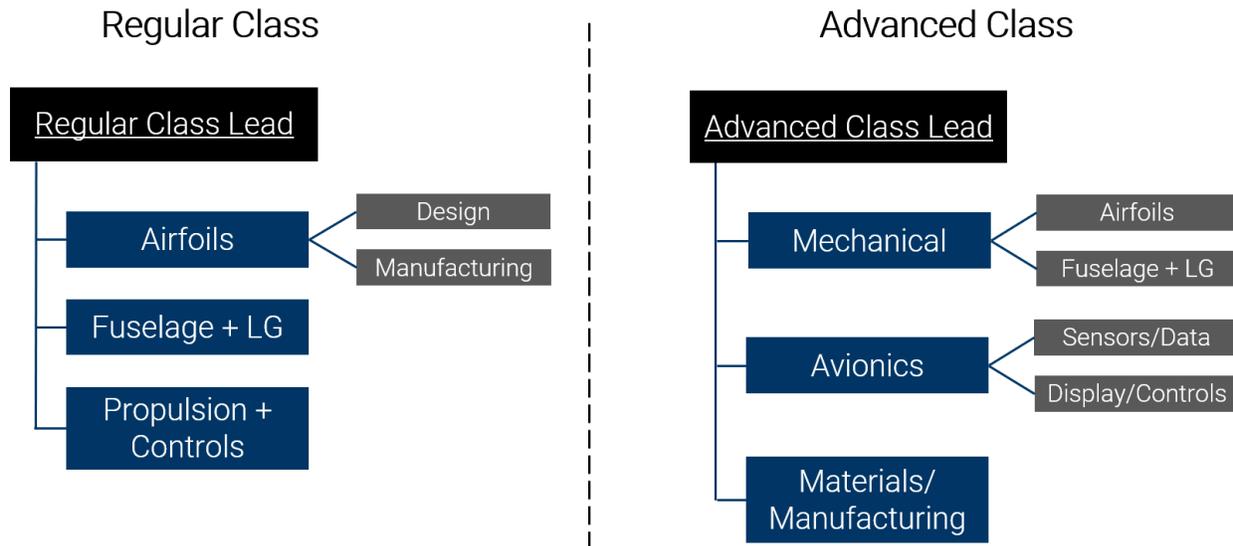




2018-19 UBC AeroDesign Technical Team

Roles & Responsibilities

Technical Team Structure Diagram



**There may be a Advanced Class propulsion sub-team depending on the new 2019 Rules.*

The UBC AeroDesign Technical Team structure begins after preliminary design and further splits into two classes: Regular Class vs Advanced Class - to reflect the two competition classes we compete in. The blue boxes above represent the *sub-teams*, each with *sub-team leads* that report to their respective *class leads*. The grey boxes indicate further *specializations/projects* within each *subteam*, each with *specialization/project leads* comprised of senior members. Normal members will operate under the broader *sub-team* category and will be assigned to *specializations/projects* when necessary.

The structure diagram above should only provide a rough guideline of how responsibilities should be delegated. Though most members will end up working solely within one sub-team, more dedicated members looking to expand their skillsets and experiences may choose to take on projects/tasks from multiple sub-teams (i.e. one person can work on the Landing Gear of Regular Class AND the Drop Pod mechanism of the Advanced Class aircraft). If you are interested in doing so, please let your class lead know.

The most up-to-date team list can be found on the drive under:

UBC AeroDesign -> 2018-19 -> Admin -> Team



REGULAR CLASS

AIRFOILS

The regular class airfoils sub-team is responsible for all lifting and control surfaces of the aircraft. This includes the wings, ailerons, v-stab, elevator, h-stab, and rudder.

In the stage of detailed design, the airfoils team will:

- > Design the structure of the wings and tail, considering: Manufacturability, structural integrity, reliability, ease-of-assembly, weight minimization, electronics integration, transportation and materials cost/sourcing.
- > Perform detailed analysis on the lifting surfaces, to validate the calculations made in preliminary design and potentially improve the configuration.

In the stage of manufacturing and testing, the airfoils team will:

- > Manufacture the parts, with considerations to: tolerances, build efficiency, replicability/consistency, and cost.
- > Performing analysis on the parts to validate design, including but not limited to: wing-load testing, flight load testing, and control surfaces range/torque testing.

Expected Learning Outcomes:

- > Software: SOLIDWORKS, CorelDRAW, XFLR5, StarCCM (CFD)
- > Mechanical Design, DFMA, FMEA



REGULAR CLASS

FUSELAGE + LG

The regular class fuselage and landing gear team is responsible for the integration of all systems (propulsion, control, airfoils) onto a central platform (more commonly called the fuselage), and developing the steering and ground-rolling system of the aircraft (more commonly called the landing gears).

During the detailed design phase, the team will:

- > Design the structure of the fuselage, ensuring that it will not break during flight. Considerations will be made to manufacturability, structural integrity, reliability, assembly, weight minimization, electronics integration, transportation, and materials cost/sourcing. Primary loading modes are bending along the length of the fuselage, torsion along the length of the fuselage, shear and shear flow due to bending.
- > Design the structure of the landing gear, with considerations to manufacturability, structural integrity, reliability, assembly, weight optimization, transportation, and materials cost/sourcing. The landing gear must be designed to withstand repeated shock loads in landing.

In the stage of manufacturing and testing, the team will:

- > Manufacture the fuselage and landing gear, with considerations to: tolerances, build efficiency, replicability/consistency, and cost.
- > Performing analysis on the parts to validate design, including but not limited to: fuselage-load testing, flight load testing, landing gear drop testing, and landing gear drag/rolling friction testing.

Expected Learning Outcomes:

- > Software: SOLIDWORKS, CorelDRAW, FEA,
- > Mechanical Design, DFMA, FMEA



REGULAR CLASS

PROPULSION + CONTROLS

The Regular Class propulsion sub-team is responsible for the design, analysis, and procurement of the aircraft propulsion system (electric motor and propeller), as well as the electronic control systems. This will involve:

- > Optimizing the thrust of the propulsion system through the analysis of the motor propeller combination. The analysis may include, but is not limited to MATLAB simulations, and wind-tunnel testing.
- > Building the electronic control systems, performing full systems tests and control surface trimming.
- > Sourcing the transmitter/receiver components.
- > Testing the control surface servo motors for adequate sway and torque, under the power limit and with the power draw of the motor. Inadequate servo torque can cause an otherwise perfect plane to crash!

The primary design goal of the control system is reliable use in competition. To ensure this, rigorous testing will be completed to determine the conditions at which the control surfaces or motor stop and address the issues adequately.

Expected Learning Outcomes:

- > Software: MATLAB, Python
- > Electrical wiring and assembly, wind-tunnel testing, FMEA



ADVANCED CLASS

MECHANICAL

The advanced class mechanical sub-team is responsible for all mechanical components of the advanced class plane. It is divided into 2 smaller subteams, the airfoils subteam and fuselage + LG subteam. The division of responsibility between these 2 subteams is like the division between the corresponding regular class teams.

The team will be responsible for:

- > Designing the exterior surfaces of the plane, including the 2D airfoil shape, 3D wing shape, empennage, fuselage and landing gear. Considerations will be made to lift, drag, and the static/dynamic stability.
- > Designing the structure of the parts, with considerations to: manufacturability, structural integrity, reliability, assembly, weight optimization, electronics integration, transportation, and materials cost/sourcing.
- > Assembling the components that have been manufactured by the materials team into the full plane. Considerations will be made to: tolerances, build efficiency, replicability/consistency, and cost.
- > Performing analysis on the parts to validate design, such as: wing-load testing, flight load testing, control surfaces range/torque testing, scale model wind tunnel testing.

Expected Learning Outcomes:

- > Software: SOLIDWORKS, CorelDRAW, XFLR5
- > Mechanical Design, DFMA, FMEA



ADVANCED CLASS

AVIONICS

The advanced class avionics sub-team is responsible for the design, creation and implementation of the electrical hardware and software of the advanced class plane. The team is divided into 2 subteams: sensors/data and display/controls.

The team is responsible for:

- > Analysing the mission requirements and designing the software and hardware system to meet those requirements with considerations to reliability, durability, redundancy, weight, and cost.
- > Sourcing all electrical components and designing all electrical circuits to meet the requirements of the control, transmission, and receiving systems.
- > Developing a gyroscopic control system to ensure plane can fly in a straight line when there is no pilot input
- > Testing all critical features of the avionics systems to ensure they meet mission requirements, including but not limited to: range, sensor data quality and accuracy, streaming and other data delay, weather effects, and disturbances from other radio systems.
- > Testing for failure conditions and reiterating the design to ensure that there is a safety margin between failure and regular flight conditions.
- > Integration of the avionics systems with the body of the plane through collaborating with the mechanical sub-team, ensuring no interference, adequate clearance, proper tolerances, etc.

Expected Learning Outcomes:

- > Software: MATLAB, C programming, circuit board design
- > Electrical wiring and assembly, full-system testing, FMEA



ADVANCED CLASS

MATERIALS

The advanced class materials subteam is responsible for the composite material manufacturing. They will work with the mechanical subteam to produce the parts required.

This will involve:

- > Manufacturing of all composites parts, with considerations to: tolerances, build efficiency, replicability/consistency, and cost. This will involve receiving part designs and tolerances from the mechanical team, which will then need to be turned into physical parts.
- > Designing custom tooling to meet manufacturing requirements, focusing on minimizing cost of production and production time.
- > Creating sample parts during the preliminary design stages to improve the manufacturing process.
- > Continuously refining and improving the composites manufacturing process and capturing the process through documentation for future years
- > Performing structural tests to validate the manufacturing process, and to gain feedback information on how to improve it.

Expected Learning Outcomes:

- > Composites manufacturing
- > Tooling design, production process improvement.