Rethinking Satellite Operations

OPSSAT, the experimental operations platform

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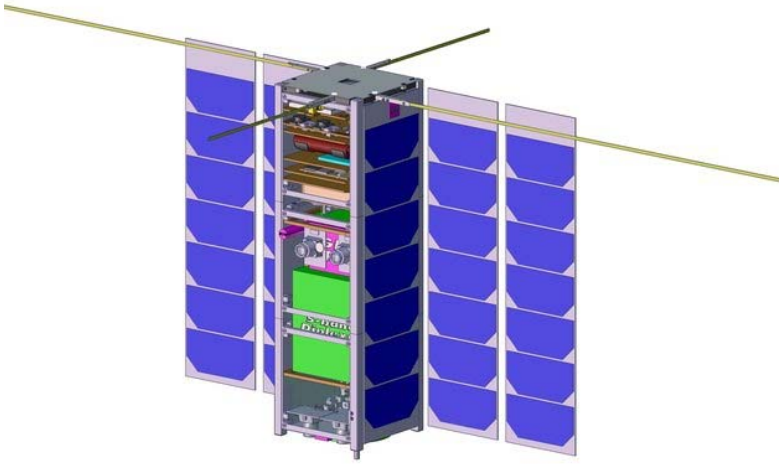
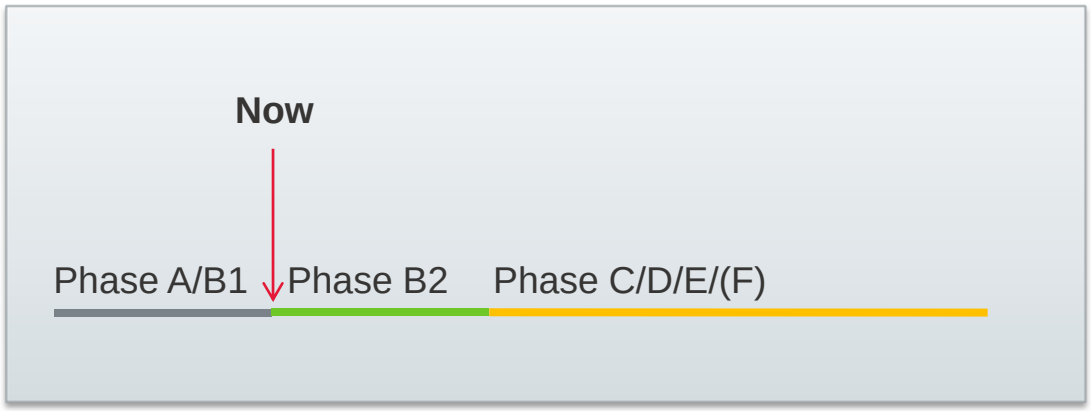
Experience the commitment®

Overview

- Concepts of OPSSAT
- Experiments
- Conclusions





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Technology Change

The World

Space Systems

Operations

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A Vicious Circle of No-Change

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Goal

… and not just for operators

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Concepts

- Provide a platform for testing new operational concepts
- Accept risks, expect failures, **ensure** recovery
- Do not judge

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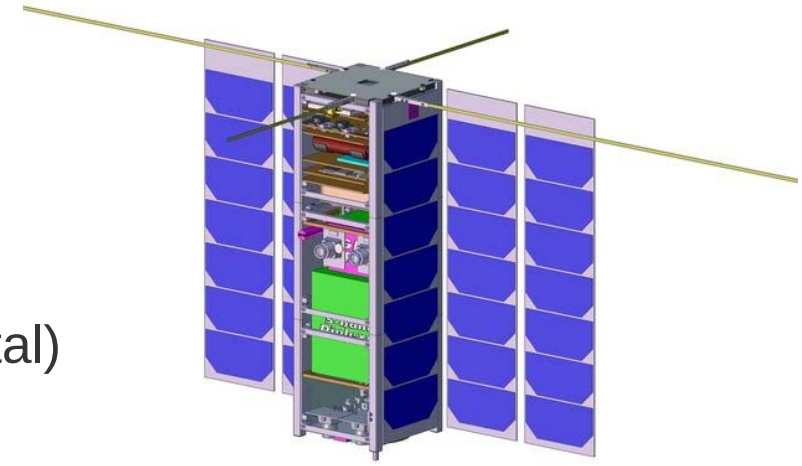
OPSSAT



- Triple Cube (10x10x30 cm)
- UHF, S-Band and X-Band (experimental)
- CCSDS Space Link
- Multiple FPGAs
- More processing power than all operational ESA satellites combined
- VM environment with Java
- Completly reconfigurable on ground and in space

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ESA Experiments

- Automation; Goal-based plan generation, On-board analysis and event recognition
- CCSDS SM&C (MO) service; standard APIs for interaction, basic monitoring and control
- Compression; Packet and real-time compression
- File based operations; Exchange of files, file store, M&C of on-board systems
- XTX (Cubesat X-Band); Basic transmission

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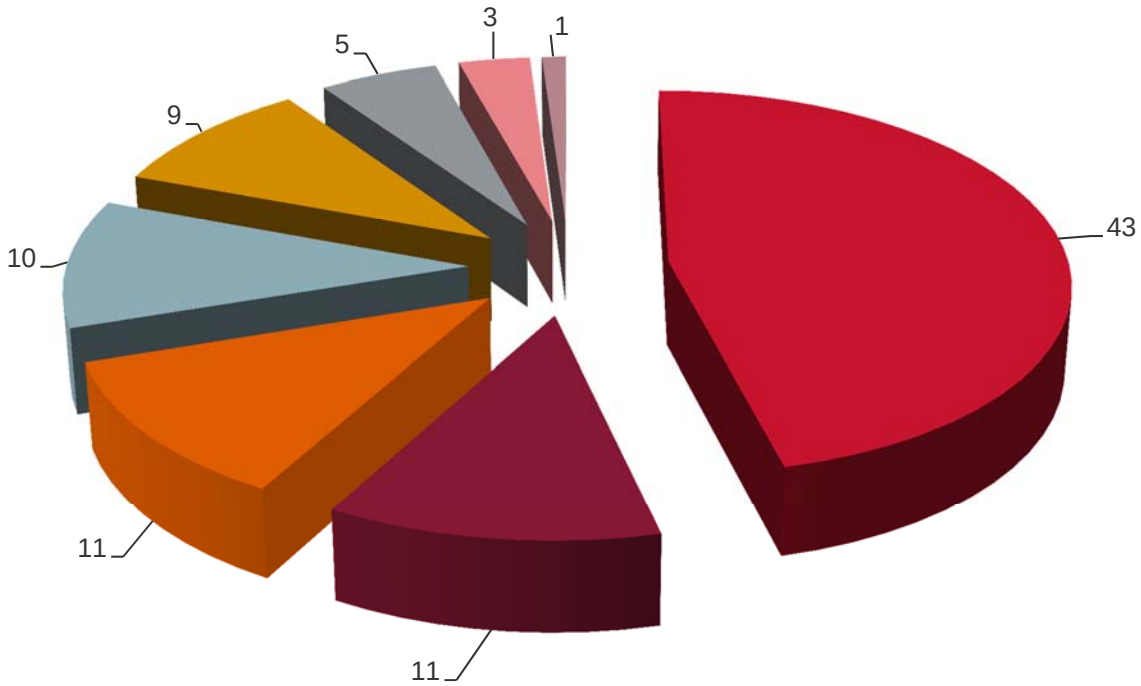
Industry Experiments



- Onboard (43)
- Radio and Coms (11)
- Schedule and Autonomy (11)
- Camera (10)
- Ground (9)
- ADCS (5)
- Protocol (3)
- Magnetic Field (1)

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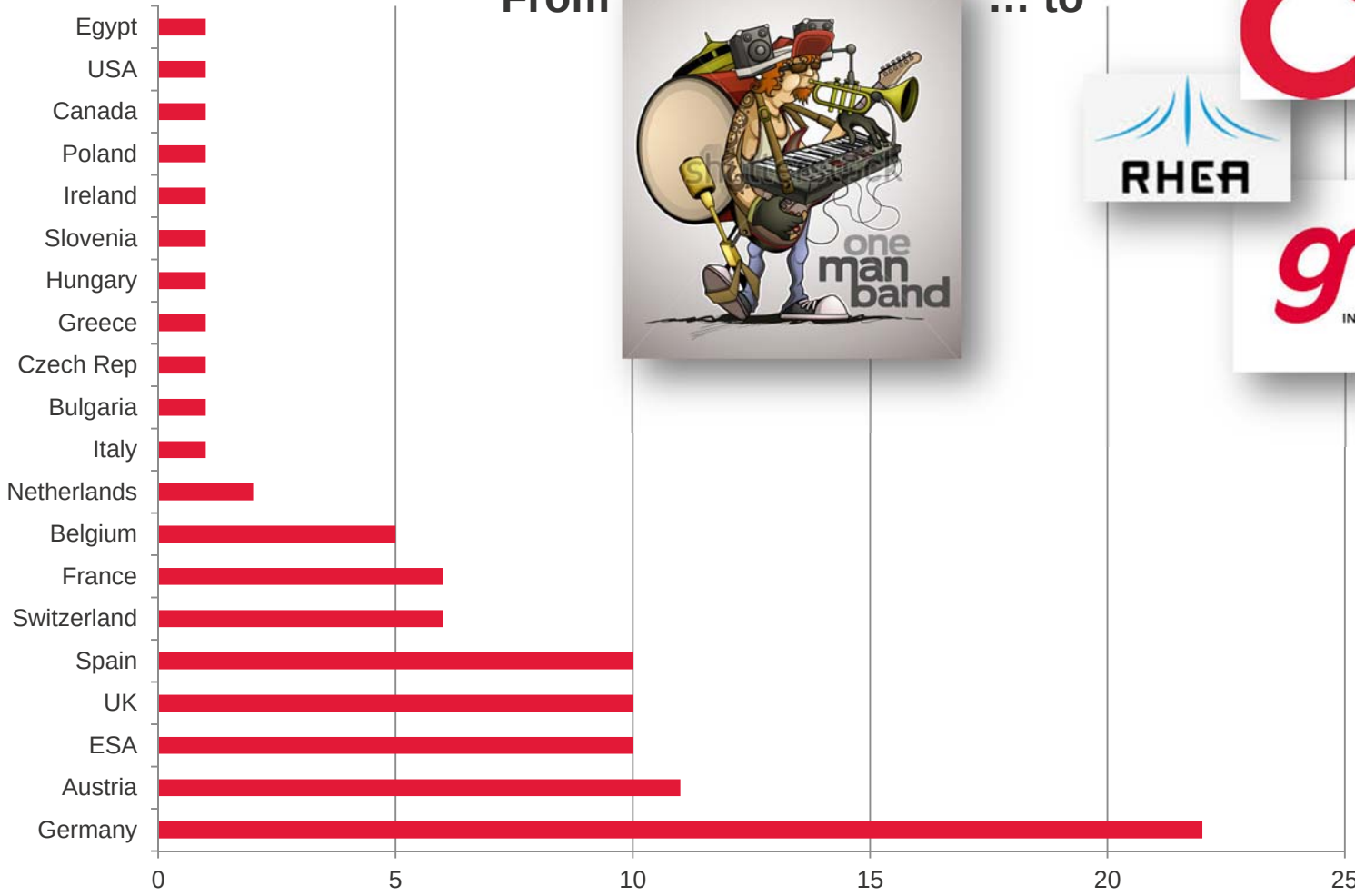
… from around the (western) world

From

… to



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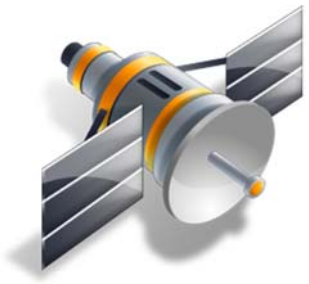
Trend

- Harmonization of Space and Ground systems
  - Satellite just a piece of HW in space
  - Use of terrestial software onboard

- Functions pushed from ground, to space



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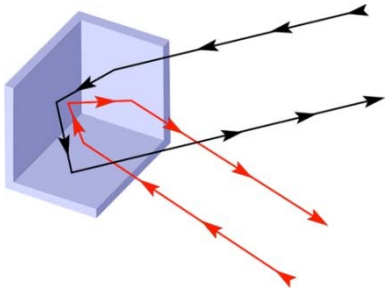

Based on EO Observation

Ranging using retroreflector

ADCS

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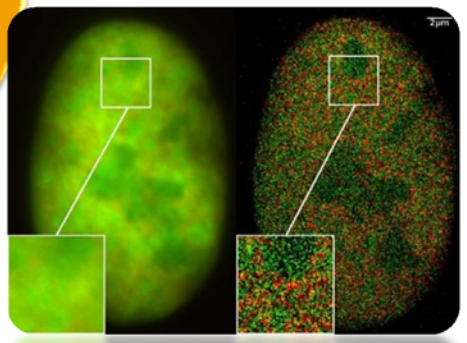
Cubesat startracker

Wave Watcher

Camera

Super resolution



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(the Ypsilon Generation Operator?)

3D

Ground Applications

Concurrent design through complete lifetime

Modern Software Management

Agent based system

Available on the App Store

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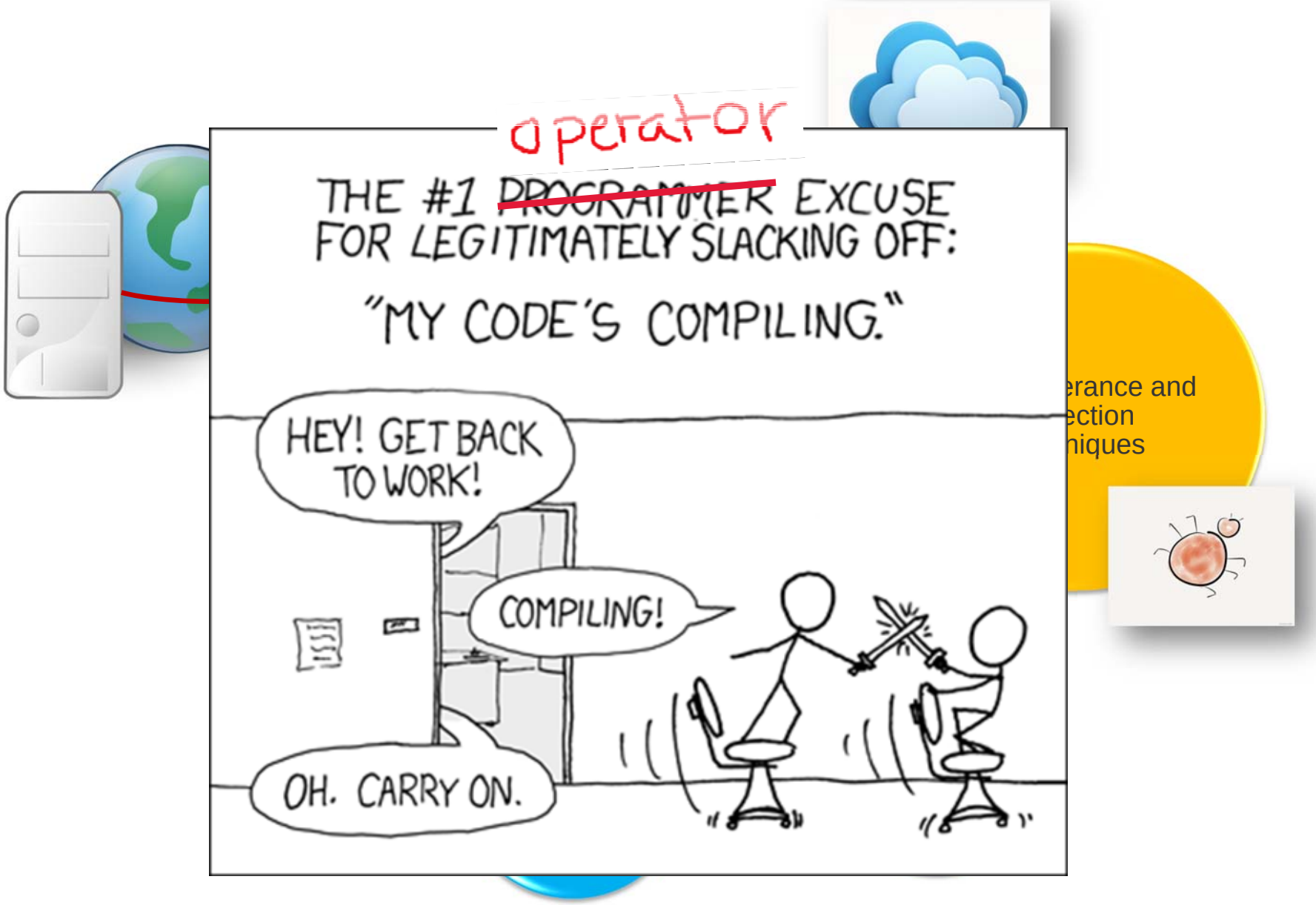

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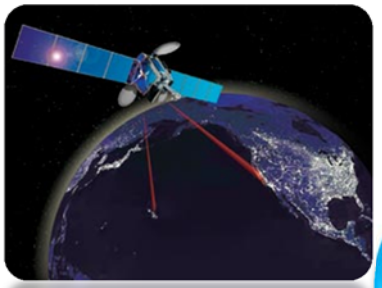
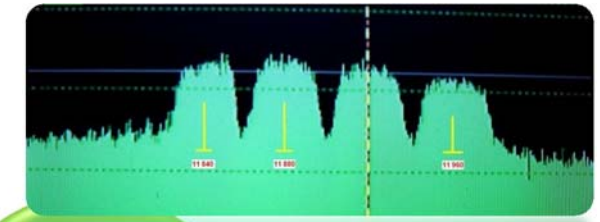




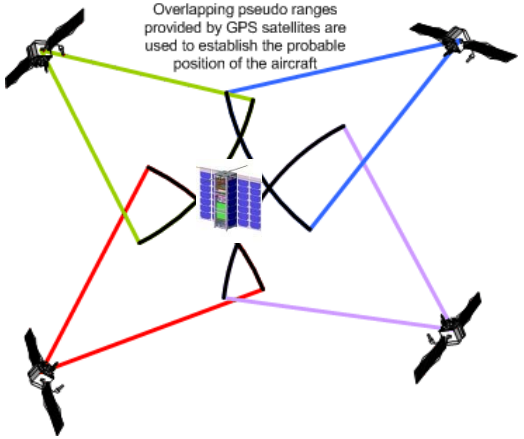
Laser com

Spectrum analyser in space

Radio and Coms

Positioning

IP in Space



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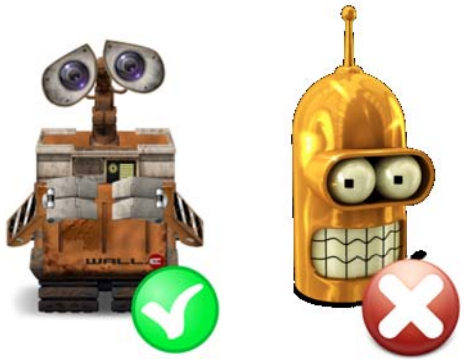


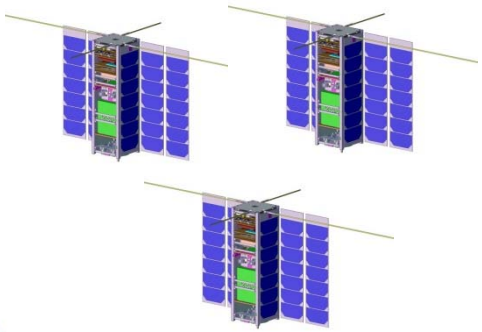
Goal based operations

Scheduling and Autonomy

Onboard Autonomy

Onboard conjunction analysis

Formation Flying



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Benefits for ESA

- Breaks the circle of no-change
- Facilitate capitalization of already performed investments
- Demonstrate what works… and what doesnt

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Benefits for Industry

- Freedom
- A platform
- A reference story
- Contacts

(Cube sized actually…)

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Conclusions

- Cubesats are not just toys
- If you want innovation, give freedom
- There are a lot of idea out there
- There is a need for an experimental platform
- The new ideas will change how we operate satellites

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