



Pavel Pačes
and the ESMO Czech Team

ESMO CZECH

CTU Lions go to the Moon

Introduction

European
Student
Moon
Orbiter



⊙ ESMO =

- **European Space Agency** project (AO6031) to support engineering education in space sciences – increase number of experts
- First student mission to the Moon (expected launch early 2014)

⊙ Assigned by **ESA** to

- Surrey Space Technologies Limited (**SSTL** England) – part of EADS Astrium and to
 - the **universities**

ESMO Mission

- Main aim: support space related education and knowledge
- Moon observation
- Radiation monitoring
- Details available on request

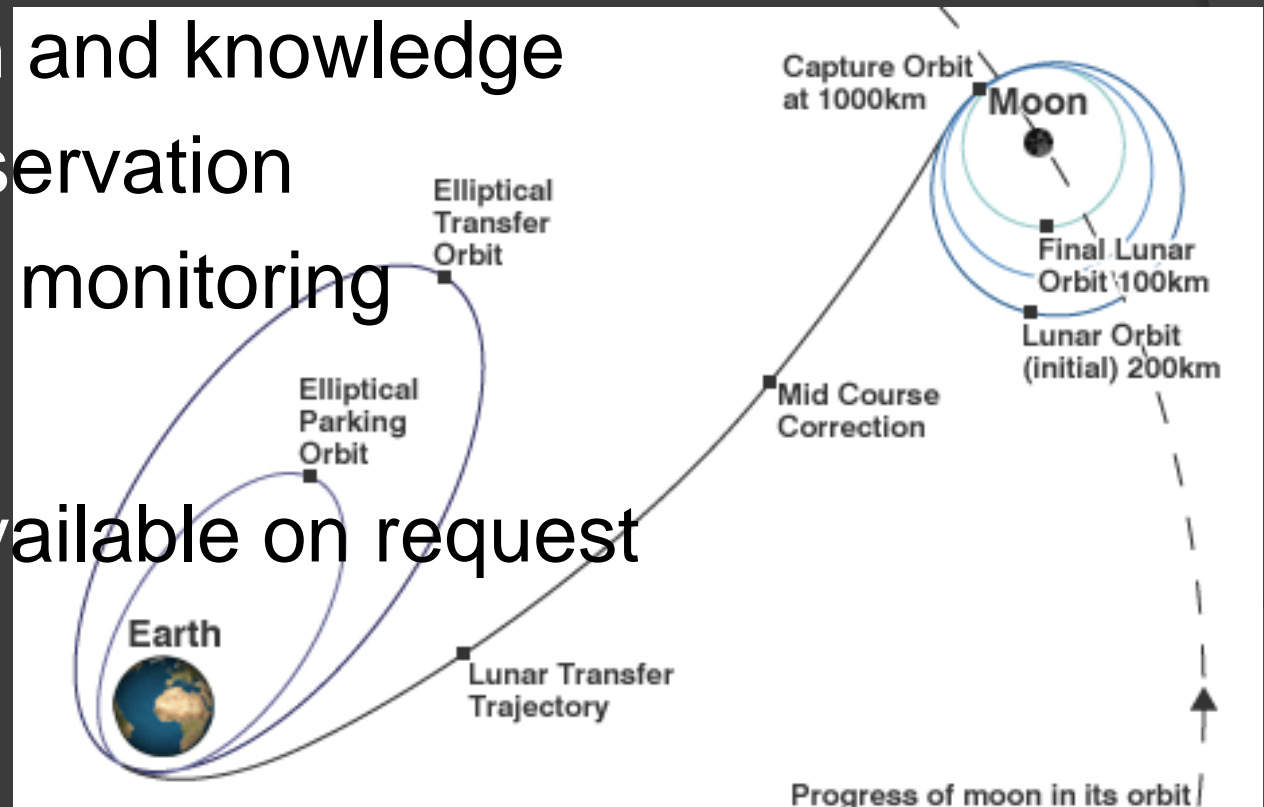
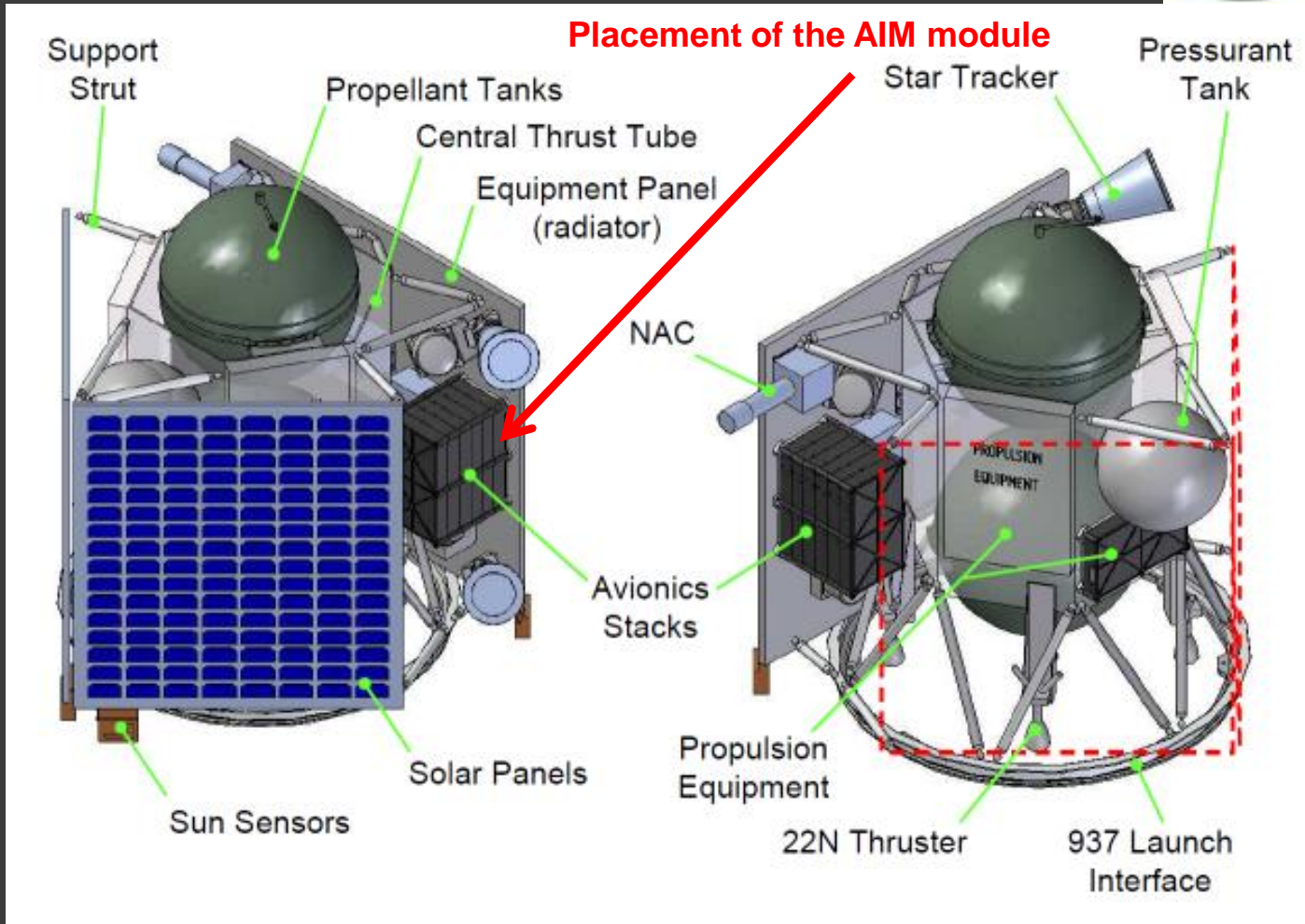


Image source: ISRO

ESMO Spacecraft



ESMO Teams

- Universities around Europe

- Complete list

<http://esmo.edu.esa.int/content/teams.aspx>



- Czech Technical University in Prague

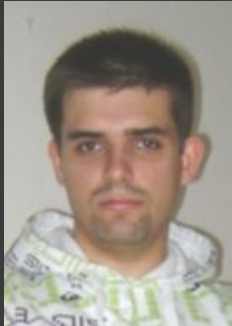
- Responsible for **AOCS Integration Module** (AIM)
- Group email: **esmo.czech@gmail.com**

ESMO CZECH Core Team



● Pavel Pačes

- PhD student, Assistant professor at CTU
- Project leader and all kinds of necessary work



● Jaroslav Laifr

- MSc student at CTU (**dept. of meas.**), future PhD student
- Space resistant electronics expert, group leader



● Ondřej Bruna

- MSc student at CTU (**dept. of contr.**), future PhD student
- Mission software expert, group leader



● Bronislav Robenek

- Bc student at CTU (**dept. of cyber.**)
- Quality assurance



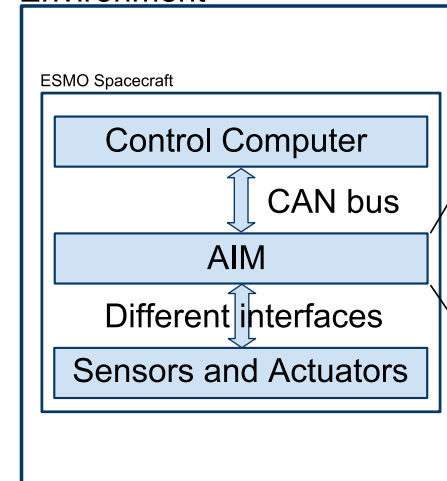
● Jan Petras

- Bc student at CTU (**dept. of meas.**)
- HW and SW design

ESMO AIM

- ◎ **A**ttitude **O**rbital and **C**ontrol **S**ystem **I**ntegration **M**odule (AIM)
- ◎ Interface between
 - Sensors and Actuators and
 - Control system

Environment



AIM module requirements

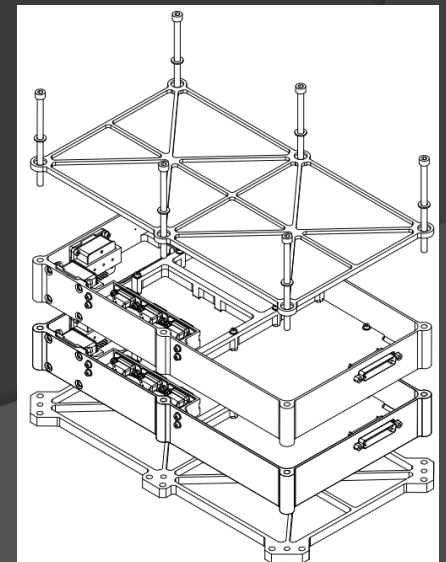
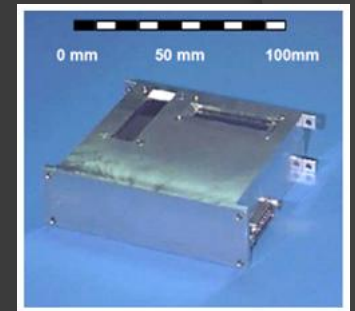
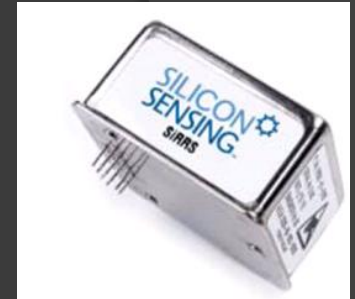
- Timing
- Sensor and actuator interfaces
- Control Computer interface

- HW design
- SW design
- Test system
- Testing

ESMO AIM (one module)

Spacecraft will carry two AIM modules (AIM0 and AIM1). Each module:

- Analogue to digital signal conversion (1÷10 sps)
 - 1x Sun Sensor (4 voltages, 120° field of view)
 - 3x gyroscopes - expected SiRRS01 (3 voltages, 3 temperatures, 3 internal test values)
- Requested accuracy < 1°
- Built-in test: bit flip, HW and SW consistency, failure recovery



CZECH Team responsibilities

- Project management
- Derived requirements specification
- Design, development and verification planning
- AIM module design and manufacturing
- Module testing
- Delivery of two Flight Models

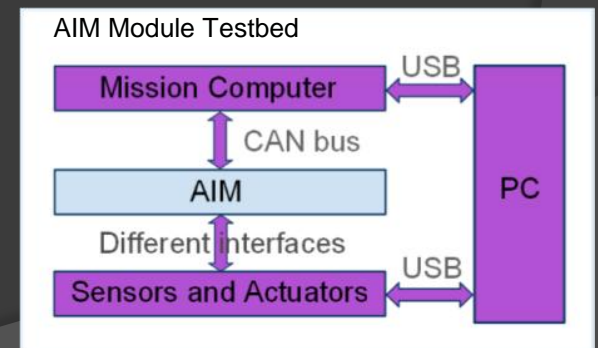
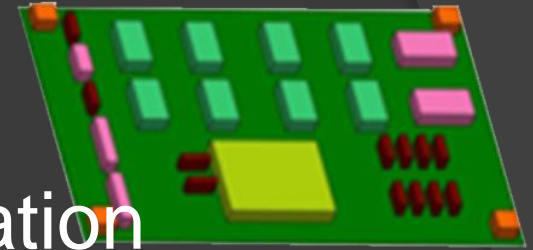


Image sources: ESMO AIM Team

Unsolved problems

Some facilities are not completely available at CTU

- Clean room or laminar flow cabinet
- Clean lab space
- Vibration test bed
- Vacuum test chamber
- Thermal-Vacuum test chamber

→ But these facilities are in the Czech Rep.

We are looking for sponsors

ESMO CZECH team looks for sponsors in following areas:

⦿ Travelling

- Different reviews with other teams (PDR, SRR, CDR, QR, etc)

⦿ Material

- Parts, mechanical components, ...

⦿ Module Assembly

- Clean lab. facilities, clean lab space, ...

⦿ Module Testing

- Shaker tables, thermal-vacuum chambers, ...

→ Any kind of sponsoring is welcomed

Current sponsors

- ⦿ CTU in Prague
 - Labs., meeting rooms, internet connection, travel expenses for kick-off meeting at SSTL England
- ⦿ Vector GMBH
 - CANbus connectivity
- ⦿ Freescale Semiconductors
 - Electronic components, development SW
- ⦿ Frentech Aerospace s.r.o. (Brno)
 - Mechanical components
- ⦿ G.L.Electronics
 - Discount for clean lab soldering services (it is still expensive)

ESMO CZECH Near Future

Spring 2011

- ⦿ Sign of Contract
(among SSTL and CTU in Prague)
- ⦿ Total Ionizing Dose Test at Nuclear Research Institute Rez plc.
- ⦿ Preliminary Design Review at ESTEC
(May 2011)

- ⦿ We look for more:
 - Sponsors (any kind – e.g. t-shirts, ...)
 - Participating students:
 - With interest in analysis:
 - Structural, Resonance, FMEA, Thermal, ...



Pavel Pačes
and the ESMO Czech Team

ESMO CZECH

CTU Lions go to the Moon

For any question please use:

esmo.czech@gmail.com