

### **Portable Sewing Machine for Repairing Rips**

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Type: Design Problem  
Student Time: Five to Eight weeks  
Location: Take home

#### **Summary**

This project is about the design of a hand held, portable sewing machine which can be used to repair rips in tents and other products which can not ordinarily be done on a regular sewing machine, either because the tent can not be dismantled, or because a sewing machine may not be available for use. This may happen at campgrounds, in army camps, in refugee camps, etc. The portable sewing machine should then be able to repair the rip while the tent is standing, without access from both sides of the cloth. Another application of the device may be in landscape construction when 3 or 4 foot wide strips of weed-block cloth is laid on the ground before rocks are spread as ground cover, and it may be desired to attach them together.

The main purpose of the project is not to necessarily come up with a new stitching technique, although this is permissible. The intention is to modify the existing machines to repair a rip in the material by pulling the pieces together and stitching from one side of the material. The machine may be designed to be manually or electrically powered. Other desirable features may also be added. However, it must be strong enough to penetrate the heavy canvas ordinarily used in heavier tents as well as the tightly woven nylon used in camping tents.

#### **ABET Descriptors**

Engr Sci Content: First Year Engineering  
Type: System design  
Elements: Establish objectives, synthesis, modeling, testing, documentation  
Features: Design methodology, creativity, design alternatives, open ended, feasibility study  
Constraints: Limited space, cost, time, human factors, weight, performance requirements, safety, aesthetics  
Effort: Individual or team

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The machine may be designed to be manually or electrically powered. Other desirable features may also be added to it. However, it must be strong enough to penetrate the heavy tent material ordinarily used in heavier tents as well as the tightly woven nylon used in camping tents.

You may want to study how a regular sewing machine works. It may introduce you to the present technology. However, there is a fundamental difference between a regular sewing machine and this machine. As a result, you must design a new technique for sewing of two pieces of material that are close to each other, but not necessarily overlapped, and your access to the fabric is only from one side.

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You must first accurately define the project requirements and design specifications. The final report must include the design specification, your alternate designs, final design, and a drawing of the final product in enough detail to describe its function.

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### **Engineering Notes:**

### **Objectives/Comments:**

This is an exercise in the design of a new and relatively difficult conceptual system in which the students will have to visualize the solution without much background in its operation. The scope of the project may be changed depending on the level and size of the group and the time available.

You may wish to enhance this project by including a session on the dissection (reverse engineering) of a regular or portable hand held sewing machine. This will introduce students to techniques of stitching by machines. The students should be encouraged to visit a sewing machine store instead if a machine is not available to them.

### **Expected Outcome:**

Students are expected to visualize the situation and synthesize a solution for it. This exercise in design forces the students to follow the design process discussed in class in defining the scope of the project, design specifications, idea generation and selection, and final implementation. The report should document each activity, including the definition and the specifications, alternate designs considered, final solution, and a sketch of the product in sufficient detail to show its operation.

### **Discussion/Follow-up:**

Future projects may involve design of component, measurement of needed forces to penetrate different types of cloth, stress analysis, power requirements, human factors of the grip and other components of the product, manufacturing techniques, cost analysis, and other pertinent issues.