Summer 2022

IAF SPACE TRANSPORTATION COMMITTEE

1. Introduction

This report presents the 2022 Summer brief report of the IAF Space Transportation Committee.

2. Latest Developments

NORWEGIAN MICROLAUNCHER SPACEPORT CONSTRUCTION ON TRACK

The construction of the spaceport for micro launchers in Andøya, Norway started in early 2022 and is progressing at full pace, including the first launch pad and integration hall construction, and checkout of launch and mission control systems. Andøya Spaceport has signed a firm contract with the German launch provider ISAR Aerospace which will be operating from the spaceport from early 2023. The licensing process is ongoing for both the spaceport and the launch operator.

Andøya Spaceport Construction Work

ORBEX REVEALS FIRST FULL-SCALE MICROLAUNCHER ROCKET DEVELOPED IN EUROPE

On May 11th, 2022, Orbex unveiled the first full-scale prototype of the Prime orbital space rocket on its dedicated launch pad publicly for the first time.

The unveiling of the first of a new generation of European launch vehicles – designed to launch a new category of very small satellites to orbit – represents a major step forward for the British rocket company as it prepares for the first ever vertical rocket launch to orbit from UK soil. Orbex´s Prime rocket is the first 'micro-launcher' developed in Europe to reach this stage of technical readiness.

With the first full integration of the Orbex rocket on a launch pad now complete, the company is able to enter a period of integrated testing, allowing dress rehearsals of rocket launches and the development and optimisation of launch procedures. Orbex recently revealed its first test launch platform at a new test facility in Kinloss, a few miles from the company's headquarters at Forres in Moray, Scotland.

Prime Rocket on Launch Pad

Prime is a 19-metre long, two-stage rocket that is powered by seven engines, that is being designed and manufactured in the UK and Denmark. The six rocket engines on the first stage of the rocket will propel the vehicle through the atmosphere to an altitude of around 80 km. The single engine on the second stage of the rocket will complete the journey to Low Earth Orbit (LEO), allowing the release of its payload of small, commercial satellites into Earth's orbit.

Uniquely, Orbex Prime is powered by a renewable bio-fuel, bio-propane, supplied by Calor UK. This fuel allows the rocket to reduce carbon emissions significantly compared to other similarly-sized rockets being developed elsewhere around the world. Prime is also a re-

usable rocket which has been engineered to leave zero debris on Earth and in orbit.

VIRGIN ORBIT TARGETING THIS SUMMER FOR 1ST-EVER ORBITAL LAUNCH FROM UK SOIL

The California-based company Virgin Orbit has three straight successful orbital missions under its belt. On the heels of a third straight successful launch from California earlier this year, Virgin Orbit plans to extend its liftoffs to the United Kingdom.

The company aims to launch for the first time this summer from Spaceport Cornwall, in the western United Kingdom. The mission will loft a satellite for Space Forge, an in-space manufacturing startup based in Wales. The coming flight will be the first orbital mission ever to launch from the UK and the first to carry a satellite developed in Wales.

Virgin Orbit conducts its launches using a modified Boeing 747 carrier aircraft, which totes a rocket called LauncherOne beneath its wing to deploy satellites in space.

Virgin Orbit says the 70-foot-long (21 meters) LauncherOne, which can launch up to 500 kg per mission, has an advantage over traditional vertically launched rockets, as air-launched missions are more responsive and flexible.

Virgin Orbit is also seeking other locations to launch from. Early possibilities could include Guam, Japan and Brazil, with more long-range opportunities potentially in play in Australia and "several European countries, as well as countries in other areas.

ITALIAN SUBORBITAL SPACEFLIGHT ACTIVITIES

Italy has been very active in pursuing the initiative of access to space through the outfitting of a suborbital spaceflight capability in the Italian territory. Besides the achievement of capturing commercial market segments like space tourism, microgravity science, and astronauts/pilots training, such an initiative is expected to engage the participation of the long tradition of the Italian industry in aerospace in the development of new technologies. A national Spaceport location has been officially designated by the Italian Ministry of Infrastructures and Transportation in the airport of Grottaglie in the Region of Puglia, Southeast Italy. Activities are on-going, handled by the Italian Civil Aviation Authority (ENAC) and supported by industry, in particular ALTEC, to establish a regulatory regime that allows execution of suborbital flights in Italy and the Spaceport regulation in the first issue has been released. Activities are ongoing led by the Italian Civil Aviation Authority to develop the Operator Regulation and the end of 2022 is targeted as a tentative date for publishing an initial issue. Italy has also started to develop a concept of operations for high altitude operations for regulatory purposes, in particular focusing on air launch transportation.

EUROPEAN SPACEPORT FORUM

The European Spaceport Forum (ESF) took place at ESRANGE, Kiruna Sweden from May 2nd to May 4th, 2022. It is a think tank group very useful to exchange ideas and address issues related to outfitting and operating Spaceports in Europe. Italy was represented by the Italian Civil Aviation Authority (ENAC) and ALTEC is part of the forum in support of ENAC.

ESA CM22 SPACE TRANSPORTATION WORKSHOP WITH MEMBER STATES AND EUROPEAN INDUSTRY

The European Space Agency organized a one-day workshop in Rome on May 12th, 2022, gathering high-level representatives from ESA member states and industry. ESA presented their vision and plans for the Space Transportation domain for the next Ministerial Conference.

ESA shared their program proposals for the different proposed pillars:

- Future Launchers Preparatory Program
- Boost!2.0
- Space Rider
- Ariane 6, Vega and P120C+ development
- Exploitation and Infrastructure

NASA TARGETING JUNE 19 FOR CRUCIAL TEST OF ARTEMIS 1 MOON ROCKET

NASA aims to roll the Artemis 1 stack back out to the launch pad on June 6. NASA plans to take another crack at a crucial fueling test of its Space Launch System (SLS) mega rocket on June 19.

SLS will make its debut on the upcoming Artemis 1 mission, which will send an uncrewed Orion capsule on a journey around the moon. But before Artemis 1 can lift off, its SLS and Orion need to complete a crucial series of prelaunch tests known as a "wet dress rehearsal."

It won't be Artemis 1's first rollout. NASA's first run at an Artemis 1 wet dress began on April 1, about two weeks after the moon rocket initially rolled out from the VAB. Several technical problems arose at the pad during April's wet dress, including a stuck valve and a hydrogen leak in one of the "umbilical" lines connecting the SLS to its mobile launch tower. The Artemis 1 team attempted

to fuel the SLS three times but ended up scrubbing the wet dress, eventually rolling the Artemis 1 stack back into the VAB for repairs on April 25.

If the wet dress goes well this time around, the Artemis 1 team can start prepping for an actual liftoff. NASA officials have said that they're aiming to launch Artemis 1 this August, though they won't set an official target date until the wet dress is complete and all data have been analyzed.

NASA's Space Launch System rocket on the Launch Pad for Wet Dress Rehearsal Test

CHINA CONDUCTED THE SECOND LONG MARCH-8 LAUNCH

Long March - 8 is a new launch vehicle of China. It can be recognized as a derivative of the Long March -7 mid-size launch vehicle. The first launch was conducted on 22 December 2020, with two side boosters attached. Compared with the first flight, the rocket has no strap-on boosters at this second launch. With no boosters, the capability to 700 km SSO is about 3 tons. China hopes to test its recovery and reusable launch vehicle via this Long March -8 rocket.

DEVELOPMENT OF NEW SUPER HEAVY LAUNCH VEHICLES I CHINA

At the beginning of 2022, China National Space Administration released the newest white book about China's space activities. According to this white book, China has the plan to develop two types of heavy launch vehicles. One is called "New generation human-rated launch vehicle", the other one is "Long March-9". The new generation human-rated launch vehicle mostly will use the technologies derived from Long March -5 launch vehicles. Both the core stage and the two boosters will be 5 meters in diameter, the same as Long March-5. The core stage, together with the two boosters, will have 7 YF-100K engines each. The liftoff thrust will be greater than 2500 tons. It is estimated that the Lunar Transfer Orbit capability of this launch vehicle is more than 25 tons.

Long March-9 will be the super-heavy launch vehicle of China. The concept has been modified several times in recent years. The basic configuration will have the capability of about 50 tons to LTO, key technologies are already in development, such as the 480-ton level rocket engine and the large diameter fuselage.

CHINA'S PRIVATE COMPANY SUFFERED LAUNCH FAILURE

Parabola-1 is the first launch vehicle that successfully achieved an orbital launch, which was designed and manufactured by a private company in China. But after the first successful launch, the second and the third launch attempts all failed.

3. Breakthroughs

The successful re-start of commercial space tourism flights in 2021 is the most significant breakthrough in the domain of Space transportation, considering the missions of Blue Origin, Virgin Galactic and SpaceX.

On July 11, 2021, Richard Branson and Virgin Galactic made a successful flight to space. Virgin Galactic Unity 22 was a sub-orbital spaceflight of the SpaceShipTwo-class VSS Unity. The crew consisted of pilots David Mackay and Michael Masucci as well as passengers Sirisha Bandla, Colin Bennett, Beth Moses, and Richard Branson.

On July 20, 2021, Jeff Bezos and Blue Origin also made a successful flight to space. During this mission, New Shepard carried its first four passengers to suborbital space. The passengers were Jeff Bezos, his brother Mark Bezos, Wally Funk, and Oliver Daemen. The second and third crewed missions of New Shepard took place in October and December 2021, respectively. The fourth crewed flight happened in March 2022.

On September 16, 2021, Crew Dragon Resilience Inspiration4 mission operated by Space X became the first orbital spaceflight with only private citizens aboard. SpaceX launched three rich businessmen and their astronaut escort to the International Space Station on April 2022 for more than a week's stay: it's SpaceX's first private charter flight to the orbiting lab after two years of carrying astronauts there for NASA.

4. Action plan for the year

It is envisaged by the IAF Space Transportation committee to organize the second Webinar in June after the successful first edition in December 2021 with presentations from Astra and China Aerospace Science & Industry Corporation (CASIC). The content of the second Webinar still needs to be defined. In a long-term perspective, it is planned to have two Webinars per year for the Space Transportation committee members.