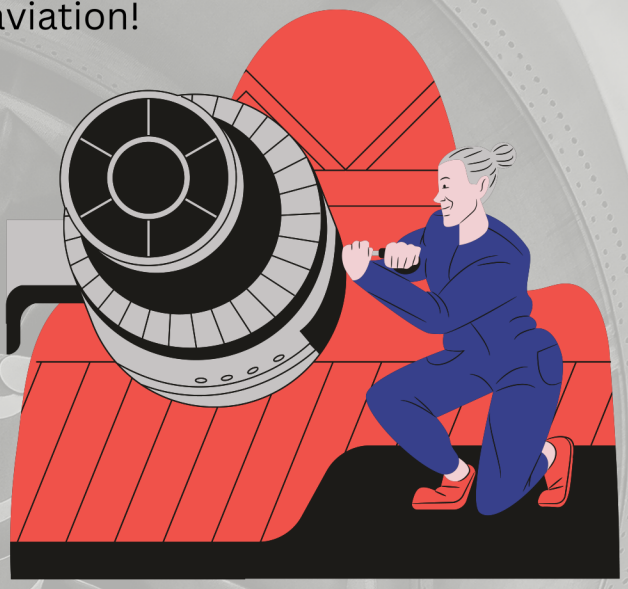
# DESIGNING A CUSTOM AIRCRAFT

## FOR HUMANITARIAN MISSIONS

STEMPILOT®.COM

Engaging Students in STEM with Flight Simulation

Are you ready to soar to new heights? Buckle up and join us for an exhilarating journey where you'll unleash your inner aerospace engineer! From crafting creative blueprints to piecing together the ultimate flying machine, get ready to design and build your very own airplane. Let's ignite our imaginations and take flight together as we delve into the thrilling realm of aviation!

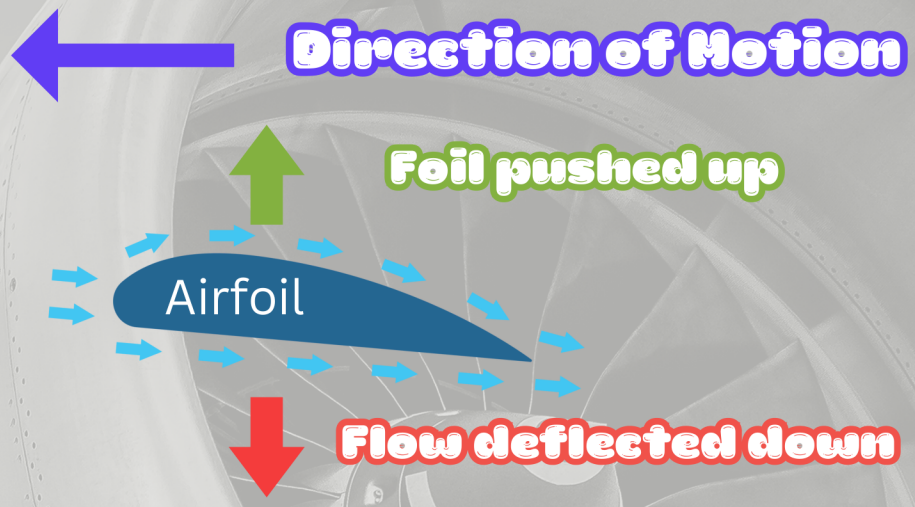


Hey there, fellow educators! Before we blast off into the awesome adventure of building our own airplanes with our students, let's take a thrilling peek into the world of airplane engineering!

When engineers gear up to design an airplane, they think about the nuts and bolts of the structure and the materials they'll use. And guess what? They've got the Four Forces of Flight as their trusty sidekicks! These forces are like the superhero team that helps airplanes zip through the clouds with style!

First up, we've got weight – it's like the Earth's gravitational pull giving the airplane a big bear hug. Engineers need to choose the right materials, like aluminum, titanium, and steel, to make sure the airplane isn't too heavy or too light.

Now, onto lift! It's the superhero force that helps airplanes defy gravity and soar high in the sky. Imagine airplane wings as magical air scoops, using their special shape, called an airfoil, to generate the perfect lift-to-drag ratio as they dance through the air!




Thrust is like the superhero engine of the airplane, zooming it forward through the sky! Picture it as the powerful force that pushes the airplane ahead, overcoming any resistance it encounters. Unlike lift, which is all about the magic of air over the wings, thrust comes from the mighty engines of the aircraft. But hey, those engines need fuel to fire up and get the plane ready for takeoff!

Now, let's meet drag – it's like the playful sidekick of the air, trying to slow the airplane down. Imagine it as the air giving the airplane a friendly high-five, but sometimes it can be a bit too enthusiastic and put the brakes on the airplane's forward motion. Kind of like when Superman swoops in to stop a speeding asteroid (well, sort of!), air has the power to resist the movement of the airplane as it flies through the sky. This resistance, known as drag or air resistance, counteracts the force of thrust and slows down the airplane's speed.

Ta-da! The fantastic Four Forces of Flight are like the ultimate blueprint for engineers to craft mind-blowing, cutting-edge aircraft that have been dazzling folks for over a century! Now that we've unlocked the secrets of these forces, it's time to roll up our sleeves and dive headfirst into designing our very own airplanes. Who's ready to take flight into a world of creativity and innovation? Let's soar!

**Lesson Plan: Designing a Custom Aircraft for Humanitarian Missions**

**Objective:**
Students will collaborate to design a custom aircraft using MachUp 5 software, capable of transporting supplies and materials to organizations like the Red Cross during times of conflict.

**Materials Needed:**
- Access to MachUp 5 software (Download it for free at MachUp 5)
- Computers or laptops
- Projector or large screen for displaying videos
- Graphing paper
- Pencils or pens

**Preparation:**
- Ensure all necessary materials are prepared in advance.
- Install MachUp 5 software on all computers prior to the lesson.

**Activity:**
- **Introduction and Video Presentation:**
  - Begin the session by presenting the video titled "The Four Forces of Flight (How Things Fly Demonstration)."
  - Facilitate an open discussion with the following prompts:
    - What materials do engineers typically consider when designing lightweight aircraft?
    - Is it preferable to utilize curved or flat wings in aircraft design? Why or why not?
- **Team Formation and Task Explanation:**
  - Explain to students that they will work in teams of 3-4 to design an aircraft capable of transporting supplies to the Red Cross and schools globally during conflicts and natural disasters, using the principles of the Four Forces of Flight.
  - Instruct students to form their teams and distribute graphing paper to each group.

- **Brainstorming and Sketching:**
  - Encourage teams to brainstorm ideas for their aircraft and sketch their initial designs on the provided graphing paper.
  - Circulate among the teams to provide guidance and support during the brainstorming process.
- **Introduction to MachUp 5:**
  - Guide students in using MachUp 5 and familiarize them with the necessary tools for aircraft design.
  - Demonstrate how to create basic shapes, adjust dimensions, and apply the principles of aerodynamics in the software.
- **Design and Development:**
  - Allow students to commence designing their aircraft using MachUp 5, emphasizing the importance of referencing their blueprints (graphing paper) throughout the process.
  - Encourage teams to focus on key elements such as wings, fuselage, landing gear, and engines.
- **Saving and Exporting Designs:**
  - Once students have completed their designs, instruct them to save and export their work to an STL format for potential 3D printing.
  - Ensure all teams have successfully exported their designs before concluding the session.

**Wrap-Up:**

Reflect on the importance of innovation and collaboration in aerospace engineering, particularly in designing aircraft for humanitarian missions. Discuss the challenges faced and the learning experiences gained during the project.

**Ready to Take Flight?**

Let's harness our creativity and engineering skills to design exceptional aircraft that can make a real difference in the world! Who's ready to take flight into a world of creativity and innovation?

**To delve further into the realm of aviation, encourage your students to participate in the following activity:**

- Task your students with presenting their aircraft designs to a United Nations committee. Their presentation should include the original design, a list of features, and highlight what sets their airplane apart from others.