

November 2021

IAF COMMERCIAL SPACEFLIGHT SAFETY COMMITTEE (CSSC)

Fostering Safe Commercial Access To Space

1. Introduction

The present brief has been prepared to provide an outlook of the major areas onto which the CSSC focused over the year.

2. Summary

SPACEPORTS: In Europe there is high interest in Spaceports Development and in general in the new Space Economy. This was in particular remarked during the Conference 'Mediterranean Aerospace Matching', held in Grottaglie in September 2021; this site was designated in 2018 by the Italian Minister of Infrastructures and Transportation as the future spaceport for suborbital flights. The 2nd National conference of Space Geopolitics was held in Caserta, Italy in October 2021, with the participation of the Italian Space Agency (ASI) and reps from different organizations, including ALTEC. In the regulatory area, following the European Concept for Higher Airspace Operations (ECHO) an EU-driven initiative, a working group for High Altitude Operations and Access to Space led by the Italian Civil Aviation Authority (ENAC) was established to start drafting its national regulatory framework covering suborbital flights, air-launch and reentry activities.

Japan has four spaceports in development: Hokkaido, Kii, Oita and Okinawa. Oita Spaceport is based on a commercial aviation airport from which All Nippon Airways (ANA) has signed an agreement with Virgin Orbit to operate the air-launched rocket carrier Launcher One.

DEBRIS REMOVAL: Japan has now five commercial space debris mitigation companies, namely Astroscale (ADR/

magnet), Ale (Electrical Tether), Axelspace (Membrane structure), Skyperfect/JSAT(Laser) as well as KHI (ADR/robot).

SUBORBITAL AND ORBITAL SPACEFLIGHT: The UK and Italy are pursuing initiatives for direct access to space from their respective territories. In the UK, the Government has published its Space Industry Regulations in July 2020, aiming at Commercial Launches from Scotland from 2023 onwards. In Italy, ALTEC is coordinating suborbital spaceflight capabilities, aiming at carrying out Ground Segment and Operations activities. This is targeting markets such as space tourism, microgravity science, and astronauts/pilots training. Other European countries (i.a. the Netherlands through the DAWN company currently testing rocket-powered drones from New Zealand) are also interested in developing infrastructures for vertical and horizontal operations.

FLIGHT AND GROUND FACILITIES: In Italy, the SpaceLand group is accelerating the development of ad-hoc-designed ground and flight facilities to fulfill the need of low-cost, user-friendly low-gravity and zero-gravity environments in support to microgravity STEMM (Science, Technology, Engineering, Math, Medicine). Operations are predicted to start from mid-2022 onwards.

SPACE TRANSPORTATION COMPANIES IN JAPAN: there are seven commercial space transportation companies in Japan including Honda which newly announced in September 2021 a small launcher development. Interstellar Technologies have already gotten into suborbital launch service. Planned operations are manned and unmanned by horizontal, vertical, sea and air launch.

3. Highlights

US NEW SAFETY REGULATIONS: New launch and reentry safety regulations (Part 450) issued by the US Federal Aviation Administration's Office of Commercial Space Transportation (FAA-AST) went into effect in 2021. Part 450 regulations may be useful to countries that are considering new national frameworks for commercial space transportation, including hosting U.S. vehicles in their country that would be licensed by the FAA. In parallel, the FAA through its Center of Excellence continues pushing medical guidelines both for Crew Members and for Spaceflight Participants (SFP).

COMMERCIAL SPACE TECHNOLOGIES: In Japan, initiatives are focusing on a pulse-destination engine development, next-gen composite high-pressure tanks and Artificial Intelligence-driven operations. The Space Liner Association (SLA) was established in Japan in May 2021 to develop reusable space vehicles for human suborbital spaceflight, LEO space tourism, and P2P space flight. SLJ is the platform formed by users, operators and manufacturers to encourage LEO and beyond space economic activities under Private-Public Partnerships (PPP).

GROUND & FLIGHT SEGMENTS: 1) Spaceports: design of the first set of SpaceLand Centers is ongoing, configured as prototypes of Mars Habitats, showcasing novel Near-Zero-Energy-Building (NZEB) and In-Situ-Resources-Utilization (ISRU) technologies, construction methods and mixed materials; such multi-facilities will be open to both users and the general public, with three target locations in Switzerland, Mauritius and central-eastern Asia 2) Flight: following on a License granted to SpaceLand by the US-Government for Spaceport development studies in Africa, an exclusive agreement has been signed with US partners to support the above mentioned projects with a novel large aircraft accessible to SpaceLand affiliates and partners for long-duration parabolic flights.

IAASS ESTABLISHES A SPACE SAFETY INSTITUTE (SSI) as an independent safety verifier for New Space, checking compliance with relevant Industry Standards using a "Safety Case" approach.

SAFETY AND PSYCHOLOGY: When safety is at stake, it is not only a question of technical advances, psychology is also an important question, especially concerning the evaluation of risks. With this point of view, the flight of

SpaceX in outer space with only "amateur" astronauts is an important milestone; For some, it shows that non-professional astronauts could be considered as "payload" or "passengers" rather than an integrated component of the safety of the system, what shall impact future designs.

4. Future Outlook

POINT TO POINT (P2P) TRANSPORTATION: From the perspective of the Global Spaceport Alliance, one of the most interesting projects in the coming years will be the effort to accomplish point-to-point transportation through space. Multiple companies are looking at developing similar systems. Successfully achieving this type of capability will require partnerships between government, industry, and academia, and will involve not only advances in engineering and technology, but also work in policy, law, regulations, customs and security, flight and ground operations, market analysis, and economics. We believe that the Commercial Spaceflight Safety Committee could play an important role in helping to bring about these transformational capabilities.

Japan is establishing and developing its hydrogen network both for ground and space transportation.

REGULATORY AND LEGAL: An adequate and harmonized regulatory framework has to be developed and refined. Exchange of information among participating countries has to be fostered.

ACCESS TO LOW-COST FACILITIES: SpaceLand Flight and Ground segments aims to help planetary exploration industry and low-G / microgravity STEM stakeholders in all continents, facilitating access to low-cost facilities for hand-on R&D, Education and Test programs.

5. Committee activities

The CSSC will focus on fostering the interactions and mutual knowledge of the committee participants. An intensive effort shall be performed in attracting more papers stimulating the sharing of information and discussing among a diverse community the various challenges of common interest. Primary focus has to be put on how Safety affects the various activities and processes. Focus on Space Traffic Management (STM) will also be given by the Committee.