LUMINOUS NAVIGATION MARKERS FOR LUNAR SURFACE EVAS

BACKGROUND
A navigation system, similar to GPS, may not be fully developed or useable on the Moon for NASA’s next lunar surface missions. Systems, even if available, may not have the resolution to help the crew maintain a clear path to safety. To solve this problem, this project proposes to investigate “Luminous Navigation Markers” to help the crew “find their way” on trails they develop as they explore the Lunar South Pole. These same markers can also be used by orbiting vehicles to survey the landing sites to map trails, just as aerial surveys are used today to provide guidance for road development. The “Luminous Navigation Markers” would run from their own power, would provide a beacon that could be observed by the crew, would be lightweight, and could be easily deployed.

PROBLEM/DESCRIPTION
The goal is to build a set of deployable beacons with the following criteria:

- Beacon is LED strobe light that would be luminous enough to resolve against lunar dust illuminated by the sun. Luminance > 10kcd/m².
- Beacon chromaticity and peak wavelength should be optimized for both human vision and energy conservation.
- Beacon also has integrated strontium aluminate photoluminescent material.
- Beacon is battery + solar powered. (Solar night is 2 weeks.)
- Beacon uses “solar petals” that are small and arranged around the beacon at an optimum angle for capturing low angle illumination from the sun. (Polar location.)
- Beacon designed to be “dropped” on the ground and land right-side-up to minimize crew having to bend down to the correct arrangement of a beacon.
- Beacon is lightweight and small. The concept is crew carries a “bag” of beacons that they drop in place, just like breadcrumbs.

DELIVERABLES
Perform nighttime field tests that include navigational hazards to demonstrate visibility to pedestrians, handheld cameras, and aerial drones. Demonstrate the longevity of solar/battery system, the brightness of strobe, and ease of deployment. Provide report documenting project findings, video surveys, design drawings, and set of prototypes to NASA.

DESIGN TEAM PROFILE

| NASA MENTOR: | Toni A. Clark, P.E./George Salazar |
|LEVEL: | Upper Division Students [JR/SR] |
|MAJOR / DISCIPLINES: | EE, ME, Industrial Design, Human Factors, Electronics Design |
|TEAMS: | Mentor will accept one team |
|DURATION: | One to Two-Semester Project |