

Problem Statement - Suspension

As mentioned in the design brief, it is required to design a lunar rover which is missioned to traverse on the lunar surface in search of lunar regolith and deliver it to a NASA in-situ resource utilization (ISRU) facility on Moon. To carry out its mission successfully an essential and critical component is the Suspension system. [1]

The suspension system should be able to support the rover's weight while enabling smooth traversal across uneven, rocky, and powdery regolith surfaces without compromising structural integrity. According to the design brief a rocker bogie suspension system should be designed for the rover

Rocker Bogie Suspension system:

The rocker-bogie system is a springless suspension system developed in 1988 originally intended to use in NASA's Mars rover Sojourner. It has since been the preferred design option to be used in rovers.

The rocker part of the suspension is designed to rotate in opposite directions relative to the body. The use of a differential made this possible. This allows the chassis to only rotate at half the angle relative to which it would pivot relative to the chassis, when travelling over steep terrain. The bogie is connected to the rocker at the rear end of the rover and connects to the two rear wheels of the rover. It helps to improve the stability of the rover. [2]

It is required to design a single rocker-bogie suspension for the front wheels and a dual rocker-bogie suspension for the rear wheels. The suspension should also be in line with the drive system to achieve the minimum ground clearance requirement and stay within the constraints of the rover size limitations.

Key constraints:

Mass (Total of the Rover):	20kg
Dimensions (Rover):	300 mm (H) × 500 mm (W) × 500 mm (L)
Ground Clearance:	>200 mm
Wheel diameter:	80 mm - 130 mm
Materials (Recommended):	Aluminium, titanium, carbon-fibre polymer composite, or steel.
Front wheels:	Single rocker bogie design
Rear wheels:	Dual rocker bogie design

Table 2: Key Constraints