SPACE GENERATION ADVISORY COUNCIL

Volume 5 - October 2024

SPACE SAFETY AND SUSTAINABILITY PROJECT GROUP

SPACE SAFETY AND SUSTAINABILITY PROJECT GROUP NEWSLETTER-OCTOBER 2024

Welcome to the latest edition of our Space Safety and Sustainability Newsletter!

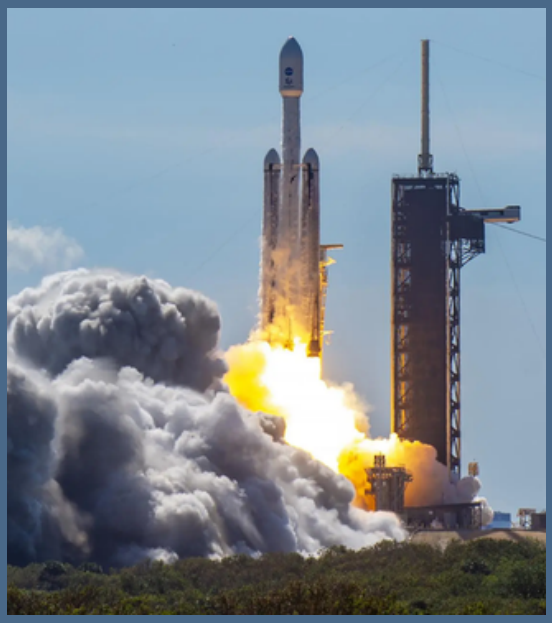
As space activity rises, managing space weather impacts on satellite operations is increasingly essential. Space weather events like solar flares and coronal mass ejections (CMEs) pose risks to satellite systems, potentially causing disruptions and damage. NOAA notes that geomagnetic storms, spurred by solar wind interactions with Earth's magnetic field, can generate electric currents harmful to satellite electronics. A notable example includes the 2022 geomagnetic storm, which caused the loss of 40 Starlink satellites due to increased atmospheric drag. The European Space Agency (ESA) also warns of radiation exposure from solar events, which can degrade satellite solar panels, reduce lifespans, and impair navigation systems. Agencies like ESA and NOAA are improving space weather monitoring, issuing real-time alerts to help mitigate these risks. As the space economy grows, investing in space weather resilience, such as enhanced radiation shielding and early warning capabilities, is critical to protect assets and ensure sustainable operations.

In this newsletter, we'll dive into a captivating selection of topics including...

- News essential
- Member spotlights
- Previous and upcoming important launches
- Stats related to Space weather
- Scholarship, competitions and SGAC vacancies
- Upcoming events
- Recent activities of Space Safety and Sustainability (SSS) Project Group
- Few important definitions

WORLD IN BRIEF: TODAY'S NEWS ESSENTIAL

NASA'S EUROPA CLIPPER SAILS TOWARD OCEAN MOON OF JUPITER

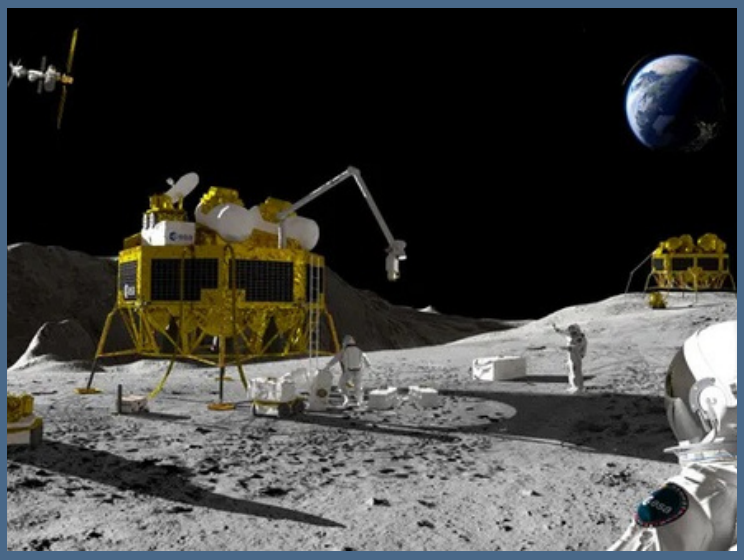


On October 14, 2024, **NASA launched the Europa Clipper**, an ambitious mission to explore Jupiter's moon Europa. With a vast ocean beneath its icy crust, Europa is a prime candidate for studying extraterrestrial habitability. Over the next several years, Clipper will orbit Jupiter, capturing high-resolution images and analyzing Europa's surface and ocean dynamics to assess its potential to support life.

CHINA LAUNCHES PLAN TO LEAD THE WORLD IN SPACE EXPLORATION

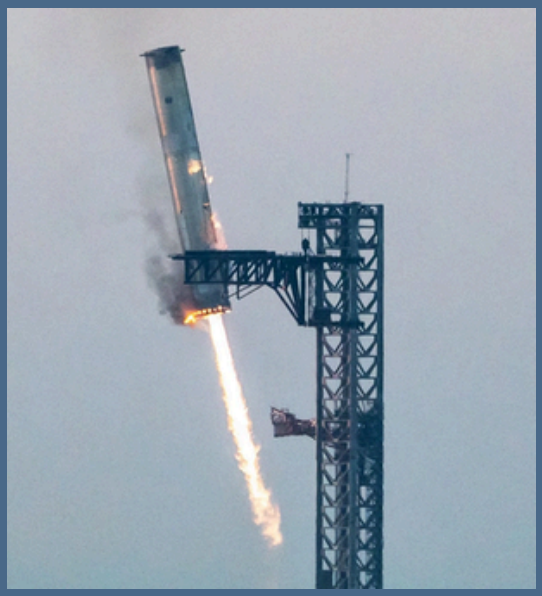
China has unveiled an ambitious **space exploration roadmap** through 2050, aiming to search for habitable planets beyond our solar system. Developed by China's Academy of Sciences, Space Administration and Manned Space Engineering Office, this first national-level plan targets areas like the universe's origin, gravitational waves, the Sun-Earth connection, and extraterrestrial life. Key phases include lunar missions and operating China's space station until 2027, creating an International Lunar Research Station by 2035, and completing 30 major space science missions by 2050. China's robust launch schedule underlines its serious commitment to these goals.

ESA'S EXPLORE 2040: EUROPE'S PATH TO THE MOON AND MARS



On October 28, 2024, the European Space Agency (ESA) launched **Explore 2040**, its bold strategy to establish a European presence in space. This campaign includes long-term human missions to the ISS, support for the lunar Gateway, and preparatory robotic missions to the Moon. ESA's Mars goals feature the *Rosalind Franklin* rover and collaboration on Mars Sample Return. Emphasizing international partnerships, the initiative highlights Europe's role in advancing science, fostering innovation, and inspiring future generations.

SPACEX'S STARSHIP ACHIEVES FIRST MID AIR CATCH OF SUPER HEAVY BOOSTER IN HISTORIC FIFTH LAUNCH



On October 13, 2024, **SpaceX successfully launched its Starship vehicle** for the fifth time from South Texas. This mission marked a historic achievement as the Super Heavy booster was caught midair by the launch tower's "chopstick" arms after lift off, a first in rocket recovery. The 400-foot Starship lifted off at 8:25 AMEDT, with the booster landing near the Mechazilla tower about seven minutes later. The mission aimed to send the 165-foot upper stage into space and return it to Earth via splashdown in the Indian Ocean. Significant upgrades included a complete overhaul of the heat shield, enhancing thermal protection for future missions.

NASA'S ECONOMIC IMPACT SOARS TO $75.6 BILLION

Jared NASA's latest economic impact report reveals a substantial contribution of **$75.6 billion to the U.S. economy in fiscal year 2023**, far exceeding its budget of $25.4 billion. The report highlights the economic output from various initiatives, notably the Moon to Mars program, which generated $23.8 billion and created nearly 96,500 jobs. Key findings include a $7.9 billion impact from climate research, benefits across 45 states, and support for over 304,000 jobs overall. Additionally, NASA filed 40 new patents, showcasing its role in technological innovation and emphasizing the agency's importance in driving economic growth and inspiring future generations.

MARK YOUR CALENDARS: UPCOMING EVENTS

7TH ANNUAL GLOBAL SATELLITE SERVICING FORUM & EXHIBITION
Nov 13-14
Arlington (Virginia) - USA

UN CONFERENCE ON SPACE LAW AND POLICY
19-21 Nov
Vienna International Centre, Austria

SPACE TECH EXPO EUROPE
Nov 19-21
Bremen, Germany

INDO-PACIFIC SPACE AND EARTH CONFERENCE
Nov 26-28
Perth, Australia

WORLD SPACE FORUM 2024
Dec 03 - 05
Bonn, Germany

EARTH-SPACE SYMPOSIUM ON SUSTAINABILITY, GOVERNANCE & FUTURES
Nov 12-13
Ultrecht Netherlands

IMPORTANT LAUNCHES

1. Name: Falcon 9 Block 5 - Starlink Group 9-10
Launch site: Vandenberg Space Force Base, California
Launch Date: November 2, 2024
Description: This mission will deploy a batch of Starlink satellites into low Earth orbit as part of SpaceX's ongoing efforts to expand its satellite internet constellation.

2. Name: PSLV-XL - PROBA 3
Launch site: Satish Dhawan Space Centre, India
Launch Date: November 29, 2024
Description: The Polar Satellite Launch Vehicle (PSLV) will carry the PROBA 3 mission, which aims to demonstrate formation flying technology in space.

3. Name: Falcon 9 Block 5 - Blue Ghost Mission 1
Launch site: Cape Canaveral Space Force Station, Florida
Launch Date: November 2024
Description: This mission aims to deploy the Blue Ghost spacecraft, which will support lunar operations and exploration initiatives. These launches highlight a busy month for space exploration, featuring a mix of commercial satellite deployments and significant missions from various space agencies.

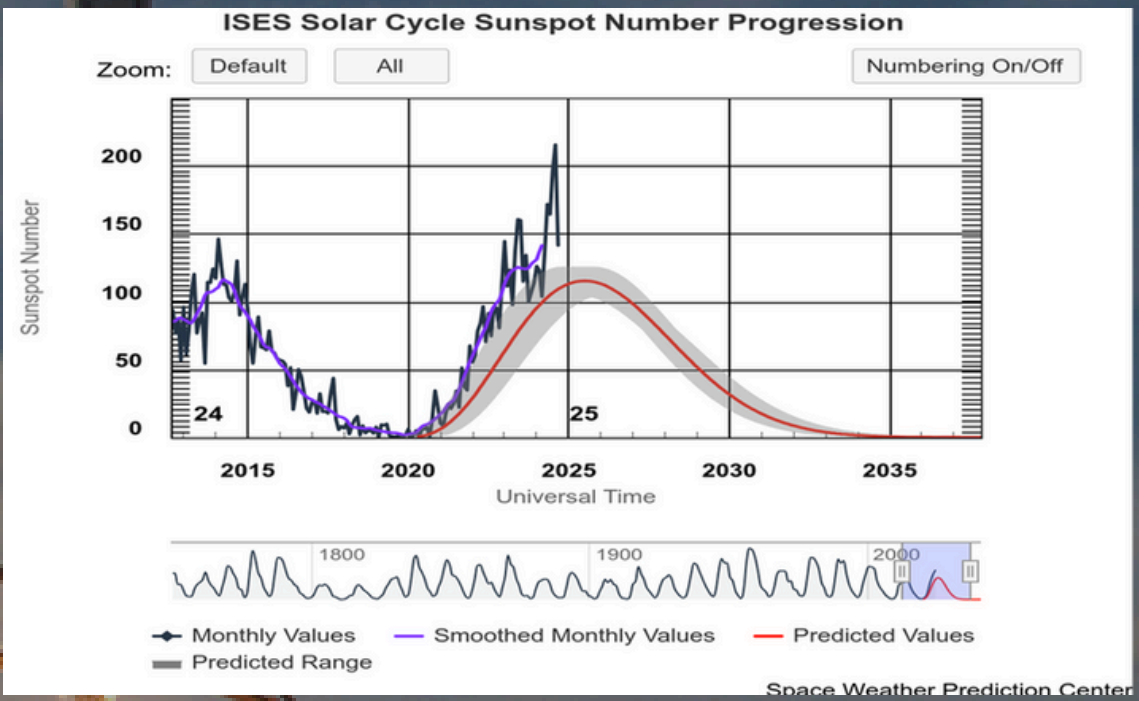
4. Name: Soyuz-2.1b - Kosmos 2579
Launch site: Plesetsk Cosmodrome, Russia
Launch Date: November 4, 2024
Description: This mission launched the Kosmos 2579 satellite, which is expected to serve reconnaissance and communication purposes in low Earth orbit. The same mission carried 02 Iranian satellites into the orbit.

STATS FOR YOU

STATS RELATED TO SPACE WEATHER

- Space weather significantly affects satellites' operations and longevity, driven mainly by solar phenomena like solar flares, coronal mass ejections (CMEs),and energetic particles. These events affect satellites in several ways; Radiation Damage and Electronic Disruptions. Charged particles from solar storms can cause "single event upsets" (SEUs) in satellite electronics, potentially resulting in errors or failures in the onboard computer systems. For instance, anomalies such as electrostatic discharges (ESD) often occur due to particle interactions with the satellite surface, leading to potential malfunctions in power systems and data communication. Increased Atmospheric Drag. Earth's upper atmosphere heats up and expands during geomagnetic storms, increasing drag on satellites in low Earth orbit (LEO). This drag slows down satellites, affecting their orbits and requiring more frequent adjustments, consuming fuel and reducing operational lifetimes. Solar Panel Degradation. Solar radiation exposure gradually reduces the efficiency of solar panels, impacting the satellite's power generation capacity. This degradation is accounted for during satellite design but still limits operational duration and may affect missions in geosynchronous orbit where the solar exposure is high4. Communication Interference. The ionosphere becomes highly disturbed during intense solar events, leading to disruptions in signal propagation for satellite communications, navigation systems, and Earth-based services dependent on satellite data (like GPS). This is especially problematic for high-precision applications like aviation and maritime navigation.

The following graph shows the progression and prediction of sunspot activity from Solar Cycle 24 to Solar Cycle 25, with sunspot numbers reflecting the level of solar activity. Solar Cycle 25, which began around 2020, is expected to peak around 2025, with sunspot numbers reaching over 150. This indicates a period of increased solar activity compared to Solar Cycle 24, though still moderate by historical standards. Higher sunspot numbers mean a higher likelihood of solar flares and geomagnetic storms, which can affect satellite operations, communications, and power grids on Earth. The graph provides both actual observations and predicted ranges, helping industries prepare for potential impacts from increased solar activity.



SCHOLARSHIPS, COMPETITIONS AND SGAC VACANCIES

Name: **AIAA Foundation**
Award: Undergraduate Scholarships & Graduate Awards by AIAA Foundation.
Deadline: 31.01.2025

Name: **Regional Coordinator Asia Pacific**
Description: The Space Generation Advisory Council is looking for an active young space leader from the Asia Pacific region to become the next Regional Coordinators (RCs) for this Region. This two-year role is a volunteer position that offers a chance to lead and be responsible for the voice of the next generation of young space leaders in the Asia Pacific region, especially as activities and excitement in the region has expanded over the past years in the space sector, and at SGAC. .
Deadline: 18.11.2024

Name: **Co-lead for Space and Cyber Security Project Group**
Description: SGAC is looking for a volunteer to become a Co-Lead of the Space and Cyber Project Group. The new Co-Lead will work with one other Co-Lead to support the activities of the Project Group, and will report to the Project Group Coordination Team of SGAC.
Deadline: 25.11.2024

SGAC Vacancies are announced **here**

SSS PROJECT GROUP UPDATES

SPACE SAFETY AND SUSTAINABILITY (SSS) MEMBERS PARTICIPATED IN SGC AND IAC 2024 ENTHUSIASTICALLY. PROJECT GROUP PRESENTED FOLLOWING PAPERS AT INTERNATIONAL ASTRONOMICAL CONGRESS 2024

Title: Optimizing Small Sat Constellation for Enhanced STM in LEO
Members: Mahhad Nayyer, Sanmukh Khadtare, Gagandeep Kaur, Riccardo Spartà, Priyanshu Kumar, Rohan Kumar Reddy, Deep Anand, Aditi Sant and Nishita Sanghvi
Objective: Develop a small satellite constellation in Low Earth Orbit to detect, track, and monitor space debris between 1 and 10 cm, enhancing space situational awareness and reducing collision risks beyond the limitations of ground-based systems.

Title: Create an Early Warning System for Floods (EWSF) in Pakistan using open-source Earth Observation data to improve flood prediction and support national stakeholders in flood preparedness.
Members: Mahhad Nayyer, Abdullah Algharrashm, KangSan Kim, Martina Dimoska, Vatasta Kou and Nhat Nguyen
Objective: Create an Early Warning System for Floods (EWSF) in Pakistan using open-source Earth Observation data to improve flood prediction and support national stakeholders in flood preparedness.

Title: A multi-faceted exploration of potential life-holding environments in outer space: Unveiling the tapestry of habitability beyond Earth
Members: Mahima Gehlot
Objective: Identify and characterize potentially habitable planets using telescope data, focusing on atmospheres, chemistry, and water. This research will guide future exploration and support the development of interstellar spacecraft for distant human exploration.

SOME IMPORTANT DEFINITIONS

Ionospheric Disturbance: It refers to disruptions in the Earth's ionosphere, a layer of the atmosphere containing charged particles (ions and electrons). These disturbances are often caused by solar activity, such as solar flares and coronal mass ejections (CMEs), which emit intense radiation and energetic particles. The increased solar radiation and particle influx can alter the density and composition of the ionosphere, affecting its ability to reflect and refract radio waves.

Solar Flare: It is a sudden, intense burst of radiation from the Sun's surface, caused by the release of magnetic energy in the Sun's atmosphere. Solar flares can emit radiation across the electromagnetic spectrum, including X-rays and ultra-violet rays. These flares can disrupt radio communications, GPS signals, and power grids on Earth and pose a radiation hazard to astronauts and satellites in space.

Geomagnetic Storm: Geomagnetic Storm is a temporary disturbance in Earth's magnetosphere, caused by solar wind and magnetic field interactions from the Sun. When charged particles from a solar event, like a coronal mass ejection (CME), collide with Earth's magnetic field, they generate electric currents in the magnetosphere and ionosphere. This can lead to disruptions in satellite operations, GPS signals, power grids, and radio communications. Geomagnetic storms are also responsible for intensifying auroras near the polar regions.

Solar cycle: It is the approximately 11-year cycle during which the Sun's magnetic activity, solar radiation, and sunspot numbers vary. It includes phases of solar maximum, characterized by increased sunspot activity and solar flares, and solar minimum, when sunspot activity is low. This cycle influences space weather and can affect Earth's climate and technology.

Solar Storm: Solar storm is a disturbance in space weather resulting from heightened solar activity, such as solar flares or coronal mass ejections (CMEs). During a solar storm, the Sun releases large amounts of charged particles and electromagnetic radiation into space, which can interact with Earth's magnetosphere. Solar storms can disrupt satellite and radio communications, GPS, and power grids on Earth, and pose a radiation risk to astronauts and spacecraft. They are also responsible for enhancing auroras near the polar regions.

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