



# UBC AeroDesign

2017-18 Year-In-Review

The completion of 2017-18 UBC AeroDesign marks the twenty-seventh year of existence of the team – the twenty-seventh time UBC AeroDesign has served as a second classroom for UBC students to experience what it is like to work on a world-class aviation project. Every year, the team upholds the tradition in competing at the international SAE Aero Design series against universities from around the world – this year with no exception. Although the team had aimed to achieve 1<sup>st</sup> place this year – and was well on-track in doing so, the team finished with a regretful 11<sup>th</sup> place out of 38 teams. Though this result may be worth celebrating for by most schools, the exceptional talent and dedication put forward by our UBC students this year definitely deserved much more. Nonetheless, with heavy hearts we have learned some very important lessons and gained some extremely valuable experiences from the “failure”, and we are extremely grateful for you, our sponsors and advisors, for your generous contributions that had enabled us to grow our technical, professional, and leadership skills.

Over the last 12 months, our team of 30 members from various engineering disciplines and other faculties put in tremendous efforts to design, prototype, build, and test our aircrafts. While new members gained insights on how a student team operates and detailed knowledge on aircraft design, our student leaders went above and beyond to gain invaluable experiences with how to lead a team and manage critical deadlines.

We would like to share with you some highlights of our year, as well as how your contributions were used. We thank you once again for helping us develop the next group of leaders who are determined to continuously make the team a success and promoting interest in aviation across campus and BC.

Thank you,

2017-18 UBC AeroDesign Team





## April 2nd -3rd

To reduce costs of shipping and transportation, we decided to rent two vehicles to bring 10 members + planes + tools down to Van Nuys, California (~20 hours of driving) to attend the 2018 SAE AeroDesign West competition. We also booked an Airbnb home with a garage, a pool, and 10 beds to accommodate the entire team. Upon arrival, we immediately began setting up the planes and tools in the garage in preparation for test flights the next day.



## April 4th -5th

We took the planes out for test flight at the Apollo competition airfield, with the following results:

| TEST ATTEMPT | PAYLOAD (LB) |
|--------------|--------------|
| Flight #1    | 26           |
| Flight #2    | 27           |
| Flight #3    | 28           |
| Flight #4    | 29           |
| Flight #5    | 30           |

This performance would have given us a 2<sup>nd</sup> place flight score at the competition (based on the East competition results)!



## April 6th (Static Events)

### STATIC EVENTS

|                        |                       |
|------------------------|-----------------------|
| Design Report          | 9 <sup>th</sup> Place |
| Technical Presentation | 4 <sup>th</sup> Place |
| Technical Inspection   | PASS - No Penalty     |

After pulling an all-nighter to prepare, we delivered our presentation and achieved an overall static event score of

**2<sup>ND</sup> PLACE!**



## April 7th (Day 1 of Flight Rounds)

Our amazing results from the test flights and static events gave us a little too much confidence prior to the flight rounds. Failing to prepare for the extreme weather that prevented most teams from taking-off, unfortunately we were unable to successfully land the plane and consequently totalled both our airplanes.

We immediately returned home and pulled another all-nighter to put together a "Frankenstein" plane from the remains of our two aircrafts.



## April 8th (Day 2 of Flight Rounds)

Back for another attempt to challenge the extreme winds, we once again put our airplane onto the runway. Unfortunately, the winds were so strong only 6 teams did NOT crash their aircrafts. We crashed.

In the end, our team came in

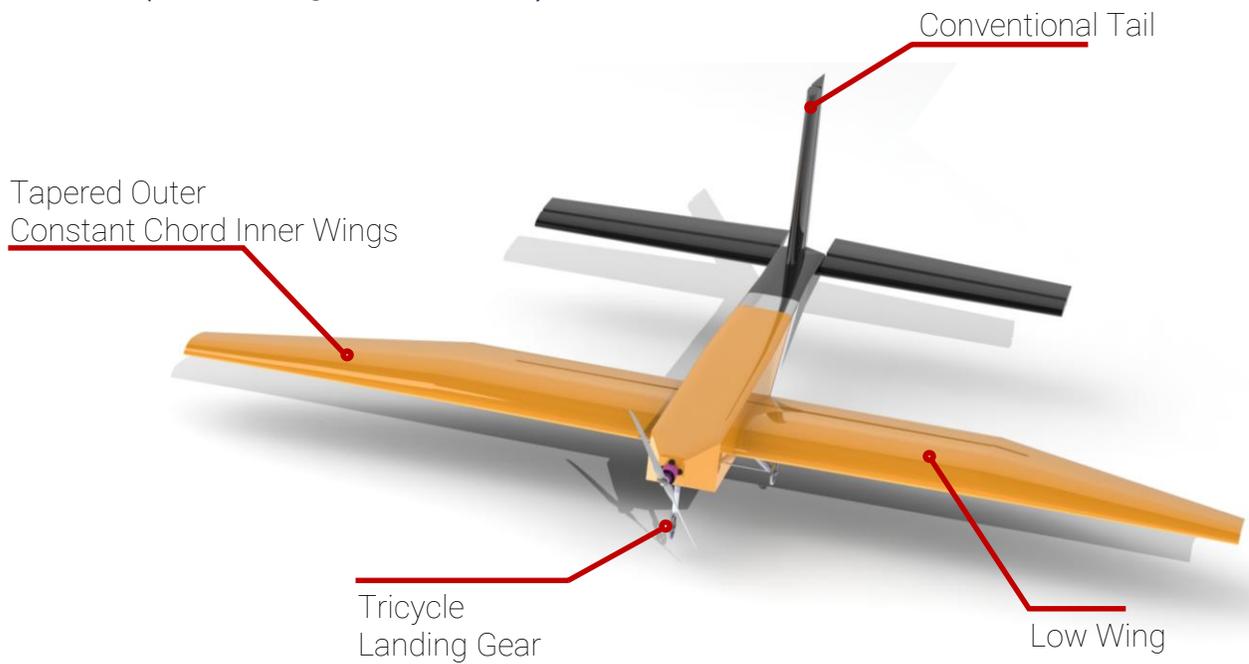
**11<sup>TH</sup> PLACE**

overall out of 38 teams at the 2018 SAE AeroDesign West competition. Though this would be an achievement for most schools, we were unable to meet our goal of achieving Top 3 this year. We spent the rest of the day sightseeing around LA to lighten the mood, but ultimately returned to Vancouver with heavy hearts...





## OP18 (aka. Orange Plane 2018)



Once again, the SAE challenge is very similar to what commercial aircraft manufacturers and airliners strive to achieve: *increase passenger and luggage carrying capabilities while minimizing power consumption.*

The team began preliminary design over the summer of 2017, performed detailed design starting in September, and built and test flew the first prototype aircraft in early December. The aircraft ultimately underwent 4 major design revision changes prior to competition, addressing issues with the h-stab structure, lateral stability, and overall weight reductions.

| SPECIFICATIONS      |                   |           |
|---------------------|-------------------|-----------|
| Max Take off Weight | 44.2lbs           | (20.0 kg) |
| Empty Weight        | 14.0 lbs          | (6.4 kg)  |
| Passengers          | 48                |           |
| Wing Span           | 144"              | 3.66 m    |
| Length              | 87.75"            | 2.23 m    |
| Max Power           | 1000 Watts        |           |
| Motor               | Hacker A50-14L V4 |           |
| Propeller Size      | APC 18" x 12      |           |



To provide more opportunities for UBC students to learn on a student team, UBC AeroDesign is constantly looking to grow the size of the team by finding new aviation projects. This year, we decided to begin doing research on the SAE Advanced Class to prepare us to compete in this new category next year, which involves designing and building nitro-powered fibre-reinforced semi-autonomous airplanes capable of dropping payloads onto a ground target. Though the team is experienced in designing wooden aircrafts controlled by experienced pilots, we have never had the chance to build avionics systems and manufacture parts out of carbon fibre. The main purpose of the Advanced Class Research team this year is to familiarize ourselves with all the new technologies and processes related to Advanced Class so we can begin next year at the same level as other Advanced Class teams.



## MATERIALS

To learn about the manufacturing process of fibre-reinforced plastics, we built a full-scale fibre-glass replica of the Alpha 40 Trainer RC plane (which was generously donated to us by Professor Konrad Walus from ECE). Our next steps for materials will be to experiment with carbon fibre manufacturing techniques, test material properties, develop manufacturing documentations, and find ways to control the characteristics of CF.



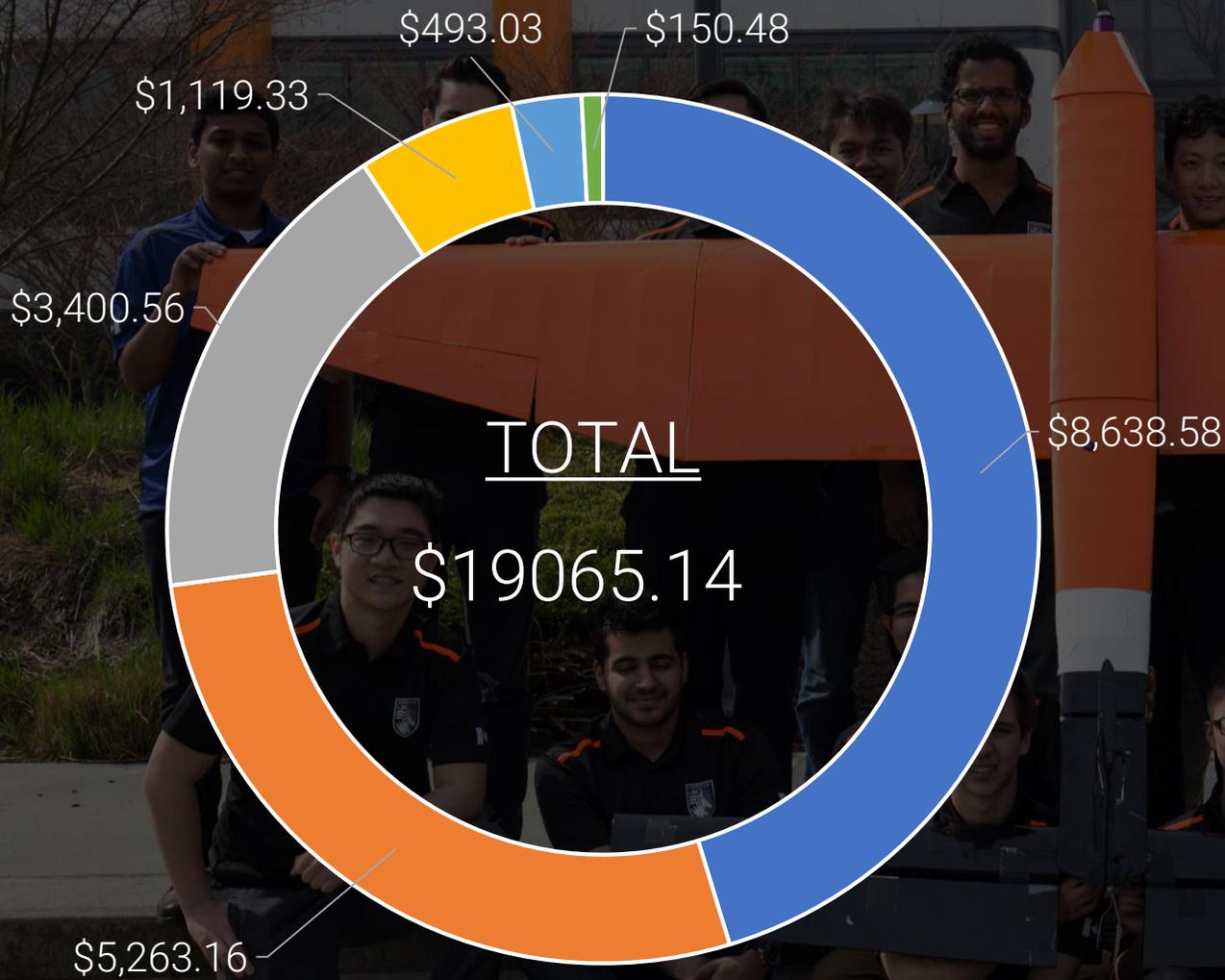
## AVIONICS

To accurately drop our payloads onto ground targets, we developed an avionic system that consists of sensors/cameras and some simple transmitting modules onboard the plane, and a ground station with receivers and a GUI. Our scheduled first test of this system will be at the beginning of June 2018.





# 2017-18 EXPENSES



- Competition Attendance
- Construction Materials
- Propulsion & Electronics
- Advanced Class Research
- Tooling & Manufacturing
- Administrative

Your financial contributions and gift in-kind donations were essential to our team's operation and successes this year. The funds allowed our team to:

- Purchase materials and electronics required to build 4 full planes,
- Buy tools and jigs for testing, manufacturing, and research,
- Operate through buying supplies and covering other administrative costs, and most importantly
- Bring 9 members and 1 pilot to our competition in Van Nuys, California (Car Rental, Airbnb, flight tickets, etc.)

Through this incredible student team opportunity, our students were able to learn what it is like to work with other engineers on an aviation challenge, represent our university at an international competition, gain professional experience by meeting and networking with industry members, and most importantly build on their university experience to one day use the skills they've acquired in the industry.



## TEAM CO-CAPTAINS



4th Year General Mechanical



3rd Year Mechatronics

Years on Team:

4

3

Co-op Experience:

Tesla, John Deere-Hitachi, Nestle Waters

D-Wave Systems, DCD, Ausenco

## TEAM STRUCTURE

### Regular Class

#### Regular Class Lead

Airfoils

Design

Manufacturing

Fuselage + LG

Propulsion + Controls

### Advanced Class

#### Advanced Class Lead

Mechanical

Airfoils

Fuselage + LG

Avionics

Sensors/Data

Display/Controls

Materials

Next year (2018-19) will mark a very important year for UBC AeroDesign. Not only will the team be re-introducing the co-captain system for better handover of leadership and knowledge, it will also be the team's first time participating in the Advanced Class category since the team's last attempt in 2006. In addition, the team will be attempting to grow to double this year's size in order to serve more UBC students, which will make us one of the largest engineering design teams at UBC. 20 senior members will be staying on the team for next year due to our successful operations, including our team captain, which has historically proven to be crucial for the team to perform well. With a larger team and an additional competition to attend, we would be extremely thankful for your continued support of UBC AeroDesign next year. Thank You.

# UBC AeroDesign 2017-18 Sponsors

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Thank You!