cleansat

BB#10
BB_SMA
ALTRAN

24/05/2016

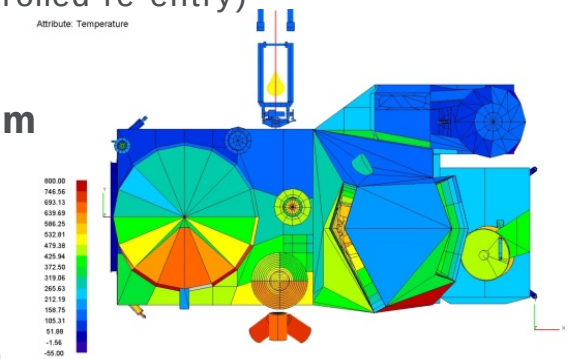
ALTRAN nimesis AIRBUS DEFENCE & SPACE OHB ThalesAlenia Space

European Space Agency

BB10 – Shape Memory Alloys

Shape **M**emory **A**lloys are used as **Release devices** activated by temperature

Application: ➔ S/C Controlled Dismantlement (asset for uncontrolled re-entry)

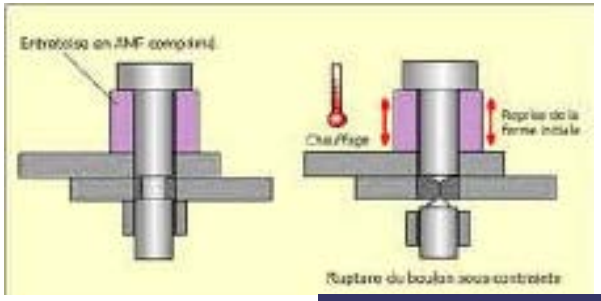


Step1 : Thermal Characterization Analysis in Pre-Rentry **<120km**

=> Activation Triggering Margin of Safety (Internal / External)

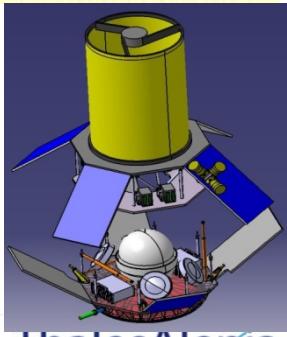
Step2 : Shape Memory Alloys Development & investigations

- European supply source of Frangibolt®-like TiNi Aerospace© alloys
- **H**igh-**T**emperature SMA development (CuAlBe, CuAlNi)
- **U**ltra **H**igh **T**emperature SMA investigation

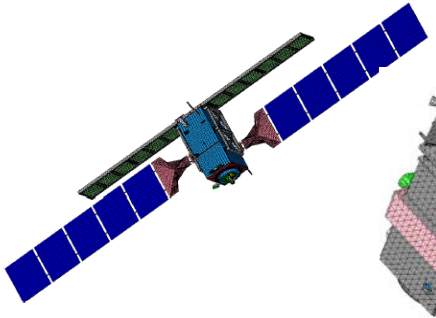


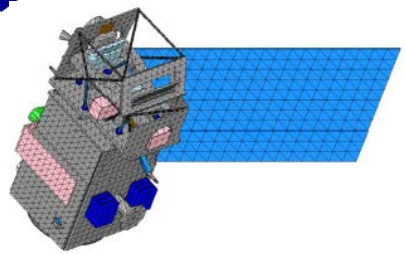
Step3 : D4D Release Devices Applications on S/C

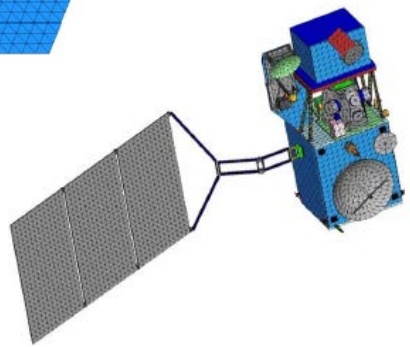
- Appendage Dismantlement ,
- Structural Frames dismantlement
- S/C architecture modification to improve dismantlement capability



Description of proposed technology Building Bloc







Applicability Range :

- Mostly **Medium – Large Class (uncontrolled Reentries)**

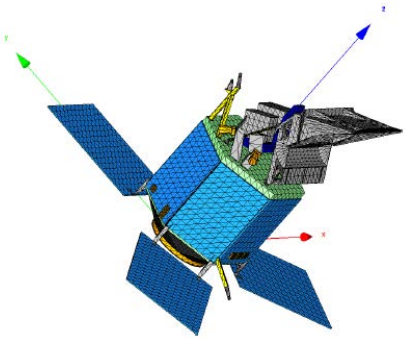
(needing D4D techniques via controlled dismantlements)

ESA-GMES Copernicus S/C : **Sentinels 1,2,3,5p**

- **Space to Ground** likely Synergies

(Safety devices – Safety valves against fire ?)

System Level Impacts :



- Risk : **Reduced** (depending thermal characterization)
- Mass Budget **:** **Slight impact** (depending on applications)
- Power Budget **: None** (autonomous used after passivation)
- Link Budget **: None** (not related)

Development

Main Technical Challenges during development

Step1 :

- ➔ Confirm adaptability of ESATAN S/C models on pre-reentry environment

Step2 :

- ➔ Find alloys with Ultra - High Temperature activation capabilities
- ➔ Validation of new materials for space applications / mecanisms specificities

Step3 :

- ➔ Design release mecanisms adapted to SMA capabilities in Re-entry heat
- ➔ Design S/C concepts Qualifications of new materials for space applications

Conclusions :

- **ESA D4D S/C** studies demonstrated need of **controlled dismantlements**
- **BB10_SMA Devices** are D4D assets for controlled dismantlement