**Lunar Sample Return via the Interplanetary Superhighway**

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The Aitken Basin at the lunar south pole is the largest impact crater known in the Solar System, piercing the Moon's mantle. A National Research Council panel recently recommended that NASA consider a robotic Lunar Sample Return mission to collect samples from the Aitlen Basin and return them to Earth for study [1]. This paper describes several approaches to a Lunar Sample Return mission. The Lunar Sample mission consists of two spacecraft: a communications orbiter module and a lander/sample return module; the combined flight system is carried to the Moon. The desired landing site in this case is on the backside of the Moon which cannot be seen from Earth; this is why a communications orbiter module is needed. Knowledge of the Interplanetary Superhighway tunnels and their dynamics provide good initial guess solutions for the final integrated solutions. The exploration of the design trade space was facilitated by JPL's LTool2001 mission design tool.