Lunar CRater Observation and Sensing Satellite

Deep Space Network

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The NASA Deep Space Network, or DSN, is an international antenna network that helps aid interplanetary spacecraft missions. Currently there are three facilities; each located 120 degrees from each other in longitude, at Goldstone, California, Madrid, Spain, and Canberra, Australia. The DSN provides the two-way connections between earth and spacecraft. The DSN also helps with radio astronomy experiments and observing variations in radio waves.

The DSN was started in January 1958, when stations were constructed in Nigeria, Singapore, and California. These were built to track the telemetry from Explorer 1. On December 3, 1958, JPL was transferred from the Army to NASA. The charge to land spacecraft on the moon and other planetary landings became NASA's responsibility. Before, the different branches of the Military all did their own operations until their combination into one civilian organization. NASA decided to make the DSN a separately managed part of NASA, so that it could participate in all deep space missions. The DSN was given the task of doing its own research and development, known as R & D, as well as operating itself. Due to this independent research and development, DSN has become the leading researching team in low-noise receivers, large parabolic-dish antennas, tracking, digital signal processing, and deep space navigation, telemetry, and command systems. Most spacecraft are deigned to operate using DSN's smaller antennas. However, in cases of emergency, the larger antennas are used to communicate with the spacecraft. The reason larger antennas are necessary in emergency situations is because the spacecraft, in its emergency state, may be required to decrease power due to the emergency. Therefore, the power of the signal is weakened and may make it impossible to be picked up with a smaller antenna. So the larger antenna is used to catch the weaker signal. An instance where human lives were involved was in the Apollo 13 mission. The spacecraft was using low power and could not use its high gain antenna, so the manned space flight network was unable to pick up and send signals. Without the largest of the DSN's systems operating and communicating with Apollo 13, the astronauts may have died.

The location of DSN systems is critical. They must be in semi mountainous valleys to prevent radio interference. This allows the technology on the DSN systems to be more sensitive, permitting them to be much more efficient. All the antennas are moveable, reflector antennas with a parabolic bowl to provide high gain. In times when accuracy is key and data cannot be lost, the stations can be used in an array. Basically, this is just having multiple stations capture data from the same source to increase sensitivity.

However, there is a blank spot in the DSN. Only one of the three DSN sites is in the southern hemisphere, so the coverage is limited. Also, many of these telescopes have been operating for 50 years and will probably need to be replaced soon. The load on the DSN will also increase greatly in the coming years as the technological age accelerates even more. It is suspected that by 2020, the DSN will be observing twice as many stations as it is now.

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