DATE: 04-26-2020

WORKING GROUP WEB PAGE:
- DevelopSpace.info/uhwg

PRESENT:
- Doug Plata (Acting Chair), John Bowen, Matt Johnson, Abbie Grace, Thomas Thornton, Bruce McKenzie.
- This meeting was not video recorded.

AGENDA:
- Brief introductions.
- Description of the Space Development Network including how the Working Groups fit in.
- Description of the Plan for Sustainable Space Development as it relates to habitats.
- Description of the Master Plan for an Initial Base (not the focus of this meeting but good context).
- Basic rules for how people within the Working Groups are to collaborate.
- Presentation of why the Plan chooses inflatables over rigids, 3D-printed, or locally-constructed.
- Limited discussion of those options.
- Presentation of the current UniHab design.
- Open discussion.
- Identification of objectives, volunteers-tasks, & setting of voluntary deadlines.
- Meeting closed.

INTRODUCTIONS:
- Each attendee was introduced.

LUNAR ROADS (A tangential topic from habitats):
- During the introductions, Thomas Thornton (Civil Engineer experienced in land development) expressed an interest in working on the lunar roads concept (DevelopSpace.info/roads). Doug stated that the Space Imaging Center at Univ AZ - Tucson has indicated that they can get us a high-resolution slope map of the Moon which we could use to approximate a network of roads throughout the Moon. Level 1 dirt roads would be minimally graded and simply be compacted by telerobots.

- At 15 mph, passengers and materials could be transported from pole to equator both ways in about 36 hours using self-driving electric vehicles.

CURRENT HABITAT CONCEPTS:
Doug Plata shared the Plan for Sustainable Space Development's current concept for habitats starting with the Moon.

INFLATABLES VS RIGID CYLINDERS VS 3D-PRINTED
- Doug shared that the Network's current view is that inflatables are the preferred initial form of habitats in that they offer much greater volume than rigid metal cylinders and use less energy and risk of equipment breakdown than 3D-printed habitats.

- All of the rest of the attendees agreed with this reasoning and so this view on inflatables remains the choice for initial habitats in the Plan.

- It was agreed that inflatables would serve as an interim solution and that ISRU-manufactured habitats would eventually become the standard form of habitat.

FLAT-ROOFED:
- Internal tethers would hold the inflatable's roof flat similar to an air mattress. Using this approach telerobots could place protective regolith on top before inflation.

- Abbie Grace (from Australia) asked about what would keep the habitat from being ruptured. Doug explained the construction with very strong material (e.g. Kevlar) and safety testing prior to launch, rip-stop, and rigid internal supports.

AESTHETICS:
- A flat-roofed habitat covered with regolith would look like a mount of dirt - not a habitat "worthy of a great nation". Doug explained that the current thinking would be to have a unified inflatable but with aesthetically-pleasing sections with double walls between which protective water could be pumped.

- Doug showed this more modular design at:
http://developspace.info/plan/images/paperbase.png

THE UNIHAB LAYOUT:
- The Plan's current Initial Habitat design is called the "UniHab" in that it would be united in that it would have everything under one roof that an Initial Crew of eight would need. It would also be united in that it would not be separate modules with heavy connectors.

- The current UniHab design (DevelopSpace.info/unihab) includes an indoor centrifuge, 35% of the volume being a hydroponic greenhouse, four bedrooms for an Initial Crew of eight, living and work areas, and utility rooms.

CENTRIFUGE:
- A low-mass centrifuge (DevelopSpace.info/centrifuge) would be within the UniHab and could give the crew full gee (with the crew doing sedentary activities not requiring turning of the head) for about two hours in the morning and two hours in the evening. It is likely that this artificial gravity and default 1/6 gravity would extend crew stay for beyond 18 months before biometical

criteria would mandate their return to Earth. This approach would greatly reduce the risk to crew due to reduced crew rotations.

- One of the attendees suggested that two of the eight people should not use the centrifuge in order to be a scientific control group to see what the effect of chronic 1/6th gravity exposure is on people.

- The so-called "artificial gravity prescription" would likely not be a continuous artificial gravity level (e.g. 0.4, 0.7, etc) but length of time at full gee per day necessary to maintain health.

SPECIALTY HABS:
- Whereas the initial UniHab would have multiple functions within one habitat, later habitats would be optimized as single purpose habitats. More on this can be found at: http://www.developspace.info/international/15-habitats.html

NEXT MEETING:
Tentatively, Sunday, May 24 - 1:00p
Meeting link: **DevelopSpace.info/zoom** (redirects to the Zoom meeting link)

TO DO LIST:
( ) Doug to follow up with Thomas re: the Lunar Roads Project.
( ) It was agreed to set up an email list to continue the dialogue and work by the Habitat Working Group.

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