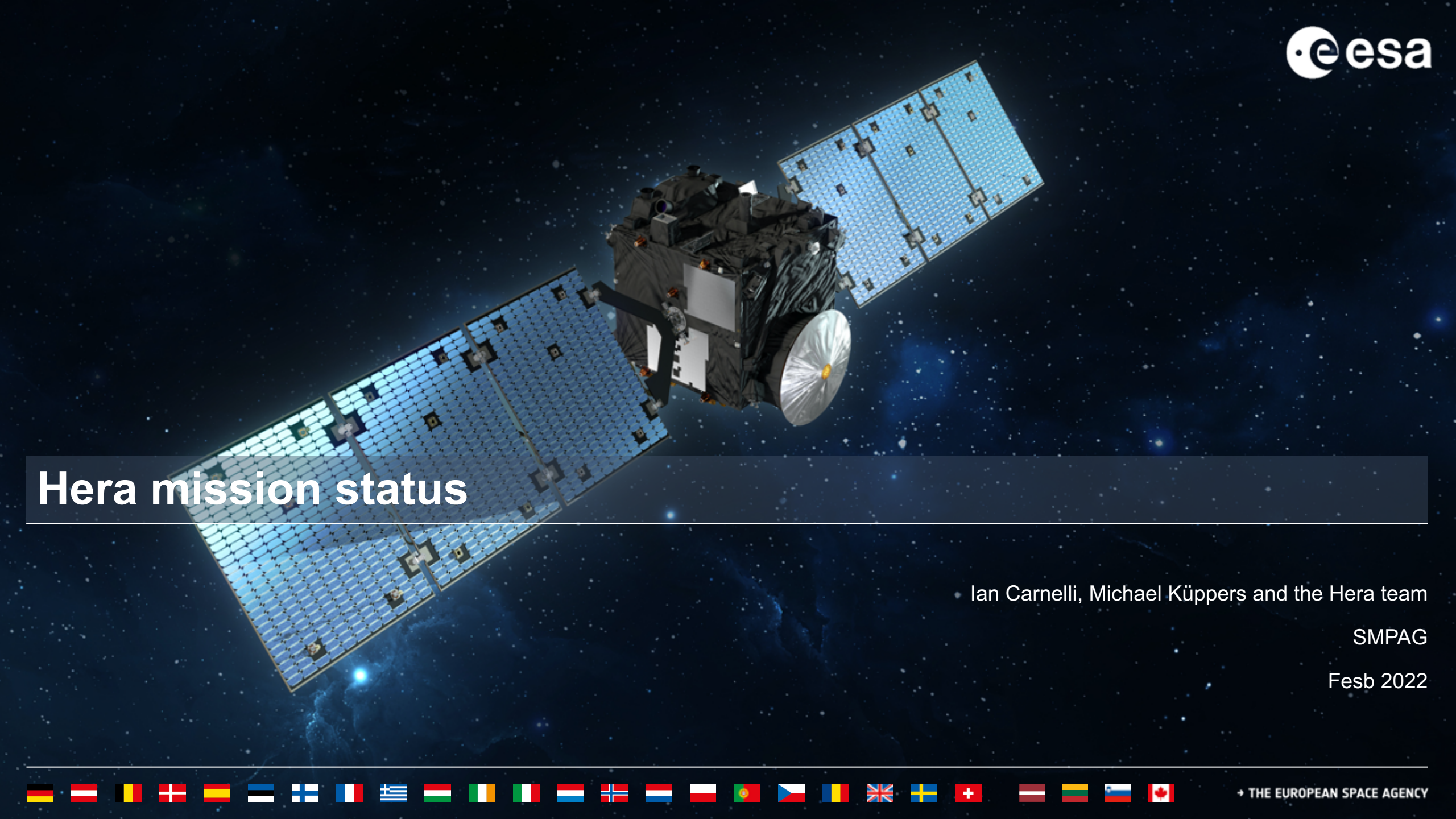


Hera mission status

Ian Carnelli, Michael Küppers and the Hera team

SMPAG

Fesb 2022

Mission objectives

Core asteroid investigation requirements:

i. Determine mass of Dimorphos

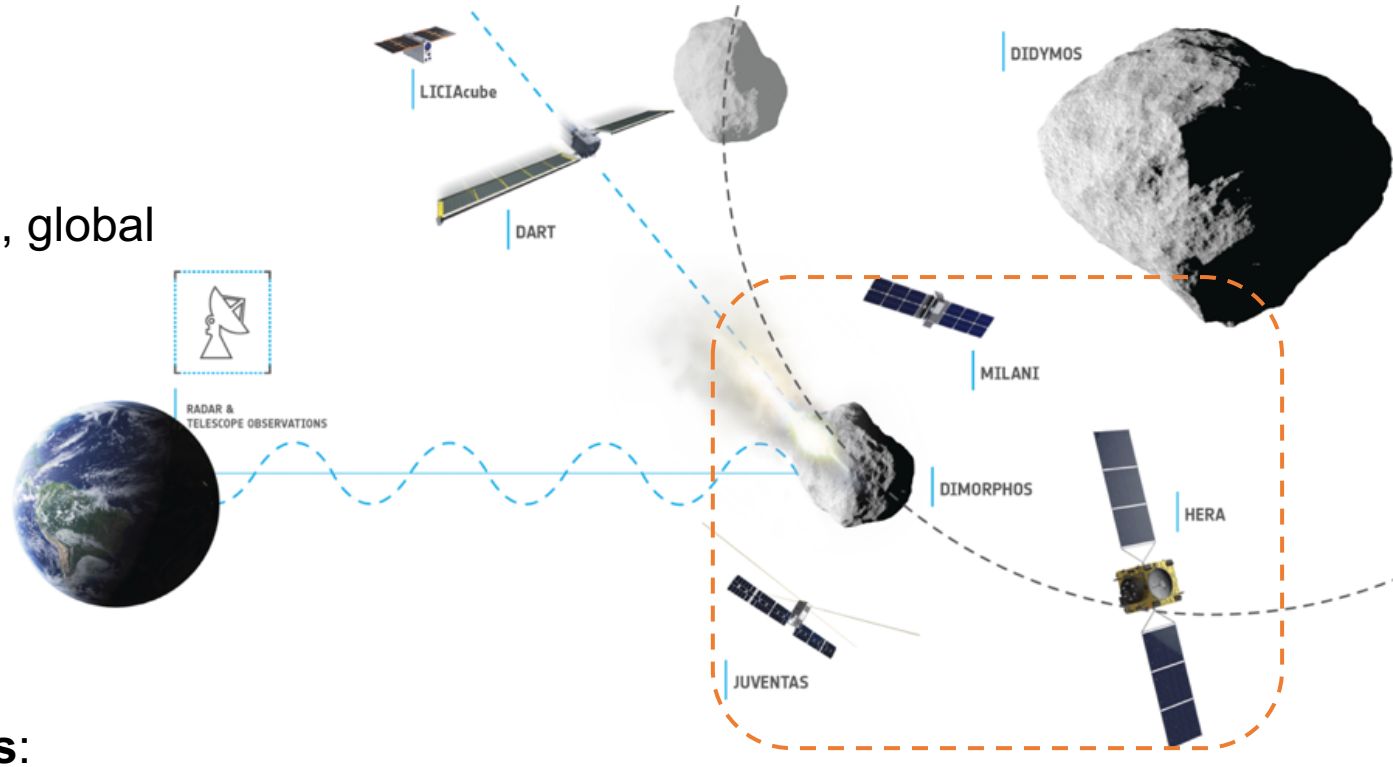
ii. Determine global properties of Dimorphos: size, global shape, volume, density, porosity

iii. Size distribution of surface material

iv. Dynamical properties of the Didymos system

v. Shape of DART's impact crater

vi. Size distribution of excavated material



Opportunity asteroid investigation requirements:

vii. Surface strength (through CubeSats landings)

viii. Interior structure of Dimorphos

ix. Composition

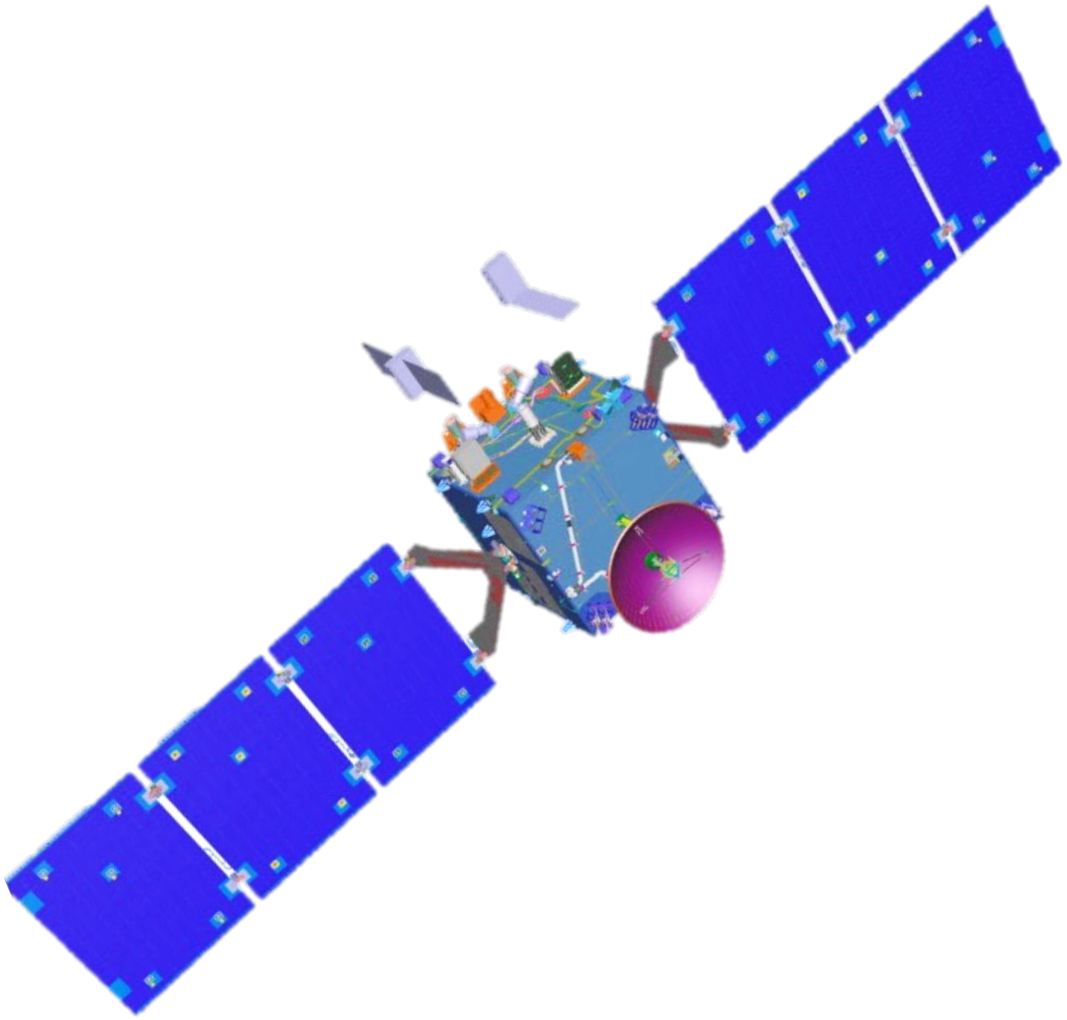
x. Transport of impact ejecta from Dimorphos to Didymos

Hera Planning Overview

- **Launch: October 2024**
- **Start rendezvous phase: December 2026**
- **Start proximity operations: February 2027**
- **End of nominal operations: September 2027**

Phase	Duration	Approximate distance range	Objectives & Constraints	GNC aspects
ECP	6 weeks	20 - 30 km	Initial physical and dynamical characterization. Didymos and Dimorphos in FOV of camera.	Commissioning.
PDP	4 weeks	As ECP	CubeSats released and commissioned.	As ECP (no science requirements).
DCP	4 weeks	8 - 20 km	Accurate characterisation of Dimorphos mass and density, and medium-resolution imaging. Different latitudes and longitudes at different local times and different viewing angles. Didymos fits in FOV of camera.	Didymos LOS navigation. Semi-autonomous or autonomous attitude guidance.
COP	6 weeks	4 - 22 km	Dimorphos high-resolution imaging and full characterization of DART´s impact crater. Different latitudes and longitudes at different local times and different viewing angles.	Didymos and/or Dimorphos LOS navigation. PALT operational. Didymos feature tracking (TBC). Autonomous attitude guidance.
EXP	6 weeks	1 - TBD km	Very high-resolution images of DART impact crater. Different local times and viewing angles.	Didymos and/or Dimorphos LOS navigation. PALT + feature tracking. Autonomous attitude guidance. Trajectory guidance.
Total	**26 weeks**			

Hera spacecraft configuration

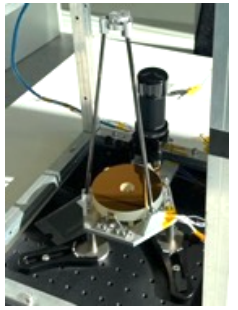


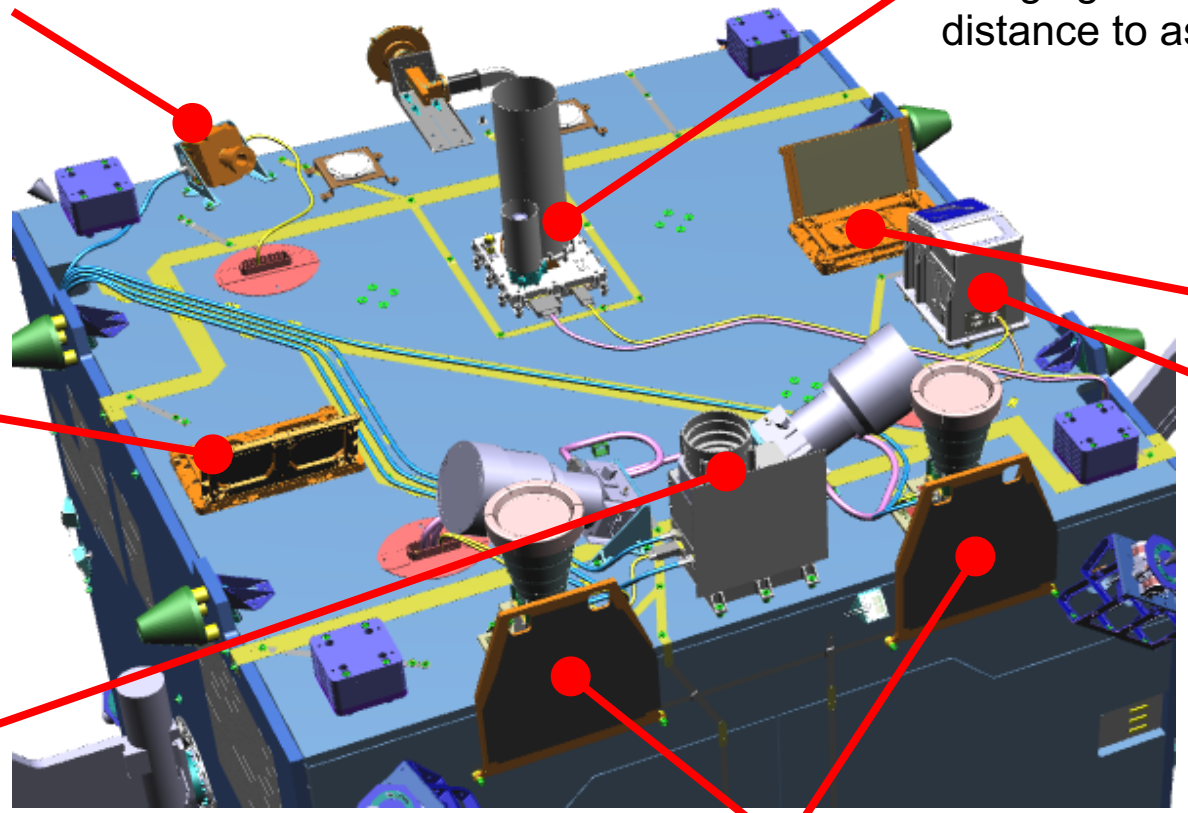
HERA - Total Launch Wet Mass		launch 2026	launch 2024
		1257 (-42)	**1240 (-41)**
Propellant		**559 (-5)**	**542 (-4)**
→ *tank filling ratio*		**97,3%**	**94,3%**
HERA - Total Dry Mass at Launch		**697.6 (-37,5)**	
Pressurant		2.0	
System margin on nominal dry mass	10%	63,2 (-32,4)	
HERA Spacecraft - Nominal Dry Mass	w/o unit MM	/w unit MM	
	570,8 (+2,5)	**632.4 (-5,1)**	
Platform	516.2 (+1,7)	573.2 (-4,1)	
Electrical Power Subsystem	117.9	131.0	
Data Handling Subsystem	24.8	26.6	
Communication Subsystem	27.1	29.3	
AOCS (with Guidance. Navigation & Control)	24.8	26.5	
Propulsion Subsystem	80.5	85.9	
Thermal Control Subsystem	16.8	20.1	
Structure Subsystem	150.1	164,6	
Harness	69.4	83,6	
Inter-Satellite Link Subsystem	4.8	5.7	
Payload	54.6 (+0.1)	59.2 (-1)	

Payload configuration

SMC: Small Monitoring Camera
Opportunity payload, mounted canted on payload deck to monitor CubeSat deployment,
FOV: ±48.3°

PALT: Planetary ALTimeter
Ranging lidar to determine distance to asteroid





Milani CubeSat
- Multispectral imager
- Retroreflectors
- Dust analyzer
- Radioscience

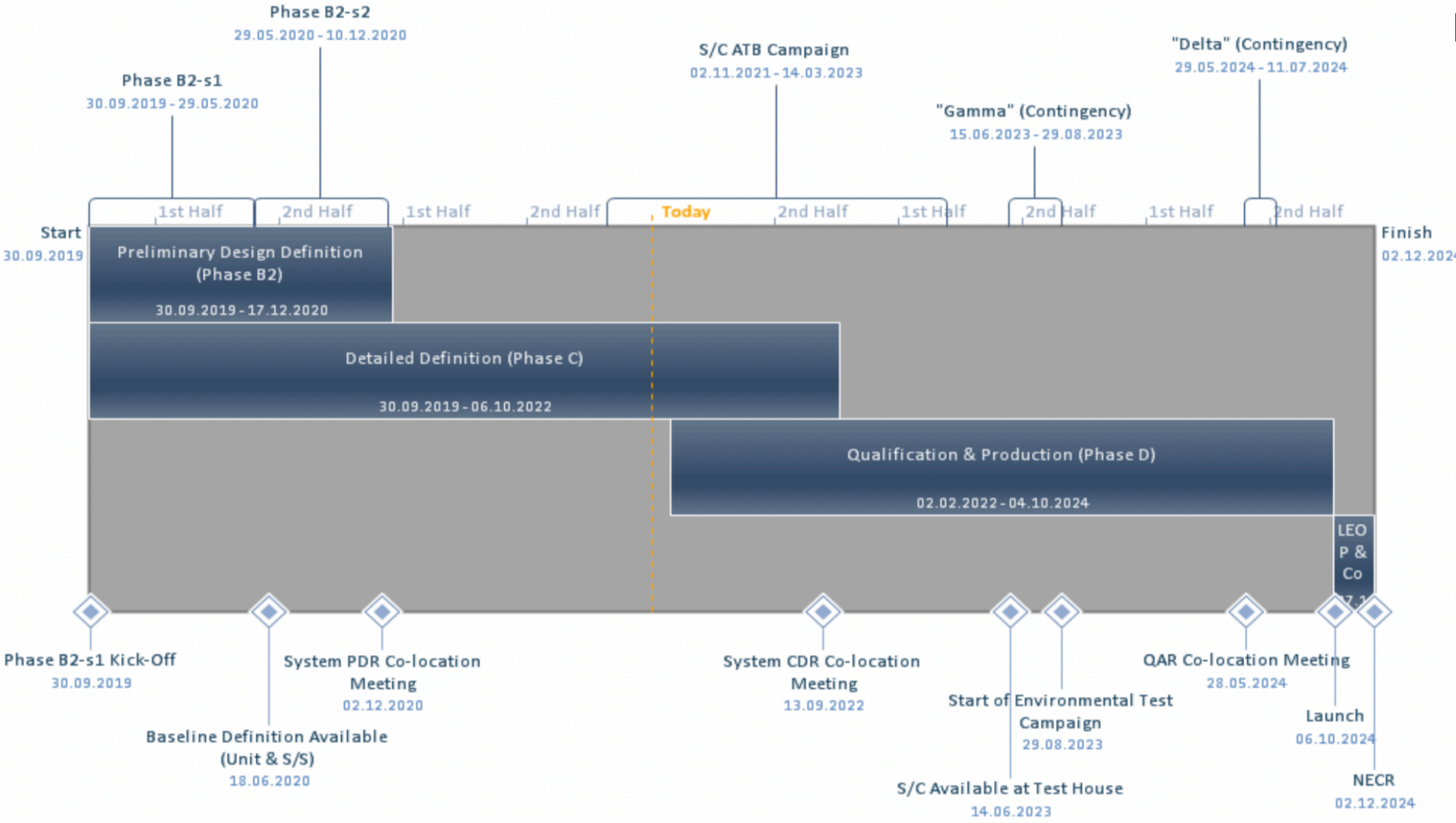
Juventas CubeSat
- Low-frequency radar
- Gravimeter
- Radioscience

Hyperscout
Multispectral snapshot imager (VNIR), FOV: 15.5°x8.3°

TIRI: Thermal InfraRed Imager
Thermal imager (8-14 µm), with filter wheel, FOV: 13.3°x10.0°

AFC: Asteroid Framing Camera(s)
Redundant visible cameras used for both GNC and science purposes, FOV: 5.5°x5.5°

Hera project schedule

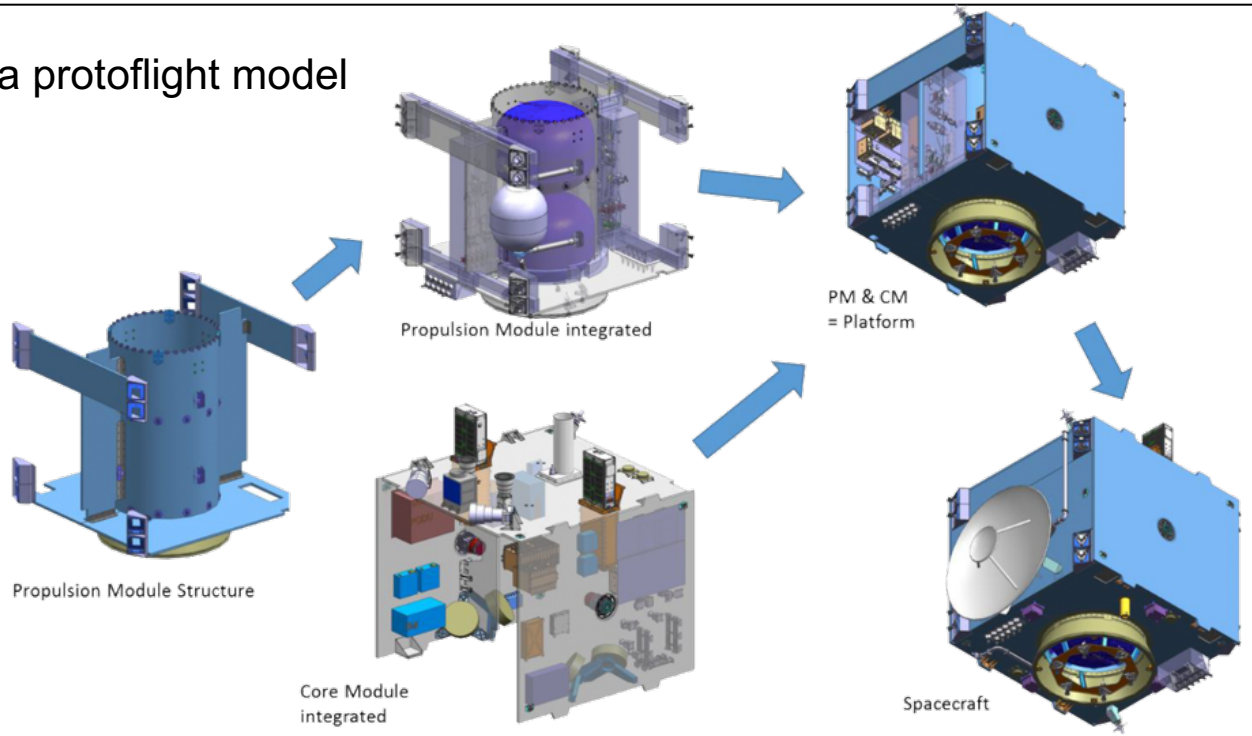


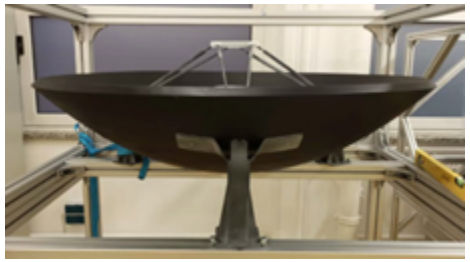
Main activities in 2022

- Completion of all s/s CDRs and sys CDR
- Complete GNC ATB integration at GMV
- Complete S/C ATB integration at OHB
- Core module PFM integration at OHB start in 2nd quarter
- Propulsion module PFM integration at AVIO start in 2nd quarter

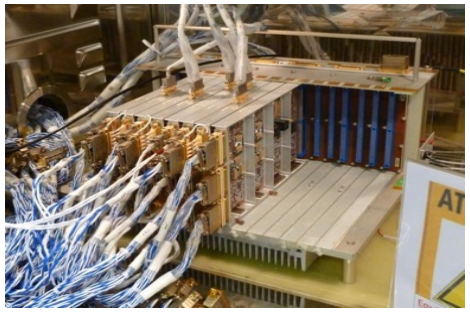
Hera spacecraft integration in 2022

Hera protoflight model

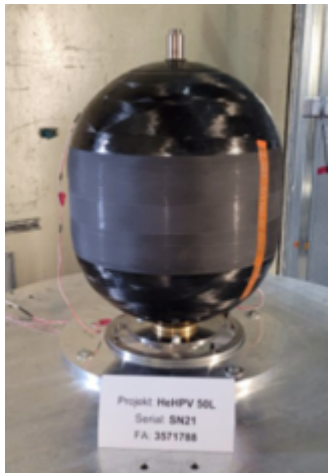




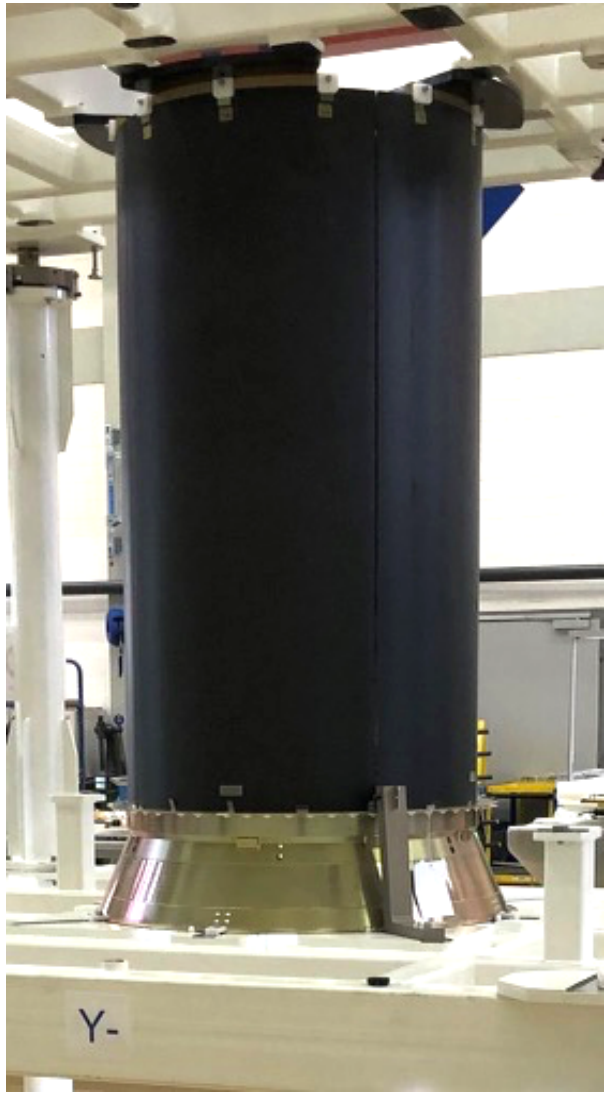
HGA SM



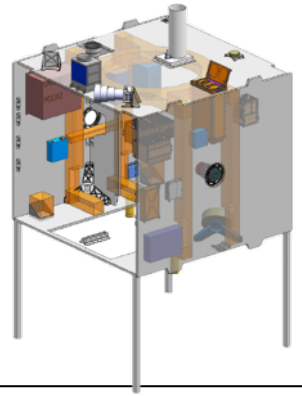
PCDU



Pressurant tank



Central tube PFM

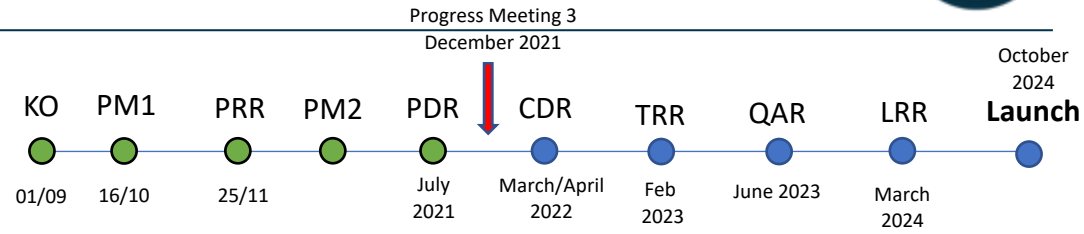


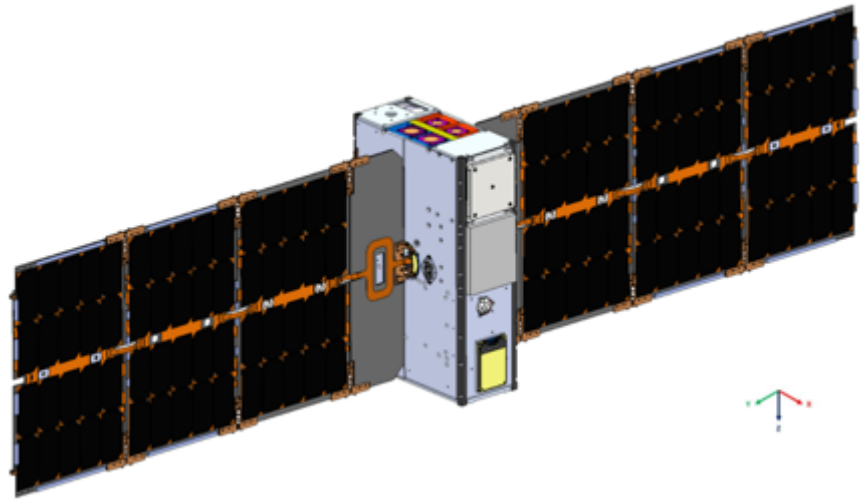
Hera avionics test bench

HERA CubeSats - MILANI

Mission Status:

- Successful System, Mission analysis and GNC PDR (July 2021)
- System CDR analysis (Mechanical and Thermal) started
- Spacecraft EM Test Bed (Flatsat) assembly on-going (all units in house).
- Structural Thermal Interface Model (STIM) specification and design on-going
- Chemical Propulsion development on-going (successful design Review in January 2022). Prototype of evaporators and fluidic on-going.

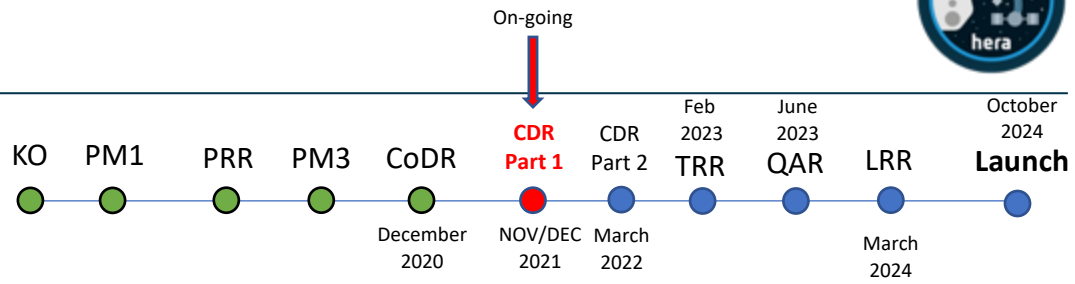




Tyvak International
A Terran Orbital Corporation

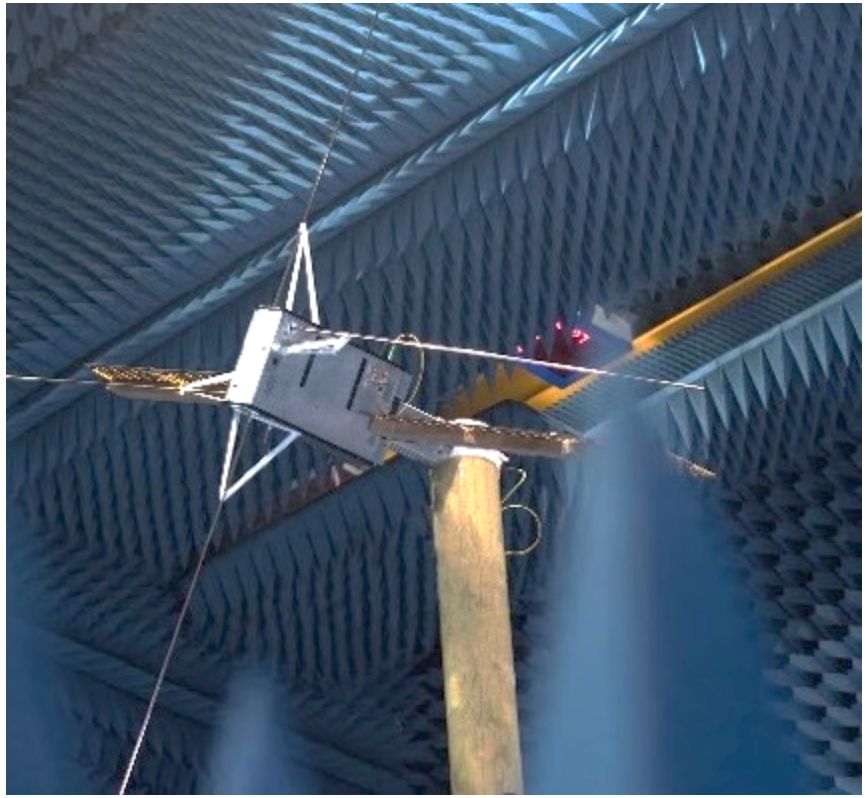
POLITECNICO MILANO 1863 · INAF · CIRA · ALTEC · Reaktor Space Lab · VTT · Finnish Meteorological Institute · huld · University of Helsinki · TECHNOLOGY FOR PROPULSION AND INNOVATION

HERA CubeSats - JUVENTAS



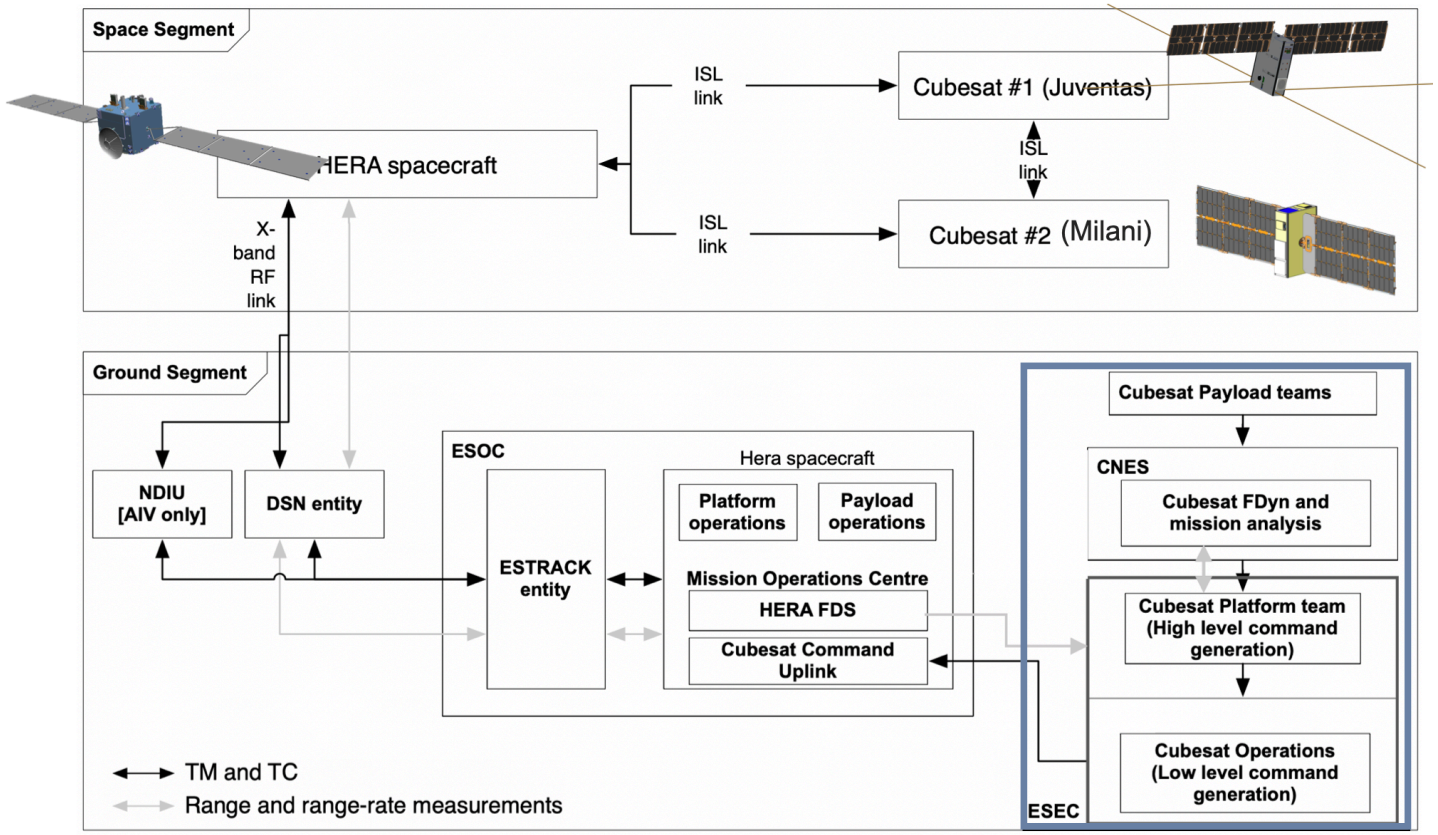
Mission Status:

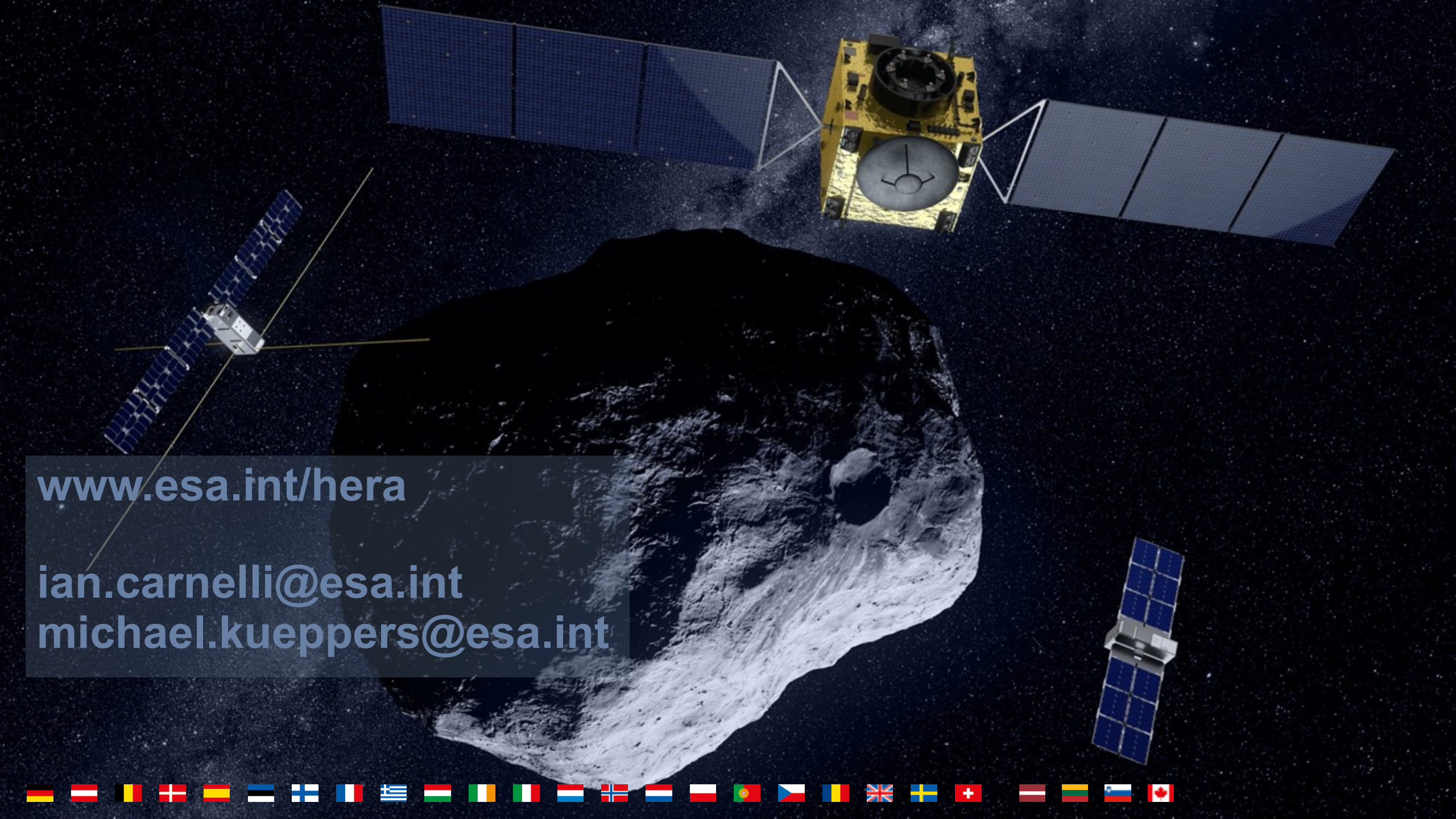
- System CDR Part 1 completed
- System CDR Part 2 (Q1 2021) - Review focus on mission operations, software, test procedures, subsystems qualification
- Successful GNC CDR – November 2021
- Successful GRASS (Gravimeter) CDR – November 2021
- JURA (Low Frequency Radar Instrument) CDR ongoing.
- LFR Testing at ESTEC Hertz facility completed
- On-going qualification of the LFR antennas deployment mechanism. Vibration test passed including shock
- On-going Heavy Ion Testing for PCDU / OBDH and Battery selected EEE parts



Ground Segment development

- H-MOC development: PDR ongoing, spacecraft simulator under procurement. OPS team ramping up in 2022.
- C-MOC: RFQ sent to industry, industrial proposal due in Feb 2022





www.esa.int/hera

ian.carnelli@esa.int
michael.kueppers@esa.int