



NOVEL NON-TRACKING FIBER OPTIC SOLAR CONCENTRATOR FOR EXTRATERRESTRIAL APPLICATIONS

BACKGROUND

There are several challenges to the utilization of solar energy for extraterrestrial human habitats in the inner solar system. Ideally, concentrated solar energy could supply virtually all the needs such as power, lighting for the habitat as well as mineral extraction and ³He reclamation from Lunar (or possibly Martian or asteroid) regolith. Ideally, if concentrated solar energy was transmitted through optical fiber it could be used for any or all of these needs. Some of these challenges are: Lunar dust – extremely hazardous to moving parts and diminishes optical surfaces, expensive solar tracking mechanisms, downtime due to mechanical failures, the necessity to perform EVAs to repair equipment as well as ever-present solar plasma and Galactic Cosmic Ray radiations, etc.

PROBLEM/DESCRIPTION

Since photovoltaic cells are very expensive with sensitive optical surfaces and dish type tracking concentrators are unrealistic, the need for an efficient energy collection system and transfer medium that overcomes these obstacles and enables the steady delivery of the collected optical energy to go where it is needed prior to the conversion process *is paramount*. This device must not require mechanical solar tracking except for latitude adjustment. This device must continuously supply high quality solar optical/thermal flux via an optical fiber (system) during periods of direct insolation and it must have an efficiency of at least 30% of incident insolation. This device must be lightweight, withstand hostile extraterrestrial environments, and have easily replaceable parts.

DELIVERABLES

Designing and ultimately prototyping this type of Novel Non-Tracking Fiber Optic Solar Concentrator System that can deliver between 10 watts and 100 watts optical/thermal is the objective of this proposal.

DESIGN TEAM PROFILE

NASA MENTOR:	Christopher Mendell and Houston Green
LEVEL:	All Levels
MAJOR / DISCIPLINES:	ME, EE, AE, Eng Phys., Math
TEAMS:	Two teams*
DURATION:	Two-Semester Project

*Number of teams willing to mentor: 2 Teams. It would probably be best to focus on two major aspects - with one team for each aspect:

- Aspect **O**: Innovative Maximization of the Optical systems designs.
- Aspect **M**: Selection and fabrication of optimized Materials.
- A third Aspect **SS**: should be Structural Support implementation *shared by both groups*. This is probably a reasonable approach to assure active and ongoing communication between teams.

