FEES
FLEXIBLE EXPERIMENTAL EMBEDDED SATELLITE

iCubeSat 28-29 May 2019
Politecnico di Milano

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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.
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,
Orbit

- Type: Sun-synchronous
- Altitude: ~575 km
- Inclination: 97°
- RAAN: 264°
- Period: 1.6 h
- Eccentricity: ~0
- Duration: 15 days
Status

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

- Uplink 1260 MHz
- IRIDIUM antenna
- PC embedded magnetorquers and integrated electronics
- Earth sensor
- Raspberry Pi Zero
- 3.5 Ah 18650 LiPo
- Aluminum frame
- Bidirectional link, SDR downlink 435 MHz
- TMTC
- FEES closed/open comparison
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
Thank you!

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