A tower on the moon could provide astronauts with light, power and guidance

August 5 2024, by Andy Tomaswick

A LUNARSABER could serve as a streetlight on the moon during its two week dark period, as show in this artist's rendition. Credit: Honeybee Robotics

Technologies for enabling NASA's Artemis mission are coming thick and fast, as plenty of problems must be solved before a permanent human presence on the moon can be established. A novel idea from Honeybee Robotics, one of the most prominent space technology companies now owned by Blue Origin, could solve plenty of them with

one piece of infrastructure.

The Lunar Utility Navigation with Advanced Remote Sensing and Autonomous Beaming for Energy Redistribution, or LUNARSABER (which must have been named by someone who really likes Star Wars), is a 100 m tall pole that can hold 1 ton of equipment on top of it. It could serve as a central power, communications, and lighting hub of an Artemis base and part of a mesh network with other places of interest on the Lunar surface.

Let's start with the enabling tech of LUNARSABER itself. No rocket can hold a 100-meter-tall tower and land it on the moon, and building such a tower on the lunar surface without any existing infrastructure would also be almost impossible. So Honeybee will leverage another existing technology—the Deployable Interlocking Actuated Bands for Linear Operations, or DIABLO system (maybe someone at Honeybee also likes Blizzard Entertainment games).

DIABLO uses a rolled piece of metal and bends it into a deployable cylindrical structure that supports heavy payloads. In this case, that structure serves as the base for LUNARSABER. But the secret sauce is what that structure enables. Let's take a look at what goes along the sides first.

Since power is such an important thing on the moon, it seems evident that putting solar panels along the sides is the most useful, and that is precisely what Honeybee is doing. In a recently released video, they discuss two types of solar panel deployments.

One looks like a yo-yo extended from the top payload holder of the LUNARSABER tower. This methodology would entirely envelop the metallic structure underneath but allow access to the sun at all angles. Alternatively, the top part of the 100 m tower could deploy its booms

that hold traditional solar panels and then track where the sun is as it makes its 14-day journey across the lunar sky.

Honeybee's engineers estimate it could produce about 100 kW of power using these techniques, but it also has some other advantages. Some parts of the lunar poles are bathed in eternal sunlight—or are very close to being so. At these places, a tall pole would capture at least some sunlight almost 95% of the time. Admittedly, the sunlight would only hit the top part of LUNARSABER, significantly decreasing its overall power output. However, having some power during the cold lunar night is undoubtedly better than not having any and relying on batteries for survival.

Supplying power is only one part of what LUNARSABER does, though. It has four main other capabilities:

1. It can beam power to other devices
2. It can track those other devices
3. It can communicate with a wide range of assets
4. It can provide light for those assets.

Let's tackle the first one first. Power beaming is all the rage in the space technology community, partly due to recent successful tests by Caltech and the US's Naval Research Laboratory. This technology could be applied to LUNARSABER as well.

If one mast is bathed in sunlight while another lingers in shadow, the one with excess power can beam power to the one needing it. Additionally, that power beaming can occur between the LUNARSABER and individual assets such as rovers or astronauts in spacesuits. If one needs a power fill-up, a 100 m tower with a power beaming system on top of it could provide that fill-up over a vast area very effectively.

Beaming power effectively to those assets requires the LUNARSABER to know where they are, though. That's where the second enabling technology comes in. It can use a series of sensors to find and track different assets as they operate around the LUNARSABER tower. Anything with a direct line of sight could be tracked and powered directly by the tower itself.

Line of sight is also helpful for the subsequent use case but unnecessary. LUNARSABER could serve as a kind of lunar cell phone tower, enabling wireless communication between the assets in its network. This prototype internet allows different rovers to coordinate together or an astronaut in one part of the base to issue a command to a rover in a different part.

Finally, to issue those commands, it would be helpful for astronauts to see where they're going. It'd also be helpful for rovers, as many of their science missions would otherwise have to wait out the two-week lunar darkness. Floodlights on the top of LUNARSABER could provide visible light to these astronauts and rovers, allowing them to effectively perform their activities whether it's lunar night or not.

Another aspect of LUNARSABER that utilizes a few of the different applications mentioned above is combining several towers in a line-of-sight mesh, which would allow both communication and power to be beamed from literally the other side of the moon. This enables two main applications that have proven a thorn in Lunar Exploration's side: constant solar power and constant communication with Earth.

Since at least half of the moon is always lit up, if engineers strategically place LUNARSABERs around the surface of the moon, there should always be at least one in full sunlight. That one sunlight tower could then wirelessly transmit power to another tower in its line of sight. That process could continue until the power is beamed back to the main

Artemis base, providing power even in the cold lunar dark.

Explorations on the other side of the moon are also tricky, limiting the area of scientific inquiry primarily to the side directly facing us. However, a strategically set-up mesh of LUNARSABERS would allow communication back to Earth, even with assets exploring the "dark" side of the moon that faces us.

As Vishnu Sangiepalli, the PI on the LUNARSABER, put it in the recent video, "The best way to describe the LUNARSABER would be a Swiss Army Knife." These multifunctional tools have been a mainstay in explorers' pockets for decades, and LUNARSABER helps match their versatility and flexibility to solve the problems facing the new lunar explorers.

More information: LUNARSABER: Lunar Utility with Navigation, Advanced Remote Sensing, and Autonomous Beaming for Energy Redistribution. www.hou.usra.edu/meetings/lpsc2024/pdf/2535.pdf

Provided by Universe Today

Citation: A tower on the moon could provide astronauts with light, power and guidance (2024, August 5) retrieved 6 August 2024 from https://phys.org/news/2024-08-tower-moon-astronauts-power-guidance.html