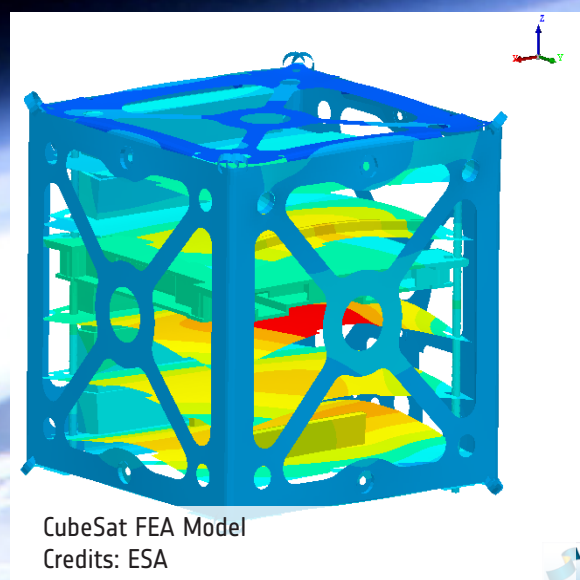


→ FREQUENCY & SPACE OBJECT REGULATIONS MANAGEMENT FOR EDUCATIONAL SMALL-SATELLITE PROGRAMMES

Authors: Piero Galeone, Joost Vanreusel, Daniel Sagath

ITU Symposium, Santiago de Chile, 7-9 November 2016



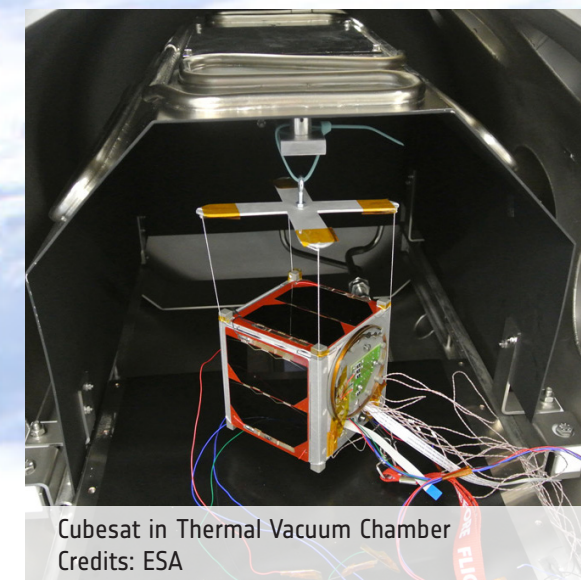
PHASE A/B/C Design Your Satellite!

PRELIMINARY &
DETAILED DESIGN



PHASE D1 Build Your Satellite!

INTEGRATION &
FUNCTIONAL TESTS



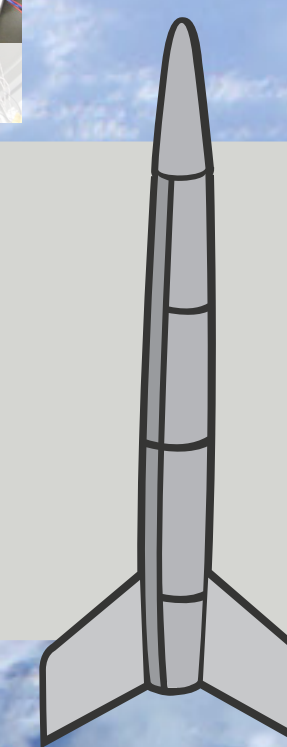
PHASE D2 Test Your Satellite!

ENVIRONMENTAL TESTS



PHASE E Launch & Operate Your Satellite!

LAUNCH CAMPAIGN &
MISSION OPERATIONS



Education plays a vital role in Europe's growth and development, and equips young citizens with the knowledge and skills that Europe needs in order to remain competitive. The ESA Education Programme is supporting this goal by exploiting the fascination of its unique and pioneering space programme for the benefit of the younger generation.

In the Fly Your Satellite! programme, the ESA Education Office is undertaking an innovative approach for educational CubeSat programmes, focussing not only on technology, but also on laws and regulations. As the CubeSat projects participating in Fly Your Satellite! are official national space activities, and as such they are bound to international regulations, legal and regulatory aspects must be properly considered in the project planning. To that end, the ESA Education Office established guidelines for small-satellite teams to support them in complying with regulations on Frequency and Space Object coordination, licensing and registration.

FLY YOUR SATELLITE!

Fly Your Satellite! is an **educational CubeSat programme** in which university teams are supported by ESA specialists to conduct the design, integration and verification campaign of their CubeSat. The programme is structured in phases and teams need to pass intermediate reviews to go to the next phase. The teams selected for Phase E are supported by ESA for the launch opportunity and operations, but the satellites are property of the universities and remain national space objects.



DOMESTIC AND INTERNATIONAL COORDINATION, LICENSING AND REGISTRATION

Organisations

- National Telecommunication Administration
 - » Frequency license; ground station + space object Call Sign
- International Telecommunication Union (ITU)
 - » International frequency registration
- International Amateur Radio Union (IARU)
 - » International frequency coordination

Registers

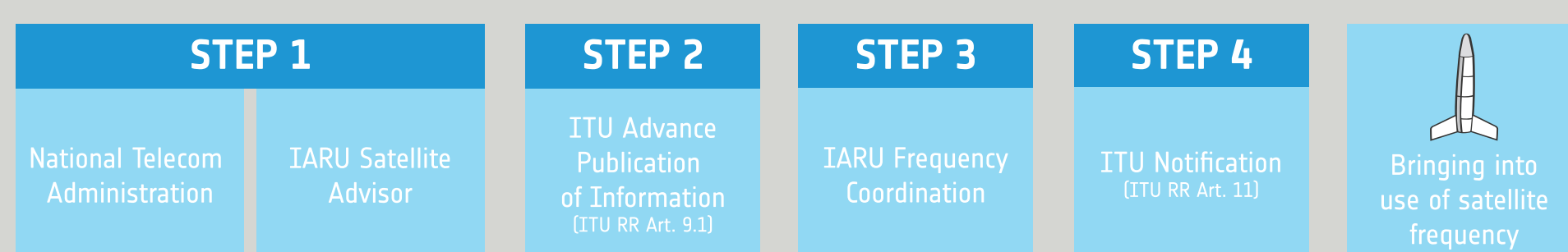
- ITU Master Register
- National Space Objects Register
- UNOOSA Register of Space Objects Launched into Outer Space

FREQUENCY REGISTRATION GUIDELINES

Content

- Rationale for Frequency Allocation
- Applicable Regulations
- Registration & Coordination Procedures
- Frequency Filing Templates

Proposed step-by-step approach



FYS: EXAMPLES IN PRACTICE

CubeSat Team Reports

- Identification of national regulations, law and responsible entities
- Actions taken w.r.t. applicable obligations
- Information regarding licensee, call sign, frequency

Examples - Impact

- Investigation on intersatellite compatibility (2 frequencies in very close range)
- ITU Radio Regulations infringement (Art. 22.1) => new telecommand implemented allowing cessation of automatic transmission in case of OBC failure
- Establishment of national space law in state of participating university

SPACE OBJECT REGISTRATION GUIDELINES

Content

- UN Treaties on Outer Space
- UN Registration Convention
- Applicable Obligations:
 - » National Space Object Registration
 - » UNOOSA Space Object Registration
- Proposed preparatory steps
- Registration Submission Form Template

OUTCOME & OUTLOOK

Law & regulation are **equally important** as technology and form indispensable part of - early - project planning.

Regulatory reasons:

- ✓ ITU Member States bound to abide ITU Constitution and Convention
- ✓ Frequency spectrum is limited natural resource
- ✓ Mandatory to avoid causing harmful interference

Practical reasons:

- ✓ Early frequency planning => fewer design changes, lower project costs, avoiding unexpected last-minute complications
- ✓ Coordination to avoid frequency band overlap
- ✓ International recognition and protection of your frequency