

IAF SPACE TRANSPORTATION COMMITTEE

1. Introduction/Summary

The objective of the IAF Space Transportation Committee is to address worldwide space transportation solutions and innovations. In particular, the goals are:

- To foster understanding and cooperation amongst space business academicians and practitioners, through the creation, diffusion, and adoption of new knowledge and lessons learned
- To build a worldwide network of communication and relationships
- To encourage, promote, and assist the development of newer members of the space community through IAC participation

The corresponding activities are devoted to different types of space transportation missions, systems (launch vehicle system and/or the propulsion stages, expendable or reusable, manned or unmanned) and their safety and support operations.

This report presents the 2023 May brief report of the Space Transportation Committee in the IAF format.



Space Transportation Committee New Members

2. Latest Developments

NASA CONTRACT AWARDED TO BLUE ORIGIN

NASA has awarded a NextSTEP-2 Appendix P Sustaining Lunar Development (SLD) contract to Blue Origin. Blue Origin's National Team partners include Lockheed Martin, Draper, Boeing, Astrobotic, and Honeybee Robotics. Under this contract, Blue Origin and its National Team partners will develop and fly both a lunar lander that can make a precision landing anywhere on the Moon's surface and a cislunar transporter.

NASA ARTEMIS I MISSION

The first launch of the Space Launch System (SLS) was conducted in November 2022 with great success as part of the first Artemis mission. The Space Transportation Committee held a committee webinar to share additional details about the launch. The mission included successful operational demonstration of all propulsion systems of the Space Launch System (cryogenic LOX-LH2 first stage, solid rocket boosters designed as an extended 5 segments version of the 4 segments Shuttle booster, cryogenic LOX-LH2 upper stage), as well as the propulsion system of the Orion Lunar spacecraft, and, in particular the primary OMS-E engine re-used from the Shuttle program, the auxiliary thruster and the reaction control thruster of the European Service Module developed in collaboration with ESA. The next and first manned flight of the Artemis program is currently scheduled for 2024.

NORWEGIAN MICROLAUNCHER SPACEPORT CONSTRUCTION ON TRACK

The construction of the spaceport for micro launchers in Andøya, Norway started in early 2022. The first construction stage is soon to be completed, including the first launch pad, an integration hall, and a temporary launch and mission control center.

Andøya Spaceport has signed a firm contract with the German launch provider Isar Aerospace which will be operating from the spaceport from late 2023. Other launch operators are in talks with Andøya Spaceport which aims to host several launch operators at once. Currently, the licensing process is in the final stage for both the spaceport and the launch operator.



Andøya Spaceport © Andøya Space

SPACE X STARSHIP LAUNCH

SpaceX conducted their first launch of the Starship vehicle system, which managed to lift-off and clear the tower successfully but was terminated after stage separation failed. SpaceX is now reviewing the data, repairing the damage to the launch site, investigating an issue of the flight termination system, and planning next steps in development. The test was the first attempt to lift off the Starship fully stacked in its launcher, whose first stage (Super Heavy Booster) is powered by 33 LOX- / LCH4 Raptor engines, for a total nominal thrust of more than 71 MN.

VIRGIN ORBIT LAUNCH FROM UK

Virgin Orbit conducted the first ever launch from UK soil in January 2023. Unfortunately, the launch failed to reach orbit. Since the launch, Virgin Orbit filed chapter 11 bankruptcy and is currently in the process of either finding new ownership or selling assets.

H3 FIRST LAUNCH ATTEMPT

In Asia, an attempt for the maiden flight of the new Japanese H3 launch vehicle has been done by JAXA in March 2023. The launch has not succeeded due to ignition problems for the second stage of the rocket, which are currently undergoing failure investigation from JAXA toward return to flight of H3. However, the new first stage of the launcher has fully worked as planned.

ARIANE 5 / VEGA-C LAUNCH ATTEMPTS

In April 2023, the 116th launch of the Ariane 5 launcher successfully brought to orbit (in its ECA version) the JUICE mission from ESA. The final Ariane 5 mission is scheduled for June 2023.

Finally, two flights of the Vega-C launcher occurred in June and December 2022, with perfect behavior and flight qualification of the P120C motor, but unfortunately with a failure on the second flight of the second stage Zefiro 40 solid rocket motor for the December 2022 attempt.

3. Breakthroughs

Dawn Aerospace has successfully completed several test flights of their rocket-powered Mk-II Aurora spaceplane. The current scaled version of the spaceplane has 5 kg payload capacity and is powered by a bi-propellant engine, providing sea-level thrust of 3.7 kN at sea-level specific impulse of 236 s and using 'greener' propellant with Hydrogen Peroxide as Oxidizer and Kerosene as Fuel. The concentration of Hydrogen Peroxide was reported as 90 %

In March 2023, Relativity Space has performed the first orbital test flight of their Terran 1 launcher. This is the first launcher nearly fully built with components manufactured using Additive Manufacturing techniques, including also the cryogenic LOX / LCH4 engines.

4. Action plan for the year

It is envisaged by the IAF Space Transportation committee to organize the fourth Webinar in August 2023. The content of the second Webinar still needs to be fully defined, but one topic will focus on the recent launch vehicle failures and the reasons behind as well as outlook respectively impact assessment on future new launch attempts.

Also the IAF Space Transportation committee is actually re-establishing the social media presence in order to attract new members and improve communication

The following papers are prepared by committee members for submission to journals this year:

- The main R&D promotion instruments used by the Brazilian Space Agency for the development of the space industry
- Brazil's first steps in the commercial space Launch Sector: what has been done in the past two years?

- Is there a new technological paradigm for the space sector?
- An analysis of the ITU applied to Space Resources and Asteroid Mining

And finally, as usual, the IAF Space Transportation committee will operate the D2 symposium at IAC 2023 in Baku.