N90-13485

Hybrid Deployable Support Truss Designs for LDR

J. Hedgepeth
Astro Aerospace Corporation
Santa Barbara, CA 93101
Summarized by B. Wada

The paper discusses concepts for a 20-meter diameter LDR deployable truss backup structure, and analytical predictions of its structural characteristics. The concept shown in FIGURE 1 is referred to as the SIXPAC; it is a combination of the PACTRUSS concept and a single-fold beam, which would make up the desired backup structure. One advantage of retaining the PACTRUSS concept is its packaging density and its capability for synchronous deployment. Various 2-meter hexagonal panel arrangements are possible for this Hybrid PACTRUSS structure depending on the panel-to-structure attachment strategies used.

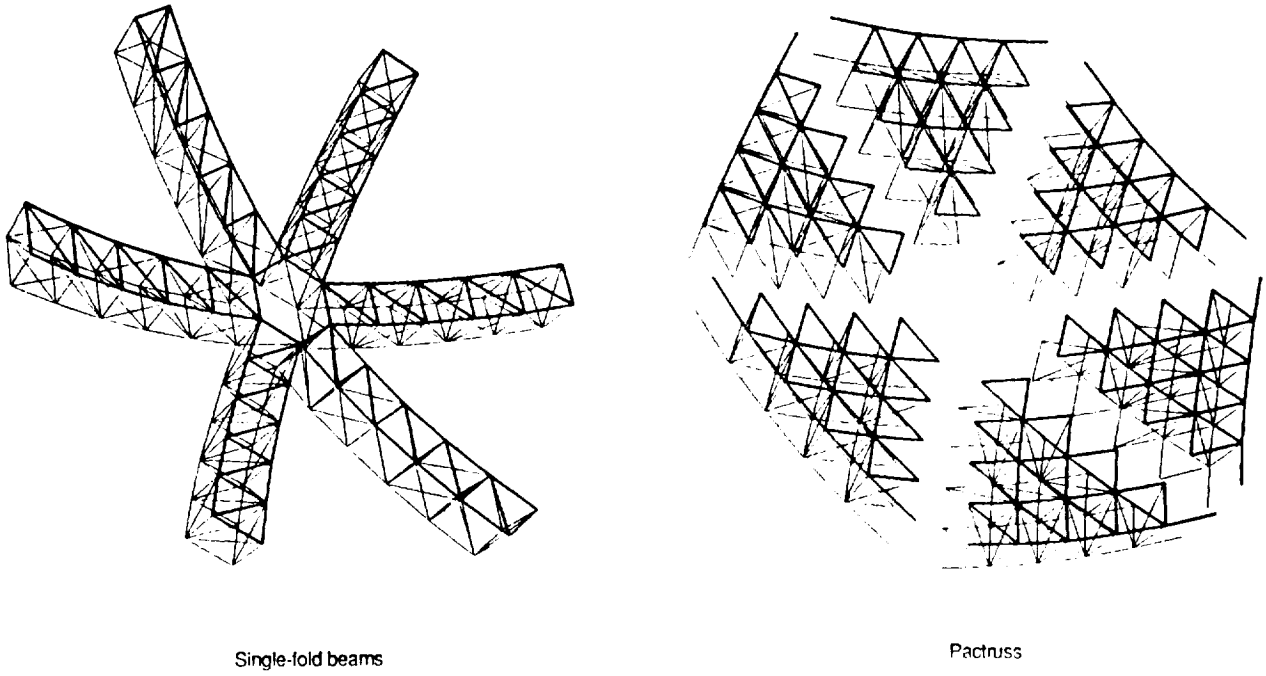

FIGURE 1. The Parts of a Hybrid PACTRUSS

A dynamic analysis of a SIXPAC concept for the LDR structure resulted in a relatively stiff structure; the first two resonant frequencies, which represented rocking about the two orthogonal axis of the structure, were both 10.4 Hz, and the third resonant frequency, which represented rotation about the axis perpendicular to the plane of the structure, was 11.7 Hz.

Static analyses of the SIXPAC using various assumptions for truss designs and panel masses of 10 kg/m^2 were performed to predict the tip displacement of the structure when supported at the center. The tip displacement ranged from 0.20-0.44 mm without the panel mass, and from 0.9-3.9 mm with the panel mass (in a 1-g field). The data indicate that the structure can be adequately ground tested to validate its required performance in space, assuming the required performance in space is approximately 100 μm. The static displacement at the tip of the structure when subjected to an angular acceleration of 0.001 rad/sec^2 were estimated to range from 0.8-7.5 μm, depending on the type of truss elements.

A joint concept, which would allow rotation of the joint during the deployment and yet provide a tight joint in its deployed state, was also presented.

In summary, a deployable structural concept exists which can meet the LDR back-up structure requirements. The analysis indicates that the structure is relatively stiff (first resonance of $\approx$10 Hz) and is therefore amenable to ground verification tests.