

# Arctic Weather Satellite - New Space Approach

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27/10/2023

# What is Arctic Weather Satellite?

- Programme includes Space Segment, Ground Segment, and Operations development, and Launch
- Prototype satellite for a future constellation
  - Microsatellite, ~140kg, ~140 W, just under 1m<sup>3</sup> (launch configuration)
- OHB Sweden is the Mission Prime, AAC Omnisys is Payload Prime and ThalesAlenia Space is Ground Segment Prime





1. Develop a prototype satellite (PFM) for a future constellation
2. Demonstrate from orbit that it is capable to improve weather forecast
3. Demonstrate significant reduction in cost and in time to allow affordable constellation
4. Define the optimal constellation



## Performance

- Weather satellites are well established and large amount of data is available and used in weather forecast
- More data does not help, unless it is of very high quality
- AWS is operational mission and not demonstration mission

## Time

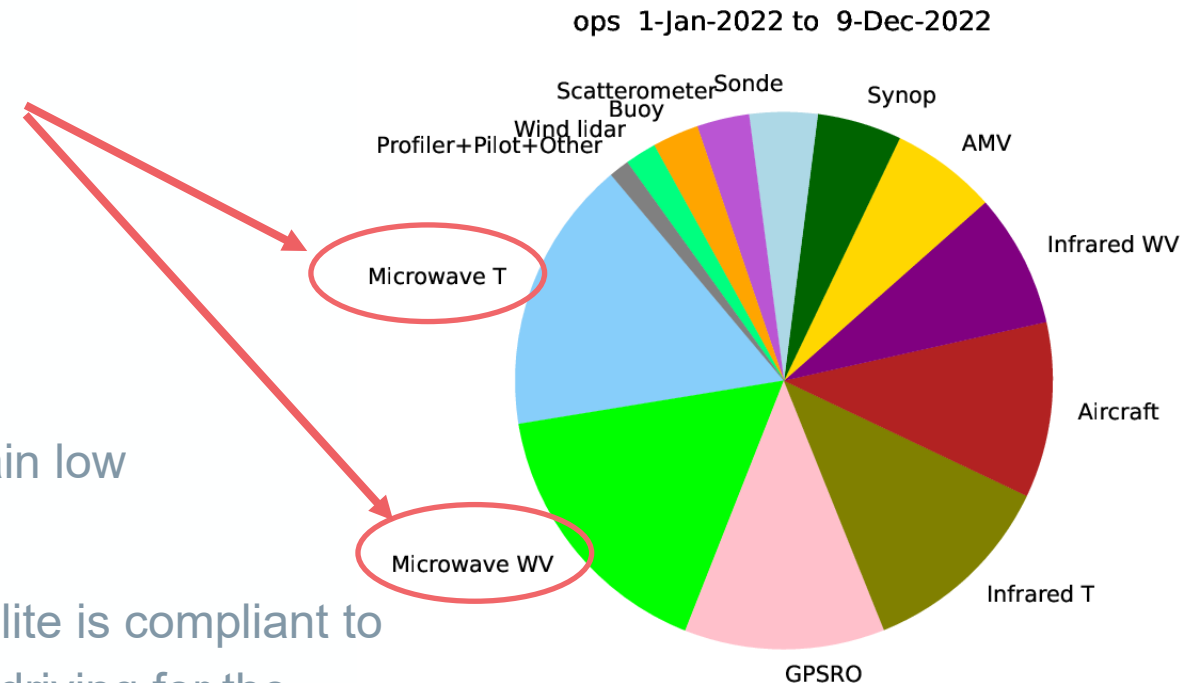
- Development time is 36 months

## Cost

- For the constellation, recurrent cost of a satellite must remain low

## Technical

- In order to maximise competition for the constellation, Satellite is compliant to large number of launchers → Qualification envelope is very driving for the structure
- Same satellite design and qualification must cover all LTANs of the constellation



- **ESA in charge of the mission development, “standard” development contract**
  - Single contract, full consortium proposal, covering Space Segment, Ground Segment, and Operations.
  - Launch service is procured separately by ESA
  - Operations and Ground Segment developed in first part of the contract, then changed to Service approach, KSAT will perform the operations under Service Level Agreement (SLA)
  
- **ESA defined the requirements to be met:**
  - Performance critical requirements
  - System and Product Assurance requirements were created, **without generic ECSS applicability**, instead “core” ECSS requirements have been implemented directly into requirements
  - Allows COTS equipment, COTS parts etc.
  
- **Light definition study was done at the beginning to align ESA-Industry requirements and expectations**

- Simplified reviews
  - Single review at mission level, covering all elements (Space, Ground, Operations, Launcher)
  - Reduced documentation
  - Short duration
  - Small, but very experienced review team from ESA side
  - Single review panel
  - Interactive review with Question/Answer session
- HW/test demonstration Key factor in reviews
  - First System Validation Test (SVT), where Mission Control System commanded Spacecraft Avionics Test Bench, was done 23 months after Kick-off!

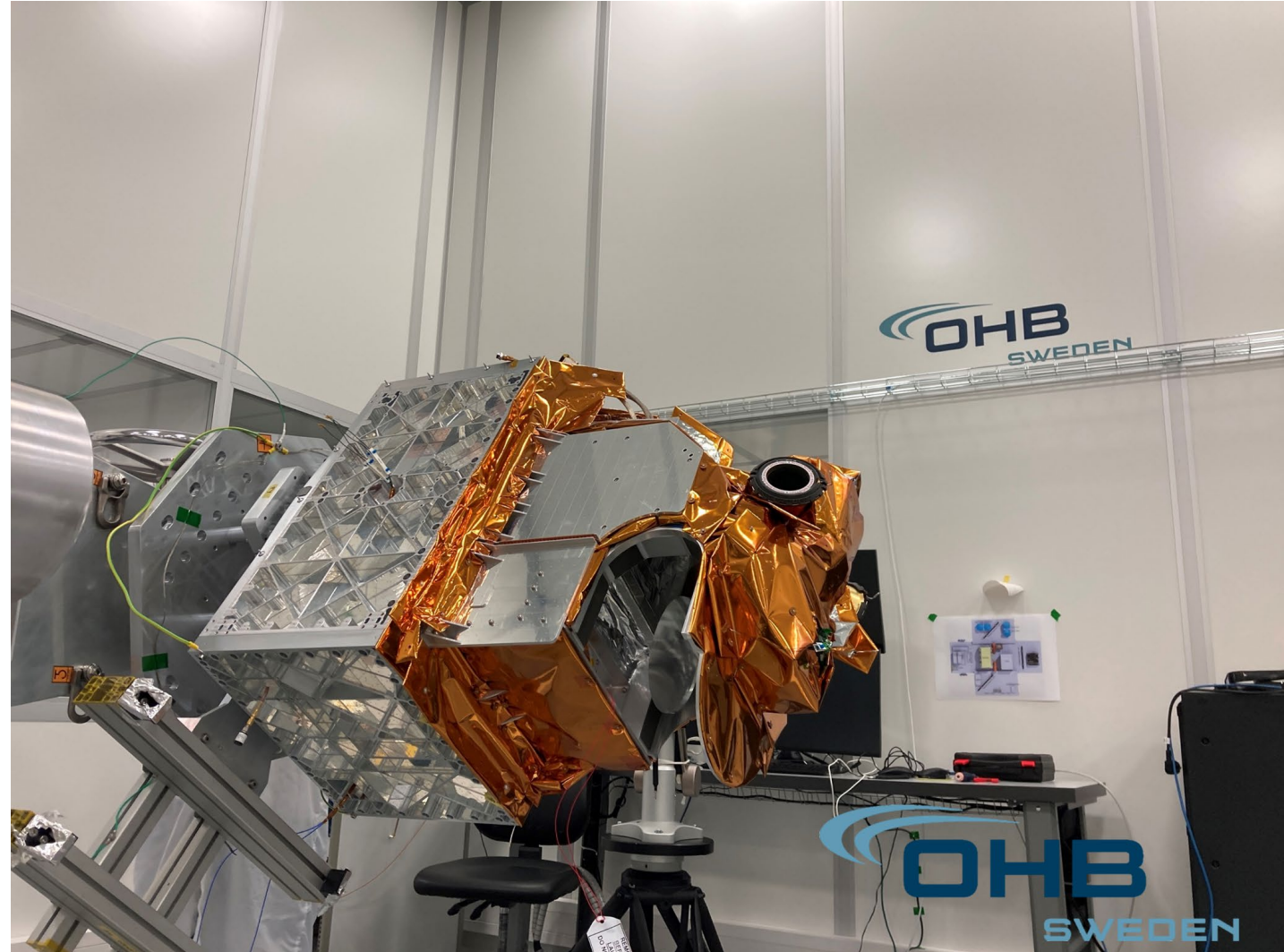
- Agile development, also in HW
  - HW and testing has priority over analyses, Several models (BB, DQM, ATB, pre-SM, SM etc.)
  - **Test to discover issues**, not expecting everything will be perfect
  - Build – test – fix issues - test again – repeat if necessary
- Example of Structural tests
  1. Satellite (pre)-structural model test
  2. Payload Structural model test
  3. Payload Structural model re-test
  4. Satellite Structural Model test
  5. Payload Structural model re-test
  6. Payload PFM test
  7. Satellite PFM test





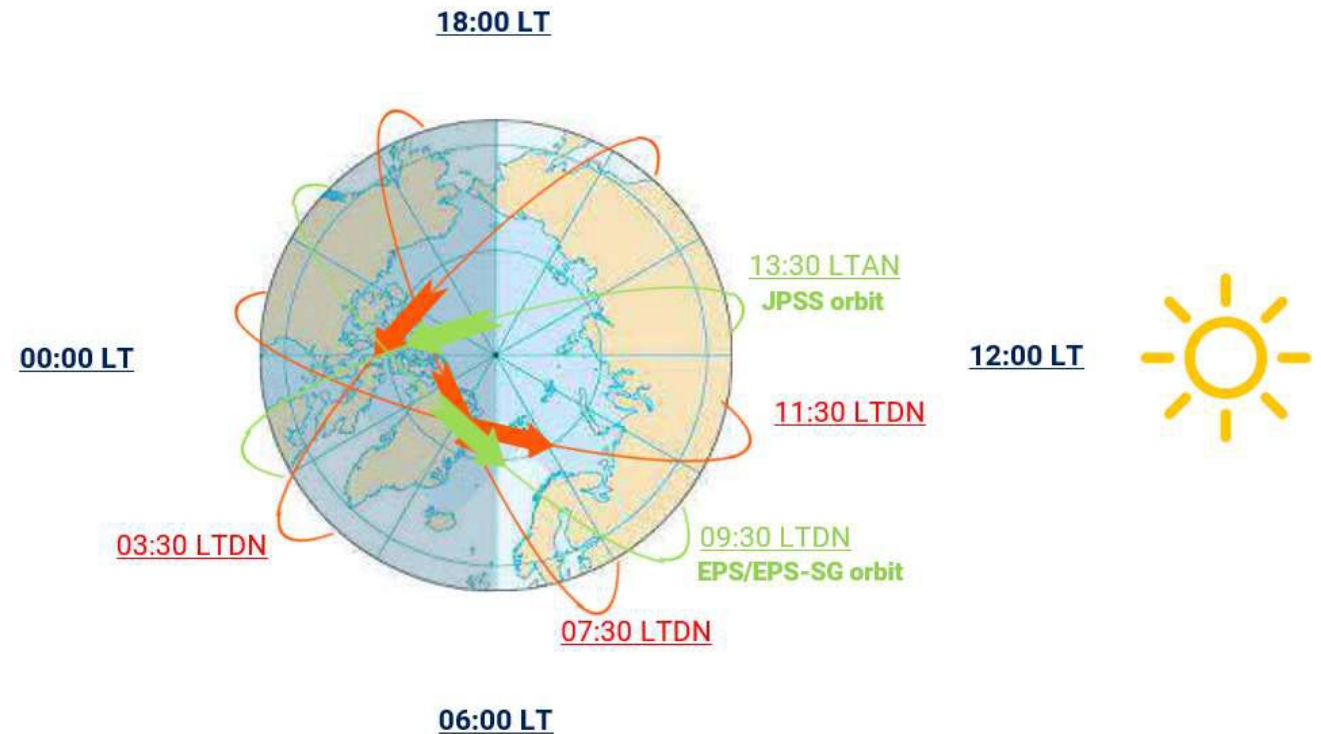
# Status Today

- Formal contract signature March 2021  
(informal KO Feb 2021)
- PDR Nov-Dec 2021
- CDR Jan-Feb 2023
- QAR Jan-Feb 2024  
(36 months from kick-off!)
  
- **Satellite built**
  - Final qualification testing will start in November
- **Ground Segment built**
  - Currently in final verification
- **Launch procured**
  - Launch June 2024





- Preparation for the constellation has also progressed as planned
- Constellation, named EPS-sterne will be done in cooperation with EUMETSAT
- Sterne will cover 3 orbital planes, LTDN 03:30, 07:30, 11:30, 2 satellites in each plane required nominally
- Will cover minimum of 13 years of operations
- 20 satellites in total, 17-20 launches
- Fully operational from 2029 onwards



- ESA projects in “New Space” development approach works well
- The development can be very fast
- Team must be experienced on both sides to allow quick and well balanced decisions
- to manage large amount of HW in different tests in challenging
- Small team sizes means more delegation at all levels
- Recurrent cost must be built into the development from day 1

[www.esa.int/aws](http://www.esa.int/aws)

