

RSC³

RESPONSIVE SPACE
CLUSTER COMPETENCE CENTER



AN OTTER FOR RESPONSIVE MARITIME DOMAIN AWARENESS

OTTER – A Small Satellite with Optical Camera and AIS Receiver
Optical Traffic Tracking Experiment for Responsive Space



Rewind of MARESEC 2022 – About RSC³



Responsive Space Cluster Competence Center (RSC³)

- Founded end of 2020 within German Aerospace Center
- Supported by German Federal Ministry of Defense
- Space has been declared a critical infrastructure
- **Focus on how to realize, extend or reactivate space-based capabilities in a responsive timeframe**
- Researching and acting on strategical, operational and tactical level of Responsive Space



Fig. 1: Trauen DLR-RSC³

➔ Initial operating capabilities required! Leads to RSC³'s first Small Satellite Mission: Maritime Situational Awareness Experiment



The Satellite OTTER – Mission Goals

Optical Traffic Tracking Experiment for Responsive Space

Objectives of the experiment:

- Initial operating capabilities for RSC³
- Detect AIS signal of a cooperative target and optically confirm their position via camera
- Demonstrate possibilities on CubeSats (Small Satellite 34x10x10cm)
- Launch with ISAR Aerospace's maiden flight

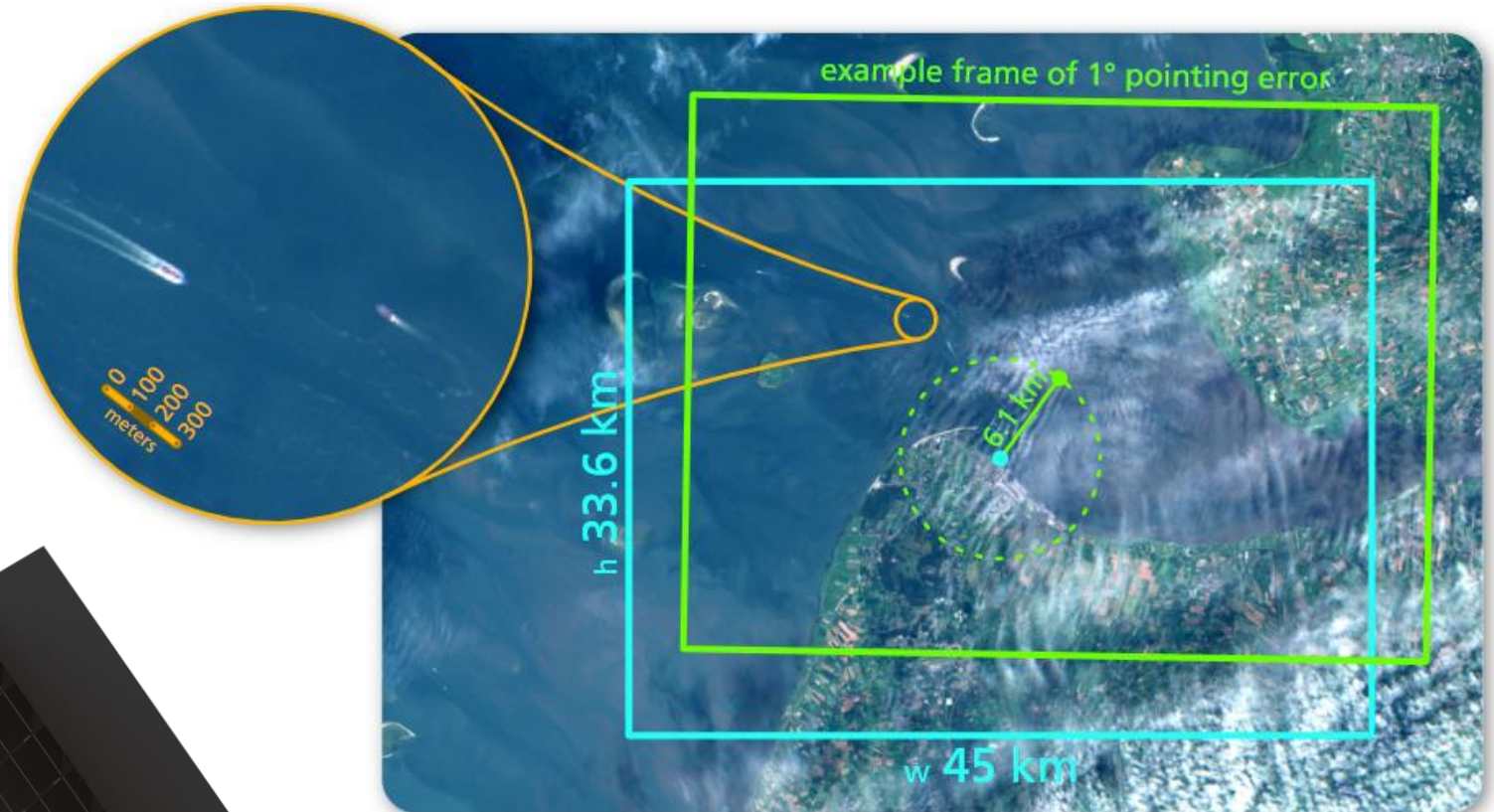
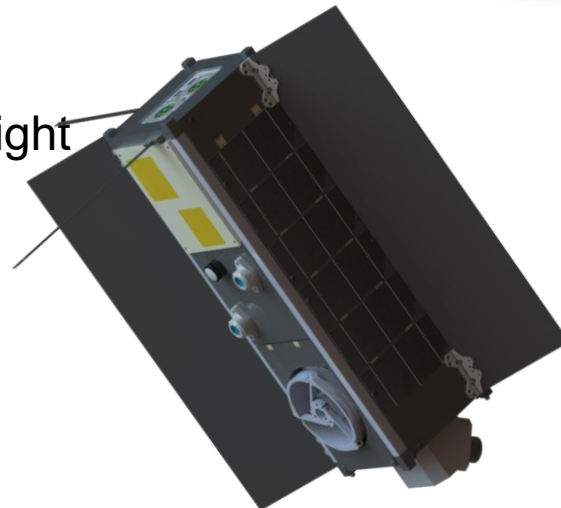


Fig. 2: Picture of Cuxhaven produced from ESA remote sensing 10m Ground Sampling Distance, as to be expected from OTTER. Visible are >50m vessels and their wake.

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Maritime Domain Awareness with Small Satellites

Operational capabilities of small satellites

- Earth observation in maritime (offshore) regions
- Tactical application (Responsive deployment of small satellites in orbit)
- Container vessels in distress
- Oil spills
- Illegal unreported unregulated fishing activities (IUU)
- Experimental communication chain (from satellite to ground station to emergency centers)
- Enabler for larger constellations

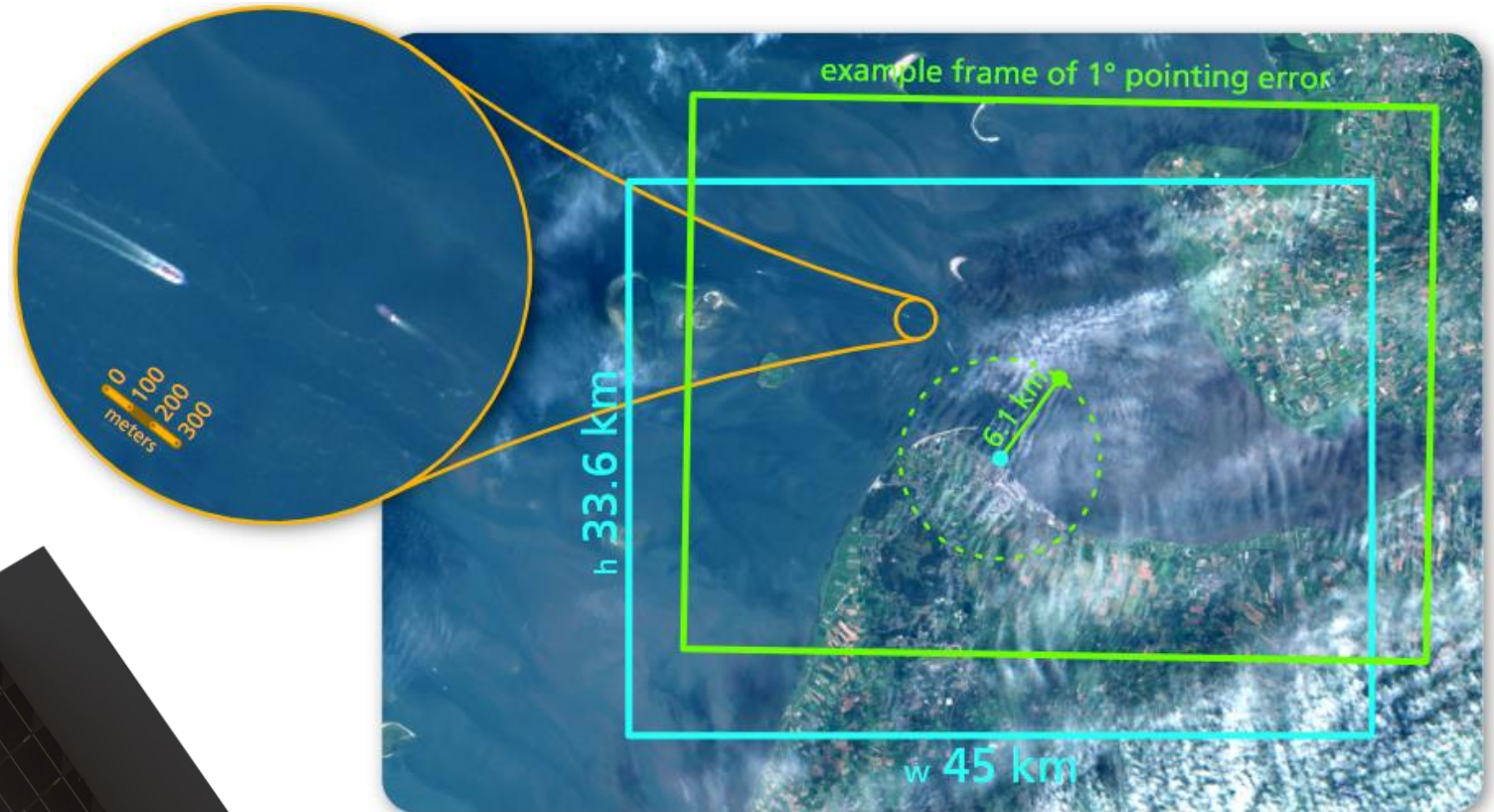
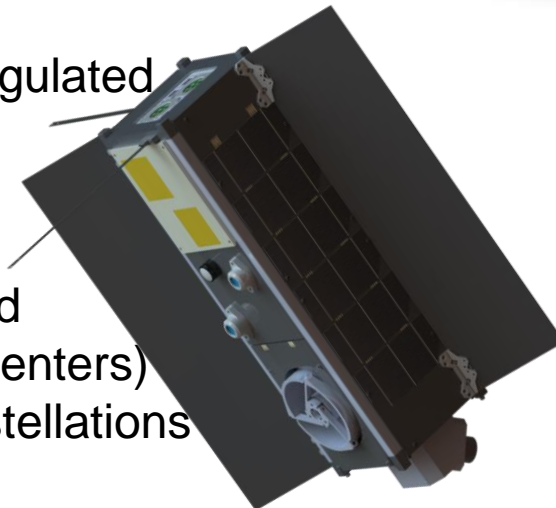


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The Satellite OTTER – Components & Strategies

- Winner of the tender for this mission: German Orbital Systems
- Together we worked out following solution seen in Fig. 3
- AIS antenna may reach saturation limits upon 250km – 350km orbit in high traffic areas → off shore imaging
- Reduce drag by flying with smallest area facing atmosphere
- Use electric propulsion for orbit raise maneuver → lifetime increase up to ~2years

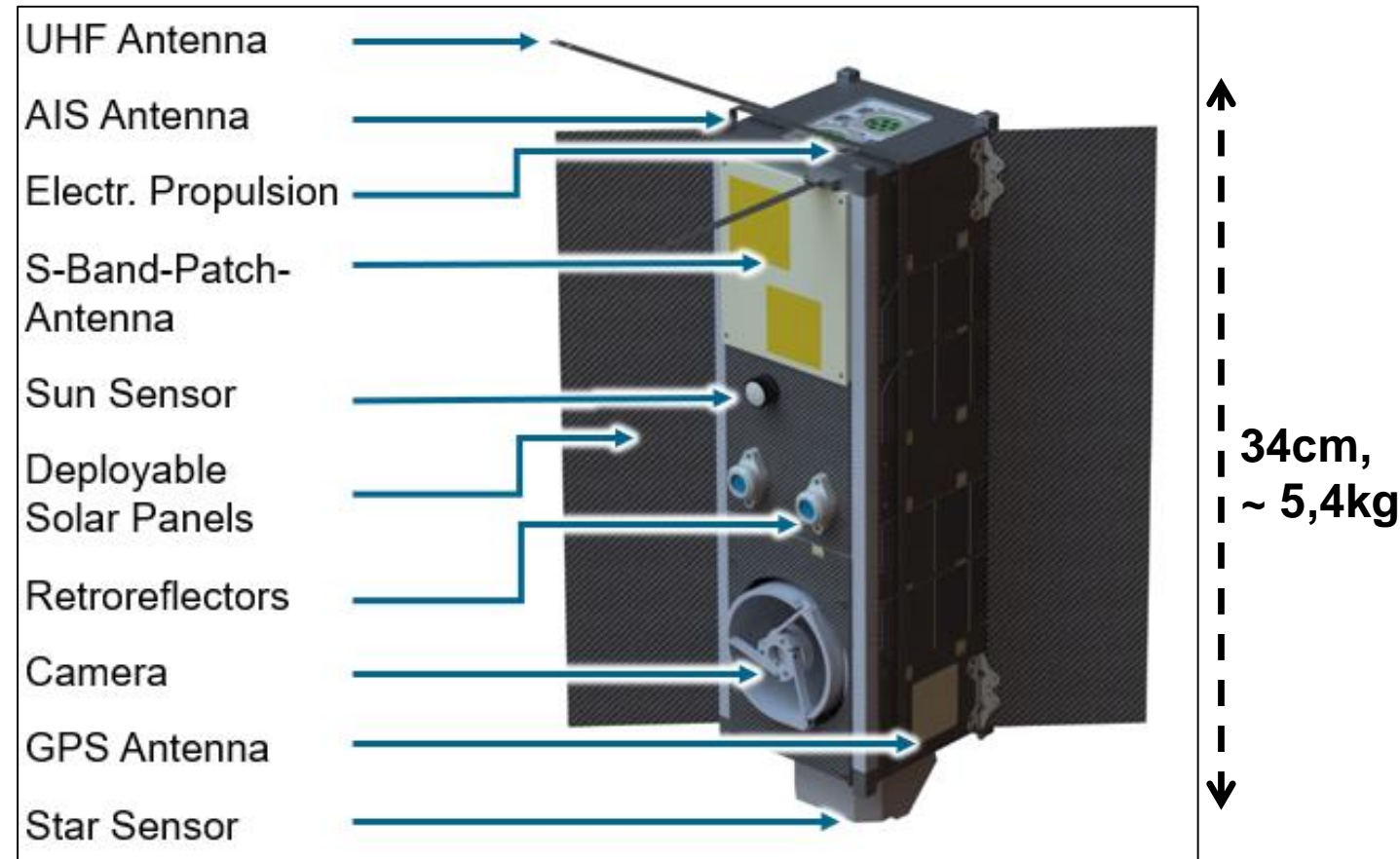


Fig. 3: The OTTER Satellite

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Satus Update & Challenges

- Satellite fully integrated
- Environment tests done
- ~~Launch end of 2022~~ → launch delayed by the provider to end of 2023
- No data can be shared from orbit yet ...
- Use time till launch for attitude & orbit control testing in Trauen
- In international exchange regarding merging of collected data (for example with radar data) and project integration into international project arrangements

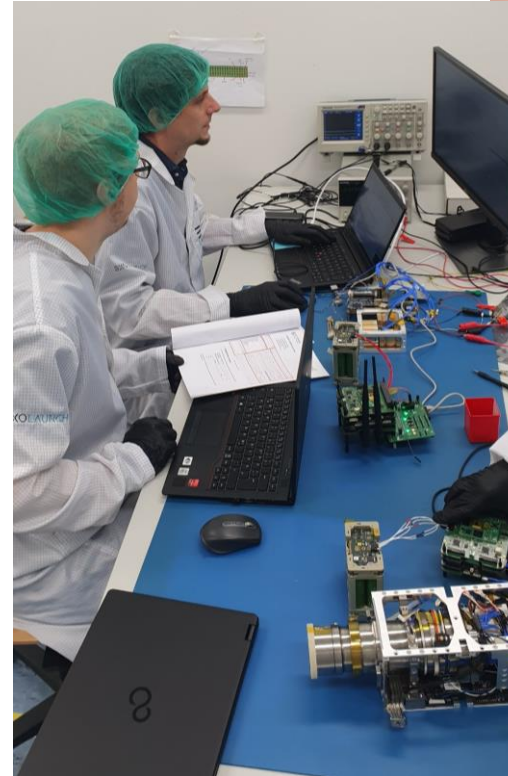


Fig. 4: Integration and functional tests of the OTTER



Fig. 5: The OTTER Satellite in a Testpod

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Questions?

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