# The SMART-1 Mission – By Sun power to the Moon

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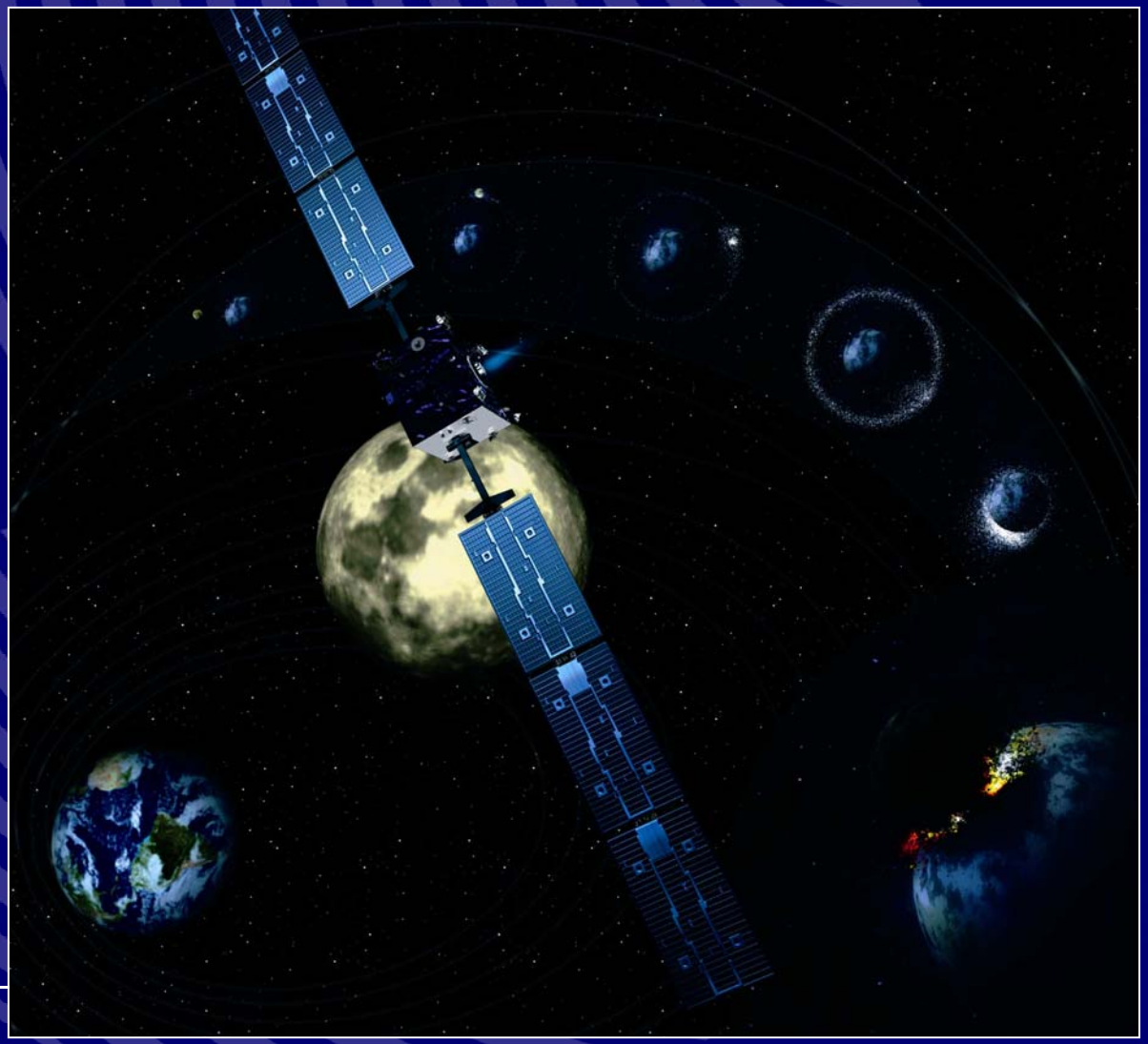
SMART-1 Project Manager



3rd April 2003

# A brief history of planetary exploration

## 1st STEP

- 1959 Luna 1 Soviet Union
  First successful planetary mission: lunar flyby

- 1959 Pioneer 4 United States
  First American planetary mission: lunar flyby

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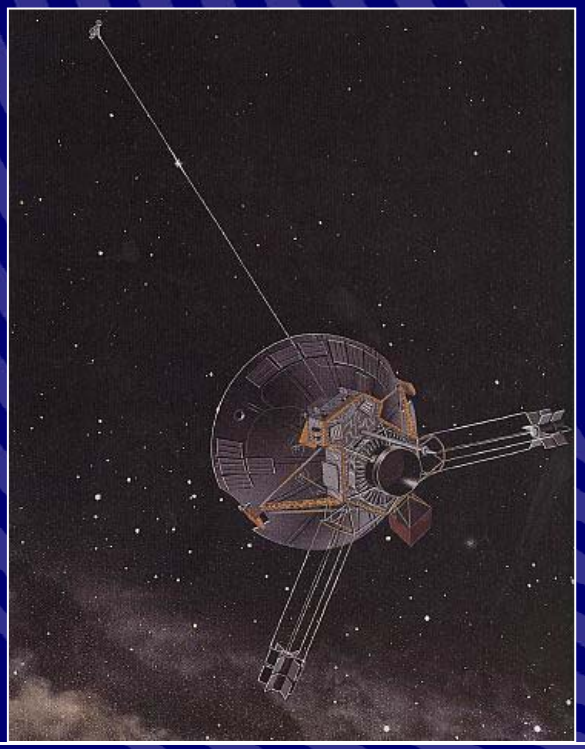
# A brief history of planetary exploration

## 2nd STEP

- 1973 Mariner 10 United States
  First spacecraft to use Gravity assist (Venus)



- 1973 Pioneer 10 United States
  First spacecraft to Outer Solar System (Jupiter)

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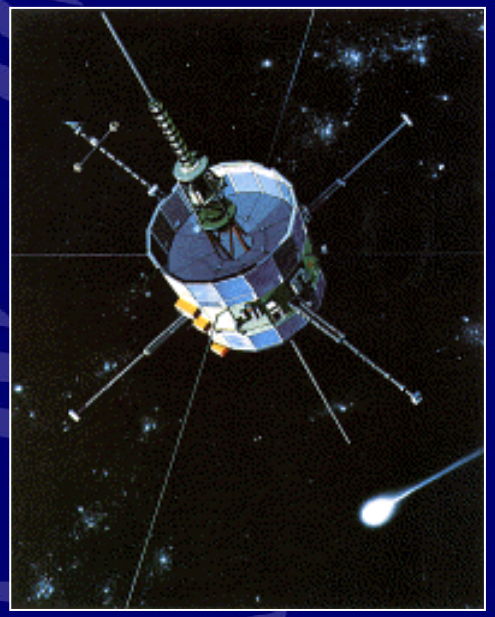
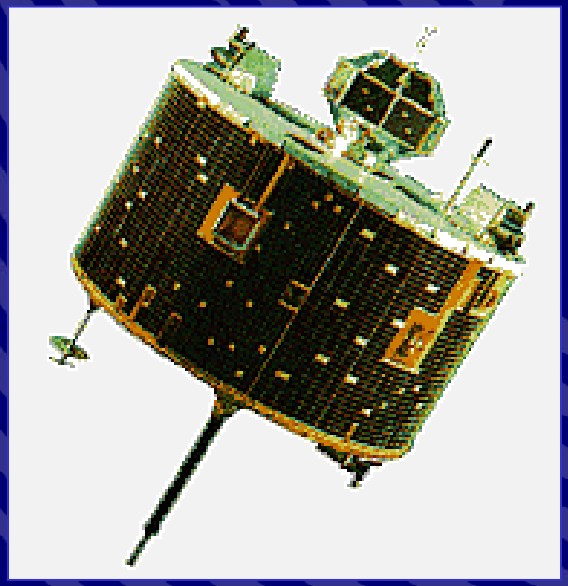
# A brief history of planetary exploration

## 3rd STEP

•1978 ISEE-3 United States
First mission to use instabilities Earth-Sun-S/C





•1990 Hiten Japan
First mission to use weak stability boundaries (Moon flyby)

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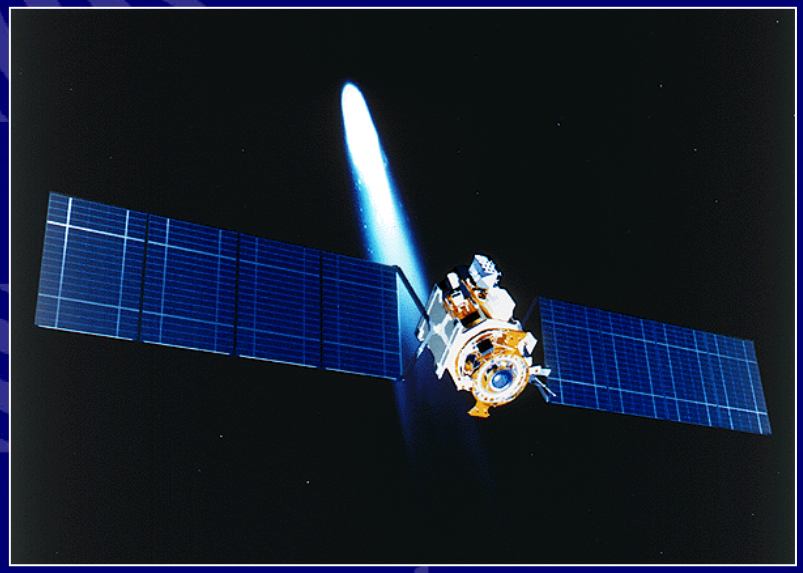
# A brief history of planetary exploration

## 4th STEP



•1998 Deep Space 1 United States
First mission to use Electric Primary Propulsion

•2003 SMART-1 European Space Agency
First mission to combine electric primary propulsion with lunar gravity assists and use dynamic instabilities

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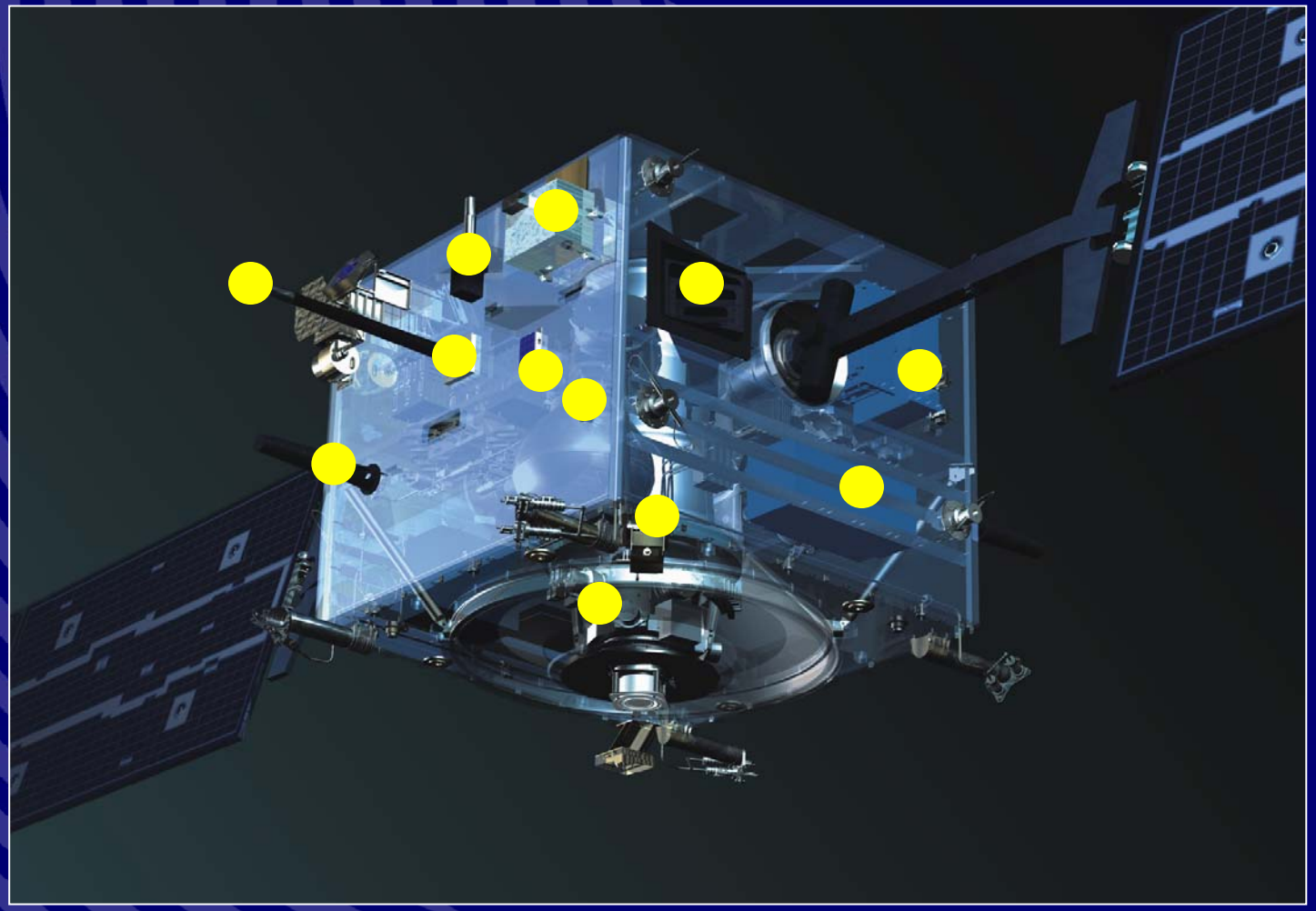
# The Spacecraft technologies

365 kg mass

1 cubic metre

14 m wings

2 kW power



- [illegible] mechanism
  (to maintain thruster pointing as fuel tanks drain)

# SMART-1 Challenges

- Extremely low cost for a planetary mission: about 100 million Euro
- Three years development programme, including technology development
  - Electric Propulsion Adaptation

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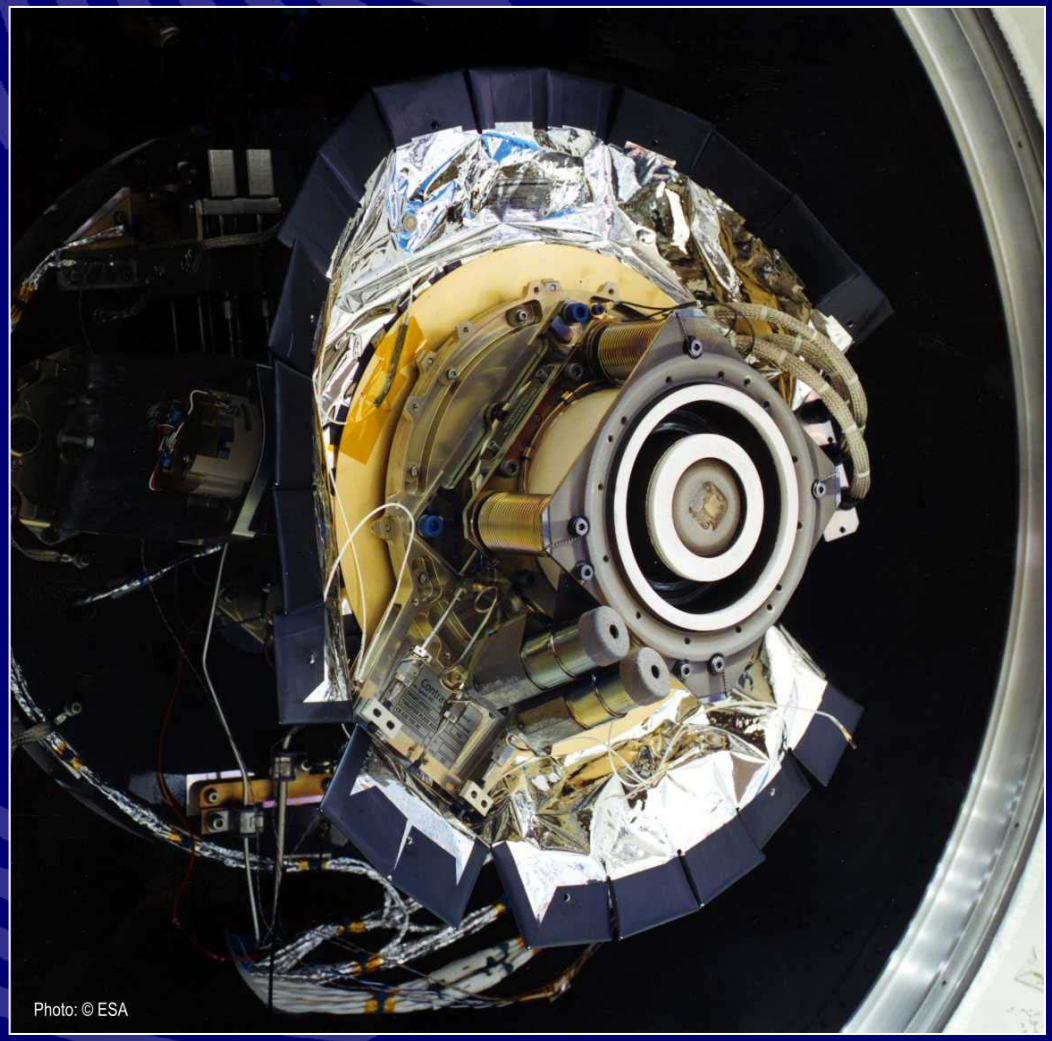
# SMART-1 Electric Propulsion System

- PPS1350 Plasma Thruster by SNECMA (F)
- Xe gas propellant (82 kg)
- Thrust 70 milli-Newton

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# SMART-1 Challenges

- Extremely low cost for a planetary mission: about 100 million Euro
- Three years development programme, including technology development
  - Electric Propulsion Adaptation
  - Avionics is a state-of-the art technology
  - Low mass – low volume – high performance

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# Avionics

## Main on-board computer

## Standard data interface: CAN

# SMART-1 Challenges

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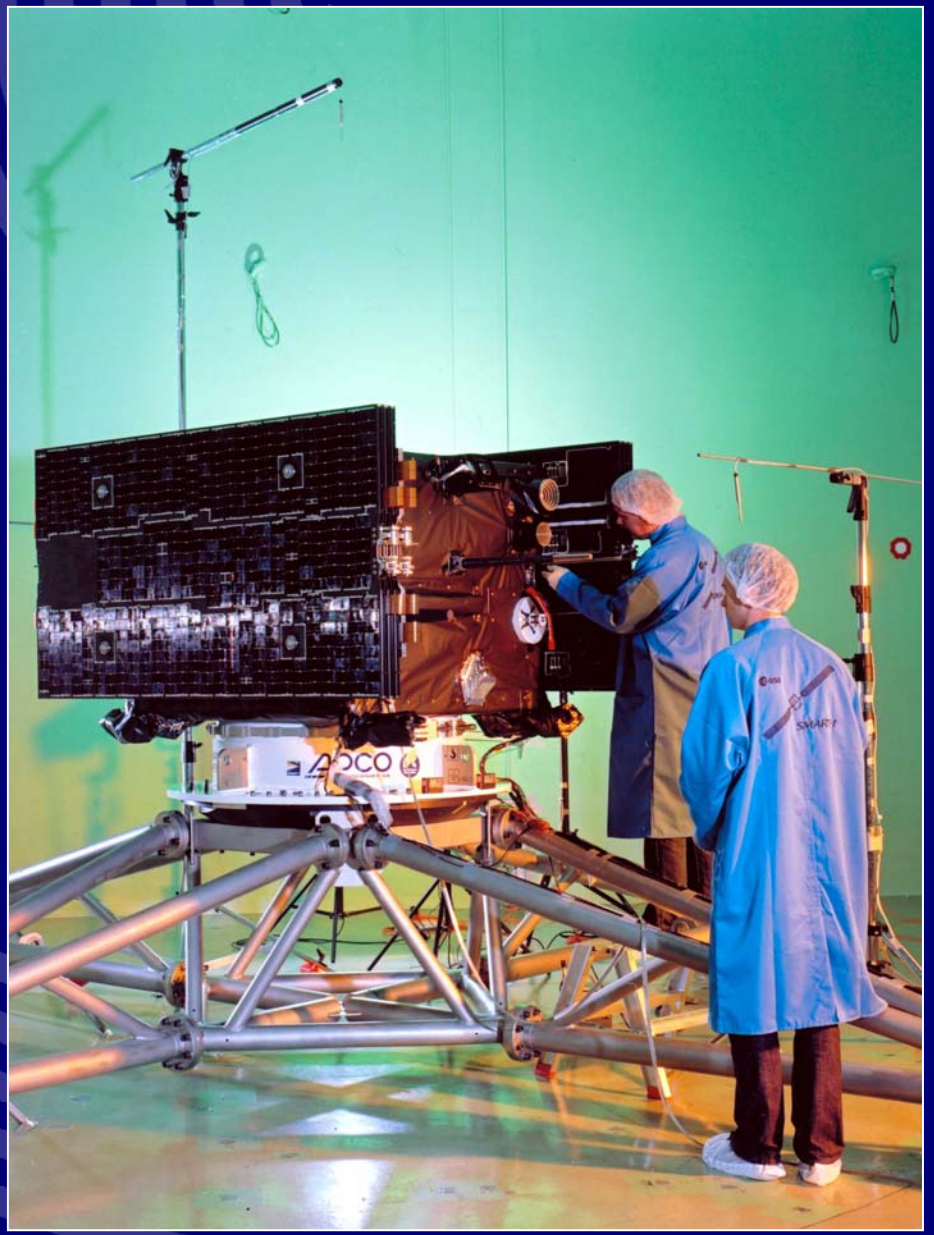
- Complete verification test campaign

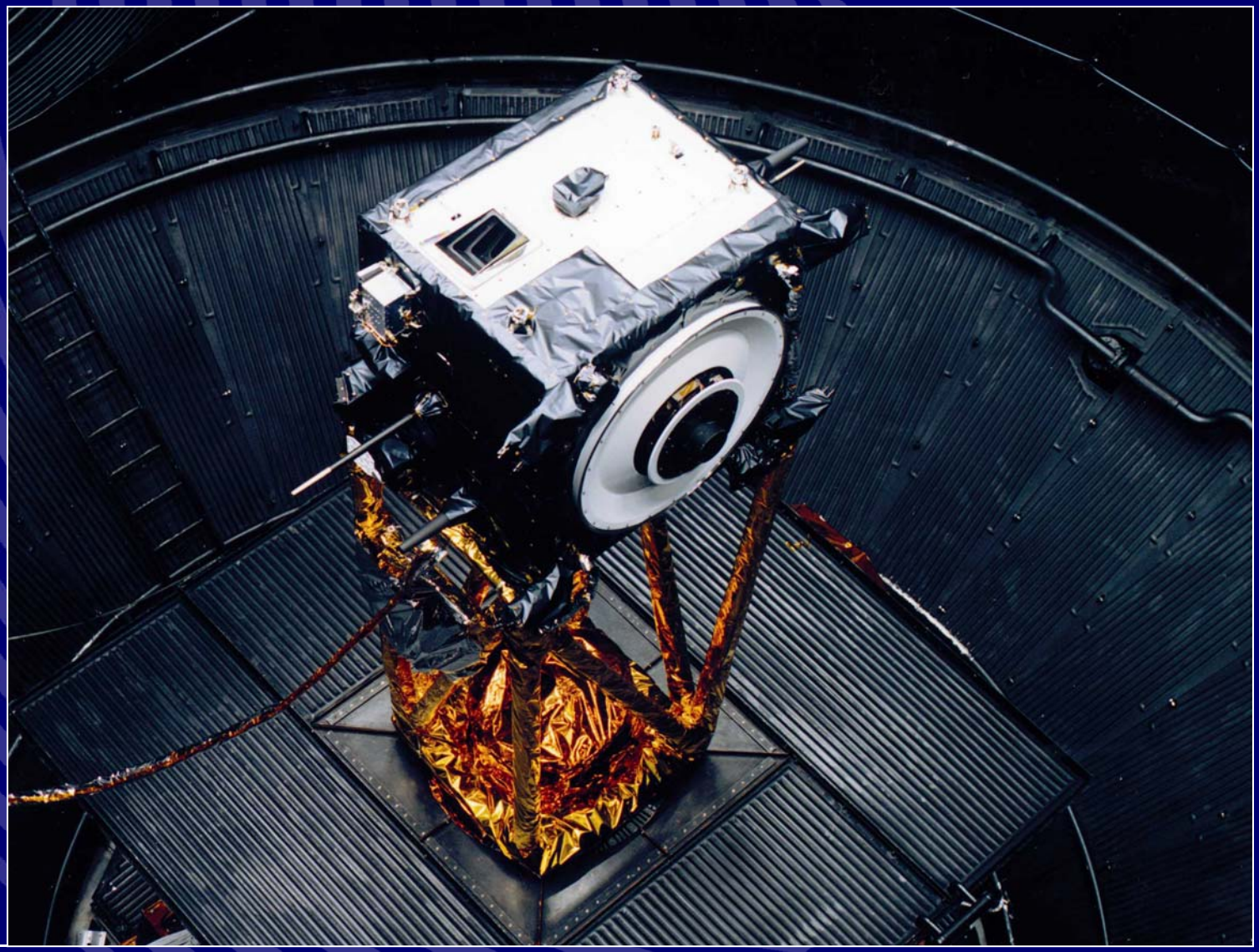
# Acoustic Test

Mechanical Verification:

- Sine test
- Acoustic Test
- Mass Properties



# Solar Simulation Test



# SMART-1 Challenges

- Extremely low cost for a planetary mission: about 100 million Euro
- Three years development programme, including technology development
  - Avionics is a state-of-the art technology
  - Low mass – low volume – high performance
- Complete verification test campaign
- The new technologies tested at system level on ground:
  - Complete end-to-end test of the electric propulsion thrusting operations

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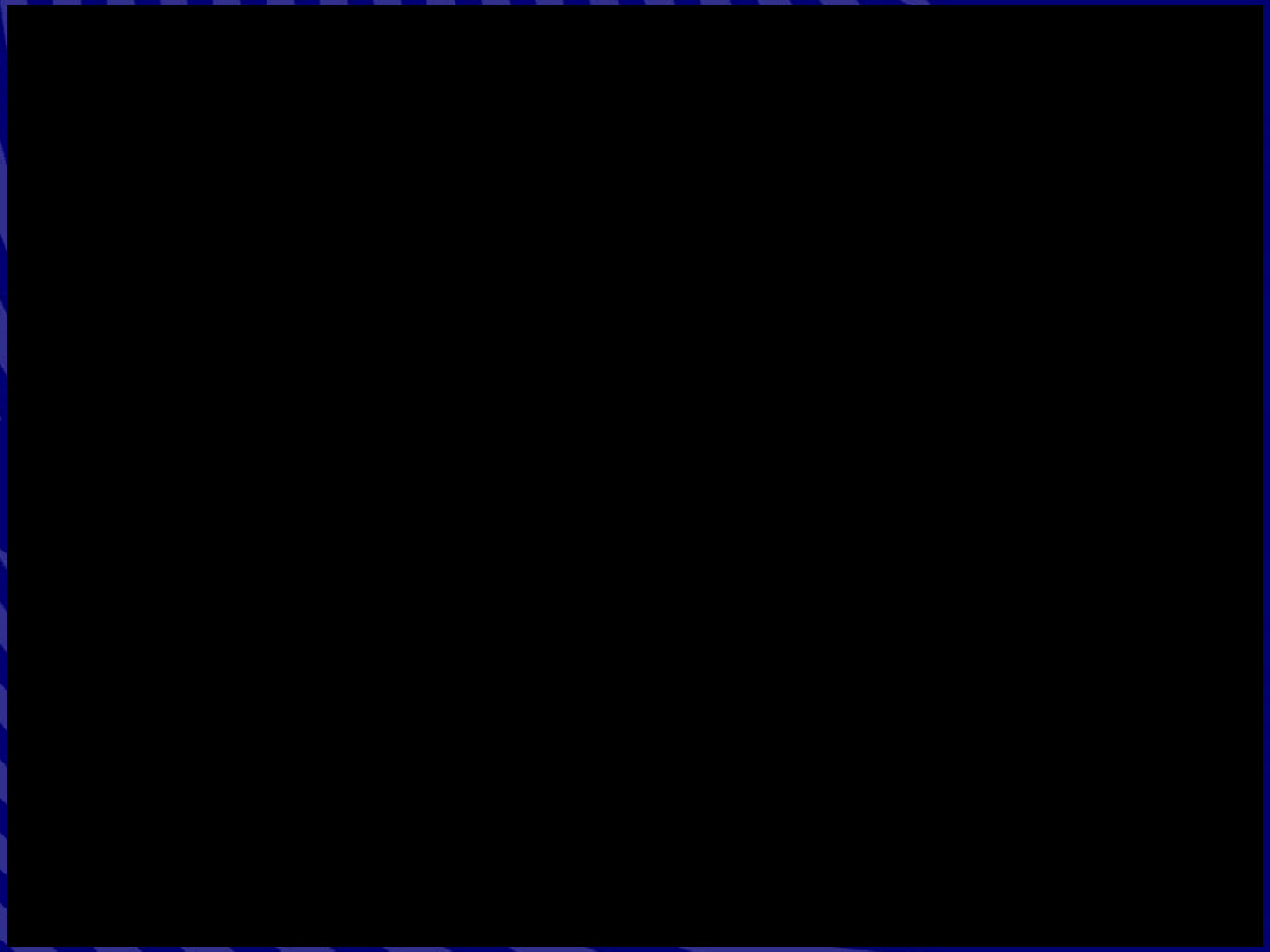
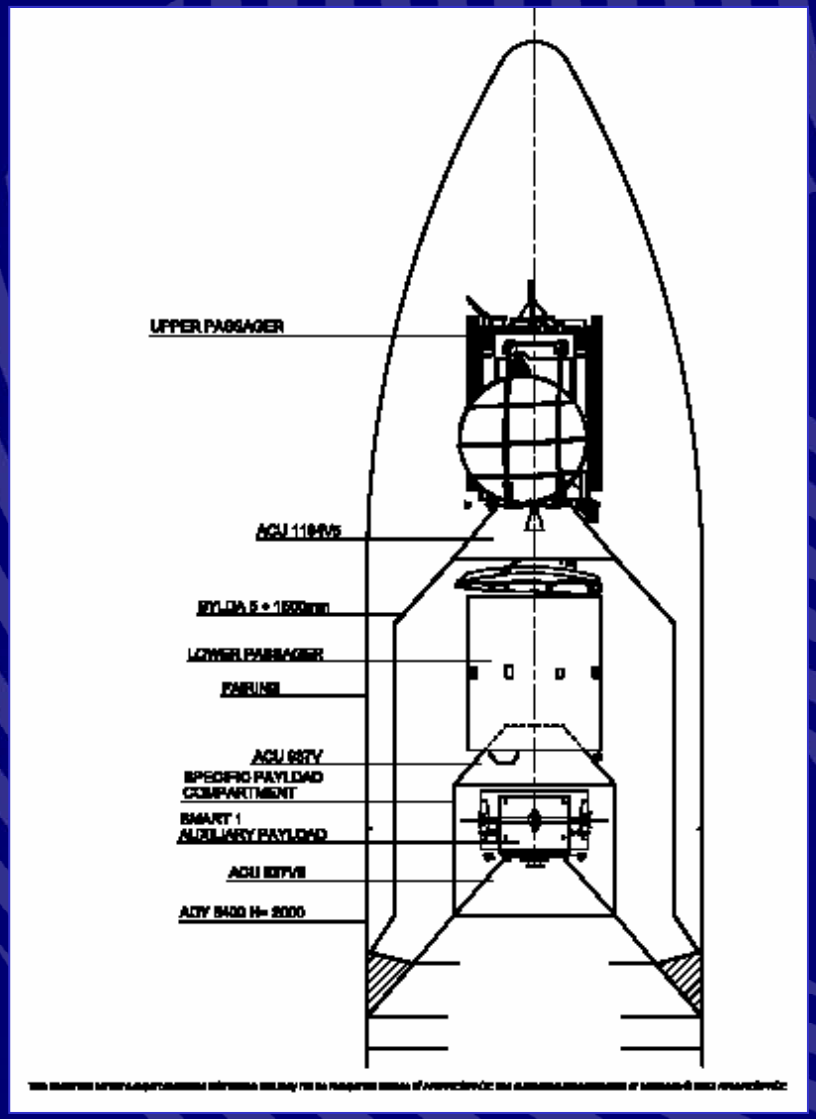
# Electric Propulsion End-to-end Test



# Present Status

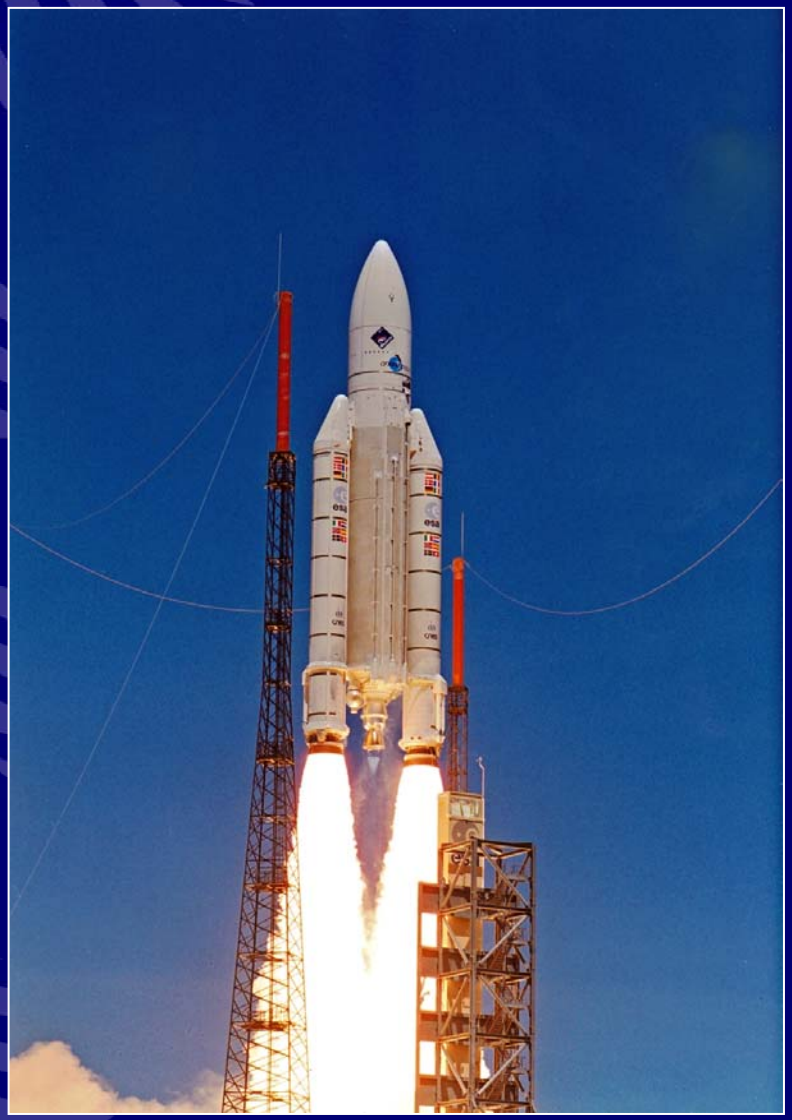



- SPC approval November 1999
- Test campaign on FM terminated at the beginning of 2003
- Operations preparation at ESOC
- Auxiliary payload of Ariane 5 launch into standard telecom sat orbit

As a third lower passenger

# Ariane 5 Launch

- Spacecraft storage until end May
- Shipment to French Guyana in mid June
- Launch expected end July 2003



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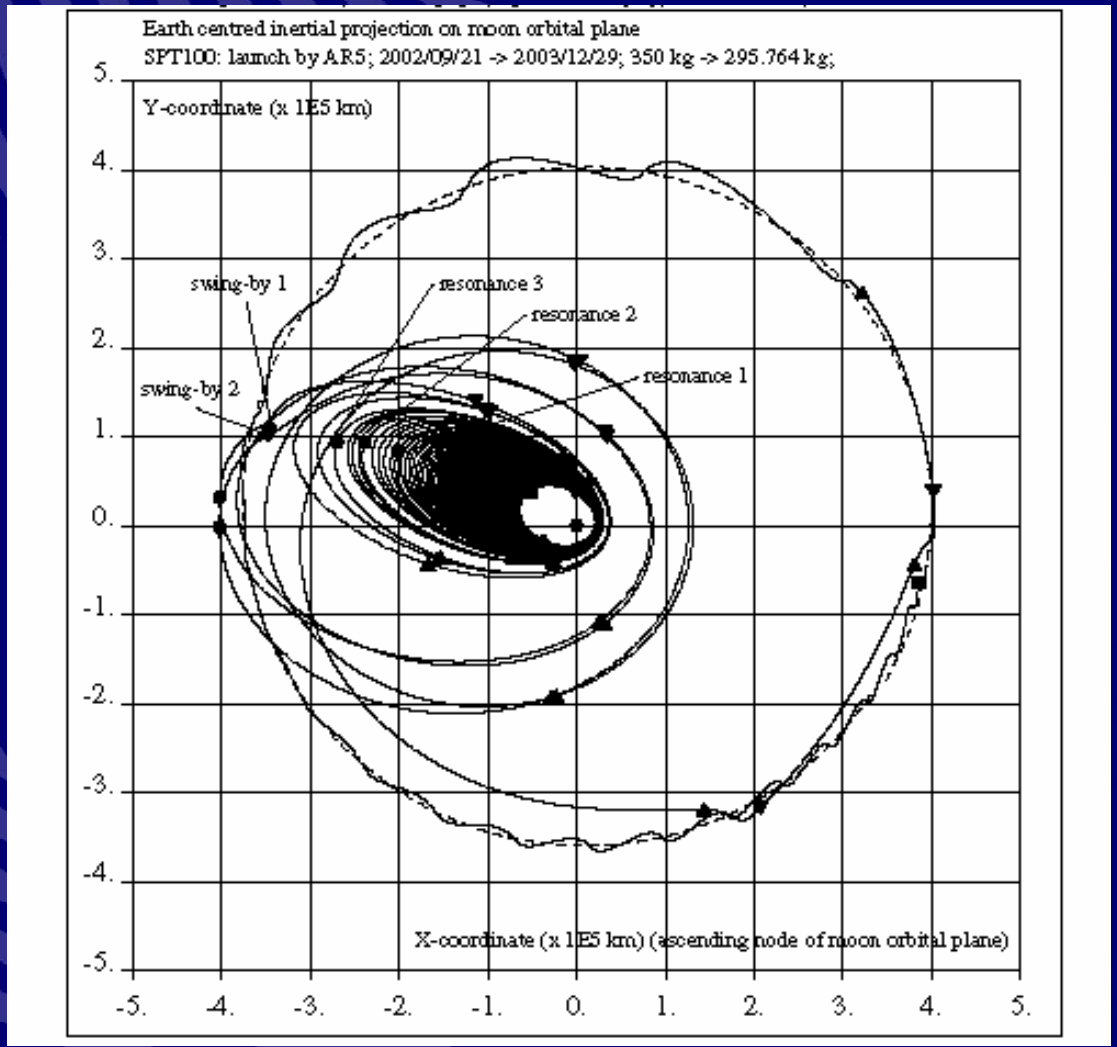
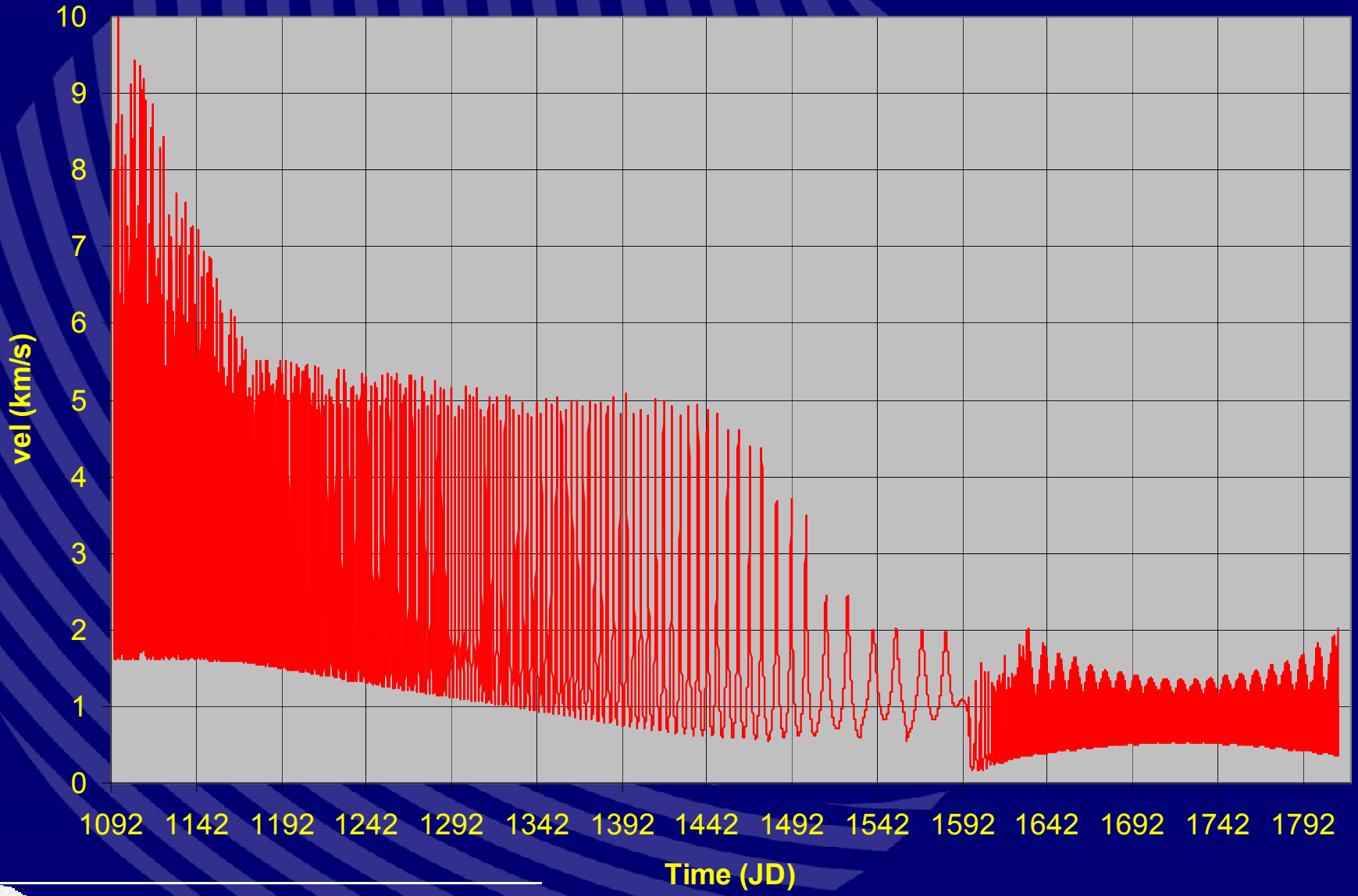
# The long journey to the Moon

- Launch separation
- Earth spiralling
- Laser link
- Autonomous navigation
- Lunar Resonances
- Lunar Swingby
- Lunar Capture
- Lunar Orbit
- Lunar observation



# The long journey to the Moon

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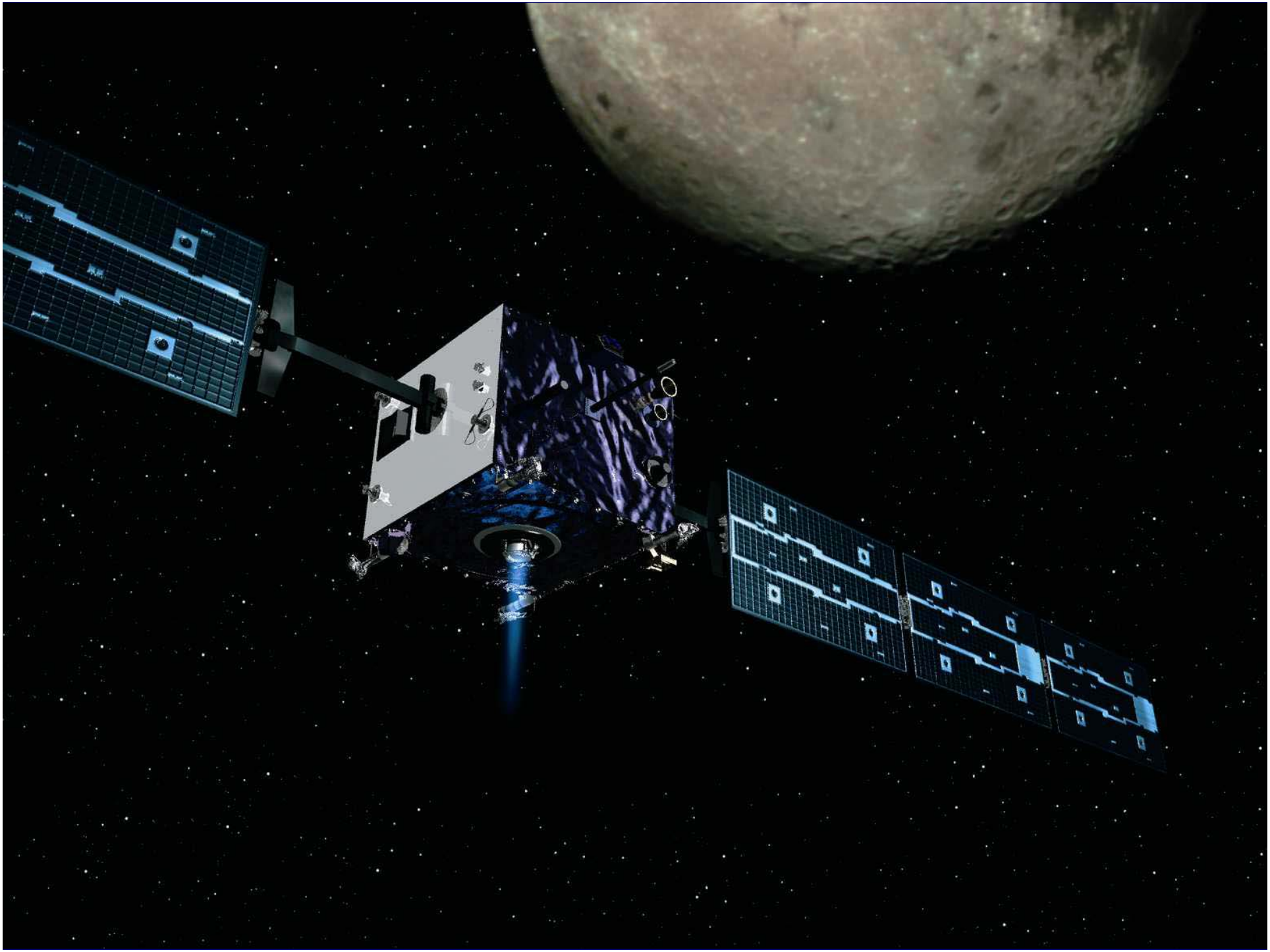

# The ESA and industry core team