

PRIMA

Core Spacecraft

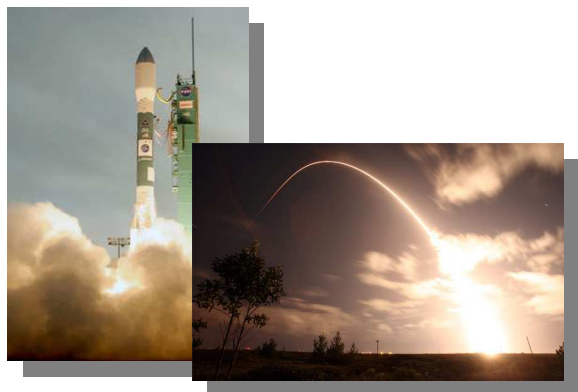
PRIMA (*Piattaforma Riconfigurabile Italiana Multi Applicativa*) is a high adaptability multimission Core Spacecraft which can be configured to support a variety of payloads and can be utilized for different classes of LEO and MEO missions. PRIMA is based upon state of art space technology, a modular architecture and an Integrated Control System.

Main Features: *PRIMA* is a 3 axis stabilized Bus, With Sun and Stars sensors and a set of 4 reaction wheels and 3 Control Momentum Gyro and 3 torque rods as actuators, with steering capabilities on each axis, the PRIMA bus offers very high pointing accuracy, up to 0.025° with in orbit calibration, pointing knowledge (0.015°), and real time orbit determination (better than 10 m) together with a dedicated propulsion system for orbit control. Computer, avionic and satellite communication back-bone is based on the Mil-1553 command bus, the LEON 3 FT processor redundant architecture provides high performances computing and processing capabilities.

PRIMA Core Spacecraft Mission Heritage

- **9 Satellites** have completed in flight acceptance and are fully operational (Radarsat-2, COSMO-SkyMed PFM, FM-2, FM-3 and FM-4, ESA GMES Sentinel-1A and 1B, ESA GMES Sentinel-3A and 3B, Cosmo Sky-Med Second Generation PFM)
- **4 satellites** in the pipeline (Cosmo Sky-Med Second Generation FM2, ESA GMES Sentinel-1 C, ESA GMES Sentinel-1 D, ESA GMES Sentinel-3 B and ESA GMES Sentinel-3 B)
- **2 Satellites** (CSG FM3-4) will be launched in the next years

- **Cumulative in flight operation of 796.104 hours (80,61 years)**
- **Flight Proven Mission Availability (e.g. RADARSAT-2 >99,8%)**



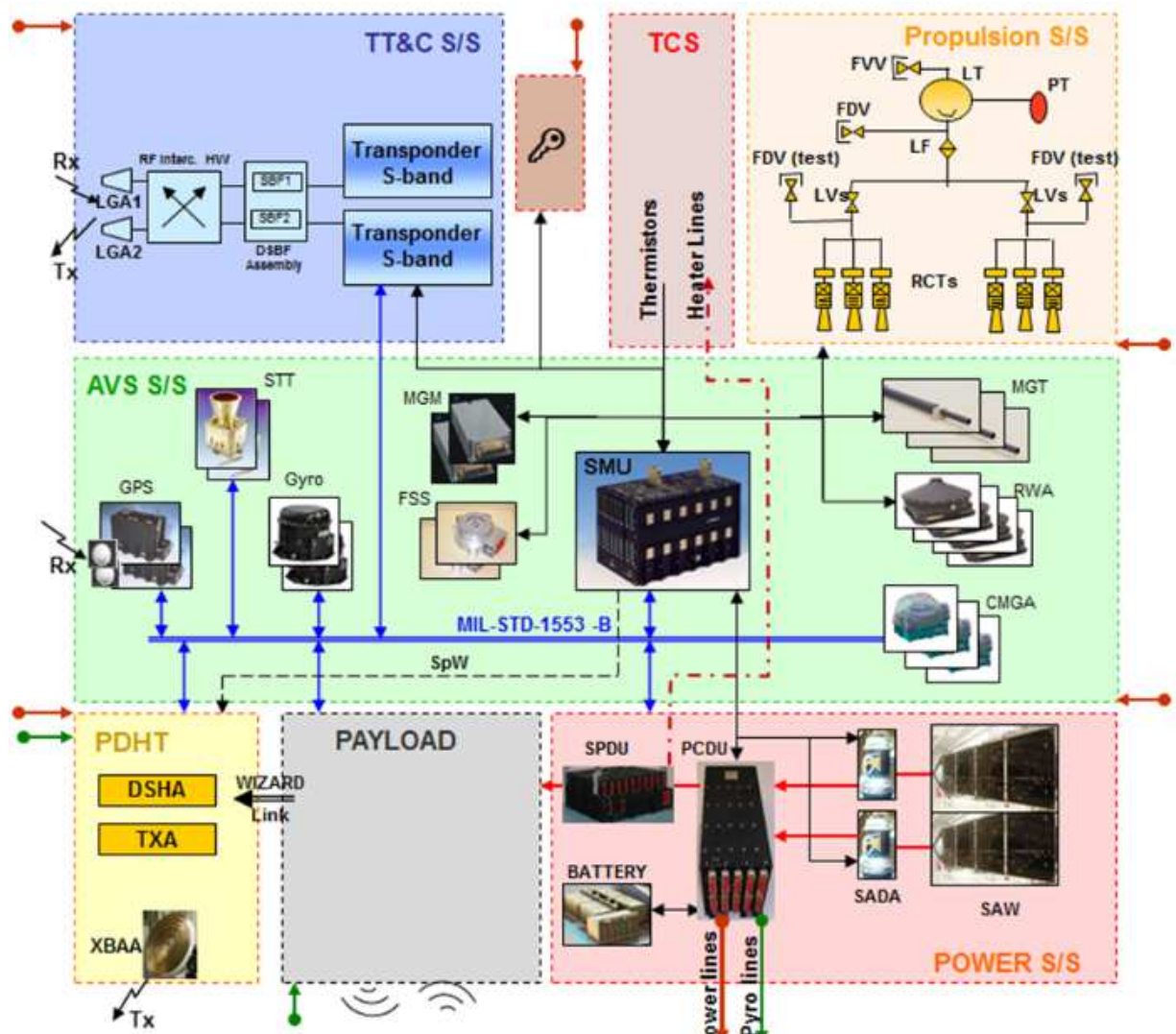
Satellite	Launch date
COSMO SkyMed	08 June 2007
COSMO SkyMed-2	09 December 2007
RADARSAT-2	14 December 2007
COSMO SkyMed-3	25 October 2008
COSMO SkyMed-4	6 November 2010
SENTINEL-1A	03 April 2014
SENTINEL-3A	16 February 2016
SENTINEL-1B	25 April 2016
SENTINEL-3B	25 April 2018
CSG PFM	18 December 2019

Launch Vehicle Compatibility and Orbit Capability

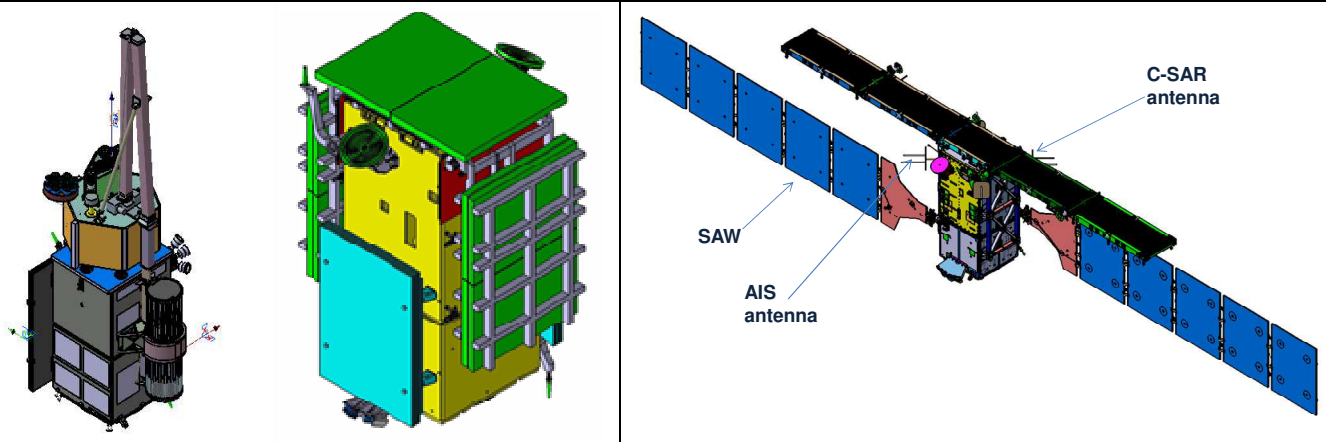
	Launcher
Launch Vehicle Compatibility	Soyuz, Vega- C , Falcon-9

Parameter	LEO Satellite Orbits
Orbit Type	LEO, Sun Synchronous
Local time Ascending Node	6:00 and 18:00 with possibility of different LTAN
Altitude	450 to 1500 km Environment limits outside indicated boundaries
Inclination	From 0° to SSO inclination Also depending on the selected Launch Vehicle
Lifetime	7 years
Reliability	0.9 @ 7 y

PRIMA Descriptive Block Diagram

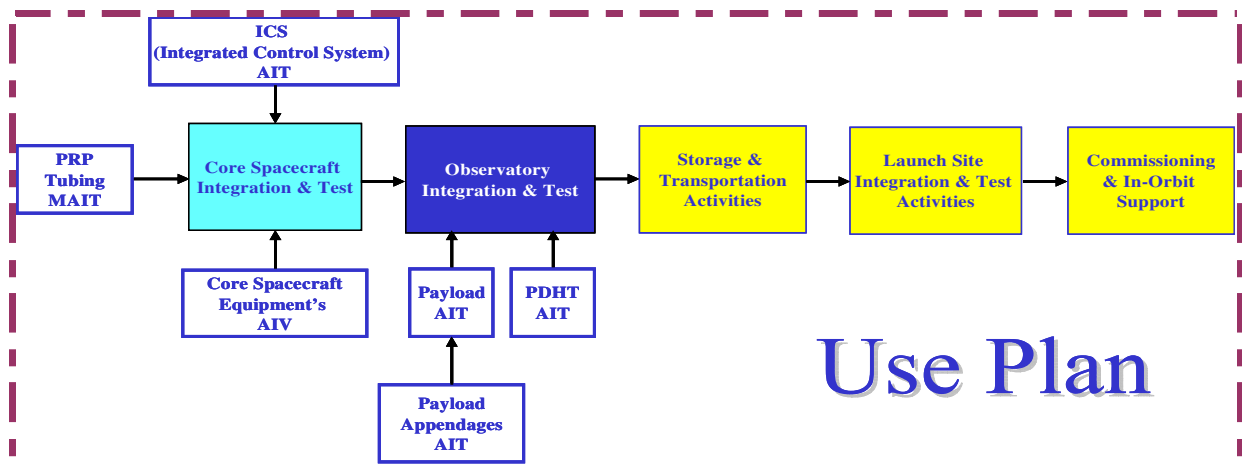


Flight and stowed-for-launch configurations



Test facilities

Thales Alenia Space Test Facilities address all the environmental test activities related to space products



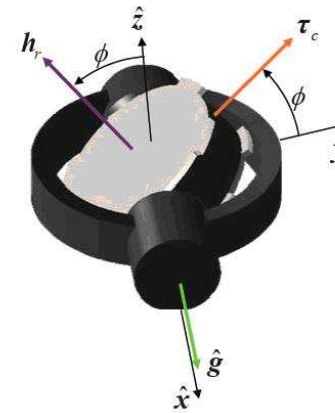
Use Plan

Variability Heritage

Variability	Heritage based on analysis, prototype, flight
Low Agility (RW)	Protoflight, based on Sentinel-1 program
High Agility (RW+CMG)	Protoflight, based on Cosmo Second Generation program
AOCS Accuracy	Protoflight, based on Sentinel-1 program
Energy Storage Capability	Protoflight, based on Cosmo Second Generation program
Improved Reliability Figure	Analysis

High Agility Option

Control Moment Gyro actuators (CMG) can be mounted on the PRIMA Core Spacecraft to provide very large torque capability. Respect to reaction wheels, CMG mechanisms are more efficient in terms of produced torque, whose value can be compared to the one of thrusters, without having their typical disadvantages.



Baseline Delivery Schedule

The following is baseline delivery schedule for an Observatory based PRIMA Core Spacecraft and the reference payload. It can of course be optimized for specific missions.

Payment Event No.	Milestone Payment Event	Month
1	S/C Requirements Review (SRR)	ARO+3
2	S/C Preliminary Design Review (PDR)	ARO+6
3	S/C Critical Design Review (CDR)	ARO+12
4	Instrument Integration Readiness Review (IIRR)	ARO+26
5	Observatory Pre-Environmental Review 1 (PER-1)	ARO+29
6	Observatory Pre-Shipment Review (PSR)	ARO+36

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