

Impact of Newcomers on Space Debris Risk

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IAASS Space Hazards Committee

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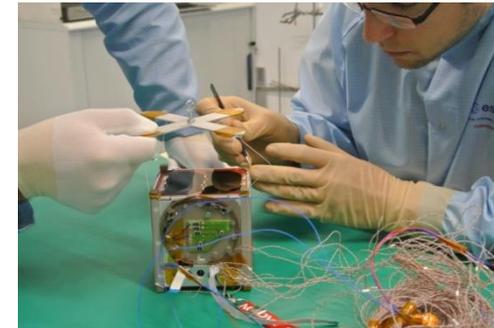
Presentation of the IAASS Workshop

During the 8th IAASS conference, 18-29 May, 2016 in Melbourne (FL), a dedicated panel session was organized to analyze the “impact of newcomers in space activity to space environment”.

Thirty experts from several countries around the world participated to the workshop and discussed the impacts on space environment of CubeSats, Chipsats and Small Satellites Constellations.

- 120 cubesats launched in 2015
- Mega constellations with several hundreds of satellites are planned
- Need to consider also upper stages and back-up satellites

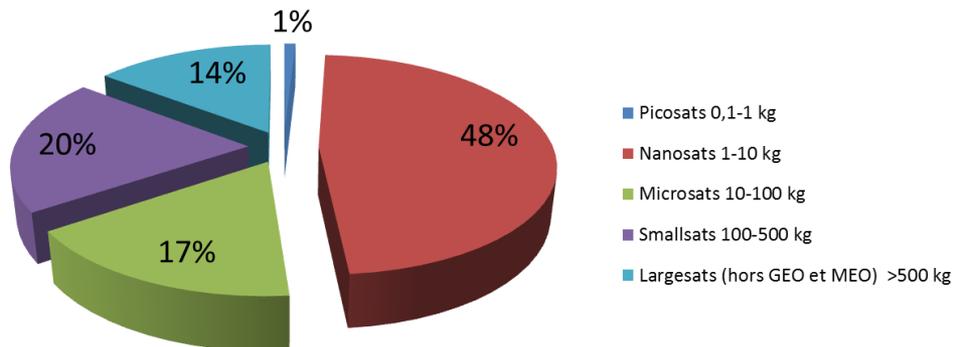
Several important consequences were discussed



Consequence #1: Increase of Objects Population in Orbit

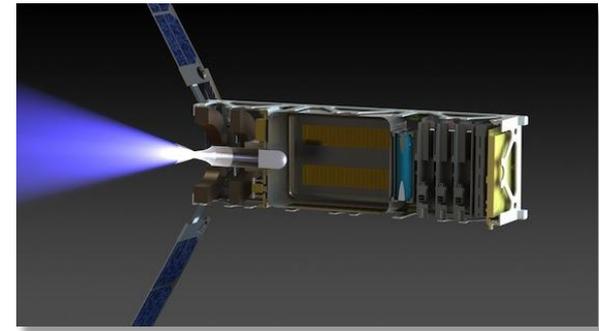
- Increased collision risk to other users of space
- More avoidance maneuvers: operational cost, lifetime reduction
- Significant impact on the long term evolution of orbital population and possible instability

LEO Operational satellites launched in 2014 and 2015
(220)



Consequence # 2: Limited Manoeuvring Capability

- Absence or limited (electric) propulsion system:
 - Impossibility of performing avoidance manoeuvres
 - Impossibility of performing disposal manoeuvres:
 - small satellites without propulsion should be deployed below 650 km to comply with the “25-year rule”. However they are often launched as “passengers” and their orbit is defined by the main payload
- Poor reliability of low-cost satellites (simplified design, reduction in the number of redundancies):
 - risk to abandon in space defunct satellites that have lost their ability to control



Consequence # 3: Non-compliance with Space Debris Regulations

- New operators may not be aware of the existence of guidelines commonly agreed at international level
- Many countries do not have a legal system to enforce these rules to their operators.
- How to ensure that all countries will monitor the activities of their operators as requested by the UN-Treaties?
- two options were discussed:
 - Verification by the launch operator, however agreement by all operators is required to avoid distortion of competition.
 - New international organization similar to the ICAO (International Civil Aviation Organization) imposing rules for the benefit of all commercial operators



Consequence # 4: New Challenges for Space Surveillance

- Difficulty to track and identify small satellites, position known with low accuracy
- Increased work load for the space surveillance systems: number of conjunctions proportional to the square of the number of objects
- Difficulty to know “who is who” when several dozens of objects are released on neighboring orbits: application of United Nations Conventions on Registration and Liability could become impossible...



Summary

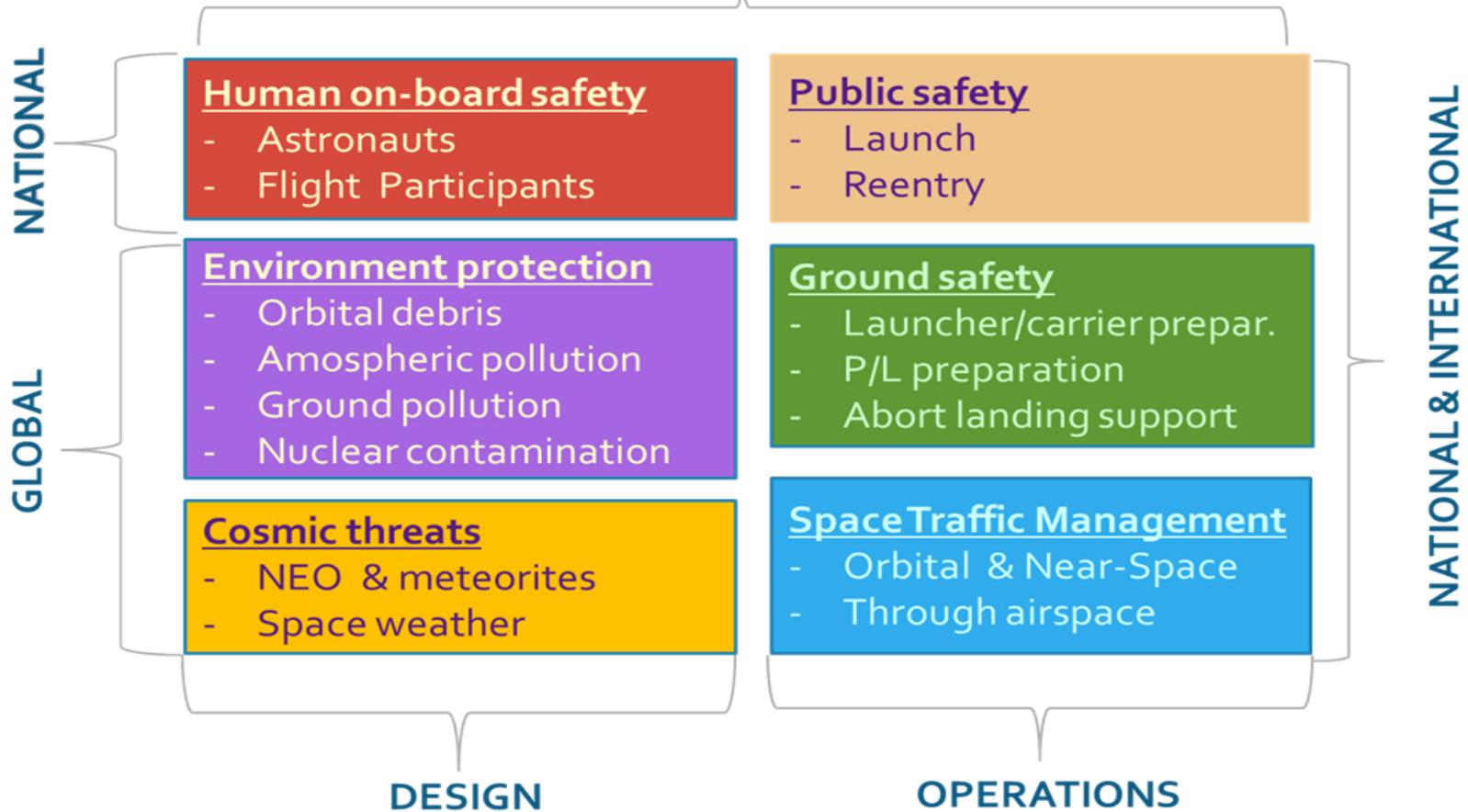
The development of small low-cost satellites such as cubesats, leads to the emergence of new projects and new operators.

Several important consequences were analyzed during the panel session organized by the IAASS in May 2016:

- ❖ short term increase of collision risk to active satellites
- ❖ inability for some smallsats to perform collision avoidance and end of life maneuvers, due to a simplified design
- ❖ poor awareness of space debris guidelines by newcomers and lack of national regulatory framework for new spacefaring countries
- ❖ new challenges for space surveillance systems
- ❖ possible long term exponential increase of objects population in low Earth orbit

About IAASS

SPACE SAFETY



About IAASS

The *International Association for the Advancement of Space Safety* (IAASS):

- non-profit organization established in 2004
- dedicated to furthering international cooperation and scientific advancement in the field of space systems safety.
- member of the International Astronautical Federation (IAF) since 2004.
- Since 2010, Observer status at the United Nations COPUOS
- Member of ICAO (International Civil Aviation Organization) Space Learning Group

Membership open to anyone having a professional interest in space safety.

Members can be physical persons, corporations, agencies, universities, institutions, and other professional associations.

IAASS is Independent & International

Mission and Goals of IAASS

Mission

- Improve safety of space missions for the general public, ground personnel, crews and flight participants.
- safeguarding and sustainability of the on-orbit environment

Goals

- Advance the science and application of Space Safety
- Improve communication, dissemination of knowledge and cooperation between interested groups and individuals
- Improve understanding and awareness of the Space Safety discipline
- Promote and improve the development of Space Safety standards
- Advocate the establishment of safety laws, rules, and regulatory bodies at national and international levels for the civil use of space

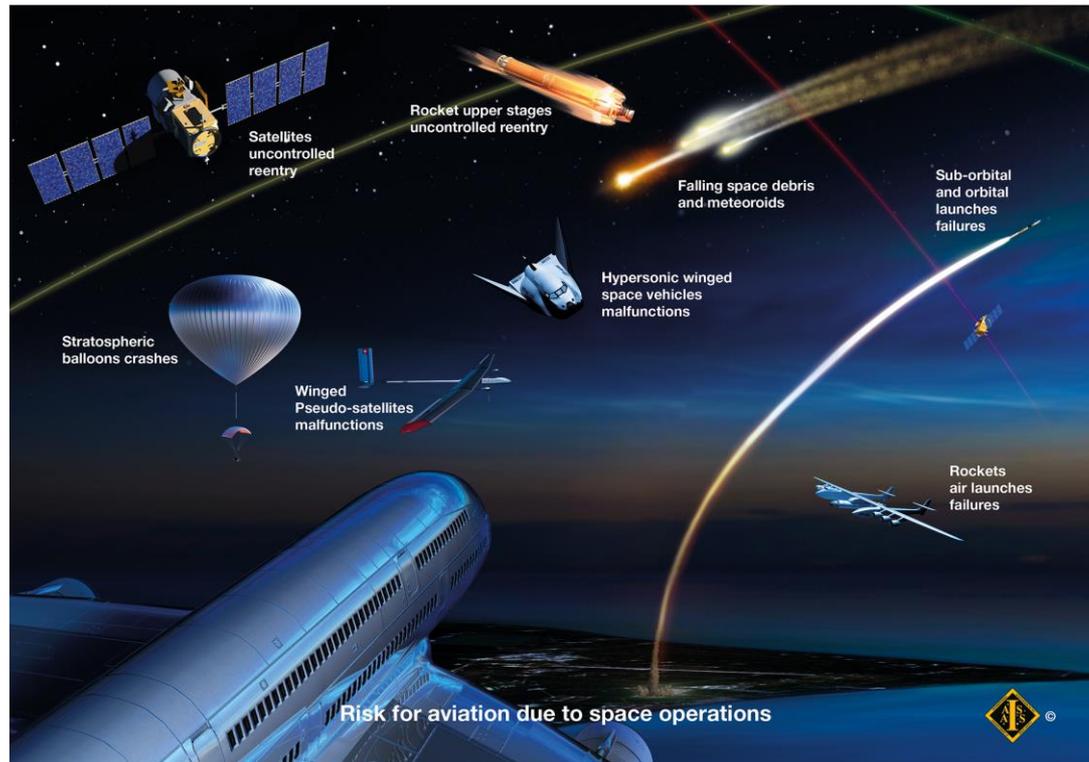


Main Activities of IAASS

Studies

The IAASS performs advanced studies on topics of major interest. Currently:

- Organizing Safety for Commercial Human Spaceflight
- Aviation Safety Risks due to Space Operations (ADMIRE)



Main Activities of IAASS

Publications on Space Safety

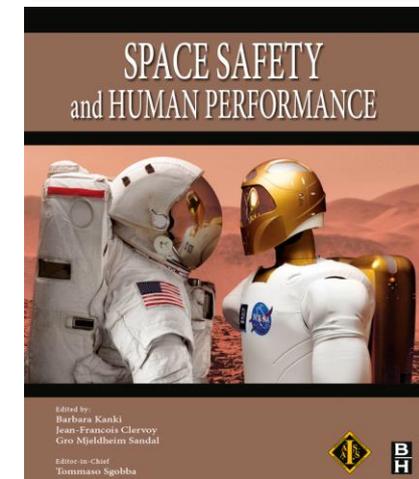
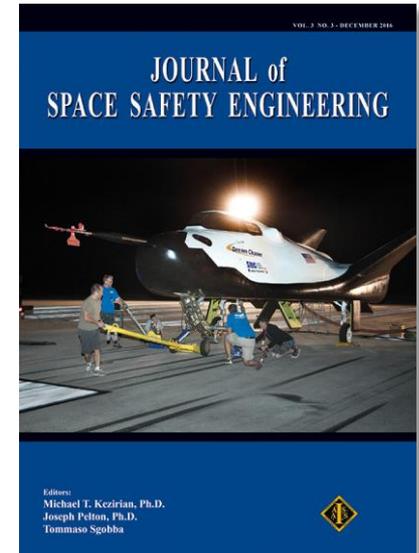
IAASS publications aim to support education in the field of space safety, and to inform about important research results and studies: books, articles, reports, Space Safety Magazine on-line, Proceedings, Standards, Journal of Space Safety Engineering. [To be published by Elsevier in 2017: “Space Safety and Human Performance”

Space Safety Events

Specialized events for continuing education and training in space safety: workshops, seminars, conferences, and hands-on courses including space debris. [New course on Space Debris, April 5-6, Toulouse (F)].

Awards

The IAASS awards individuals and organizations that made a significant contribution towards improving space safety.



THANK YOU FOR YOUR ATTENTION!

<http://iaass.space-safety.org/>



Next conference: Toulouse (France) 18-20 October 2017