Potential Approach to Understanding Challenges and Developing Recommendations on Long-Term Sustainability of Outer Space Activities Proposal by UK

1. The following paper provides insight into how the table of challenges developed using the Chairs Working Paper can be used to help develop draft recommendations. The intention of this approach is to compliment other proposals on developing draft recommendations.

2. The Work Plan of the Working Group on the Long-Term Sustainability of Outer Space Activities identifies that in 2026 a draft final report is to be finalised which includes :

   (a) Information on the identification and study of challenges, and corresponding recommendations, as well as possible new guidelines for the long-term sustainability of outer space activities;
   (b) Information on experiences, practices and lessons learned from voluntary implementation of the adopted Guidelines and recommendations for their further practical implementation;
   (c) Information on and recommendations for capacity-building and awareness-raising activities, including those related to improving international cooperation in capacity-building, taking into particular consideration the requirements of emerging space nations and developing countries;
   (d) Recommendations on future activities and work.

3. From these elements, it can be seen that alongside capturing information and experiences, recommendations are expected to be developed across the three pillars of the Working Groups method of work. To provide substantive and jointly agreed recommendations, these recommendations must be built from evidence and experiences that are currently captured as challenges. An initial set of overarching themes of challenges was provided in A/AC/105/C.1/L.410, a Working paper by the Chair of the Working Group which was released in December 2023. Importantly, the paper is a non-consensus view of the discussions to date but is a starting point which summarises the key themes and areas highlighted through the meetings of the Working Group.

4. Section III of the Working Paper by the Chair of the Working Group looks at “Overarching themes on challenges to the long-term sustainability of outer space activities”. As mentioned, these challenges can be seen as a starting point to define the need for a recommendation. In reviewing these challenges it was noticed by the UK that they are a combination of different challenges related to the original mandate of the Working Group: challenges associated with the implementation of the current guidelines, areas where member states have highlighted that additional capacity building measures would be useful and new areas that are currently not addressed by the existing long-term sustainability guidelines.

5. In the table in Annex A of this paper, the UK has made a first attempt at splitting the challenges captured by the Chair in the Working Paper into 3 types of challenge, with the titles closely aligned to previously agreed phrasing. The UK sees this table as a first attempt to interpret these challenges which can be used to identify synergies, gaps and prioritise the key themes ahead of building recommendations. Through an open discussion of these challenges the Working Group will better understand where challenges are currently found and jointly identify the type of recommendations which could be developed to address them.

6. To further develop the challenges that have been identified to date and provide a basis to develop recommendations by the Working Group the UK proposes the following approach:

   a. Hold an informal virtual meeting in May to discuss the approach proposed by the UK to categorise the challenges, seeking feedback on this approach ahead of future informals
   b. Hold informals at the COPUOS Plenary in June 2024 to work through the challenges sequentially in the table proposed by the UK. The intention is to develop the detailed understanding behind the challenges and potentially uncover new challenges not previously discussed. The output of this discussion will form the basis of future recommendations to address the challenges identified.
   c. Member States to use the output of the informals held at COPUOS to start to develop recommendations to address the challenges identified which can be submitted to the Chair in late 2024. The Chair will then consolidate these recommendations into a paper for release at the 62nd STSC.
   d. In the 62nd STSC, an in-depth review can focus on further elaborating and discussing the recommendations raised by member states.

7. The UK believes this approach to be an efficient method to collect, review, and agree the challenges which have been identified so that they can be used to inform the development of future recommendations. Importantly, it is hoped this approach balances the need to prepare to deliver the output of the Working Group in 2026 with an auditable reasoning of where recommendations have been developed from.

Annex A : Overarching Themes on Challenges from the Chair's Working Paper split between 3 challenge types. To note bracketed text has been added by the UK to start to link the challenges to existing guidelines

Challenges related to the implementation of the Long-term Sustainability Guidelines	**Challenges related to Capacity Building in the frame of the Long-term Sustainability Guidelines**	**Challenges related to new areas that may not be captured by the Long-term Sustainability Guidelines**
Registration of space objects Mechanisms for improving registration practices for large constellations (A5.7 change of status of space operations)	*Registration of space objects* - The timely registration of space objects (A5.1 comprehensive regulation practices)	*Space situational awareness and collision avoidance* The safety of human spaceflights and space stations (noting link to B4.5 consult on screening criteria and notification thresholds & B5.4 common international standards … for pre-launch assessments)
Registration of space objects Special responsibilities of launching States related to uncontrolled re-entries (A5.1 comprehensive regulation practices… factor in safety)	*Registration of space objects* How to address ongoing complexities related to the status of launching States (A5.4 clarification and/or resolution to a particular registration issue & A5.8 launched object that contains other space objects)	*Safety and security of space operations* The supervision and safe conduct of close-proximity rendezvous operations (noting link to A.3 supervise national space activities)
Space situational awareness and collision avoidance The increased need for timely and accurate space situational awareness information and related data to be made available in a common/interoperable format (B2.3 sharing orbital information … common, internationally recognized standards)	*Space situational awareness and collision avoidance* The trackability and manoeuvrability of CubeSats and nanosats (B8.1 promote design approaches that increase trackability)	*Safety and security of space operations* The prevention of dangerous alterations of space environment parameters resulting from intentional modifications
Space situational awareness and collision avoidance Improvements to space situational awareness and connected information-sharing, for conjunction-free launches and the safety of human spaceflight missions (B5.5 exchange … trends in the change of the risk of collision of space objects)	*Space situational awareness and collision avoidance* Air traffic coordination during the passage of space objects in airspace (B5.6 notice for mariners and pilots)	*Safety and security of space operations* The implementation of operational and technological measures of self-restraint on States' space activities in order to prevent adverse developments in outer space

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Space situational awareness and collision avoidance Improved mechanisms to locate the appropriate points of contact for operational communications (B1.1 regularly updated contact information)	*Space situational awareness and collision avoidance* The prevention of on-orbit failures of space systems, especially those that are mass-produced using commercial off-the-shelf components (B8.2 design such objects to implement applicable international and national space debris mitigation standards and/or guidelines)	*Safety and security of space operations* The implementation of policy aimed at precluding interference with the operation of foreign space objects through unauthorized access to their on-board hardware and software
Space situational awareness and collision avoidance An improved mode of inter-operator coordination (B1.1 achieved either by providing such information to…)	*Space situational awareness and collision avoidance* A standardized method of risk assessment and a common protocol for collision avoidance (B4.2 develop and implement in an appropriate manner approaches to and methods for conjunction assessment)	*Safety and security of space operations* The preclusion of activities that could damage foreign ground and information infrastructure related to space activities
Space situational awareness and collision avoidance The contact information of small satellite operators for coordination and data exchange to mitigate collision risk (B1.1 regularly updated contact information)	*Space situational awareness and collision avoidance* A lack of required data, information, knowledge, technology and infrastructure to implement the Guidelines (C.3 Promote and support capacity-building)	*Safety and security of space operations* Cyber threats, including those posed by private actors
Space situational awareness and collision avoidance The exchange of operational ephemeris (B2.2 improve such accuracy … from different sources & B2.3 information exchange) (noting link to capacity building)	*Awareness-raising and international cooperation* - Mechanisms to ensure that emerging spacefaring nations enjoy inclusive participation in space activities (C.3 Promote and support capacity-building)	*Debris mitigation and active debris removal* - The development and implementation of criteria and procedures for the preparation and conduct of space activities aimed at the active removal of space objects from orbit (noting link to D.2 new measures to manage the space debris population)
Safety and security of space operations The observance of spacecraft manoeuvring rules to avoid collisions (e.g. between human-rated spacecraft, robotic spacecraft and constellations) (B4.4 collision avoidance manoeuvre decision-making)	*Awareness-raising and international cooperation* - Mechanisms to ensure equitable access to low-Earth orbit (C.3 Promote and support capacity-building)	*Debris mitigation and active debris removal* - The assignment of ownership to space debris (noting link to A.5 enhance practice of registering space objects, A5.7 change of status in operations)

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Safety and security of space operations Operational transparency (e.g. notifications of manoeuvres that may result in safety issues to other operators) (B1.2 timely coordination … orbital collisions)	*Awareness-raising and international cooperation* Mechanisms to address the lack of required data, information, knowledge, technology and infrastructure to implement the Guidelines (C.3 Promote and support capacity-building)	*Debris mitigation and active debris removal* - Appropriate solutions for the active removal and destruction of non - registered space objects
Safety and security of space operations Requirements related to spacecraft manoeuvrability in various orbits (B8.2 debris mitigation standards and/or guidelines)	*Technical developments, space exploration and sustainability* - The need for the cooperation of all Member States and the full support of developed countries in the implementation of research and the sustainability of space exploration (C.3 Promote and support capacity-building)	*Debris mitigation and active debris removal* - Cyber safety, including in relation to space debris mitigation (noting link to B.8 design and operation of space objects)
Safety and security of space operations The failure to reach an international agreement on mechanisms and standards required for the implementation of some Guidelines that require data-sharing or consultation (B1 share information on space objects to B8 Design and operation of space objects)	*Technical Developments, space exploration and sustainability* - Approaches to the design and operation of small-size space objects (B.8 Design and operation of space objects)	*Debris mitigation and active debris removal* - Transparency and safety assurance to encourage private sector actors to implement space debris removal activities (noting link to B4.4 collision avoidance manoeuvre decision-making processes, and B8 design and operation of space objects)
Safety and security of space operations The predominance of a competitive environment motivated by commercial and political views, which will prevent the formation of an interactive and cooperative approach among Member States (B4.5 encourage conjunction assessment service providers under their jurisdiction, C1.1 promote and facilitate international cooperation)		*Technical developments, space exploration and sustainability* - The effect of multiplication of spaceports

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Safety and security of space operations The deployment of thousands of satellites in near-Earth space in the form of large or mega constellations, which can cause orbital congestion and limit the free and equal access of other Member States to the peaceful exploration and use of outer space, which is recognized as the common interest of all humanity (A.4 equitable, rational and efficient use of the radio frequency spectrum and the various orbital regions used by satellites, B.4 perform conjunction assessments)		*Technical developments, space exploration and sustainability* - Protection of the dark and quiet skies, including for astronomical observations
Awareness-raising and international cooperation - mechanisms and standards needed to implement the Guidelines that require data-sharing or consultation (B.2.3 internationally recognized standards to enable collaboration and information exchange)		*Technical developments, space exploration and sustainability* - The sustainability of deep space missions
Awareness-raising and international cooperation The promotion of interactive and cooperative approaches among members to avoid a competitive space environment (D1.5 encourage the participation of developing countries, C1.1 promote and facilitate international cooperation)		
Debris mitigation and active debris removal - the safe conduct of operations for the destruction of in-orbit space objects (B.8.2 debris mitigation standards and/or guidelines)		
Debris mitigation and active debris removal - Good practices for active debris removal (A.2.2.f using existing international technical standards)		

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Technical developments, space exploration and sustainability - Long-term contributions and challenges of large-scale commercial space Launches (A.5 Enhance the practice of registering space objects & B.5 Develop practical approaches for pre-launch conjunction assessment)		
Technical developments, space exploration and sustainability - The sustainability of on-orbit operations and on-orbit manufacturing (B.8.2 design such objects to implement applicable international and national space debris mitigation standards A.2.2.b to consider debris mitigation guidelines when developing, revising or amending national regulatory frameworks)		