Cover Page (1 page) - To be merged later with the report’s pdf

Certificate of Compliance (1 page) - Scanned or Digital Copy?

Table of Contents, Table of Figures, Table of Tables, Table of References and Table of Acronyms (3 pages)

DAS-GUI (3 pages)

Around 20 images in total (5 pages)

Design(PA, PADA, GTV) (15 pages)

2D Drawing and TDS (2 pages) - To be merged later with the report’s pdf

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# 

## **1.0 Summary**

The following design report summarizes the team philosophy and the methodical approach used in the development of the PA, PADA and GTV taking into consideration the pre-decided rules and stipulations of the competition. The report also discusses the modelling and construction methods, telemetry and FPV subsystems. Trade-offs between superior materials and practical restraints have been elaborated and the compromises made are duly justified.

**1.1 Overview**

The aircraft has been designed keeping in mind the rules and requirements stated for the

advanced class of the SAE Aero Design Competition, 2022. We used efficient planning and

construction methodologies to enhance the abilities and qualities of the aircraft. The problems

faced during the entire process were broken down into smaller sub-problems to find optimal

solutions without compromising the timelines. During the entire course of design and fabrication, the primary objectives of the team were to-

* Learn new concepts to help in creation of an efficient UAV
* Go above and beyond the conventional methods to achieve new levels of excellence

## **1.2 Competition Conclusions/Objectives**

The advanced class of the competition deals with designing a combination of systems that can provide humanitarian aid during a wildfire by delivering water, and is capable of dropping a powered autonomous aircraft at a targeted location that would contain parts for a ground transport vehicle. The FPV and Data Acquisition Systems work together to assist the payload specialist in this task.

## **1.3 Discriminators**

## · Introduction of a vertical spar in the wings helps in decreasing the wing flutter and flex.

## · The design of the fuselage enables a larger internal volume coupled with a small drag.

## · The fuselage has been fabricated as a single, seamless member to improve the strength.

## · The in-house DAS provides a wide range of telemetry data ranging from the basic orientation of the UAV to the instantaneous velocity of the aircraft.

## · Rapid prototyping was employed to facilitate analyses.

## Thus, the overall design philosophy, fabrication and allied systems together create a UAV which stands a class apart.

## 

## **2.0 Team Management**

For effective management, accountability and work distribution, the team is divided into many departments, each including members from different disciplines of engineering. This results in a hierarchical arrangement where individual department members report to their respective department heads, who in turn report to the team manager, who updates the team captain regarding the same(Fig 2.1). The faculty advisor acts as a link between the team and the college.

*\_fig2.1\_*

## **2.1 Schedule Summary**

The initial research phase lasted for 2 months, beginning in August, 2021 where the team helped familiarise the newer members with the designing aspects, materials and fabrication processes. The team also undertook extensive market research and surveys during the same period. Considering the delay encountered due to the lockdown, the work on DAS and GUI started in early September, with the design phase following in October. The work of other departments also started subsequently. The schedule has been summarized in the Gantt Chart shown below (Fig 2.2).

*\_fig2.2\_*

## 

## 3.0 FFS

## 3.1 Strategy

## 3.2 Validation and Risk Management

## 3.3 Environment Considerations

## 

## 

## 4.0 PA

## 4.1 Design (Features, Selection, Configuration)

## 4.1.1 Wings

## 4.1.2 Fuselage

## 4.1.3 Empennage

## 4.1.4 Landing Gears

## 

## 

## 5.0 PADA

## 5.1 Design (Features, Selection, Configuration)

## 5.1.1 Wings

## 5.1.2 Fuselage

## 5.1.3 Empennage

## 

## 

## 6.0 GTV

## 6.1 Design (Features, Selection, Configuration)

## 

## 

## 7.0 Materials

## 7.0.1 PA

## 7.0.2 PADA

## 7.0.3 GTV

## 

## 

## Analysis

## Tools/Softwares

## Drag

## Flow

## Developed Models

## Performance

## Downwash

## Static & Dynamic Stability

## Aeroelasticity

## 

## 

## Manufacturing

## PA

## PADA

## GTV

## 

## 

## Assembly

## PA

## PADA

## GTV

## 

## 

## Sub-assembly

## Dropping Mechanism

## 

## Build Accuracy & Factor of Safety

## 

## 

## DAS

## Features

## Motor Testing (PA, PADA)

## Propellor Selection

## V-n Graph

## GUI Layout

## ACS

## 

## 

## Marketing & Cost

## 

## Conclusion

TDS (1 page)

2D Drawing (1 page)