

# DESTINY+

Demonstration and  
Experiment of

Space

Technology for  
INterplanetary  
voYage

with

Phaethon  
fLyby and  
dUst Science

- ★ Technology demonstration & science observation.
- ★ Engineering mission is led by ISAS\_JAXA.
- ★ Science mission is led by Chiba Inst. of Technology.
- ★ International collaboration with DLR for Dust Analyzer.

2015: Proposal submitted

2016: MDR, ΔMDR

2017: Selected !

2018-19: Phase-A study

2020: SRR, RFP, SDR

2021: JAXA project approved, PDR

2022: CDR

2024: Launch

2028: Phaethon flyby

## Engineering Goals

- Expand the range of applications for electric propulsion
- Acquire advanced flyby exploration technologies

## Science Goals

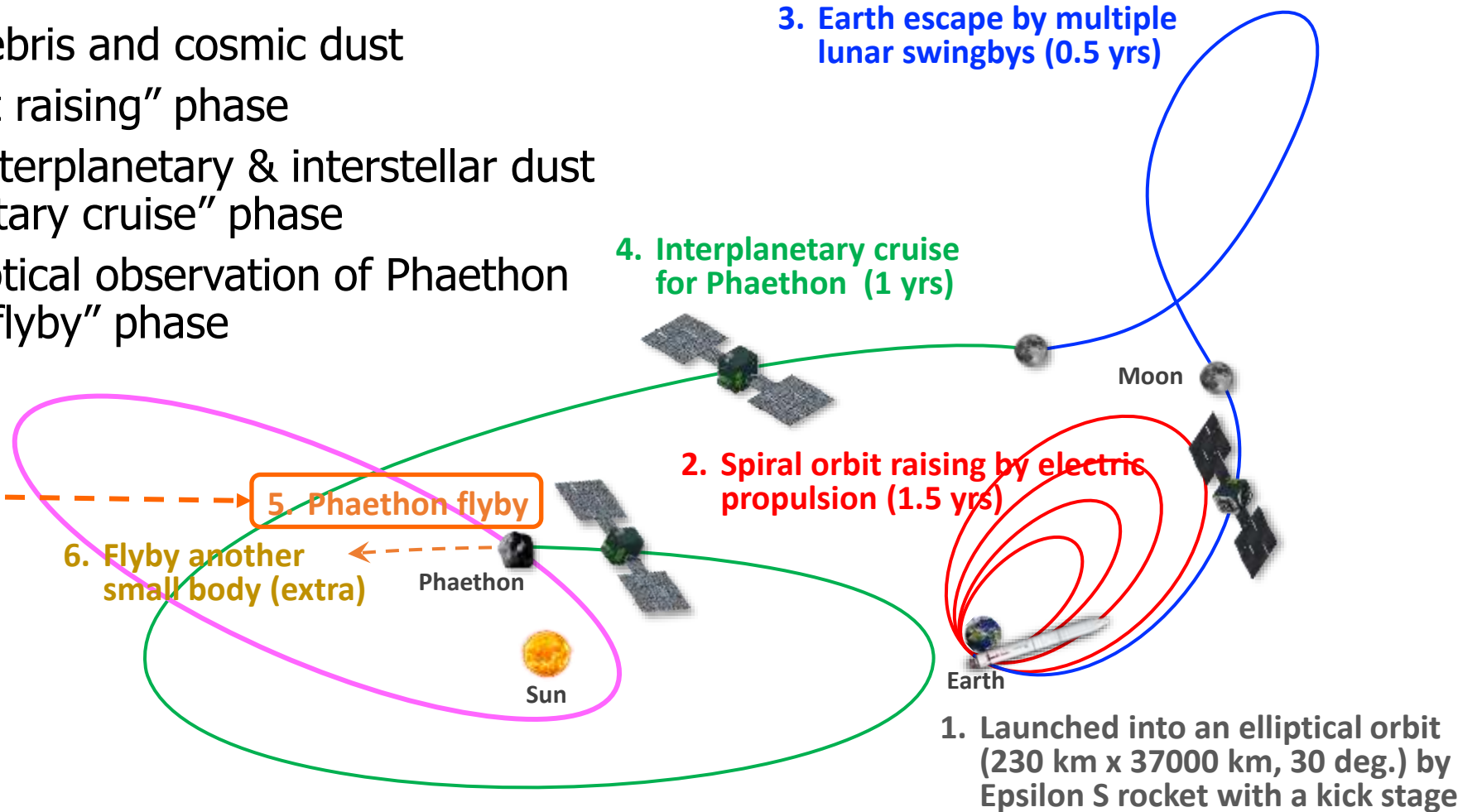
- Characterize cosmic dust en route to Earth (before atmospheric entry)
- Understand geology of Phaethon, Geminids parent and active asteroid

# Mission Profiles and Scenarios

## Science activities

- In-situ analyses of debris and cosmic dust during "2. Spiral orbit raising" phase
- In-situ analyses of Interplanetary & interstellar dust during "4. Interplanetary cruise" phase
- Dust analyses and optical observation of Phaethon during "5. Phaethon flyby" phase

Phaethon flyby point:  
 Geocentric distance: 0.33 au  
 Heliocentric distance: 0.91 au  
 Flyby speed: 36 km/sec



# Science goals and objectives

Science goals	Science objectives
1. Characterize dust en route to Earth (before atmospheric entry)	a. Determine mass, speed, arrival direction, and chemical composition of IDPs around 1 au to constrain their origin: asteroidal or cometary.
	b. Determine chemical composition (esp. organics) of interstellar dust around 1 au.
	c. Determine chemical composition of dust from <b>Geminids-parent</b> Phaethon and the dust trail.
2. Understand geology of Phaethon : <b>Geminids parent</b> and <b>active asteroids</b>	d. Constrain dust ejection mechanism from <b>active asteroids</b> .
	e. Understand global surface material distribution.

# Science objectives and payloads

## Phaethon imaging

★ Developed by PERC, Chiba Inst of Technology

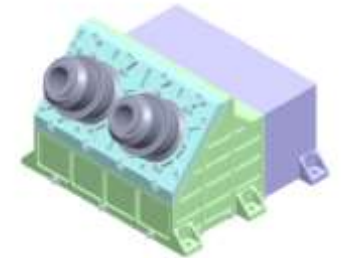
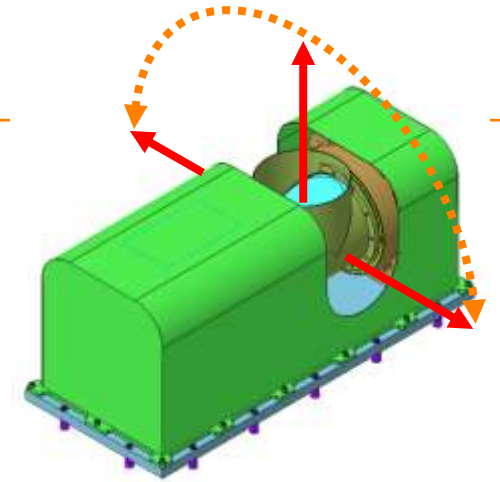
3D shape

Surface geology <10 m/pix

VIS-NIR spectral variation  
<100 m/pix

Telescopic CAmera  
for Phaethon (TCAP)

Multiband CAmera  
for Phaethon (MCAP)



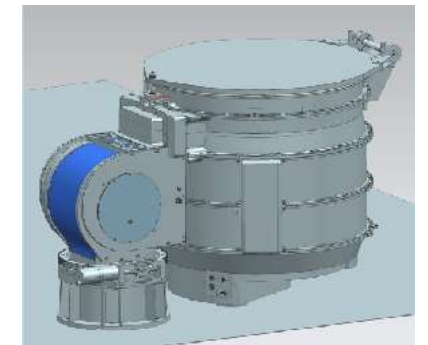
## Dust analyses

★ Developed by Univ. of Stuttgart

Physical & Chemical properties of  
IDPs and interstellar dust

Physical & chemical properties of  
nearby Phaethon & dust trails

DESTINY+ Dust  
Analyzer (DDA)



# Flyby imaging sequence

- 5 days prior to flyby, optical navigation starts with TCAP images.
- By 7.5 hr before the closest flyby, trajectory correction maneuver is complete, autonomous maneuver starts.

