



China Launches Test-bed For High-Bandwidth Communications Satellites

OE Watch Commentary: In January, China launched a test-bed satellite that it hopes will become the first of a new generation of powerful communications satellites. The new satellite, SJ-20 [实践二十号], or “Shijian” for test or verification, is the first launch of the new Dongfanghong-5 series communication satellite.

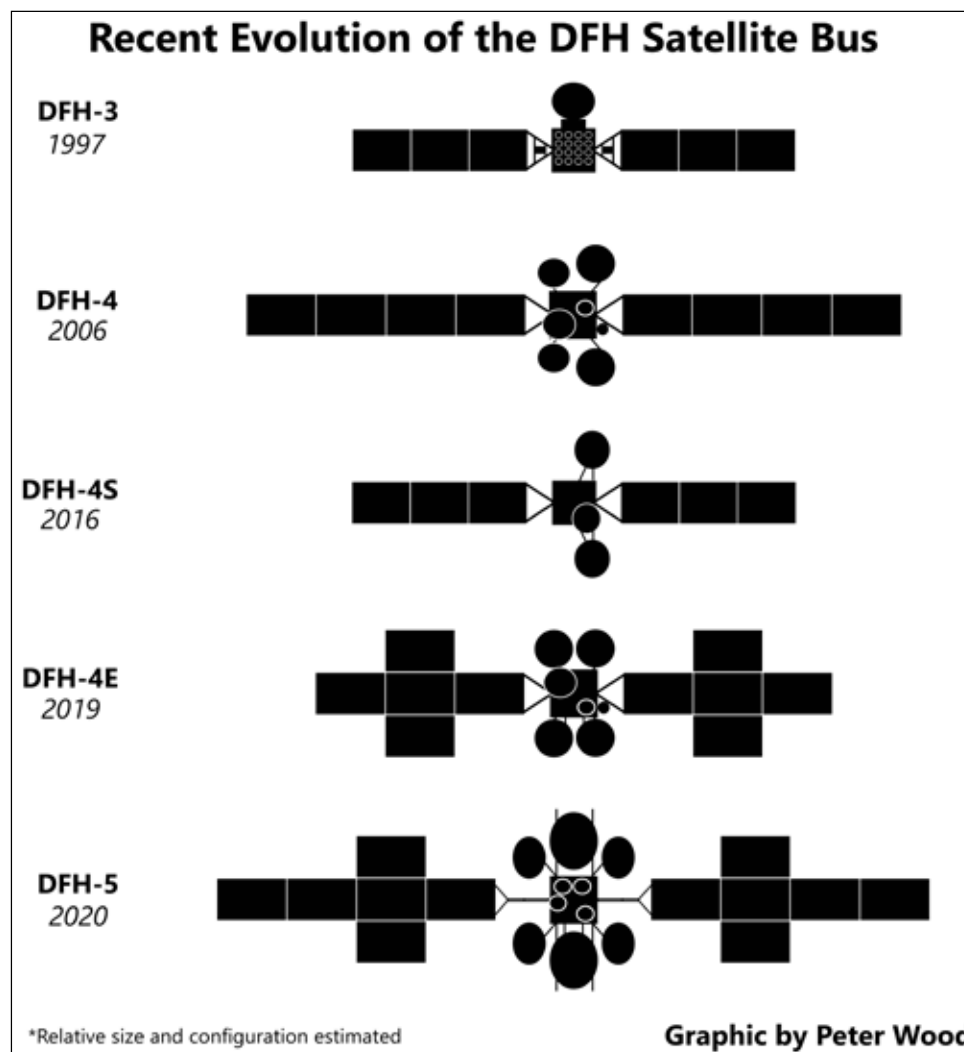
While most internet and other data applications use fiber optic cables, satellites are now challenging long-held assumptions that satellites can only act as a compliment or extension of ground networks. Companies like OneWeb in the UK and Amazon’s Project Kuiper and SpaceX’s Starlink program plan to use massive constellations of smaller communications satellites in lower orbits (with 648, 3,000 and 42,000 satellites respectively) to offer high-speed internet.

By contrast, China appears to be opting for a smaller number of high-throughput satellites (HTS), which can transmit massive volumes of data. The Shijian, China’s heaviest satellite to date, is capable of broadband internet in the Ka (26.5–40) and Extremely High-Frequency Q/V bands (33-75 GHz). Chinese scientists are particularly excited about the ability to transmit in the higher bands, as it allows the satellites to use Ka-band bandwidth for other connections, resulting in lowered costs. In the article, Li Feng [李峰], chief designer of the SJ-20, noted that the ability to transmit in Q/V increases transmission bandwidth by “4-5 times.”

To provide the required power, the article notes that the Dongfanghong-5 bus has a huge array of solar panels. With the 12 panels fully extended, the satellite is 40 meters end-to-end. The core module is also significantly larger than previous generations (see graphic), 2.5 tons heavier and features more antennae clusters.

For China, these satellites are even more important and are “keystones” in their broader ambitions for space. China envisions a network connecting several constellations of satellites with airborne ISR sensors, ground stations, and end-users, the “Space-Earth Integration Network Project” [国家天地一体化信息网络工程]. The ambitious project spans civilian and military organizations and will connect government agencies with SOEs and private companies to accomplish their goals.

The commercial aspect of these constellations is also key, and the development of the Dongfanghong-5 series is in anticipation of demand in the near future. Chinese planners see the satellite industry as an economic bonanza that will provide space-based communication and television services across Asia and Europe to complement its infrastructure and investment projects that are part of the Belt and Road Initiative. The article also notes that the satellites are part of “Broadband China” [宽带中国], a plan launched in August 2013 by the Chinese government for a phased rollout of improved mobile and broadband internet coverage for the country, slated for completion by 2020. **End OE Watch Commentary (Wood)**



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Continued: China Launches Test-bed For High-Bandwidth Communications Satellites

Source: “未来20年通信卫星就靠它 (The Next 20 Years of Communications Satellites Will Depend on It),” *Economic Daily* [经济日报], 4 January 2020. http://www.xinhuanet.com/politics/2020-01/04/c_1125420981.htm

Recently, China successfully launched the Shijian-20 satellite via a Long March 5 carrier rocket from the Wenchang space launch center. This satellite is the first flight test satellite of a new generation of large-scale geostationary satellite platform independently developed by China. The Dongfanghong-5 satellite bus, will continue maturing of new technologies, promote the application of new technologies, and is of great significance to the development of China's aerospace technology.

The Shijian-20 satellite was developed by the Fifth Institute of the Aerospace Science and Technology Corporation and weighs eight tons. It is both the heaviest satellite currently most technologically advanced satellite developed by China. The primary task of the satellite is to verify the technical stability of the Dongfanghong-5 hub, as well as test more than 10 world-leading technologies.

Develop the satellite platform first

Communication satellites act as 'neural networks' for today's information society. They offer the advantages of long-distance, large coverage area, a large number of high-quality communication channels. It is widely used in international and domestic or regional communications, maritime communications, television broadcasting, and other fields.

Satellite application performance is often achieved by loading different functional loads on a common platform. Currently, many countries have adopted the design method of a satellite "bus" that, with very little modification can handle different payloads, shortening the satellite development cycle, saving development funds, and improving satellite reliability.

..With the development of China's economy and continuous acceleration of national defense modernization, it is becoming more and more important that China's communication satellites make significant leaps in performance. Academician Zhou Zhicheng [周志成] (chief designer and project head of the Shijian-20 and Dongfanghong-5 programs) noted that the "original reason for developing the Dongfanghong-5 was because China needs high-throughput communication satellites." The Dongfanghong-5's characteristics of "high loads, high power, and high-accuracy control," are an international benchmark, and which can meet China's demands for high-throughput communication satellites for the next 20 years.

Through the use of modular design and digital development, the Dongfanghong-5 hub can greatly shorten the satellite development cycle and improve production efficiency. For mature general-purpose loads, the satellite development cycle does not exceed 36 months. At the same time, the localization rate of the Dongfanghong-5 hub has reached 100%, further driving the development of China's domestic aerospace equipment.

As China's common platform for large-scale satellites in geosynchronous orbit, the Dongfanghong-5 hub is highly adaptive and can be widely used in high-orbit communications, microwave remote sensing, optical remote sensing, space scientific exploration, scientific experiments, orbit services, etc.

The successful launch of the Shijian-20 satellite, therefore, represents an important step forward in the Dongfanghong-5 program and lays a solid foundation for its use in other applications. With the development of commercial satellite live broadcasting, emergency communications, mobile communications, Internet of Things and other business applications, as well as the steady development of conventional GEO-orbit satellite communications, the satellite communications industry represents a major market.

Industry predictions indicate that by 2022, high-throughput satellites will account for 50% of the total global satellite bandwidth; in the same timeframe demand for China's satellite broadband will also reach more than 1TB. Facing broad demand and in the interest of furthering the national "Belt and Road" and "Broadband China" strategies, China will rely on the Dongfanghong-5 as a platform to develop several communication satellites capable of transmitting between 100GB and 1TB, which will provide service to countries along the "Belt and Road" and surrounding areas.