AERO FABRICATION CLUB

SAE AEROTHON 2024

UNCREWED AIRCRAFT SYSTEM (UAS)
DESIGN, BUILD, AND FLY CONTEST

Event Report

Team Name: Air Guardians

Team Number: AT2024-084

Team Members:

1) Ritik Jangid
2) Sankalp
3) Chetan Anand Jhariya
4) Sanjay Singh
5) Shashaank Srivastava
6) Rohit TM
7) Sumit Chouhan
8) Siddharth Pandey
9) Ayush Saksena
10) Gauri Nandan Krishna

Faculty Advisor - Prof. Vijay Kumar Gupta

Problem Statement

The objective for this year's contest is to design, build, and fly a multirotor UAV that can deliver cargo to a specified location. The teams shall design a UAV that can carry a specified payload and deliver it to a target area by manual as well as autonomous operations.

The Aerothon 2024 is organized in **two phases**

Design Report Submission –

The design report phase was the first phase of this competition. The design report consists of a CAD model, CFD analysis of the model, thrust calculation, component list, programs and algorithms for autonomous flight, etc. We submitted our design reports of both teams on 26th June 2024

Rendered CAD Model

Technical Presentation –

The technical presentation was the part of the first phase of this competition. The presentation was held at the M.S. Ramaiah Institute of Technology, Bengaluru on 26th June.

5 members from the team attended the presentation phase. Judges from various industries were present during the presentation. Our presentation was very interactive and it went very well.

Image at Presentation Phase

Flight Round - The flight round is the second phase of this competition in which we have to fly the drone manually as well as autonomously. The flight round is scheduled for 15th November (tentative) in Bengaluru.

Our journey (For Design Phase)

Day 1 - June 22, 4:00 AM: The Beginning
Our journey commenced in the early hours of June 22nd from our institute. Armed with excitement and determination, we embarked on this trip, leaving behind the comfort of our campus for the bustling city of Bangalore. The journey promised to be a memorable one. Our train to KSS Bangalore was scheduled to depart at 9:00 AM on the 22nd. The 36-hour train journey that lay ahead was both daunting and exciting. Packed with supplies, laptops, and anticipation, we boarded the train. As the landscape outside shifted from our hometown to new and unfamiliar terrain, we immersed ourselves in brainstorming and design discussions.

Day 2 - June 23, 9:00 PM: The Hotel Hunt
One of the challenges we encountered was finding suitable accommodation. Bangalore's vibrant and bustling atmosphere meant that hotel options were aplenty but finding the right balance between affordability and services took time. Finally, by 9:00 PM, we checked into a hotel that met our criteria.

Day 3 - June 24: Presentation Day at Bangalore
The next day marked the culmination of our journey. We hailed auto rickshaws to reach Ramaiah Institute of Technology for the presentation of our drone design. Nervous yet determined, we presented our hard work, innovative ideas, and intricate designs to the judges. The experience was both exhilarating and challenging, pushing us to showcase the best of our abilities.
After an exhaustive day at Ramaiah Institute of Technology, we returned to our hotel by 8:00 PM. The day was filled with

discussions and evaluations of our presentation. We started preparing for our departure, which was scheduled for the evening of June 25th.

Day 4 - June 25: Departure from Bangalore
Our departure from Bangalore took place on the evening of June 25th. Having completed our Aerothon 2024 presentation, we were eager to return to the comfort of our institute. However, an unexpected challenge awaited us at the railway station. Our train, scheduled to depart at its allotted time, was delayed by a staggering 11 hours.We were left with no option but to patiently await the train's arrival.

Day 5 - June 26: The Extended Train Journey
Once the train arrived, we boarded it with mixed emotions. The 36-hour journey from Bangalore to Jabalpur stretched ahead of us. The camaraderie among our team members and the memories of our Aerothon adventure kept us in high spirits during this extended travel time.

Day 6 - June 27: Arrival at Our Institute
On June 27th, we finally reached our institute, marking the end of our adventurous trip. Despite the train delay, the exhausting journey, and the additional expenses, the experience had been invaluable. We had successfully participated in Aerothon 2024 and gained valuable insights into the world of aircraft innovation.

Challenges Faced:
Throughout our journey to and from Bangalore for Aerothon 2024, we encountered several significant challenges. These challenges included:-

1. **Academic Commitments**: Some team members had to depart early due to impending end-semester exams. This challenge required us to adjust our schedules and ensure they could safely return to attend their academic responsibilities. Our end semester exams are likely to clash during the phase 2 of this competition.

Manufacturing and Flight Phase (Phase-2):

The manufacturing phase was the most important phase of this event. We were using 3d printing for the manufacturing of the mounts. We used extruded carbon fibre square rods in the rotor arms of the UAV. We had spitted the whole UAV into almost 3 parts the top plate, bottom plate and the rotor arms. We have used a Raspberry Pi-4 for on-board computation for autonomous flight operation.


In campus testing of the Drone

Journey of Team in Final Event:

Our team built the UAV with dedication and passion. We started our journey on 15th November 2024. We reached the main event i.e. SAE INDIA AEROTHON Gitam university Bangalore, with great excitement and enthusiasm.

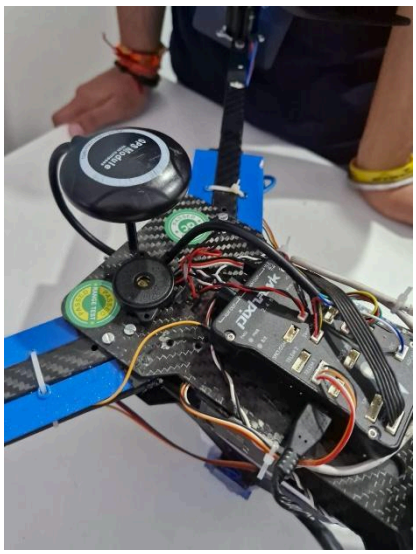
Started our event on 14 th November-

Accommodation- Day 1 (14th November):

The first day was filled with anticipation and excitement as we arrived at the event site. The team eagerly waited for registration and room allotment. Once the registration process was complete, we settled into our rooms. Later that evening, we also underwent our Technical Inspection (T.I.), marking the beginning of our journey in the competition.

Round 1 - Physical UAS inspection:

Our Technical Inspection was scheduled for the afternoon slot and went smoothly, as our aircraft met all the required criteria. During the process, we had insightful discussions with other teams, exchanging ideas and experiences. After the inspection, we were instructed to submit our drones, which would be returned to us the following morning.



The Clearing of technical inspection

Day-2.

Round 1 - Day 2 (15 th November):

Manual flight rounds were there on 15 th November. We had our first round of day 2 early in the morning at 10am. followed by the final autonomous detection round held at 2p.m. We had completed both rounds of flight. We had good interaction with other teams.

Drone Before take-off - Round 2

Drone performing Autonomous Hotspot detection - Round 3

Round 2 - Day 2 (16 th November)

The round featured an obstacle course and an autonomous payload drop, with a few minor challenges along the way. The manual flight rounds took place in the first half of the day, followed by the autonomous payload drop in the second half. Additionally, we had our technical presentation, where we were evaluated on the various methods implemented for the autonomous functionality of our drone. With both flight rounds and the presentation successfully completed, we eagerly awaited the results.

Drone completing the obstacle course

Result:

We secured a position of AIR 1 in the phase 1 of Aerothon 2024 qualifying for the Phase 2.

We Secured the special Award for the best Autonomous mission 4 in phase 2

Conclusion

In conclusion, our journey to Bangalore for the Aerothon 2024 was an unforgettable adventure filled with highs and lows. Despite the challenges we faced, it was a remarkable experience that tested our teamwork, adaptability, and determination.

As we look back on this journey, we can confidently say that the lessons learned and the memories created have enriched our personal and professional lives. We are grateful for the opportunity to have been a part of Aerothon 2024 and look forward to applying the knowledge and skills gained during this adventure in our future endeavors. This journey has reinforced our belief in the importance of determination, adaptability, and teamwork in achieving success, no matter the challenges that may arise along the way.