Remarks by the Secretary General
of the International Civil Aviation Organization (ICAO)
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

(17 February 2023)

1. According to the American Institute of Aeronautics and Astronautics, on Christmas Day, 1996, an object they believe was no bigger than a marble impacted the windshield of a Boeing 757 at a typical cruising altitude of just over 30,000 feet.

2. Media accounts of the incident reported that it cracked the outer pane of the three-ply windshield, posing a cockpit depressurization threat and forcing the flight crew to make an emergency landing.

3. This report could very well be describing a fragment from a piece of a re-entered space object, and what it reveals to us is that even very small fragments of falling space-debris can cause serious aircraft safety risks causing an emergency, or even an accident.

4. Of additional interest is the fact that more rockets and space objects were launched in 2022 than during *any* previous year, according to data from our colleagues at the United Nations Office of Outer Space Affairs (OOSA).

5. These 2022 results are most likely due to the immense swarms of satellites now being deployed in low-earth orbit, and with the significant growth of such mega constellations, vastly increased numbers of spacecraft, after the end of their missions, will also need to be de-orbited in the future.

6. Many of these will of course be managed very safely over the ocean and away from air routes, but the sheer number of spacecraft launched of to be launch raises an increasing possibility of uncontrolled re-entries, whether due to unpredictable failures or due to impacts with fragments from orbital collisions.

7. Although the Boeing 757 windshield impact case was a rare event, over the course of 2022, there were a number of occasions when Civil Aviation Authorities around the world had to react to, and manage, similar associated safety risks. One country even went so far as to consider closing part of its airspace to mitigate the risk posed by a potential hazard.

8. To put this further into perspective, the last five years have seen the number of rocket launches *double* globally, and just in the United States, the Federal Aviation Administration (FAA) managed a record-breaking 92 launches and capsule re-entries in 2022, up 33% from the prior year.

9. So far in 2023, Space X alone has been conducting launches at the rate of one every four days.

10. There were also more than 10 launch failures in both 2020 and 2021, and these pose their own unique risks to civilian operations. The overall launch failure rate has been greatly reduced over the last 50 years, but in absolute terms, the numbers of failures each year remains similar to the number seen during the late 1970s.

11. In addition, the increasing number of launch and re-entry missions is posing new challenges to what used to be normal airline flight frequency, in geographic areas where launches are more prevalent.

12. Since safety is such a paramount objective in our sector, it should come as no surprise that the risk of falling space debris to international civil aviation is a matter of increasing concern to ICAO's global community.

13. And we also have to consider both the safety and flight frequency risks in the context of the total number of flights in our global network doubling every fifteen years since the mid-1970s.

14. Annex 19 of the Chicago Convention, which relates to Safety Management, defines safety itself as:

> *"The state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are **reduced and controlled** to an acceptable level."*

15. However, it's not easy to calculate the risk levels in this area, at least not to a degree of accuracy that the aviation community is generally accustomed to.

16. It also remains important to recognize that there is still no 100% proven instance of space debris having ever actually hit an aircraft, and that more generally, in the entire history of space exploration, incidents of falling space debris causing injury to people have been extremely rare.

17. So while risk levels today remain low, they are undoubtedly expected to grow, and at a rapid pace.

18. And as we prefer to stay ahead of the game in global aviation, where any risks to the safety and dependability of international air transport are concerned, I am pleased to introduce you to what ICAO is currently working on, and some perspectives on some priorities we might focus on going forward.

19. One area of our efforts today sees us engaging more closely with the Air Traffic Management community to improve the safety of the skies with respect to space launches.

20. To that end, the *Separation and Airspace Safety Panel* of the ICAO *Air Navigation Commission* continues to explore improvements based on the work done by Member States, including the FAA's *Acceptable Level of Risk (ALR)* concept.

21. More recently, the 184 countries, which participated at the 41st Session of the ICAO Assembly last October, endorsed that ICAO should begin more closely examining matters related to Higher Airspace Operations, which includes space-bound vehicles as they traverse through the atmosphere.

22. Our work in this area is being greatly informed by the knowledge and experience of our Member States, including the United States' *ConOps for Upper 'Class E' Traffic Management (ETM),* and the European Union's *Concept of Higher Airspace Operations (ECHO).*

23. In parallel to that, ICAO staff are actively engaging with appropriate Member States to ensure that space launches are being properly planned, and that related data and information are being sufficiently and readily shared.

24. In terms of what else we could do, one of the key issues is to understand what we can do better from a technical perspective:

    1. For example, are there ways to enhance surveillance and sharpen the risk profiles associated with falling space debris?

    2. Is there a better way to provide early warning sufficient to ensure mitigating action can be taken by aircraft operators and flight crews?

    3. Can rockets and satellites be made with materials that are less hazardous to aviation?

25. In general, I think we can all agree that there are a number of technical measures that could be implemented, to help ensure safe and secure skies for everyone.

26. But technological enhancements are developed and implemented in a complex ecosystem, and one that includes legal, social, political, and other components.

27. Additionally, while international civil aviation has to abide by the provisions of the Chicago Convention and its international Standards, the role of ICAO in the Outer Space sector is currently limited.

28. **One of our first priorities** is to continue to identify and explain where there are clear mandates of the Chicago Convention relating to Space Transport.

29. This question was in fact discussed at length by countries at our 40th Assembly, in 2019, and the result was a new *Resolution* on Commercial Space Transport, reaffirming our role in developing policy guidance in the areas where international Commercial Space Transport operations intersect with international civil aviation, and in close coordination with the United Nations Office of Outer Space Affairs (OOSA).

30. **A second priority** we've established is to acknowledge and plan our actions based on the clear understanding that this is a multi-sector problem, requiring a multi-sector solution.

31. This brings us to our **third priority,** which focuses on promoting 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*.

32. Both of these documents are the result of many years of work by the Committee on the Peaceful Uses of Outer Space, inclusive of its scientific and technical sub-committee, and they provide a good launching point for us to start coordinating necessary safety risk mitigation requirements in both sectors.

33. This provides a good structure and foundation for further multilateral progress in this area, but it's success very much depends on you, the experts with multidisciplinary specialities and the Civil Aviation Authorities, and in particular our colleagues from Space Launch capable States.

34. We greatly encourage you to share your insights, experiences and concerns with us here, and we will be working with UN OOSA to assure that all relevant information and contributions are duly considered by the outer space-related segments of next year's *United Nations Summit of the Future.*

35. We are very eager to listen to your views, and to understand what the international civil aviation community can do to contribute to and support this important area.

36. Thank you.