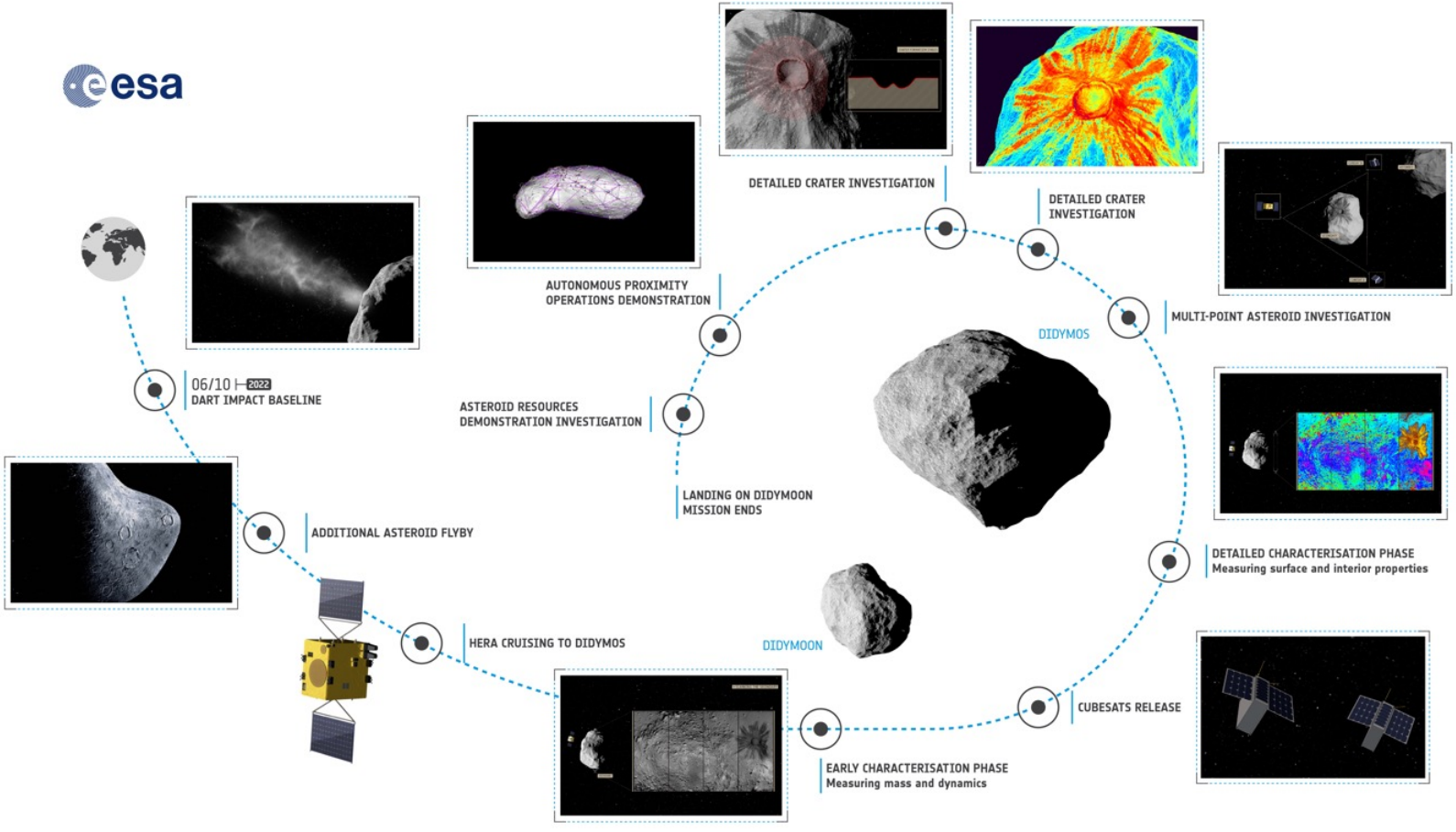
HERA autonomous GNC functionalities and additional opportunities

INNOVATING SOLUTIONS

AGENDA

1. HERA mission phases
2. Close proximity operations
3. Vision Based HERA GNC
4. Image Processing & Navigation
5. Conclusions

HERA Mission Phases



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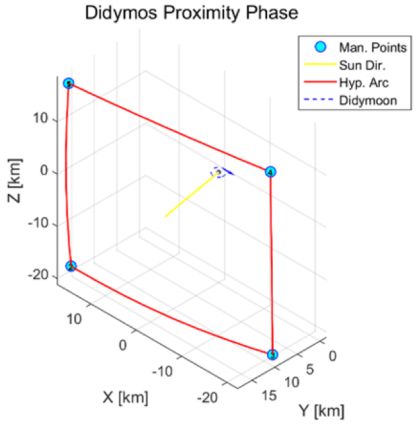
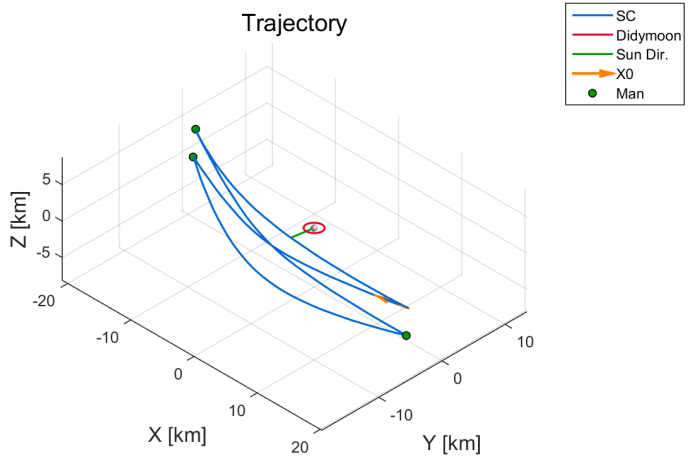
Close proximity operations

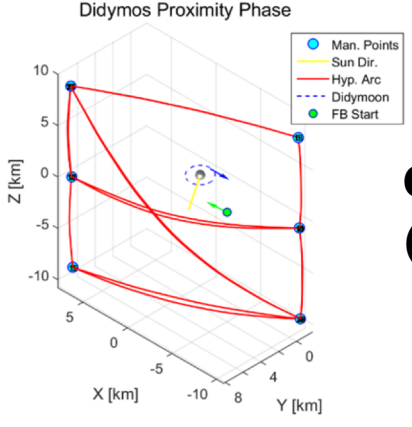
Early
Characterization
Phase
(@35 km)



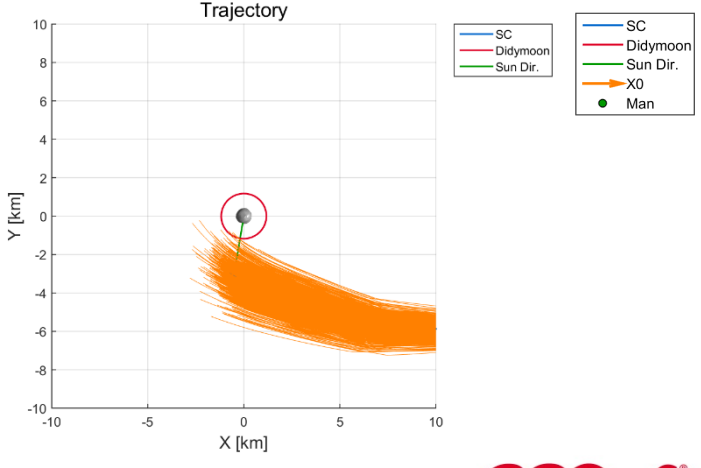
DCP3
(@6 km)



Detailed
Characterization
Phase
(@10 km)



Close Fly-by
(@1 km)

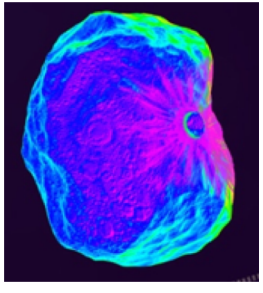


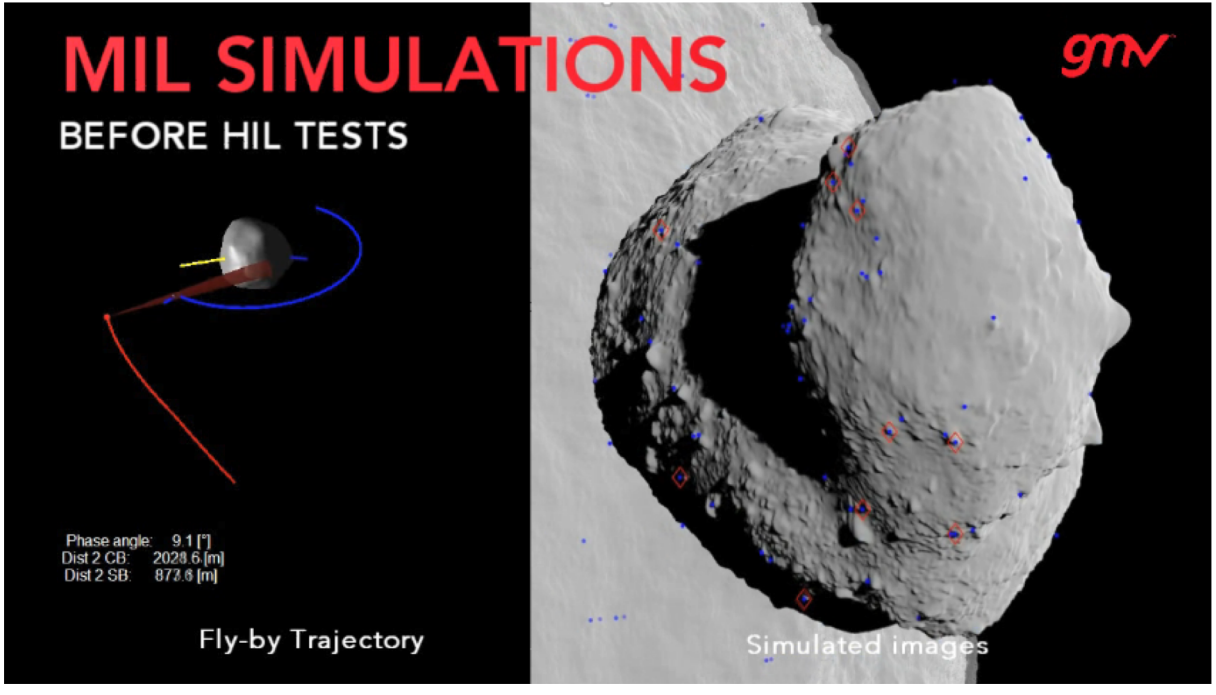
Close proximity operations

Close Fly-by

(@ Few hundred meters from Didymoon)

- High res imaging
- Radio science
- CubeSat bouncing



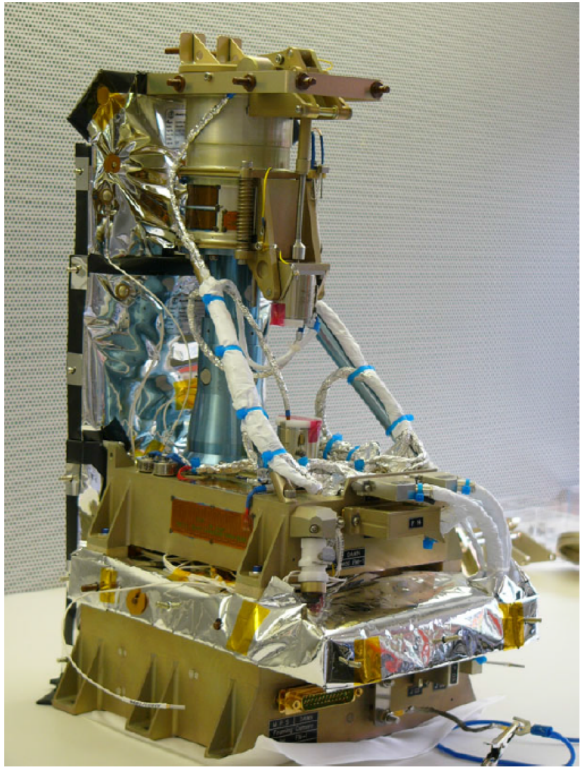


Vision based HERA GNC

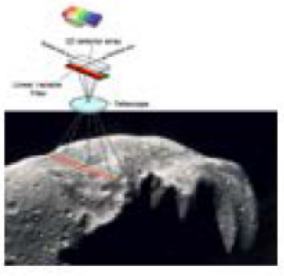
- **AFC** used and payload and navigation sensor
- **The HERA GNC subsystem** is design to work with the AFC as baseline, but data fusion with other payloads is an option to be safer…

  … and get closer!
- **The key is the Navigation** and it needs measurements.

Asteroid **F**raming **C**amera



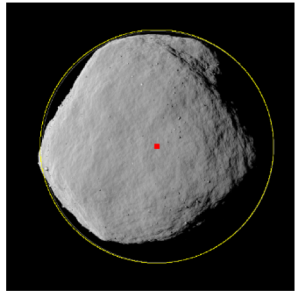
CHITY

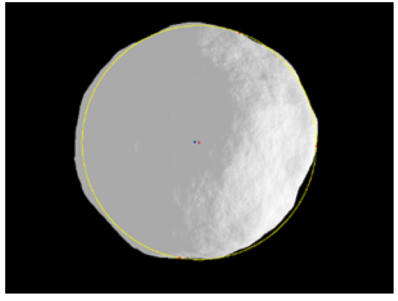


PALT

Image Processing & Navigation

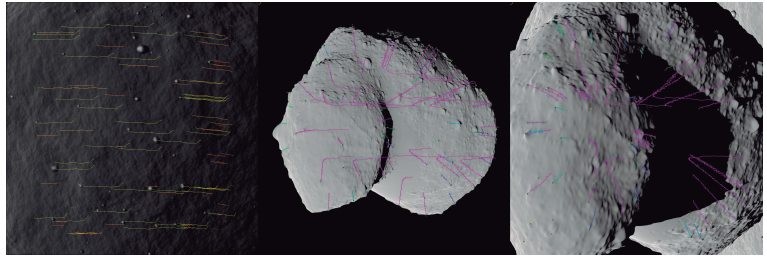
- **Centroiding algorithms using AFC**
- **Centroiding algorithms using CHITY**
- **Feature tracking**





These IP algorithms allow for:

- autonomous and semi-autonomous attitude guidance
- On-board navigation
- Autonomous manoeuvres

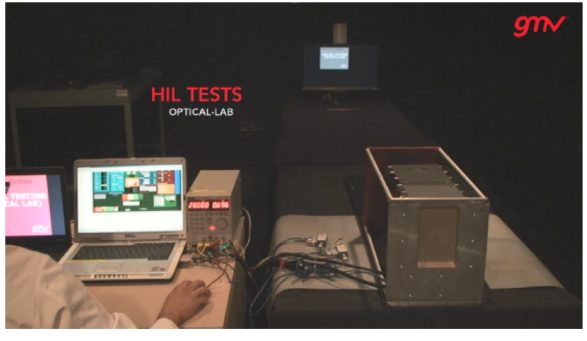


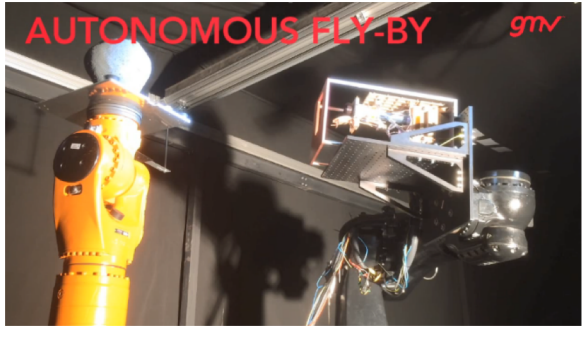
Summary and Conclusions

Why do we need an autonomous GNC?

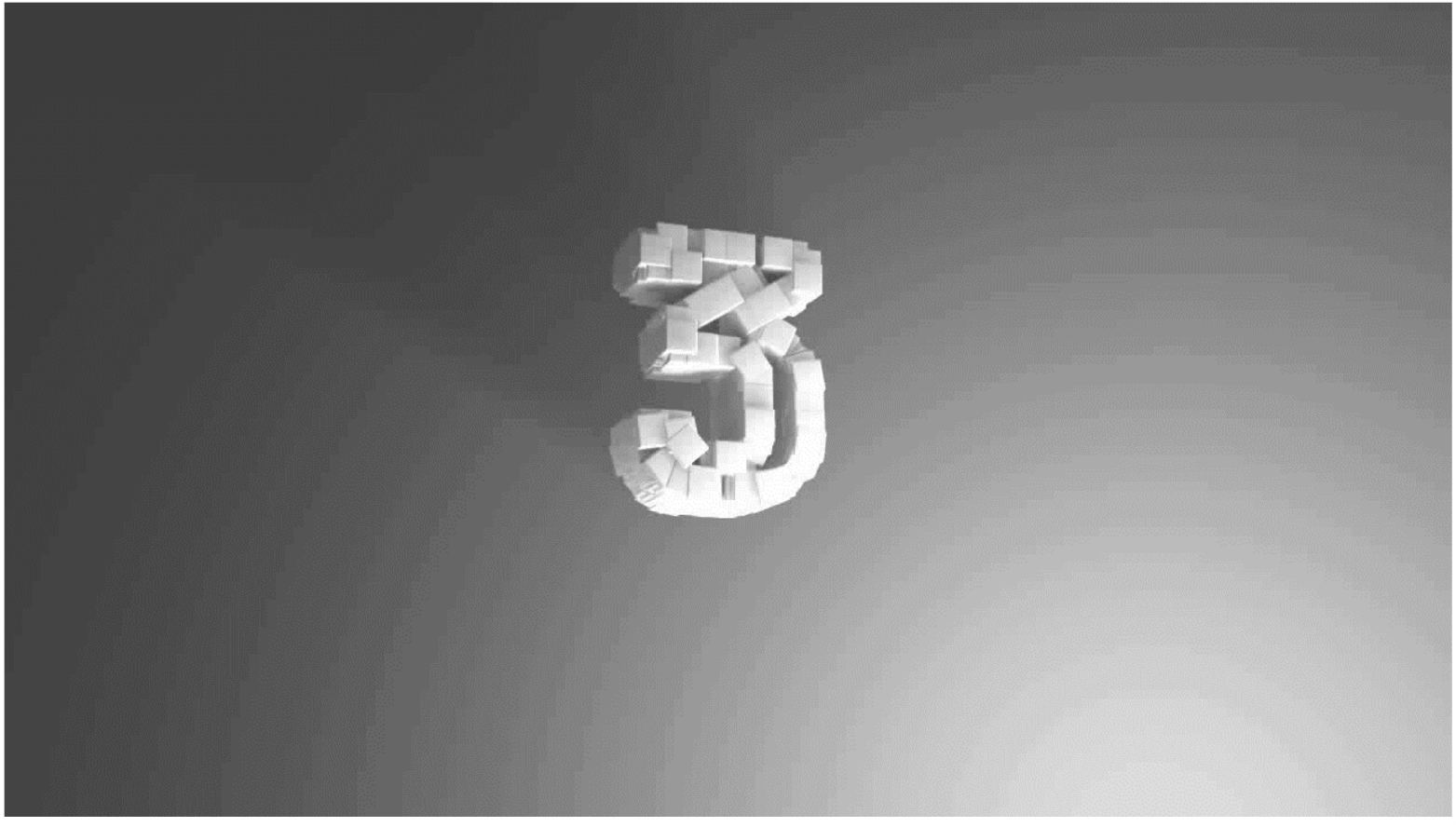
- get closer to the surface
- be intrinsically safe
- extract more science from Hera
- enable future applications (e.g. in-orbit servicing, ISRU)

Autonomy is a key feature, a driver for space exploration in order to achieve more and more ambitious goals.





HIL tests with the AFC



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THANK YOU

The HERA GNC team

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