

Gossamer Condor Design Brief Answer Key

Introduction

What would you do if you had a teacher that expected you to complete an assignment, but refused to tell you what the assignment was? Imagine, too, that the result of this assignment was expected to be submitted in a specific format, which was also not explained to you. Oh yes, and there was a due date. But, you were not told what that was either. How could a person be expected to accomplish anything under such conditions?

Engineers need to know what problems they are addressing. They must have an idea about the degree to which the solution should be carried out, along with what the solution should do to solve the problem. And, the engineer must work within constraints, such as time and budget. A design brief is a tool that is used to concisely identify the problem, solution expectations, and project constraints. The engineer will often return to the design brief throughout a design process to assess the progress and validity of his/her creative work.

Design briefs will be used throughout the Introduction to Engineering Design™ course. Long term projects will be initiated with design briefs, and as you become a more proficient designer you will be required to write your own. This activity is designed to guide you through the development of a design brief by observing a design project from start to finish. The information gained in this lesson will not only help you understand how to create a design brief, it will also allow you to observe the design process in action.

Equipment

- The Flight of the Gossamer Condor DVD
- Television or computer with projector and audio amplifier
- DVD player
- Pencil

Procedure

In this activity, you will witness the development of the first controlled, sustainable human-powered aircraft as chronicled in the Academy Award-winning documentary, *The Flight of the Gossamer Condor*.

Imagine that you have traveled back to the mid 1970s. You are part of a design team that is attempting to build a human-powered aircraft. The project leader has given you the responsibility of defining the problem, stating the expectations that the solution must meet, and identifying the project constraints. Your design brief will serve as a guide to the team as they work through the design process.

From your observations of the film, answer the following questions and record your information in the design brief on the following page. You may use the space underneath the questions to take notes through the film.

1. Who was responsible for the design of the Gossamer Condor? Write your answer on the line next to the word "Designer" in the design brief.
2. What was the problem that the designer and his team were trying to solve? Be advised, the problem was not to design an aircraft. The design of an aircraft was part of the solution to the problem. Write your answer as a complete sentence(s) on the lines next to the words "Problem Statement" in the design brief.
3. To what degree was the solution to be realized? Was the designer's intention to merely sketch an idea and be done? Was the intention to come up with an idea, build it, and stop there? Or, was it the designer's intention to design, build, and test an idea?
4. What expectation(s) did the design have to meet before it would be considered a successful solution to the problem? In other words, what did the solution have to do? Combine your answer with the answer from question three, and write it as a complete sentence(s) on the lines next to the words "Design Statement" in the design brief.
5. What limitations did the design team have to work with? What criteria did the solution have to meet?

Gossamer Condor Design Brief

- Designer: **Paul MacCready**
- Problem Statement: **No human-powered aircraft has ever been developed that could truly fly or win the Kremer Prize.**
- Design Statement: **Design, build, and test a controlled, sustainable human-powered aircraft that meets the criteria set forth by the Royal Aeronautical Society for the Kremer prize.**
- Constraints:
- 1. Maximum 1/3 horsepower human engine output**
 - 2. Unassisted take-off**
 - 3. Able to ascend to a height of at least 10 feet**
 - 4. Must fly a continuous distance of at least one mile around two pylons placed 1/2 mile apart**
 - 5. Capable of making complete left and right turns**
 - 6. After a full mile-long flight, must ascend again to a height of at least 10 feet**

Conclusion

1. Aside from being the first to solve the problem, what was the major motivating factor for the designer of the Gossamer Condor?

The winner of the Kremer prize was awarded 50,000 £ (approximately \$100,000).

2. Where did the idea for the Gossamer Condor come from, and what did it have to do with the power output of a bicyclist?

MacCready was daydreaming about hang gliding. He knew that a hang glider required 1 horsepower to function. So, MacCready rationalized that by tripling the dimensions of the wing and keeping the overall weight the same, the resulting aircraft would require only 1/3 horsepower. 1/3 horsepower is approximately the maximum output of a bicyclist pedaling at full speed.

3. What was the major natural element that caused the most problems to the Gossamer Condor?

Wind was the major natural element that caused the most problems.

4. What were three major differences between the first generation design and the final generation design of the Gossamer Condor?

The final generation Gossamer Condor had swept back wings, the wings undersides were covered with mylar, and there was an enclosed space for the pilot. All of these changes increased the airplane's performance.

5. How long did it take the design team to accomplish their goal? Was this the amount of time that the design team expected?

The design team thought they would have the problem solved in a matter of a few months. However, to solve the problem and win the Kremer prize took approximately one year.