# **EO Mission Capability Review 2023 Questionnaire Guidelines**

The UK Space Agency (UKSA) and the Department for Science, Innovation and Technology (DSIT) are undertaking an Earth Observation Mission Capability Review (EOMCR).

The [EO Investment Package](https://www.gov.uk/government/publications/earth-observation-investment/projects-in-receipt-of-funding) (announced in December 2022) includes a £15m uplift in funding for the UK’s national EO technology programme over the period to March 2025. Whilst the EOMCR questionnaire itself is not a proposal for funds, the results will enable UK Government to target upcoming support for the sector. The findings will be used to design restricted competitions and competitive Announcements of Opportunity for grant funding through CEOI; beyond this, they will provide a key piece of evidence to help the UKSA, DSIT and wider government make the case for further investment in EO missions and instrumentation development.

The EOMCR will seek to understand the nature and current status of civil EO mission concepts being developed in the UK, for any ownership model or any purpose. This could include national missions, European Space Agency (ESA) mission candidates, bilateral or other international collaborative missions (outside of ESA), or fully commercial missions. They could be scientific, operational, or commercial in nature, or a combination thereof.

The completed EOMCR questionnaires will enable a strategic overview of the range and scale of the ambitions of the UK EO sector for new missions and instrumentation. The questionnaire will capture information on the ‘size and shape’ of potential missions, including rough order of magnitude (ROM) costs. The responses will be subject to peer review to ensure a robust assessment of user needs, plausibility, viability, and affordability. The results will enable an analysis of:

* Missions which are mature in concept, with partners in place, which could progress rapidly to a flight build and launch should funding be available;
* More speculative missions which are at an early stage and with interest from partners, which could benefit from further study feasibility studies and/or Technology Readiness Level (TRL) raising;
* The nature of any support that might be sought from government over the life of the mission, ranging from early stage technology development through to post-launch purchasing of data.

Responses will be considered within UK Government but will not be published, in order to protect commercial sensitivity. A high-level, commercial IP-free summary will be made available in due course. The questionnaire is divided into seven sections:

* Part 1 – Mission Characteristics
* Part 2 – Strategic assessment – will be used by the peer review team
* Part 3 – Technical Assessment – will be used by the peer review team
* Part 4 – Support required from HMG
* Part 5 – Asks for some mission specifics regarding instrumentation hosting and Cal/Val, as well as any unusual mission level requirements such as ultra-precise pointing etc
* Part 6 – Captures some basic complexity, viability and cost information
* Part 7 – Explores international, competition and dual-use perspectives in more detail

**Please give succinct answers, using the table provided in the pro-forma below.** The EOMCR panel will use this information to understand your proposed mission concept. Your response should be sent to ceoiadmin@le.ac.uk by **Thursday May 4th at 4pm**. Enquiries should please be sent to Dr Chris Brownsword cbrownsword@qinetiq.com and Dr Rob Scott rob@scottspace.co.uk from the CEOI leadership team.

# **Part 1 – Mission Characteristics**

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|  | Topic | Response (not to exceed 2 sides of A4, font size 10) |
| Q1 | **Mission Name** | Please provide the adopted name for your mission proposal |
| Q2 | **National, Bilateral, ESA or other International mission** | Indicate whether this is to be a national, bilateral, or fully international mission, and involving which agencies and/or organisations.  |
| Q3 | **Overall UK Footprint** | Roughly what proportion of the mission and noble work will fall in the UK? |
| Q4 | **Lead UK Organisation** | Who will lead from the UK side? |
| Q5 | **UK Points of Contact** | Name all UK mission POCs and provide email addresses.  |
| Q6 | **EO Mission Objectives** | What are the main mission objectives? E.g., what will be the mission products, and are these: scientific, climate, commercial, operational, or other.  |
| Q7 | **Mission Type (see guidance)** | Indicate what type of mission is planned, for example is this for a single spacecraft, a constellation, an IOD for proof of concept, a CubeSat mission or e.g., ESA Explorer class  |
| Q8 | **Flight Opportunity(s)** | What flight opportunities exist or are planned, e.g., in ESA, with commercial funding, with national funding, or as part of another bilateral/international collaboration.  |
| Q9 | **Mission Timescale** | Please describe a credible timescale for the mission, including mission study phases, TRL raising, build, test, and launch and operations phases.  |
| Q10 | **Current Mission Status & Readiness** | At what stage is the collaboration or project: discussion, planning, all partners on board, agreements/MOUs in place, funding status of all partners. Assess the overall maturity of the mission concept using the scale in the table below (MRL1 to MRL9) and briefly justify the assessment.

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| --- | --- |
| MRL 1: Early mission concept proposed  | MRL 6: Mission design at PDR level (Completion of system design) |
| MRL 2: Initial mission/system analysis carried out  | MRL 7: Mission design at CDR level (completion of detailed design) |
| MRL 3: First mission study completed, including mission ROM cost estimate | MRL 8: Mission implementation in progress |
| MRL 4: Mission Phase 0/feasibility study completed, with improved cost estimate | MRL 9: Mission in orbit |
| MRL 5: Mission phase A study (or equivalent) completed |  |

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| Q11 | **Geophysical observables** | Describe the fundamental geophysical observables of the mission instrumentation, and indicate in Q15 how these will be transformed into useful/valuable products  |
| Q12 | **Instrument/sensor description (with estimate of current SRL and TRL)**  | List and briefly describe the main EO instruments along with an estimate of the current TRL and SRL for the proposed implementation and use. Also indicate dependencies on other data streams from outside the mission.  |
| Q13 | **Cost range overall** | Estimated cost of the mission overall, to include build, launch and operations.  |
| Q14 | **Cost to UK (ROM)** | What is likely to be the proportion of costs falling to the UK? |
| Q15 | **Main Data Products** | What are the main product streams from the mission and what are their primary purposes? Indicate briefly how the geophysical observables (Q11) will be converted into these products. Please give estimated SRL level. What data applications will be available at the start of the mission? |
| Q16 | **User Community - Benefits and Beneficiaries** | Who are the principal users/customers/beneficiaries, e.g., government, scientists, commercial users. Please give details of the utility of these products to each community, and the likely impact.  |

# **Part 2 – Strategic Assessment**

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|  | Topic | Response (not to exceed 1 side of A4, font size 10) |
| Q17 | **Describe the Benefit and impact of the mission (Science)** | Provide a paragraph on the scientific impact and benefit of the proposed mission, and why this significantly improves on what has been done before. |
| Q18 | **Describe the Benefit and impact of the mission (Society)** | Provide a paragraph on the societal benefit and impact expected from the mission. |
| Q19 | **Describe the Benefit and impact of the mission (Commercial)** | Provide a paragraph on the commercial expectations from the mission, including upstream exports and downstream services. |
| Q20 | **How does the mission concept align with UK Strategy?** | Briefly highlight how this mission concept could support the goals of any particularly relevant UK Government national strategy, such as the [National Space Strategy](https://www.gov.uk/government/publications/national-space-strategy), the [Defence Space Strategy](https://www.gov.uk/government/publications/defence-space-strategy-operationalising-the-space-domain), the [EO Technology Strategy](https://www.gov.uk/government/publications/uk-earth-observation-technology-strategy) and the [Net Zero Strategy](https://www.gov.uk/government/publications/net-zero-strategy). |
| Q21 | **How does the mission concept align with International Strategy?** | For example, does it address strategy implied by the ESA Living Planet programme, NASA Decadal Survey, or other major international strategic ambitions? |

# **Part 3 – Technical Assessment**

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|  | Topic | Response (not to exceed 1 side of A4, font size 10) |
| Q22 | **Growth – Describe how the mission builds on UK EO Capability** | Explain how the mission builds on critical UK capability essential for future UK participation in missions, infrastructure, or other space-based services. |
| Q23 | **Growth – Likelihood of Exploitation** | How urgent is the requirement for mission, and how will it lead to a high level of exploitation? |
| Q24 | **Describe the Technological Innovation** | Outline the innovative aspects of the mission and the technology, and what opportunities exist for broader exploitation of these innovations? |
| Q25 | **Summarise the Implementation risks** | What are the major risks of the mission and instrumentation concept, and how should these risks be contrasted with the potential reward? |
| Q26 | **Provide evidence of credibility, viability, and value for money** | Explain why your consortium is credible to deliver this mission, and describe the level of viability of the concept, and why it would represent good value for money. |

# **Part 4 – Support required from Government and UK Space Agency**

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|  | Topic | Response (not to exceed 1 side of A4, font size 10) |
| Q27 | **What overall support does this mission concept need from the UK Government?** | Please indicate what support would be needed from HMG overall. For example: * would the mission require HMG as an anchor customer for services/products?
* Funding for launch services, potentially for UK soil or elsewhere?
* Support for spacecraft operations
* Funding for ground segment and processing facilities
* Funding for build phases?
* Other?
 |
| Q28 | **Please provide Gateway Milestones, defining standalone packages of work.** | Please indicate timing, duration and approximate cost of studies, TRL raising activities, or build phases that could each be supported by a single package of funding. Note that funding is currently only available until April 2025. |
| Q29 | **What specific support is needed to advance the mission in the next 2 years?** | **TRL raising?** | What elements need TRL raising to meet gateway levels for the mission |
| **Business plan?** | Do you need assistance with a business plan to make the case for the mission support, and to develop downstream services? |
| **Instrument S/W simulator?** | Will you need an end-to-end instrument simulator to support instrument development and meet (e.g., ESA) agency requirements.  |
| **Collaborators/ Partners?** | Do you need help in finding national and international collaborators and partners who could part fund the mission? |
| **Mission study/CDF support?** | Are you at the stage when a full mission study is needed, e.g., at Phase 0 or via a concurrent design rapid study?  |
| **Test/Qualification?** | What test and qualification facilities are needed.  |
| **Access to National Facilities** | Do you need to access the National Satellite Test Facility, Space Park Leicester, Satellite Applications Catapult, or similar facilities? |
| **Airborne/Field demonstration?** | Do you need to perform a field or airborne demonstration in order to demonstrate TRL/SRL levels to capture a mission opportunity? |
| **Market study?** | Do you need to perform a market study for potential commercial users.  |
| **Other?** | What other support do you need in the short term?  |
| **Costs?** | Please, if possible, estimate roughly the cost of the above potential interventions.  |
| Q30 | **What additional support would be useful.** | Please detail additional support requirements here and indicate whether essential/critical or ‘nice to have’. |

# **Part 5 - Instrument/Mission specifics**

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|  | Topic | Response (not to exceed 1 side of A4, font size 10) |
| Q31 | **Instrument Concepts** | Elaborating on Q12, describe the instrument(s) that will generate the principal mission products, including any dependence on data from other instruments or sources. |
| Q32 | **Instrument development stages** | What development stages do you need? Please give details of duration scope and approximate cost.  |
| Q33 | **Calibration / Validation Concept** | Describe any new infrastructure, development, collaboration, or research needed for product calibration and validation. Also describe any particularly challenging aspects of performance and how they will be validated. |
| Q34 | **Instrument Hosting** | Describe the intended payload hosting arrangement. E.g., dedicated mission; hosted mission on 3rd party platform; etc. If hosted / bilateral, provide evidence that the partner organization has an identified, currently progressing programme with a partnership opportunity. |
| Q35 | **Mission Requirements** | Describe any challenging requirements to achieve mission objectives (e.g. high pointing accuracy / stability / power generation / heat dissipation / etc.).  |

# **Part 6 - Mission Cost, Complexity and Viability**

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|  | Topic | Response (not to exceed 1 side of A4, font size 10) |
| Q36  | **Assessment of Overall Mission Cost and Complexity** | Please fill in the table below, marking each section with one ‘x’, aside from giving a number for Q1

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| 1 | **Constellation size or 1 spacecraft** |  |  | 6 | **Complexity (Space Segment)** |  |
| 2 | **Payload maturity** |  |  |  | Simple |  |
|  | Mature  |  |  |  | Intermediate |  |
|  | Minor evolution |  |  |  | Challenging |  |
|  | New critical elements |  |  | 7 | **Complexity (Operations)** |  |
|  | Highly innovative |  |  |  | Simple |  |
| 3 | **Ground Station Needs** |  |  |  | Intermediate |  |
|  | Existing Single station |  |  |  | Challenging |  |
|  | Existing Modest network  |  |  | 8 | **Complexity (Ground Segment)** |  |
|  | Existing Multiple ground stations  |  |  |  | Simple |  |
|  | New Single station |  |  |  | Intermediate |  |
|  | New Modest network  |  |  |  | Challenging |  |
|  | New Multiple ground stations  |  |  | 9 | **Overall Mission Cost Range** |  |
| 4 | **Data Delivery** |  |  |  | <£1m |  |
|  | Non urgent delivery |  |  |  | £1-10m |  |
|  | Operational timescales |  |  |  | £10-50m |  |
|  | Time critical  |  |  |  | £50-100m |  |
| 5 | **Product chain maturity** |  |  |  | Above £100m |  |
|  | Development required |  |  |  |  |   |
|  | Research products  |  |  |  |  |  |
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| Q37  | **Further cost & complexity information** | Please provide any information that you think would be useful to explain your choices here, and provide any further information that you can on the overall mission cost. |

# **Part 7 – International Collaboration, Competition, and Dual Use**

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|  | Topic | Response (not to exceed 1 side of A4, font size 10) |
| Q38 | **International** | Please outline the expected, and/or potential for, international/bilateral collaboration, and the status of any related dialogue with actual or potential international partners. Provide details of potential international collaborations, including wider aspects and benefits. Provide current status and potential next steps.  |
| Q39 | **Competition** | Please outline any potential competition, either from UK groups or international groups. What other initiatives could undermine the value of your proposition, and how does this affect the timing of your mission? |
| Q40 | **Dual Use** | As far as is possible, please outline the potential for dual use (i.e., application to security and/or defence applications) of the technology, instrument or mission, explaining your reasoning along with any dialogue with the defence community to date.  |

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**Thank you for taking the time to respond.**

Your response should be sent to ceoiadmin@le.ac.uk by **Thursday May 4th at 4pm**.

Any enquiries should please be sent to Dr Chris Brownsword cbrownsword@qinetiq.com and Dr Rob Scott rob@scottspace.co.uk from the CEOI leadership team.