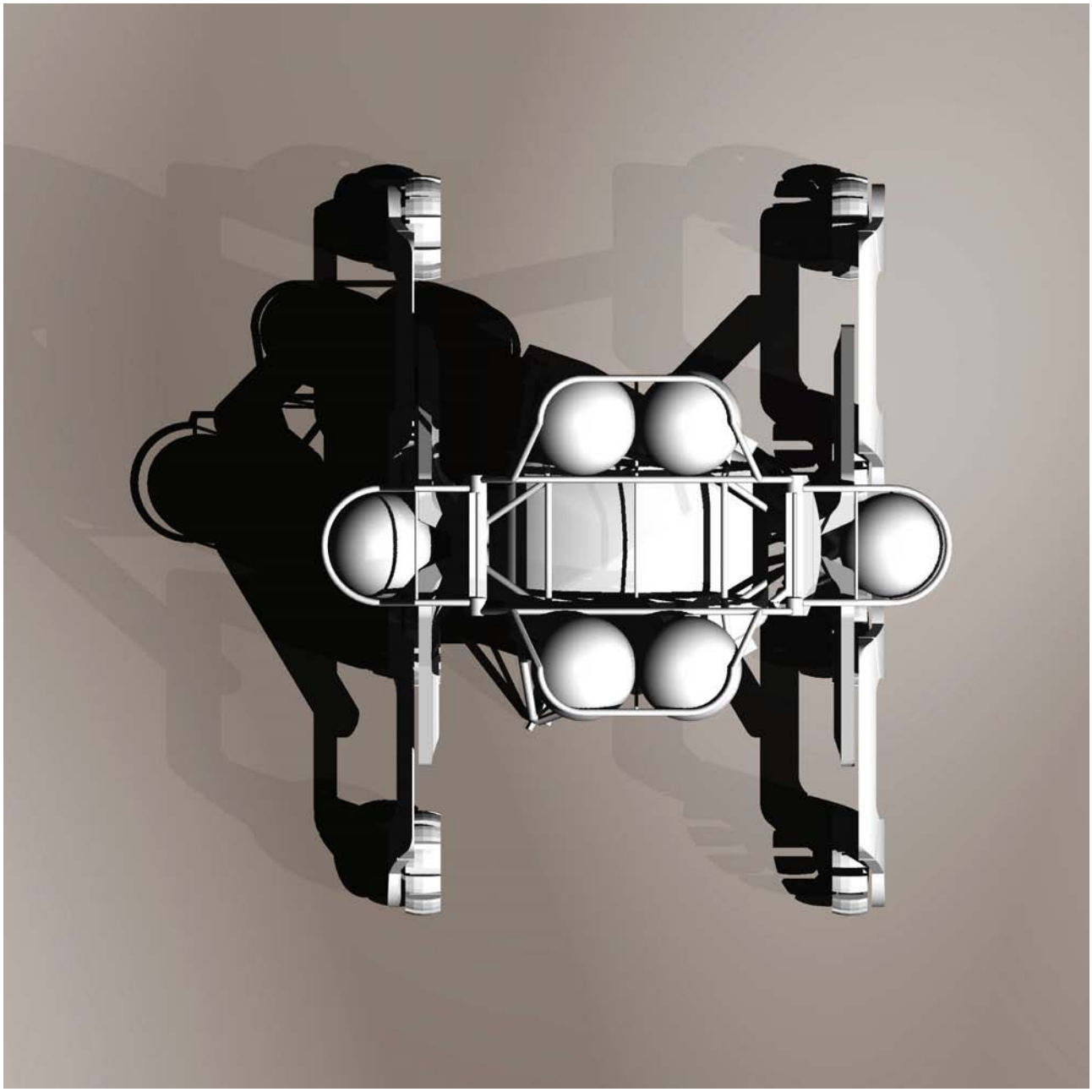

Mobitat

A Concept for a Mobile Planetary Space Habitat
Plug-in Creations Aerospace

The Mobitat is a self-contained pressure vessel habitat for use on the Moon, Mars, and other planetary surfaces. The Mobitat is a combination lander and mobile rover consisting of two major subsystems: mobile platform / lander and modular pressure vessel. The mobile platform portion can be detached from the pressure vessel for use as a separate crane or mount for drilling and construction implements. The pressure vessel can be docked with others of its kind to create larger outposts and bases.

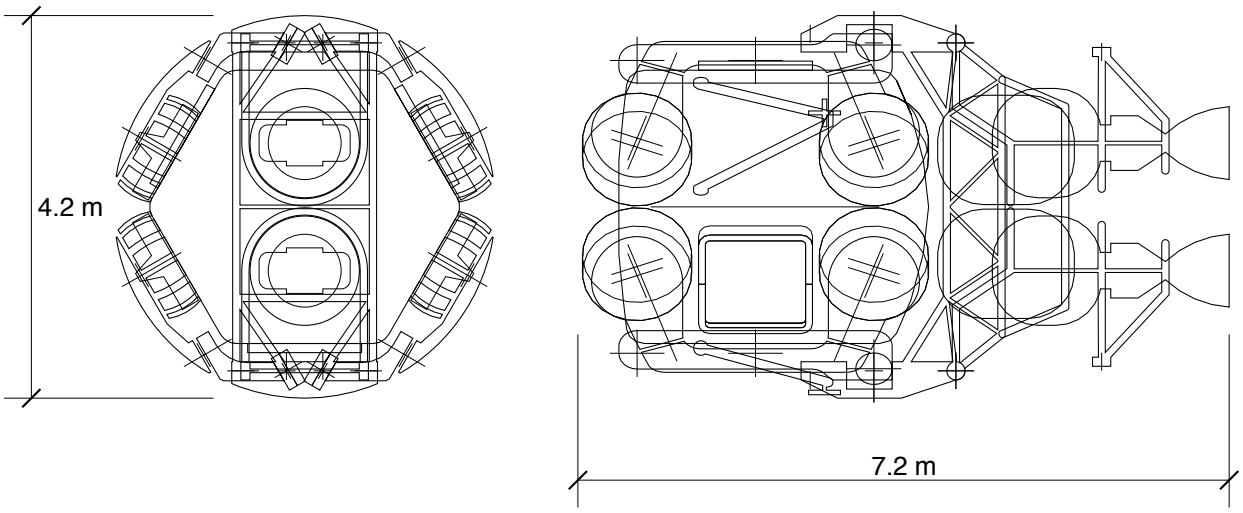

Figure 1: Mobitat in folded package

The Mobitat folds into a package 7.2 meters long by 4.2 meters in diameter (Figure 1). This size will fit into a variety of launch vehicles including the Shuttle payload bay (Figure 2).

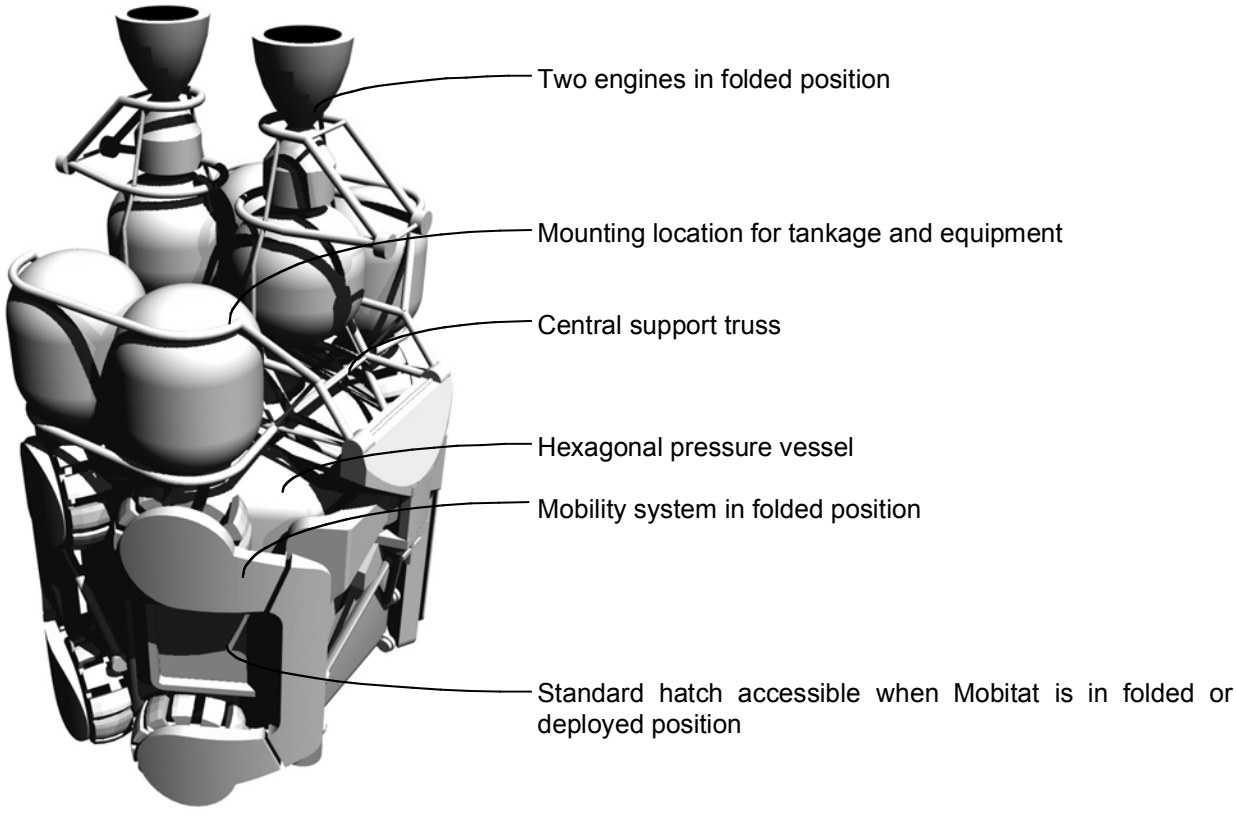

Figure 2: Rendered view of Mobitat in folded position

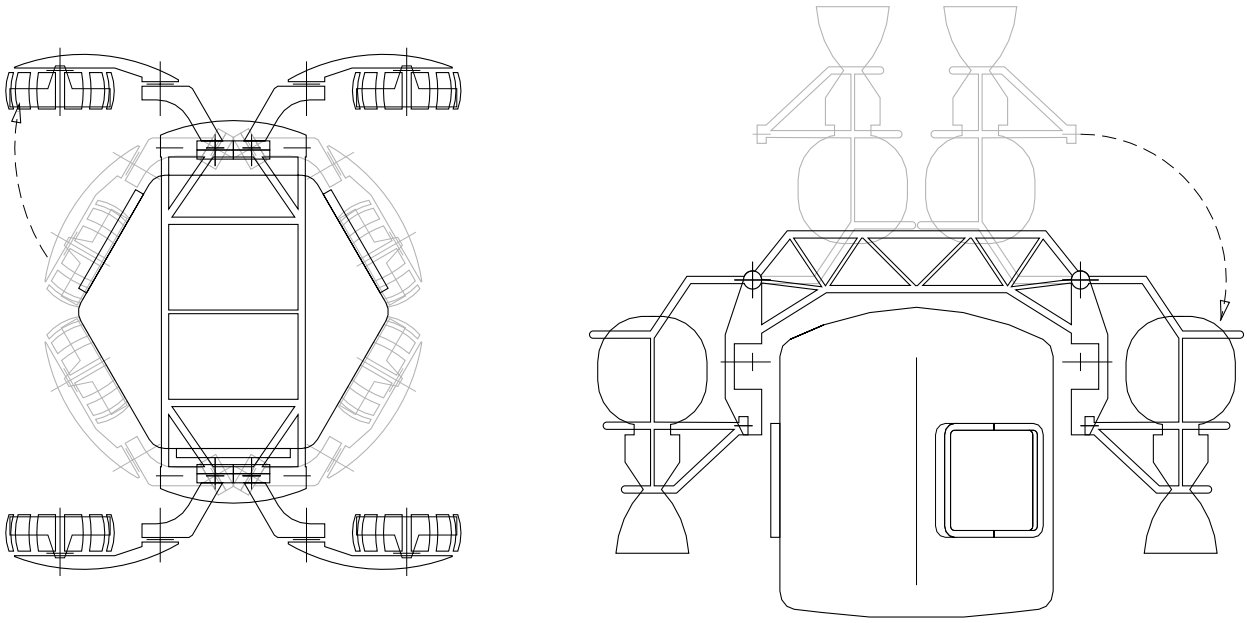

Figure 3: Deployable structures on Mobitat

The Mobitat has two major deployable systems. In Figure 3 on the left, the mobility system swings away from the main body and central supporting truss and unfolds. On the right, the engines swing down into position for lander deployment.

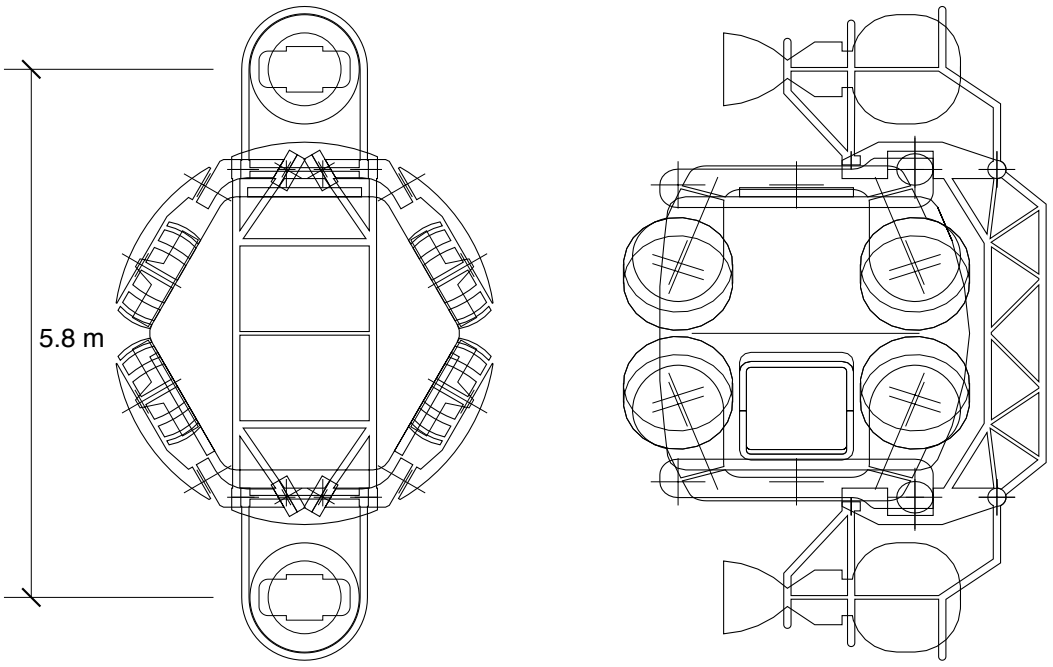

Figure 4: Engines held away from the main body

The engines in their deployed position are mounted on either side of the main body. The thrust force is directed to either end of the central supporting truss (Figure 4 & Figure 5), affecting lift for the vehicle.

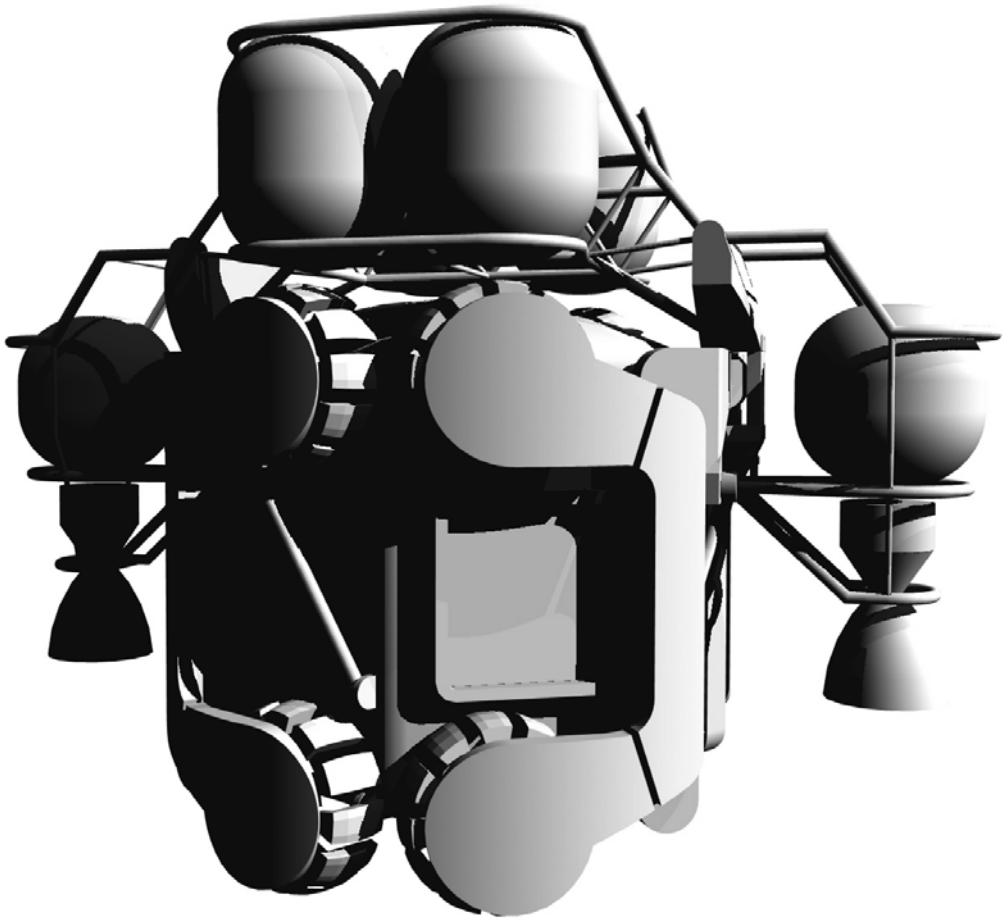

Figure 5: Mobitat in lander configuration

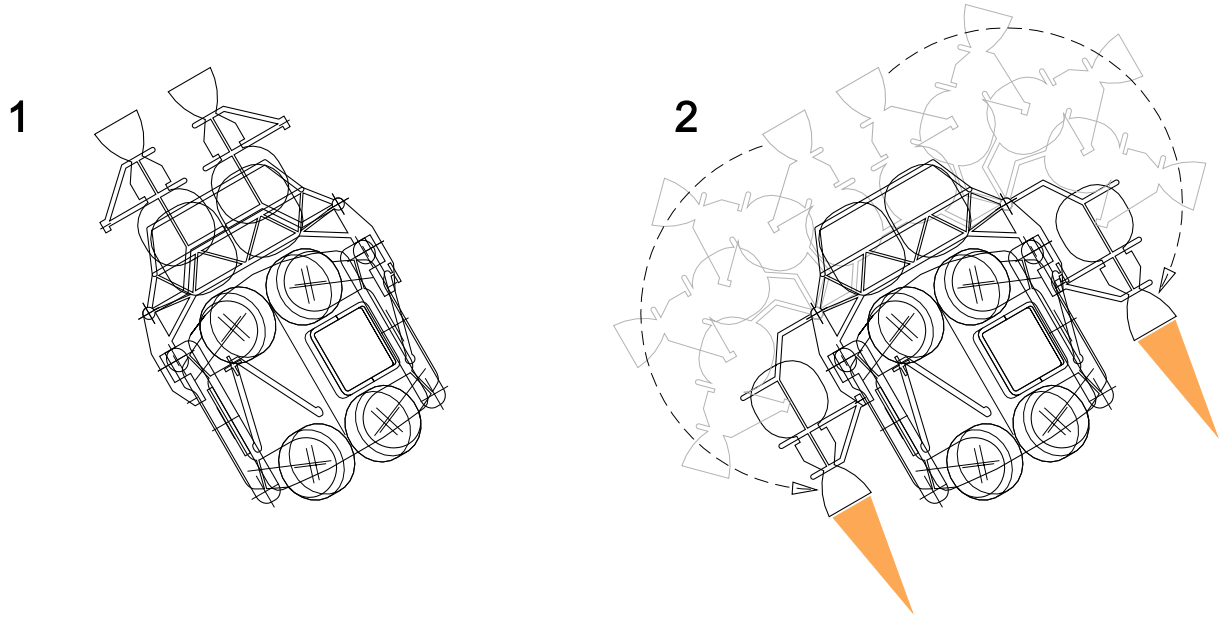

Figure 6: Landing sequence: stowed package and lander configuration

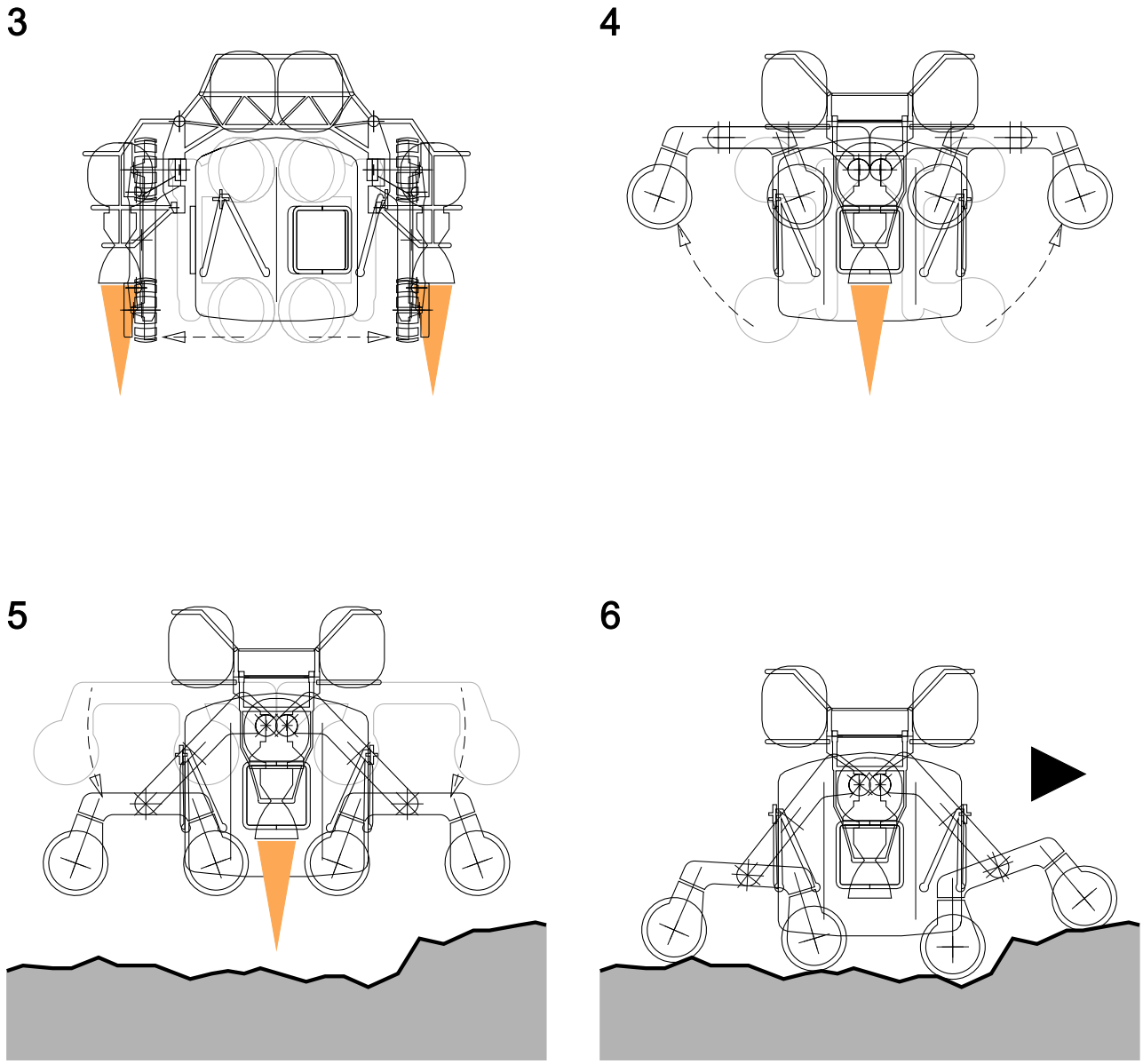

Figure 7: Landing sequence: mobility system deployment, touch down, and Landing complete

The landing sequence begins with 1) delivery of folded package to Lunar orbit (Figure 6), whereupon 2) the engines deploy to either side of main body. During the descent (Figure 7), 3) the mobility system deploys leaving 4) the wheel carriage assemblies clear of the thrust exhaust. 5) The wheel carriage assemblies lower themselves just before landing to 6) affect a smooth touchdown on a variety of even or uneven surfaces.

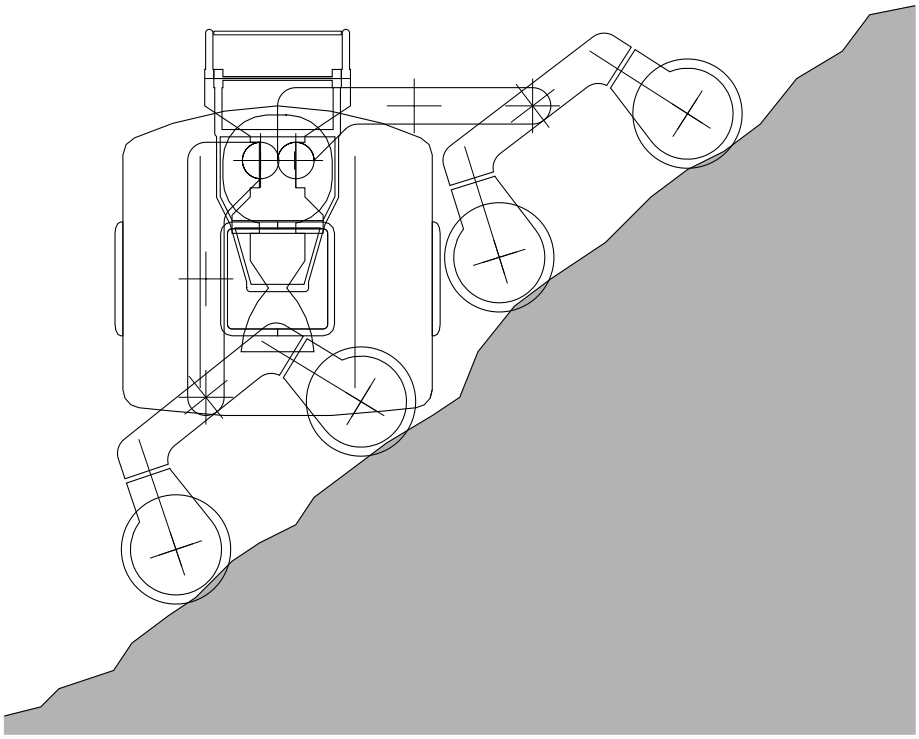

Figure 8: Mobility system on slope

The Mobitat mobility system is designed to handle severe obstacles and slopes while keeping the pressure vessel module level (Figure 8). In most cases, the traction of the wheels on the surface will fail well before the maximum climbing angle is reached. Also, a capacity for shifting the center of gravity is possible to allow “stepping over” large obstacles while maintaining a level stance for the pressure vessel module (Figure 9).

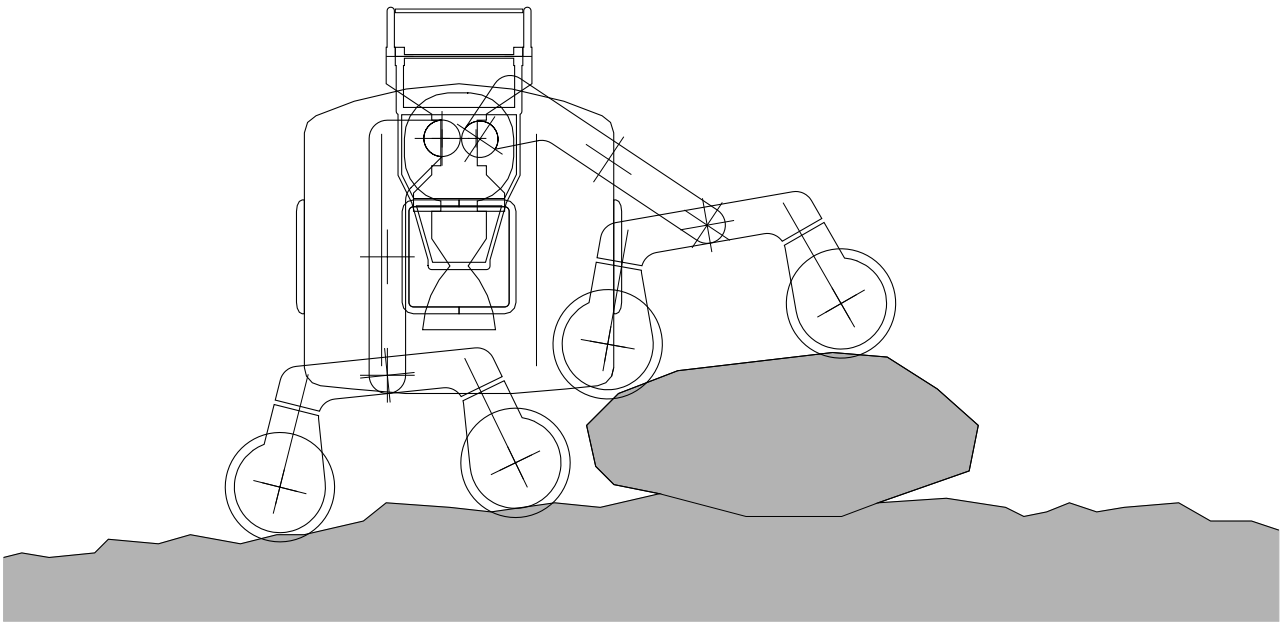

Figure 9: Mobitat can "step over" some obstacles by shifting center of gravity

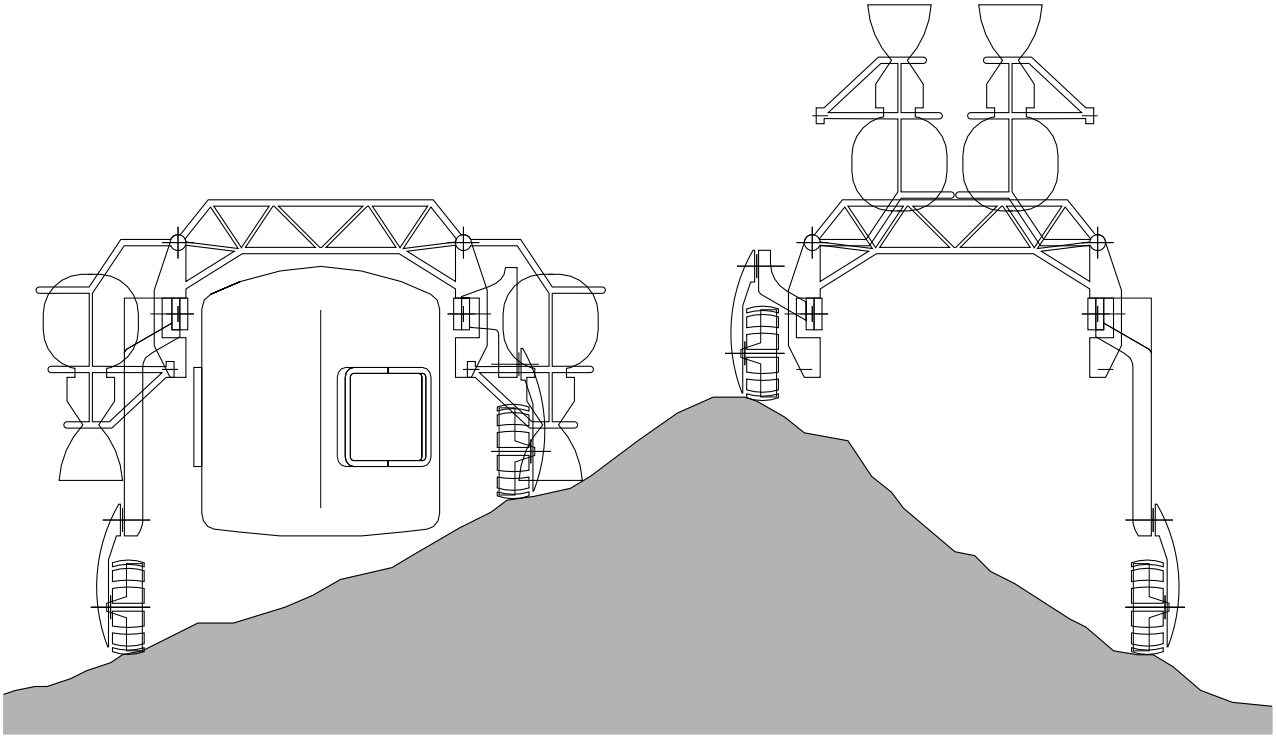

Figure 10: Mobility system on transverse slope

On transverse slopes, the Mobitat has the ability to manipulate wheel carriage assemblies independently in order to maintain a level stance for the pressure vessel module (Figure 10, left). If the engines are stowed (right) and module detached, the capacity for traverse can include severe slopes.

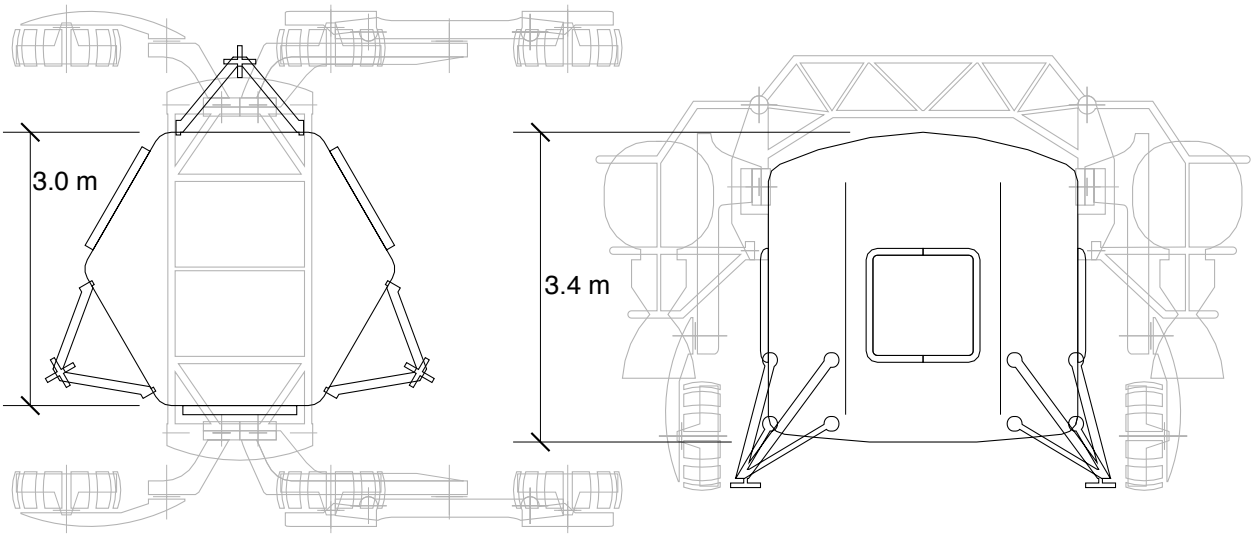

Figure 11: Pressure vessel module

The pressure vessel module is a hexagonal shape (Figure 11). In order to fold in the wheel assembly carriages of the mobility system, the 4.2 meter allowed maximum envelope dictates that the habitable module be 3.0 meters wide. The module is 3.4 meters high.

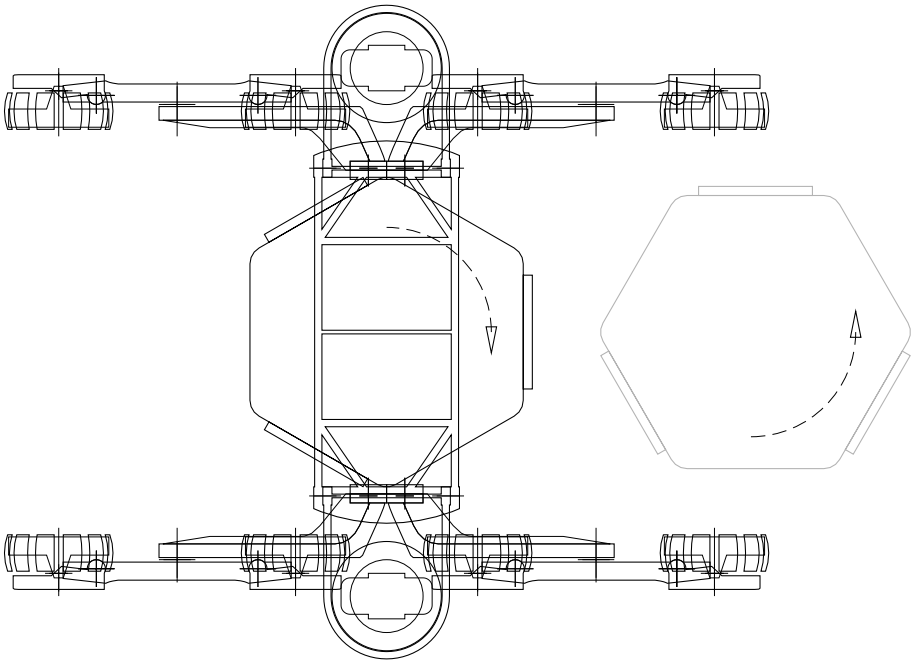

Figure 12: Repositioning of pressure vessel module

The pressure vessel module is attached to the central supporting truss via adjustable interface hardware. The interface hardware can make small local adjustments in order to facilitate the fitting of two or more modules together. The interface can also rotate the module to allow “corner” first or “face” first orientation (Figure 12).

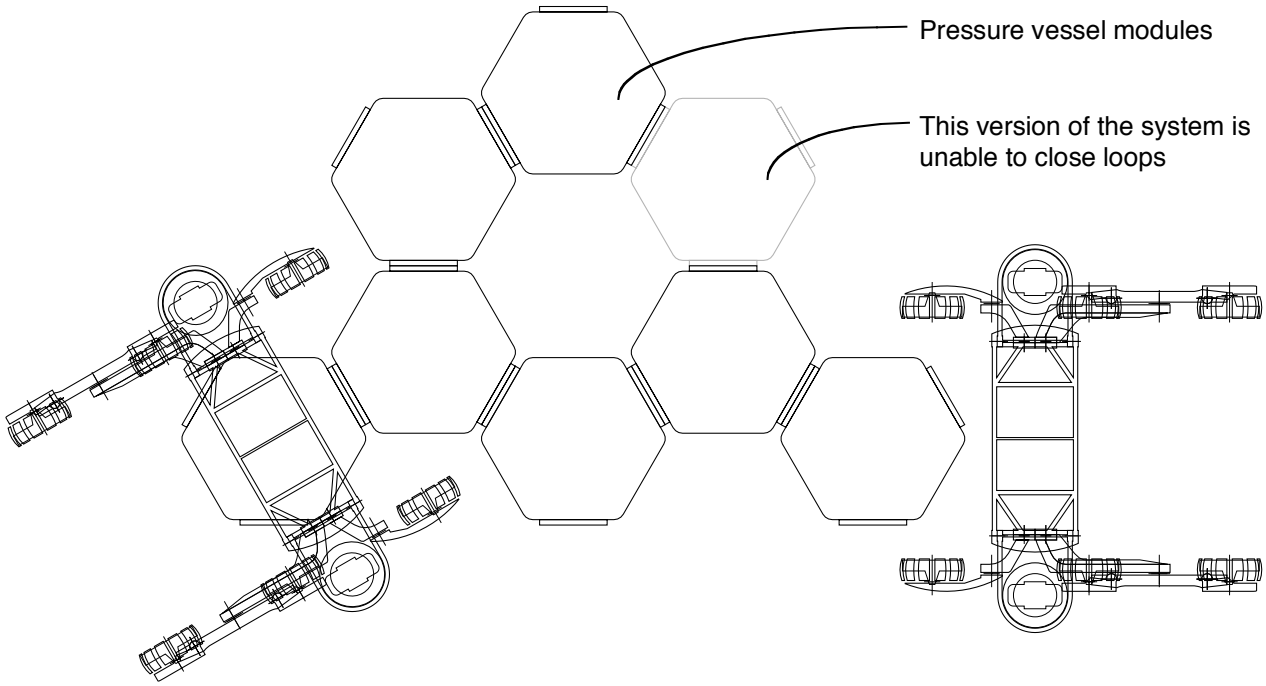

Figure 13: Module assembly into larger outpost or bases

Pressure vessel modules can be assembled into larger complexes to form outposts or bases (Figure 13). The mobility platform can be detached from the module once it has been placed. However, modules cannot maintain attachment to the platforms if they are assembled into groups. Also, at this stage this system does not allow complete closure of circulation and egress loops. Since no site is level, large assemblies of modules would need to have small local adjustment capacity at each hatch.

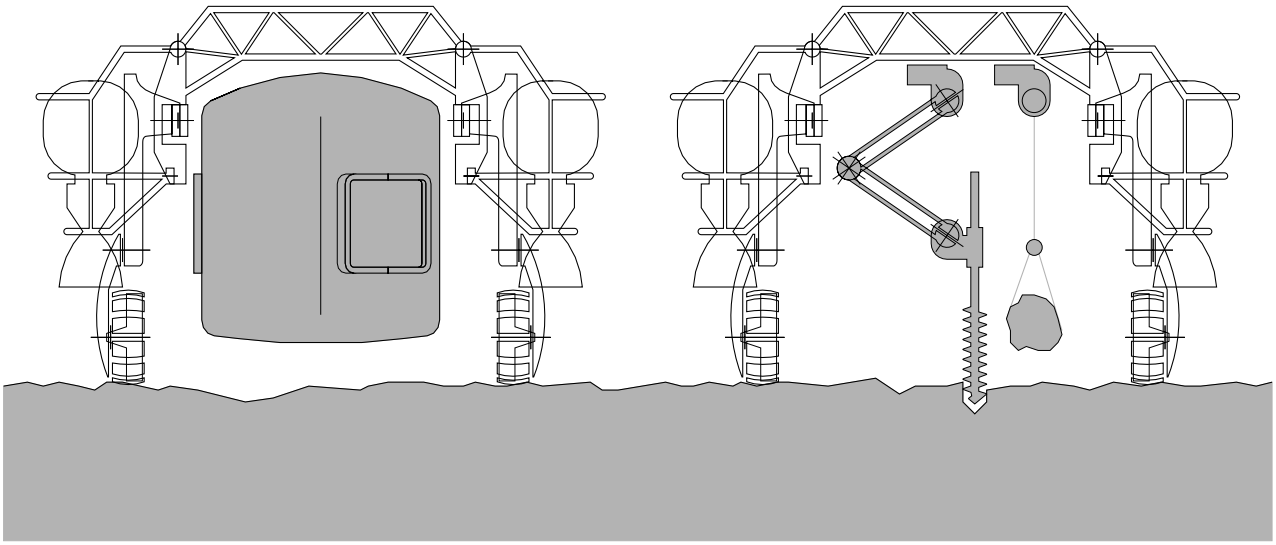

Figure 14: Alternative uses for mobile platform

The mobile platform can be used for a variety of tasks in addition to carrying pressure vessel modules (Figure 14). These tasks can include crane, drilling platform, mobility for excavation and construction implements, etc. Figure 15 shows the deployed surface mode of the Mobitat.

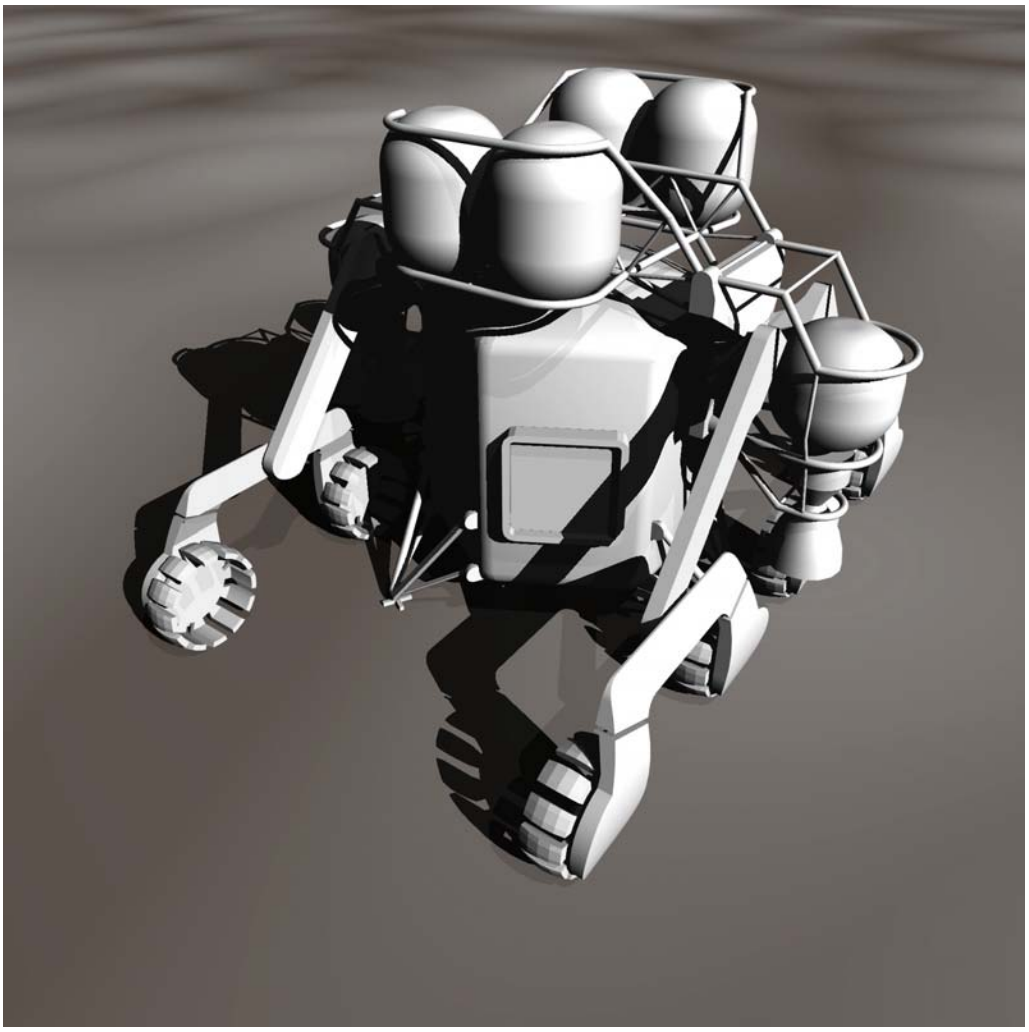

Figure 15: Mobitat in deployed surface mode

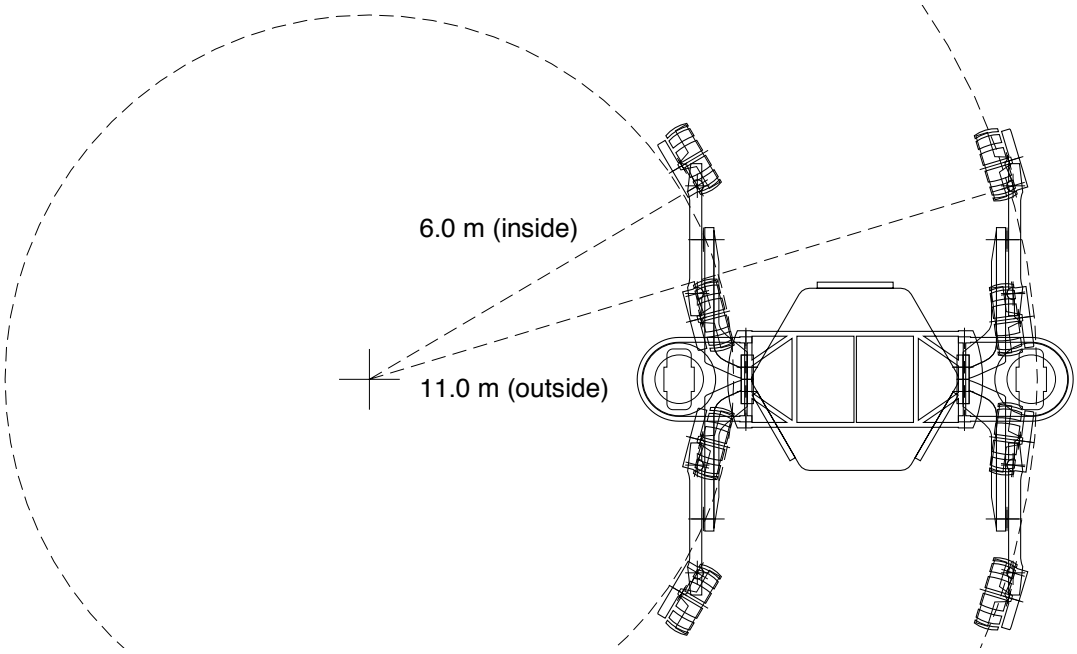

Figure 16: Mobile platform turning radius

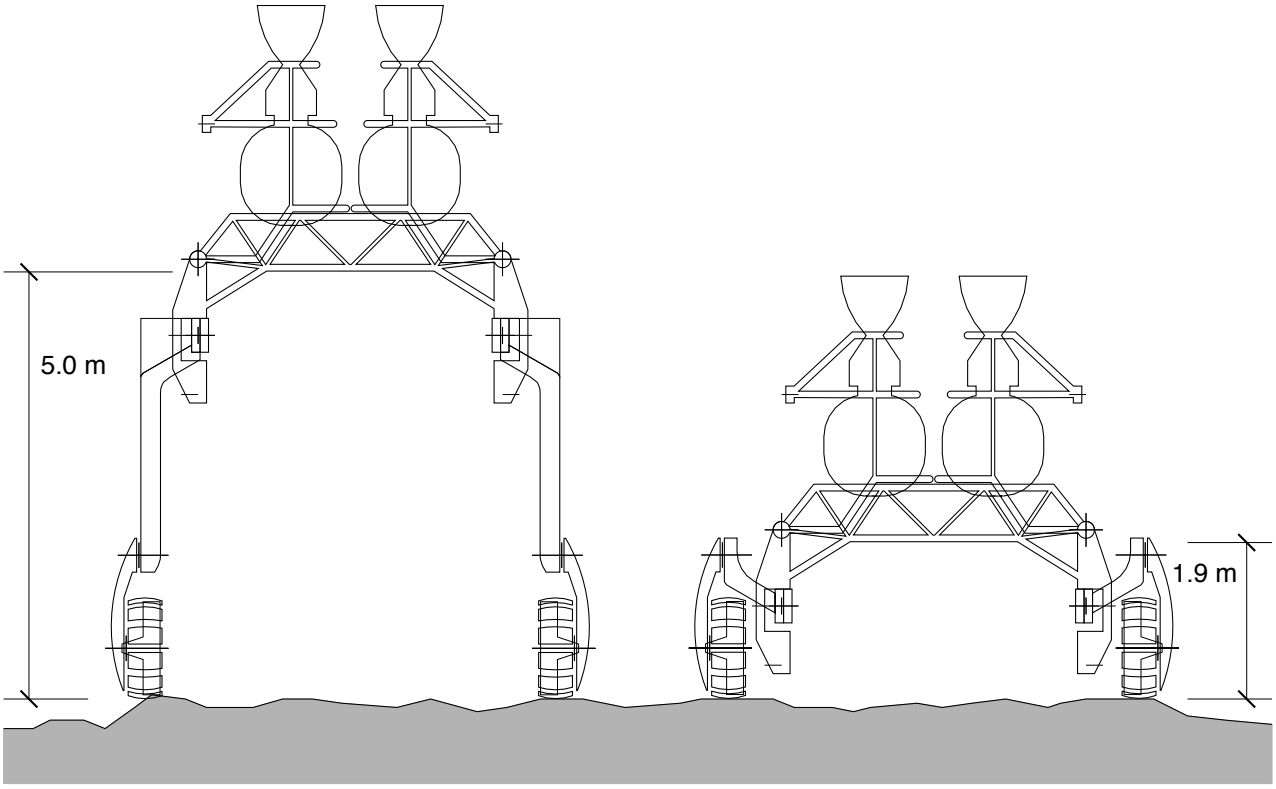

Figure 17: Lift range of mobile platform

The mobile platform has an inside turning radius of 6.0 meters, and outside turning radius of 11.0 meters (Figure 16). In its extended position, the central support truss has 5.0 meters of clearance above a level surface. The minimum clearance is 1.9 meters (Figure 17).

Evaluation of Mobitat

This version of the Mobitat is highly conceptual. The kinematics and robotic systems are workable, but several questions remain, such as the robustness of a deployable engine, including flexible fuel connections, etc. Also, sizes for many members are approximated at this time and would need to be designed more precisely should further development of this concept be pursued. Essentially the Mobitat can function both as a habitat and a rover, with advanced performance of suspension and mobility systems. An advantage of this system is that the mobile platform can be used for a variety of uses in addition to the relocation or conveyance of pressure vessel modules. However, disadvantages include the inability to keep the platforms attached when two or more modules are to be assembled together. Multiple Mobitat modules each have their associated lander / mobile platforms, so an assemblage of several modules may result in multiple redundant unused mobile platforms sitting around.

As a preliminary concept, the Mobitat still has a few problems that need to be overcome. In spite of this, clearly the system has many concepts that are worthy of continued study.