

Ambulance Engineering Design Project Packet

Client Statement (Engineering Challenge)

Here at E.G. Benedict Ambulance Company, we pride ourselves in providing the most up-to-date, cutting edge, emergency response vehicles available. Through discussions with our customers, we have identified *patient safety during transport* as a major concern. This has become a new focus for our development group. We would like you to design a patient safety system for our next-generation ambulance. This safety system may be limited to the safety restraints, or include vehicle modifications. Patient safety is our number one goal.



Problem Statement (A detailed description of needs to be met.)

Design and construct a patient safety system for an ambulance. The safety system must keep a model patient (a raw egg) from breaking during a front-end collision. The safety system may be a combination of restraints and vehicle design. The safety system cannot exceed an additional 11 grams of weight added to the ambulance frame.

Functions (What the design project/product will do.)

- The ambulance securely holds the egg/patient in a lying down position.
- The ambulance patient safety system keeps the egg/patient from breaking during a front-end collision.

Constraints (The design criteria that *MUST* be met to be considered acceptable and successful.)

- The prototype ambulance will be made from recycled materials from home.
- The completed prototype ambulance must not add more than 11 grams to the weight of the provided frame.
- The patient safety system must hold the egg/patient in a lying down position.

Background Research

For homework, use the internet to research: modern ambulance safety systems, patient restraints, how seatbelts work and other related topics. Make sure to keep a record of relevant information and the source website(s).

Research will vary.

Possible Design Solutions

For homework, on a piece of graph paper, sketch three possible design solutions. Then, with your group, discuss each design with team members. Create a pro and con T-chart for each design. *Tip:* Create your T-charts on the same paper as your designs so you are less likely to lose them.

Answers (sketches) will vary.

Prototype Creation (describe your selected design and why you chose the design you did)

Example answer: My group chose to use design #1 because it used the most readily available materials. This design also had the patient attached in the middle of the frame and I believe this provides important additional protection.

Prototype Testing

1. Place the model patient (a raw egg) into the prototype ambulance.
2. Adjust the ramp angle to level 1 (back of ramp is set on 1 milk crate).
3. To simulate a front-end collision, roll the ambulance prototype down the ramp into the wall.
4. If the raw egg does not crack, the patient survived. Proceed to increase the ramp height by adding 1 additional milk crate and repeat the test.
5. Continue increasing the ramp height and testing until the patient does not survive or 5 milk crates have been used.

Test Results (Description of test results, facts only)

Example results:

Level 1: The egg did not move during the collision testing.

Level 2: The egg shifted to the front of the restraining belts, but did not slide out completely.

Level 3: The egg slipped out of the restraining belts and broke when it hit the floor. "Patient" did not survive. End of testing for this prototype.

Level 4: Unable to test.

Level 5: Unable to test.

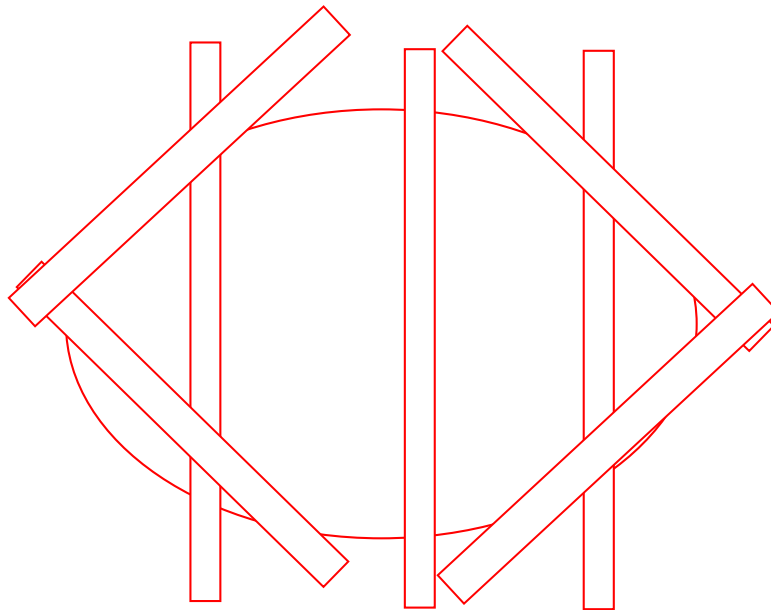
Evaluation of Results (Based on the test results was your design effective? How do you know?)

Example answer: Based on our group's test results, I feel that our prototype ambulance was very successful. Our design was able to keep the egg/patient from breaking at both level 1 and level 2 collisions. Unfortunately, during the level 3 collision test, our egg slid out of the restraints and broke.

Future Recommendations (Based on the test results and your evaluation of the results, what you would recommend for improvements to your design, why would you make the described changes)

Example answer: For the design of the next generation of the ambulance, I suggest a change to the passenger safety restraints. The current design uses three straps across the patient. I recommend adding straps that form V-shapes at the top and bottom of the patient. These V-shaped straps would be in addition to the existing straps to hold the passenger more securely while experiencing the forward and backward forces of front-end collisions.

Sketch your recommended design changes in the space below:



In the diagram below, identify the person(s) or group that performed each role during the design process:

