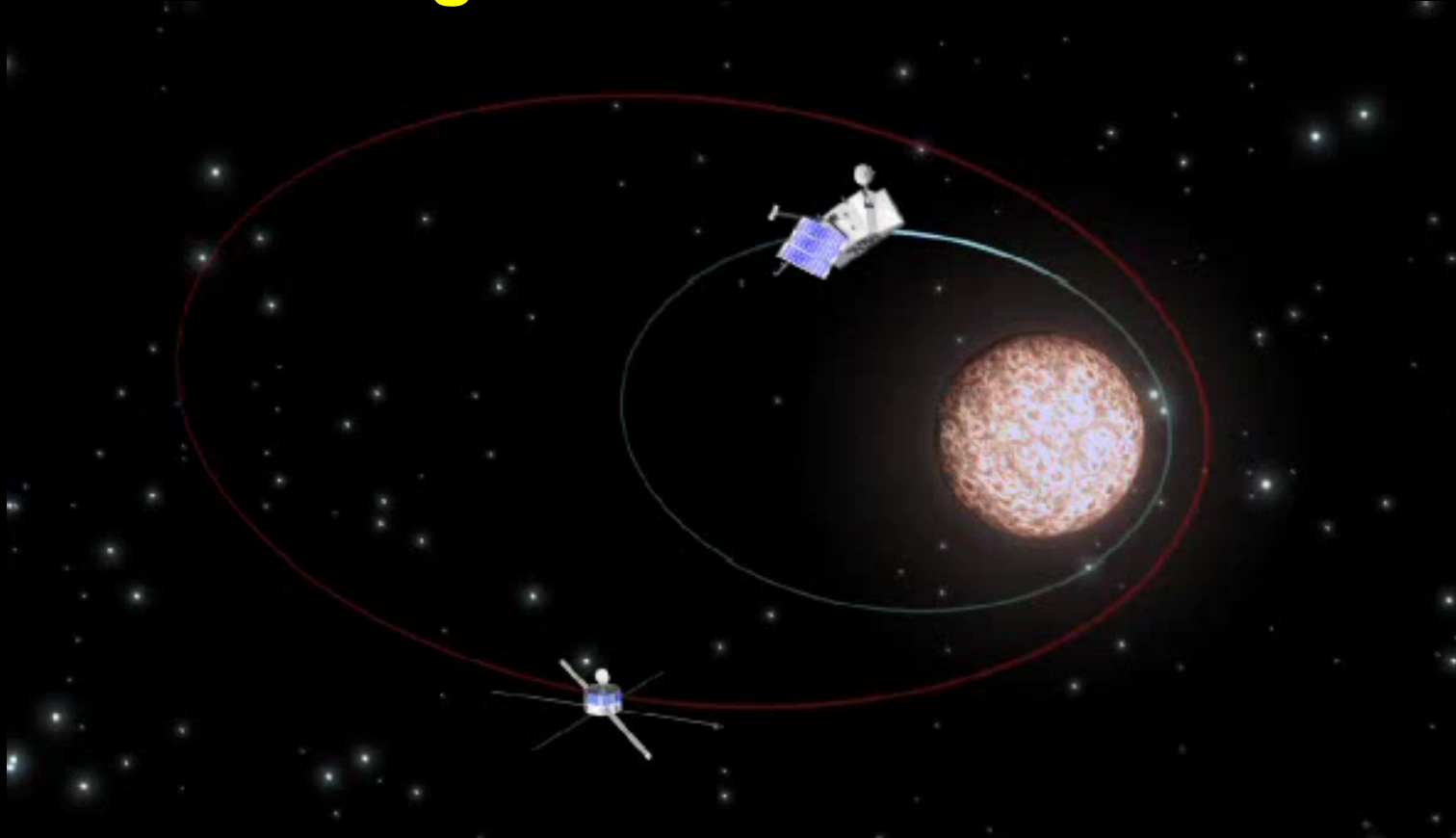


# BepiColombo

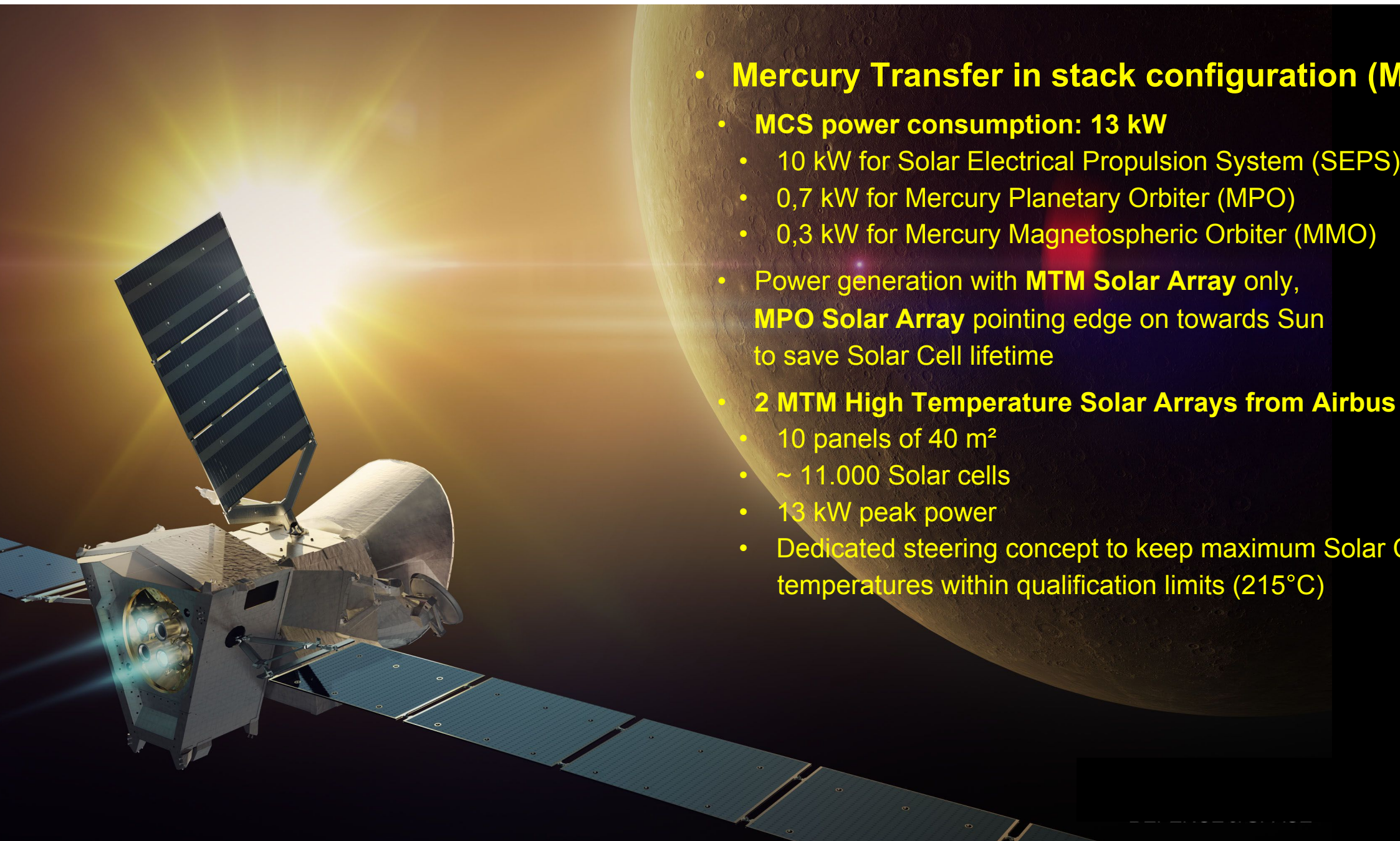
## Technologies for Power Generation



DEFENCE AND SPACE

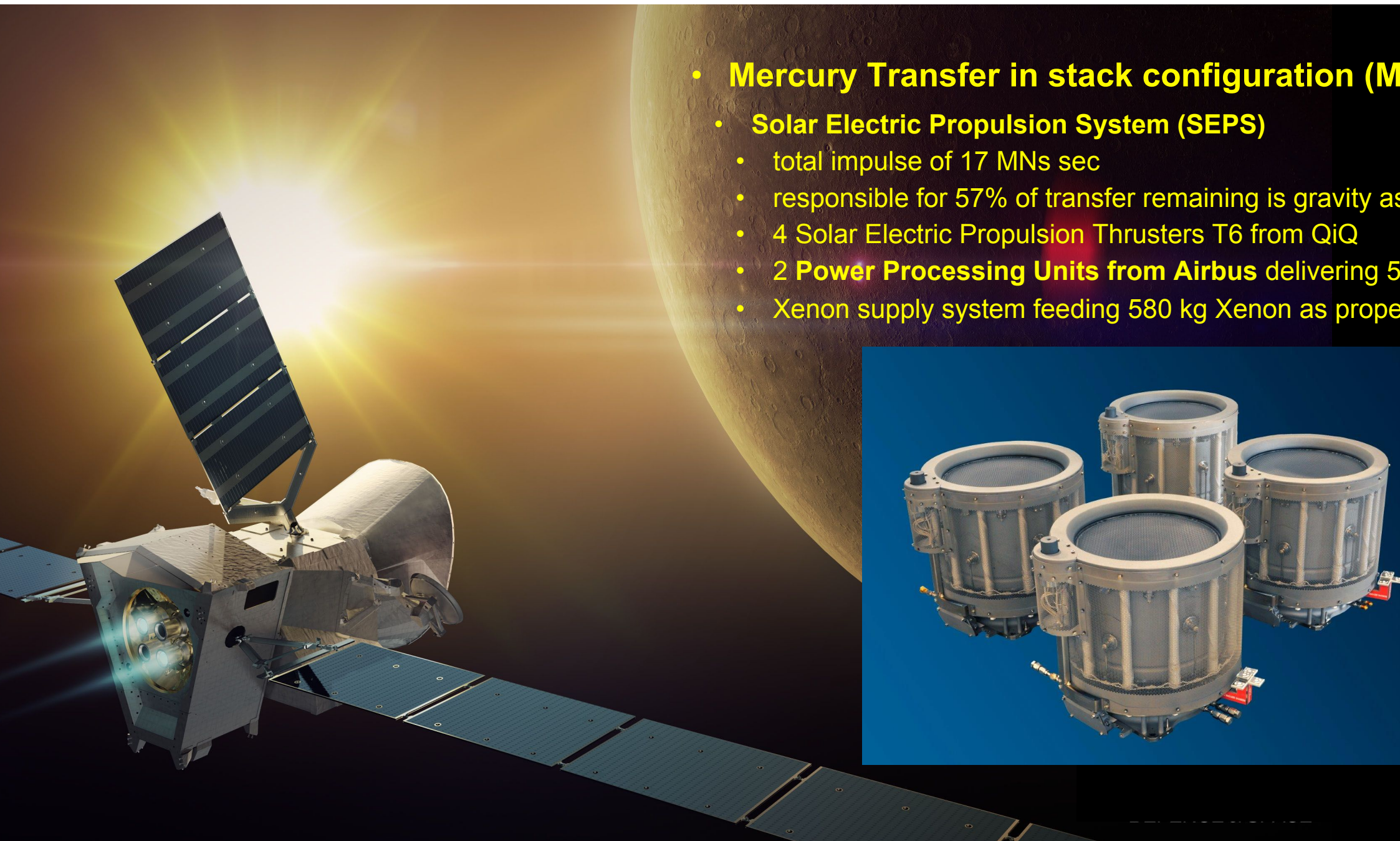
Markus Schelkle  
6 July 2017

AIRB



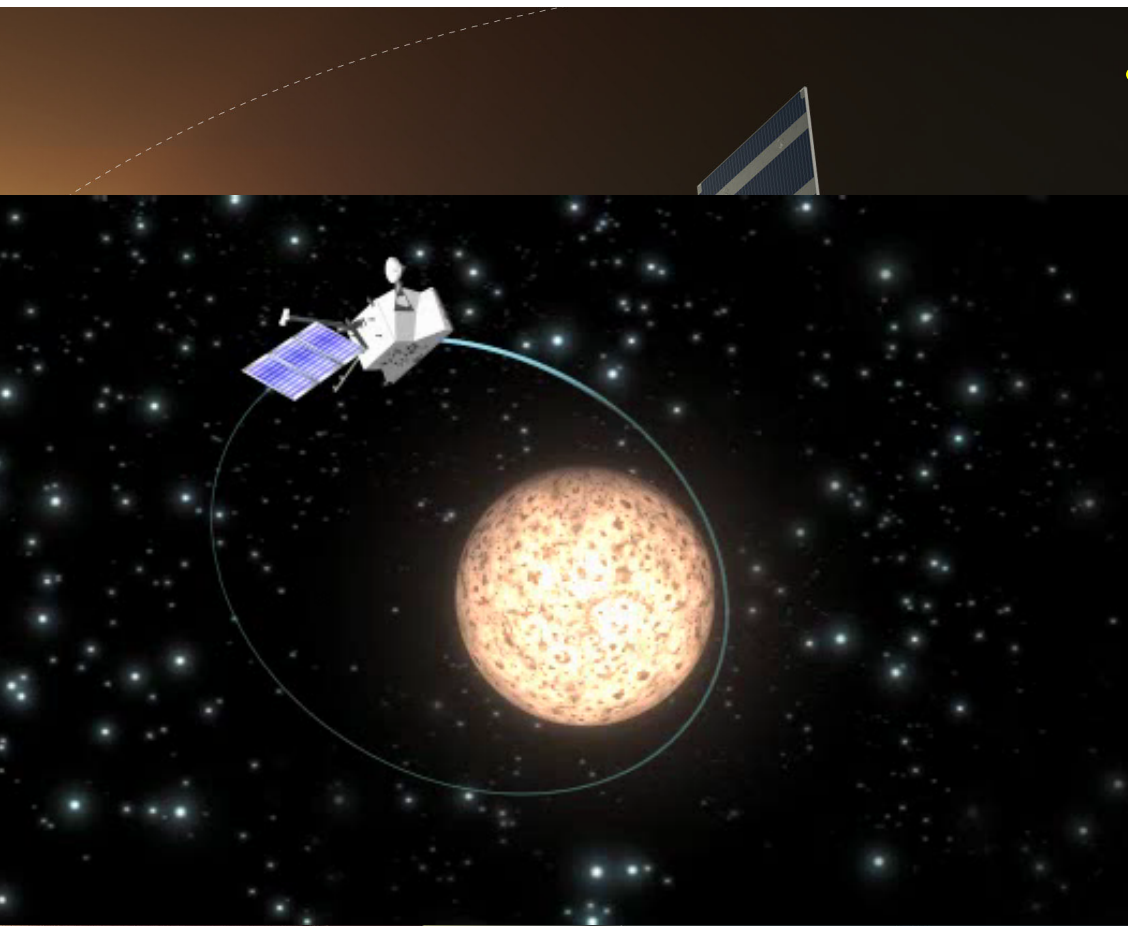
- **Mercury Transfer in stack configuration (M**
- **MCS power consumption: 13 kW**
  - 10 kW for Solar Electrical Propulsion System (SEPS)
  - 0,7 kW for Mercury Planetary Orbiter (MPO)
  - 0,3 kW for Mercury Magnetospheric Orbiter (MMO)
- Power generation with **MTM Solar Array** only, **MPO Solar Array** pointing edge on towards Sun to save Solar Cell lifetime
- **2 MTM High Temperature Solar Arrays from Airbus**
  - 10 panels of 40 m<sup>2</sup>
  - ~ 11.000 Solar cells
  - 13 kW peak power
  - Dedicated steering concept to keep maximum Solar C temperatures within qualification limits (215°C)





- **Mercury Transfer in stack configuration (M**
- **Solar Electric Propulsion System (SEPS)**
  - total impulse of 17 MNs sec
  - responsible for 57% of transfer remaining is gravity as
  - 4 Solar Electric Propulsion Thrusters T6 from QiQ
  - **2 Power Processing Units from Airbus** delivering 5
  - Xenon supply system feeding 580 kg Xenon as propellant

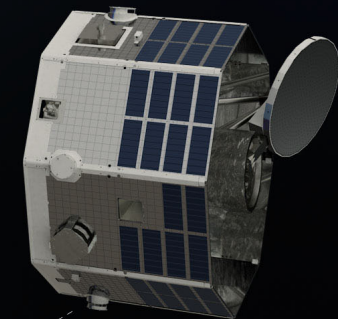
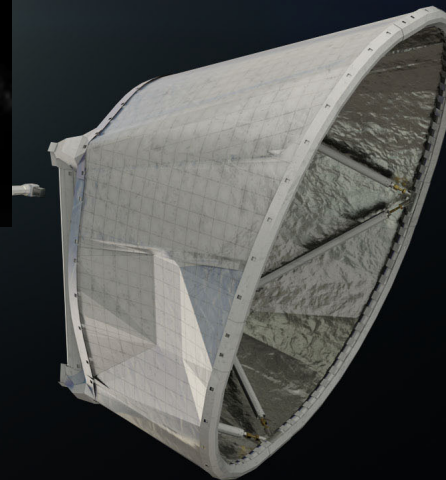




the contractor for ESA,  
**Defence and Space** is  
 able for designing and  
 all of the European  
 craft hardware.

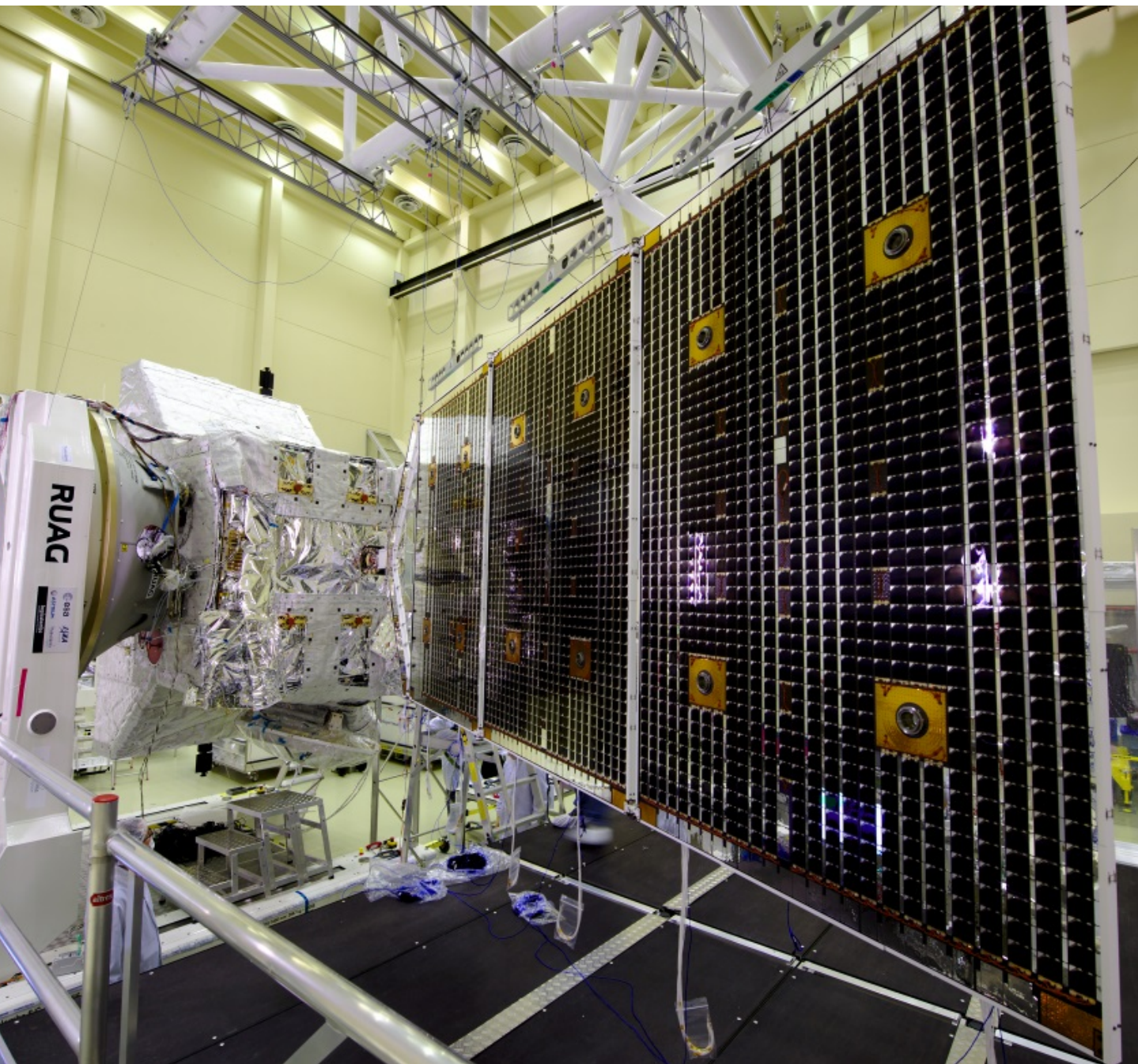
## • In operational orbits

- MPO and MMO independent power supply in combination with a dedicated operational concept
- **MMO** spinning with body mounted Solar Array
- **MPO**
  - nadir oriented with radiator pointing to deep space & Array pointing towards Sun at an angle providing enough power but keeping Solar Cell temperatures below qualification limit
  - S/C protection within 3 sec after failure via hot redundant Failure Control Electronics (FCE)



- **MPO Solar Array from Airbus** of 8 m<sup>2</sup> providing up to 1000 W with ~ 3000 solar cells





- **Solar Array Key Technologies**

- **Qualification temperatures:**
  - Materials:  $-170^{\circ}\text{C} \dots 560^{\circ}\text{C}$
  - Solar cells:  $-170^{\circ}\text{C} \dots 215^{\circ}\text{C}$
- **High temperature substrates**
  - **MPO:** High temperature full carbon fiber sandwich from Airbus
  - **MTM:** High temperature aluminum carbon sandwich
- **High temperature & UV resistant Cell Assembly from Azur Space**
  - Improved 3G28 design
  - UV protection via mesa wall
- Blocking diode development based on SiC technology
- Heat rejection with OSRs and special coated titanium shields
- All Solar Array parts had to be newly developed and qualified for BepiColombo