



RECONFIGURABLE LIGHTING SYSTEMS FOR SPACECRAFT HABITATS BEYOND LOW EARTH ORBIT

BACKGROUND

When astronauts begin to explore interplanetary locations beyond a ‘one day’s drive’ from Earth, they will face many challenges that are potentially unexpected by architects and engineers on Earth. Sending a ‘care package’ full of electronics and tools to the crew will likely not be helpful nor realistic, especially for time critical applications. Architects and engineers of systems planned for locations beyond Low Earth Orbit need to consider supplying astronauts ‘building blocks’ that allows the crew to maintain and upgrade their spacecraft as the crew need to adjust their tasks real-time to adjust to adapt to new challenges. There will be many challenges to the crew, but a key one that could dramatically impact their safety and productivity is maintenance of the spacecraft’s lighting system and adjustment of exterior lighting for exploration planetary activities.

PROBLEM DESCRIPTION

Currently spacecraft lighting systems are fixed solutions that are fully installed, and portable lights are designed in the same way. The lighting systems are fully self-contained and can’t be easily modified, even though the basic design concept of lamps is fairly simple. An innovative solution would be to outfit the spacecraft with lighting systems and components that are repairable by the crew and provide the crew with the basic building blocks to make their own lights. For this project, demonstrate a lighting system maintenance and development kit that demonstrates standardization the following capabilities: Optics & beam control; direct and indirect lighting options; diffusers to hide LEDs; illumination output options to provide task illumination levels of 100-1000 lux; options for hard mount to vehicle structure, on poles, suspended, or portable (by hand); 3D print options for enclosures, diffusers, and optics; LED thermal management options; LED driver options; battery options; LED color temperature options; wiring options; and Lamp Control options.

DELIVERABLES

Product development kit, demonstration-video of assembly range of systems possible with development kit, training document on how to use the development kit, drawings and part numbers of components, 3D print files for components requiring 3D printing, and trade study justifying design concept.

DESIGN TEAM PROFILE

NASA MENTOR:	Toni A. Clark, P.E. (Leidos Inc.)
LEVEL:	UPPER DIVISION [SOPH/JR/SR]
MAJOR / DISCIPLINES:	ME, EE, Architecture, Physics (Optics), Human Factors
TEAMS:	Mentor will accept one team
DURATION:	One or Two Semester Project

