



Clean Space Industrial Days

# e.Deorbit and Space Servicing Vehicle

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What have we done since the last Clean Space Industry Days?

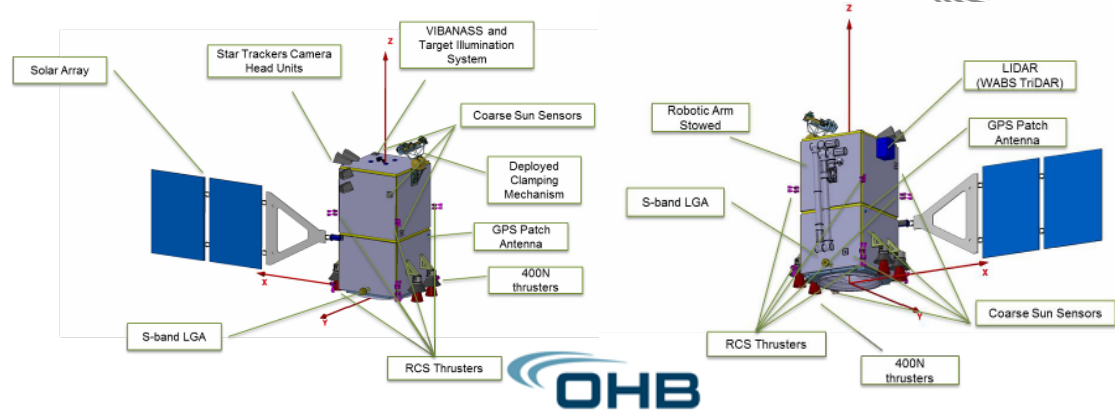
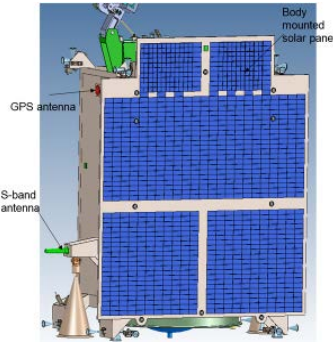
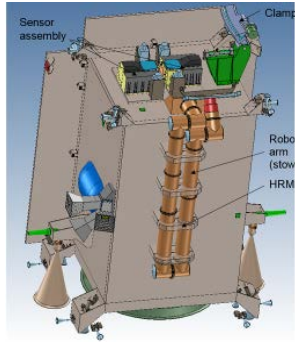
What is now the long term plan? -> Space Servicing Vehicle

What is the short term plan? -> CDF study, GSTP compendium

## What have we done since the last Clean Space Industry Days?

1. Finished phase B1
  - See next presentation
  - Decision to hold iSRR instead of SRR
2. Prepared Consolidation phase and released ITT
3. Prepared GSTP compendium on Maturation Phase
4. External presentations
5. Other ADR activities

# e.Deorbit - Phase B1

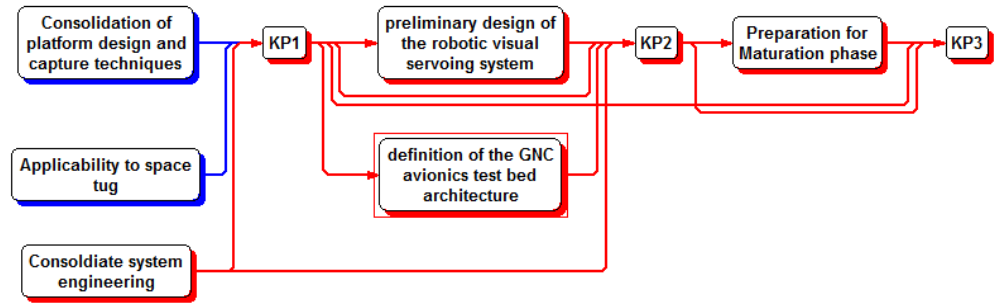


- Compact design. Minimization of deployed panels etc.
- Dry mass: 800-900 kg. Wet mass: 1.7t
- Propulsion system consisting of main engines and RCS engines
- Robotic arm stowed on side panel during launch
- Instruments (LIDAR, wide angle cameras, narrow angle cameras) placed on top panel
- Clamping mechanism placed on top panel
- iSRR completed in January 2017. Absence of programmatic documents -> 'i'SRR

# e.Deorbit - Consolidation Phase

1. Bridges phase B1 & B2 (consolidate system engineering)
2. Actions stemming from iSRR
  - Consolidate platform design
  - Robotics visual servoing system / compliant controller
  - GNC avionics architecture definition
  - Cost update
3. First bridge to space tug based ADR mission

- ITT released May 2017
- Bids Received by August
- TEB held in September
- Negotiation phase October



# e.Deorbit - Maturation Phase



- E.Deorbit not presented as new mission during MC 2016



- Instead GSTP compendium created for a technology development programme, driven by a system study

## Proposal Content – 4 Parallel Contracts (41 M€)

### System Study

Preliminary Definition Phase (Phase B)  
13.5 M€

### Requirements

### Technology Developments

GNC for ADR developments to TRL6  
10 M€

Robotic developments to TRL 6  
11.5 M€

Net development with sounding rocket test TRL6  
6 M€



# e.Deorbit - External presentations

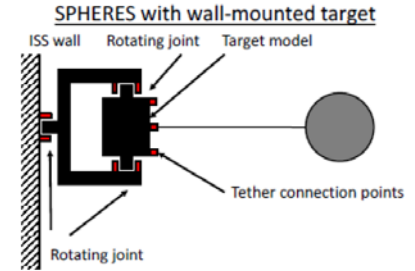


- Publications:
  - ESOC's Debris Conference 2017
  - IAC 2017 Australia
  - ASTRA 2017 at ESTEC
  - Cubesat Industry Days (e.Inspector)
  - MBSE related (e.g. SECESA 2016)
- Articles:
  - Journal of the British Interplanetary Society
  - Dutch Tweakers, Italian main news (RAI) etc.
- Many blogs on our blog, as well as Twitter. Thomas Pesquet's feature in space debris video



# Other ADR activities in the past 12 months

- Several ADR technology developments
  - See GNC (today) and robotics sessions (tomorrow)
  - ISS spheres (Cranfield & GMV)
- ADR for Mega constellations
  - ITT released and won by TAS-I
  - See mega constellations session (Thursday afternoon)
- e.Inspector
  - Cubesat to inspect ENVISAT. CDF study done.
  - See Thursday morning session





## What is now the long term plan?

1. Space Servicing Vehicle
2. Launch e.Inspector for ENVISAT inspection (+ - 2020)

# Space Servicing Vehicle



- SSV = vehicle to be used for several use cases
- E.g. tug from one orbit to another, refueling, service, **ADR**
- Today there is no ESA programme requirement for on-orbit servicing or a tug
- But.... strong similarities between SSV and e.Deorbit
- And.. Strong support from industry
  
- Future: e.Deorbit as space servicing vehicle application?



## What is the short term plan?

1. CDF study on Space Servicing Vehicle
2. GSTP Compendium update
3. Investigate implementation of e.Inspector in GSTP (small/new memberstates)

# Short term plan – CDF study

Draft objectives:

- Consolidate the mission level requirements together with the end-users (directorates and industry)
- Defining the Space Servicing Vehicle configuration for the different mission scenarios
- Refine the mission scenarios, initial concept of operations, and system capabilities
- Assess the synergies between the different mission concepts
- Derive a roadmap for implementation of the mission and the technology developments



# GSTP Compendium update



- Following the CDF study, requirements of the Maturation phase are defined
- Possible update of Compendium
- Upon proper subscription, ITT's will be released in 2018
- Investigate implementation of e.Inspector design



# Conclusion



- Still an inspiring mission
- But several years of launch delay compared to a full mission approved at MC2016 (+- four years)
  - Nobody can say we didn't try if ENVISAT collides!
- Stronger support now for technology developments than before, as space servicing vehicle!
- But system still missing. Hopefully better news in 2018!
- New cubesat-type mission under consideration for ENVISAT inspection, with small & new memberstates



# Thank you!



## GSTP Compendium

<http://emits.sso.esa.int/emits-doc/ESTEC/News/GSTP-E1-Develop-CleanSpace-Compendium2017.pdf>

## Blog

<http://blogs.esa.int/cleanspace/>

## Twitter

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