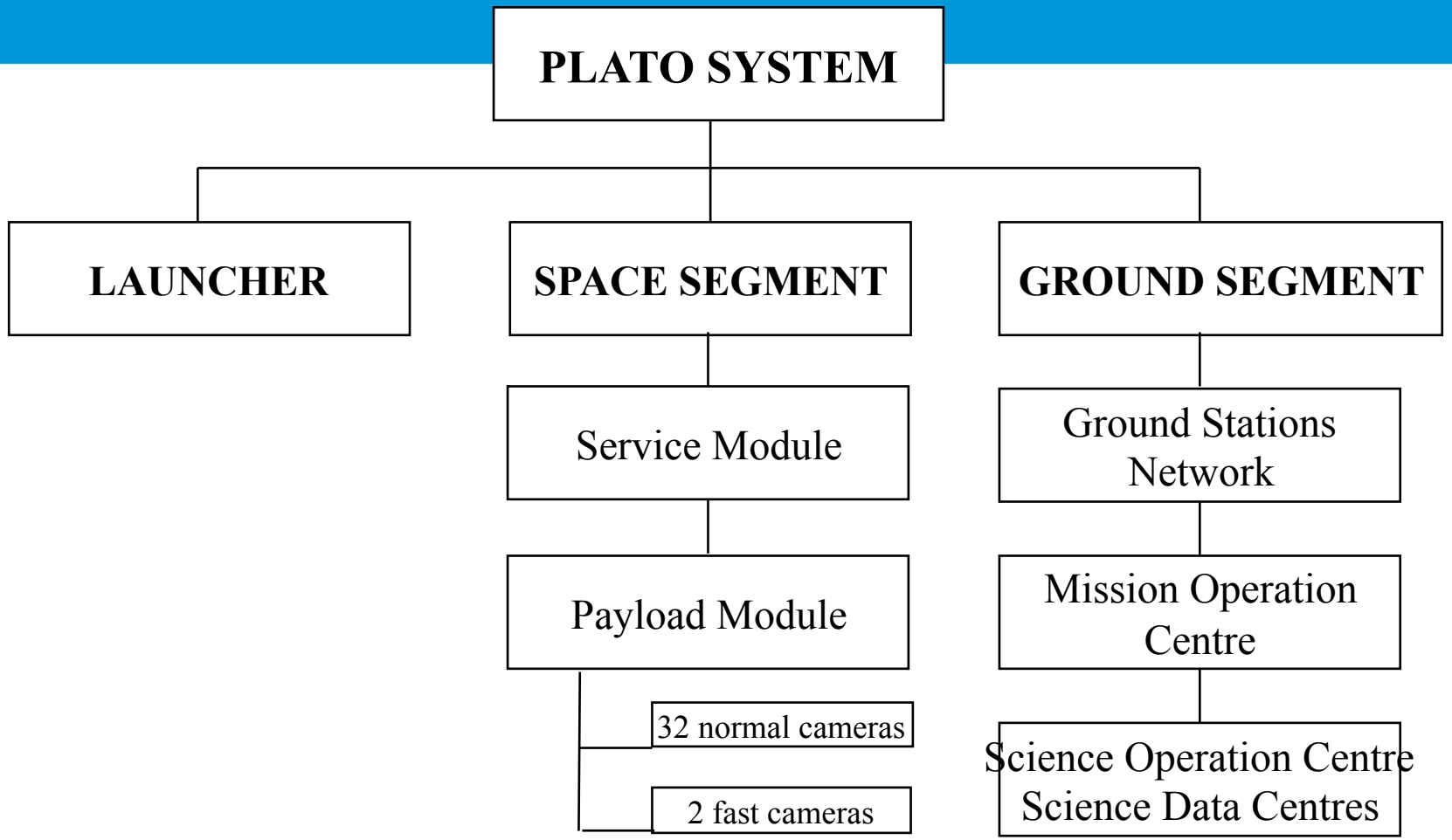
PLATO Mission Overview

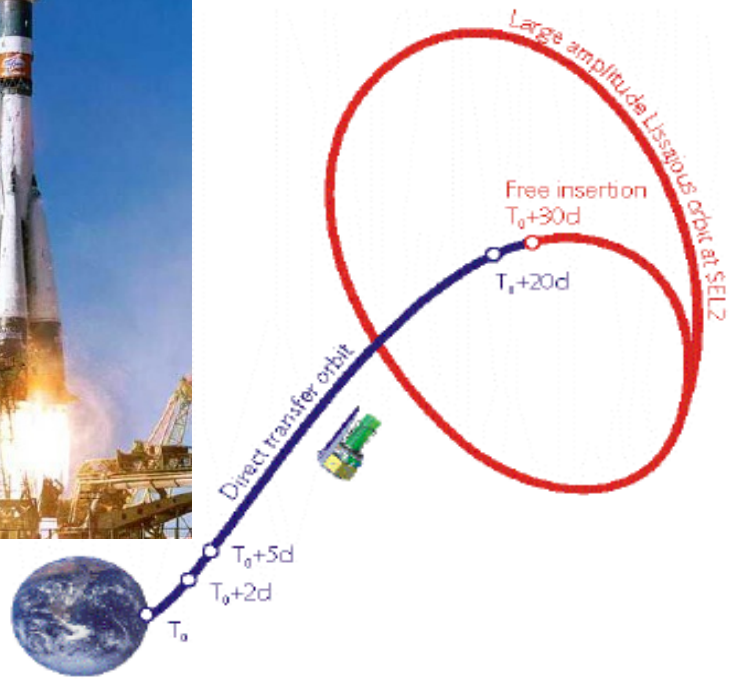
1. **Mission operation concept**
2. Candidate spacecraft architectures
3. PLATO study status at ESA
4. Summary

PLATO Product Tree



PLATO Launcher

- Launcher: Soyuz ST2-1B from Kourou
- Halo orbit around L2 Earth-Sun Lagrangian
- Direct injection into tranfer orbit
  - Transfer time: 30 days
- Launch vehicle capacity:
  - 2100 kg (excl. adapter)
  - 3.86 m diameter fairing
- Launch: 2024 (compatible with 2022)
- Mission science operation duration: 6.0 years



PLATO Ground Segment

- Mission Operation Centre
  - at ESOC (Darmstadt, Germany)
- Science Operation Center
  - at ESAC (Villafranca, Spain)
- Ground Station:
  - New-Norcia antenna

    (with Cebreros/Kourou as back-up)
  - Daily science communication in X band
  - Command and control in X band

PLATO Space Segment

The reference payload consists of:

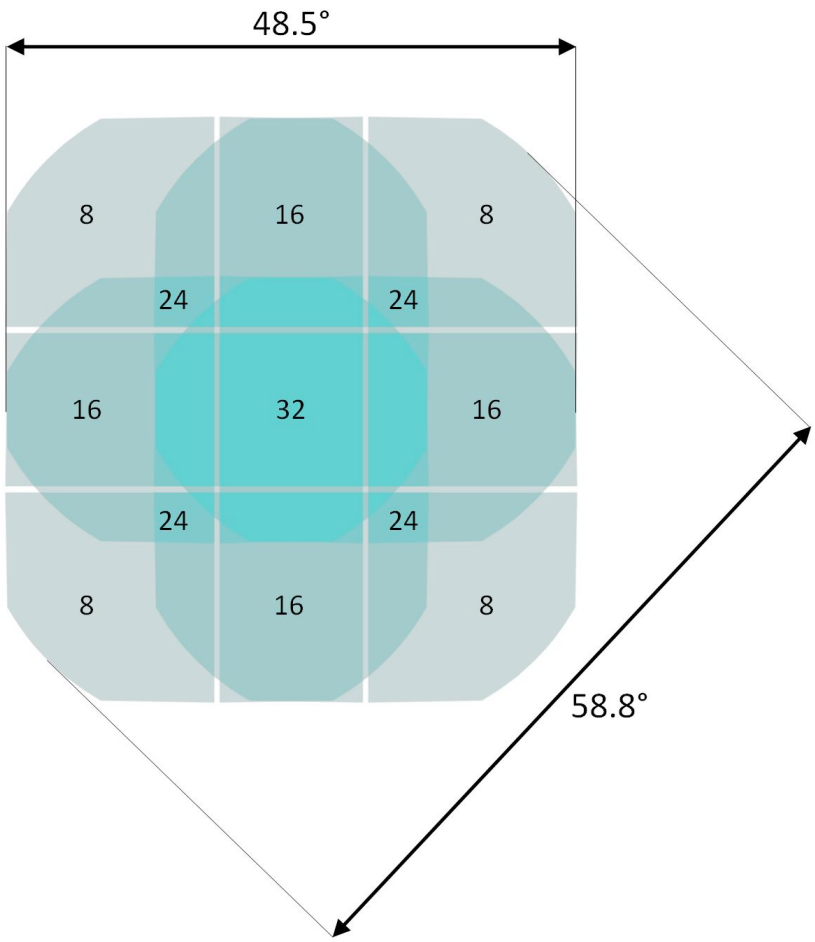
- 32 normal + 2 fast cameras (incl. telescopes, FPAs, FEEs, flex-cables, TCS),
- 4 main (MEU) and 1 fast (FEU) electronics units (including 4x4 +2 DPUs),
- 1 redundant ICU (for further processing, compression and packetization),
- 4 normal + 1 fast ancillary electronics units (power and synch. signals dist.)

The service module consists of:

- S/C Structure
- Thermal control subsystem
- Propulsion subsystem
- Attitude and Orbit Control subsystem
- Communication subsystem
- Power subsystem
- Data handling subsystem

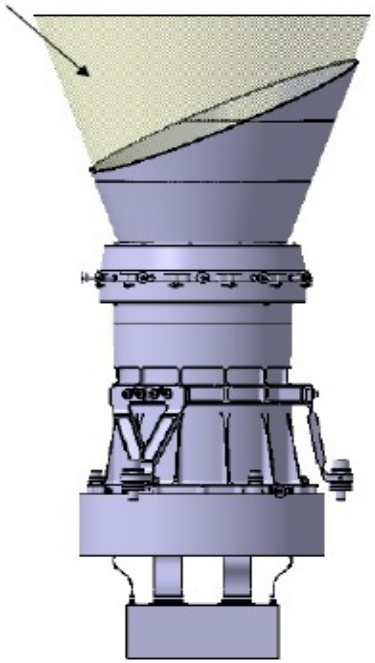
PLATO telescopes configuration

- 34 refractive telescopes mounted individually on the optical bench,
- 32 telescopes in 4 groups with FoV partially overlapping,
- 2 dedicated telescopes for bright stars and colour requirements
- Large total FoV: ~1900 deg^2
- Telescopes based on dioptric system with 6 lenses (1 aspheric), 120 mm pupil
- Individual baffles for stray-light rejection and thermal dissipation
- 4 CCDs per FPA with 4510×4510 pixels of 18 μm each

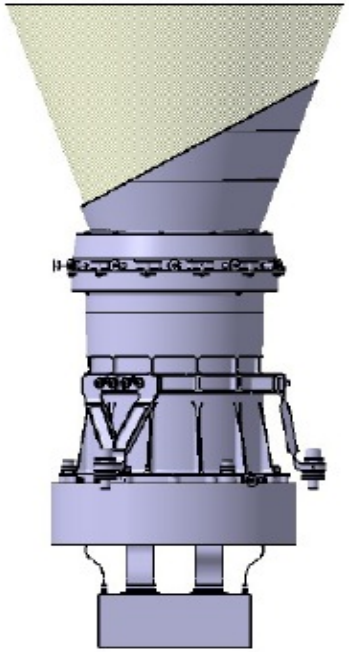


PLATO telescopes configuration

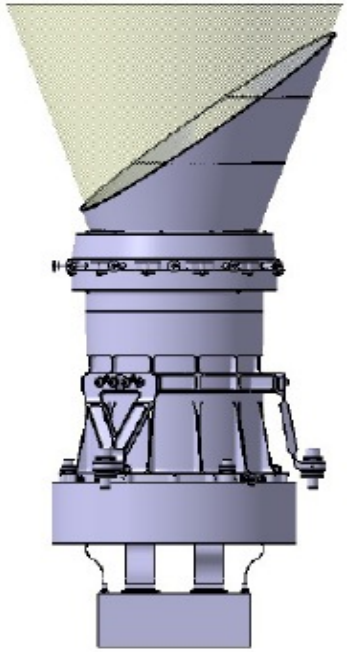
UFOV = 20° half-cone



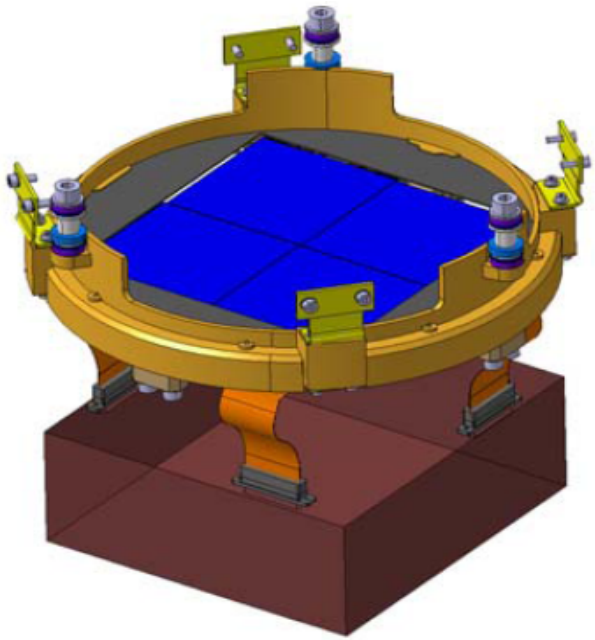
Normal Camera Sub-Group 1
(similar to sub-group 3)



Fast Camera



Normal Camera Sub-Group 2
(similar to sub-group 4)



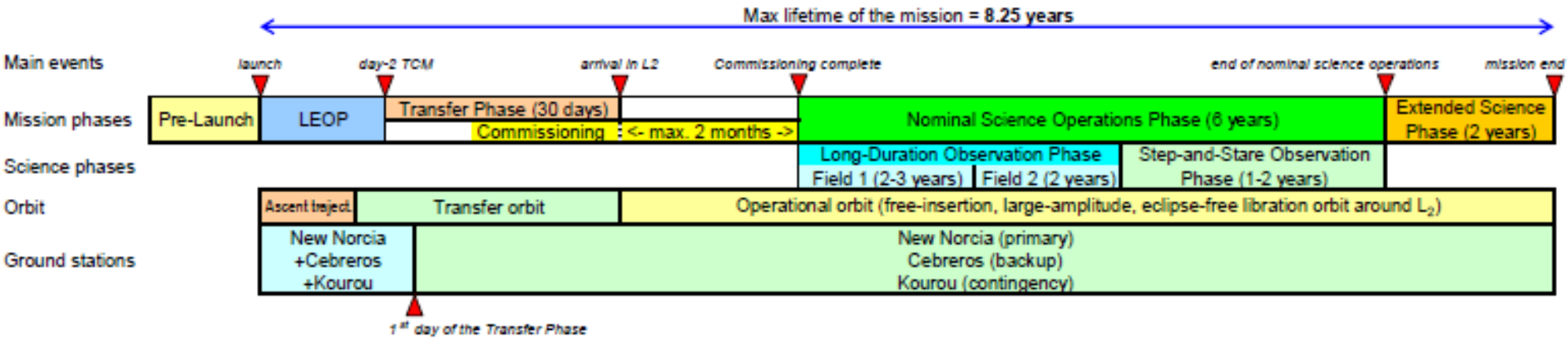
FPA (CCDs in blue), interface structure (yellow) and FEE (brown box), connected by the flexi-cables (orange strips).

PLATO payload configuration

Unit	Qty	Unit Mass [kg]	Mass w/o Margin [kg]	Mass w/ 20% Margin [kg]
Normal Camera (w/o N-FEE)	32	12.2	390.4	468.5
Fast Camera (w/o F-FEE)	2	12.2	24.4	29.3
N-FEE	32	1.1	35.2	42.2
F-FEE	2	1.2	2.4	2.9
N-AEU	4	4.0	16	19.2
F-AEU	1	2.3	2.3	2.8
MEU	4	4.7	18.9	22.7
FEU	1	4.5	4.5	5.4
ICU	1	5.7	5.7	6.8

~ 600 kg max. mass allocation;
~ 800 W max power allocation; ~ 100 Gb daily data volume;

PLATO mission operation concept

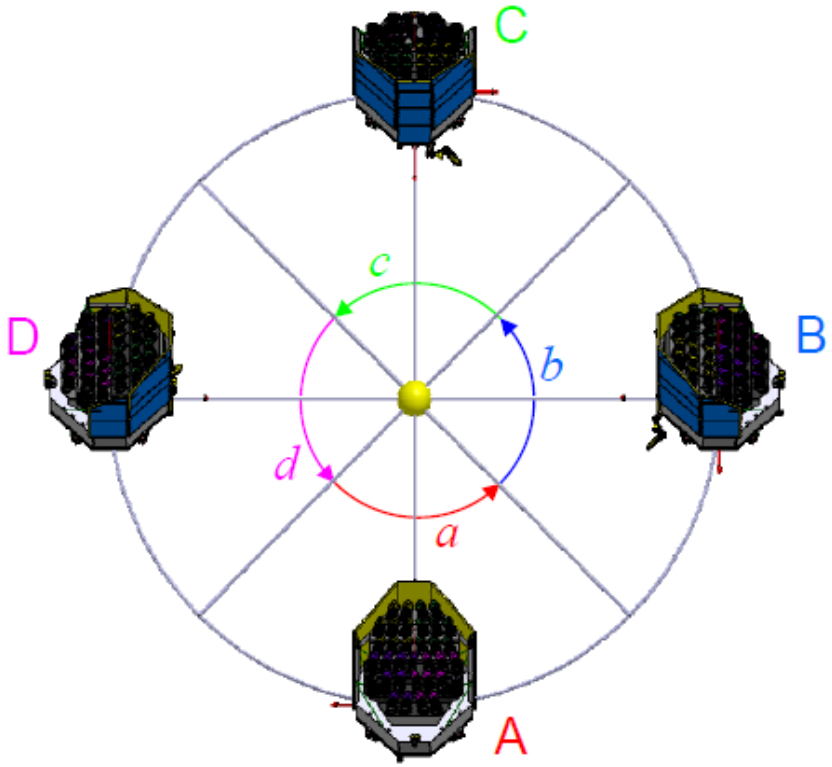


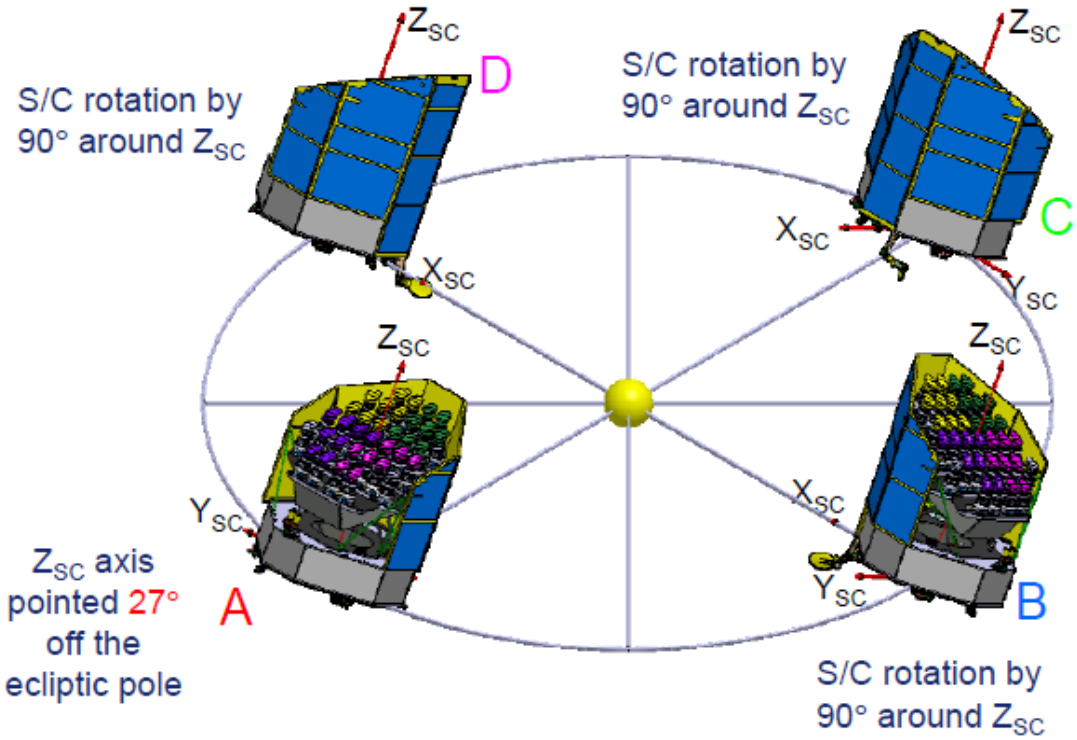
Nominal Science Operations Phase (6 years):

- Long-Duration Observation Phases above 63 degrees or below -63 degrees in ecliptic latitude, and at any ecliptic longitude for at least two years,
- Step-and-Stare Phase to observe several sky fields (2 to 5 months each) with centres located at any ecliptic latitude and longitude, subject to favourable Sun direction.

PLATO mission operation concept

- During the long duration observation phase, the spacecraft is rotated every 3 months around the mean boresight axis of the payload cameras.





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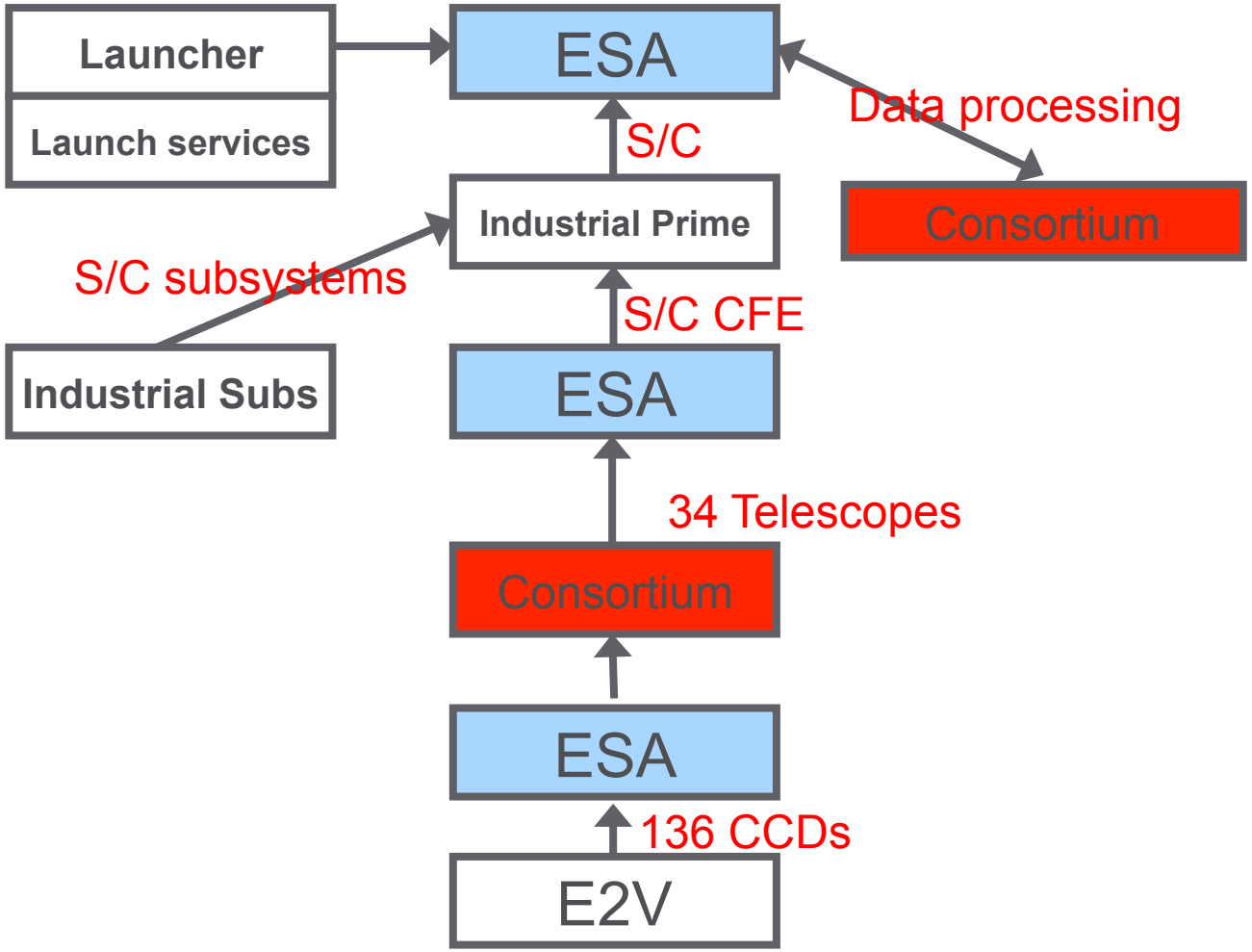
2. **Candidate spacecraft architectures**

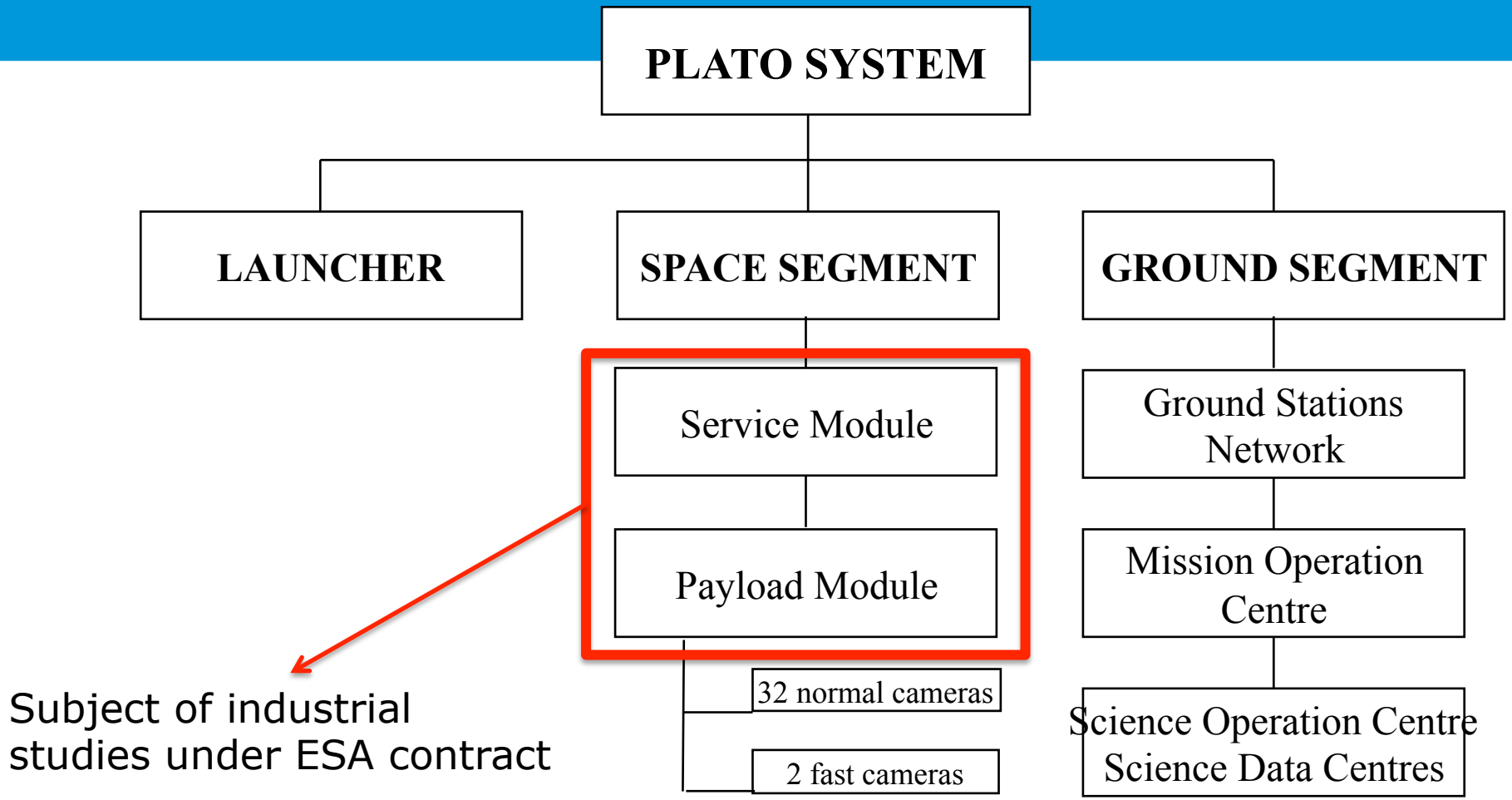
3. PLATO definition study status

4. Summary

PLATO organization



PLATO industrial studies



PLATO industrial studies

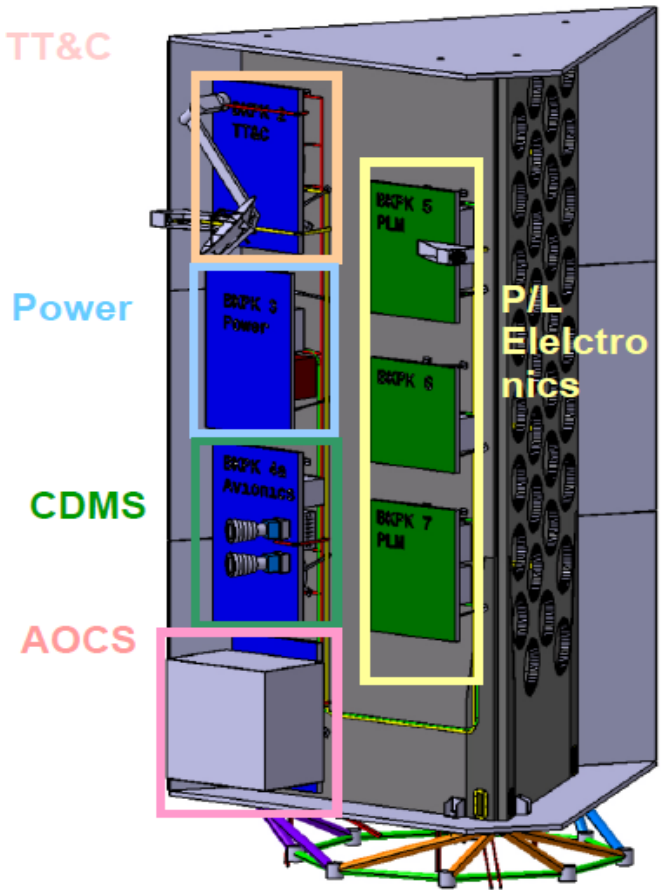
- A Definition Phase (A/B1) of the PLATO mission was run between June 2010 and December 2011. It included:
  - Definition of System Requirements and Functional Specification,
  - Payload Module Design,
  - Spacecraft and Service Module Design,
  - Definition of Development and Verification Approach,
  - Programmatic and Cost.

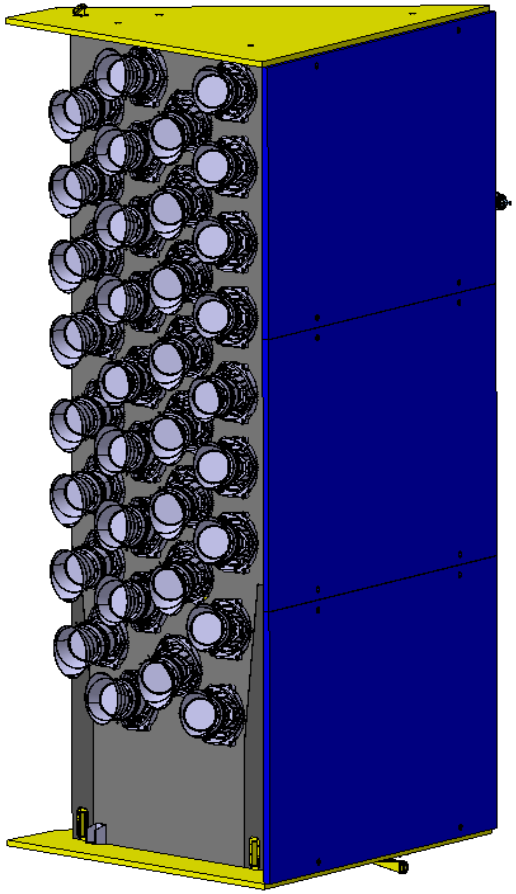
- The Definition Phase (A/B1) was supported by two industrial Contractors working independently and in parallel: ASTRIUM SAS (Toulouse) and TAS-I (Turin).

- A Preliminary Requirement Review (PRR) completed the Phase A in May 2011.

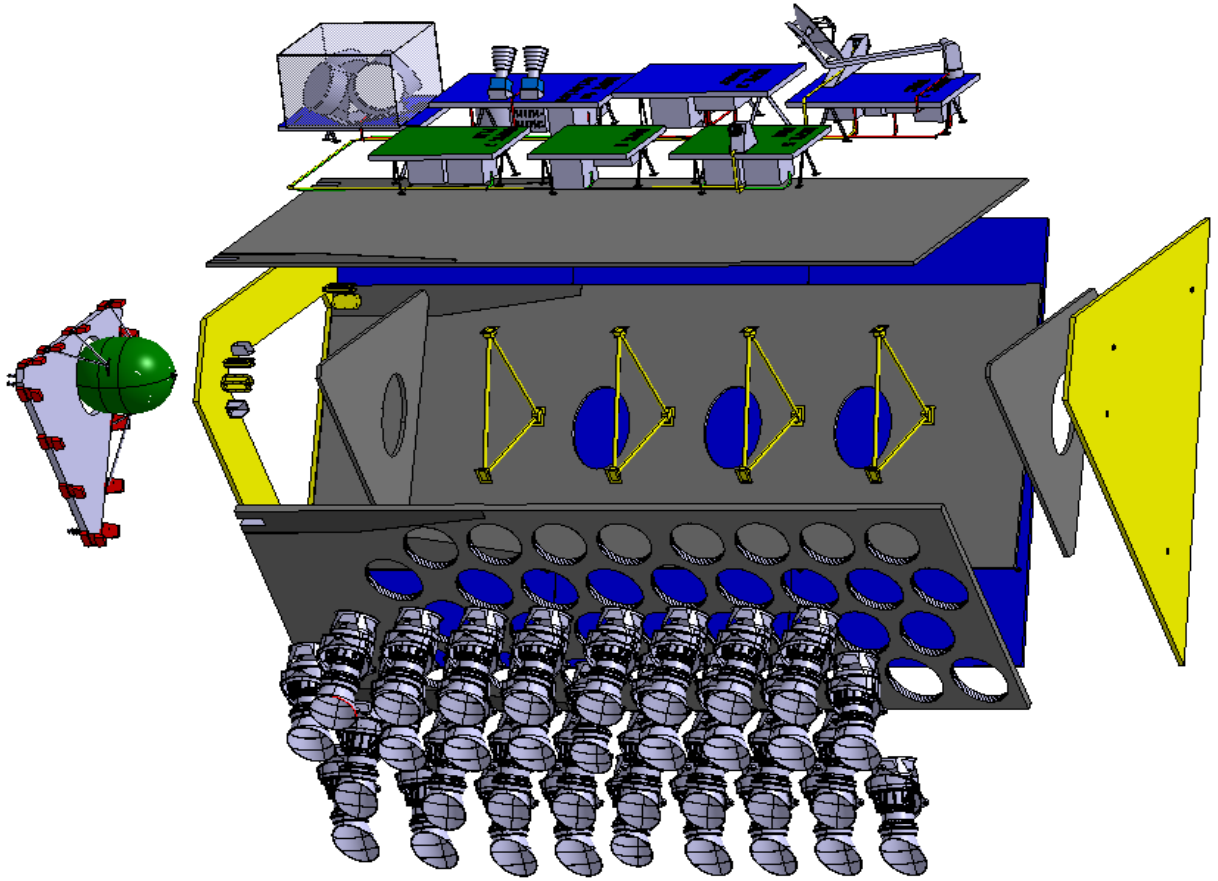
PLATO spacecraft preliminary design

Astrium concept (1)



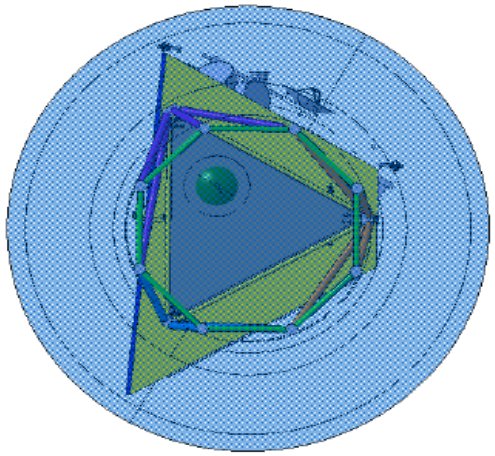


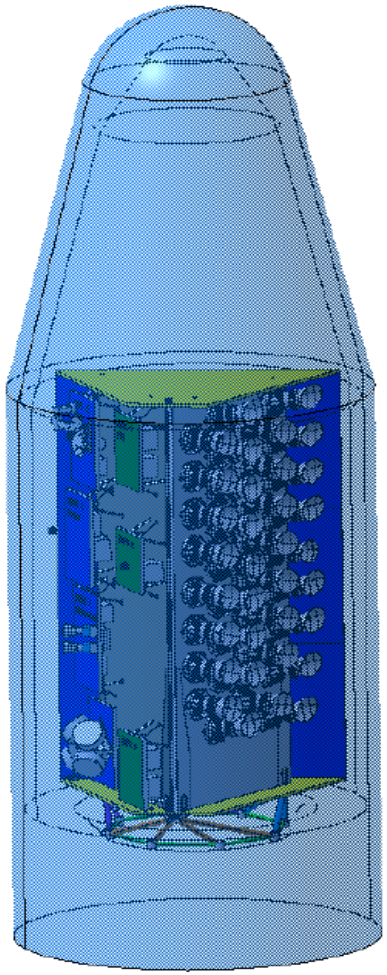
Astrium concept (2)



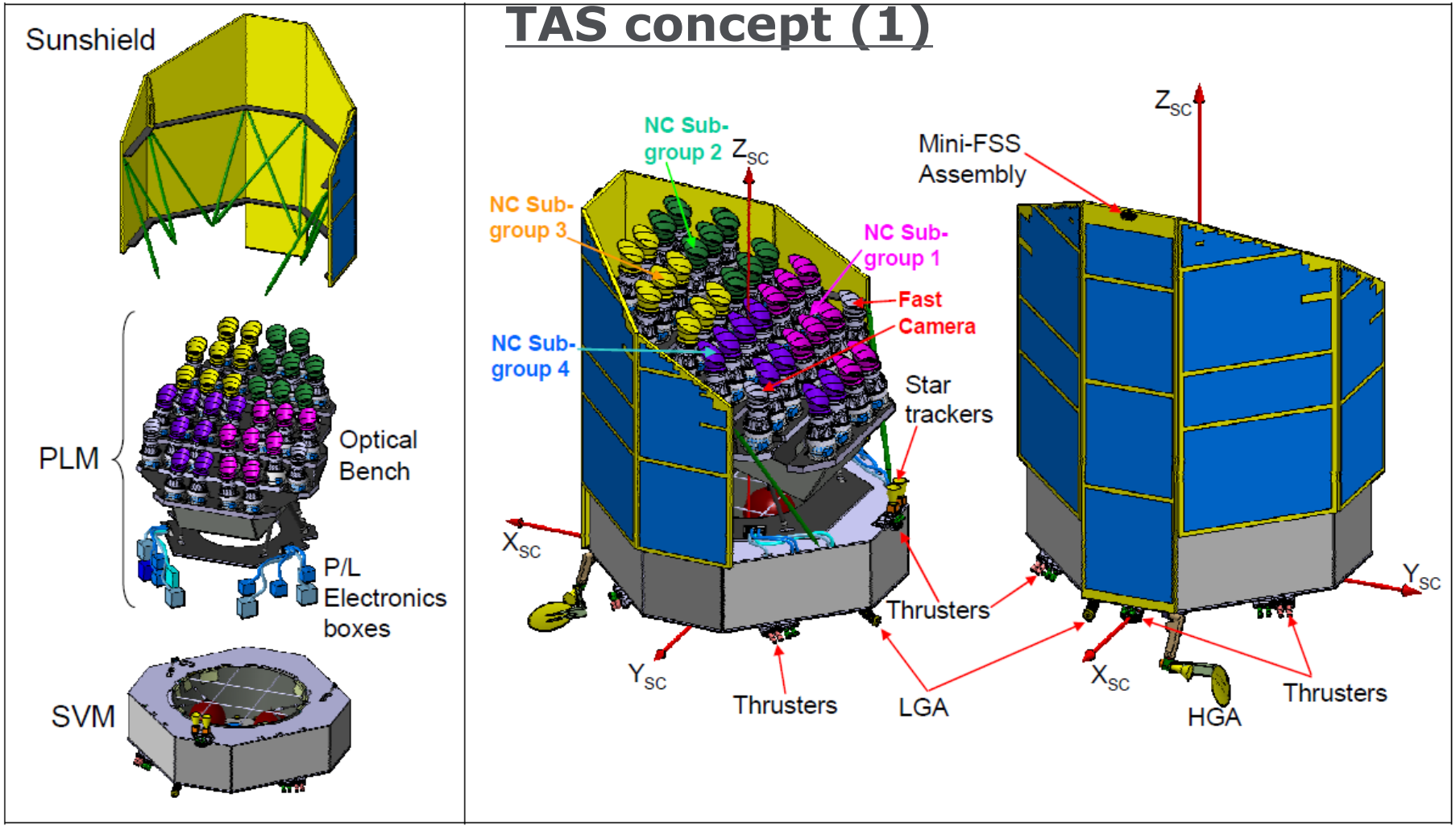
Astrium concept (3)

View of Satellite at launch



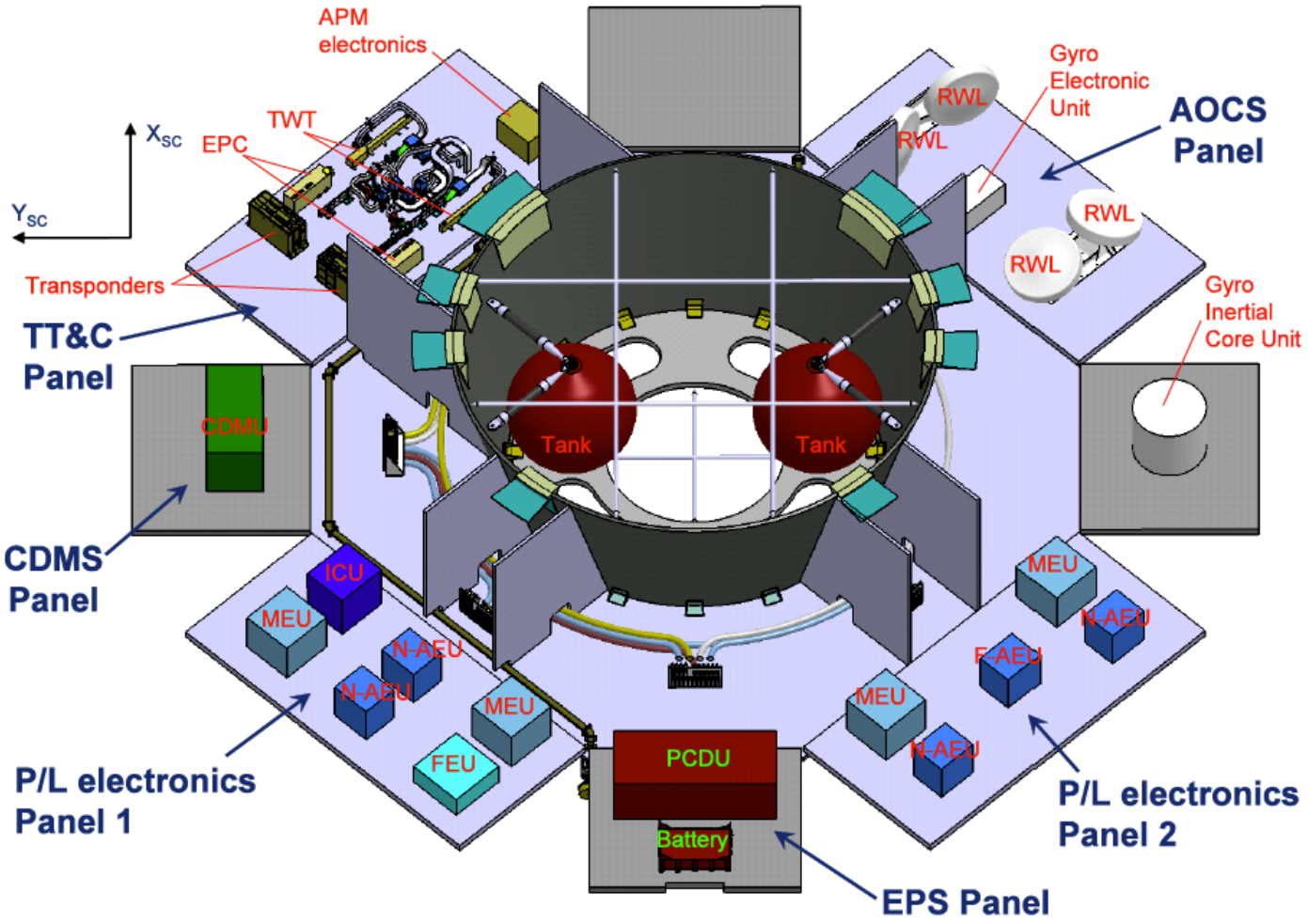


PLATO spacecraft preliminary design



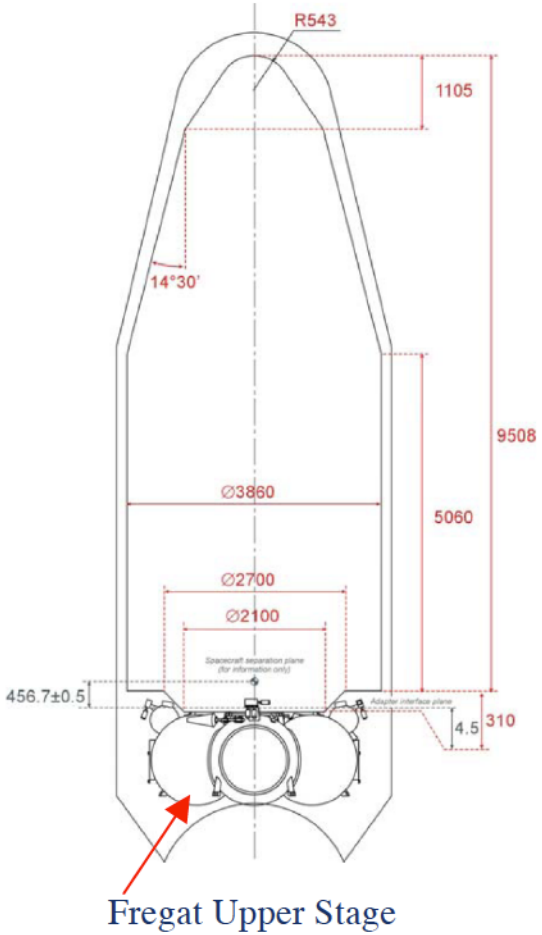
PLATO spacecraft preliminary design

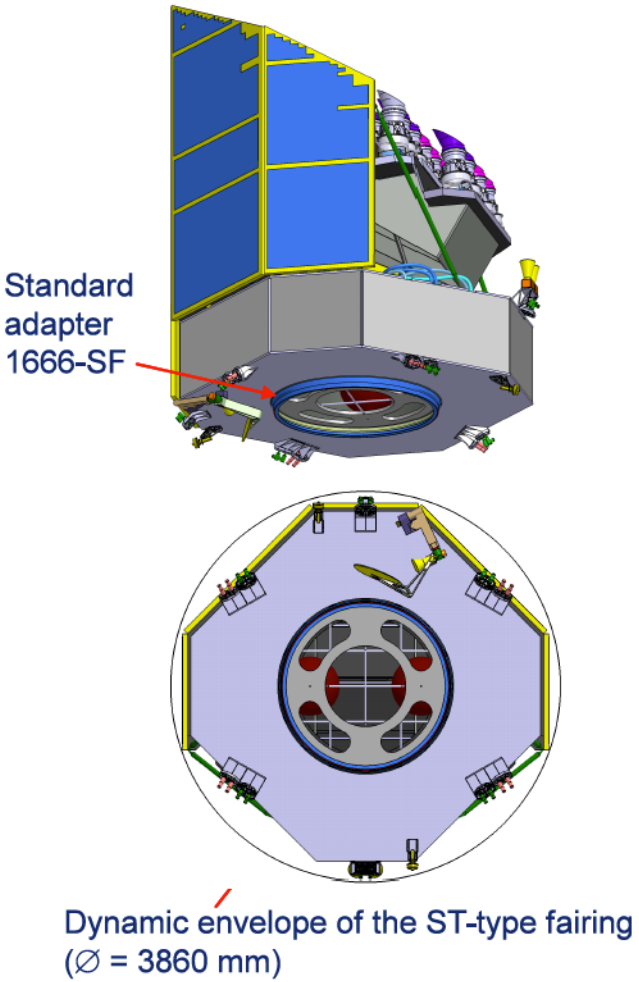
TAS concept (2)

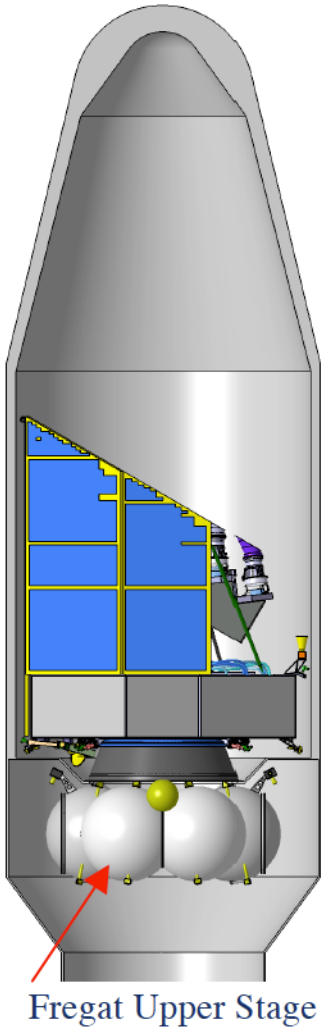


PLATO spacecraft preliminary design

TAS concept (3)







PLATO spacecraft preliminary design

Astrium and TAS proposed different designs with similarities at S/S:

- Fixed Solar Array mounted on the body and on the Sunshield,
- Fast cameras providing feedback to the Attitude Control,
- PLM with passive Thermal control,
- X-band for up/down link (downlink at 8.7 Mbit/sec),
- X-band deployable and steerable HGA with two DoF,
- Attitude Control with reaction wheels and N2H4 propulsion as actuators
- Science Mode Attitude Control with feedback from FGS, Gyros and STRs
- Ga As triple junction solar cells

- Off-the shelf platform units or units derived from existing ones -> high TRL
- The same instruments except for the harness (to be provided by Industry)
- System level development based on AVM, STM and FM

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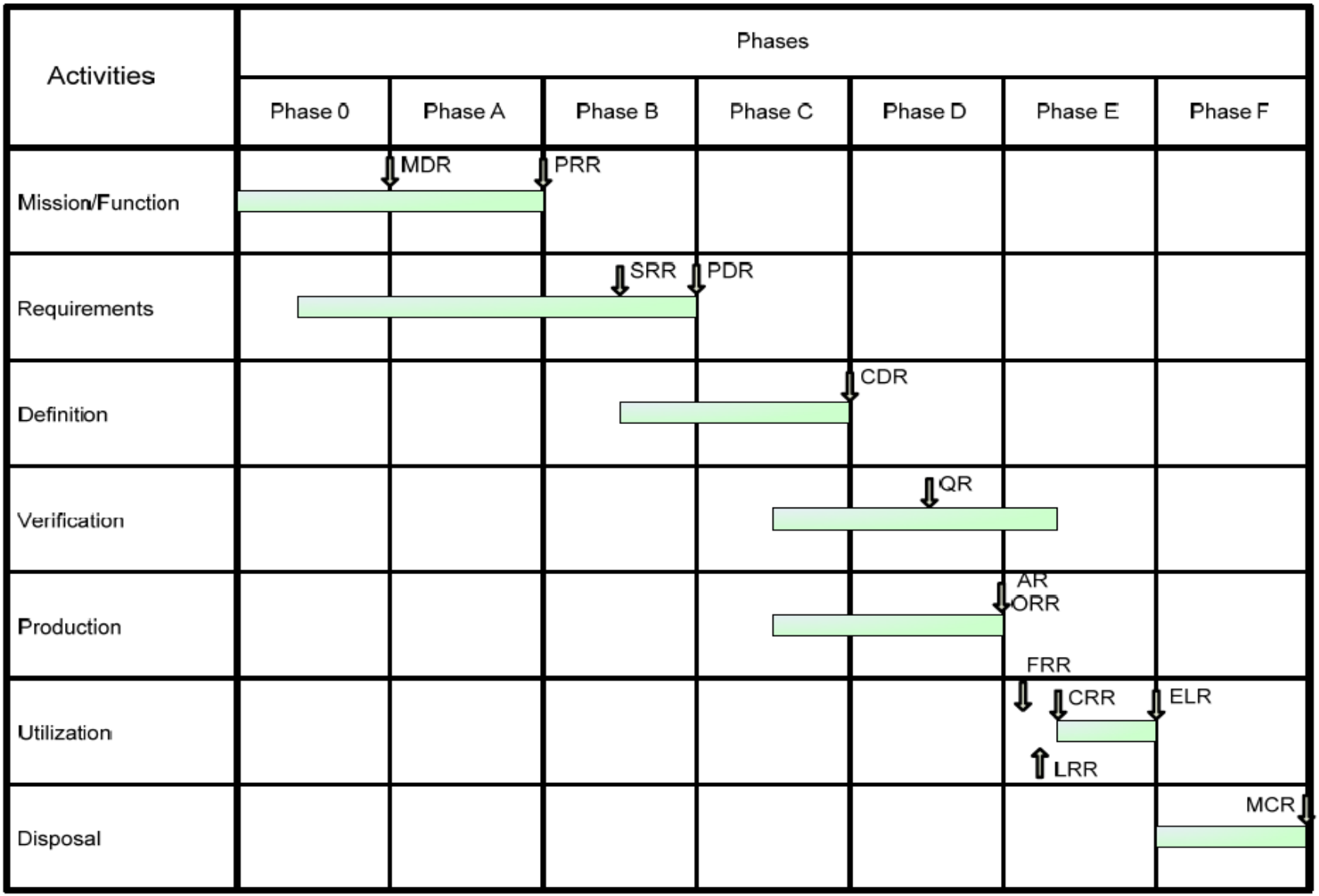
Typical Project Life Cycle (ECSS)



PLATO next step: M3 missions PRR

Preliminary requirement reviews of the 5 candidate M3 missions (ECHO, LOFT, MARCO_POLO, PLATO, STE_QUEST) will be held in October-November 2013 with the aim to verify:

- The adequacy and completeness of the science requirements and breakdown to space segment requirements,
- The technical feasibility of the space segment,
- The feasibility of the space segment development program.

PLATO next step: M3 missions PRR

The M3 mission PRRs are an input to the M3 mission selection process.

Since PLATO already went through a Preliminary Requirement Review during the M1/M2 selection process and since its technical definition has not changed, its review will be limited to a review of an updated programmatic and cost data package by a PLATO cost review panel.

→ PLATO programmatic and cost to ESA (CCDs, spacecraft, launch, operation) shall be updated before September.

→ Cost and programmatic aspects of Consortium proposal shall be updated

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Summary

- ASTRIUM and TAS have identified candidate design concepts of the PLATO spacecraft.

- PLATO schedule and cost estimates shall be updated before September 2013.

- Preliminary Requirements Reviews (PRR) of candidate M3 missions will be organized in October/November 2013.

- PLATO M3 PRR will be limited to a review of an updated programmatic and cost data package by a PLATO cost review panel.

Thanks for your attention

P. Gondoin
Philippe.Gondoin@esa.int