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PRESSURIZED ROVER FOR THE LUNAR POLE – CONCEPT, MISSION AND TESTING OPTIONS

Abstract

The lunar south pole is usually preferred as the target for next landers, opposite the lunar north pole region offers some advantages for wide radius rover missions and future surface harvesting. This study analyzes realizable lunar rover exploration mission for American and European astronauts within 2020-2026 horizon.

The Lunar Semi-Robotic Pressurized Rover (LSPR) concept is to be able to support crew of three astronauts (commander, engineer and scientist) for up to one week and then operate unmanned. Studies proposing to send two rovers with two astronauts each at the same time make good sense, but requires great, very hardly reachable, costs. One vehicle for one mission look like more realistic at the time. Psychologically, three astronauts can be effective in case of quick decisions and solving problems with no real-time connection to ground control.

Operating in the pole areas, vehicle moves mainly in shadows. Windows can only be used with reflectors on and low lights inside the cabin. Therefore windows will be most of the time shielded to protect from the lunar dust and radiation. Astronauts will use advanced navigation and terrain recognition systems, more than direct eye contact, to drive the rover and windows will be used mostly when astronauts wants to take better look on sample candidates. At the time they can use Multipurpose Robotic Arm (MRA), which can be also operated by one astronaut to support other two when performing EVAs.

Rover design functions combines those of Eurobot and NASA LER/SEV concepts. Pressurized hull is based on the Thales Alenia modules. By size parameters it is close to the nowadays developed Cygnus Enhanced. The front has similarities with Copula module. The rear Flexible Airlock (FA) allows connecting to a lander from different angles. The FA is connected to the Rover Pressurized Module with two suit ports and small lock which allows astronauts to enter the pressurized airlock module to service and clean their space-suits. Chassis is equipped with lunar soil harvesting mechanism to test for future usage.

For multiple re-usage the rover will be dependent on a solar power station which will be navigated to land on constantly illuminated site (like north rim of Peary Crater).

When unmanned, rover can continue robotic exploration ,measure condition of the cabin, which can be possibly used a year later.and service the power platform.