Control of Optical Systems

D. Founds
Air Force Space Systems Command
Kirtland Air Force Base, NM 87117-6008
Summarized by B. Wada

This paper summarizes some of the current and planned activities at the Air Force Systems Command in structures and controls for optical-type systems. Many of the activities are contracted to industry; one task is an in-house program which includes a hardware test program.

The objective of the in-house program, referred to as the Aluminum Beam Expander Structure (ABES), is to address issues involved in on-orbit system identification. The structure, which appears similar to the LDR backup structure, is about 35 feet tall, and is shown in FIGURE 1. The activity to date has been limited to acquisition of about 250 hours of test data. About 30 hours of data per excitation force is gathered in order to obtain sufficient data for a good statistical estimate of the structural parameters. The data has not been reduced [It now has. Ed.].

The development of an Integrated Structural Modeling (ISM) computer program is being done by Boeing Aerospace Company. The objective of the contracted effort is to develop a combined optics, structures, thermal, controls, and multibody dynamics simulation code.

Two contracts to demonstrate by test the capability to develop Space Active Vibration Isolation (SAVI) exist with Honeywell Space Systems and Martin Marietta. One effort is to develop 80 dB isolators that have the ability to transmit large loads for use with 6000 kg payloads with a bandwidth from 1-2000 Hz. The other activity is to develop 80 dB isolators for a 200 kg payload with a bandwidth from 1-2000 Hz.

A contract with TRW, referred to as the Joint Optics Structures Experiment (JOSE), also exits. As the test structure, the composite HALO truss structure, which has well-characterized modes up to 100 Hz and about 2% modal damping, will be used to demonstrate the active control of space structures technology on a complex optical system. The objective is to provide active control over 1-500 Hz bandwidth.

The other contracted programs are related to areas of interest which are not directly applicable to LDR. The objectives of these areas include (1) demonstration of passive acquisition and tracking, (2) demonstration of active illumination techniques in acquisition and tracking, (3) demonstration of the designation and maintenance of aimpoint at operational ranges, (4) demonstration of the ATP inertial reference unit functions necessary for fine tracking, and (5) demonstration of precision tracking at operational ranges in a ground brassboard.

Many of the requirements appear to be much more stringent than those needed for LDR. The efforts on ABES and JOSE should provide valuable information for the LDR program. The technology under development for SAVI, for example, may help guide activities for providing isolation in the LDR structure.

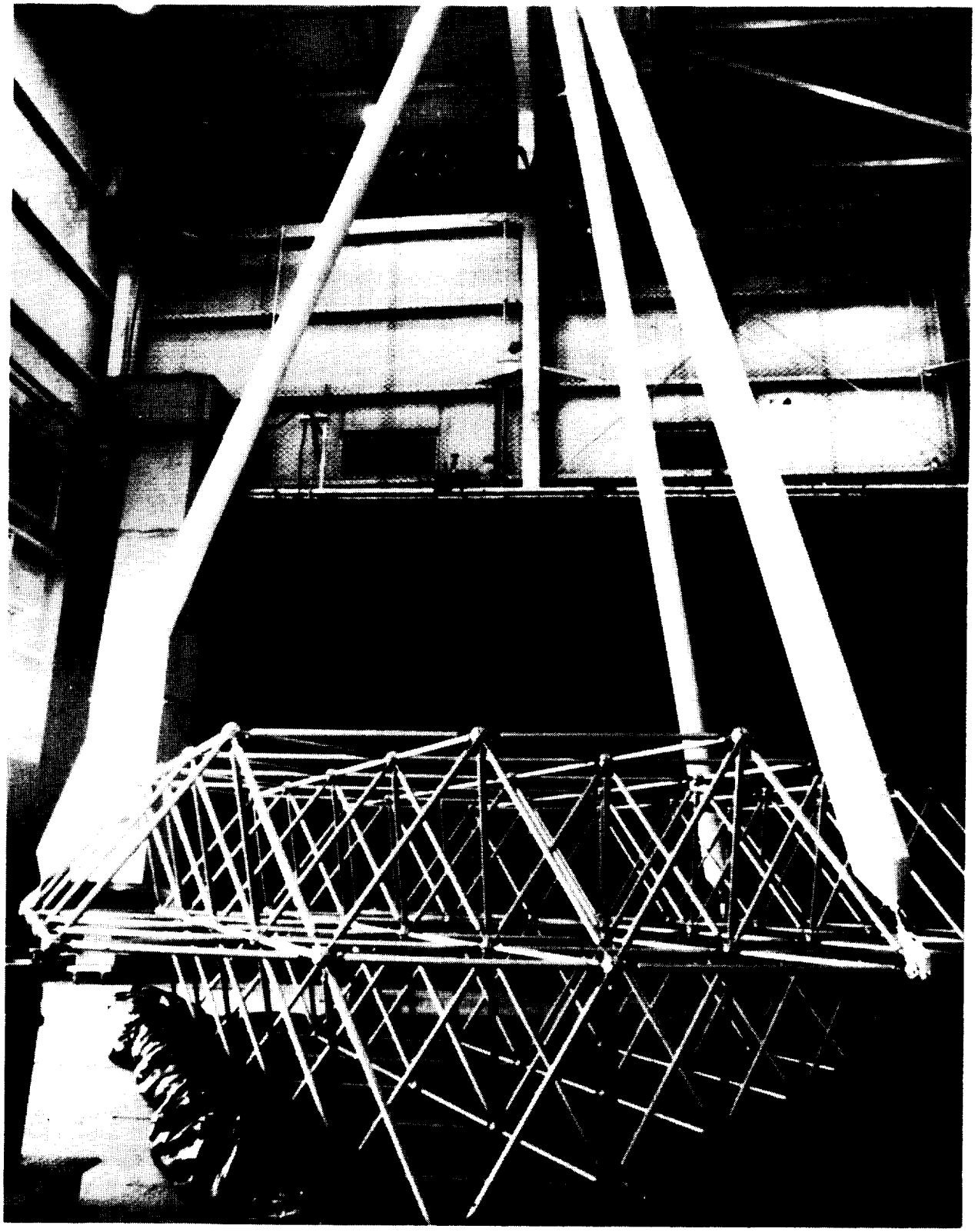

FIGURE 1. The ABES Structure at Kirtland Air Force Base