



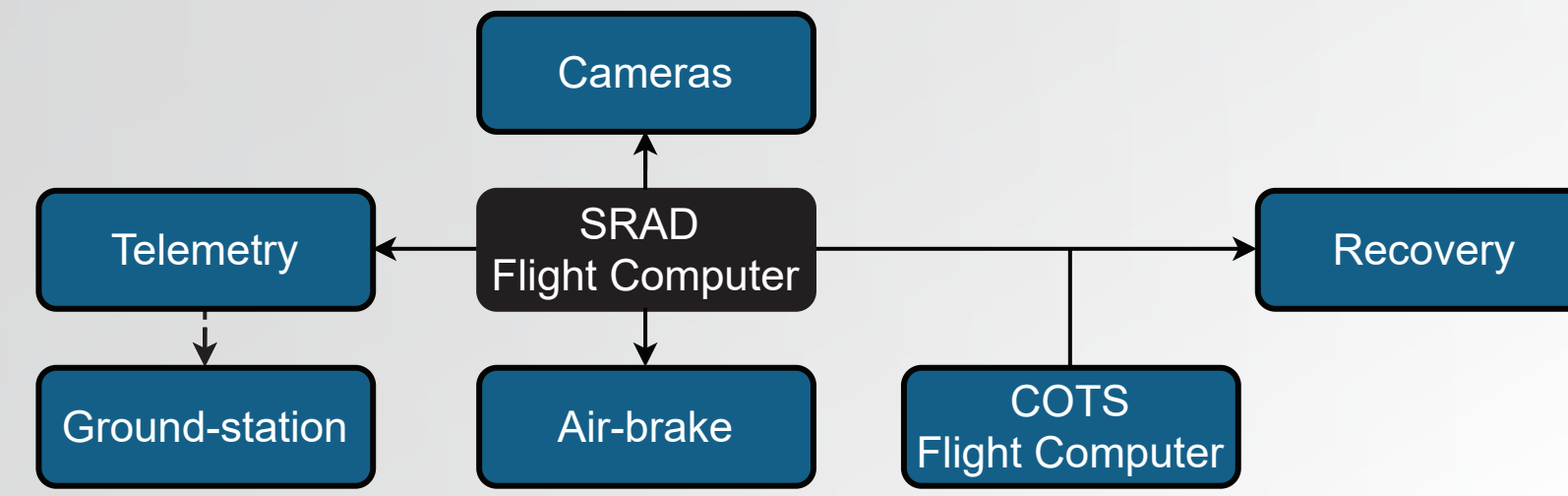
# ASTG

# AVES 02

Team Name **Aerospace Team Graz**  
 Rocket Name **AVES**  
 Category **S3** (3 km solid SRAD)  
 University **Technical University Graz**  
 Country **Austria**  
 Team ID **02**

## Avionics Subsystem

Student Researched And Developed (SRAD):  
 Flight-computer, Real Time Operating System (RTOS), Realtime Air-brake Control System in Cruise Phase, Telemetry System, Ground Station Software for realtime visualization  
 COTS flight-computer: redundant Recovery deployment



## Payload Subsystem

3x CanSats: 345 mm length and 66 mm diam.  
 outsourced to projects by students:  
 HTL Neufelden school: Flight Computer with air pressure, vertical acceleration and temperature measurements  
 HTL Pinkafeld school: Raspberry Pi Pico with an air pressure sensor to calculate height and a temperature sensor

**Nose cone:** 3D printed PA12 geometry optimized for velocities below Mach 1 carries the Payload Subsystem

## Introduction and Mission Goals

The Aerospace Team Graz was founded in late 2019 and consists of about 65 students from a variety of fields of study. Despite being the second project, **AVES** will be the first rocket designed and built by the team to be launched.

The main **mission goals** are to successfully launch our rocket, reach the target apogee of 3 km as accurate as possible and to safely land and recover AVES. Additionally, this mission and the competition itself will help the team members to gain experience, to expand their knowledge and to make new friends and colleagues from all over Europe.

## Features & Highlights

**SRAD** Flight Computer  
 Operating System  
 Solid Rocket Motor  
 Air-brake  
 360° Camera  
 CanSats (Schools)

## Hard Facts

Diameter **123mm**  
 Mass **24kg** max. velocity **0.9 Mach** max. acc. **10g**  
 Length **2690mm** total impulse **7100Ns** burn time **3sec**

**Fins:** Carbon fiber reinforced polymer (CFRP) with high strength material 3D printed mounting rails

**Tail cone:** 3D printed PA12

## Propulsion Subsystem

Aluminum structure: tube with inner axial threads, a „bulkhead“ on top and a nozzle retainer at the bottom along with O-rings seal the combustion chamber  
 Insulation: cotton-phenolic resin tube  
 Nozzle: de Laval type and made of graphite  
 Propellant: Potassium Nitrate + Sorbitol (Rocket Candy) mixed, melted and casted into a 3D printed mold  
 Ignition: radial igniter inserted with „igniter elevator“

**Air-brake system:** aerodynamical drag control with stepper motor mechanism optimised for maximum drag

**RADAX joint:** weight-optimised with integrated mounting

## Recovery Subsystem

Opening System: self-designed & redundant, triggered at apogee cold gas (Argon) cartridge used to separate rocket at nosecone and deploy the drogue parachute  
 Ejection system: segmented nut releasing mechanism as well as pyro-bolt (for redundancy) used to deploy the main parachute  
 Drogue parachute: 1 m diam.; 0.5 kN opening shock force calculated final velocity: 25.6 m/s  
 Main parachute: 4.5 m diam.; 3.5 kN opening shock force calculated final velocity: 5.6 m/s

## Flight Cycle with Key Events

