UK SPACE AGENCY

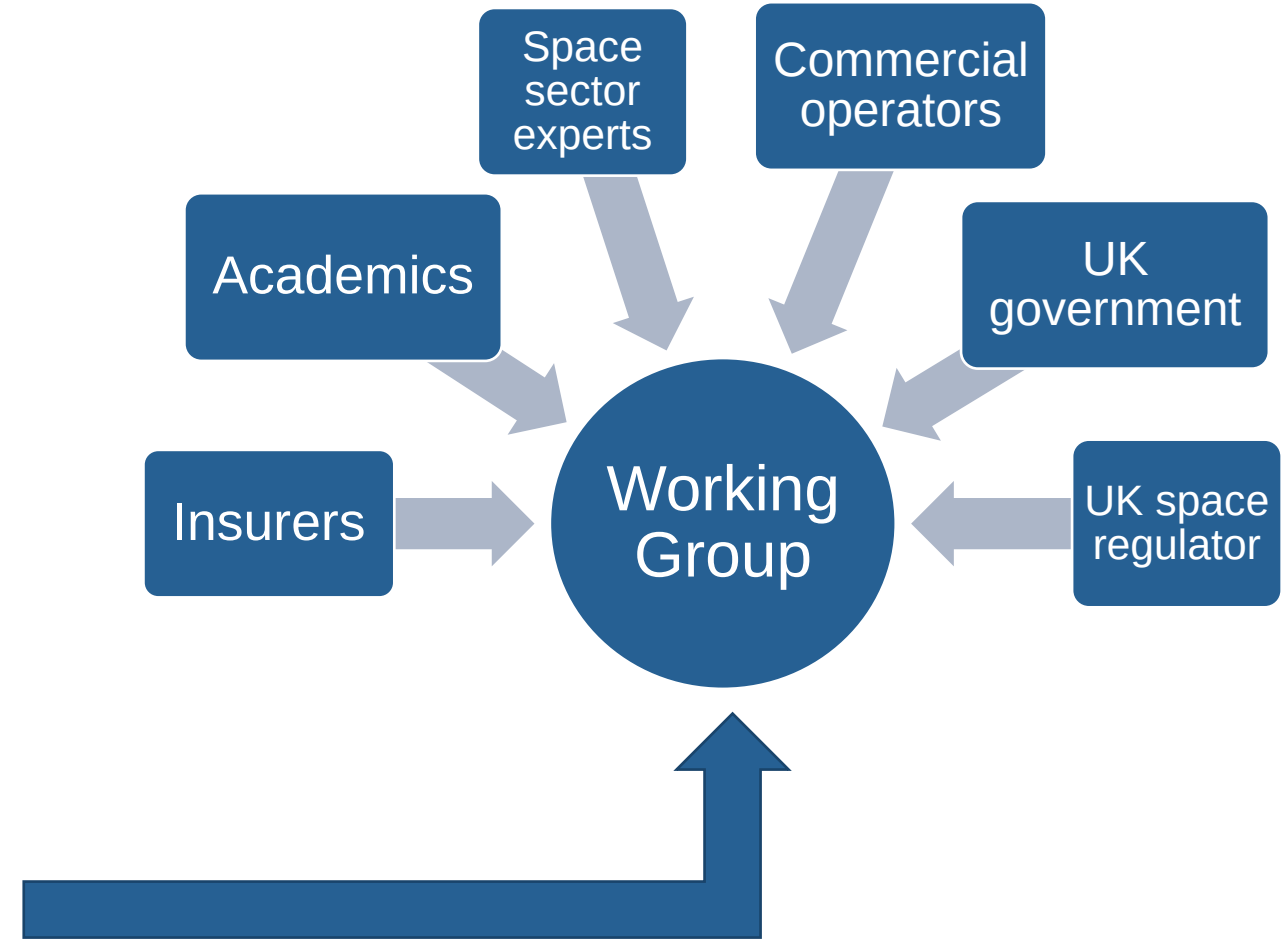
Greening space systems engineering – UK initiatives on space sustainability

UN / Austria Symposium 2022

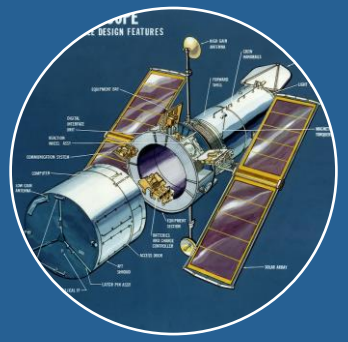
Wednesday 14 September 2022

Plan for Sustainability

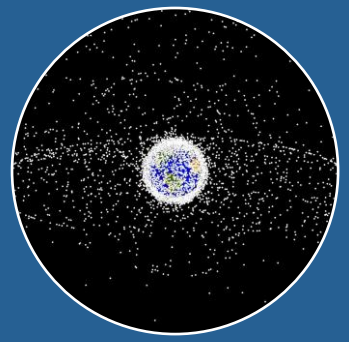
- Announced at Summit for Space Sustainability in June 2022
- Space Sustainability Standard
- Reviewing the orbital regulatory framework
- Reviewing the UK's liability and insurance framework



Safety – sustainability approach to setting liability limits for satellite operators – assessment criteria

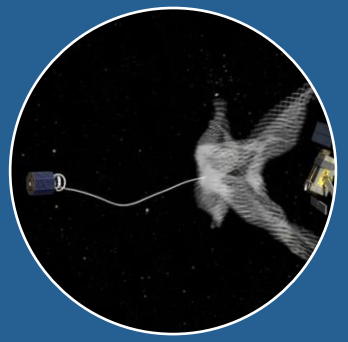


Minimising risk through spacecraft and mission design



Minimising potential for debris during operations

Minimising risk post operations



Use of third-party providers to reduce risks

Photo credits: ESA/NASA

Setting liability limits using safety – sustainability criteria – early thinking

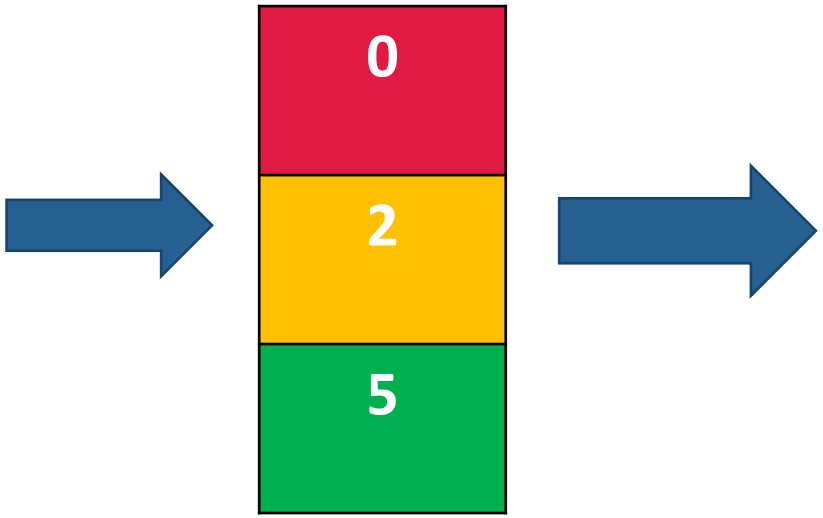
Assessment criterion

Assessment criterion

Assessment criterion

Assessment criterion

Assess each criterion



£	Score
0	15-20
[De-minimis]	[10-14]
20	6-9
50	0-5

Alternatives to traditional third-party liability insurance approach

Reflections to date on developing the methodology

Sustainability - very broad and complex but gaps in evidence	Narrowed focus to what operators can control	Outcome-focused criteria	Include stakeholders – ideas and buy-in	Industry initiatives / investor requirements

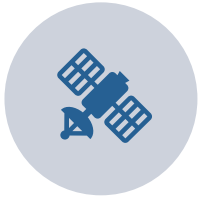
Developing outcome-focussed criteria – not mandating practices but need transparent guidance

Evolving area – no clear definition of what sustainability is or set of actions to address.

Gaps in current evidence base – further research needed.

Long-Term sustainability guidelines don't address wider sustainability considerations

Considered including measures to reduce impact on earth's environment - longer term development



Need to consider trade-offs between different elements

Earth & Space Sustainability Initiative - A strategy for a transparent global space ESG standard

"The space ecosystem touches many aspects of daily life, abounds with commercial investment and increased commercial use cases, and plays a key role in advancing global sustainability and security priorities.

The sector is at an inflection point; leaders believe that existing frameworks are no longer sufficient to manage the full breadth of today's most pressing issues, including space debris and the commercialization of low-Earth orbit (LEO)."

McKinsey May 2022

The UK can lead and collaborate globally to establish an international transparent ESG space sustainability standard. This global standard and the work underpinning it must:

- provide investors and insurers with the information and confidence to:
  - understand what constitutes sustainable activities in space to enable effective investment and insurance decisions;
  - access high quality granular ESG data from space; and
  - consider the technical, economic, regulatory and global governance challenges to allow the space economy to fulfil its potential; and
- cover the whole space system lifecycle.

The Kitemark will be linked to the raising of investment and market access - unlocking ESG assets and investment.

This work can harness the existing world leading expertise across the UK industry and academia and also the experience of the recognised leading UK finance and insurance community.

The expertise gained and knowhow generated by the Kitemark can be exchanged and developed with other space nations and training offered. This is especially important for new space nations or those seeking to upgrade their regulatory framework.

Earth & Space Sustainability Initiative — A strategy to incentivise space sustainability

Industry-led sustainability Kitemark, devised by industry in partnership with the finance and insurance communities and the government to cover all aspects of the design, manufacture, launch, operation and demise of satellites, taking into account ISO and IADC standards and the Space Sustainability Rating (World Economic Forum) while providing a consolidated standard – identifying and closing gaps in existing standards.

Finance - Investors and financial markets are increasingly requiring a compelling ESG plan. Investors are applying such non- financial factors to identify material risks and growth and investment opportunities. The Kitemark offers a stamp of approval recognised by regulators offering confidence to investors.

Recognised by the financial and insurance communities and regulators, the Kitemark will offer a standard which evidences compliance with international sustainability best practice.

Kitemark will incentivise companies to adopt best practice and officially recognize those who take steps to minimize their footprint on Earth's orbit.

Design and manufacture	Launch	Operation	Demise	Measurement & Verification	Energy, Water and Food

• Design for demise of the satellite
• Advanced digital design standards
• Automation and robotics in manufacture and testing
• Impact on ground based science
	• Rocket fuel
	• Launch-originated debris
	• Reusability
	• Horizontal launch systems
	• Standardisation and global coordination of launch safety frameworks for nuclear powered space systems
		• Manoeuvrability of small satellites (in LEO)
		• Risk assessment at platform level or aggregation over "constellation"
		• Trackability of small satellites
		• Debris aspects of close proximity operations
		• Propulsion
		• Sustainability of spectrum
		• In-orbit servicing
			• Reliability of disposal systems at End of Life (EOL)
			• Effectiveness of drag (aerodynamic/ electrodynamic) enhancement devices.
			• Alternatives to de-orbiting solutions
				• Carbon measurement, quantification
				• Methane measurement and quantification
				• Biodiversity tracking, measurement and standards
				• Oceans and maritime domain awareness
				• Active tracking of the impact activities on earth that have positive effect on the environment
					• Space enabler for:
					  • water security
					  • food security
					  • agritech.
					• Energy – sustainable hydrogen, advanced nuclear fuels, advanced reactors, biomass solutions and microgrids
					• Global sustainability challenges - driving financial and economic inclusion.

Earth & Space Sustainability Initiative - A strategy for global leadership in greenhouse gas reduction

An opportunity for the UK to both lead and collaborate globally, in the new $Tn asset classes of ESG and Data.

- Enabled by data, Earth monitoring instruments and constellations - provides the measurements, verification, assessments and certification of impactful climate change mitigation initiatives on the ground.
- Underpinned by the Earth and Space Sustainability Initiative and Kitemark.
- Directly incentivise investment in greenhouse gas (e.g. carbon and methane) reduction initiatives with net positive economic and environmental impacts.
- Facilitates the UK to lead on the establishment of a path away from voluntary offsetting to the establishment of an international compliance market with effective carbon pricing.
- The UK will be the early mover in establishing an internationally regulated carbon and greenhouse gas exchange underpinned by space and ground based data.

Earth and Space Sustainability Initiative and standards to work as a universal translator to enable space and non-space sectors e.g. finance and insurance to collaborate to address space and global sustainability challenges.

Space as an enabler to unlock ESG assets and provide tangible solutions on Earth to address climate change, food security, water security and zero carbon energy solutions

- Accelerate the adoption of sustainable practices, behaviours and norms, enabled by space, with impact across all sectors of the economy and accelerate the migration to net zero by 2050.
- Expand the collaboration with finance and Fintech sectors to unlock ESG assets in large corporates for re-investment in sustainability initiatives around the world.
- ESG standards to unlock investment in financial and technological inclusion in developing nations.
- Incentivised investment in net zero energy generation technology and approaches.
- Galvanise political and regulatory support to unlock the deployment of strategic technologies.

Contacts:
ALDEN Legal, Professor Joanne Wheeler MBE joanne.wheeler@wearealden.com
REEF Group, Piers Slater, pslater@reefgroup.co.uk
Space Park Leicester (University of Leicester), Professor Richard Ambrosi, richard.ambrosi@space-park.co.uk