Fact Sheet
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The Naval Space Surveillance System

Notional view from space of the "Space Fence" surveillance system.

The Naval Space Surveillance System is a Very High Frequency radar network located at sites across the southern United States (from California to Georgia) with a centralized data processing site at the Naval Network and Space Operations Command in Dahlgren, Virginia. The "Space Fence" or "Fence" as it is known, operates as one segment of the U.S. Space Command's Space Surveillance Network, which is a mission critical information technology system that detects and predicts locations of satellites.

The primary mission of the Naval Space Surveillance System is to predict locations of potentially hostile satellites that may compromise movements of the U. S. Navy. Additionally, the space surveillance system plays a role in tracking a small portion of the estimated 35 million manmade objects orbiting the earth since the launch of Sputnik October 4, 1957.[1]

The Satellite Detection and Reconnaissance Defense (the former designation of the NSSS) reached initial operating capability in 1961. Since then, the role of the "Space Fence" has grown. The system detects space objects from new launches, maneuvers of existing objects, breakups of existing objects, and provides data to users from its catalog of space objects. Orbital parameters of more than 10,000 objects are maintained in this catalog -- which has now gained usage by NASA, weather agencies, and friendly foreign agencies. The information is essential to computing the collision avoidance information to de-conflict launch windows with known orbiting space objects. However, the primary mission of the "Space Fence" is to warn the Fleet about potentially hostile surveillance.

This is one of the Naval Space Surveillance System antennas used by the present VHF radio frequency equipment.

In the late 1990s, the Space and Naval Warfare Systems Command planned to develop a service life extension program for the VHF Space Fence. In the process of gathering information from industry for such a program, the Navy discovered that the cost of improving the detection capability of the Naval Space Surveillance System by moving into the S-band frequency range was about the same as replacing 40-year old VHF technology with new versions of the same equipment.

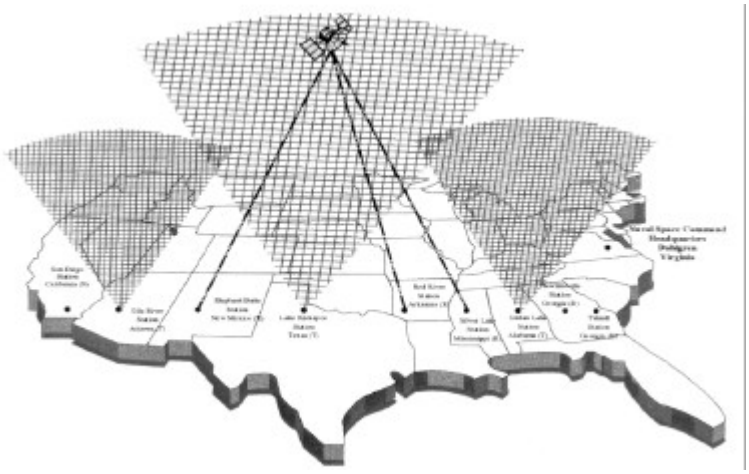
The NSSS modernization program will upgrade the existing system to meet the requirements from the U.S. Space Command mission need statement for space control that was approved and validated by the Joint Requirements Oversight Council in March 1997. The draft Operational

Requirement Document includes specific requirements from the mission need statement. The most important new requirement is the ability to detect smaller orbital objects.

The system that became operational in 1961 was designed to locate objects about the size of the Russian Sputnik or U.S. Navy Vanguard satellites. The VHF radar could "see" objects as small as 12-inches or 30 centimeters in diameter – roughly the same size as a basketball. Hands on cataloging techniques and computer development have kept pace with the growing numbers of orbital objects, allowing adequate cataloging of the 10,000 or so "visible" large objects that pass over the United States today in low earth orbit.

Sailors in the Navy's Space Operations Center monitor data from the Naval Space Surveillance System at Dahlgren, Virginia.

The improved S-band system will have the ability to "see" much smaller objects. The goal is to be able to detect objects as small as five centimeters – a little larger than a golf ball. The S-band system will look for material such as rocket launch boosters and upper stages, debris from satellite breakups and collisions and other hazards to navigation by manned and unmanned space flight at a range of 160 km to 1,000 km from the earth's surface. Resolving and cataloging thousands more objects will be a challenge for the cataloging techniques of today, employing current generation commercial off the shelf computer systems to expand the catalog to more than 100,000 items – a small percentage of all the material believed to be orbiting near the earth.


This is a notional view of the current VHF Naval Space Surveillance System showing both transmitter and receiver sites across the southern United States.

Over the course of nine years, from late 2002 to about 2010, up to three S-Band radar system complexes will be installed and made operational while all nine existing VHF antenna transmitter and receiver arrays are expected to be dismantled. The S-Band radars are to be located at the Gila River, Lake Kickapoo, and Jordan Lake sites. During that period, the Program Office will also be responsible for a Service Life Extension Program to keep the "Fence" operating during the VHF to S-Band transition. The S-Band radar arrays are expected to be located on some, but not necessarily all of the complexes that currently house VHF arrays.

Over the same period, the data processing center at Dahlgren will be upgraded to interface with the Air Force Integrated Space Command and Control architecture to be installed in the Cheyenne Mountain Operations Center. The goal is that the Naval Network and Space Operations Command operations center will be a fully compatible backup to the Cheyenne Mountain Operations Center for satellite mission processing.

The present Naval Space Surveillance System transmitter sites are: Gila River (near Maricopa, Arizona – 40 miles south of Phoenix); Lake Kickapoo (near Archer City, Texas – about 25 miles south of Wichita Falls); Jordan Lake (near Wetumpka, Alabama – about 21 miles northeast of Montgomery). The VHF receiver sites are located at Chula Vista (south of San Diego), Elephant Butte (east of Truth Or Consequences, New Mexico); Red River (near Lewisville, Arkansas – about 30 miles east of Texarkana); Silver Lake (near Hollandale, Mississippi – about 65 miles north of Vicksburg); Hawkinsville, Georgia (about 47 miles south of Macon); and Tattnall County (near Glennville, Georgia – about 68 miles west of Savannah).

Note 1: National Science and Technology Council Interagency Report on Orbital Debris, November 1995.