Planetary Resources, the asteroid mining company, is developing a range of deep-space robotic prospectors named "Arkyd." These spacecraft will explore the inner solar system, prospecting near-Earth asteroids to identify and characterize their potential for in-space resources. To enable the commercial viability of such missions, new low-cost, robust, and efficient systems are required.

Planetary Resources has designed such a spacecraft platform that can be rapidly iterated to accommodate science and technology platforms as payloads and instruments built for internal risk-reduction needs and utilization by external customers. A capable spacecraft bus architecture and subsystem components have been developed and utilized a Cubesat form factor to enable rapid demonstration of new technologies in Earth orbit.

The Arkyd series spacecraft began with a 3U demonstration, the Arkyd-3, in low-Earth orbit and has now evolved to a 6U, Arkyd-6, scheduled for launch at the end of 2015. The Arkyd-100 and Arkyd-200 spacecraft, currently in development, continue this evolution of spacecraft development and maturation, building the platform to a full scientific remote sensing system capable of leaving low Earth orbit and exploring deep space.

**ARKYD OPERATIONS**

On July 16, 2015, the Arkyd-3 Reflight spacecraft was deployed from the ISS, starting the first on-orbit operations of an Arkyd Spacecraft. Since then, the spacecraft has undergone several in-orbit demonstrations and has enabledPlanetary Resources to integrate optical communications as well as other advanced technologies into the spacecraft platform.

**LOOKING AHEAD**

The Arkyd-100 will be the first spacecraft to utilize optical communications to an Earth station, the system’s primary purpose to convey scientific data. The spacecraft will also be the first to demonstrate high delta-V propulsion, an essential capability for deep-space exploration. The Arkyd-200 will be the first spacecraft to escape the confines of Earth orbit, enabling the platform to explore other targets of interest within the inner solar system.

**ARKYD-100 – CAPABLE EARTH-BASED SCIENCECRAFT / DEEP SPACE PATHFINDER**

- **Instrument**: The Arkyd-100 utilizes a larger optical aperture to facilitate the suite of scientific instruments necessary for asteroid science. The spacecraft is designed to accommodate a range of instruments, including
  - **S-band downlink**: up to 40 Mbps
  - **X-band downlink**: up to 40 Mbps
  - **Free space optical communications**: enabling direct downlink to Earth stations

**ARKYD-200 – ARKYD INTERPLANETARY SPACECRAFT, THE PROSPECTORS**

- **Power**: The spacecraft utilizes solar power to enable mission operations. The Arkyd-200 is designed to accommodate a range of payload instruments, including
  - **Reaction wheels and dual star trackers**: enabling coordinated operations
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**Looking Ahead**

- **Spacecraft Mass**: 50 kg
- **Power**: 150W (1 Au)
- **Communications**: X-band downlink, 0.5 to 2 Mbps
- **Payload Instruments**:
  - **MWIR imager**: based on heritage from the Arkyd-6 configuration, operating across 3-5um
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**Planetary Resources**

Planetary Resources, the asteroid mining company, uses Earth orbit as a testbed for the development of deep space robotic prospectors. The company is developing a range of spacecraft platforms, including the Arkyd-3, Arkyd-6, Arkyd-100, and Arkyd-200, to explore the inner solar system and prospect near-Earth asteroids for in-space resources.

**Core Capabilities of Arkyd Subsystems**

- **AVIONICS**: The spacecraft Avionics is core to the spacecraft operations, including flight control, data handling, and communication systems. The architecture was designed for scalability and reliability, supporting state-of-the-art spacecraft vehicle performance while enabling the accommodation of hosted experimental payloads.
- **POWER**: The spacecraft power system is designed to provide a simple power system architecture with minimal interface requirements. The spacecraft power system is designed to provide a simple power system architecture with minimal interface requirements.
- **INSTRUMENT**: The payload interface was designed to provide a simple payload interface to the spacecraft bus to enable rapid demonstration of new technologies in Earth orbit.

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