

AIAA's new CEO, Clay Mowry

Which of these doesn't belong?

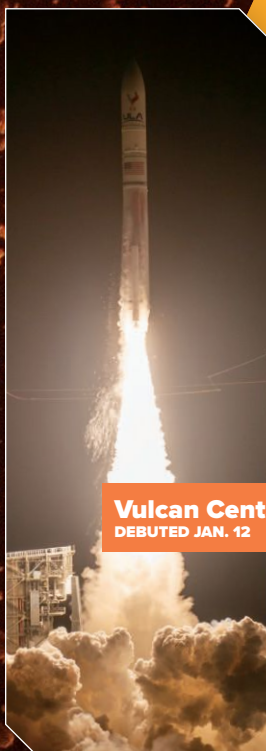
The danger of Starlink

AEROSPACE

★ ★ ★ A M E R I C A ★ ★ ★

2024 YEAR-IN-REVIEW

FOUR FIRSTS FOR ROCKETS



Vulcan Centaur
DEBUTED JAN. 12



H3 FIRST CUSTOMER
LAUNCH, JULY 1



Ariane 6
DEBUTED JULY 9



Super Heavy
TOWER CATCH, OCT. 13

PLUS



Boom's first flight
and dozens of
other breakthroughs

Powering missions to Earth's moon and other planetary moons

BY GIANG LAM AND JEREMIAH MCNATT

The **Aerospace Power Systems Technical Committee** focuses on the analysis, design, test or application of electric power systems or elements of electric power systems for aerospace use.

NASA is funding concepts for electrical power generation of a future lunar power grid under its **Vertical Solar Array Technology (VSAT)** and **Fission Surface Power** projects.

In January, NASA wrapped up phase one of FSP, in which three contractors created concepts for small **nuclear fission reactors** for future demonstrations on the lunar surface. The reactors were to be designed to stay under 6 metric tons in mass, with the ability to produce 40 kilowatts of electrical power and operate for 10 years. "In the U.S., 40 kW can, on average, provide electrical power for 33 households," NASA said in a press release. The solicitation for phase two is planned for next year, with results of the phase one studies guiding the requirements for the final reactor.

In July, **Astrobotic** of Pennsylvania began thermal vacuum testing at NASA's Johnson Space Center in Texas to demonstrate vertical deployment of its **VSAT concept**. In phase two of the project, scheduled to conclude in December, Astrobotic, Honeybee and Lockheed Martin were tasked to design and develop **10 kW-size solar arrays** and deploy them vertically in a vacuum to simulate lunar gravity, one-sixth that on Earth's. Other VSAT requirements include stable deployment on uneven terrain, autonomous retraction to enable system mobility and surviving the long duration of cold lunar nights.

In the area of lunar exploration, **JAXA, the Japan Aerospace Exploration Agency**, in January landed its **Smart Landing for Investigating Moon** on the lunar surface. Astrobotic's **Peregrine** lander was launched in January and Texas-based Intuitive Machines' **Odysseus** lander was launched in February on the inaugural missions funded by **NASA's Commercial Lunar Payload Services program**. Only Odysseus made it to the lunar surface, though the lander tipped over shortly after touching down.

In September, **NASA's Lunar Trailblazer** spacecraft completed environmental testing. The 200-kilogram spacecraft will be powered by two deployable solar arrays that provide 280 watts of electrical power. Part of the agency's **Small Innovative Missions for Planetary Exploration program**, Lunar Trailblazer with its two scientific instruments is to map the distribution of water on the lunar surface. Lunar Trailblazer is scheduled to be launched as a secondary payload with Intuitive Machines' second lunar lander in early 2025.

NASA also advanced plans to explore the moons

of other planets. In April, the agency announced that its **Dragonfly** mission to **Titan**, Saturn's organic-rich moon, has been approved to complete the final design, construction and test of the spacecraft. Planned to be launched no earlier than 2028, the Dragonfly spacecraft is a **quadcopter drone** with eight rotors and will be roughly the size of the largest Mars rover. Dragonfly is being designed to fly for approximately half an hour at a time and travel up to 10 kilometers on a single battery charge, powered by a **radioisotope thermoelectric generator** producing 70 W nominally.

In October, **NASA's Europa Clipper** spacecraft was launched to begin its 5.5-year journey to **Europa**, one of Jupiter's icy moons. The spacecraft is equipped with solar arrays designed to produce 20 kW at Earth and 700 W at Europa. With the solar arrays deployed, the spacecraft spans some 30.5 meters. Once in orbit around Jupiter, Clipper is to make some 50 **flybys** into Europa's atmosphere to study the moon's icy ocean, composition and geology. ★

▼ Technicians at NASA's Kennedy Space Center in August finished stowing each of Europa Clipper's 14.2-meter-long solar arrays. Clipper was launched in October and is scheduled to arrive in orbit around Jupiter in 2030 to begin flybys of Europa.

NASA/Frank Michaux

