

AN ATV FOR THE MOON

Finn Braun¹ and Pascal Lee^{1,2,3,4}

¹Mars Institute; ²SETI Institute; ³Kepler Space University, ⁴NASA Ames Research Center.

E-mails: finn.braun.ab@gmail.com, pascal.lee@marsinstitute.net.

Summary: A design for a future ATV (All-Terrain Vehicle) for astronauts on the Moon is presented.

Introduction: Astronauts on the Moon will need a multipurpose fleet of vehicles to conduct a wide range of activities: science, exploration, logistics, lunar development, etc. ATVs, or quads, have been proposed as individual astronaut transports [1-3]. ATVs are low-mass, low-power, high-torque, nimble, rugged, versatile field rovers. They help maximize operational flexibility, increase productivity, and enhance safety, in particular via redundancy if designed to carry two astronauts in a contingency [2,3]. ATVs would serve as mobile life support systems (LSSs) capable of recharging lightweight spacesuit portable LSSs (PLSSs) [2,3]. ATVs would also be “smart”, *i.e.*, have self-driving astronaut-following autonomy, and serve as robotic rovers when not driven by crew [2,3].

This Study: The present lunar ATV design study began with sketches by P. Lee of a single astronaut rover incorporating features not present on the Apollo Lunar Rover, derived from extensive ATV operations experience at the Haughton-Mars Project in the Arctic, in part in collaboration with Hamilton Sundstrand (now Collins Aerospace) [1-3]: *e.g.*, PLSS recharging island [2], handle bars, roll cage, solar panel, instrument deck, robotic arm [4], winches, and rear-facing jumpseat [2,3] (**Fig 1**).



Figure 1. Lunar ATV concept. (Sketch by P. Lee).

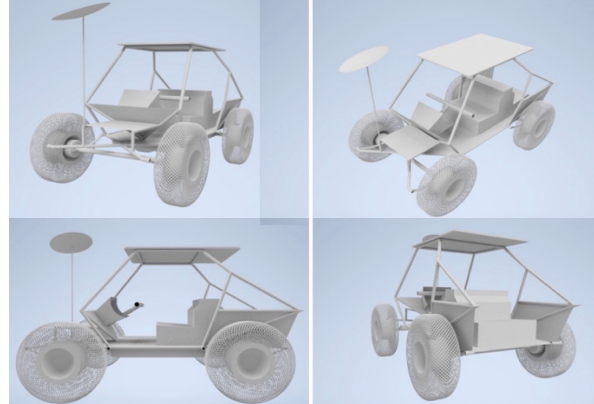


Figure 2. Lunar ATV concept design. Perspective views of the Lunar ATV. (CAD by F. Braun).

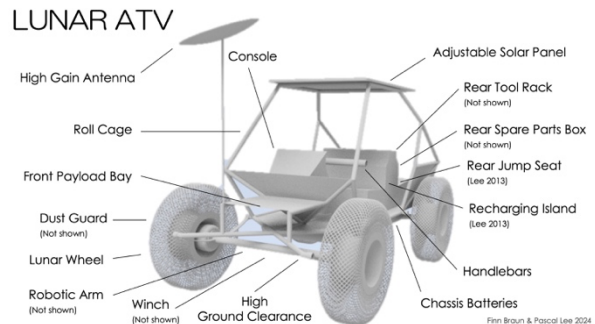


Figure 3. The Lunar ATV. (This Study).

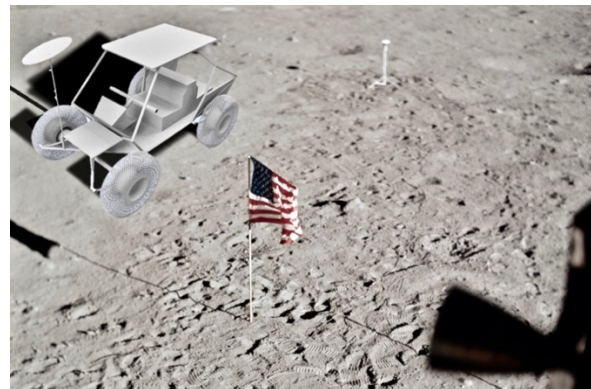


Figure 4. Lunar ATV on the Moon. Rendering of the lunar ATV on the Moon (NASA Apollo 11 pic).

Computer-Aided Design (CAD) graphic models of the lunar ATV were created by F. Braun (**Figs. 2 to 4**), incorporating proven design elements from terrestrial ATVs and the Apollo Lunar Rover, and the novel design features listed above.

Conclusion: A design for a compact lunar ATV incorporating new features was created. Such a vehicle could serve Artemis astronauts on the Moon, and would pave the way for a Mars ATV [2].

Acknowledgments: This work was supported in part via NASA Coop Agreement NNX14AT27A and via NASA grant award 80NSSC21M0004.

References: [1] Lee 2002. Mars on Earth: The NASA Haughton-Mars Project. *Ad Astra*, May-Jun, 2002, 12-17, 51-53; [2] Lee 2013. *Mission: Mars*. Scholastic, 48pp; [3] Lee 2020. *LSSW-2020, Sci. Enabled by Mobility*, #6015; [4] Lee et al. 2011. Human exploration of asteroids, the Moon, and Mars using robotic arm-equipped pressurized vehicles. *ASCE Earth & Space 2012*, Pasadena, CA, 10 pp.