55-14
ABS ONLY
146716

N93-22231

ABSTRACT TITLE: Six-Degree of Freedom Test Facility

AUTHOR: Michelle A. Bittel

AFFILIATION: Lockheed Engineering & Sciences Company

TELEPHONE/FAX: (713) 483-7492/(713) 483-5830

Shuttle to Space station docking has become an important issue in the last few years. Docking sensors have been proposed that will provide high precision measurements required for the fuel efficient rendezvous and docking of space vehicles. These sensors will also be used for satellite servicing and orbital assembly. The performance of the docking sensors must be tested before they are implemented in a space environment. A Six-Degree-of-Freedom(6-DOF) Test Facility has been developed at the Tracking & Communications Section, Johnson Space Center to test the static and dynamic accuracies of docking sensors. A candidate sensor is evaluated by comparing the sensor's static position and velocity measurements to the more accurate 6-DOF system.

The hardware comprising the facility is very robust. An air-bearing 12-meter granite rail system highlights the system. Five rotary stages provide rotational movement. Additional hardware supporting the facility include a Global Positioning System (GPS) Time Receiver, a rate meter, and a metrology system. A centralized computer with associated software controls the facility. The 6-DOF facility can provide one degree of translation (range) and five degrees of rotation (bearing angles and attitude). Range accuracies are 10.0 microns/meter while rotational accuracies are +/- 0.001 degrees.

The 6-DOF Test Facility's hardware is fully integrated. Software has been developed in-house to support system operation. The system has been tested statically and the operational parameters verified. System accuracies remain to be determined. Dynamic testing of the facility is expected to begin shortly. Several companies such as McDonnell Douglas, Autonomous Technologies, and General Dynamics, are scheduled to test sensors in the next few months. The 6-DOF facility will be available for use in November 1991.

This presentation will describe the subcomponents, operation, and capabilities of the 6-DOF Test Facility. Discussions will be held on system accuracies. Additional applications of the 6-DOF system will also be addressed.