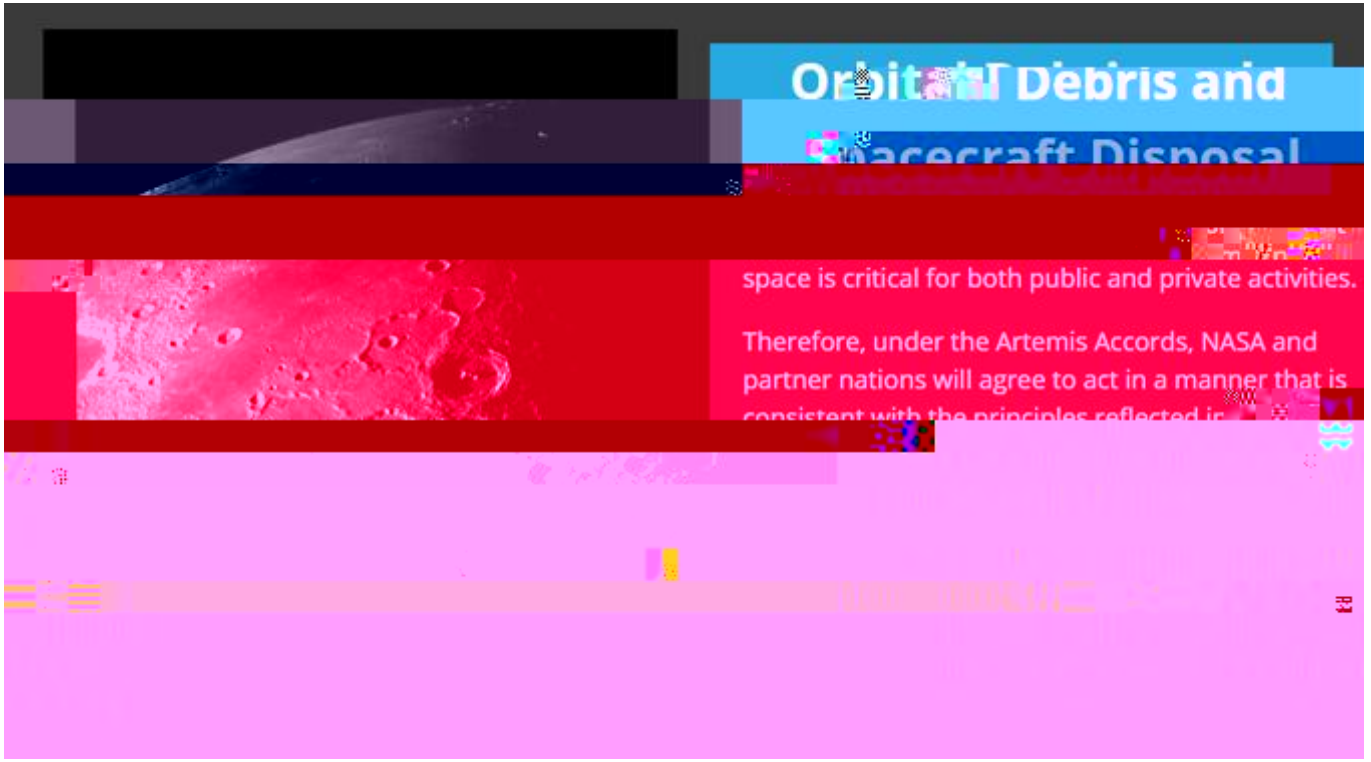
Space Debris and Spacecraft Disposal

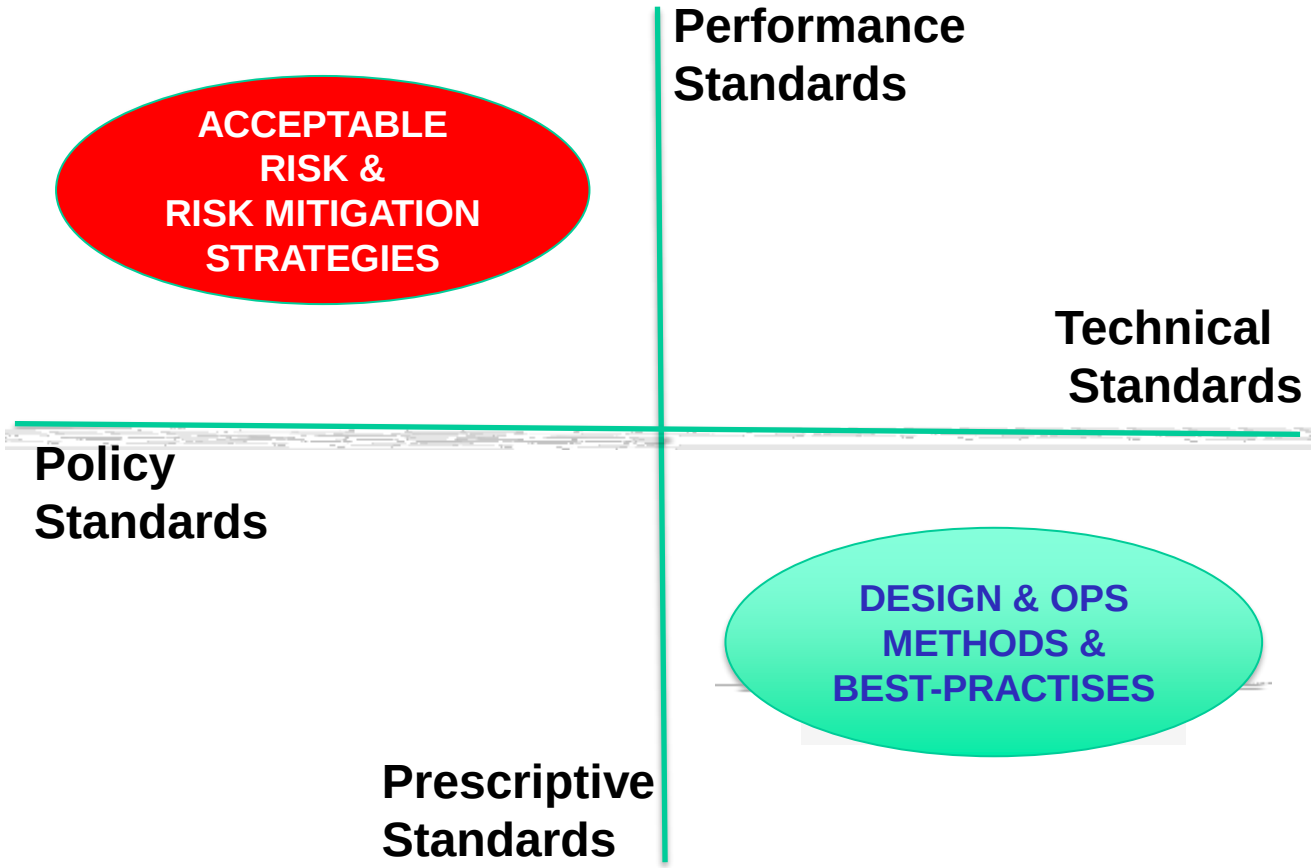
Orbital Debris and Spacecraft Disposal



Committment to effective compliance with UN Space Debris Mitigation Guidelines through policies, and national

Policy Standards vs Industrial Standards

The implementation of UN guidelines on space debris requires the development of standards and compliance enforcement.



Policy Standards vs Industrial Standards

The ISO (International Standardization Organization) institutional mission is to develop industrial standards to facilitate international commerce, and not to set up safety policies (e.g. ISO 24113 for Space Debris), which are a government responsibility.

Interoperability / Emergency Assistance

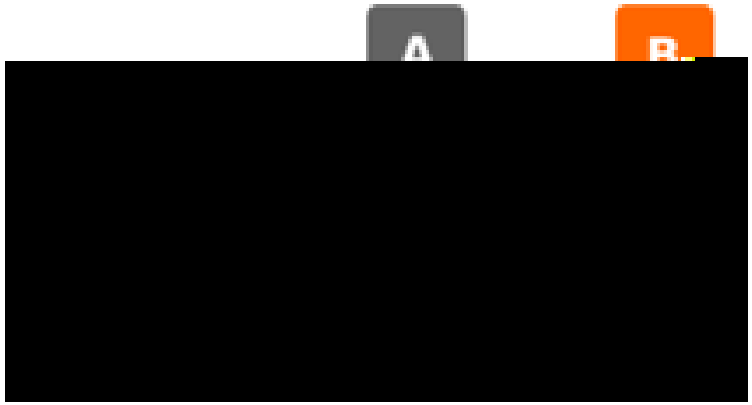
Interoperability

In the context of Moon surface operations, the systems that could interoperate are vehicles, space suits, habitat/modules, robots, and associated data and power systems.

Achieving Technical Interoperability

Interoperability can be achieved through:

- ***de facto standards*** or
- ***open standards***



- *De facto standards* usually reflect a “monopolistic” situation
- *Open standards* presuppose the free involvement of all stakeholders

International Deep Space Interoperability Standards

In the period 2018-2019, the International Space Station (ISS) partners agencies derived from the ISS specifications eight ***International Deep Space Interoperability Standards*** *with the goal of defining 9 #Bropf-pdm870.000010729 0 720 4 r*

Emergency Assistance

Rendering assistance to astronauts in distress on a Moon mission requires development of emergency capabilities and resources, systems interoperability, emergency procedures, preplanning, training, and integrated safety analyses.

Emergency Assistance should be an International Program

- The Moon surface area is about 38 million square miles, more than twice the size of Russia. Emergency assistance on the surface would be possible only if Moon bases will be in close proximity.

- Emergency assistance requires surface-to-surface communication. Line of sight limitation can be solved using orbiting relay satellites and wireless ground infrastructure. Moon outposts of different countries would need integrated communication and navigation services.

Emergency Assistance should be an International Program (cont'd)

- Emergency assistance requires compatible hardware/software and procedures between EVA suits and habitats for astronauts ingress/egress, including the case of incapacitated astronaut.

- Sheltering of astronauts in distress requires overdesigned life support systems, prepositioning of extra consumables, and emergency accommodation.

- Emergency equipment and procedures require testing and periodic end-to-end training by simulation.

Emergency Assistance: Liabilities?

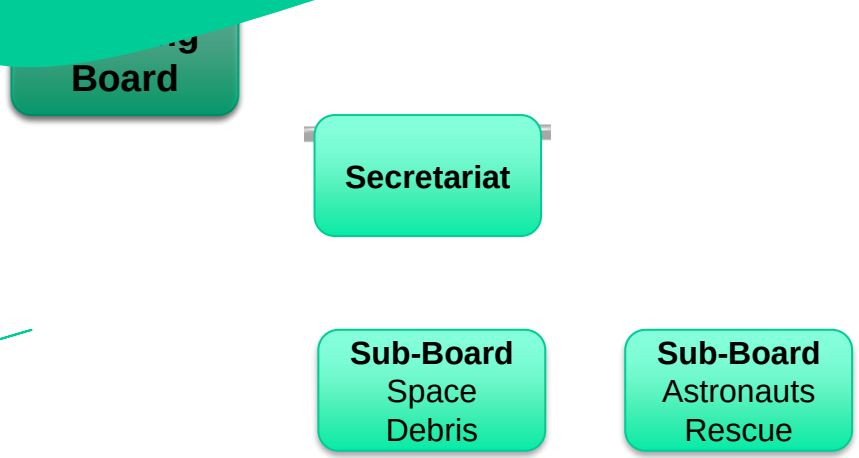
IAASS Safety Standardization Cooperation Proposal: Background

At the 2nd IAASS Conference in Chicago (IL) in 2007, Bryan O'Connor NASA Associated Administrator Safety & MA suggested that international space governance could be better achieved through cooperation on space safety standards. The IAASS followed up with a draft MoU that NASA presented first to FAA/AST and then jointly to the DoS.

In 2008, IAASS received a letter from DoS stating that «*the United States Government does not believe that a set*

IAASS Safety Standardization Cooperation Proposal: Standards Groupings (cont'd)

IV) **Space Debris**.

IAASS Safety Standardization Cooperation Proposal: Organization

- The top body for guiding and coordinating all aspects [illegible] safety standardization activity is the **Steering Board**. Each [illegible] Party would have one representative as member of the Ste[illegible].
- The Steering Board would be support[illegible] Boards d[illegible] areas of standardization and by a[illegible].
- The Steering Board deci[illegible] unanimity.