

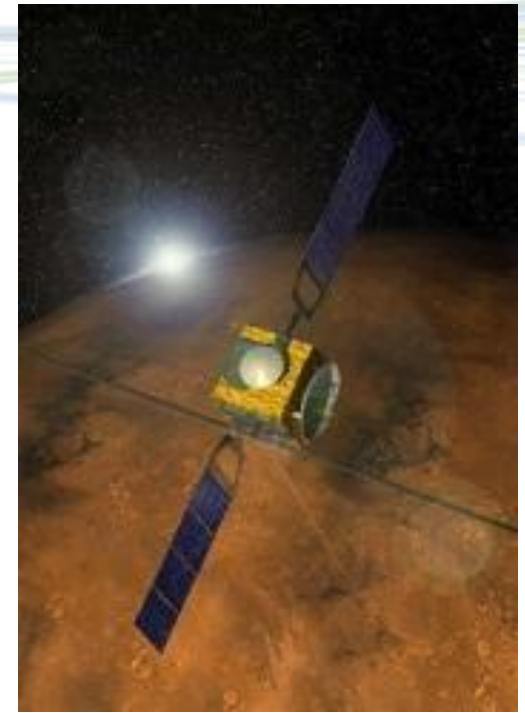
Airbus Defence and Space – Space Systems

The Airbus Experience from Science missions

Phil Windred

Mars Express & Venus Express

- Mars Express and Venus Express represent an inter-planetary design suitable for Carrington mission
- Both missions are orbiters, studying the planets' atmospheres and surface (Mars only)
- Both missions have been highly successful ; design life less than 5 years with Mars Express still operational after more than 10 years and Venus Express running out of fuel after 9 years
- Propulsion system sized for orbit insertion and is an excellent fit to requirement for the Carrington L5 mission
- MeX took 4 years from PDR to Launch, VeX less than 3 years
- The Carrington mission presents similar challenges to MeX and VeX



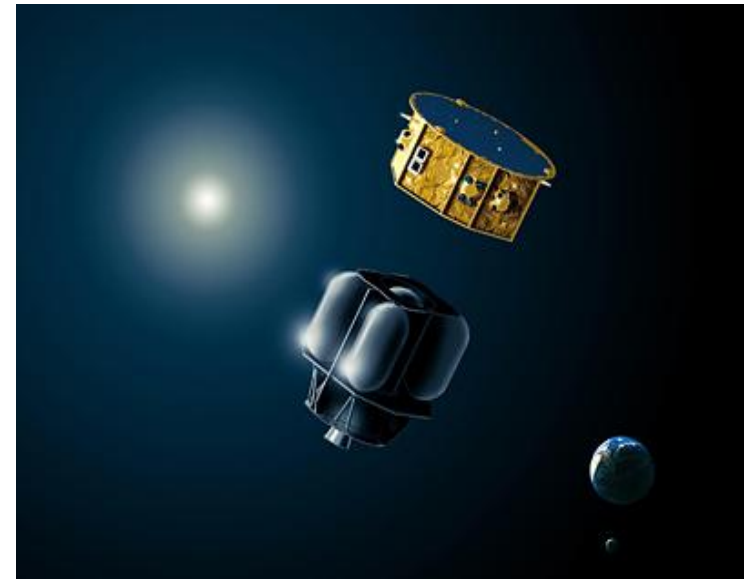
Solar Orbiter

- **Solar Orbiter** – understanding physics of solar activity. Closer to the sun than ever before leading to major thermal design challenges.
- Carrying science instruments from RAL, Imperial College, UCL plus European and US instruments.
 - Mix of in-situ and remote sensing instruments is very comparable to Carrington
- Much tougher mission than Carrington but demonstrates capability to integrate large number of solar physics instruments into a single satellite, including sensitive magnetic instruments. Due to launch in 2018.



Lisa Pathfinder

- Technology demonstrator for future gravitational wave observatory
- Science leadership in gravitational waves and gravity theory plus technology from Univ. Glasgow, Univ. Birmingham, Imperial College.
- Due to launch this year
- Mission to orbit about L1 with possible mission extension to Earth-Sun gravitational saddle point
- Very interesting navigational challenge using low thrust propulsion



Key Spacecraft design challenges for Carrington

- All parts of the Carrington design are enveloped by these existing missions:
 - Navigation – less challenging than Solar Orbiter and Lisa Pathfinder
 - Mechanical – relatively small spacecraft – conventional approach as per all Airbus satellites
 - Power – conventional approach as per all Airbus satellites
 - Thermal – conventional approach as per all Airbus satellites
 - Communications – deep space design as Mex, Vex & Solar Orbiter
 - Propulsion – deep space design as Mex, Vex & Solar Orbiter
 - Radiation – deep space design as Mex, Vex & Solar Orbiter
 - Magnetic, Cleanliness – Special measures as per Solar Orbiter
- As ESA spacecraft, all these mission were built by consortiums spread across Europe lead by Airbus. The capability to produce the complete spacecraft exists within the UK (Platform: Airbus/SSTL, Instruments: RAL/UCL/Imperial).