Resource Prospector: Mission Overview and Current Activities D. Andrews[1], A. Colaprete[1], J. Quinn[3], B. Bluethmann[2], G. Chavers[4], J. Trimble[1], [1]NASA Ames Research Center, Moffett Field, CA, [2]NASA Johnson Space Center, Houston, TX, [3]NASA Kennedy Space Center, FL, [4]NASA Marshall Spaceflight Center, AL.

Introduction: The Resource Prospector (RP) is an In-Situ Resource Utilization (ISRU) technology demonstration mission being developed by the NASA Human Exploration and Operations Mission Directorate's (HEOMD) within the Advanced Exploration Systems (AES) Division (Figure 1). The mission will demonstrate volatiles prospecting and extraction from lunar regolith to validate an ISRU capability. The mission will address key Strategic Knowledge Gaps (SKGs) for robotic and human exploration to the Moon, Near Earth Asteroids (NEAs), and ultimately Mars, as well as meet the strategic goals of the Global Exploration Roadmap (GER), offered by the *International Space Exploration Coordination Group (ISECG)*.

Figure 1. Resource Prospector

Overview: RP will provide knowledge to inform the selection of future mission destinations, support the development of exploration systems, and reduce the risk associated with human exploration. Expanding human presence beyond low-Earth orbit to asteroids and Mars will require the maximum possible use of local materials, so-called in-situ resources. The moon presents a unique destination to conduct robotic investigations that advance ISRU capabilities, as well as providing significant exploration and science value. Lunar regolith contains useful resources such as water, Oxygen, silicon, and light metals, like aluminum and titanium. Oxygen can be harvested from the trapped water in the regolith for life support (breathable air), or be used to create rocket propellant (oxidizer). Regolith can be used to protect against radiation exposure, be processed into solar cells, or used to manufacture construction materials such as bricks and glass. RP will characterize the constituents and distribution of water and other volatiles at the poles of the Moon, enabling innovative uses of local resources, in addition to validating ISRU capabilities. This capability will be valuable as a potential resource to harvest in support of missions to near-Earth asteroids (NEAs) and Mars.

Figure 2. The RP15 Rover and Payload during first drive in the rock yard at JSC.

In order to reduce risk and explore system designs, the RP project attempted a two-fold approaches to development as it looked towards flight. Flight planning continued by defining requirements, interface definitions and developing partnerships, but we also used FY2015 to define, develop, build and test an earth-terrestrial prototype rover and payload system – a mission-in-a-year. This terrestrial prototype, called "RP15" (Figure 2), was built to both inform the system design, and to be a partnership advocacy tool for this unique mission.

RP15 must be affordable within the resource and time constraints of fiscal year 2015, while working to the following Needs, Goals, and Objectives provided by HEOMD/AES:

1. Demonstrate rover mobility in a 1g environment
2. The Surface Segment (prototype rover + payload system) shall represent the flight system concept with as much fidelity as affordable (limited by cost and schedule)
3. Priority should be given to illustrating mission functionality over support functionality, which exists solely to support mission functionality

This talk will provide an overview of RP project developments, including the design, build and test of the RP15 rover/payload system in relevant environment.