

*AME 40463: Capstone Design Project, Spring 2008*

Date: 24 January 2008  
To: Dr. S. Batill, Dr. M. Staniscic, colleagues  
From: Derek Lipp  
Subject: Individual Design Concept – Solar Power Rangers

Purpose: This memo provides the initial concept and functional details for a solar power supply. Design requirements outlined in a previous memo are met including the 12 VDC, 20 W specifications.

General overview: The design includes seven components: a solar collector, a Stirling heat engine, an integrated circuit, a battery, a motor/generator, a fan blade, and mounts. These components provide the necessary functions to collect solar energy and convert it to a useful, electrical form.

Solar Collector: The solar collector unit gathers incident solar rays and focuses them upon the hot couple of the Stirling engine. The unit will be designed with a geometry specific to the application or will be a recycled device that meets or closely approximates the desired function.

Stirling Engine: The Stirling Engine will be mounted in a position above the battery and collector. It will drive a motor via a crankshaft designed to integrate with the motor on one end and a fan blade on the other.

Integrated Circuit: The integrated circuit provides the “intelligence” for the project. The circuit will consist of a switch-mode power supply designed to take an input voltage from the generator and convert it to the desired 12 VDC output. The circuit will also charge/discharge a battery as needed to ensure continuous power is delivered. The circuit will be enclosed in a weather-proof box that will repel rain. To ensure that all water is shed away from internal components, all wires and connections will be on the bottom of the box.

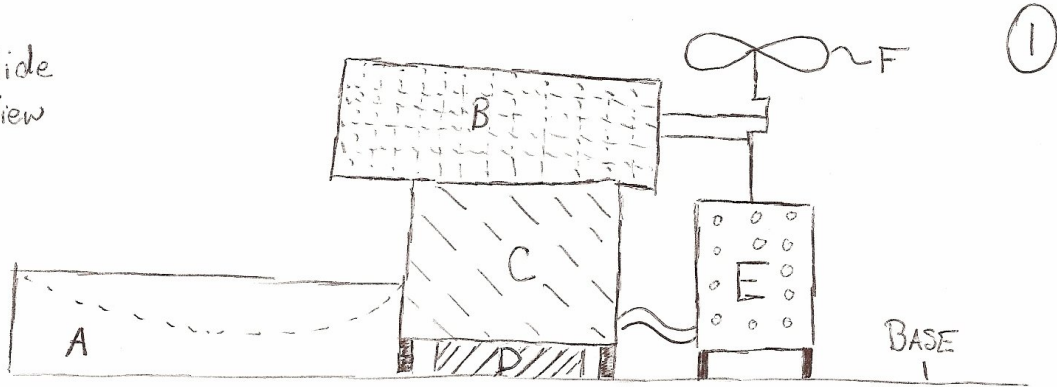
Battery: A standard 12 volt car battery or similar collection of cells will provide storage for times when the solar generator does not fulfilled power requirements. This component may easily fill the “recycled” technology requirement.

Generator: The generator will also fulfill a “recycled” need. It will be a DC motor or alternator. By driving the motor with a mechanical device, the leads will provide an electrical power source that can be manipulated to meet the design requirements.

Fan Blade: The fan blade serves two purposes. First, it provides air circulation over the cold couple of the Stirling engine to increase efficiency. The second function of the fan blade is to be a flywheel, supplementing the action of the generator’s rotor.

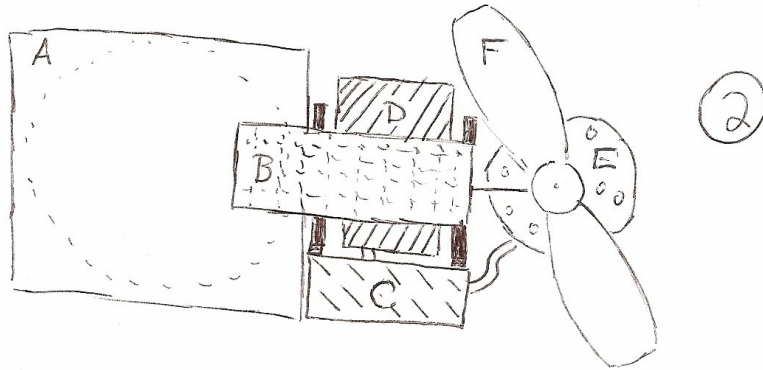
Mounts: The base will be a material yet to be determined and the mounting brackets will be designed/chosen based on design needs.

Side View

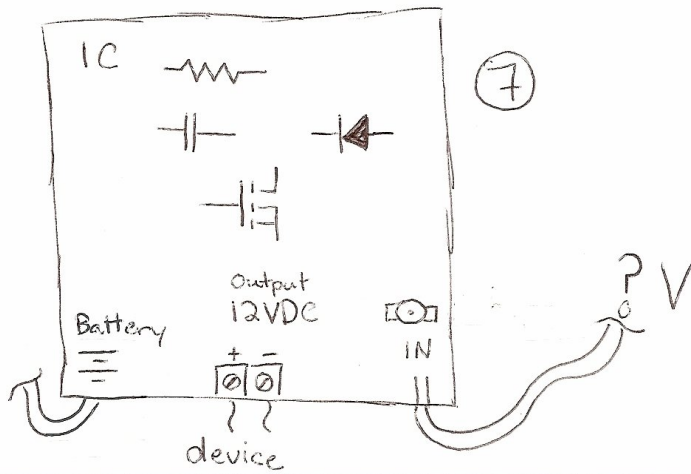
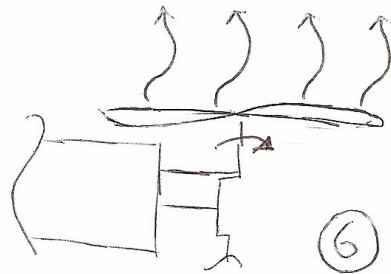
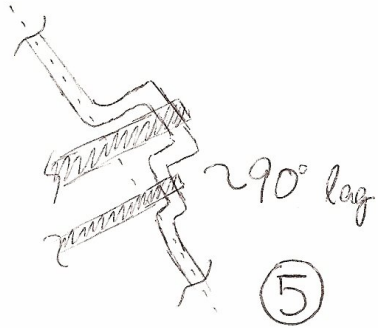
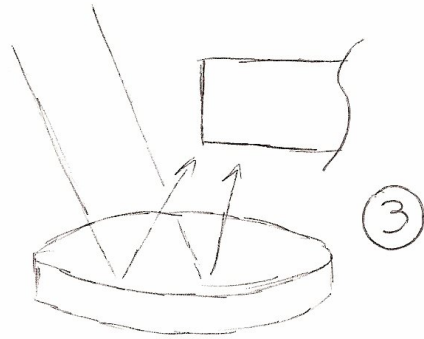


- ▣ - A - Solar Collector
- ▣ - B - Stirling Engine
- ▣ - C - IC Board/Box
- ▣ - D - Battery
- ▣ - E - Motor/Generator
- ▣ - F - Fan Blade
- - Mounting Brackets

Top View



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