

Manufacturing

Truss Beam with Self-Aligning Adaptors

Truss beams with convex-curved rods, shear web panels, and self-aligning adapters

The invention is comprised of a truss beam that is assembled using rods, shear web panels, and self-aligning adapters (SAAs). The shape of the SAA provides relatively high joint strength and allows a simple manufacturing process. The SAA is designed so that the fitting yields before the adhesive fails. Joint strength is achieved through precise bond line control which is maintained by a tight fitting bore in the root. The assembly process is streamlined in that the rod can be inserted until it bottoms out and the bore will hold the rod in proper alignment along the length of the glue line. Adhesive is injected after fit-up allowing flexibility in a larger fabrication process. An inspection hole is used to verify that the joint has been properly filled with adhesive and prevent adhesive from detrimentally flowing into the alignment hole. This design presents an attractive option for structural members in applications requiring optimum strength to weight, including but not limited to spacecraft, aircraft, high performance ground vehicles, sports equipment, and tall architectural structures.

BENEFITS

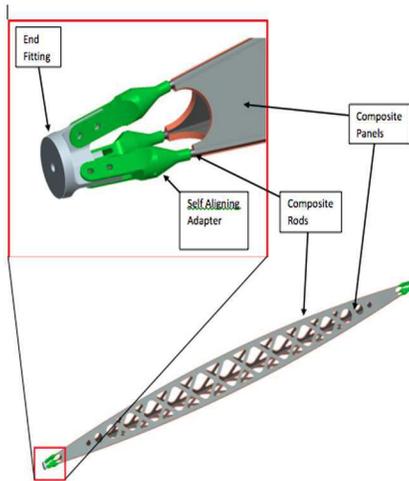
- Optimized Axial Strength to Beam Weight
- High joint strength
- Low cost
- Highly resistant to buckling
- Global stability of the truss beam
- Increased reliability and repeatability
- Simple manufacturing process

technology solution



THE TECHNOLOGY

The truss beam consists of a three convex-curved rods with self-aligning adapters (SAAs) adhesively attached at each end. Shear web panels are attached to adjacent pairs of rods, providing buckling resistance for the truss beam. The rods are adjacent to each other, centered around a common longitudinal axis, and oriented so that adjacent rod ends intersect at a common work point on the longitudinal axis. The rods curvature is designed to prevent buckling for the truss beam. Each SAA has longitudinal bores that provide self-alignment of the rods during installation in the SAAs. This self-aligning feature results in maximum strength adhesive bonds at the SAA. In one specific hardware architecture of the present invention, pultruded unidirectional carbon fiber rods have been coupled with carbon fiber shear web panels and metal SAAs, resulting in a high strength to weight and low cost truss beam that is highly resistant to buckling.



CE Beam Assembly

APPLICATIONS

The technology has several potential applications:

- Spacecraft
- Aircraft
- Lunar Landers and infrastructures
- Payload adapters
- Space truss structures
- Rigid Airship truss structures
- Bridges, ultra tall sky scrapers
- High performance ground vehicles
- Tall architectural structures

PUBLICATIONS

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National Aeronautics and Space Administration

Technology Partnerships Office

Ames Research Center

MS 202A-3
Moffett Field, CA 94035
855-627-2249
ARC-TechTransfer@mail.nasa.gov

<http://technology.nasa.gov/>

www.nasa.gov

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