking the full potential of RPO, fostering the sustainable and equitable use of spectrum and orbital resources. The continued expansion of the RPO industry plays a crucial role in advancing research, defence, and commercial interests. As the commercial RPO sector advances from experimental and demonstration stages to offering essential services within the space industry, including critical support for the UK government, securing reliable spectrum access is becoming urgent.

The UK government increasingly relies on commercial RPO operators to support its space sustainability objectives. The inability to secure spectrum access for a critical mission could have significant repercussions for the UK's strategic interests in space. Additionally, as other nations rapidly advance their RPO capabilities, ensuring the UK remains competitive in the global landscape requires decisive regulatory action.

The Consortium proposes to consider where regulatory involvement could advance spectrum policy for RPO missions within the ITU framework, such as by:

- clearly establishing spectrum policies and guidelines within the ITU Radio Regulations to accommodate RPO operations,
- strengthening its involvement in ITU discussions, particularly in relation to Resolution 219 (Bucharest, 2022) and ITU-R Resolution 74 (RA-23) on space sustainability, to ensure that UK interests are represented,

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- supporting technical and regulatory studies that pave the way for a dedicated spectrum allocation for RPO missions in relevant ITU Working Parties or the World Radiocommunication Conference (WRC), and
- conducting a comprehensive review of existing regulations to address limitations, such as filing procedures, suspension of use, and bringing-into-use (BIU) requirements for RPO filings.

Considering the strategic importance of RPO and IOS to the UK's space sector, based on River Advisers' findings and work conducted so far in the Sandbox on spectrum, the Consortium proposes working with the regulator to develop consolidated recommendations on the challenges identified. Considering the strategic importance of RPO and IOS to the UK's space sector, the specific challenges associated with spectrum access for RPO missions deserve heightened focus.

5.2 Third Party Liability Insurance

The Insurance Workstream featured input and engagement from a leading space broker, Willis Towers Watson (WTW). Inputs obtained from WTW were informed by individuals from leading underwriters offering space in-orbit TPL insurance.

Brokers and underwriters engaged in various MVP, Liability and Insurance workshops during the Sandbox, informing discussions particularly around liability risk assessment from insurers' perspective, and current practice in the insurance market. This input also shaped and informed several of the Consortium's Challenges and Recommendations.

WTW summarized their findings for the Consortium, outlining:

- typical orbital TPL coverage arrangements including type of coverage and likely exclusions, and
- underwriting considerations for RPO TPL coverage such as market capacity and factors impacting insurability.

WTW provided input on the TMC from an insurance perspective, including key RPO-specific considerations for insuring such a mission. WTW also provided recommendations from the insurers' perspective on RPO licensing, including areas requiring clarity such as attachment and detachment points and cross waivers, and the role of State-to-State agreements in clarifying any risk sharing arrangements at international level.

5.3 IADC Guidelines Compliance Assessment

The Consortium developed some specific findings and recommendations concerning the assessment of compliance to the IADC Space Debris Mitigation Guidelines (IADC Guidelines). The Consortium considers the IADC Guidelines crucial for ensuring sustainable space operations by limiting debris generation during normal operations, minimising on-orbit break-ups, ensuring post-mission disposal, and preventing collisions.

As part of the Sandbox, the technical team conducted an assessment to evaluate the compliance of the TMC with the IADC Guidelines. The objective was to identify areas where the guidelines might pose challenges for UK-licensed RPO missions. The methodology involved translating the guidelines into specific requirements and then verifying if the TMC met these requirements. Compliance was assessed through analysis (e.g., re-entry analysis using

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ESA DRAMA tools), by review of the mission concept, or if compliance was not demonstrated but feasible.

The assessment revealed that the TMC was compliant with most of the identified requirements, either by design or through demonstrated analysis. However, compliance could not be demonstrated for two requirements due to the mission's early development stage. An interesting aspect was the deliberate choice of the insertion orbit for the servicer spacecraft, which would result in re-entry in more than 25 years if it failed upon arrival. This choice raised questions about post-mission disposal (PMD) guidelines and their interpretation.

This work highlighted the need to conduct further study of the IADC Guidelines, interpreting them for RPO missions and translating them into verifiable requirements.

The Consortium is thus proposing to conduct a detailed analysis on the specific challenges associated with calculating the PMD success rate for RPO missions in Stage 2 of the Sandbox. This initiative aims to address the current lack of a standard approach for such a calculation, particularly when dealing with orbits that exceed the 25-year threshold set by the IADC Guidelines. The study would provide recommendations to regulators to facilitate the demonstration process and facilitate the sustainability assessment for RPO missions conducted as part of the licensing process.

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6 Economic & Industry Impact

6.1 Market Relevance

RPO and, more broadly, ISAM activities, are projected to be among the fastest-growing segments of the global space sector. Demand is driven by satellite fleet operators seeking life-extension, debris removal, in-orbit repair and refuelling, and other services enabled by RPO technologies. These services potentially offer significant cost savings to satellite owners (by deferring replacement or managing failures in orbit) and can improve overall orbital sustainability by actively mitigating debris.

Studies indicate a rapidly expanding market for ISAM services worldwide. Several countries, including the United States and members of the European Union, have already begun developing frameworks and funding programmes to support ISAM. As the UK pursues a world-leading role in high-value space technologies and services, a clear and predictable regulatory environment for RPO can be instrumental in attracting investment, boosting competitiveness, and capturing part of this growing international market. The Sandbox, by aligning policy, licensing, and operational requirements, aims to position the UK as an early mover in this segment, thereby increasing the likelihood of establishing both a robust domestic supply chain and a strong export market.

6.2 Preliminary Cost-Benefit Analysis

A detailed cost-benefit analysis (CBA) conducted by know.space quantified the direct and indirect effects of the Sandbox (without applying Keynesian multipliers, in line with HMT Green Book guidance). This analysis encompasses both the immediate efficiency gains from an improved licensing process and the broader macroeconomic benefits of stimulating investment and innovation in UK-based RPO-enabled ISAM markets. The key findings are summarised below.

1. Overall Benefits

The analysis estimates that the Sandbox could generate approximately £12.3 million in real discounted benefits over the 2024–2038 period. These benefits arise from:

- cost savings to operators through clearer regulatory guidance and faster time to licence,
- reduced regulatory burden on the CAA and associated government stakeholders, and
- additional Gross Value Added (GVA) generated as the UK attracts and retains RPO-enabled ISAM activities,
- productivity gains measured as wage premia to individuals employed in UK ISAM activities who would otherwise work in lower-value jobs.

A significant share of the projected benefit derives from incremental market growth in the RPO sector. By clarifying and speeding up the UK licensing process, the Sandbox can help the UK capture an increased share of global ISAM revenues, which are forecasted to expand rapidly in the coming decade.

2. Cost of the Sandbox

The real (inflation-adjusted) cost of implementing the Sandbox stages is estimated at roughly £2.1 million, including procurement and overhead.

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3. Value for Money

Under central assumptions, the net present social value (NPSV) of the Sandbox is around £10.2 million, implying that every £1 of public investment could yield nearly £5 in benefits.

Even under lower-bound estimates of market growth and cost savings, the analysis indicates a favourable return on investment, with an NPSV/Departmental Expenditure Limit ratio of over 2.

The upper-bound scenario suggests potential returns as high as 6–7 times the public investment.

4. Non-Monetisable Benefits

Beyond monetised impacts, the Sandbox is expected to enhance the UK's reputation as a forward-looking regulator, influencing international standards for RPO. It may also foster knowledge spillovers and encourage workforce development in highly skilled roles.

The Sandbox provides a testbed for novel policy tools and best practices, potentially informing further improvements in space regulation and beyond.

5. Key Risks and Uncertainties

As the ISAM sector is still nascent, the realisation of benefits depends on broader market acceptance of RPO solutions and continued technological progress.

The degree to which the UK can maintain its regulatory lead will also influence long-term benefits. If other jurisdictions rapidly develop similarly advanced frameworks, the UK's "first mover advantage" could be diminished.

In conclusion, the know.space analysis finds that continuing the Sandbox into further stages represents a strong value-for-money proposition, with potential to generate measurable economic benefits, foster new jobs, and advance the UK's international standing in space sustainability and innovation. The next phases of the Sandbox are expected to refine, validate, and operationalise the recommendations that emerged from Stage 1, thereby helping ensure that the forecast benefits are realised.

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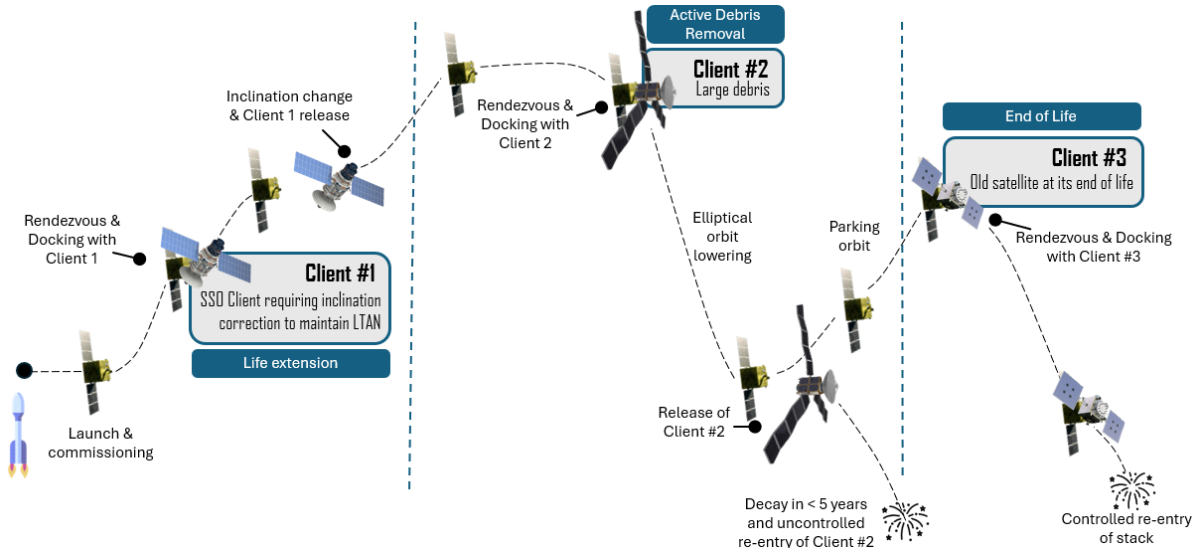
7 Appendix

7.1 Target Mission Concept

This section outlines the Target Mission Concept (TMC) developed during the RPO Sandbox. The TMC consists of the servicing of up to 3 client satellites, shown in the figure below.



The TMC Servicer will perform 3 different services:

- **Life Extension**: by correcting the inclination of a prepared client to maintain Sun Synchronous Orbit and thus continue to perform observations as nominally intended.
- **Active Debris Removal**: an unprepared, non-operational, non-cooperative Client #2 will be deorbited.
- **End-of-Life**: an unprepared, but operational and cooperative Client #3, reaching the end of its mission and to be deorbited.

The Servicer is registered in the UK and operated in the UK. The launch, which was procured by the Servicer's operator, is set to be from French Guiana, France. The selected launcher is Ariane 6 on a rideshare launch (as secondary payload) to SSO.

After launch, the Servicer will rendezvous and dock with Client #1, which is operational, cooperative and prepared for service. It will perform an AOCS takeover and modify the Client's orbit by performing an inclination change to the desired correction. Once in the desired orbit, the Servicer will release Client #1, which will continue to operate. This will conclude the first service.

The Servicer will then change its orbit to match Client #2's by performing RAAN matching, inclination correction, and altitude changes. It will then rendezvous and capture Client #2, which is non-operational, non-cooperative and not prepared for service. The Servicer will gain control of the stack and perform a deorbiting service. For this, it will place the Client in a rapidly decaying elliptical orbit (natural decay < 5 years), before releasing it in its new disposal orbit. The Servicer will not re-enter with the Client and Client #2 will perform an uncontrolled atmospheric re-entry. This concludes the second service.

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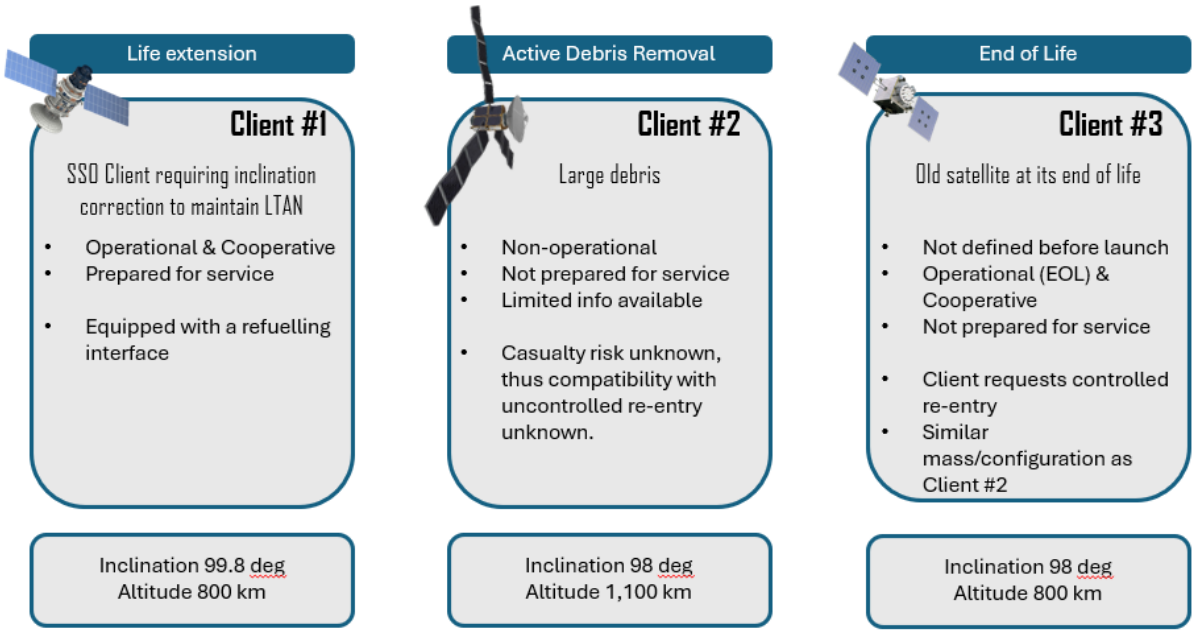

The Servicer is designed to service 3 clients, but not all clients may have been defined before launch. After the second service, the Servicer will place itself in a parking orbit waiting for identification and authorisation of a 3rd Client service. The Servicer is designed to service an envelope of client properties (mass, geometry, moment of inertia, tumbling rate etc.) and before proceeding to a 3rd service, an assessment will be met to confirm the Client meets the envelope criteria of the Servicer's capabilities. The Servicer is designed to be able to wait in orbit for up to 1 year before a 3rd Client is identified.

Once Client #3 is identified and confirmed, the Servicer will change its orbit to match Client #3's by performing RAAN matching, inclination correction, and altitude changes. It will then rendezvous and capture Client #3, which is operational (past its end of mission), cooperative and not prepared for service. The Servicer will gain control of the stack and perform a deorbiting service. For this Client, it is assumed that a controlled re-entry is required, which the Servicer will have been designed to be able to perform. The Servicer will thus perform a controlled re-entry of the stack, with a targeted re-entry within the South Pacific Ocean Uninhabited Area (SPOUA).

This will conclude the mission.

7.1.1 Clients' Descriptions

The mission will nominally service 3 different clients, shown below.

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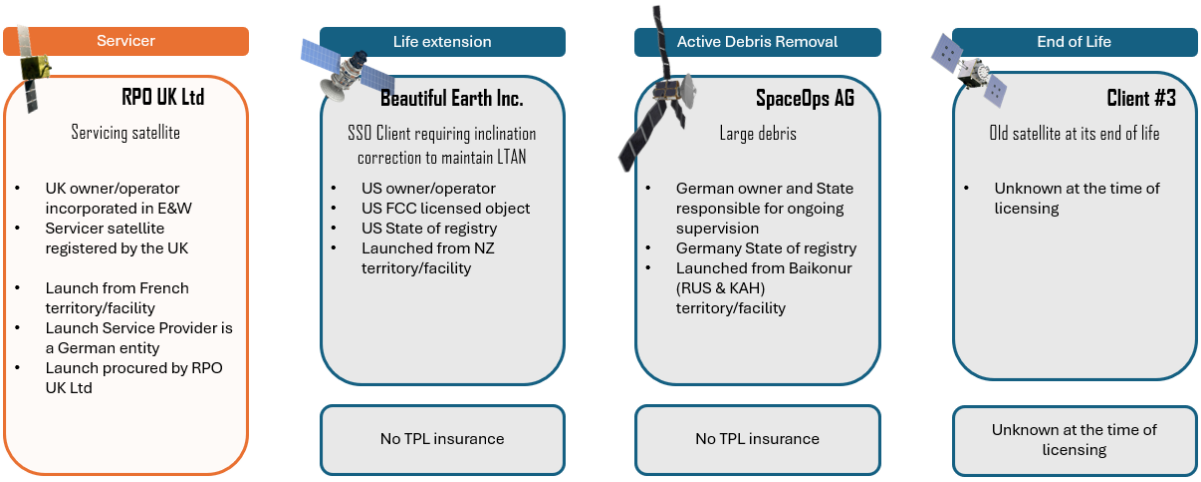

Client #1: SSO Client requiring inclination correction to maintain LTAN

Client #1 is an Earth Observation satellite operating in a Sun-Synchronous Orbit (SSO) at an altitude of 800km, and currently at an inclination of 99.8 degrees. While the satellite is fully operational, its inclination, and thus its LTAN have slowly started to drift, which is a common issue for SSO missions. This drift threatens to compromise the satellite's operational effectiveness.

The primary objective for Client #1's servicing is to perform an inclination correction manoeuvre to get back to 98.8 degrees (the targeted inclination at an altitude of 800 km to maintain a Sun-Synchronous Orbit). This adjustment aims to correct the drift rate of the Right Ascension of the Ascending Node (RAAN), thereby stabilising the Local Time of Ascending Node (LTAN) of the satellite. By doing so, the satellite can continue its Earth Observation mission with a maintained Field of View on required region of Earth and consistent lighting conditions, which is crucial for SSO missions.

Client #1 has the following characteristics:

- It has a US owner/operator,
- It was licensed by the US FCC,
- It was launched from New Zealand,
- It has no Third-Party Liability insurance,
- It is fully operational,
- It is equipped with a refuelling interface, which enables refuelling and docking, as well as visual aids/fiducial markers,
- It is cooperative, i.e. it can support a third-party docking by maintaining a suitable attitude for approach and docking as well as able to disable any FDIR or attitude-control post docking.

Client #2: Large debris

Client #2 is a non-operational satellite which has become a piece of debris. It has the following characteristics:

- It has a German owner, and the State is responsible for its ongoing supervision,

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- Germany is the State of registry,
- It was launched from Central Asia,
- It has no Third-Party Liability insurance,
- It is non-operational (electrically dead) and thus non-cooperative, and its observed rotational rate is within the Servicer's design range,
- It is not prepared for service (no specific docking feature on the satellite),
- Its manufacturer no longer exists, and thus limited information is available about the satellite:
- Due to the uncertainty around the inside of the satellite and its apparent ballistic coefficient, it is unknown whether its casualty risk is below 1E-4.

Client #3: Old satellite at its End-of-Life

Client #3 is not defined before launch. However, for the purpose of the TMC, it is assumed Client #3 is an old satellite, not prepared for In-Orbit-Servicing activities, which is currently reaching its End-of-Life in an orbit where it does not meet current Space Debris Mitigation Guidelines. The assumption has been made that a suitable candidate has been selected and meets the following criteria, in alignment with the mission definition and Servicer design:

- It is still operational (reaching its end-of-life) at the time of service,
- It is cooperative, i.e. capable of supporting a third-party docking by maintaining a suitable attitude for approach and docking, as well as able to disable any FDIR or attitude control systems post-docking,
- It is not prepared for service (no specific docking feature on the satellite),
- It has similar mass properties and configuration as Client #2
- The customer has requested a controlled re-entry for its satellite.

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