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SHAPING THE FUTURE OF AEROSPACE

Communications satellites proliferate into an expanding multi-orbit domain

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The **Communications Systems Technical Committee** is working to advance communications systems in space applications.

▲ Thirty-six satellites for Eutelsat OneWeb's broadband constellation were launched in March aboard a Launch Vehicle Mark-3 developed by the Indian Space Research Organisation. The launch completed the Gen 1 constellation, comprised of 618 satellites.

Eutelsat OneWeb

This year continued the expansion of satellite launches across multiple orbits. In August, **BryceTech** of Virginia reported that 2,500 satellites were launched in 2022, up from 1,800 in 2021 and 1,300 in 2020. Communications was the primary mission for 80% of those satellites.

For **low-Earth orbit**, constellations comprised the majority of launches. As of October, **SpaceX** launched 1,600 satellites for its **Starlink** broadband constellation, **Eutelsat OneWeb** of the U.K. launched 132 broadband satellites, **Planet Labs** of California 36 satellites, **Swarm Technologies** of California 12 and **Spire Global** of Virginia three. In October, the first two prototypes for **Amazon's planned Project Kuiper constellation** were launched. Plans call for launching 1,800 satellites by mid-2026 and deploying all 3,236 by 2029.

There were a number of developments for emerging **LEO direct-to-device service**, in which satellites would provide communications directly to and from cellphones. **Apple** announced in February that it financed **MDA** of Canada to manufacture 17 **Globalstar satellites**, scheduled to be launched in 2025 to support iPhone SOS emergency services already rolling out via the existing Globalstar network. In January, **Inmarsat** of the U.K. announced an agreement with California-based **Viasat** to develop satellite connectivity for smartphones; **Inmarsat** of the U.K. and **Viasat** of California announced a similar agreement in April. In May, Texas-based **AST SpaceMobile** announced successful demonstrations with its **BlueWalker3 prototype**, proving that the satellite can relay calls in 4G and 5G. In August, **Lynk Global** of Virginia began **direct-to-device 5G service** via its three satellite "cell towers." **SpaceX** committed to offering direct-to-smartphone service starting in 2024 with text and then voice and data in 2025.

In April and September, a combined 28 **Tranche 0 satellites** were launched for the **Space Development Agency's Proliferated Warfighter Space Architecture**. Following the 2022 awards for 126 transport and 35 tracking **Tranche 1 satellites**, SDA in August awarded contracts for a combined 72 **Tranche 2 Transport Layer satellites** to **Northrop Grumman** and **Lockheed Martin** and in October awarded contracts for another 100 Tranche 2 satellites to **York Space Systems** and **Northrop Grumman**.

In June, the **European Commission** selected a consortium made up of **Airbus Defence and Space, Eutelsat, Hispasat, SES and Thales Alenia Space** to build spacecraft for its planned **IRIS2** multi-orbit constellation.

For **medium-Earth orbit**, the third and fourth **SES O3B mPower** satellites were launched in April. Electrical issues discovered shortly after launch prompted SES in October to announce that **Boeing** will build two additional O3B satellites for launch in 2026. The fifth and six O3B satellites were launched in November. In September, **Intelsat** reported that it will decide early next year whether to develop its own MEO constellation to provide communications services starting in 2027.

For **geosynchronous equatorial orbit**, large satellite builders continued to compete for orders. Fewer than 10 orders were placed this year, down from the average of 20 in past years. In July, Maryland-based **Hughes Network Systems' Jupiter 3** was launched, marking the heaviest communication satellite in orbit. The satellite, built by **Maxar Technologies** of Colorado, provides 500 gigabits per second for broadband services. **Viasat** struggled, announcing in August that its **Viasat-Inmarsat-6 F2** launched in February suffered a total power loss. Also, its **Viasat-Americas-3** satellite launched in May experienced partial loss due to an antenna failure. Fewer awards for flexible software-defined satellite solutions were made, including for **Airbus Onesat** and **Thales Inspire** satellites designed to provide operators flexibility and hedges against unpredictable market shifts. Fortunately, there was an increase in smaller, 1-2-kilowatt-class micro-GEO satellite awards for reduced services: The first **Astranis** satellite launched in May, and the company secured additional awards. Also in May, **Inmarsat** ordered three satellites from **SWISSto12** of Switzerland.

These advances in LEO, MEO and GEO pave the way for expanding applications into cislunar and lunar orbits, and the coalescence of nonterrestrial networks demonstrates this emerging integrated multi-orbit space domain and suite of communications services. ★