

HABITATS

17 – StarHab

SUMMARY

The concept of StarHab is of a Starship landing on its tail and then tilted over, using tethers, onto a large, inflatable pillow. This concept is proposed as a simple way of establishing the first permanent habitat on the Moon for the Initial Permanent Crew. The Crew would land separately, enter, clear the propellant tanks, and then cut doorways through the methane tank. Using pre-welded attachment points, they would move floor sections, walks, doors, furniture and equipment from the payload bay throughout the rest of the StarHab. The end result would be a habitat, 2.5 times more voluminous than the ISS. StarHab would be thoroughly networked. This Chapter goes into what each section would contain.

What would be the simplest, most logical first habitat whether it was on the Moon or Mars?

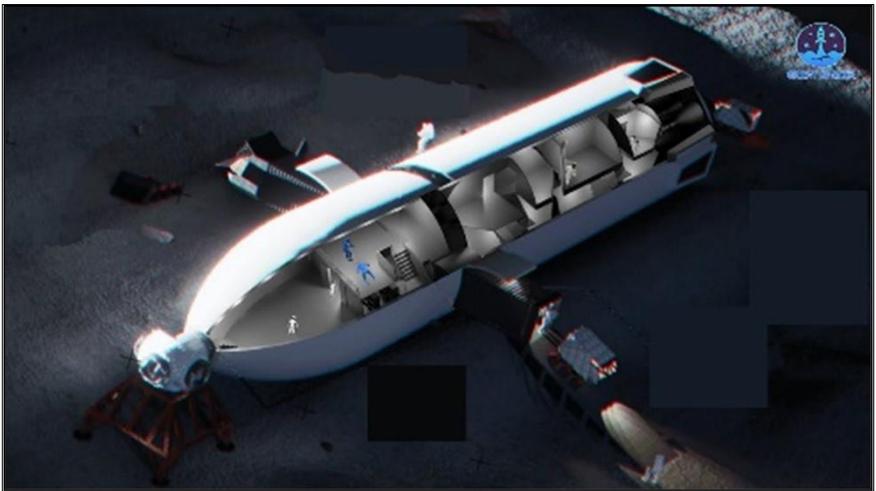
Many space advocates have imagined any number of different types of habitats. There's the aluminum cylinder that we have lots of experience with on the ISS. There's the inflatable habs concept perhaps located within a lava tube. Then there's the ever-so-popular 3D printed habitat.

But the first habitat could be practically no habitat at all (the best hab is no hab?). Instead of the Initial Crew exiting their lander and setting up a habitat, they could just remain in their lander and call it home. After all, it's already set up with power systems, life support and thermal control systems. And indeed, SpaceX's artists have rendered this concept, and it was shown after the ninth Starship test flight.

However, providing a vertically oriented Starship with enough radiation shielding for a long-term, Initial Permanent Crew is somewhat of a problem. One could imagine robots filling bags with lunar dirt to be winched up and placed around the crew compartment. Also, in the vertical orientation, a lot of the floor space would be taken up with the stairway (or ladder) to the next floor. And if one were to utilize the propellant tanks for habitable space, there would be about fifteen, 3-meter high stories -- that's a lot of climbing for a single habitat.

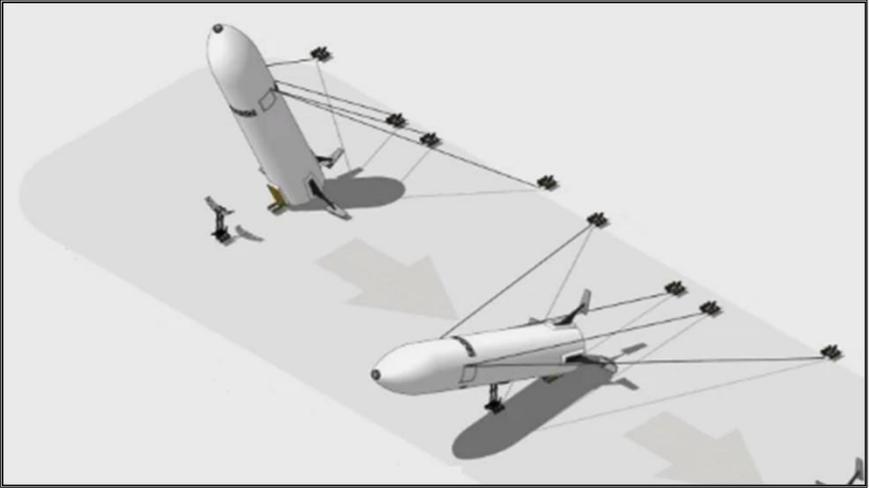
But the Space Development Network working with graduates from the International Space University are proposing that a Starship be designed to become a horizontal habitat (aka StarHab).

The StarHab concept is that of an upper stage Starship modified where the payload section has been outfitted with three horizontal floors with sections of flooring, walls, equipment, and furniture stacked in the payload bay between the floors. Prior to launch, anchor points would have been welded into the sides of the methane and oxygen propellant tanks to which flooring panels could be affixed thereby resulting in three floors throughout the entirety of the StarHab. By using all three sections of the Starship it would be turned into a habitat with a volume 2.5 times that of the ISS (all from a single Starship landing!).



Cutaway rendering of the StarHab.

Upon landing on the lunar surface, the liquid methane and oxygen would be removed and any residual completely vented to the infinite vacuum of space. Next, dexterous robots would be lowered from the cargo bay doors. Then, three long tethers would be dropped down, and the robots would take the ends of the tethers and use ground anchors to secure them into the ground at three points of a triangle around the StarHab. Perhaps deep penetrating helical anchors would work best like that used in NASA's Lunar Anchoring Device Concept (LaRC, 2011).



The StarHab being horizontalized using tethers.

Next, using electric winches, the StarHab would be slowly tilted over in a very controlled manner. After being tilted down to perhaps 35° above the lunar surface the tethers would be released with the StarHab tilting over to the ground in a controlled manner using either a scissor lift or large inflatable pillow. The result would be a completely horizontalized Starship.

Subsequently, robotic vehicles would pile loose lunar dirt on top of the StarHab to provide shielding for space radiation and micrometeorites and thermal insulation. Later, the Initial Permanent Crew would land in a separate Starship a short distance away and would drive to the StarHab and enter it via an airlock.

Once inside the StarHab, the Crew would cut doorways through each of the three floors of the central methane tank. The crew would move flooring sections from the payload bay through the cut-out doorways of the methane tank and secure the bottom, middle, and top floors to the welded anchor points. They would then return to the payload bay and move and attach vertical walls, doors, electrical/comms lines, equipment, and furniture. The final result would be a large habitat with plenty of space for the Initial Permanent Crew to live and work within.

The Network has completed our own design of the StarHab as follows and we welcome additional work by professional space architects.

From aft to front, the upper floor would contain a kitchen, pantry, dining area, living room, and Agriculture1 area. The middle floor would contain four bedrooms, a fitness/performance area, centrifuge, and storage area. The bottom floor would contain office space, utilities room, and Agriculture2 area. Below the bottom floor would be a basement with storage area.

From the ISU team's detailed estimate, we think that the internal set-up phase would take the Initial Crew of eight working regular astronaut hours (10-12 hours/day) about two weeks. Likely there would be an "Commissioning Day" as this little Team, this representative of humanity, begins settling down and operating their modern, little homestead.

To see how the Initial Permanent Crew would live and work in the StarHab, read chapters 20-22 and 28-31 respectively.