SwRI to demonstrate low-cost miniature solar observatory

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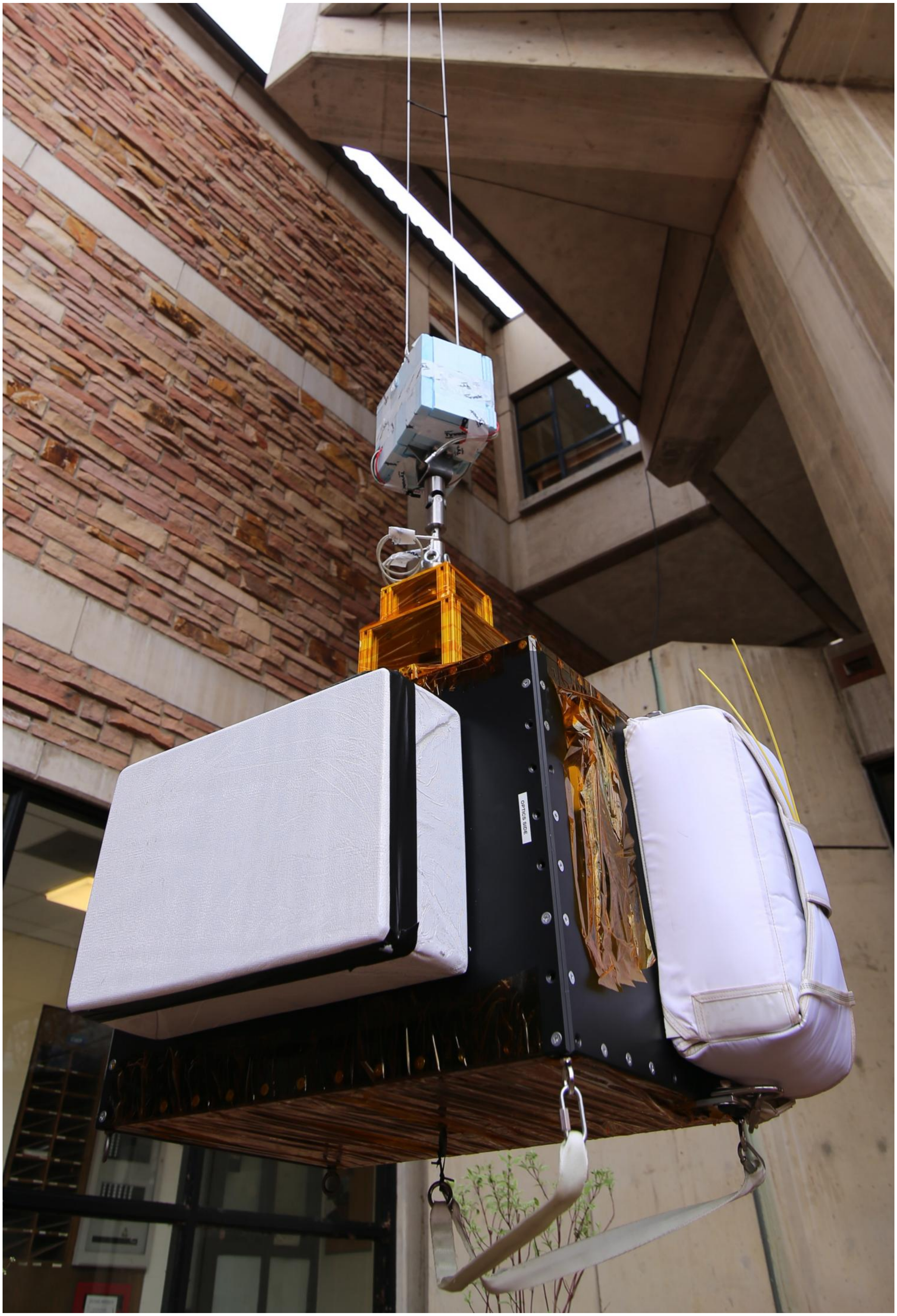
OPTICS SIDE

The SwRI Solar Instrument Pointing Platform (SSIPP) is a miniature, low-cost solar observatory designed to conduct solar research from the near-space environment. SwRI hang tested the SSIPP payload, which will be demonstrated in August carried aloft by a stratospheric balloon. Credit: Southwest Research Institute

Southwest Research Institute will flight test a miniature solar observatory on a six-hour high-altitude balloon mission scheduled for the end of August. The SwRI Solar Instrument Pointing Platform (SSIPP) is a complete, high-precision solar observatory about the size of a mini fridge and weighing 160 pounds.

"This novel, low-cost prototype was developed for less than $1 million, which is one-tenth the cost of other comparable balloon-borne observatories," said Principal Investigator Dr. Craig DeForest, a principal scientist in SwRI's Space Science and Engineering Division. "Funded by NASA's Game-Changing Technologies program, SSIPP is a reusable, optical table-based platform. This novel approach breaks down barriers to science by allowing low-cost solar research."

SSIPP collects solar data using infrared, ultraviolet, or visible light instruments on an optical table, similar to those used in ground-based observatories but from a near-space environment. This arcsecond-class observatory provides optical precision equivalent to imaging a dime from a mile away. Originally conceived to fly aboard a commercial suborbital rocket, SSIPP has now been adapted for balloon flight. Collecting data from the edge of space—around 20 miles above the Earth's surface—avoids image distortions caused by looking through the atmosphere.

"SSIPP could support the development of a range of new instruments for the near-space environment at relatively low cost," DeForest said. "Using a standard optical table platform increases flexibility, allowing scientists to try new things and develop new technologies without designing a custom observatory."

During the demonstration, scientists will spend two hours commissioning the observatory and searching for visible signatures of "high-frequency" solar soundwaves, which are actually some eight octaves below the deepest audible notes. By contrast, the most studied sound waves in the Sun (the solar "P-modes" used to probe the solar interior) are five octaves deeper still.

The surface of the Sun is covered with granular convection cells analogous to a pot of water at a rolling boil. Continuously, every 5 minutes, a million of these cells erupt, creating sound waves at a range of frequencies. SSIPP will image the solar atmosphere to understand their heat and noise properties. The comparatively high frequency of the "solar ultrasound" waves makes them undetectable by ground-based observatories.

"The transfer of heat to the surface of our star is a violent and tremendously loud process," DeForest said. "Soundwaves heat the solar atmosphere to extremely high temperatures, but it's a poorly understood process. Existing measurements of the solar infrasound cannot account for all the energy required."

SSIPP will launch aboard a World View stratospheric balloon, funded by NASA's Flight Opportunities Program under the Space Technology Mission Directorate. The program is managed by NASA's Armstrong Flight Research Center in Edwards, California.

Provided by Southwest Research Institute