



WORKING PAPER

LEGAL COMMITTEE – 39TH SESSION

(Montréal, 25 – 28 June 2024)

Agenda Item 3: Review of the General Work Programme of the Legal Committee

**RE-ENTRY OF SPACE OBJECTS AFFECTING
INTERNATIONAL AIR NAVIGATION**

(Presented by the Republic of South Africa)

1. INTRODUCTION

1.1 The global reliance on space-based technology for its daily functioning is ever increasing. Satellite technology supports a wide variety of industries including aviation, defence, maritime, agriculture, science, etc.

1.2 The aviation industry has derived significant benefits from the Global Navigation Satellite System (“GNSS”) which provides communications, navigation, surveillance (“CNS”) in support of air traffic management (“ATM”) services worldwide. GNSS has enabled Performance Based Navigation (“PBN”) which has provided navigation guidance for all phases of flight, including surveillance and communication through Automatic Dependent Surveillance–Broadcast (“ADS-B”), Automatic Dependent Surveillance–Contract (“ADS-C”) and other related services.

1.3 Although the advantages of satellite technology within the aviation industry are significant, another consideration becoming more prevalent for aviation is the potential risks associated with the re-entry of space objects associated with satellite technology (re-entry of rockets used for launching of satellites, de-orbiting of satellites reaching end of life, and other space objects created from satellites damages by other space debris).

1.4 On 17 February 2023 the ICAO Secretary General provided opening remarks to the joint workshop on the risks to airplanes in flight from re-entering space debris, hosted by the Outer Space Institute of the University of British Columbia; Institute of Air and Space Law of McGill University; and International Association for the Advancement of Space Safety. The three (3) specific priorities raised by the ICAO Secretary General to guide the workshop included:

1.4.1 To continue to identify and explain where there are clear mandates of the Chicago Convention relating to Space Transport.

1.4.2 To acknowledge and plan our actions based on the clear understanding that this is a multi-sector problem, requiring a multi-sector solution.

1.4.3 To promote near-term action by outer space stakeholders to implement the already existing Guidelines for the Long-term Sustainability of Outer Space Activities, and the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space.

2. DISCUSSION

2.1 As of 4 May 2024, the satellite tracking website “<https://orbit.ing-now.com/>” listed 9,900 active satellites in various Earth orbits, namely Low Earth Orbit (“**LEO**”), Medium Earth Orbit (“**MEO**”) and Geostationary/Geosynchronous orbit (“**GEO**”). The satellite numbers could grow to several hundred thousand by the year 2027. Most of the satellites are found in the LEO with the near-Earth environment already starting to get congested.

2.2 Considering the current number of satellites in orbit, and the expected growth of the industry, it can be anticipated that the number of rocket launches needed to maintain these orbiting constellations will also increase, which in turn will increase the number of miscellaneous debris left in orbit such as abandoned rocket bodies, damaged and inactive satellites, and other debris fragments. As a consequence of the increase in satellites, the risk of collisions between two or more satellites is enhanced, and so is the risk of increase in debris.

2.3 Because objects orbiting at low enough altitudes continue to be affected by the topmost parts of Earth's atmosphere, a drag is created that eventually causes a re-entry, leading to uncontrollable re-entries. There are many elements that make it difficult to predict these re-entries, including fluctuations in the atmosphere itself.

2.4 Engine burn is used during a controlled re-entry to guide the rocket body to a recovery zone or a distant region of the ocean. For this reason, some fuel needs to be kept in the rocket body, and the engines need to be able to ignite again. It should be recognised that although certain operations are categorised as controlled re-entry, the footprint on the Earth's surface (usually remote oceanic areas) of the recovery zone is large. Although agencies and States track and predict various re-entering space objects, the accuracy of those predictions varies greatly over time, and currently, the precise location of a re-entry cannot be predicted with enough accuracy to provide meaningful warnings.

2.5 With ICAO's drive towards Trajectory Based Operations (“**TBO**”), the conjunctions between uncontrollable/controllable re-entries becomes critical including the ability to share this information across a wide range of stakeholders, ensuring a real time picture.

2.6 Any controlled or uncontrolled re-entry of a space object represents a risk to aviation safety, and although recorded incidents has been marginal, it requires careful consideration by the aviation sector.

2.7 The workshop held between 17 – 18 February 2023 named, “Ensuring the safety of aviation when there are uncontrolled space object re-entries”, developed several recommendations that can be accessed on the following link: <https://unitingaviation.com/news/safety/ensuring-the-safety-of-aviation-when-there-are-uncontrolled-space-object-reentries/>

2.8 **Legal Aspects to Consider Regarding the Re-Entry of Space Objects Affecting International Air Navigation Services**

2.8.1 The Convention on International Civil Aviation in Article 1 states: “The contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory.” However, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer

Space, including the Moon and Other Celestial Bodies, in Article II states: “Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.” ICAO’s role in the Outer Space sector is therefore limited.

2.8.2 International Space Law is underpinned by five international treaties, namely:

- a) The Outer Space Treaty - “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies”;
- b) The Rescue Agreement - “The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space”;
- c) The Moon Agreement - “The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies”;
- d) The Liability Convention - “The Convention on International Liability for Damage Caused by Space Objects”; and
- e) The Registration Convention - “The Convention on Registration of Objects Launched into Outer Space”.

2.8.3 There is a need to review and align terminology and definitions contained within the International Space Law and Treaties with what is contained in the Chicago Convention and related Annexes, more specifically terminology and definitions associated with “damages” and “compensation”.

2.8.4 It is submitted that the Legal Committee must consider the Montreal Recommendations on Aviation Safety and Uncontrolled Space Object Re-entries emanating from the workshop and identify any legal aspects which require further development.

3. CONCLUSION

3.1 Based on the above, it is clear that there is a need for space law to align with aviation law. If space law and aviation law do not align with each other, then this may lead to catastrophic results such as major damage to aircraft and land, as well as loss of life.

3.2 However, an alignment of space law and aviation law will lead to positive results which will save the Earth, the property on Earth as well as the lives on Earth.

3.3 It is recommended that the Legal Committee requests the ICAO Council to include in the Work Programme of the ICAO Legal Committee the need to develop a legal framework to ensure the alignment of aviation law and space law in order to avoid the risks posed by space debris to aviation safety.