The Astrolabe Bus

Astrolabe can take you where you want to go

- Planetary remote sensing
  - Mercury, Venus, Earth, Mars
- Celestial body rendezvous
  - Moons, comets, asteroids
- Lagrange point and heliocentric orbits
- Geostationary Earth Orbit (GEO)
- Low Earth Orbit (LEO)

Instrument Accommodation (highly configurable)

- Surface or kinematic mounting
- RS-422, LVDS, Spacewire, 1553 interfaces available
- Up to 500 kg available to instrument payload
- Up to 700 Watts available to instrument payload
- ~1 Mbps data to Earth from deep space or 10’s of Mbps from LEO or GEO
- Nadir, zenith, limb, solar pointing
- Scanning or stationary
- High precision pointing
  - Control: 6 arcmin
  - Knowledge: 1 arcmin
  - Jitter: 2 arcsec/3 sec
- Sun avoidance/Sun protection
- Thermally isolated or thermally sinked
- Precision thermal control available

Leveraging our 70 year history of successful space exploration, LASP achieves cost-effective mission and spacecraft customization through whole-system synthesis by our highly experienced systems engineering and program management teams, together with our world-renowned scientists and mission operations group. This unique combination of mission segments within a single organization creates the critical ethos necessary to produce a targeted, effective, and collaborative mission solution.
Astrolabe is a highly configurable bus that can accommodate deep-space, GEO, or LEO missions.

The Emirates Mars Mission (EMM) bus, the origins of Astrolabe, was a joint international effort between LASP and the Mohammad Bin Rashid Space Center in the United Arab Emirates.

- Heritage components in custom solutions
- Parallel integration design maximizes available instrument development time
- Agile, responsive, inclusive, and payload-focused development team
- Highly test-driven development philosophy
- Significant experience developing high-performance pointing platforms
- Highly configurable fault-protection systems
- International collaboration: ITAR/EAR/Export control and licensing successfully implemented over three years
- On-site development labs, clean rooms, and thermal-vacuum testing chambers

## Spacecraft Overview

- **ADCS**
  - 3-axis stabilized, inertially pointed
  - Redundant star trackers and IRUs
  - 4 for 3 reaction wheels
  - 8 for 4 one-Newton RCS thrusters for reaction wheel desaturation, safe mode, and roll control during Delta-V maneuvers
- **Command and Data Handling**
  - Selectively redundant computer with extensive fault protection
  - Architecture supports a fully redundant configuration
- **Flight Software**
  - Based on NASA’s open-source CFE-CFS software with mission-specific applications
- **Electrical Power Systems**
  - Direct energy transfer system
  - Deployable, non-articulating arrays, 12 strings; articulated arrays available
  - Lithium ion battery with m-for-n cell redundancy
  - Fully internally redundant Power Control Unit
- **Thermal**
  - Thermostatically and flight software controlled heaters (most redundant)

- Multi-layer insulation (MLI)
- Passive radiators
- **Telecom**
  - 1.85-meter high gain antenna
  - Spherical coverage low gain antennas
  - High-reliability deep-space X-band radio talking to NASA’s DSN; Ka-band available for higher rate communications
  - 100-watt TWTA
- **Propulsion**
  - Regulated monopropellant hydrazine
  - 6 x 100 Newton Delta V thrusters for planetary orbit insertion or celestial body rendezvous
  - 8 x one-Newton RCS thrusters; larger thrusters available for greater maneuverability
- **Structure**
  - Central thrust cylinder with honeycomb composite panels
- **Launch Vehicle**
  - Compatible with any GEVS enveloped launch capability
  - Proven interface heritage with Mitsubishi Heavy Industries HIIA

## Additional Services

**Program Management**—Adept at tailoring projects for customer-desired levels of engagement, reporting, and access

**Mission Design and Navigation**—Significant experience in implementing complex, interplanetary orbits and trajectories with partners

**Mission, Spacecraft, and Instrument Systems Engineering**—Broad experience architecting and implementing mission, spacecraft, and instrument solutions; all under one organizational group to foster collaboration and cohesion

**Mission Operations**—On-site mission operations experts and facilities implementing turn-key solutions with extensive experience flying both Earth-orbiting and deep-space missions

**Data Systems**—Hosted data centers, data processing experts, and web-based interactive data tools developers

For more info on Astrolabe and LASP engineering services, please contact:

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