NEC Starts Operation of Satellite Integration Center

NEC has begun operations at its new Satellite Integration Center. Recently constructed on the site of the Fuchu Plant in a suburb of Tokyo, the new Center will assemble, evaluate and test satellites (**Photo 1**). With existing production facilities at the Fuchu Plant and Sagamihara Plant already capable of assembling up to four satellites, the launch of the new Satellite Integration Center enables NEC to assemble as many as eight satellites at the same time. Thanks to the provision of evaluation/testing equipment that accommodates the manufacture of large-scale satellites, the new facility has made possible the establishment of a full-scale integrated in-house production system.

Housed in a structure standing 50 meters tall with an area of about 9,900 square meters, the Satellite Integration Center features two-story satellite assembly rooms (high-bay) with an interior height of about 20 meters and a clean environment to ensure high quality is maintained at all times. It is also equipped with advanced vibration, acoustic, and thermal vacuum testing equipment applicable to large-scale satellites. Built to withstand earthquakes exceeding level 6 on Japan's seven-stage seismic scale, this facility has been designed to ensure that it can continue operations even in the event of a disaster.

The Satellite Integration Center is located in the immediate proximity of the existing satellite production/testing area at the Fuchu Plant. The fact that all operations ranging from the production/testing of equipment to the assembly of satellites, as well as comprehensive electrical tests and environmental tests, can now be implemented at the same plant will help improve production capability while contributing to a dramatic improvement of production efficiency. Now that NEC has its own testing equipment, which it previously had to borrow from its clients, NEC has the flexibility to address the needs of overseas clients, giving it the opportunity to expand its space business globally.

Sending reliable quality to outer space

Because satellites in operation in outer space cannot be repaired once they have been launched, extremely high reliability is required. At the Satellite Integration Center, our testing systems allow us to simulate the acoustic and vibration environment experienced during launch and the thermal vacuum environment of outer space, ensuring that our satellites have the quality and reliability essential for operation in space.

Thermal vacuum testing equipment

In the vacuum of space, satellites are exposed to an environment where there is a temperature difference of over 250°C, with temperatures exceeding 100°C in areas exposed to sunlight and below –150°C where the sun is blocked. This means that satellites must be designed to maintain internal electronic components within the appropriate temperature ranges. In the center's large-scale space chamber, which measures 8 meters in diameter and 12 meters in depth, thermal vacuum testing is conducted

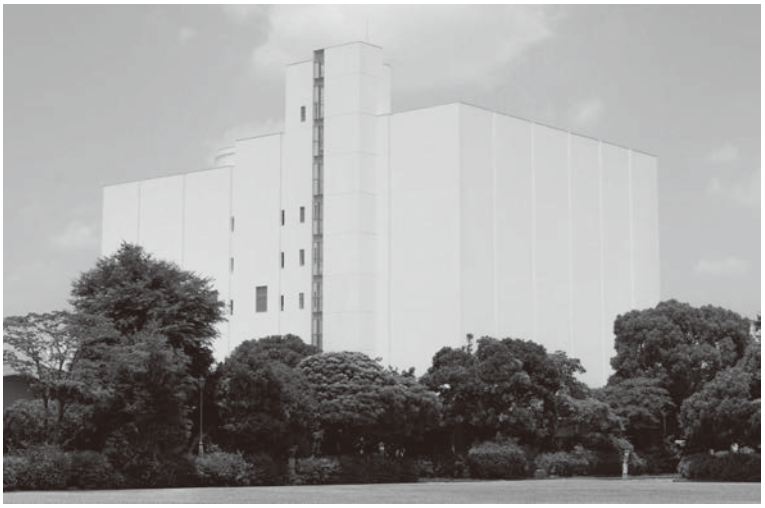

Photo 1 Exterior view of Satellite Integration Center.

in a simulated space environment to determine whether or not a satellite functions correctly in accordance with its design. During testing; the temperature of the interior wall is changed from an ultra-low temperature environment of below 173°C to a high-temperature environment of about 90°C by pumping liquid nitrogen or nitrogen gas through partitions in the chamber. A high-vacuum environment is also created by using a vacuum pump to simulate the actual environment of outer space.

Checking the performance of optical equipment that will be deployed on board an earth observation satellite requires special care as even minute vibrations transmitted from the peripheral environment can affect the measurements. To prevent this, a special mechanism to eliminate these vibrations is added to the frame in the large-scale space chamber (**Photo 2**) in which the satellite and testing equipment are placed, making it possible to test even extremely high-precision optical equipment.

Vibration testing equipment

In addition to being able to withstand the tremendous noise produced by a rocket during launch, the satellite must also be able to endure the enormous vibrations that accompany the launching process. In vibration testing, a vibration environment that simulates the launch environment is reproduced in the space chamber to check that the airframe functions correctly after the excitation of vibration.

Capable of accommodating an 8-ton class satellite, this vibration testing equipment features vibration excitation frequencies of 5 to 2,000 Hz, enabling it to accurately reproduce the different vibration environments produced by various rockets made in and outside Japan.

Acoustic testing equipment

The sound generated by a rocket engine during the launching of a satellite is extremely loud, and a satellite needs to be able to withstand sound up to about 140 dB.

Our acoustic testing equipment is the most powerful available in Japan and is capable of reproduction of sound pressure of up to 151 dB.

NEC's space solution

NEC has managed the integration of sixty-seven satellites, including Osumi, Japan's first satellite, which was launched in 1970 and the Hayabusa space probe, which successfully returned samples from the Itokawa asteroid. With the Satellite Integration Center now in operation, NEC boasts the fully integrated production systems for NEC's advanced standard satellite bus, the NEXTAR Series (**Fig.**).

Satellites are a form of infrastructure not affected by disasters on earth. They also feature the ability to simultaneously observe a wide range from their vantage point in orbit, to connect extensive areas, and to transmit information simultaneously to many people. NEC's space business processes and analyzes various data from satellites and contributes to solving problems here on earth by offering the results to users via IT networks. By effectively combining the earth observation satellite's function to "see," the navigation satellite's function to precisely "measure," and the communications satellite's function to "distribute" information, NEC is able to provide space

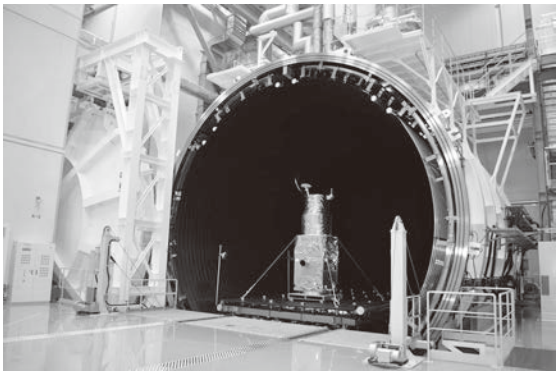

Photo 2 Large-scale space chamber.

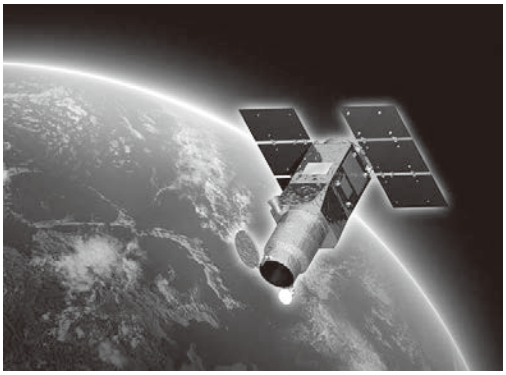

Fig. NEXTAR - NEC's standard satellite system.

solutions to a wide variety of fields including disaster surveillance, environment surveillance, agriculture/fishery support, car navigation, and satellite broadcasting.

NEC is committed to pursuing a more prosperous future for humanity and for the planet, a future we believe can be better supported by exploiting the benefits of space exploration. To this end, NEC will continue to work towards achieving social and economic benefits using the highly reliable, leading-edge technology made possible by Japan's space development.

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* NEXTAR : NEC Next Generation Star

Drawing on the know-how and expertise that we have accumulated over the past several decades, our standard bus system for small satellites enables us to produce high-performance satellites at low cost in short periods of time. The bus features inter-satellite communications fully compliant with the SpaceWire standard and standardization of all onboard computers using SpaceCube2.

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