

# POLAR PLATFORM "A"



## Key Requirements and Objectives

- Unmanned vehicle designed for multiple mission payload accommodation.
- Separate standard Utilities Module and mission dedicated Payload Module.
- Flexible payload accommodation capability for multidisciplinary instruments.
- Nominally precise Earth pointing; in degraded mode pointing within a cone of  $15^\circ$  about nadir.
- Autonomous operation for periods of up to 24 hours without ground support.
- 4 years minimum lifetime.
- Optimum commonality with other COLUMBUS elements.

Figure: 1.1.-1.

# COLUMBUS

## Main Design and Performance Features

- LAUNCH:
  - Vehicle: ARIANE 5.
  - Mass: 7100 Kg (incl. 2000 Kg Payload, 440 Kg Propellant).
  - Dimensions: 10 m x 3.6 m diameter (Stowed).
  
- CONFIGURATION:
  - Ten-sided 3.6 m diameter Utilities Module.
  - Rectangular Payload Module.
  - One wing solar array.
  
- ELECTRICAL:  
POWER
  - 120 VDC unregulated.
  - 7.5 KW total solar array output power (End of Life);  
2.0 KW average for payload.
  - Dedicated power distribution for subsystems and payload.
  - 8 Nickel Cadmium batteries for energy storage.
  
- GUIDANCE,  
NAVIGATION AND  
CONTROL:
  - Dedicated real-time bus (1553 B).
  - Attitude control with 200 Nms reaction wheels and  
2000 Am<sup>2</sup> magnetorquers.
  - Switchable yaw steering.
  - Attitude measurement: 0.03°, 0.01°/sec (3 Sigma).
  - Pointing accuracy: 0.1°.
  
- PROPULSION:
  - Twenty monopropellant 20 N thrusters.
  
- DATA MANAGEMENT:
  - Minimum Telemetry/Telecommand for initialisation and safe mode.
  - Independent data acquisition and processing for subsystems and payload.
  - Transparent data communication, ISO Layer Model.
  - Two identical local area networks (10 Mbps).
  - Scientific medium rate data multiplexing and transmission to ground.
  - Automated systems operation incl. failure detection, isolation and recovery.
  - Data storage: 3 Mbps and 10 Mbps recording; 50 Mbps playback;  
30 Gigabits storage.
  
- COMMUNICATION:
  - Direct and via DRS to/from ground: S-Band (omni-directional).
  - Direct to ground: X-Band (global coverage).
  - Via DRS: Ka-Band, 1.2 m steerable antenna 4 m boom.
  
- RELIABILITY:
  - 0.75 for 4 years.

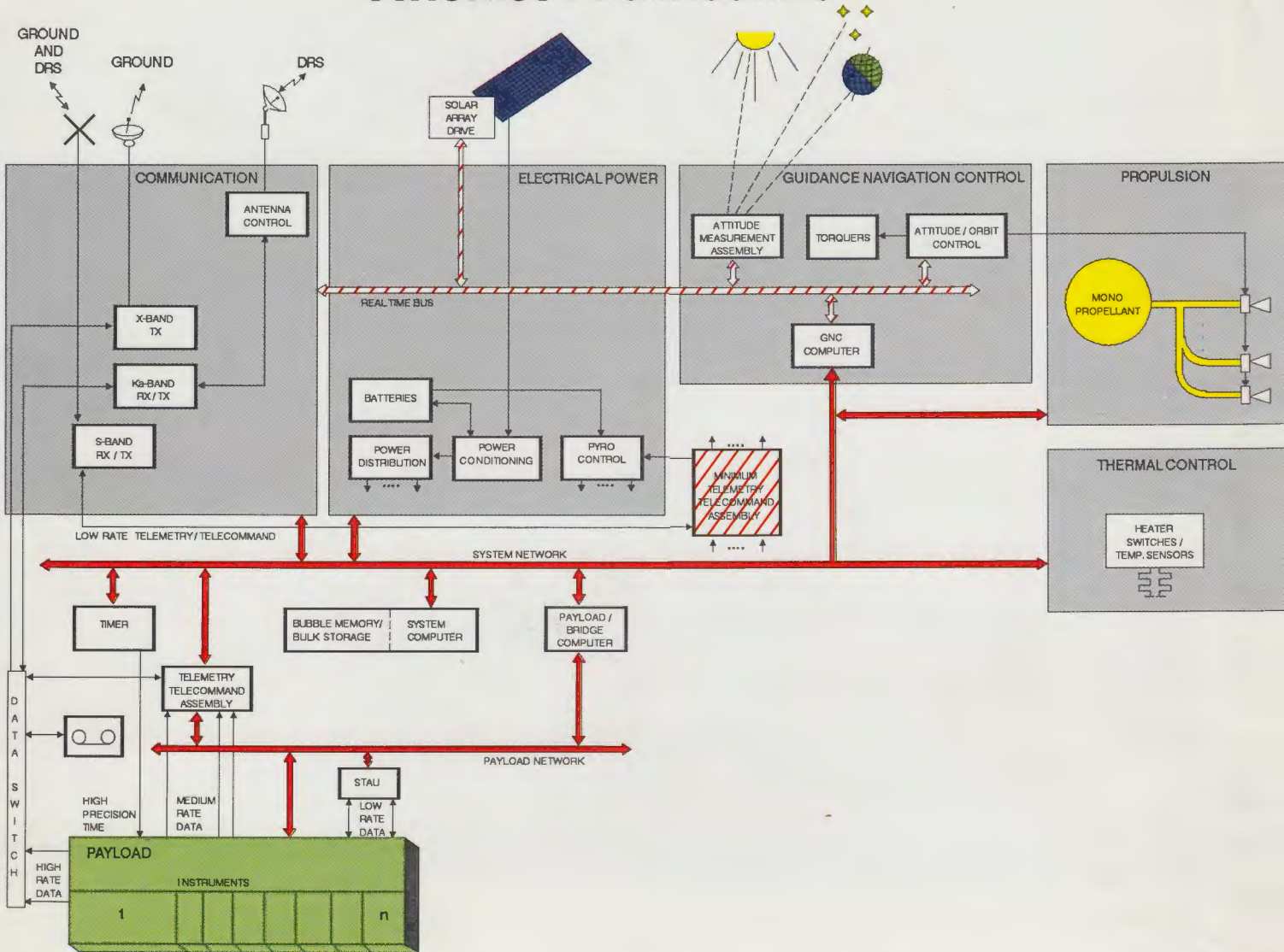
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# Avionics Architecture



## First Mission Payload Complement

- Sixteen payload instruments on Payload Module; fifty RF-transmitter/receiver channels ranging from UHF to 180 GHz; seventy interdependent fields of view.
- Operational Instruments;
  - Advanced Minimum Resolution Imaging Radiometer.
  - Advanced Microwave Sounding Unit.
  - ARGOS Data Collection and Location System.
  - Earth Radiation Budget Instrument.
  - Search and Rescue.
  - NOAA Direct Broadcast.
- Core Instruments:
  - Radar Altimeter.
  - Wind Scatterometer.
  - Medium Resolution Imaging Spectrometer.
  - Synthetic Aperture Radar or Multiband Imaging.
  - Microwave Radiometer or Atmospheric LIDAR.
- Space Science Instruments:
  - Space Environment Monitor.
  - Auroral Imaging Observatory.
  - Particles and Field Measurements Fabry-Perot Interferometer.
  - Global Electrodynamics Monitor.



## Payload Resources

Data/Command Channels	Payload Data Links	Flight Ops Links	On Board Process.
4 High Rate (50 or 100 MBPS)	X		
8 Medium Rate (0.5 to 32 MBPS)	X		
20 Low Rate (Composite < 5 MBPS)	X	X	X
20 Command	X	X	X
20 Time signal interfaces (10 microsec accuracy)			X

- Electrical Power
  - 15 Outlets 800 W peak, 350 W continuous.
  - 15 Outlets 200 W continuous.
  - Regulation 120 VDC + 1%/-3.5%
  - 3 Dedicated power outlets for launch / ascent support.
- Thermal
  - Up to 400W transfer between Payload Module and instruments.
  - Interface temperature controlled between 0<sup>o</sup> and 25<sup>o</sup> C.
- Instrument accommodation on honeycomb sandwich panels with flexible accommodation pattern.

## Transportation & Launch

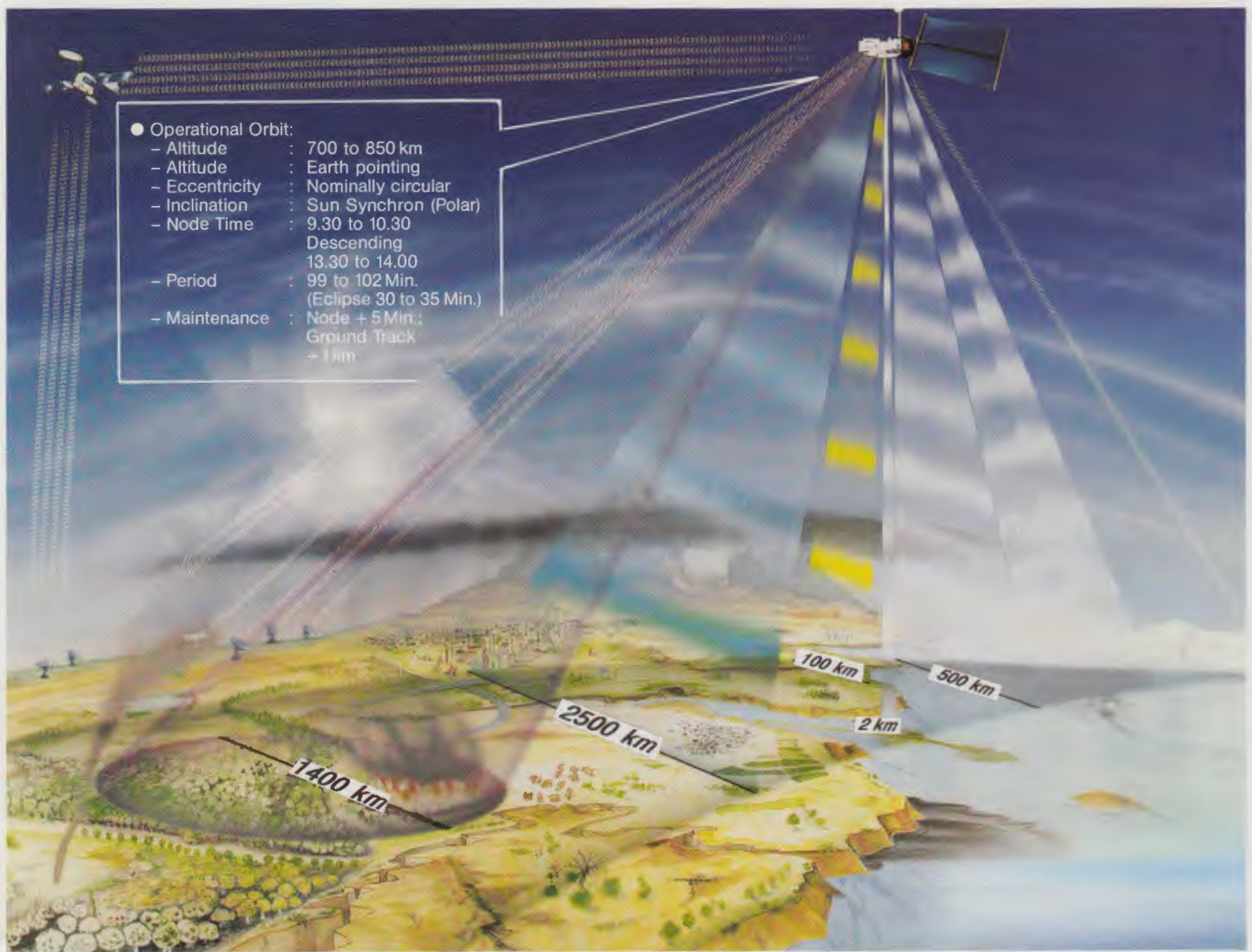


- Final Polar Platform integration and test at BAe / Bristol
- Transport to Kourou by ship
- Launch by ARIANE 5, either in single or dual payload configuration, into transfer orbit (operational altitude minus 5 km)





# POLAR PLATFORM "A" MISSION SCENARIO



## Scientific Mission Objectives

- Investigation of Global Environmental Problems:
  - 'Greenhouse' effect.
  - Ozone depletion.
  - Tropical deforestation.
  - Desertification.
  - Urbanization.
  - Pollution.
- Global Observation of the Earth:
  - Continuous, simultaneous, coherent observation in many spectral bands over long periods of time.
- Zones of Interest:
  - Land.
  - Ocean and ice.
  - Atmosphere and weather.