

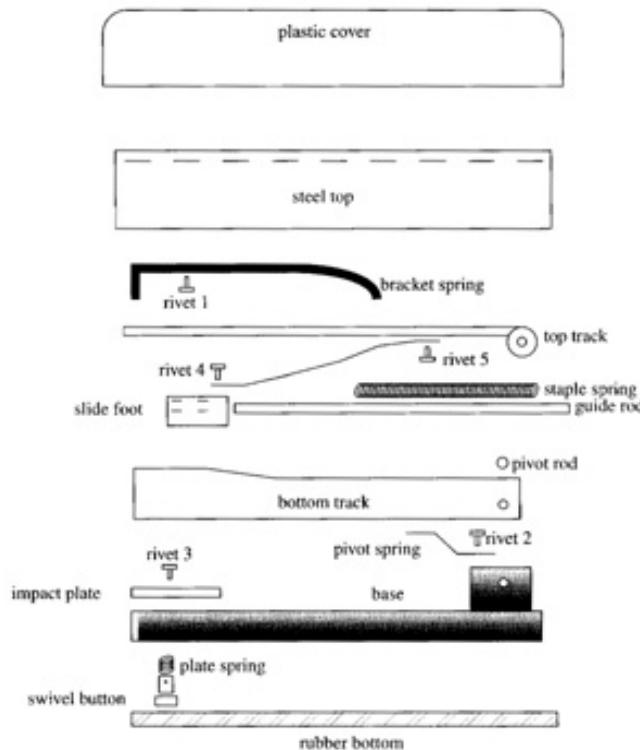


ME450: REVERSE ENGINEERING WORKSHEET

What is Reverse Engineering?

It's likely that many of you will have heard this phrase before, but what does it mean? Simply put, Reverse Engineering refers to the process of examining an existing product with the goal of understanding how it works. Of course, there's a lot more to it than that. As Otto and Wood explain, "Reverse engineering initiates the redesign process, wherein a product is observed, disassembled, analyzed, and documented in terms of its functionality, form, physical principles, manufacturability, and assemblability. The intent of this process is to fully understand and represent the current instantiation of a product"¹. As seen from this definition, it serves a variety of purposes. Lefever and Wood identify five common uses².

1. Benchmarking. Is often useful for comparing a group of products in a detailed manner.
2. Evaluating a Competitor's Product. Can be performed either to examine patent violation or to analyze the product for cloning or design modification.
3. Quality Improvement. Searches for ways to improve an existing product.
4. Cost Reduction. Evaluates the product and/or manufacturing methods in search of cost savings.
5. Pure Understanding. Attempts to obtain an in-depth understanding of a product for intellectual purposes.



Example of an exploded view of a stapler³

When performing reverse engineering, there are a variety of tasks that one might perform to aid in the understanding of the product. Below are just a few.

- visually inspect the product
- take pictures
- subject it to load tests
- disassemble the product
- sketch an "exploded view" (see left)
- measure both the system and components (weight, dimensions, color, material, etc.)
- operate the product in its current form
- operate each of components to understand their function
- catalogue parts in a Bill of Materials

¹ Otto, KN and Wood, KL. "A Reverse Engineering and Redesign Methodology for Product Evolution," 1996 ASME Design Theory and Methodology Conference, DETC/DTM-1523, Irvine, CA, 1996.

² Lefever, DD and Wood, KL. "Design for Assembly Techniques in Reverse Engineering and Redesign," 1996 ASME Design Theory and Methodology Conference, DETC/DTM-1507, Irvine, CA, 1996.

³ Otto, KN and Wood, KL. "Product Design: Techniques in Reverse Engineering and New Product Development" Prentice Hall, Upper Saddle River, NJ, 2001, p. 215.



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Having a basic understanding of what reverse engineering means, now it's your turn to experience it for yourselves. As you unscrew, disassemble, smash, dissect, and otherwise destroy your products, answer the following questions. Make sketches where appropriate. Answer the first two questions before disassembling your product.

- What is the main task that the product is meant to accomplish? What other uses might it have?
- How do you think the product works? Be specific. What do you expect to find after disassembling it?
- Begin disassembling the product. What is the function of each component?
- How do the various components work together?
- How was this component manufactured? What materials were used?
- How might another device serve the same function as one or more of the existing components?
- Is there a more economical way to achieve the same functionality?
- Is there a more environmentally sound way to achieve the same functionality?