



Demise Observation Capsule (DOC) Development Status

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4th International Space Debris Re-entry Workshop



Consortium





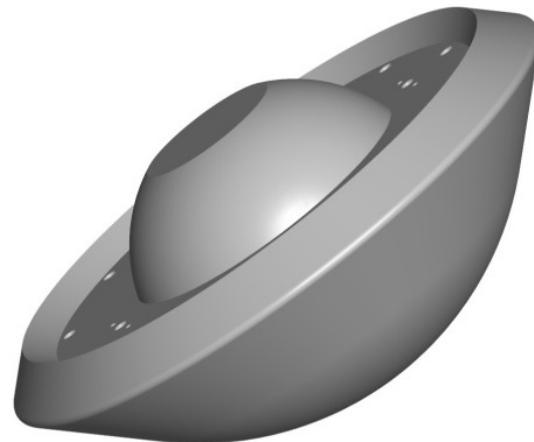
Demise Observation Capsule

“Providing a clear perspective on stage re-entry”



What DOC records:

- Images of upper stage
- Key disintegration events
- Trajectory



Goals

Breakup

- Document key disintegration events
- Stage, Payload and Instrument demise
- Complete health status

Trajectory

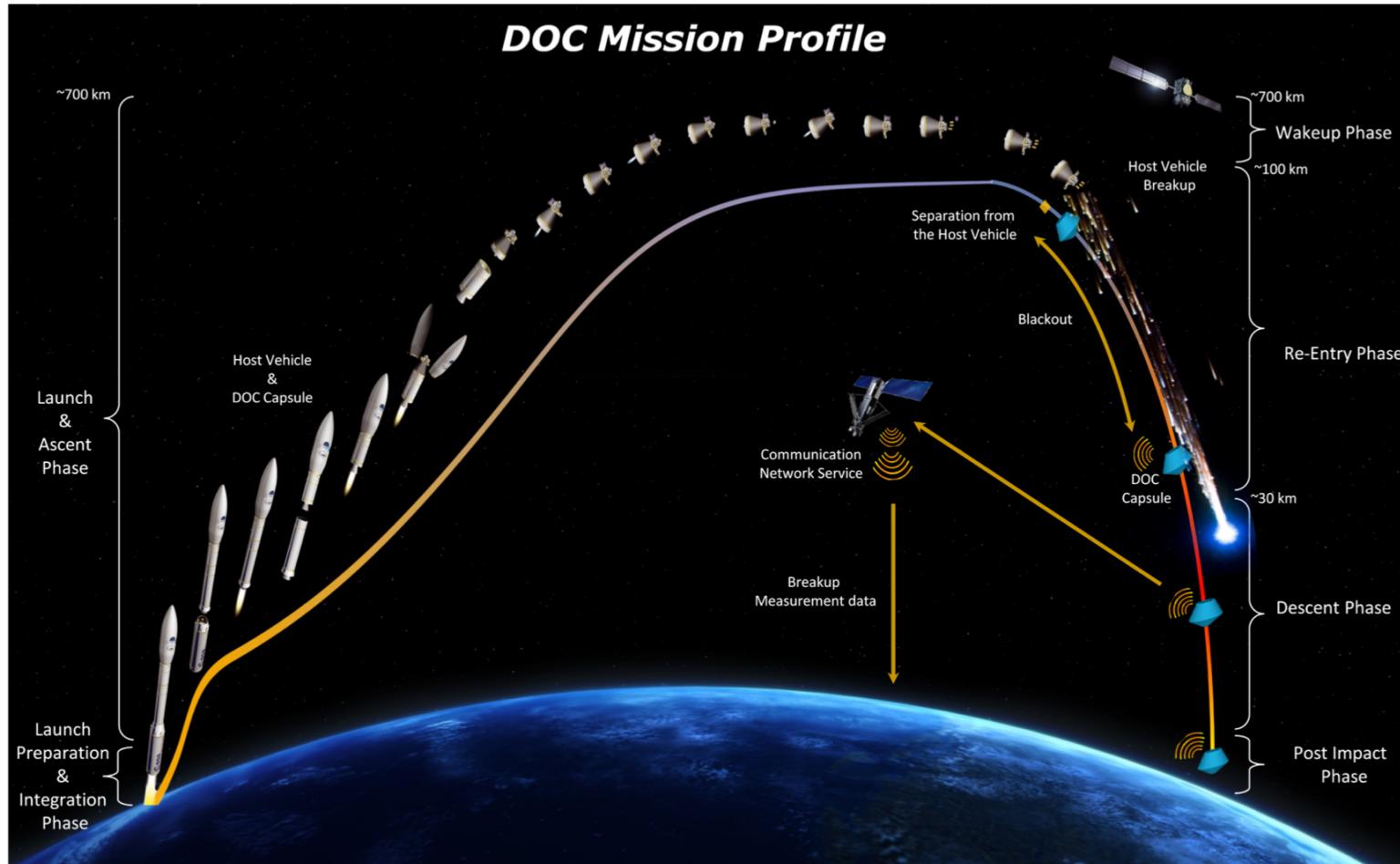
- Validation of re-entry models
- Understand re-entry physics
- Obtain data to 'design for demise'
- Structural, aero-thermodynamic and material databases

Footprint

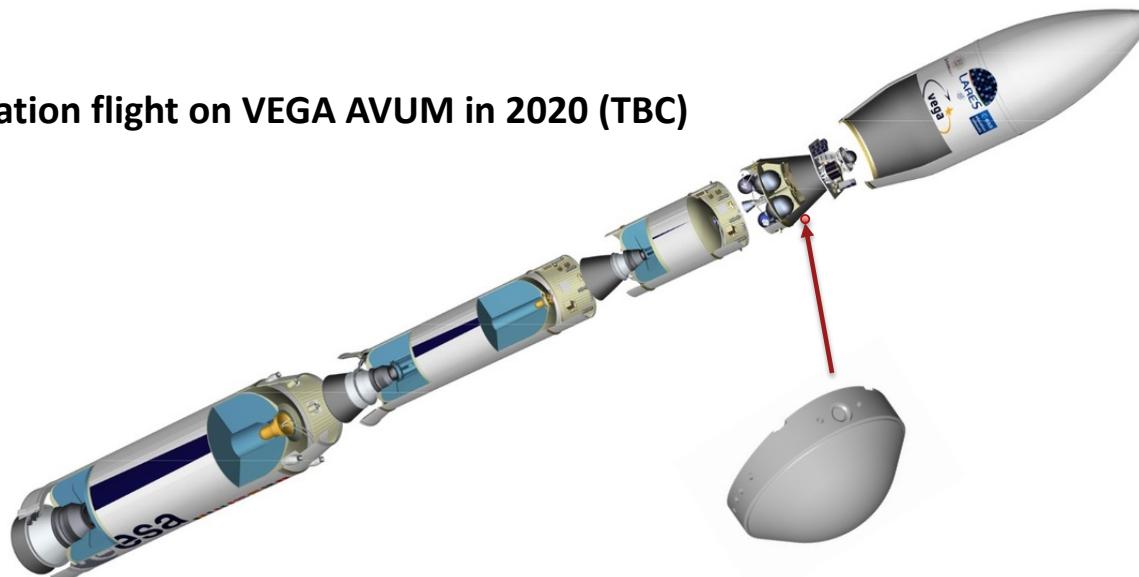
- Regulatory Compliance
- Reducing impact footprint
- Re-entry public safety



The Mission

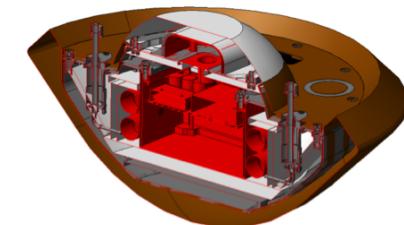


Qualification flight on VEGA AVUM in 2020 (TBC)



The Capsule

- Robust, optimized and modular design for a **multitude** of launch vehicles/stages:
3rd and 4th stage(s)
- **Rideshare** item: no impact on launcher payloads or operations
- **Safe & controlled** separation from the stage after its passivation
- On-board software design for **autonomous mission** performance & in-flight data transfer
- Flight-ready equipment: PFM + GSE:
 - Mass: <10kg
 - Diameter: ~350mm
- **Miniaturized electronics and sensors**
 - Versatile and extendable sensor suite
- Observation **cameras** on host vehicle and capsule
- **IRIDIUM Modem**
- **ITAR-free** equipment



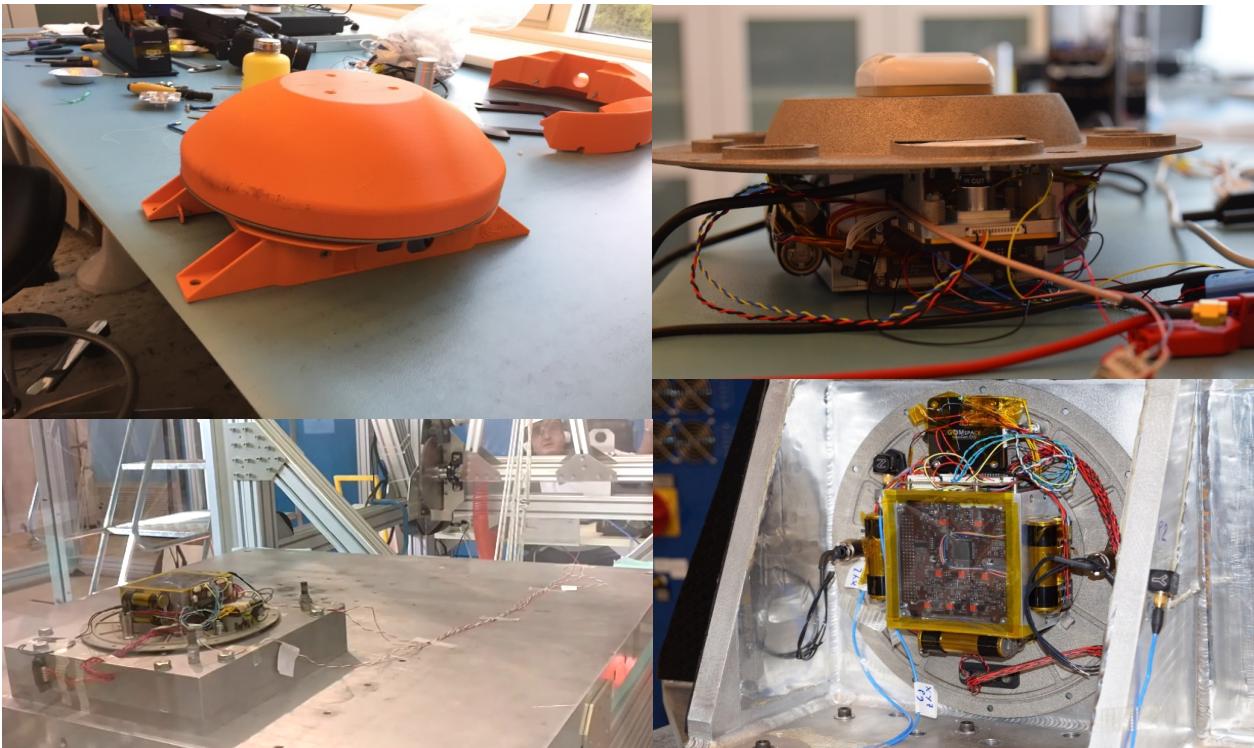
The Capsule – Sensor Package

Instrument	Model	Delivers	Range
GPS	NovaTel OEM615	Time	
		Position	>7300 km ECEF
		Velocity	>8 km/s
IMU	ADIS16488	Acceleration	$\pm 18\text{ g}$
		Angular rate	$>\pm 480^\circ/\text{s}$
		Magnetometer	$>\pm 0.18\text{ mT}$
		Temperature	-40° C - +85° C
		Pressure Images	120 kPa
Camera (Onboard & Host Vehicle I/F)	C1U NanoCam		
Thermocouples	Type K	Temperature	-200° C – 1260° C
Accelerometers	ADXL375	High acceleration	$\pm 200\text{ g}$
Pressure sensor	Kulite XTEL-190M	External Pressure	170 kPa
Pressure sensor	MKS 905	Internal Pressure	120 kPa



EQM Testing

EQM (EBB) Test Campaign (GOMSpace & CIRA)



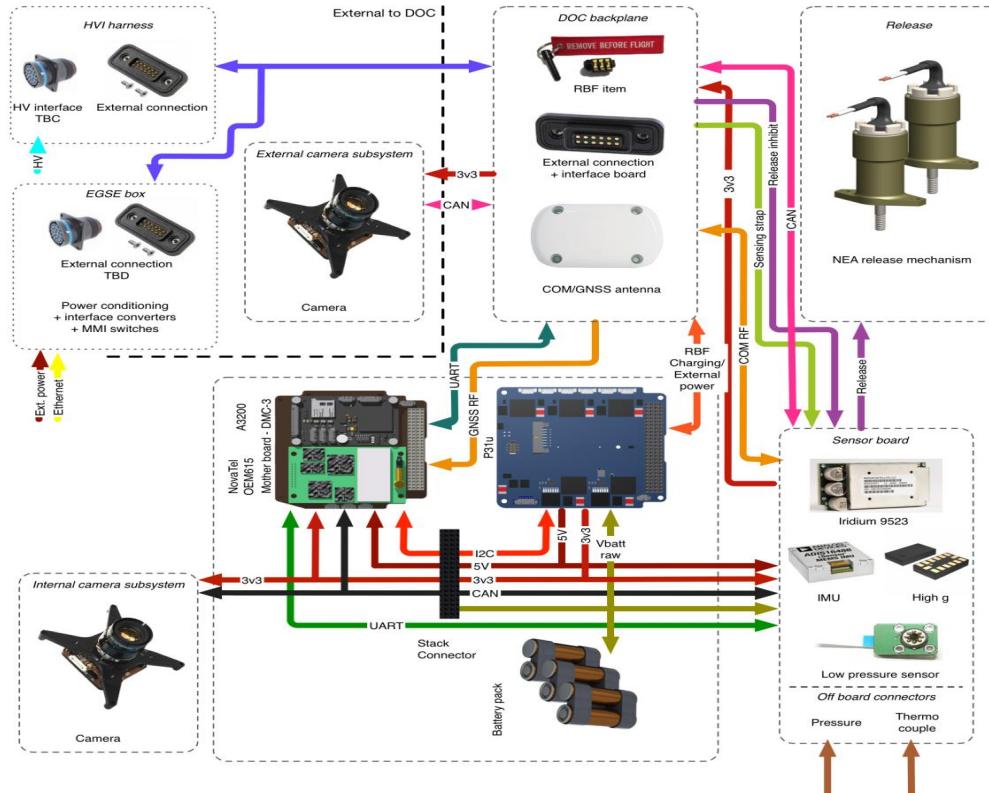
Back-up Slides

Back-up Slides



DOC avionics

DOC Avionics



EQM Testing

