Lifting one boom at a time

The Redwire Atlas

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Background

The Roll Out Solar Array, also known as ROSA, is a solar array deployment system manufactured by Redwire Space in Goleta, CA. The ROSA is comprised of unrolling carbon fiber booms that can range anywhere from 10-100 ft in length. Before being rolled up these booms need to be moved into an oven on the outside of Redwire's facility. This presents a problem for Redwire as their currently method involves expensive and time consuming manual labor. Our team's objective is to create a transportation device that will heavily reduce the time and money it takes to move the ROSA.

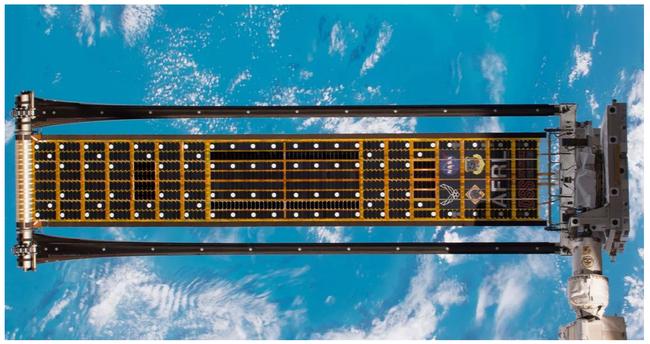
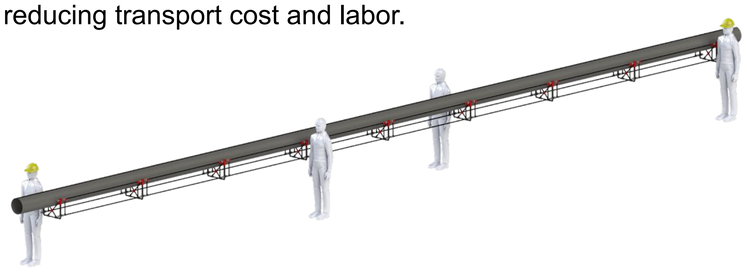


Figure 1: Image of the ROSA being deployed on the ISS.

Solution

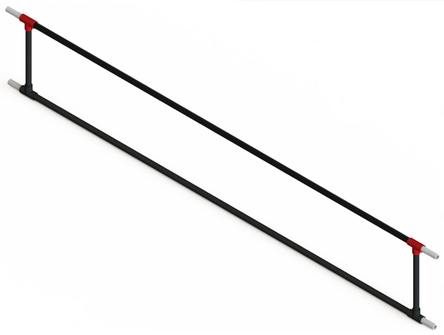
Our team's solution is an assembling carbon fiber and PVC structure that can be quickly assmebled to carry and support ROSA's booms. Our Device, the Atlas, provides a rigid, lightweight, and modular frame to securely support the boom, providing convenient support points to reduce risks to the boom's integrity and minimizing the need for tens of operators. Through a simple assembly process, the Atlas enables technicians to safely and effortlessly transport the booms, streamlining coordination efforts and significantly reducing transport cost and labor.



Design

Figure 2: A fully assembled Atlas unit.

Sub Assemblies



1: Rectangle Assemblies

- Vertical poles are made of high modulus carbon fiber.
- The rest of the structure is made of PVC.
- Colors designate where to connect, red to red and black to black.

2: Coupling Plates

- Entire structure is PVC except for the hose and bike clamps.
- Steel worm clamps are permanently set while the bike clamps are tighten during assembly.

Deflection Test

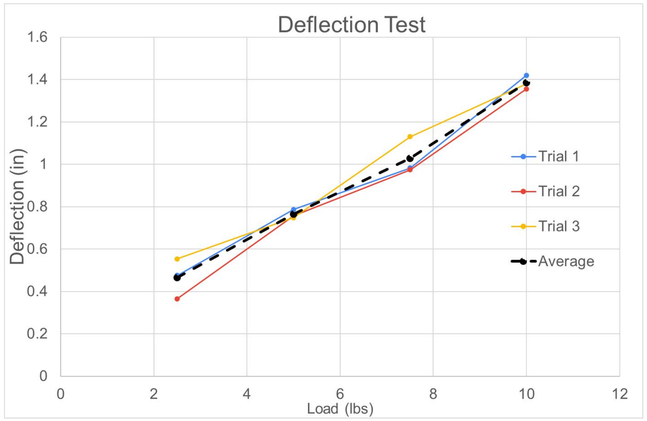


Figure 3: Graph of deflection test results.

With two Atlas units assembled, we placed a series of induced loads on the structure and measured its deflection to test its rigidity. By using two fixed ends we slowly added weight to the center coupling in 2.5lb increments. After three trials we found the center on average deflected 1.39" at a maximum 10lb load.

Assembling Test

Trial 1	**8:19s**
Trial 2	**4:01s**
Trial 3	**2:28s**

Table 1: Assembly times measured during the test.

To test the assembly time of the Atlas we had four individuals who had no knowledge of the Atlas attempt to assemble two sections with very little instruction and while being timed. After three trials we found that the assemble after each successive test was nearly halved.

Conclusion

- The Atlas provides a faster and more efficient method for transporting ROSA.
- The Atlas is rigid and easily assemblable.
- Future improvements include better sockets for the coupling plates, possible redesign of the coupling plates to reduce weight, and more precise manufacturing of all Atlas components.

REDWIRE

Acknowledgements:

- Redwire: Matt LaPointe, Prakash Bajgain, Lluvia Morales, Tanner Wick, and Kelsey Judd.
- Teaching Staff: Tyler Susko, Kirk Fields, Trevor Marks, Josh Bowie, and Connor Tang.

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