

# 3D Printing Drone Project: Instructor Notes

This project that will help your students design a mini quadcopter drone. This hands-on activity fosters creativity, problem-solving skills, and helps introduce your students to 3D printing strategies.



## Project Scenario

A design competition has been announced where you must design, create, and race a micro drone. To compete in the competition, you are required to develop and 3D print a lightweight drone chassis below 10g total. The design must still contain motor protection and some sort of landing gear and follow the same overall size and location of all components. You should aim to get your main chassis between 5-7g and minimize all other components as much as reasonable

## Learning Objectives

### Research

Students will demonstrate their ability to research key information on the principles of rotary flight and translate these into innovative concepts. They will also work evaluate the different concepts, the design merits and shortcomings, to generate a final solution

### Applying the Design Process

Students will understand how to carry out the design process, from design to manufacture. They will understand the trade-offs between design intent, design for manufacture, and assembly. Furthermore, they will develop their reasoning skills to navigate design choices

### Evaluating Performance

Students will evaluate the performance of their design by considering the overall mass of components, and this might impact flight stability and manoeuvrability. Additionally, students will use these observations as feedback and document actionable conclusions.

## Suggested Project Stages

### Research and Ideation



Students can conduct thorough research on rotary flight theory and micro drone design requirements. They can brainstorm many creative ideas and innovative concepts, aiming to meet competition criteria while prioritizing flight performance and stability. Finally, they converge on a final design concept and capture their reasoning

### Design Iteration



Students can use **Autodesk Fusion 360** to design the micro drone components to meet the competition specification. They can use the **Simulation** workspace to assess structural performance analysis and drive design changes such as weight reduction from their findings. They should also consider the 3D printing process and assembly

### Build and Test



After finalizing their designs, students can manufacture and test them, or test them using analysis tools in Fusion 360. They should consider the potential for the drone to fly. Educators can then assess the students' design concepts, iterative design process, adherence to competition rules, manufacturability and the assembly process

## Tips for Students 3D Printing Micro Drones



Avoid designing overhangs and unsupported structures that might cause printing issues



The ideal print orientation minimizes the need for support structures and maximizes printing stability



Print the model as component parts to assemble instead of printing a single, complex model



Before printing the full-sized model, do a smaller scale test or print individual sections to identify issues before committing to a larger print

## Extension: Additional parts that may required for flight testing

### Drone components

- AIO flight controller with ESCs & Receiver
- 4 motors
- 4 propellers (2 CW, 2CCW)
- FPV camera + FPV transmitter
- Battery

### Other components

- Transmitter
- FPV signal receiver and antenna
- Monitor or goggles to view video feed

## Additional Links & Resources

[autodesk.com/certification/learn/module/project-design-a-model-for-3d-printing](https://autodesk.com/certification/learn/module/project-design-a-model-for-3d-printing)  
[autodesk.com/certification/learn/course/learn-fusion-360-in-90-minutes](https://autodesk.com/certification/learn/course/learn-fusion-360-in-90-minutes)

This micro drone is a sub-class of drones that is intended to be flown indoors. If you build and fly your micro drone, as a safety precaution, you should check your local regulations to ensure there are no additional guidelines that must be followed. See project webpage for additional safety information