

WE LOOK AFTER THE EARTH BEAT



# Space Exploration –European leadership

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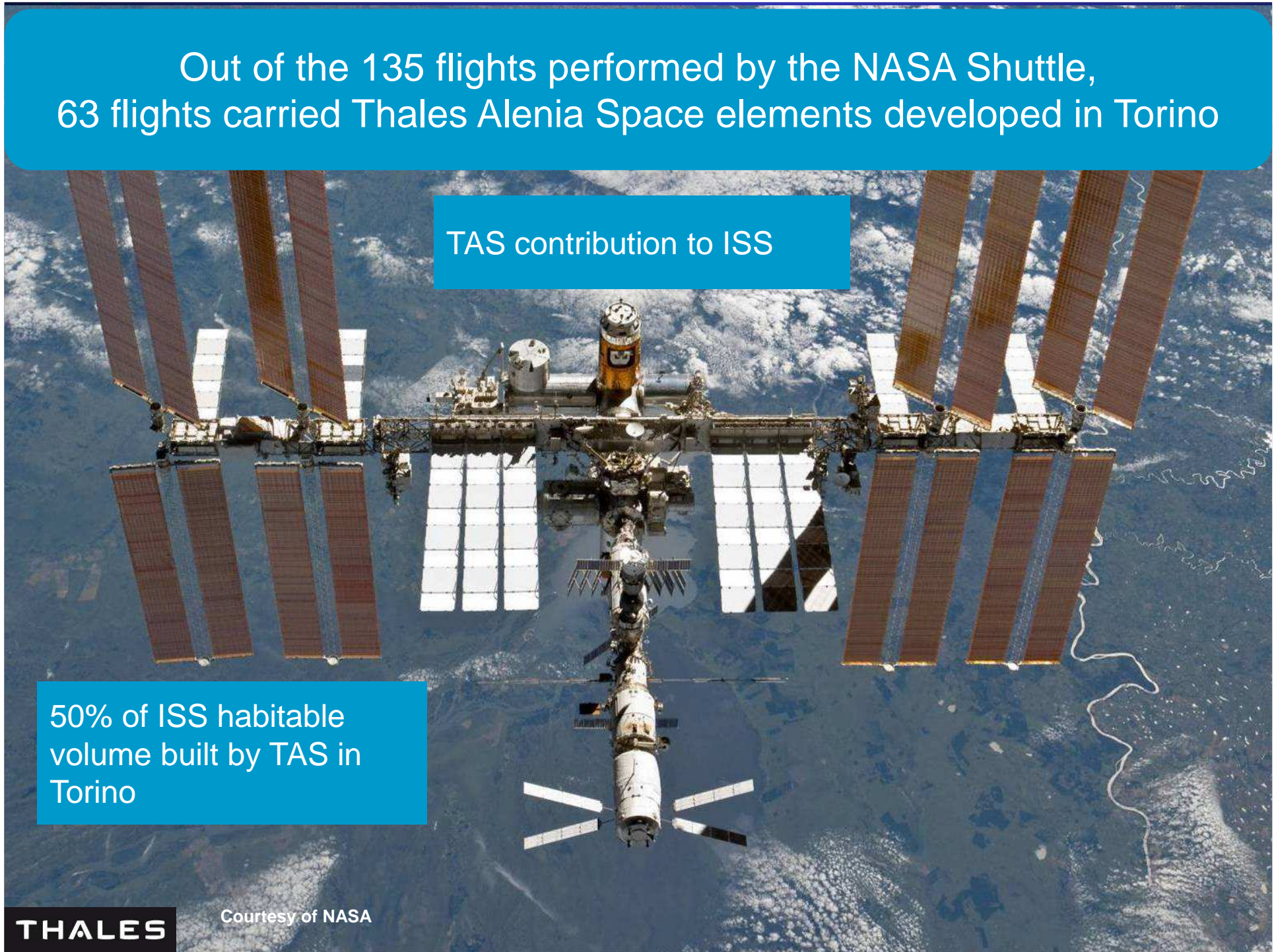
Out of the 135 flights performed by the NASA Shuttle, 63 flights carried Thales Alenia Space elements developed in Torino

TAS contribution to ISS

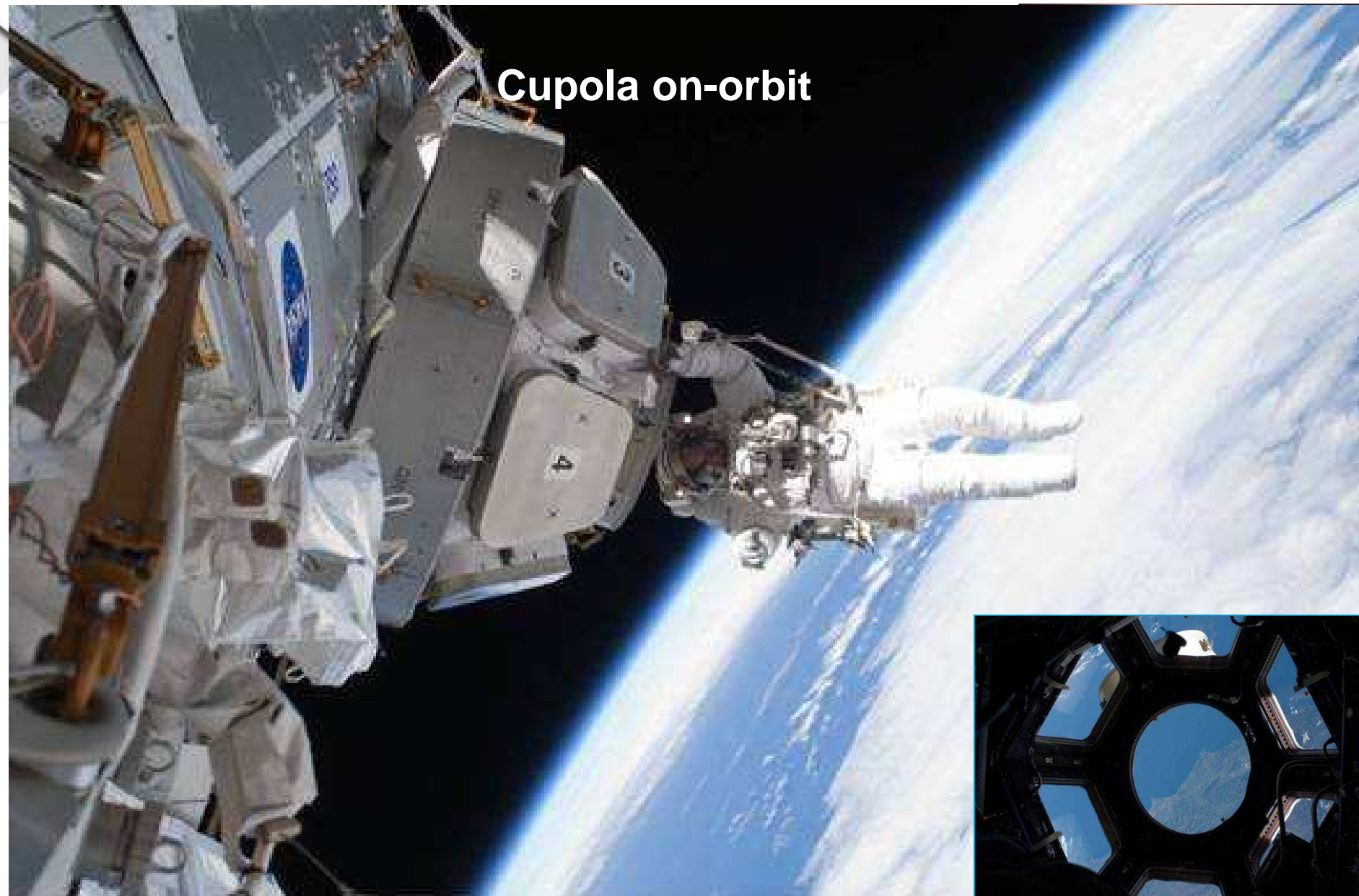
50% of ISS habitable volume built by TAS in Torino

**THALES**

Courtesy of NASA



## Cupola on-orbit



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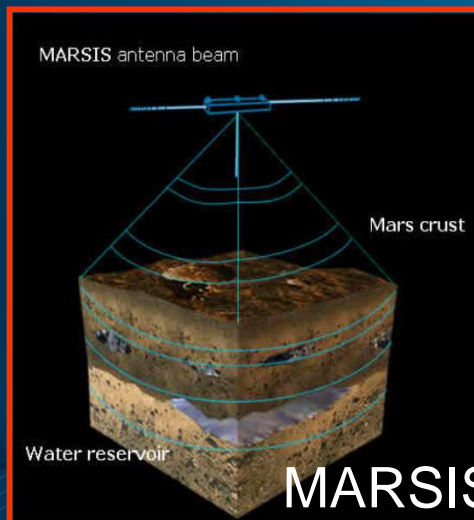
# Thales Alenia Space: Planetary Exploration

## *Huygens*

**The farthest human made vehicle ever landed on a celestial body**

“ A success, a scientific success, a fantastic engineering success for Europe. We are the first visitors on Titan. We will reveal the wonders of a new world ”

Jean-Jacques Dordain  
ESA General director  
Darmstadt, 14 January 2005



## **RADAR for MARS**



## ► 2016: ExoMars Trace Gas Orbiter

- Its science will improve our understanding of Mars and of key atmospheric processes of potential astrobiological relevance.
- An excellent base for international collaboration.
- Master landing technologies for future European missions.

## ► 2018: ExoMars Rover

- A great exobiology mission.
- The first ever to combine mobility with access to the subsurface.
- The rover's Pasteur payload contains next-generation instruments.
- The rover will study for the first time:
  - Organics and biomarkers for past and present life at depth;
  - Vertical characterisation of geochemistry and water.
- The rover implements novel sample handling and locomotion.
- A step closer to Mars Sample Return.

Credit: MEX/HRSC

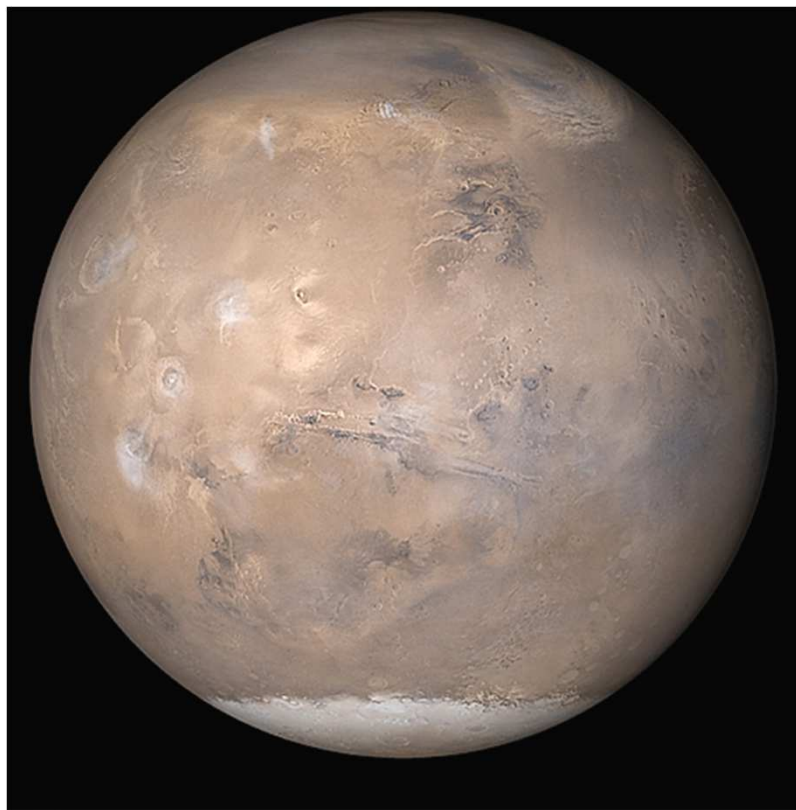
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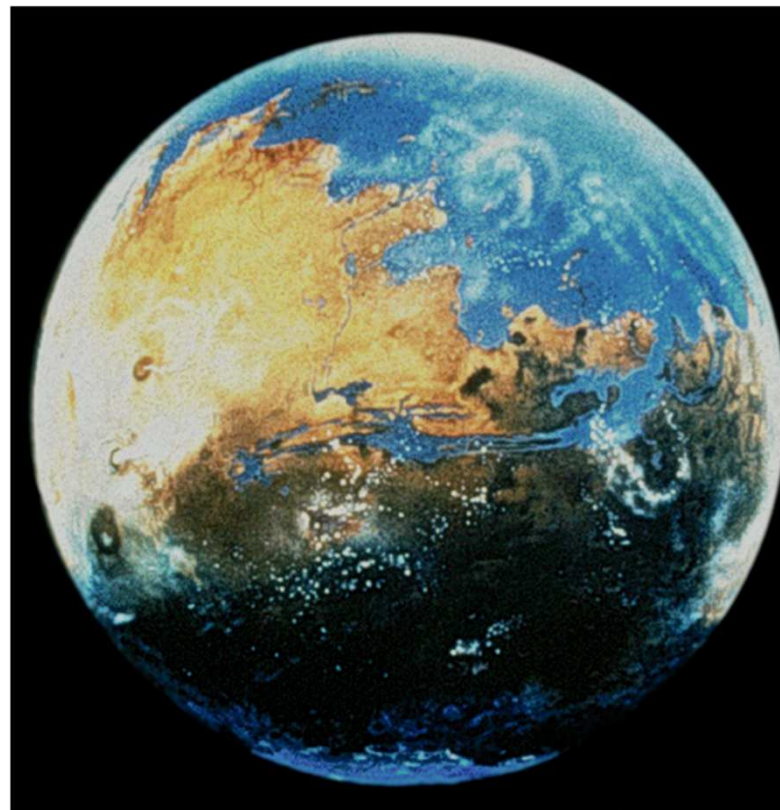




# why MARS?



Now: Cold and Arid



Past: Wet and Warm?

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# Mission 2016 Satellite Composite



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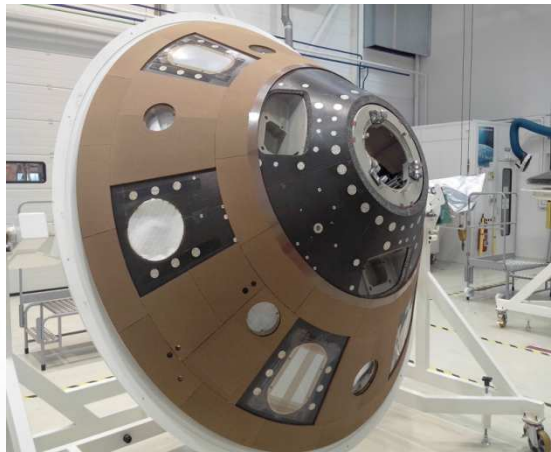
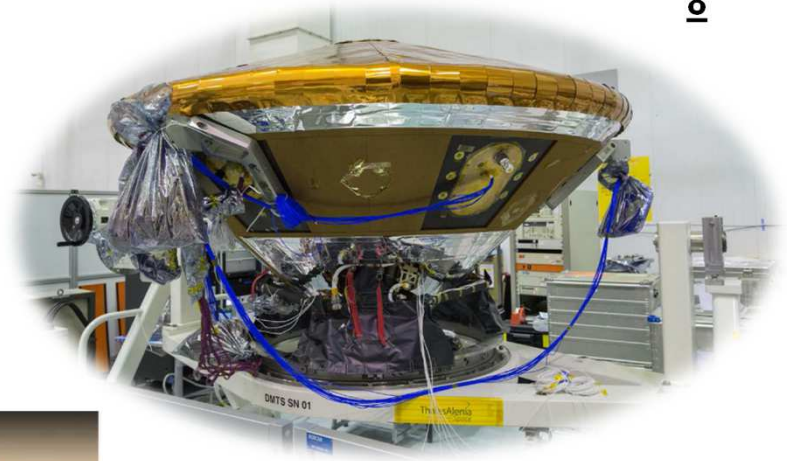
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# Mission 2016 EDM Schiaparelli



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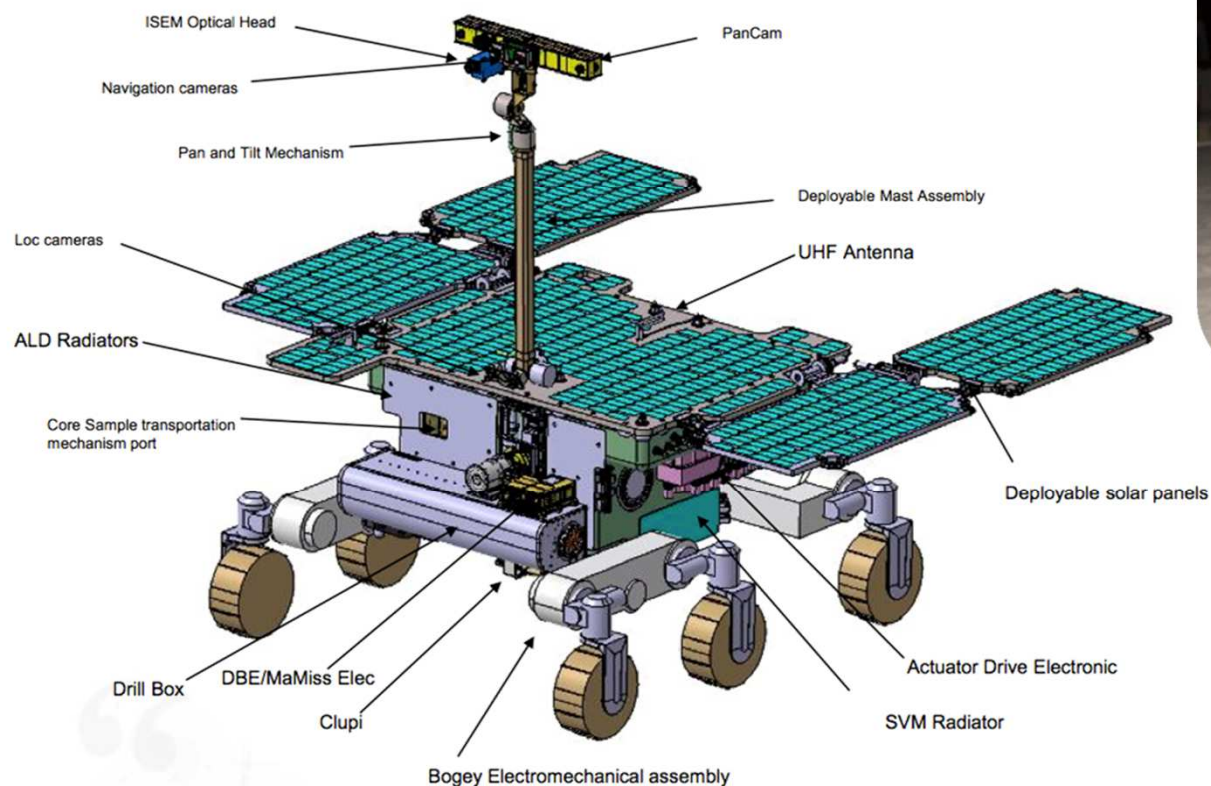
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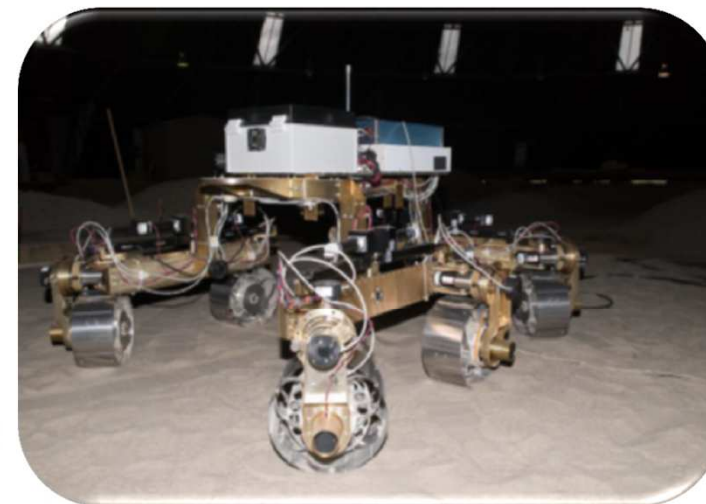
# Mission 2020 Rover



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**Modulo Rover**



**Rover: test vehicle for mobility**

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# Mission 2020 what

- **PRESENT LIFE:** Biological markers, such as:



Amino acids



Nucleobases



Sugars



Phospholipids



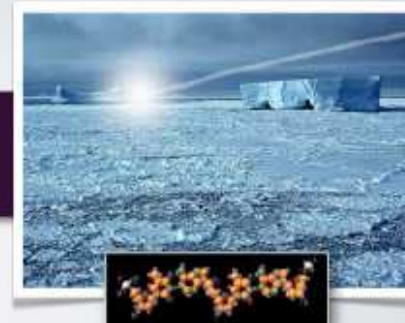
Pigments

...

- **PAST LIFE:** Organic residues of biological origin;  
(chemical, chiral, spectroscopic, and isotopic info)  
  
Images of fossil organisms and their structure;  
(morphological evidence)



- **DELIVERED ORGANICS:** by meteoritic and cometary infall.



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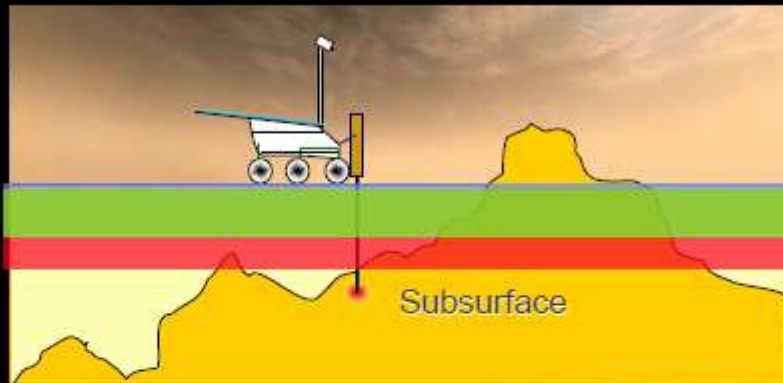
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# Mission 2020 where



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## Penetration of organic destructive agents

UV Radiation	~ 1 mm
Oxidants	~ 1 m
Ionising Radiation	~ 1.5 m

## ExoMars exobiology strategy:

- Identify and study the appropriate type of outcrop;
- Collect samples below the degradation horizon and analyze them.

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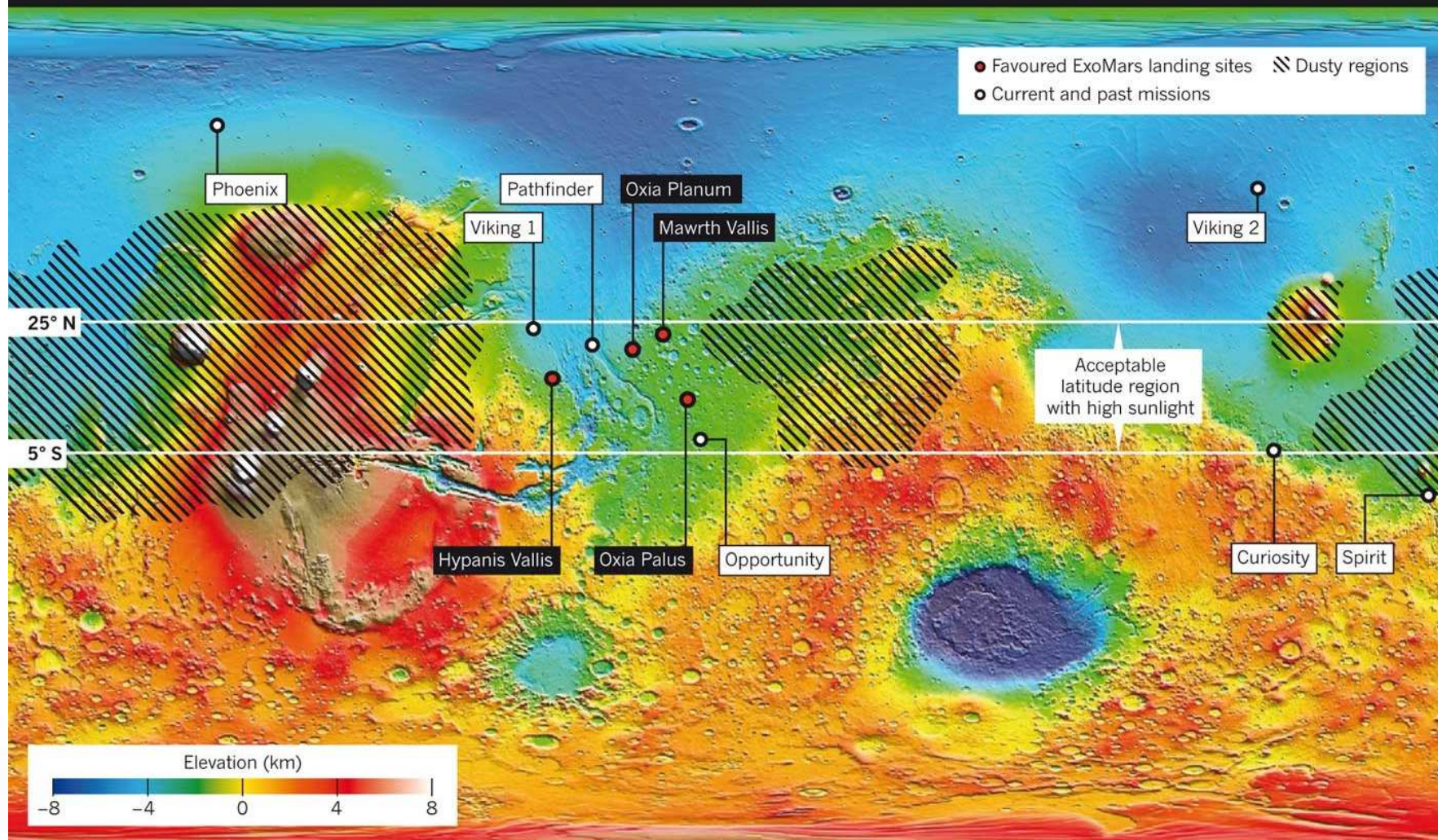


# Mission 2018

## Possible sites

### HOMING IN

European scientists have selected four favourable landing sites for the ExoMars rover. The sites must satisfy three engineering requirements: a low elevation, plentiful sunlight and little dust.



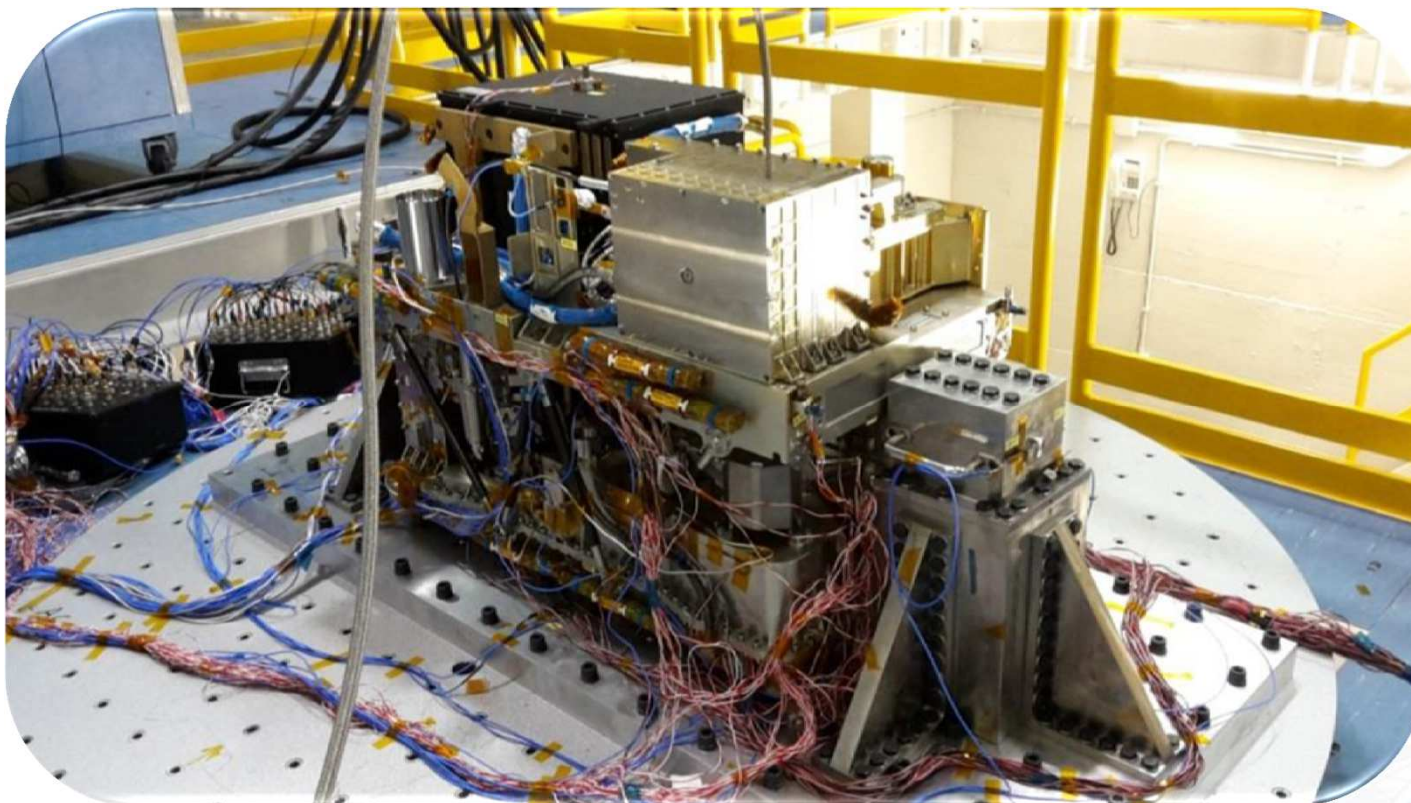


# Mission 2020

## Technology ready



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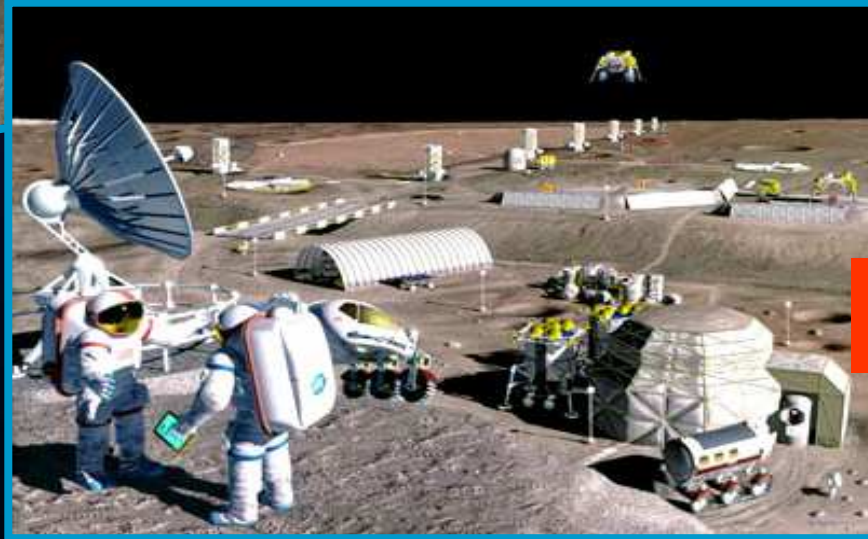
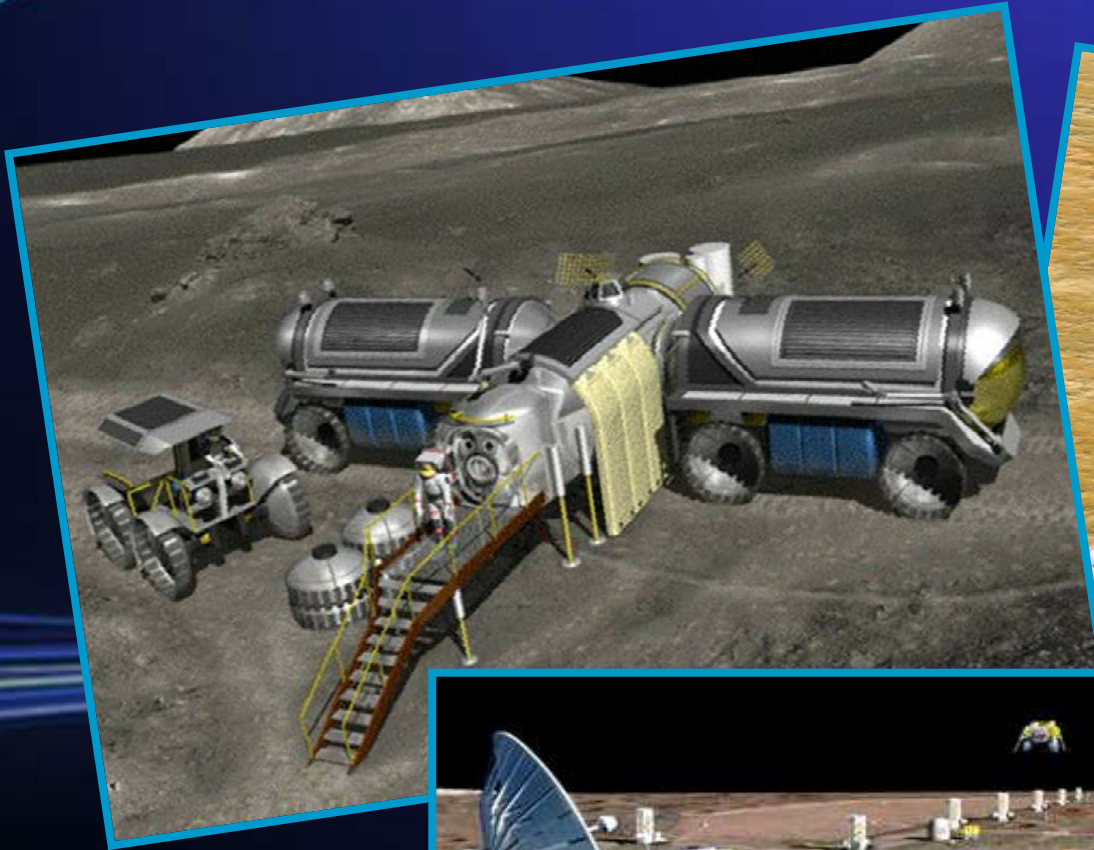


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# Preparation for Exploration – System Studies



European Architectures  
for Exploration (ESA)

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# Preparation for Exploration – Technologies



Virtual Simulation



Planetary Environment



Smart Skin



Food Production



Regenerative Fuel Cells

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Rendez Vous Demonstrator



Water Regeneration