



**Aerospace  
Systems Division**

Human Factors Analysis  
Effort for LRRR

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The following compilation of Crew Systems and Operations human factors analysis design criteria and requirements inputs to the LRRR Design Group constitutes the baseline parameters required to modify the Apollo 11 LRRR design to the Apollo 14 configuration.

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The following design criteria and requirements inputs were provided to the LRRR design group during the course of the LRRR program:

1. Design LRRR for deployment by one astronaut.
2. Eliminate all sharp edges, corners, protruberances, burrs, and abrasive surfaces. The minimum radius for any external edge or corner should be 0.03 inch.
3. Prevent astronaut exposure to all hinged surfaces.
4. The LRRR carry handle, UHT and UHT sockets, and pull rings should permit the astronaut to deploy the LRRR from a standing position.
5. The LRRR design should permit the astronaut to perform one-handed reach operations between 22 and 66 inches off the ground, perform one-handed manipulations between 28 and 60 inches off the ground, and perform two-handed manipulations between 30 and 48 inches off the ground.
6. The UHT socket (s) should be located as close to the center of mass of the deployed configuration as possible.
7. The carry handle should be opposite the back support structure, oriented horizontally and as close to the center of mass of the stowed configuration as possible.
8. Pull ring inside diameter should be 2 inches minimum.
9. White, matte thermal control paint (no glare) should be used on the LRRR.
10. Black or orange markings on a white background should be used for astronaut cues and instructional decals.



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11. The astronaut should not be required to exert a force of less than 3 pounds or more than 30 pounds.
12. The clearance between the LRRR release mechanism handle and the Grumman pallet should be at least 2 inches. (Grumman-supplied hardware)
13. The length of the LRRR release mechanism handle should be at least 4 inches, on the right side, measured from the side of the shaft. (Grumman-supplied hardware)