Engineering Design Challenge

Welcome!

Please sit with your team for this presentation

Engineering Design Challenge

Why a Design Challenge?

- Learn the Engineering Design Process
- Work with a team of other talented TAME students
- Have fun!

Today's Challenge

Design and test a wrapping machine for an airplane fuselage inspired by Boeing's 787 Dreamliner.

Your wrapping machine must be self-supported and the wrapping mechanism must be human-operated.

Boeing 787 Dreamliner

The 787 Dreamliner is very fuel efficient because lightweight composite materials are used to build it.

Carbon fiber is one such composite material. It is made by encasing thin carbon fibers within plastic to keep the material lightweight, but strong.

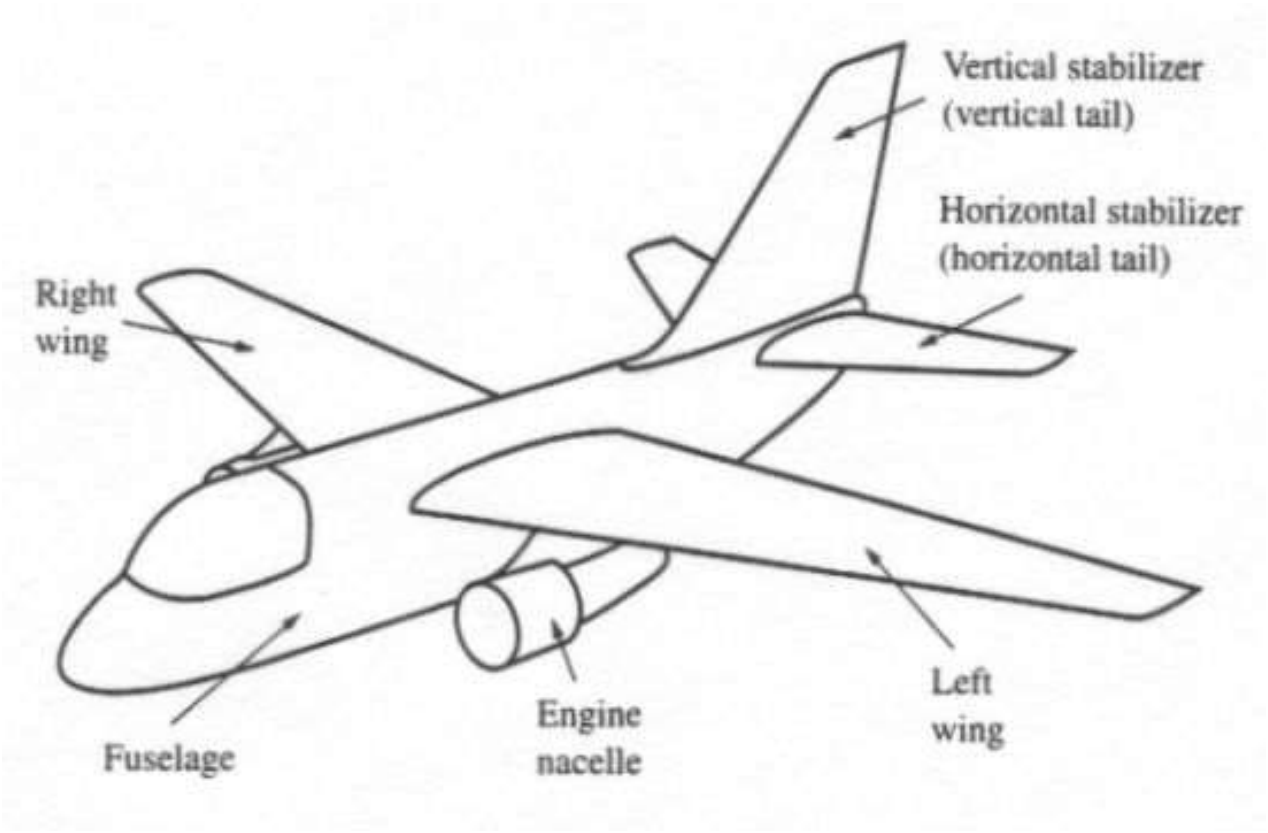
For the 787, Boeing engineers designed and built a machine that wrapped the fiber around the fuselage.

Boeing 787 Dreamliner

Video: The Boeing Company, www.boeing.com

http://www.boeing.com/innovation/#/commercial/787-game-changing-innovation

Parts of an airplane



From AerospaceWeb.Org

Your Wrapping Machine

Your 787 inspired wrapping machine must

1. Self-support the fuselage
2. Be operated by a team-member for 20 seconds
3. Cover the fuselage in a single layer of fiber with no gaps or overlapping strands

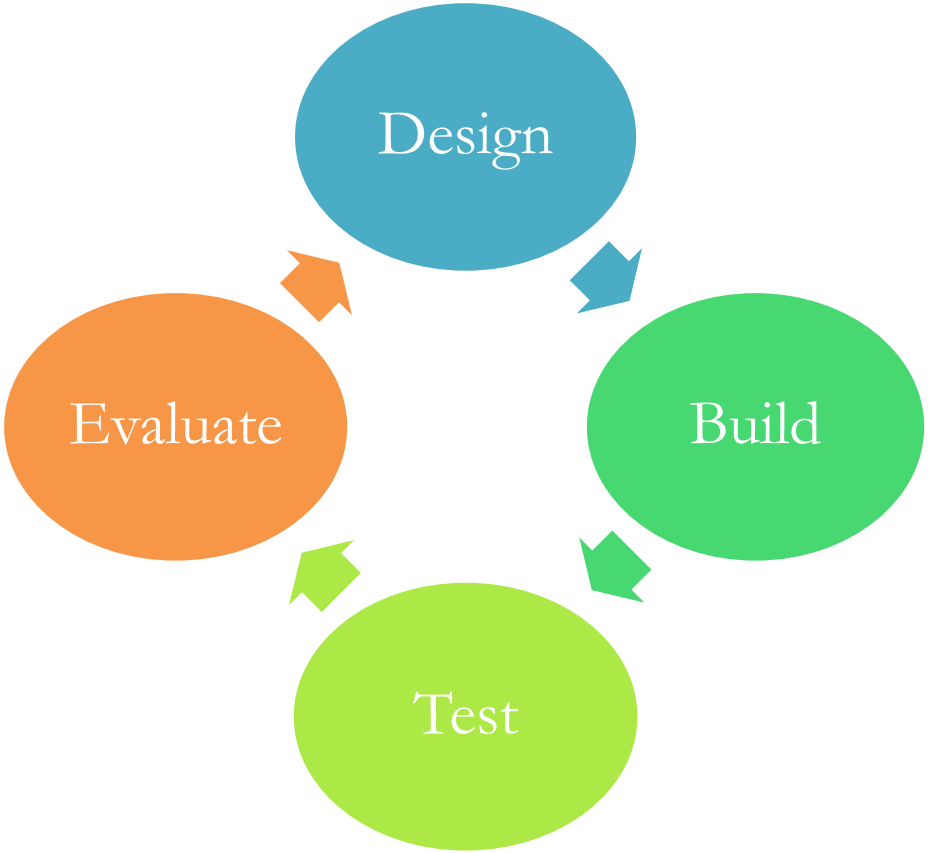
Challenge

You will have 60 **minutes** to design, build and test your project.

Suggested schedule:

- Design – 10 minutes
- Build – 30 minutes
- Test and refine – 20 minutes

Engineering Design Process



Team Roles

Each team member has a role and each role is assigned to a team member

- Systems Engineer
- Design Engineer
- Structural Engineer
- Production Engineer
- Test Engineer

Teams and Supplies

Each team will be given the same set of instructions and supplies.

Be sure to check your supplies immediately since any missing supplies must be replaced in the **first five minutes of the challenge**.

Read all instructions carefully before beginning the challenge.

Design Requirements

- The fuselage must be supported in the wrapping machine and cannot be held by team members while it is being wrapped
- A team member must secure the wrapping mechanism and the fiber as appropriate to start off the wrapping process.
- Team members may not touch the fiber once testing begins
- Cover as much of the fuselage as possible, making sure that the fiber is in a single, even layer throughout, and eliminating gaps between the fiber coils will lead to maximum points

Scoring

Wrapping mechanism must operate at least 20 seconds to earn a high score

Scoring based on

1. **Wrapping mechanism worked for 20 seconds**
2. **Length of fuselage wrapped**
3. **Number of single-layer fiber coils on fuselage**

- **Other recognitions:** Creative use of materials, innovative design, interesting name, and adaptability of design for the wrapping machine will all add to your point total. **The team with the most points wins!**

Testing Process

- The **Structural Engineer** on the team will **verify the system is ready for judging**.
- The **Test Engineer** will **show** the judges the **wrapping mechanism and identify which part will be moved during testing.** No other part of the wrapping machine, the fuselage, or fiber may be held by team members.

Recommendations

- Spend about 10 minutes planning and drawing your design before building.
- Test your wrapping machine as you build to make sure it will support the fuselage.
- Divide and conquer – allow team members to work on different parts of the design.
- Be creative. There are many different ways to build a winning wrapping machine so think about different approaches you could take.

Engineering Design Challenge

Read the instructions carefully, follow them precisely.

Read what the rules state and base your decisions on the rules.

If the rules do not state that you cannot do something, then you may do it, as long as it is safe and not destructive.

Engineering Design Challenge

You are responsible for cleaning up your work area. You will not be judged until your area is clean and all trash has been thrown out.

Engineering Design Challenge

Wait until your team number is called to leave this area.

Good luck!