

# Sherpa

## A Hybrid Walking and Driving Rover for Planetary Exploration

### System Description

Sherpa is a hybrid driving and walking rover, that is equipped with a wheel drive as well as an actuated suspension system. Using the actuated suspension system, it is possible to generate combined walking/driving motions and even short traverses of pure walking motion. The goal is to have an energy efficient (wheeled) locomotion, that can be advanced in difficult situations using the active suspension or "legs" of the system. Sherpa was originally developed within the multi robot system RIMRES. Its tasks encompass the transportation of a walking scout robot (CREX) and the transportation and assembly of scientific payloads.

### Technical Details

- **Size (variable, data for standard configuration):**
  - Foot print: ca. 2.4 m x 2.4 m
  - Ground clearance: ca. 0.5 m
  - Height of the manipulator basis: ca. 1.2 m
- **Mass:** ca. 200 kg
- **Additional Payload:** 50 kg
- **Power supply:**
  - LiPo battery with 48.8 V / 8000 mAh
  - Runtime with battery about 1,5 h
- **Velocity:** max. 0.5 m/s; typical: 0.1 m/s
- **Actuation:**
  - 4 x Legs with 6 DoF each: 4 DoF used for positioning the wheel, 2 DoF for wheel drive and wheel steering
  - 6 DoF manipulator, using a dual actuation in the shoulder for increased torque
- Inertial measuring unit in the central body (MTi-28A53G35) used to get information for ground adaption and for odometry purposes
- Hokuyo UTM-30LX for generating point clouds (for mapping and navigation purposes)
- A custom tiltable stereo camera using two Prosilica GC650 cameras (used for visual odometry)
- Current, voltage, position, speed, and temperature sensors in each joint
- Two active electro-mechanical interfaces with a camera for manipulating scientific payload modules and for connecting the walking scout to the central body
- 4 payload bays with (passive) electro-mechanical interfaces for transportation and operation of scientific payloads
- Flexible metal wheels are used to cope with small irregularities of the ground

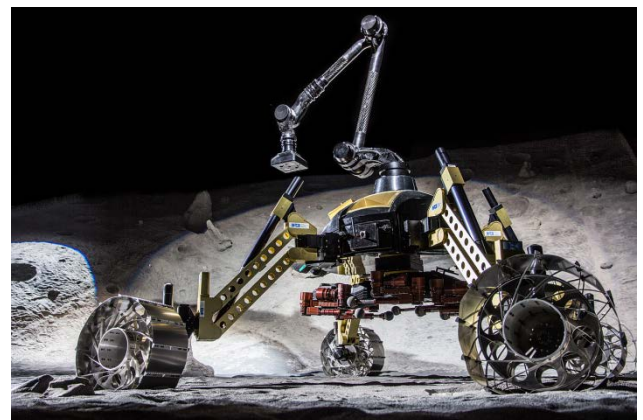


Sherpa's Manipulator is strong enough to support the robot when two wheels are lifted off the ground.

**Application:** Logistics, Production and Consumer

**Projects:** **RIMRES**  
Reconfigurable Integrated Multi-Robot  
Exploration System  
(09/2009 - 12/2012)

**TransTerrA**  
Semi-autonomous cooperative exploration  
of planetary surfaces including the  
installation of a logistic chain as well as  
consideration of the terrestrial applicability of  
individual aspects  
(05/2013 - 04/2017)



Sherpa is transporting CREX (beneath the central body) to a crater rim where the walking scout is deployed to explore the inner parts of the crater.