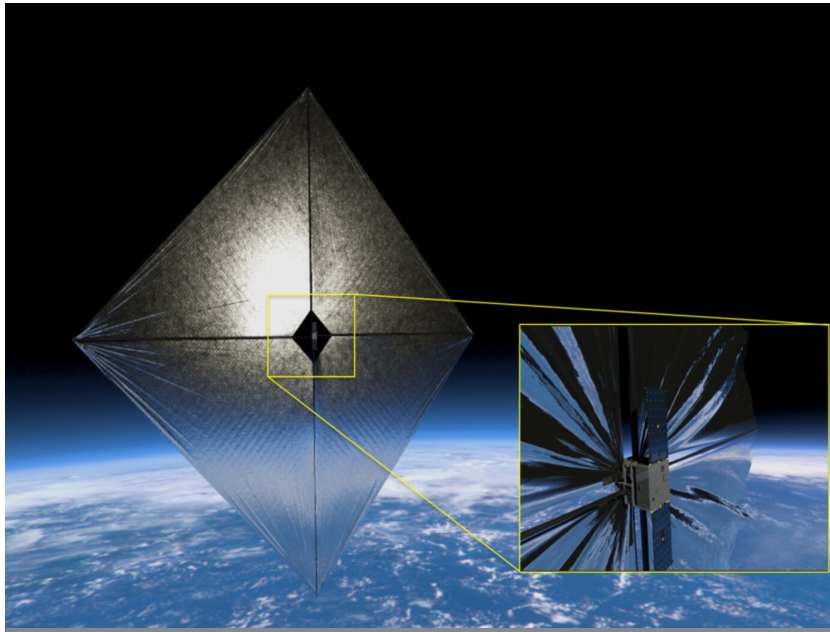




TECHNOLOGY SOLUTION

Mechanical and Fluid Systems



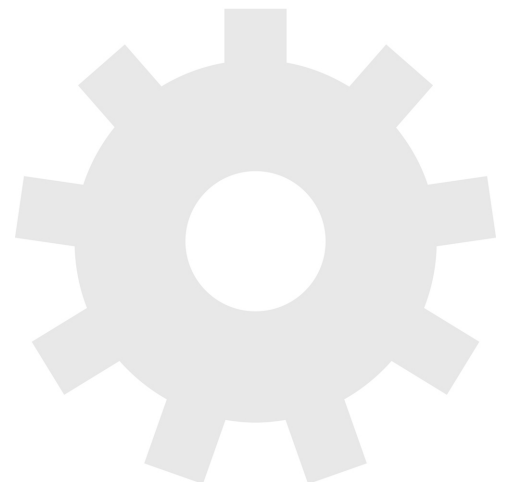
COROTUB Corrugated Rollable Tubular Boom

A Longer, Stronger Boom for Small Satellites

Deployable booms will enable the next generation of highly-functional satellites—hoisting the added solar panels and antennas that provide power, propulsion, and stronger communication capabilities to extend satellite life and enable travel further from earth. NASA's new COROTUB boom is flattened, rolled, and stowed in a small package for easy transport to remote locations. When unfurled, it expands into a load-bearing structural boom. Compared to other thin-shelled booms, COROTUB has improved stiffness, strength, and stability, while maintaining the package size as other booms. COROTUB might be erected from an orbiting satellite to hoist and support equipment; or may be unfurled to set up emergency shelters, communication towers, or masts for antennas or solar power in remote areas on other planets, the moon, or here on earth. This NASA technology is available for your company to license and develop into a commercial product. NASA does not manufacture products for commercial sale.

BENEFITS

- Lightweight: foldable and rollable structural material enables large antennas, radiators, solar panels and other instruments on satellites.
- Shorter transition length from the rolled up position to reach full deployment compared to non-corrugated booms, enabling more compact systems
- Higher bending strength and torsional stiffness compared to non-corrugated designs
- Reduced shape distortion during prolonged stowage while rolled
- Larger cross sections and longer lengths for boom designs to meet demanding structural applications (e.g., deployment against gravity, long lengths, etc.)

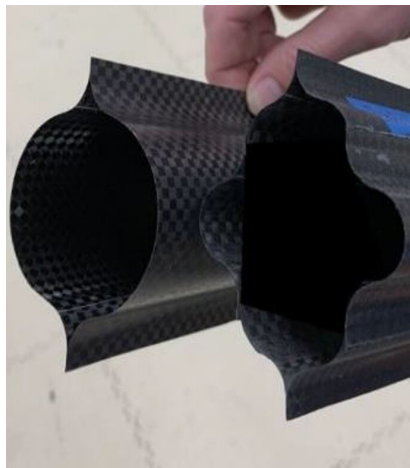


THE TECHNOLOGY

Deployable composite booms are particularly attractive in space constrained applications. Their high packaging volume efficiency enables relatively large spacecraft systems required for power generation, communications, or propulsion to be housed within small volumes. COROTUB is a monolithic closed-section tubular thin-shelled structure that's been shown to scale efficiently up to 50m yet maintain its strength. COROTUB's two corrugated thin shells form a closed section, which yields high bending and torsional stiffness, allowing for high dimensional stability. Computational analysis and early tests show that the corrugation provides increased strength against buckling, enabling longer booms and targeting more demanding structural applications than non-corrugated designs. The corrugation geometry that dictates the boom cross-section shape was informed by parametric studies to optimize the parameters that most influence the cross-section's area moment of inertia and torsional constant. The corrugated designs were found to improve the boom bending and axial strength and to shorten the length of the boom transition from flat/rolled to deployed.



COROTUB reaches its full extension over a shorter distance compared to non-corrugated boom designs.



On the left in the above image is a traditional boom and next to it, the new COROTUB of the same size.

APPLICATIONS

The technology has several potential applications:

- Space: hoisting solar arrays, antennas, radiators, solar sails, drag cells, sun shields, etc.
- Planetary: for building large structures and or masts to support hardware for communications and power
- Terrestrial: can be hauled and unfurled into pole structures to build housing or masts to support hardware for communications and power in outpost areas

PUBLICATIONS

Patent Pending

Fernandez, Juan and Volle, Christopher, Corrugated Rollable Tubular Booms (presentation). AIAA Scitech Forum (virtual). January 4-8, 2021.