FEES

FLEXIBLE EXPERIMENTAL EMBEDDED SATELLITE

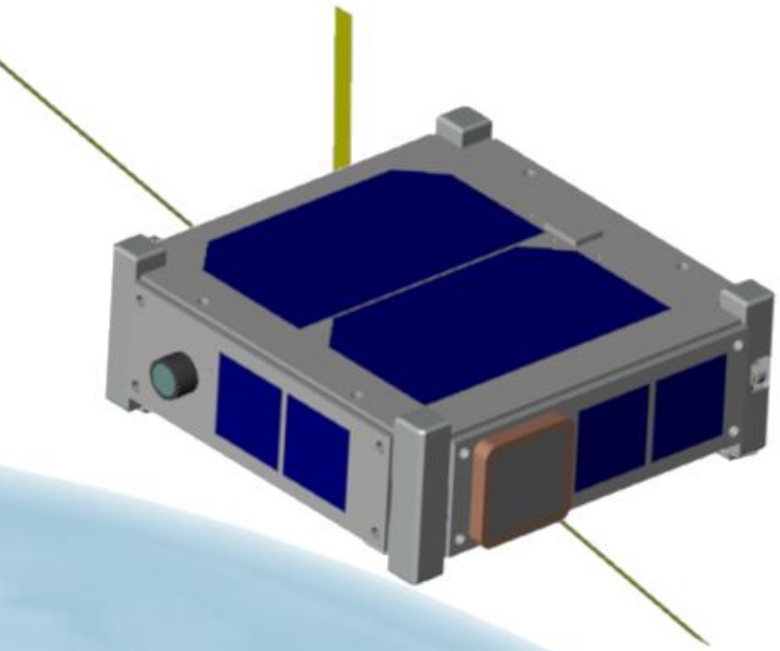
iCubeSat 28-29 May 2019

Politecnico di Milano

G. Morelli, G. Parissenti, R. Navoni, D. Ambroggi, J. Hofman, M. Pavia, G. Gabetta, S. Ampolo, Y. Surel, M. Lavagna, P. Gramazio, A. Niro, A. Colagrossi, L. Bucci, J. Haze, B. Bertucci.

GP ADVANCED PROJECTS

Contents

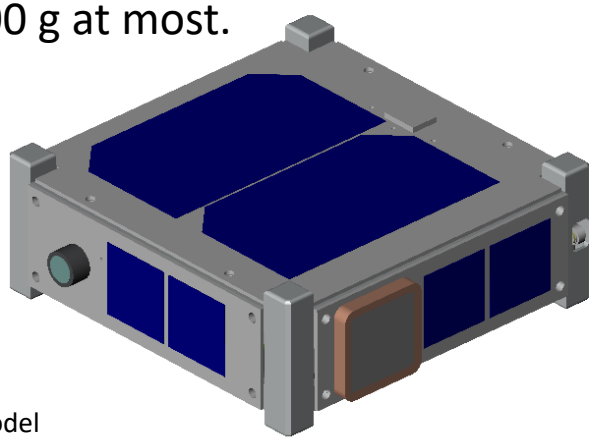


- Introduction
- Partners
- Mission: statement and primary objectives
- Mission: secondary objectives
- Orbit
- Current status
- Design
- Payload

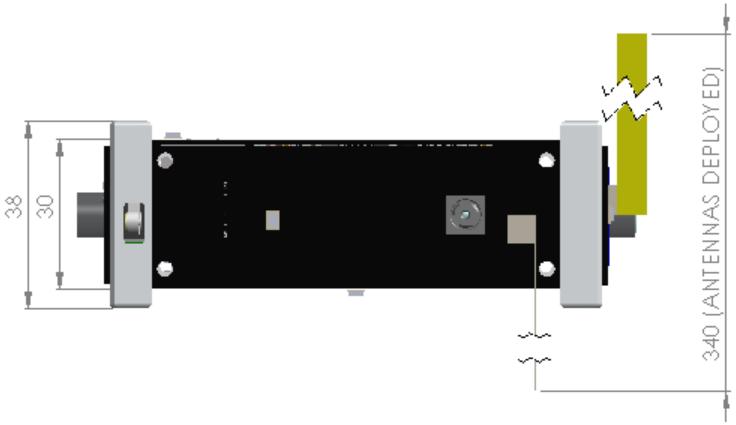
GP ADVANCED PROJECTS

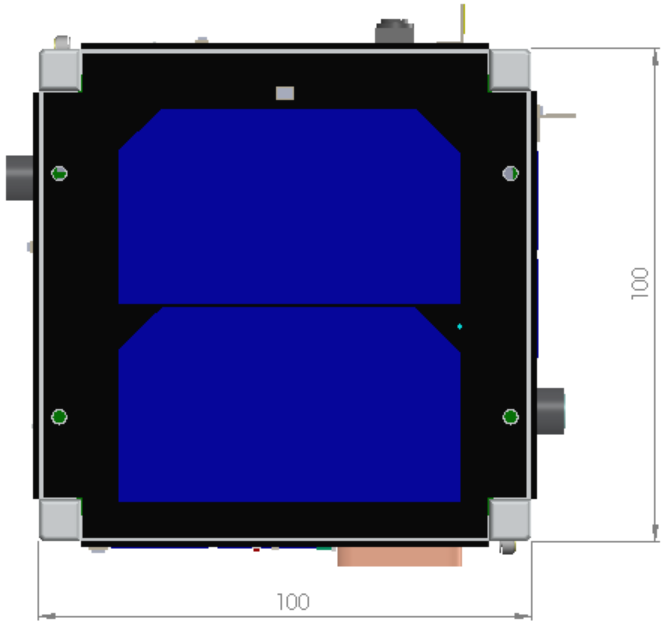
Introduction

- **FEES** (Flexible Experimental Embedded Satellite) - a 1/3U CubeSat to be launched within Q1 2020 – is a **pico-platform** for technology IOV/IOT, focused on critical on-board subsystems, specifically miniaturized for such reduced platforms:
  - 10x10x3 cm volume
  - 300 g at most.



FEES model





GP ADVANCED PROJECTS

Partners

- GP Advanced Projects: project management and system engineering,

- Laser navigation: electronics and SDR, FW development,
- Politecnico di Milano: mission analysis, thermal analysis, ADCS algorithm, FW development, AIV/AIT,
- Linkit: TT&C,
- Brno University: total dose measurement,
- CESI: solar cells,
- Università degli Studi di Perugia: AIV/AIT.

Mission: statement and primary objective

« Flexible Experimental Embedded Satellite (FEES)'s goal is to validate an experimental platform for in-orbit testing of space components.»

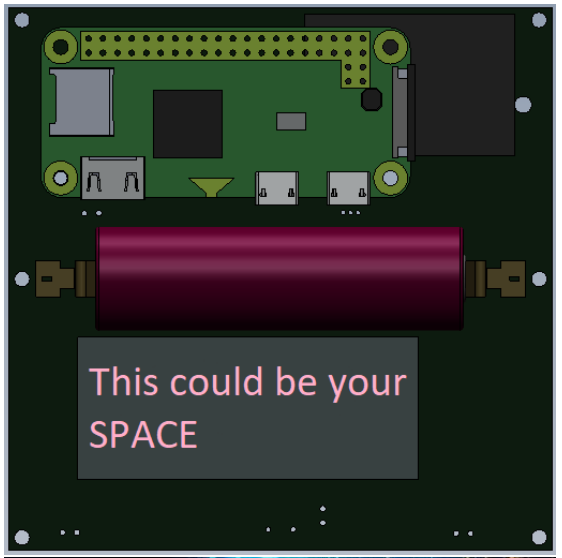
- As previously introduced, the primary mission of the FEES is the **in-orbit testing and validation** of the S/C itself (e.g. Attitude Determination System) and the components defined as P/L. By doing so, FEES shall be considered a verified nano-platform for further launches, whether these will carry in-house designed components or stakeholder's P/L.

- Requirements
  - 2 weeks survival in SSO
  - Subsystem's testing
  - Data communication

Mission: secondary objectives

- Mission plan development:
  - ➢ extending the possibility of carrying third party P/L; availability onboard the next S/C for a low price.
- Data retrieving and handling:
  - ➢ Proving FEES is a useful, **versatile** platform for many LEO applications.
- Testing of Software Defined Radio (SDR) digital technology.
  - ➢ Different communication protocols will allow to identify the best solution for future missions' needs,

Potential Payload Space on the MainBoard



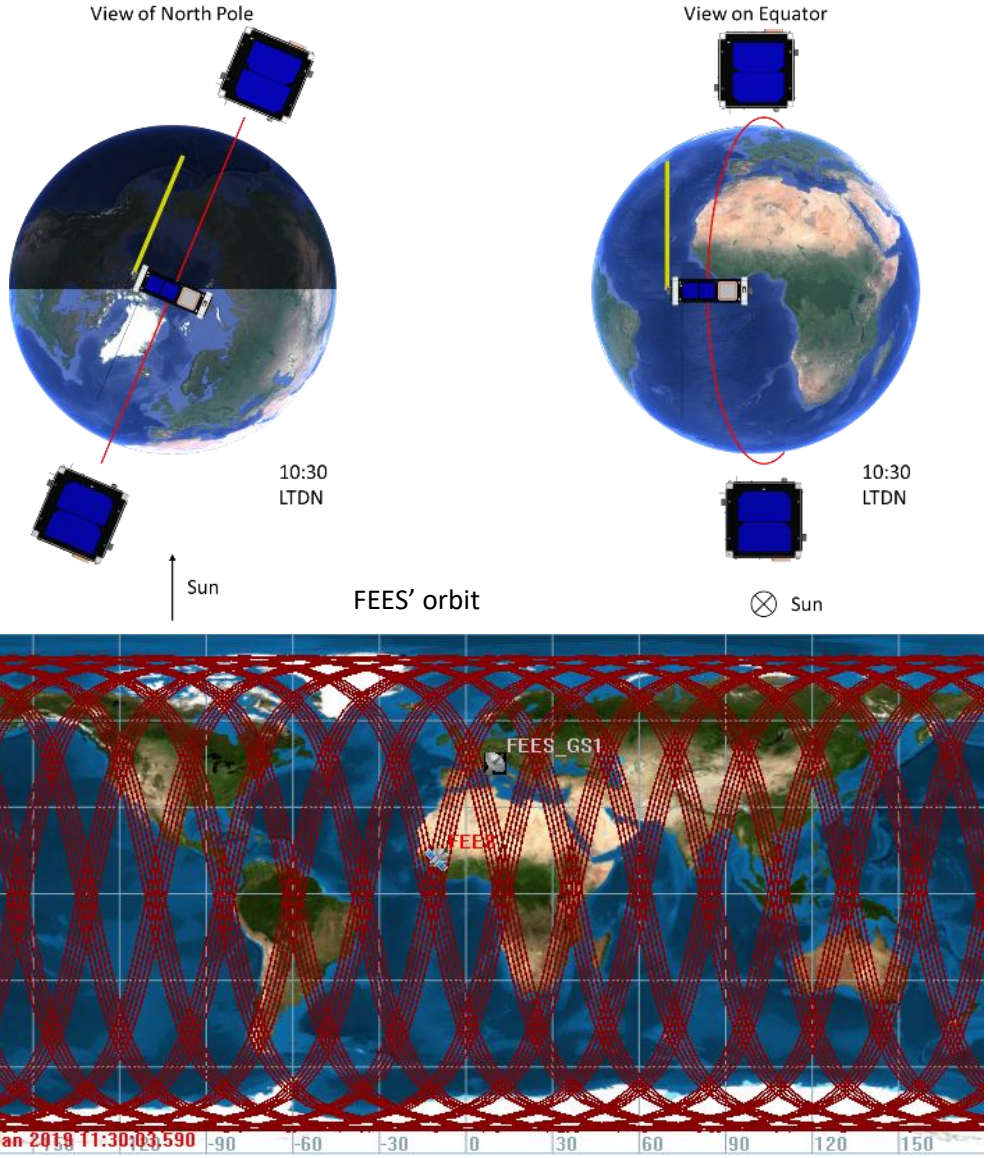
GP ADVANCED PROJECTS

Orbit

- Type: Sun-synchronous

- Altitude: ~575 km
- Inclination: 97°
- RAAN: 264°
- Period: 1,6 h
- Eccentricity: ~0

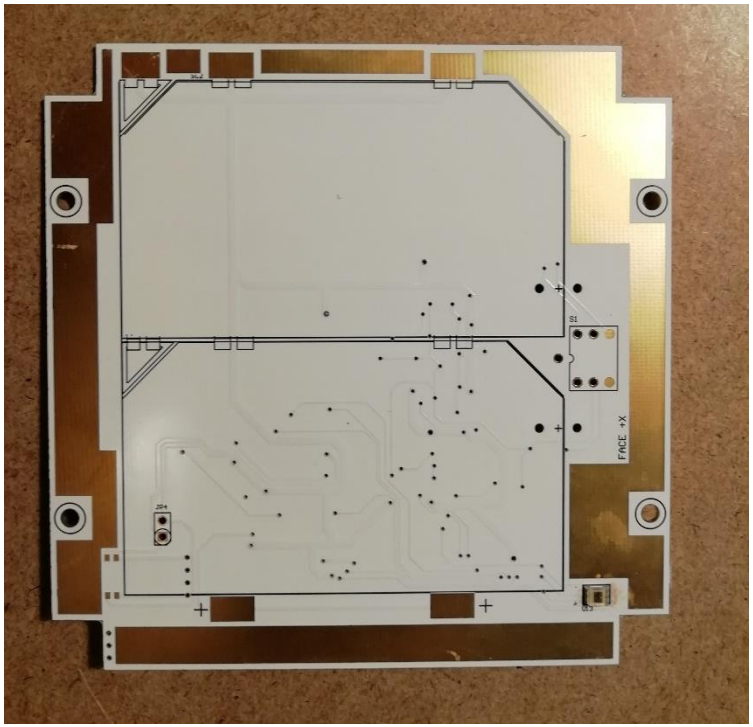
- Duration: 15 days



GP ADVANCED PROJECTS

Status

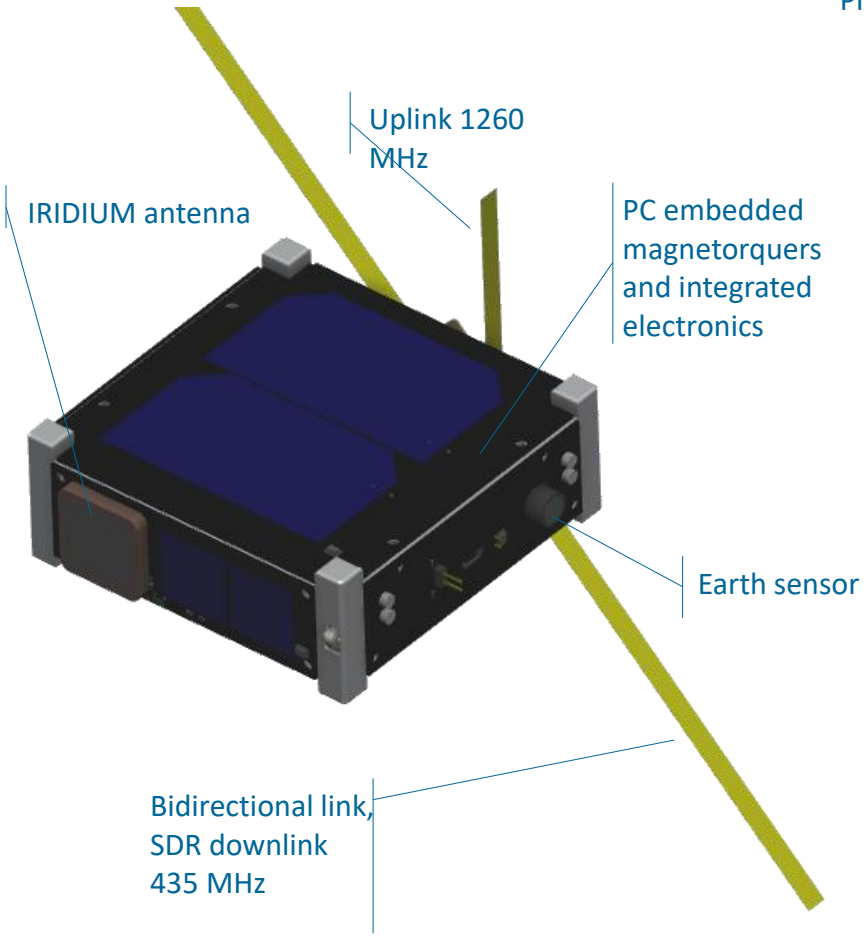
- PDR ✓
- QM – Manufacturing and Assemb ✓
  - Boards
  - Structure
  - EGSE/MGSE
- Test Campaign (Qualification - QM)
  - Late June 2019
- CDR
- Test Campaign (Acceptance - FM)
- Integration
- Launch (Soyuz-2, Q1 2020)

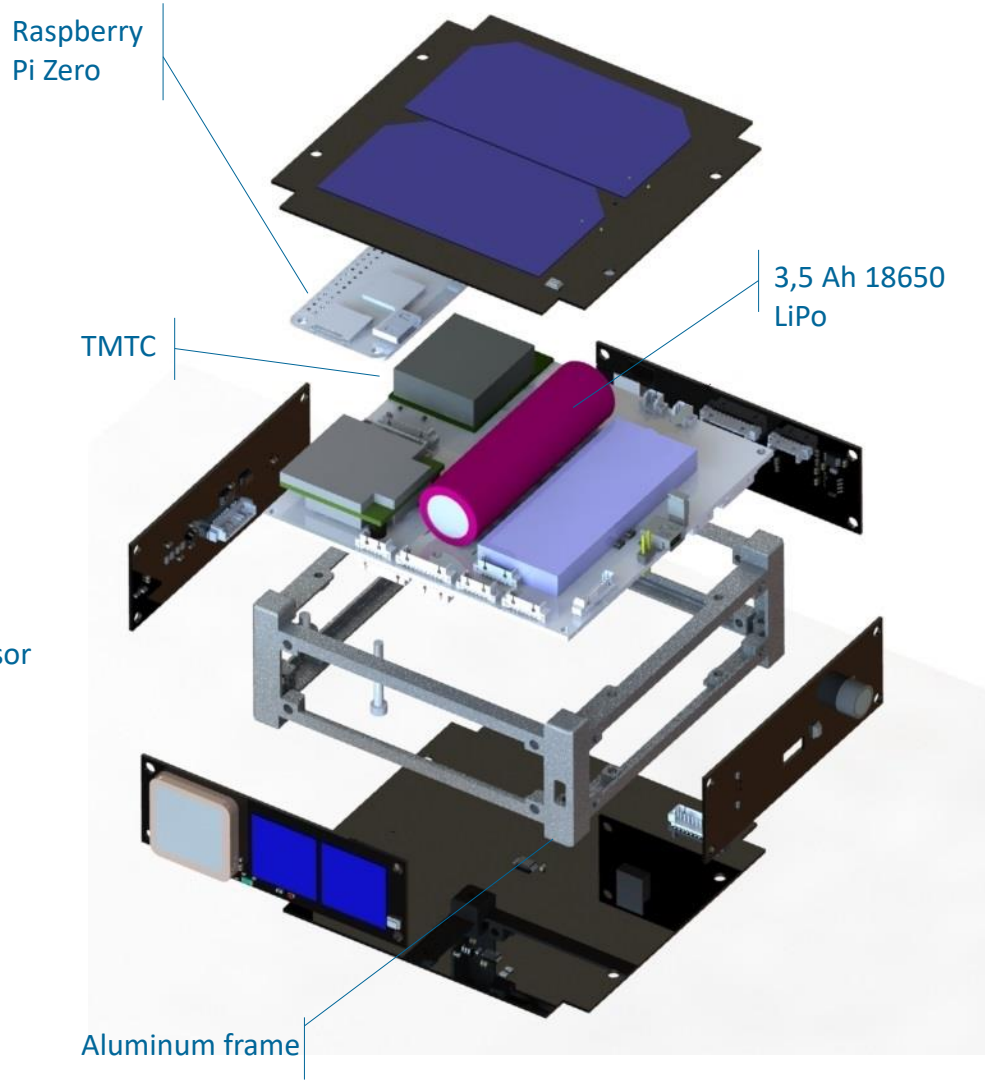


Top board

GP ADVANCED PROJECTS

Systems





FEES closed/open comparison

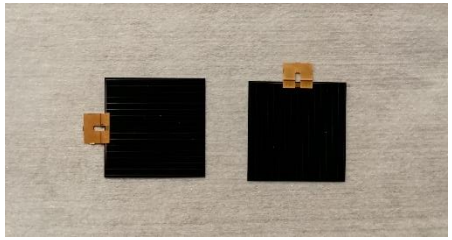
GP Advanced Projects

GP ADVANCED PROJECTS

Payload

- Complementary telecommunication system based on satellite calls constellation IRIDIUM (TBC regulations)
- RadEx2 (short for Radiation Experiment 2), a miniature-scale TID (total ionizing dose) experiment
- 2x2 cm experimental solar cells
- Software Defined Radio experiment
- Earth imaging camera

IRIDIUM module


2x2 cells

FEES' camera

GP ADVANCED PROJECTS

Thank you!

Giulio Morelli

Systems engineer at GP Advanced Projects

Mail:
giulio.morelli@gpadvancedprojects.com

Tel: +39 030 7821542

Guido Parissenti	GP Advanced Projects
Roberto Navoni	Laser Navigation
Diego Ambroggi	
Jiří Hofman	Brno University of Technology
Marco Pavia	Linkit
Giuseppe Gabetta	CESI
Stefano Ampolo	Politecnico di Milano
Yann Surel	Politecnico di Milano
Michèle Lavagna	Politecnico di Milano
Pasqualino Gramazio	Politecnico di Milano
Alfonso Niro	Politecnico di Milano
Andrea Colagrossi	Politecnico di Milano
Lorenzo Bucci	Politecnico di Milano
Jiří Haze	Brno University of Technology
Bruna Bertucci	Università degli Studi di Perugia

GP ADVANCED PROJECTS