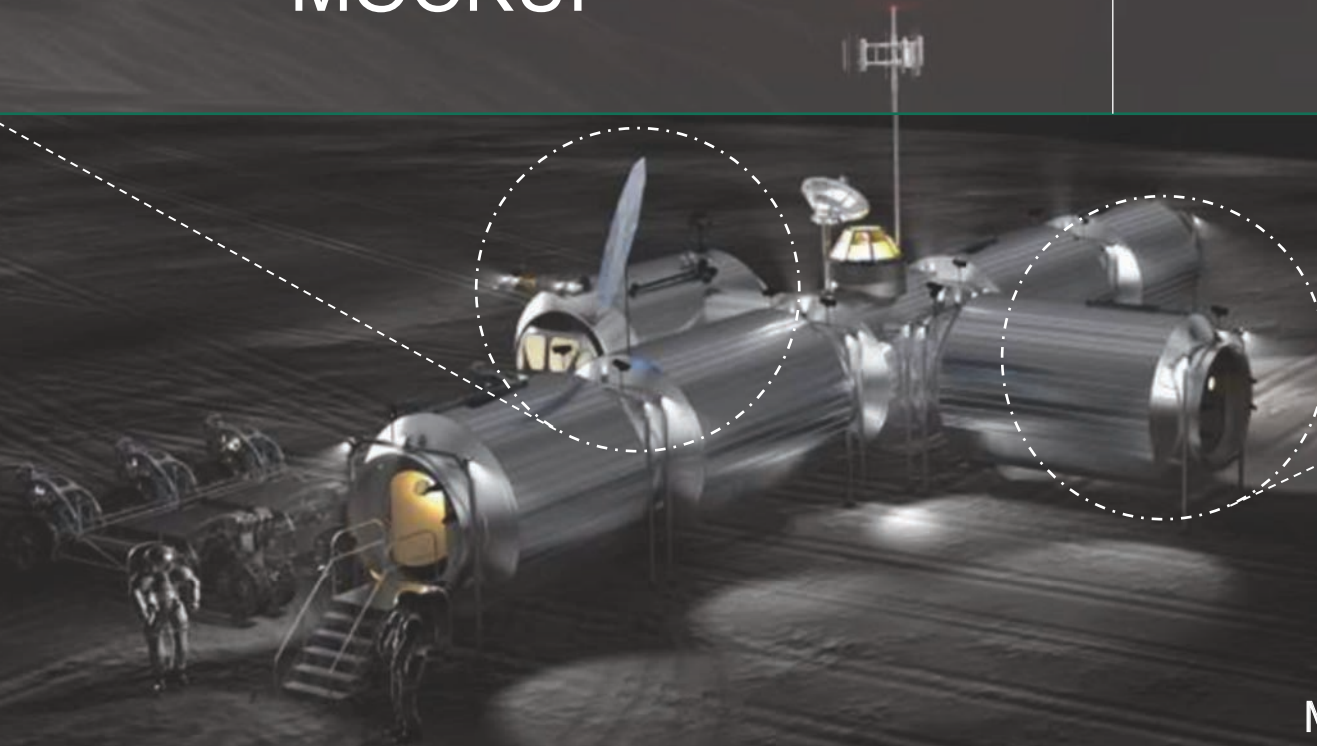


CONSTRUCTION PREPARATION | MOBILELAB MOCKUP

HUMAN FACTORS ASSESSMENT | ECLSS MODULE



Paola Gonzalez Marquez, Space Architect
Mentors: David Smitherman, Sr. Space Architect
Tanya Andrews, Human Factors Engineer
Summer Internship 2020



Human Factors Assessment

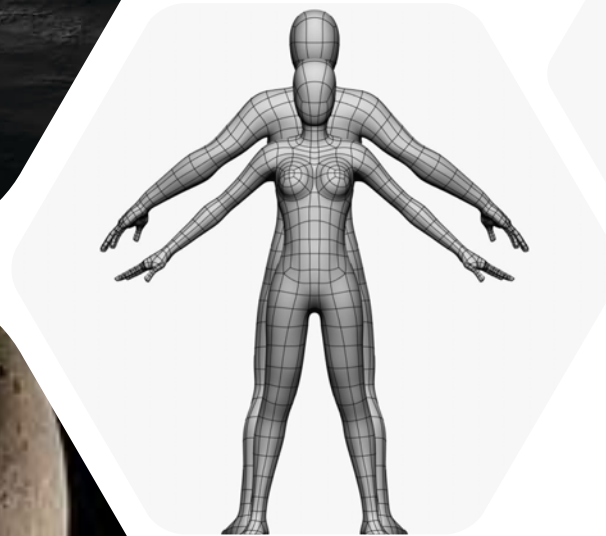
Interior ECLSS module | Transformation from Phase 1 - 4



Advanced Concepts Office

Space Architect, Paola Gonzalez Marquez

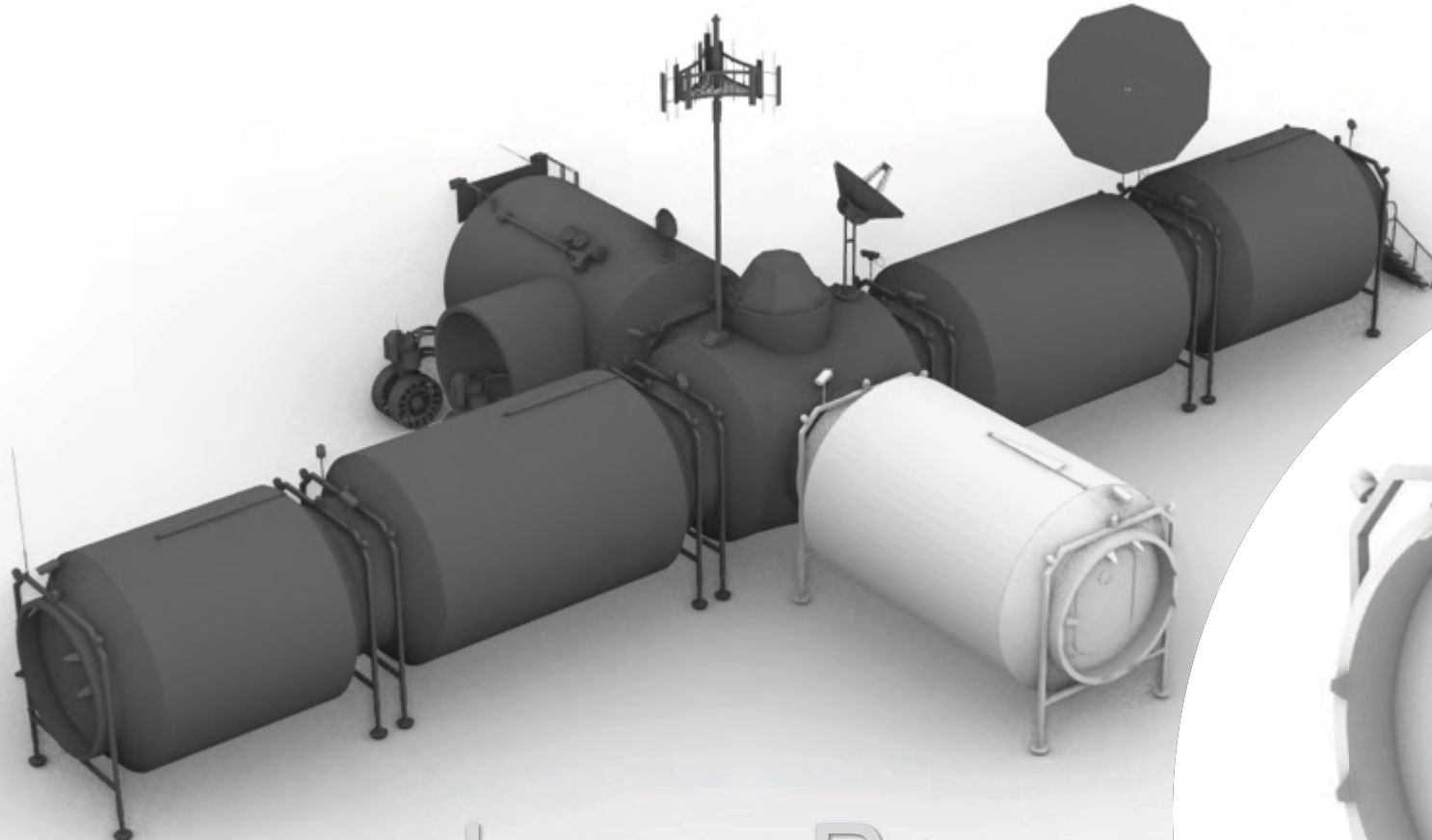
Mentor: Sr. Space Architect, David Smitherman



Task

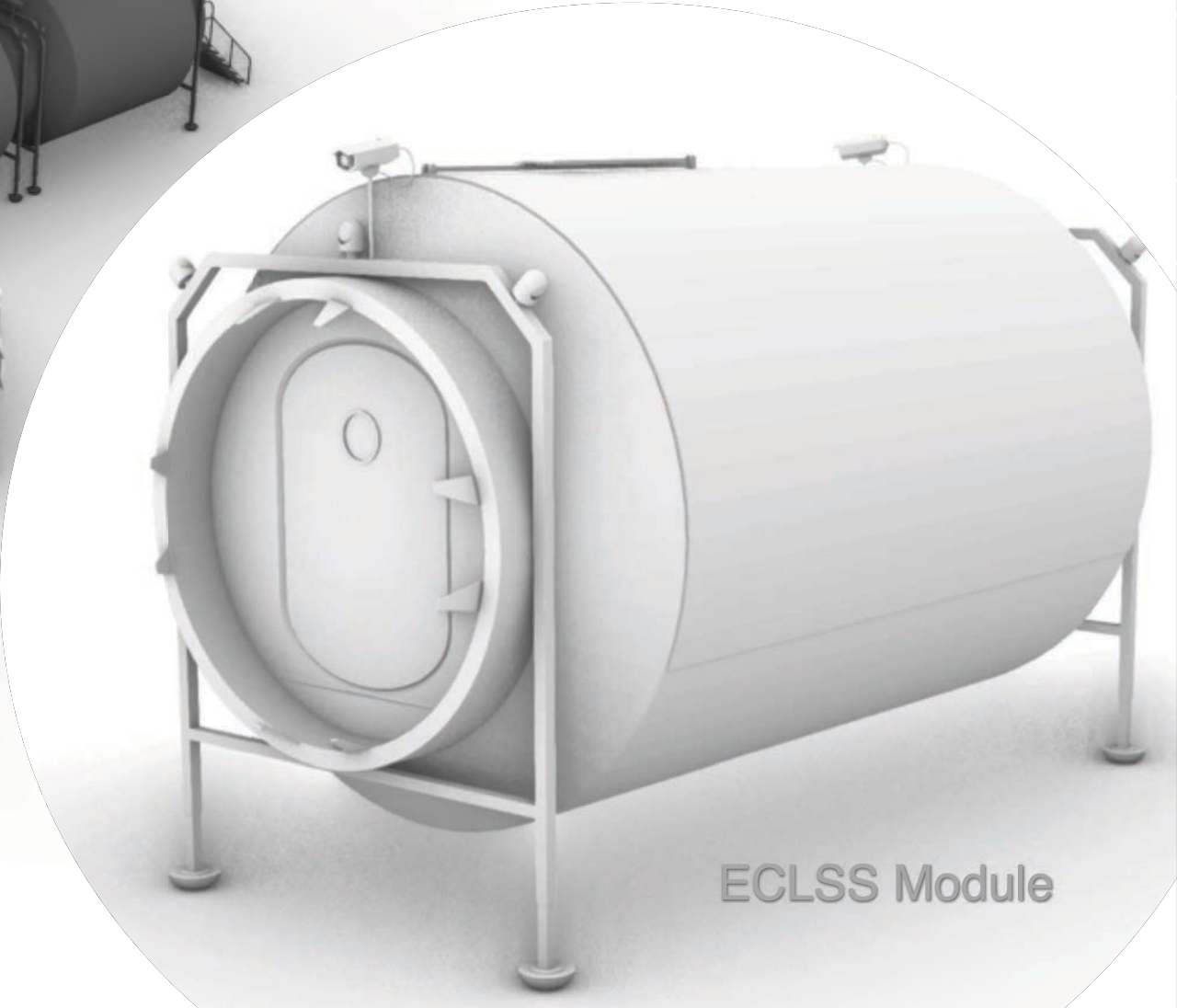
Human factors assessment has been completed as a matter of verifying that 1 or 2 crew members can transform and adapt the interior space of the ECLSS module from Phase 1 to Phase 2; Phase 2 to 3; and 3 to 4.

The assessment has been completed based on the unsuited 5th percentile female and 99th percentile male. This has been accomplished after the creation of the 3D model of the ECLSS module and its interior components.



A 3D rendering of a Lunar Base, showing a complex of interconnected cylindrical modules. The base includes a central hub with various antennas and a tall mast, and several long cylindrical sections. One section is white, while the others are dark grey. The entire structure is supported by thin legs. A large, dark, octagonal satellite dish is positioned on top of one of the modules.

Lunar Base

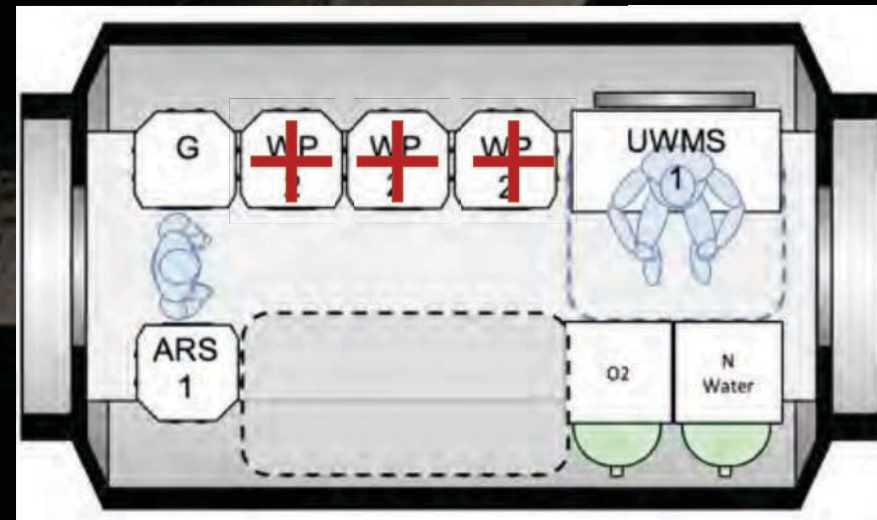
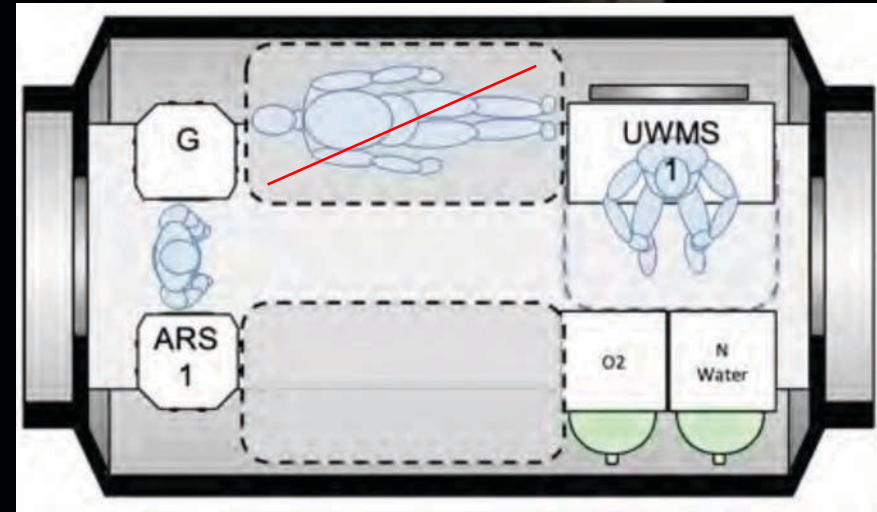


A 3D rendering of an ECLSS (Environmental Control and Life Support System) Module. It is a large, white, cylindrical module with a prominent circular hatch on the front. The hatch has a thick, multi-layered frame and a central oval opening. The module is supported by four thin legs.

ECLSS Module

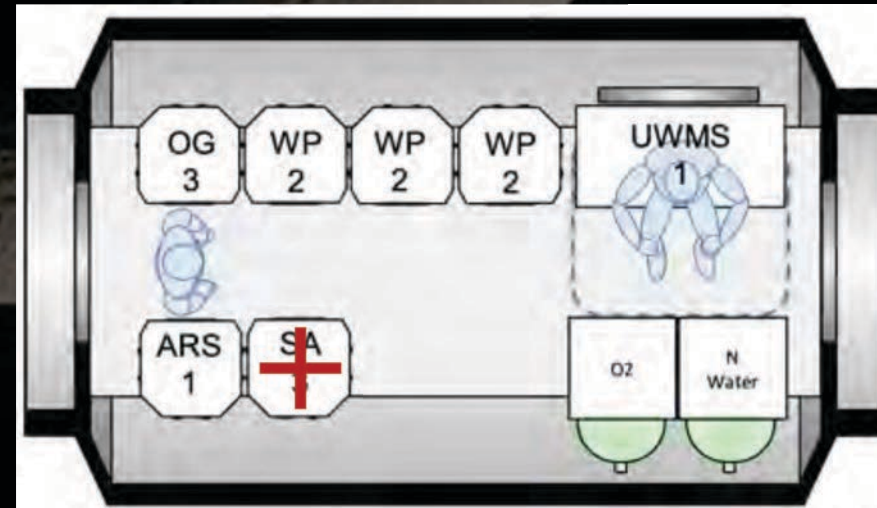
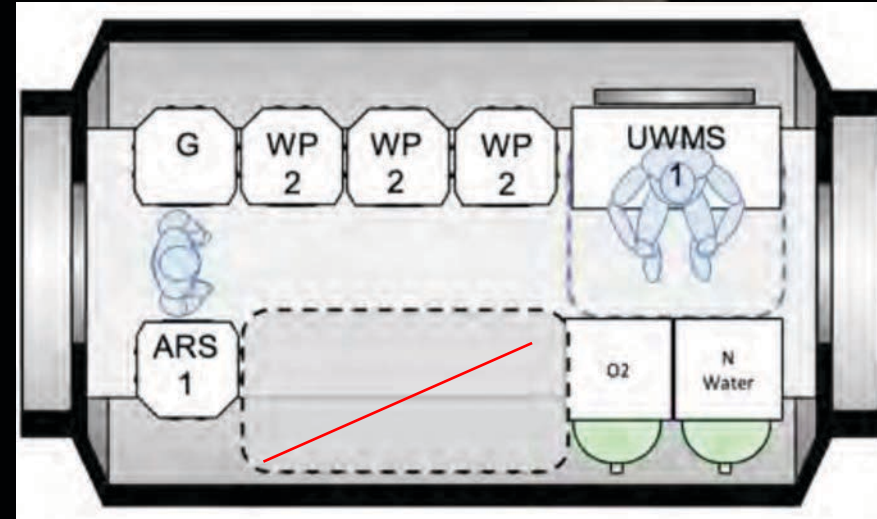
Transformation 1:

Phase 1 to Phase 2 is the removal of the 1st bed bunk and installing 3 water processor (WP) pallets.



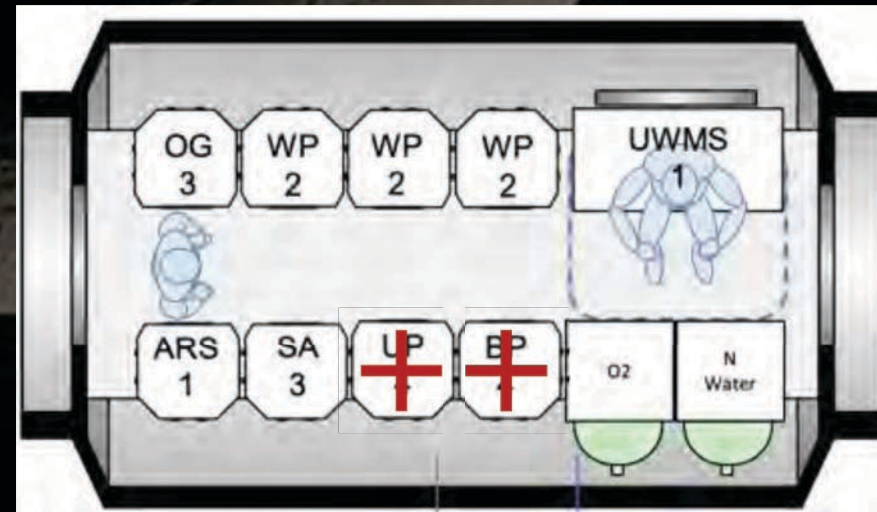
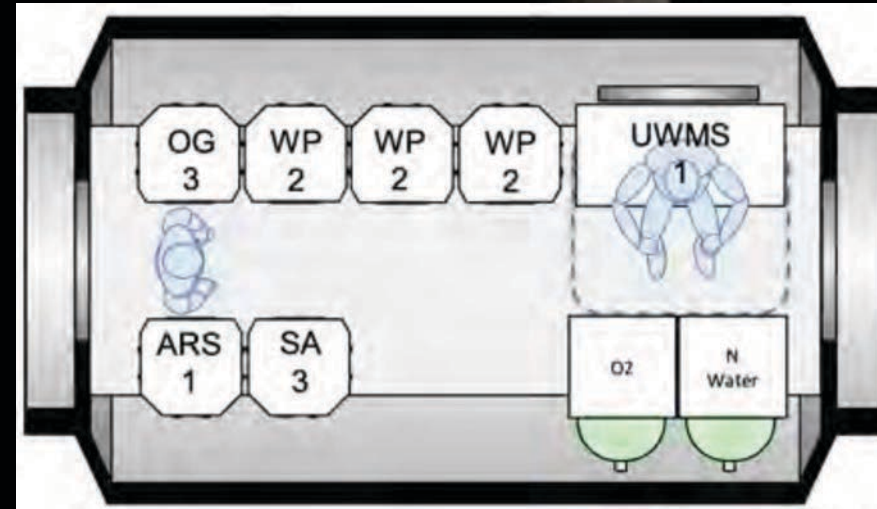
Transformation 2:

Phase 2 to Phase 3 is the removal of the 2nd bed bunk and installing 1 SA pallet, and removal of the galley (G) pallet and installing the oxygen generator (OG) pallet.

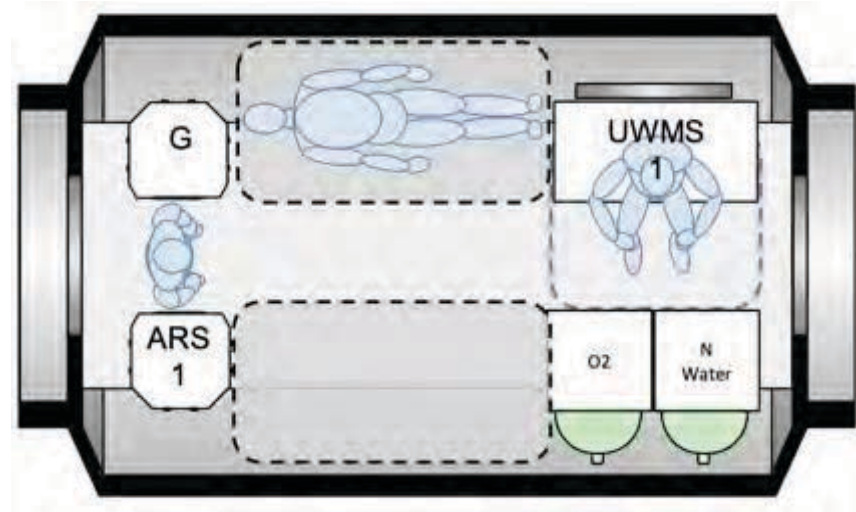


Transformation 3:

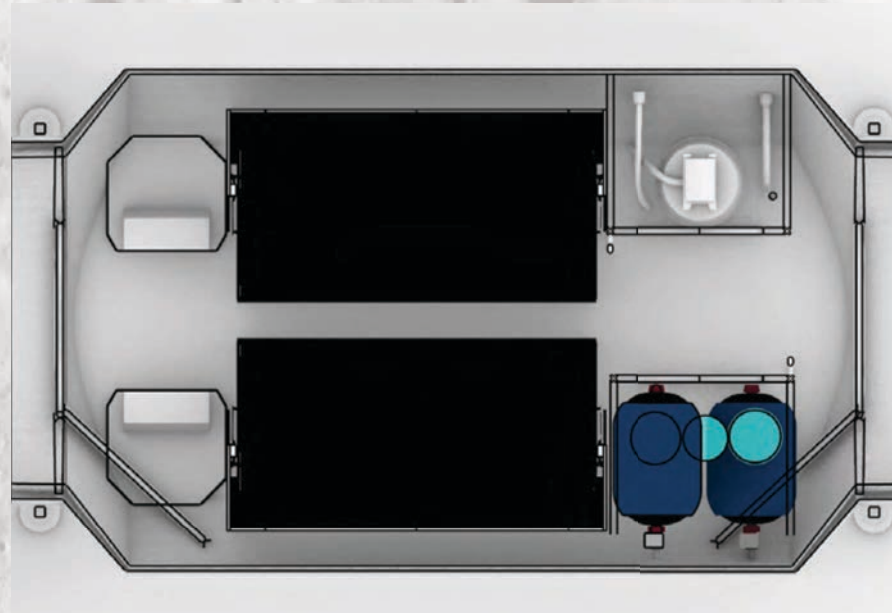
Phase 3 to Phase 4 is the addition of UP and BP pallets.



Creation of 3D Models from 2D Schematics

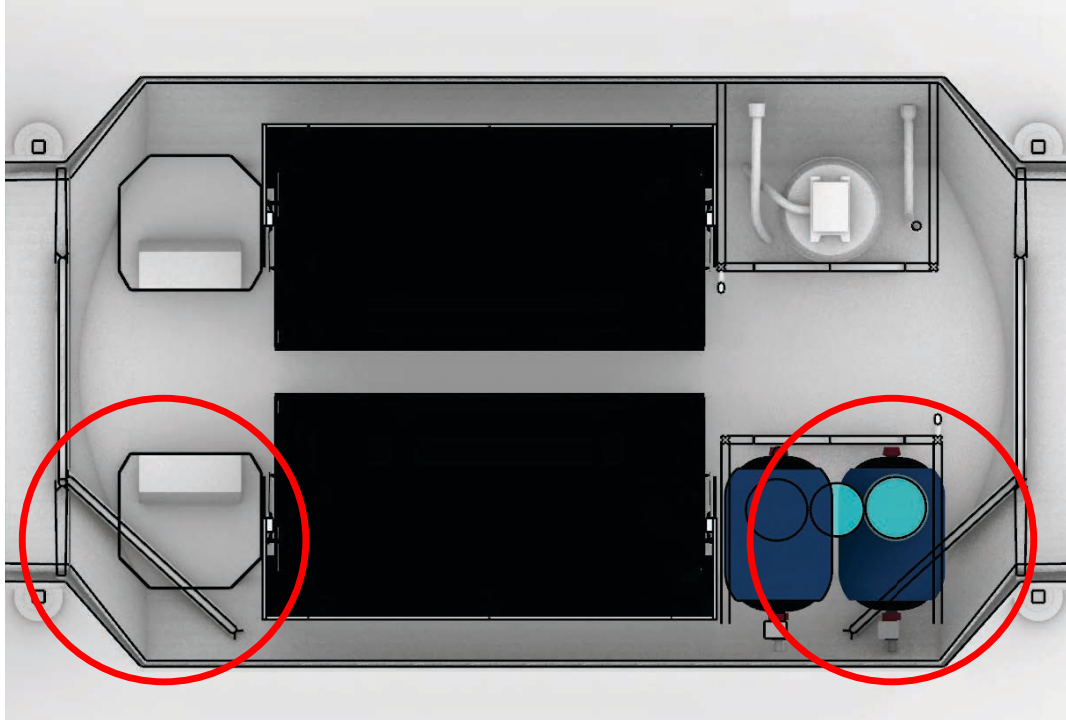


2D

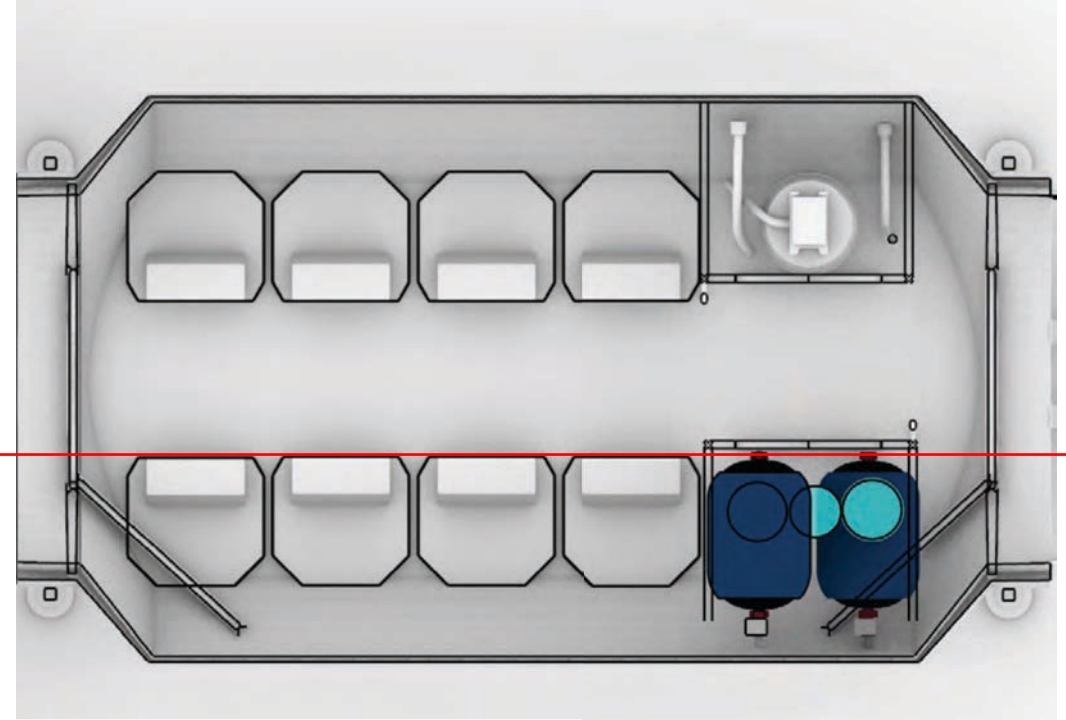


3D

ISSUES SPOTED | Hatch Clash with ECLSS Pallets & Tanks



Phase 1

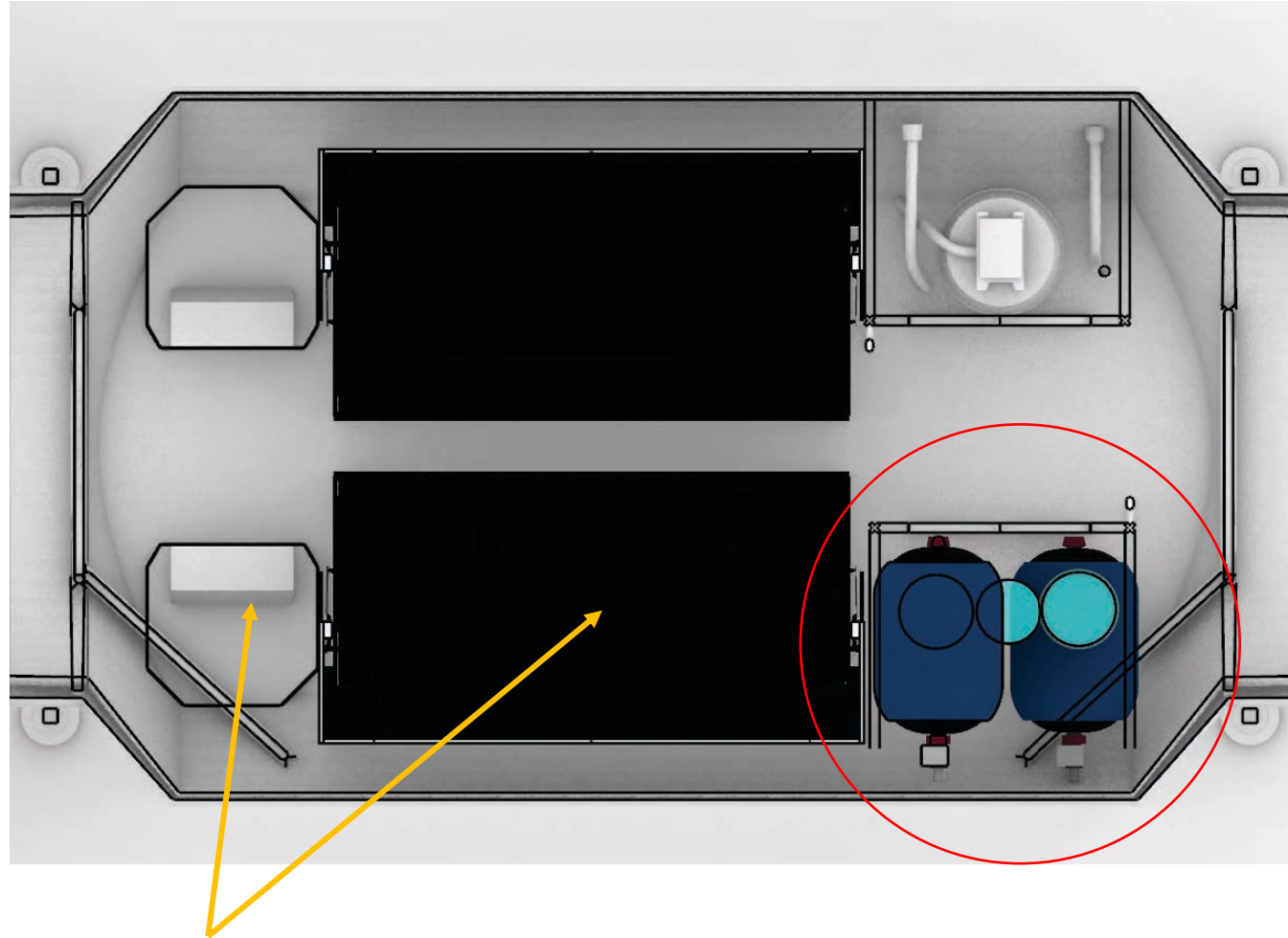


Phase 4

ISSUES SPOTED | Hatch Clash with ECLSS Pallets



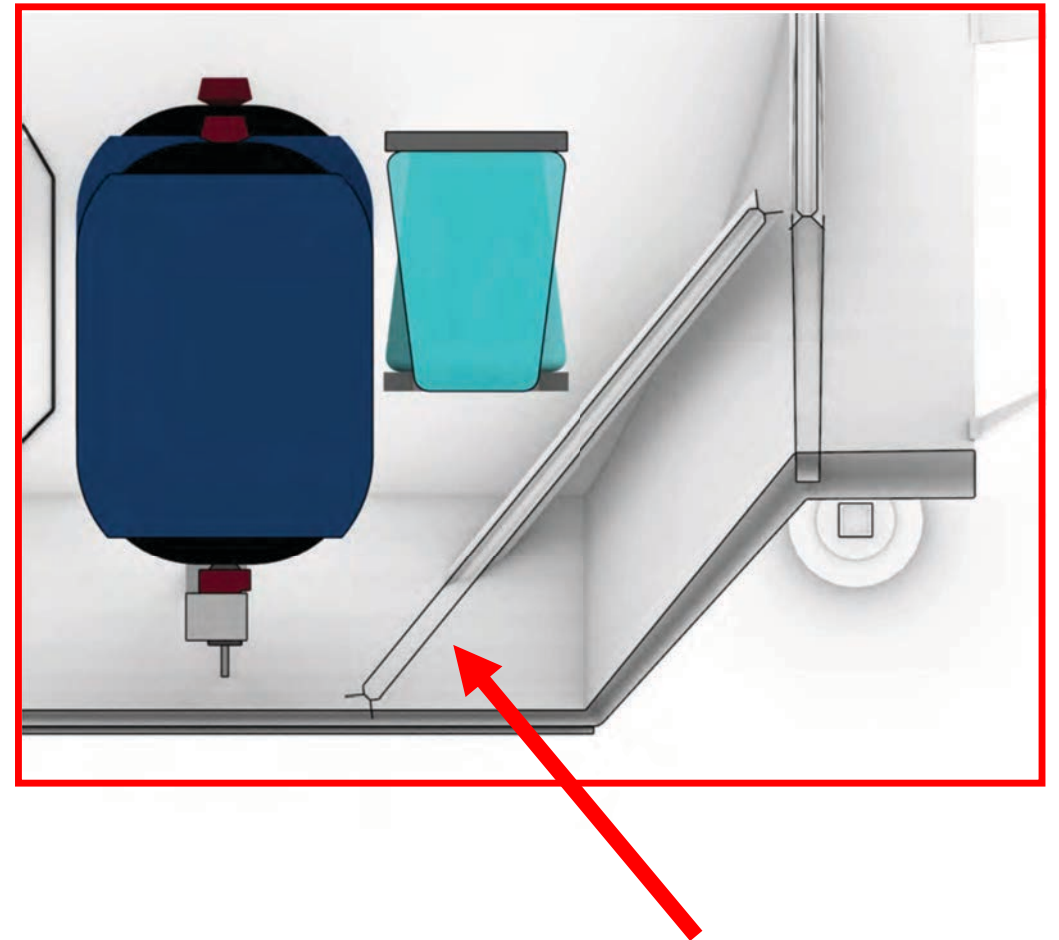
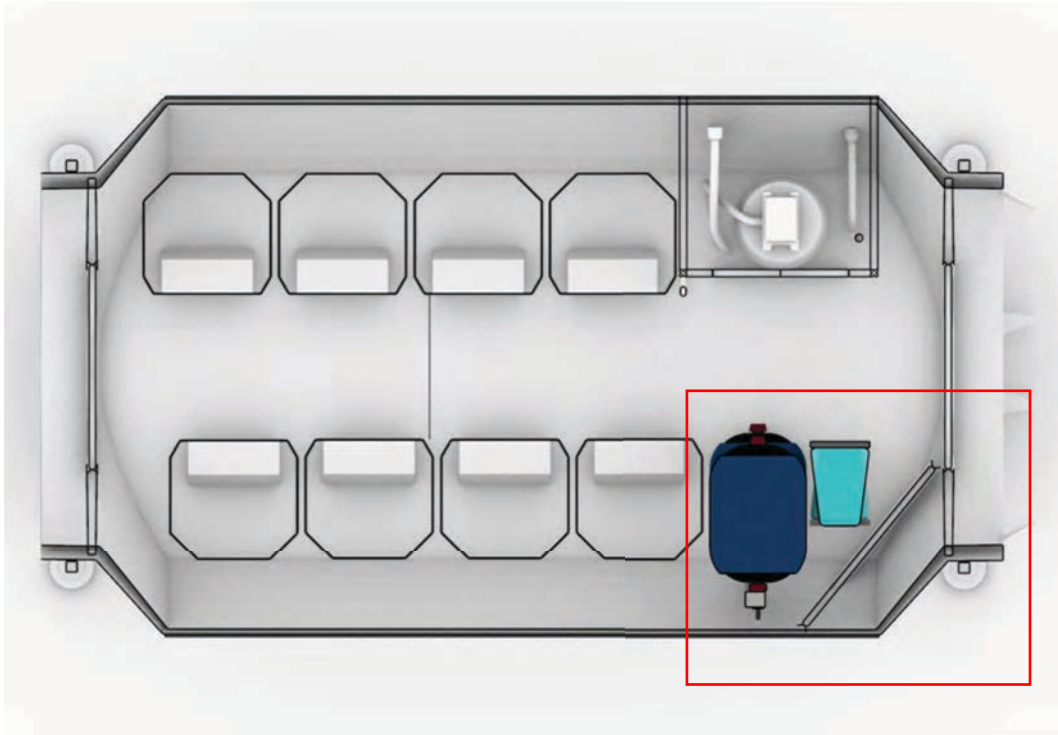
1ST MOVE: Modify Tank Arrangement



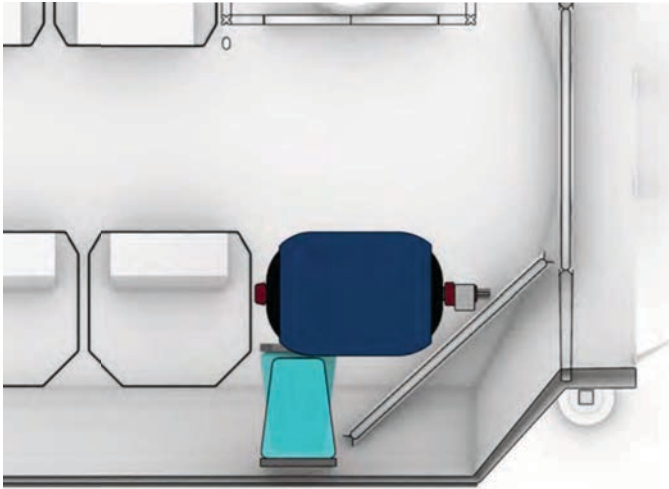
1ST MOVE: Modify Tank Arrangement



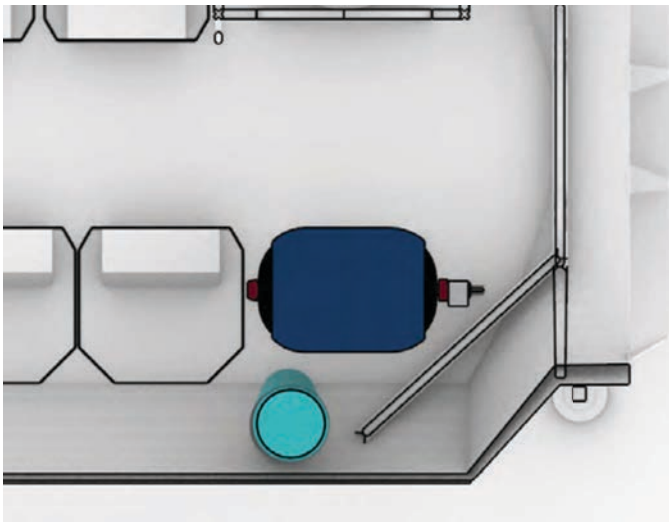
1ST MOVE: Modify Tank Arrangement



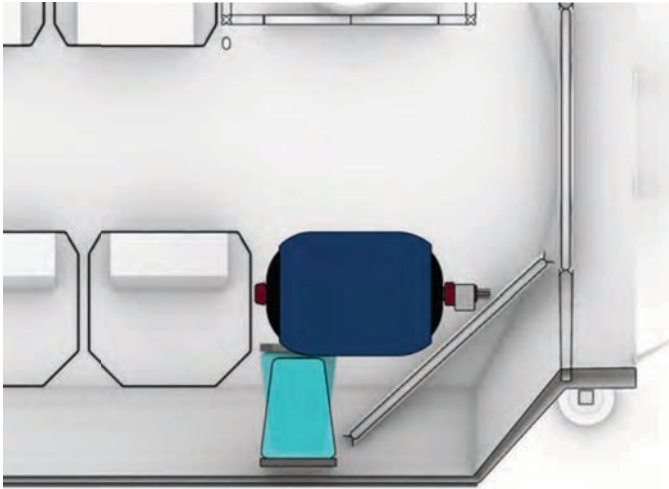
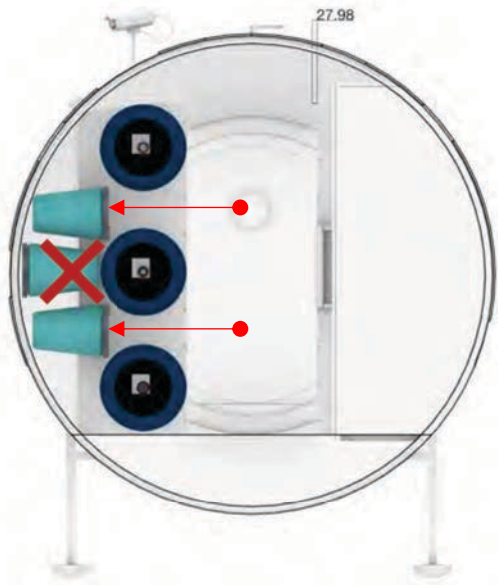
HORIZONTAL



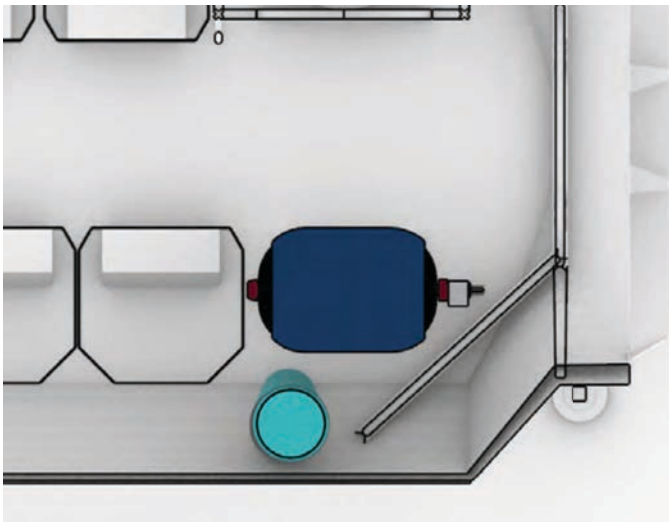
VERTICAL



HORIZONTAL



VERTICAL



RECOMMENDATIONS:

1. Rearrange the position of the tanks to permit the hatches to open and close sliding behind the tanks.
2. OR Create custom shape water, nitrogen and oxygen tanks to fit the area allocated and optimize volume usage.
3. Design a bi-folded hatch that can open without obstructing nearby compartments.
4. Consider extending the length and the diameter of the ECLSS module.

Bi-folded Hatch Concept



3D Model ECLSS Pallet I Handle Positions Based on Original Clip Orientation

front



back



ECLSS Pallet Handle Positions Based on Human Factors Assessment



01



02

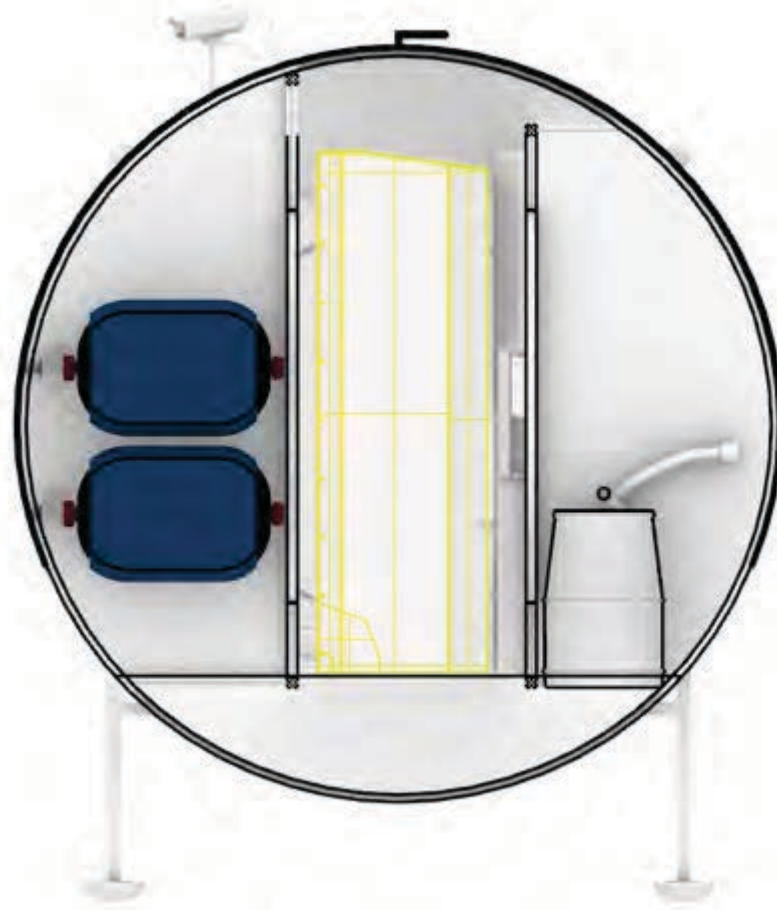


03



04

ECLSS Pallet Fits Through

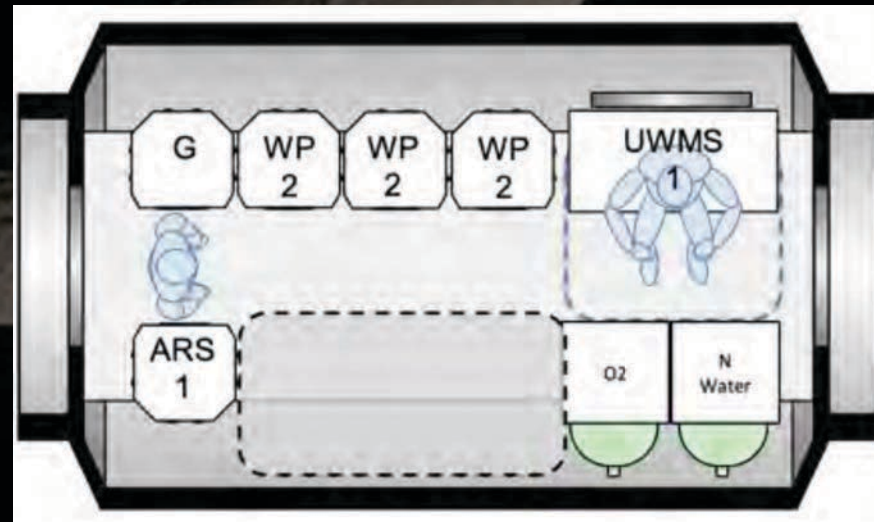
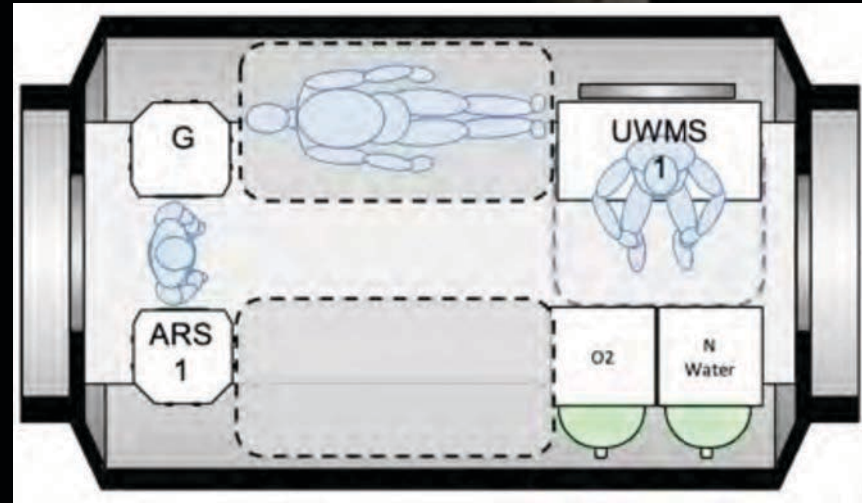


RECOMMENDATIONS:

1. Install rollers at the bottom of the ECLSS pallets for easy transport from its initial placement.

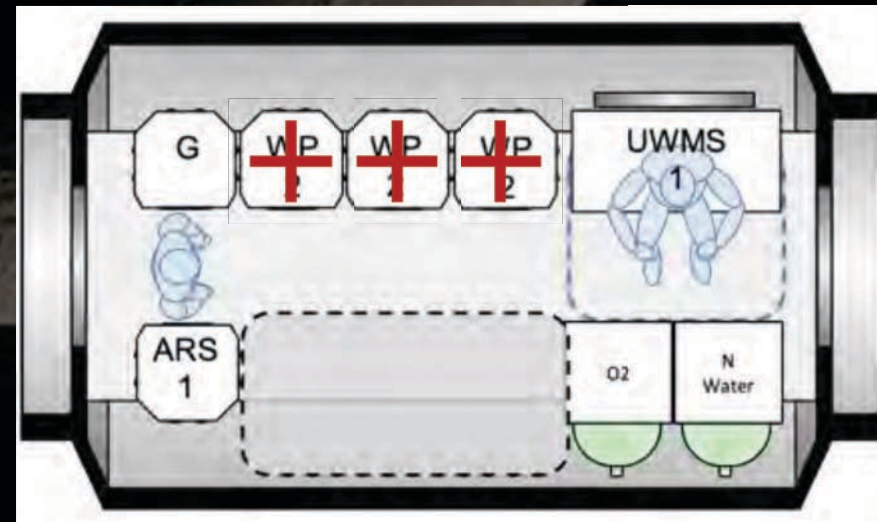
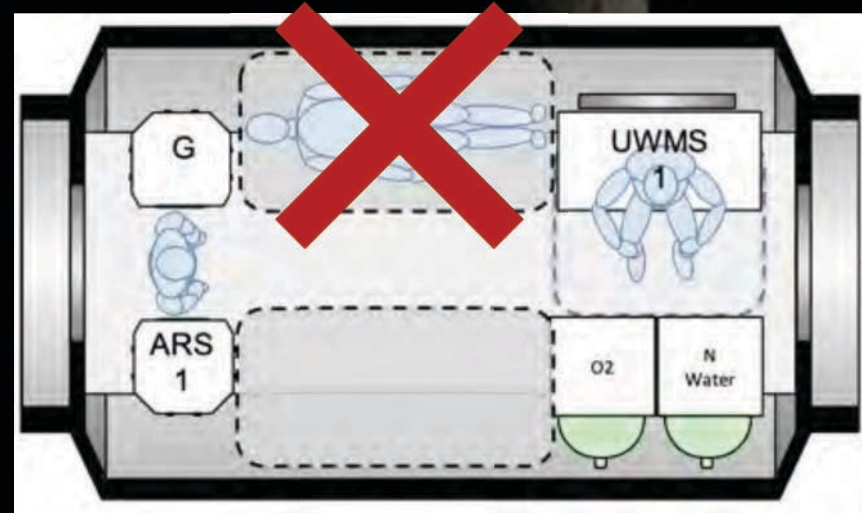
Transformation 1:

Phase 1 to Phase 2 is the removal of the 1st bed bunk and installing 3 water processor (WP) pallets.



Transformation 1:

Phase 1 to Phase 2 is the removal of the 1st bed bunk and installing 3 water processor (WP) pallets.





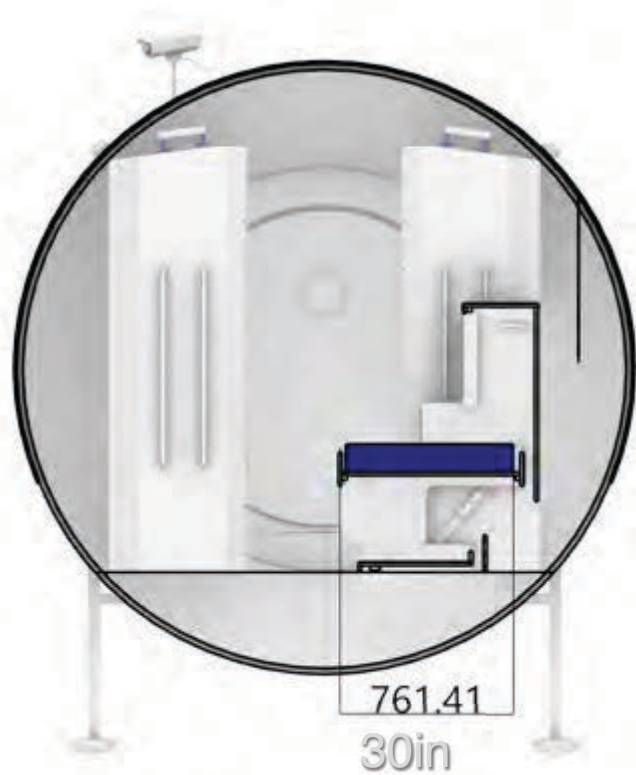


PHASE 1 - 2

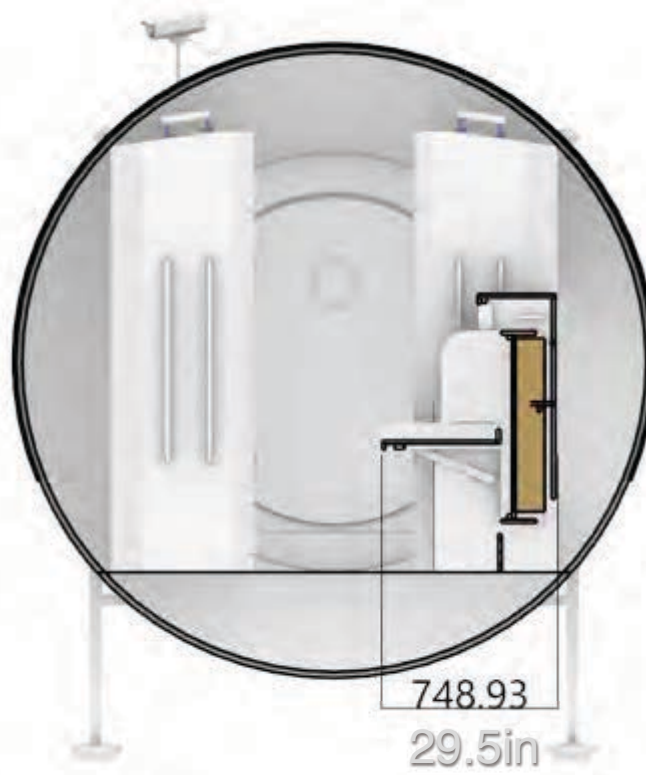
FUNCTION	TASK NUMBER	TASK	SUBTASK NUMBER	SUBTASK	POSITION/MOTION
REMOVAL of bed bunk #1	A.01	Module entry	A.01.1	Unlock module door	
			A.01.2	Open door	
			A.01.3	Lock door opened	
	A.02	Uninstall bed bunk #1	A.02.1	Unscrew furniture from the wall	
	A.03	Remove bed bunk #1 from module	A.03.1	Pull-out furniture perpendicular to wall	
			A.03.2	Slide furniture parallel to wall, out of the module	
INSTALLATION of water processor (WP) pallets #1, #2, #3	B.01	Module entry	B.01.1	Unlock module door	
			B.01.2	Open door	
			B.01.3	Lock door opened	
	B.02	Insert WP #1 into Module	B.02.1	Push WP #1 along the corridor	
	B.03	Locate WP #1	B.03.1	Insert WP #1 in place towards wall	
	B.04	Install WP #1	B.04.1	Bend down towards connectors box	
			B.04.2	Connect ducts	
	B.05	Module exit	B.05.1	Stand up	
			B.05.2	Walk out of module	
	B.06	Insert WP #2 into Module	B.06.1	Push WP #2 along the corridor	
	B.07	Locate WP #2	B.07.1	Insert WP #1 in place towards wall	
	B.08	Install WP #2	B.08.1	Bend down towards connectors box	
			B.08.2	Connect ducts	
	B.09	Module exit	B.09.1	Stand up	
			B.09.2	Walk out of module	
	B.10	Insert WP #3 into Module	B.10.1	Push WP #2 along the corridor	
	B.11	Locate WP #3	B.11.1	Bend down towards connectors box	
			B.11.2	Connect ducts	
	B.12	Install WP #3	B.12.1	Bend down towards connectors box	
			B.12.2	Connect ducts	

Transformable Furniture

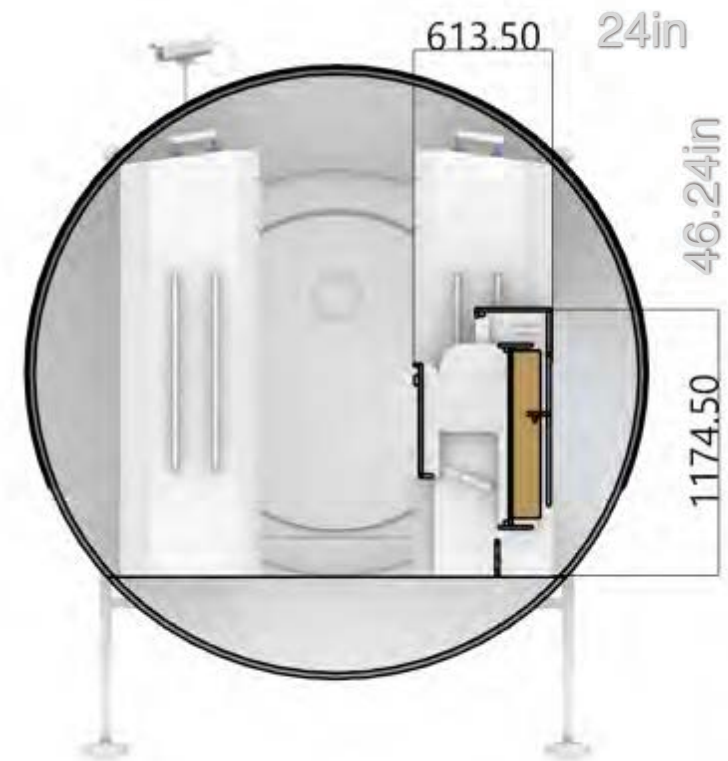
Bed-> Desk -> To go



Bed



Desk



To go

Transformable Furniture

Bed-> Desk -> To go



RECOMMENDATIONS:

1. Utilize transformable beds with similar width dimensions as the ECLSS pallets in order to maintain an adequate width and clearance of the pathway.

Temporary Ramp



RECOMMENDATIONS:

1. A ramp between modules is needed to transport the components from module to module.

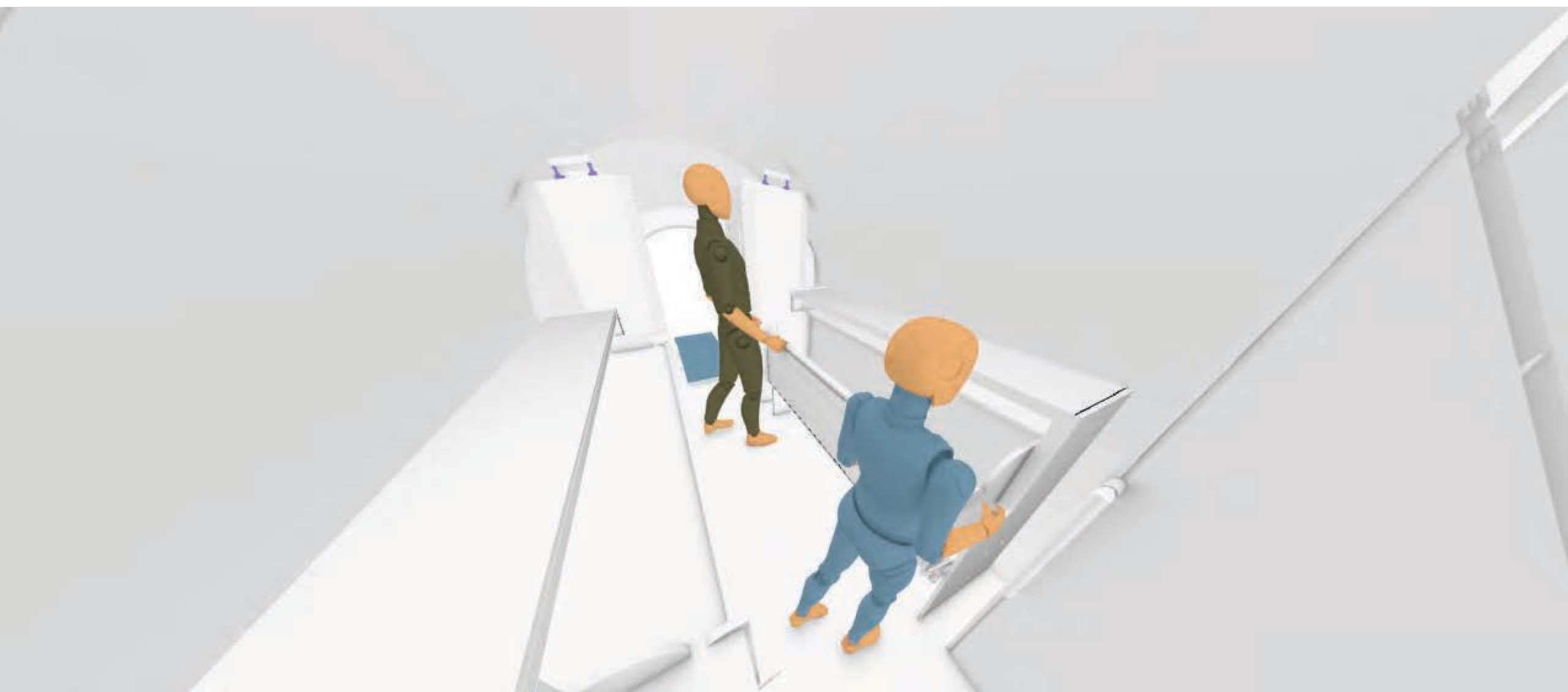




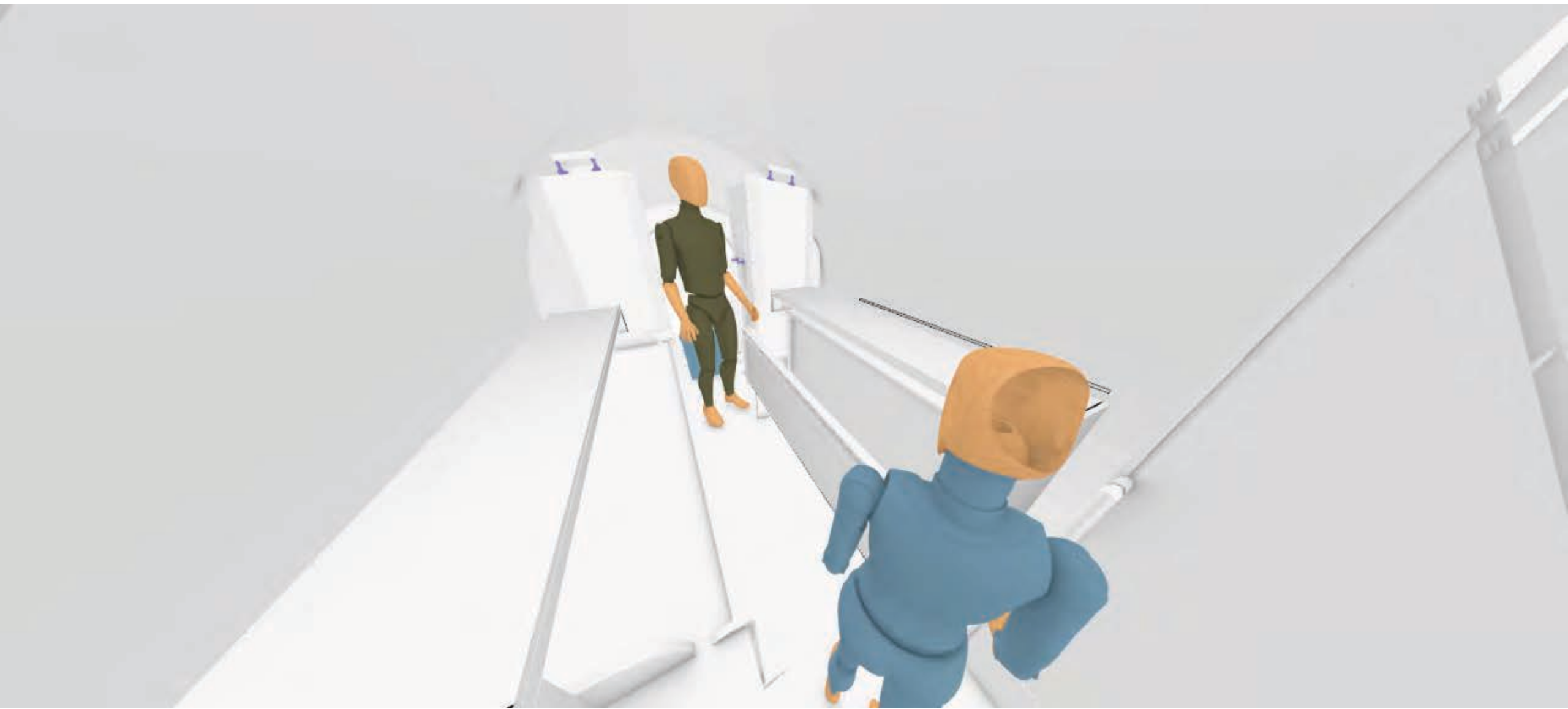








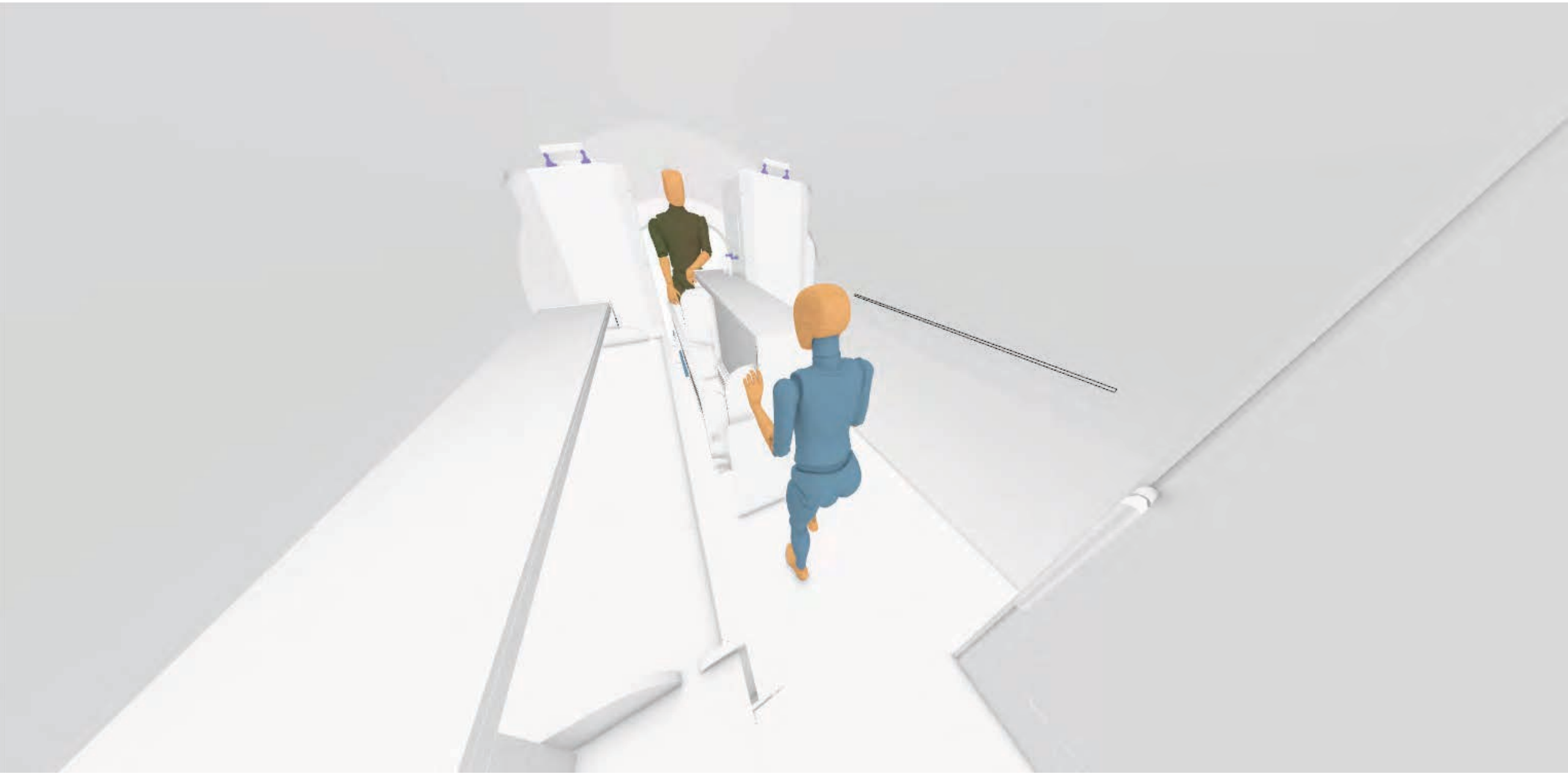






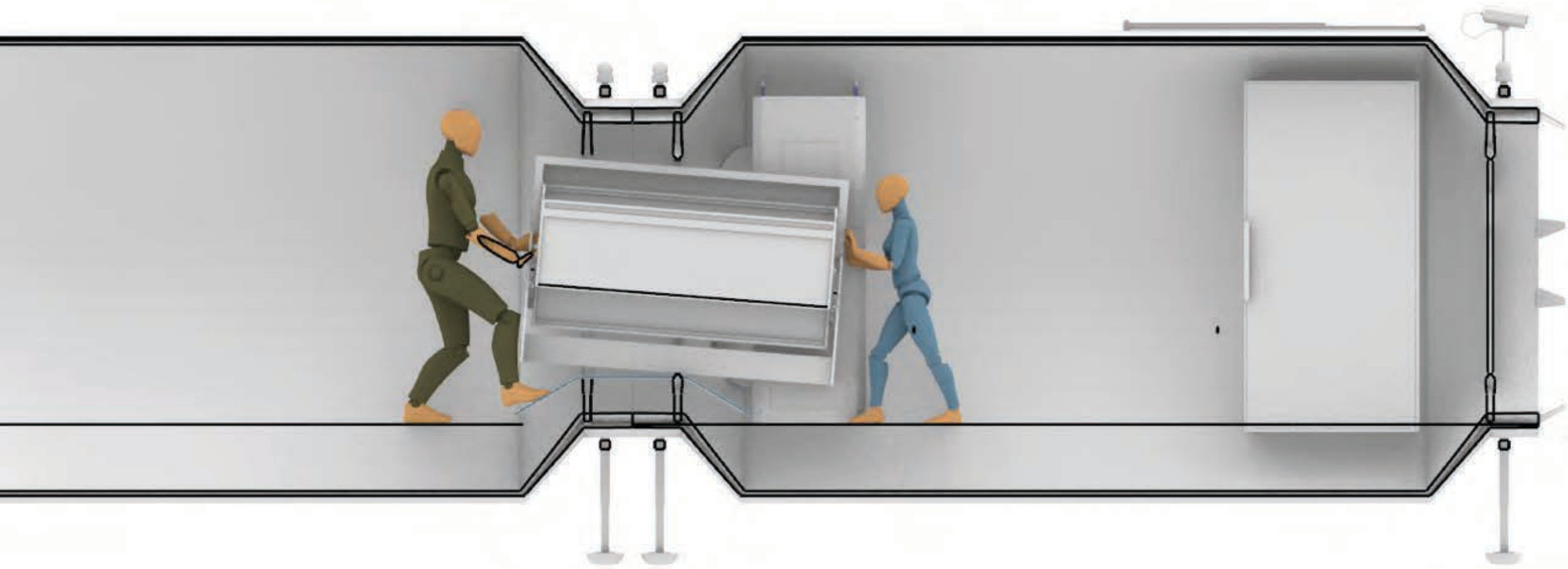










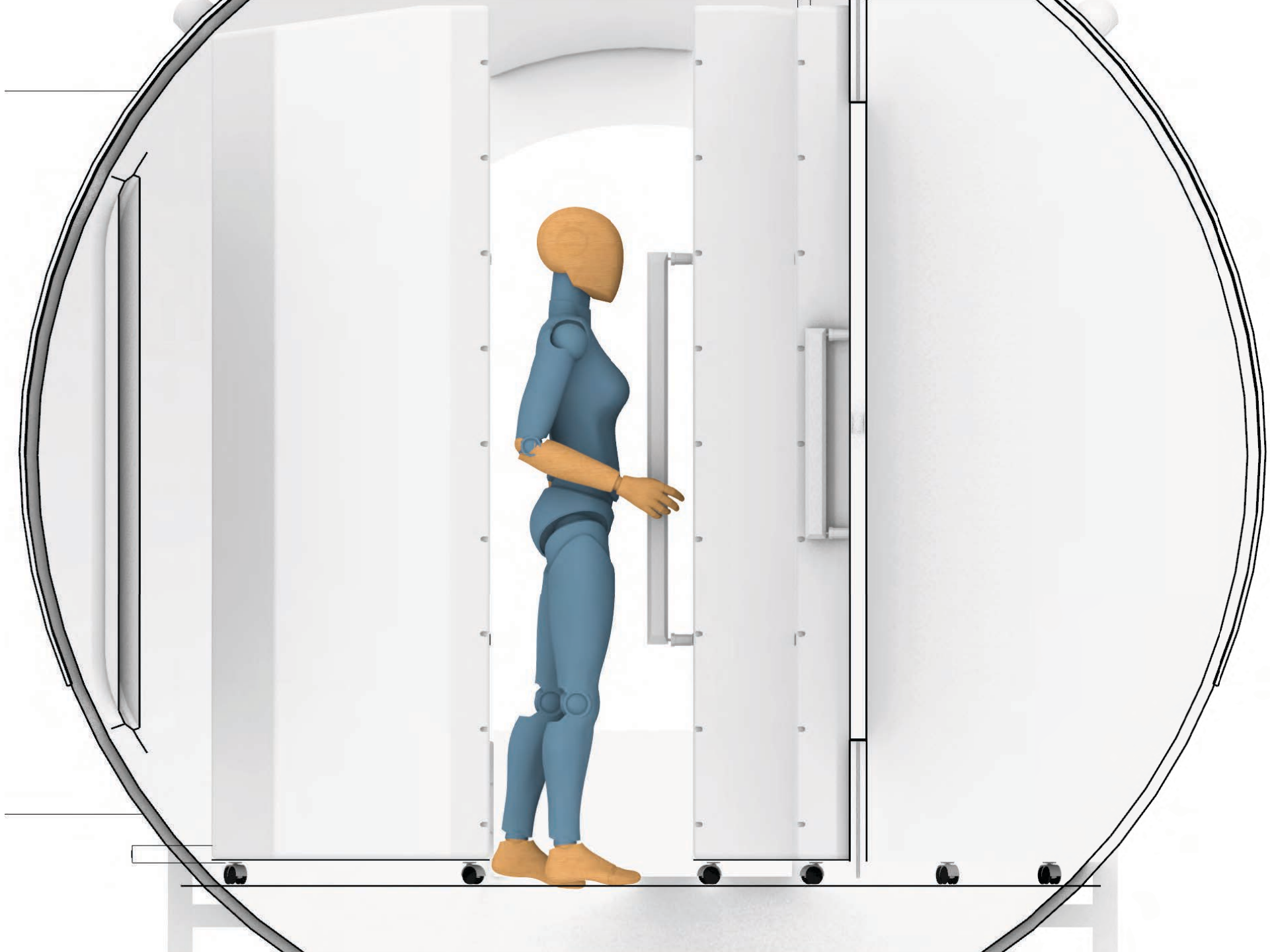


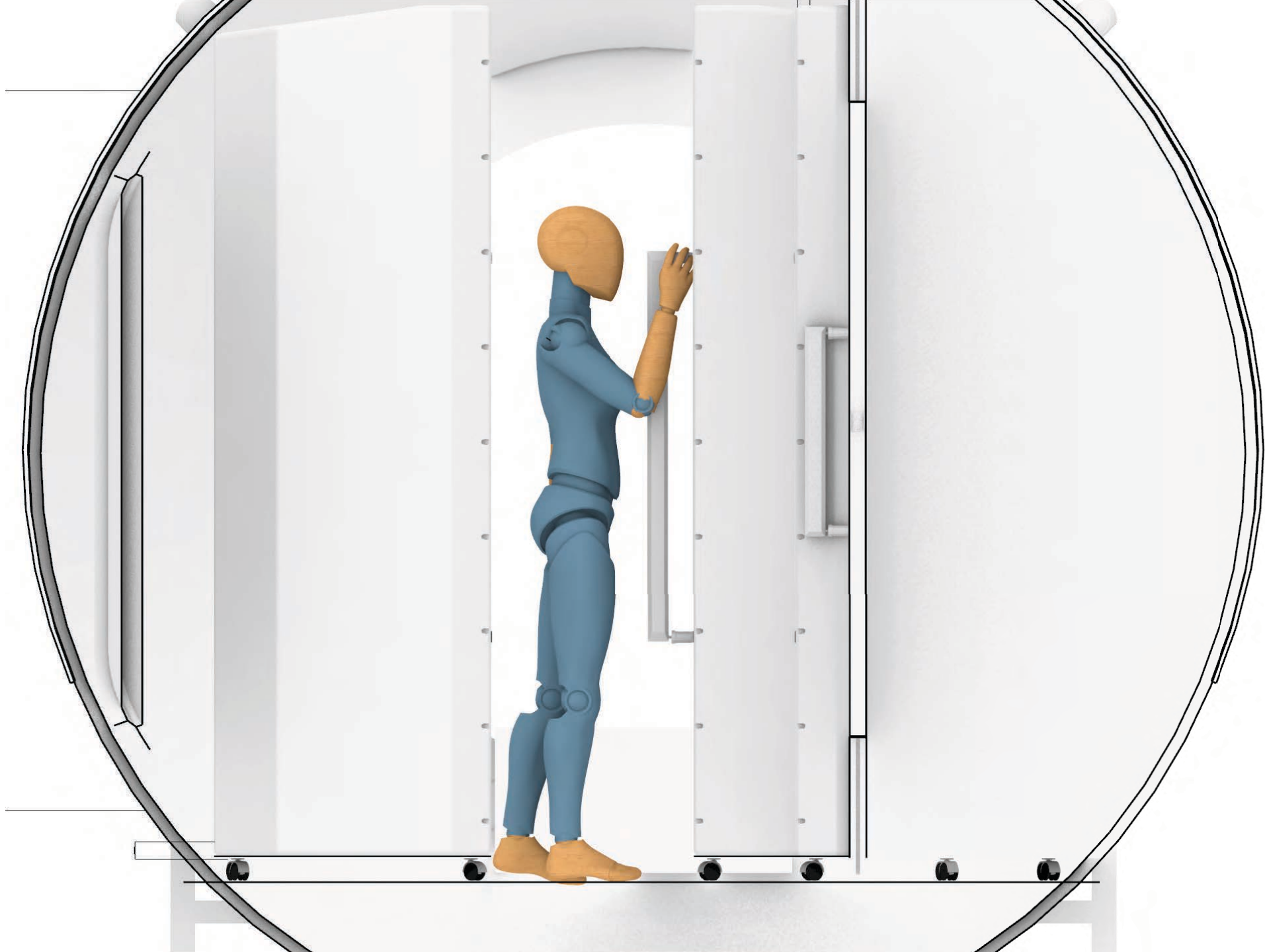
RECOMMENDATIONS:

1. Install rollers at the bottom of the beds for easy transport from its initial placement.



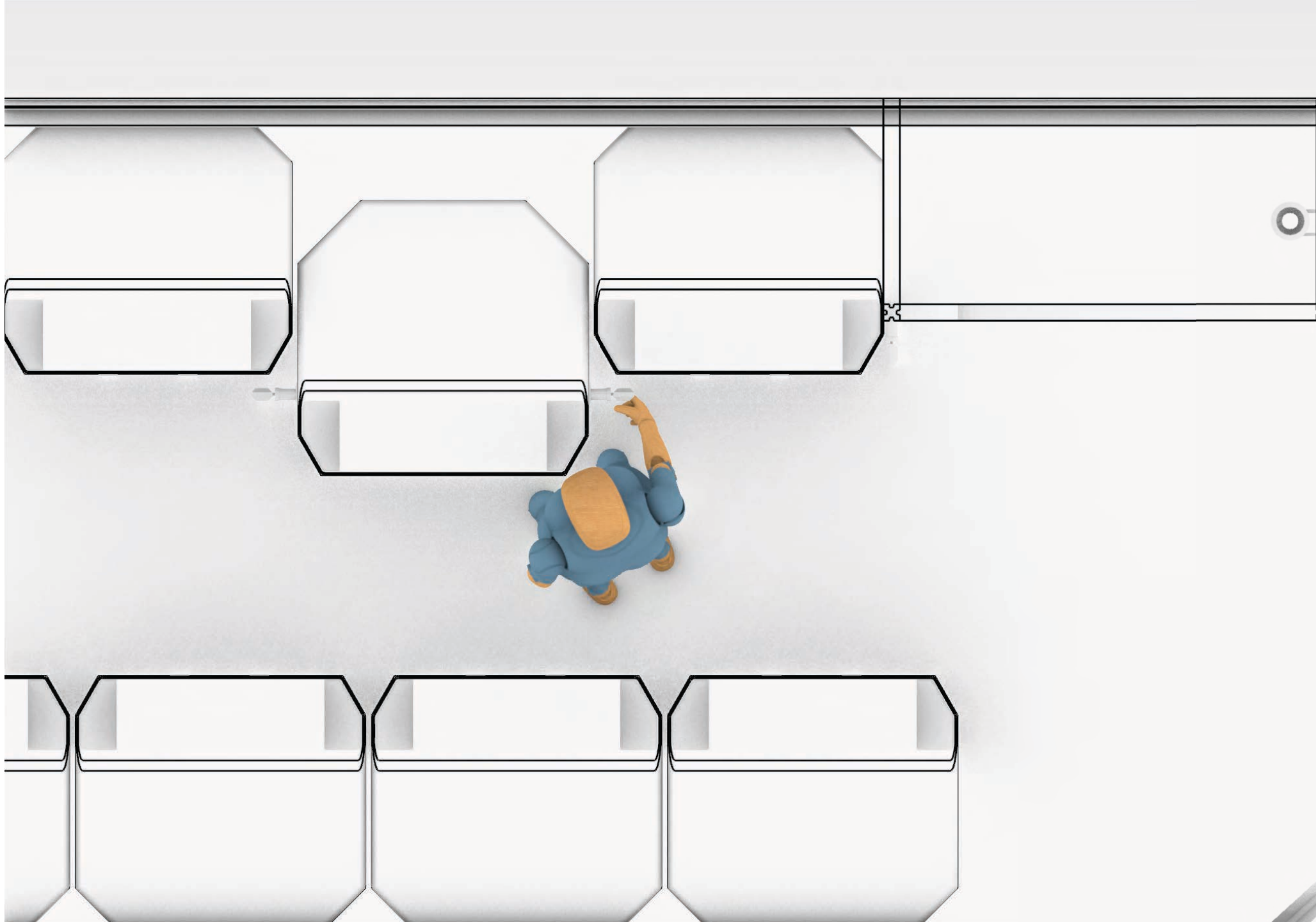




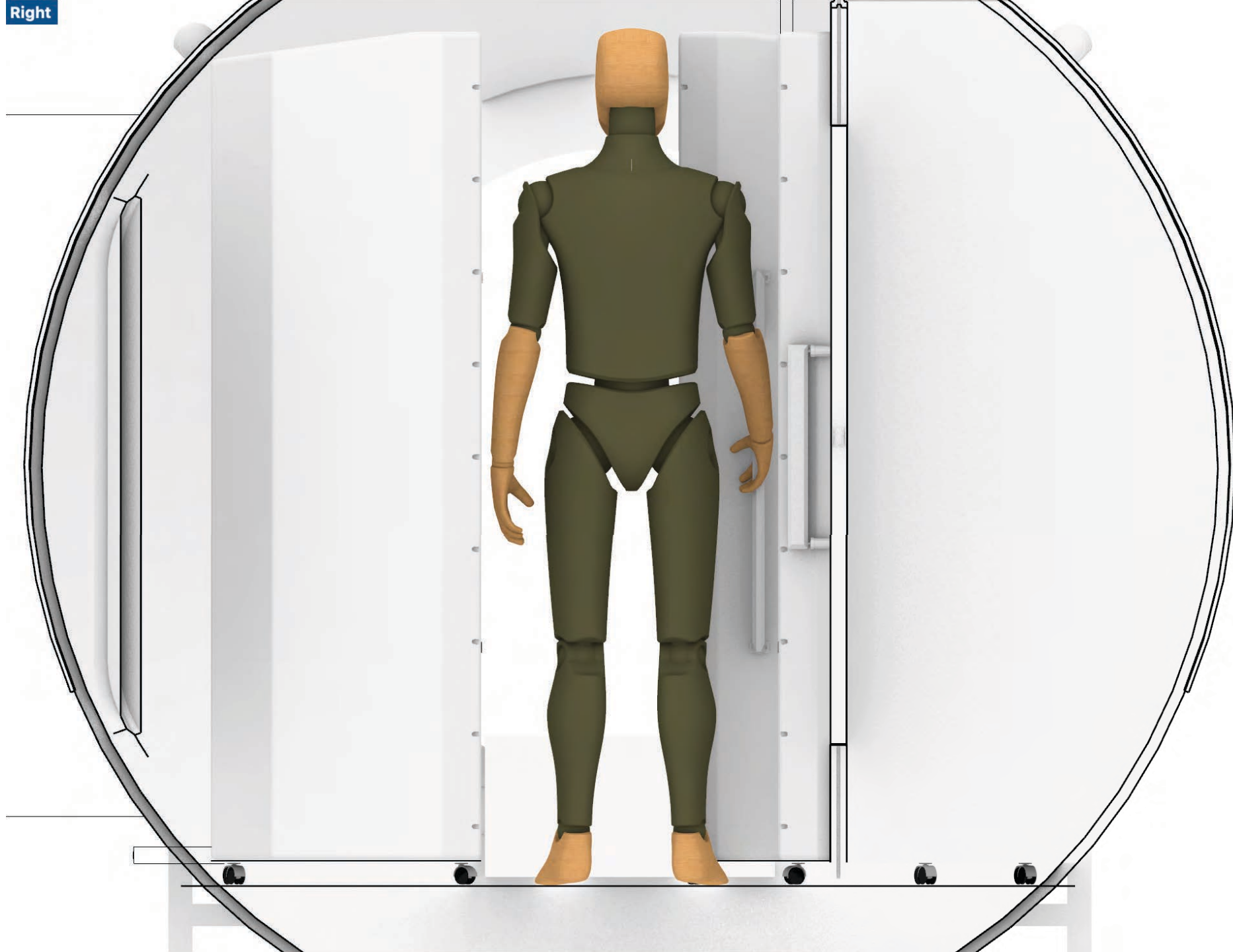








Right





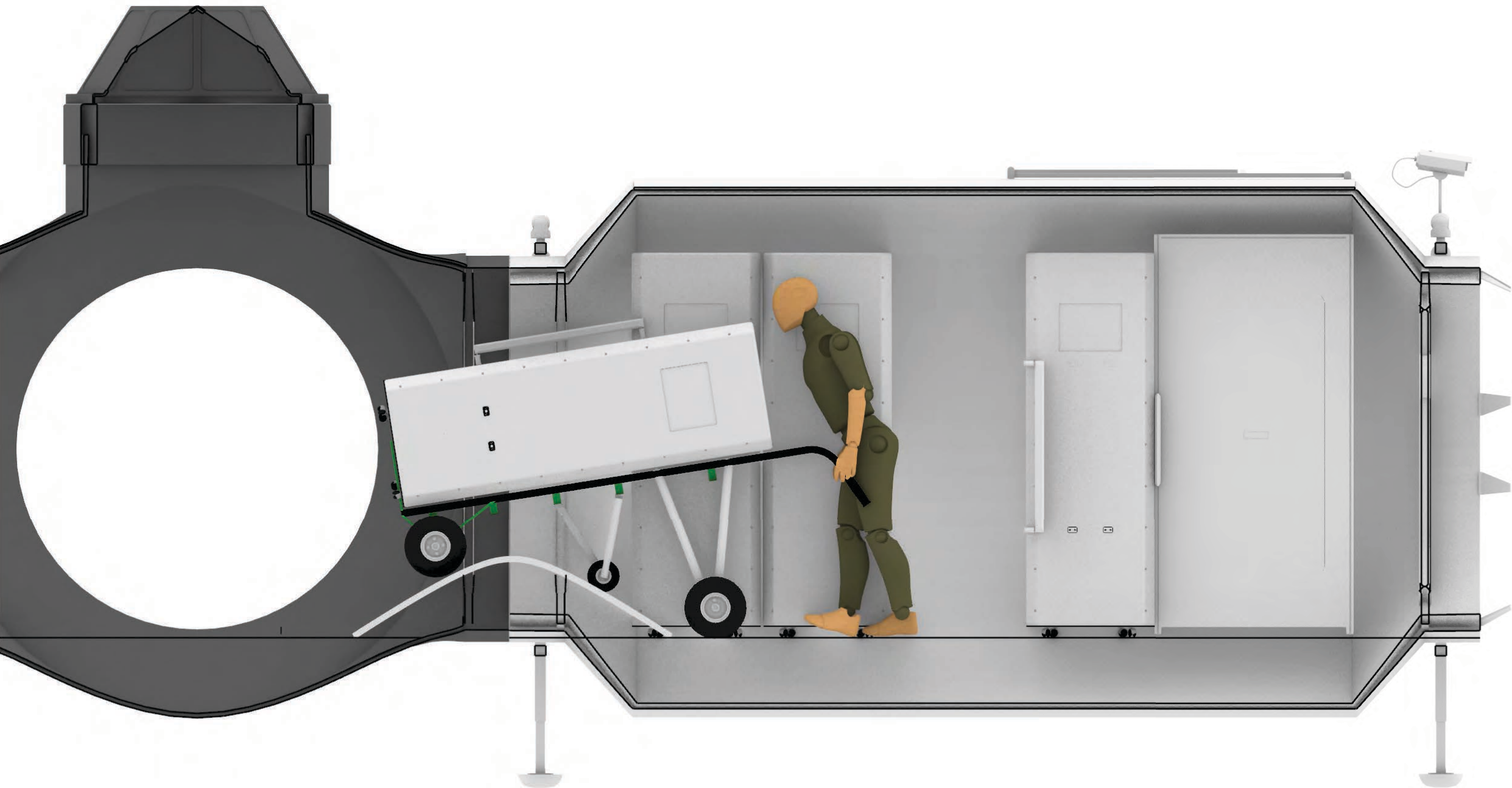












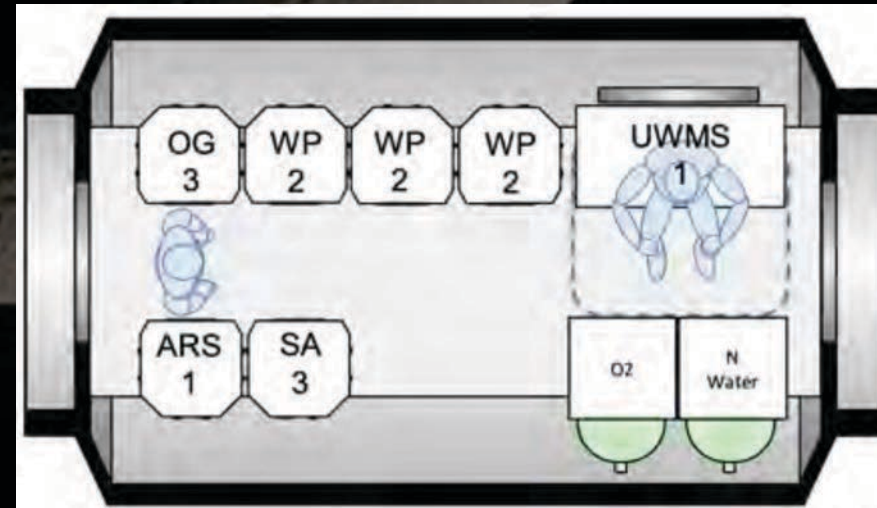
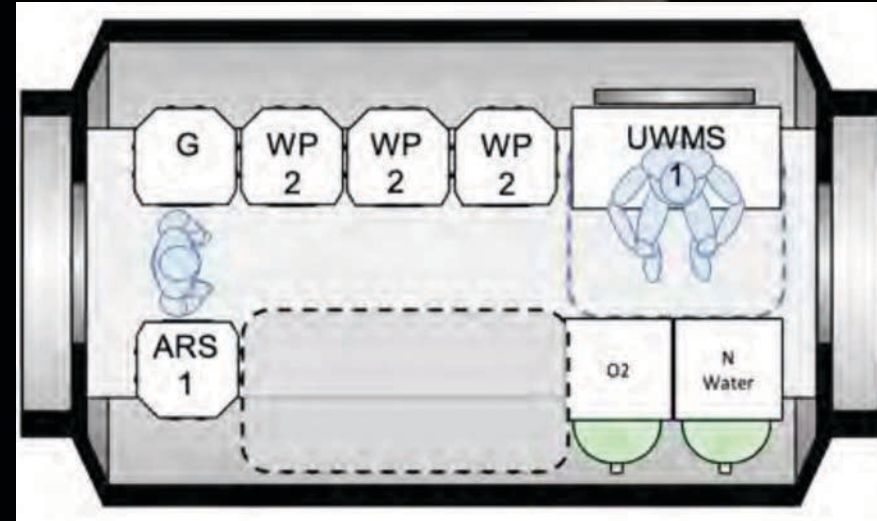


RECOMMENDATIONS:

1. Utilize a dolly to move the ECLSS pallets and the beds from module to module. The dolly must be able to hold the total weight of the components through a cot-type system to evade crew injury.

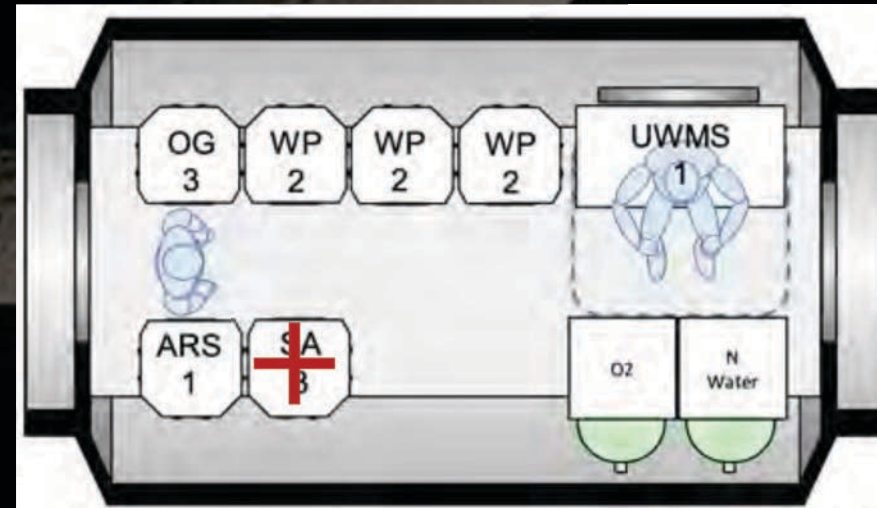
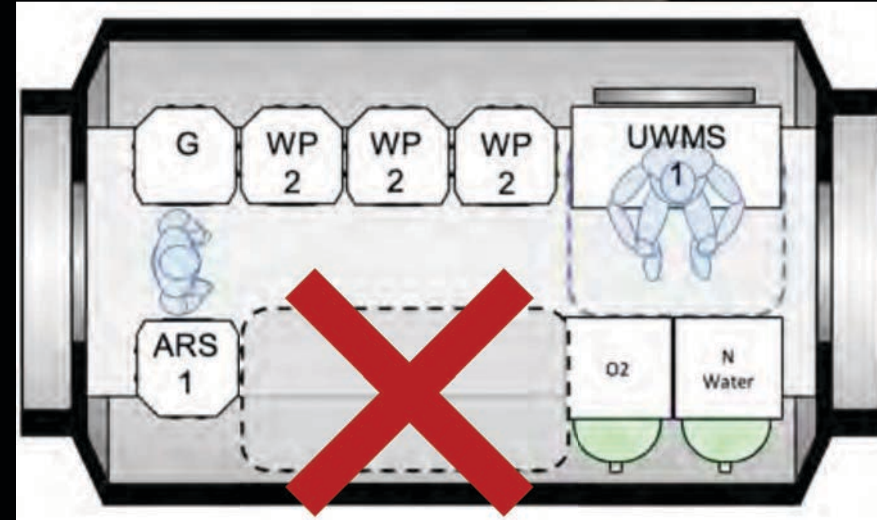
Transformation 2:

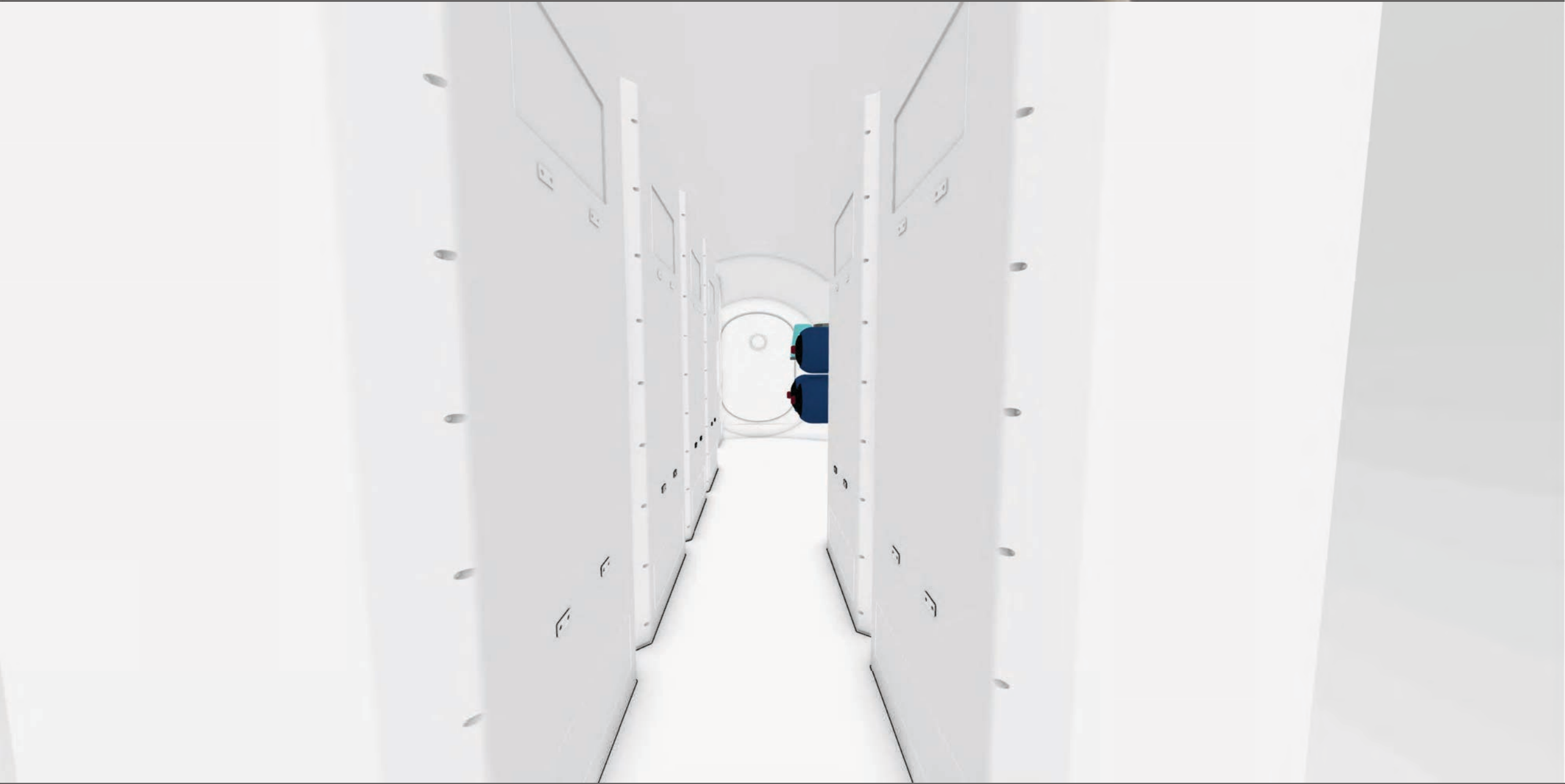
Phase 2 to Phase 3 is the removal of the 2nd bed bunk and installing 1 SA pallet, and removal of the galley (G) pallet and installing the oxygen generator (OG) pallet.



Transformation 2:

Phase 2 to Phase 3 is the removal of the 2nd bed bunk and installing 1 SA pallet, and removal of the galley (G) pallet and installing the oxygen generator (OG) pallet.

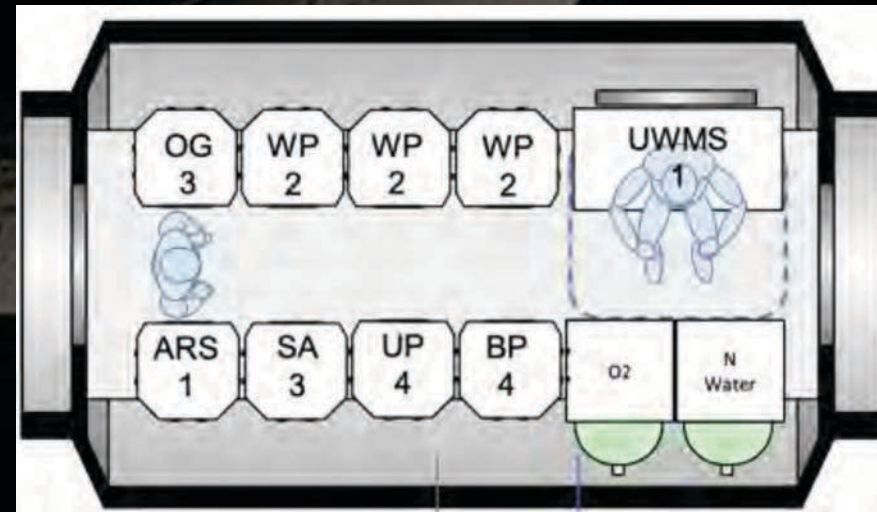
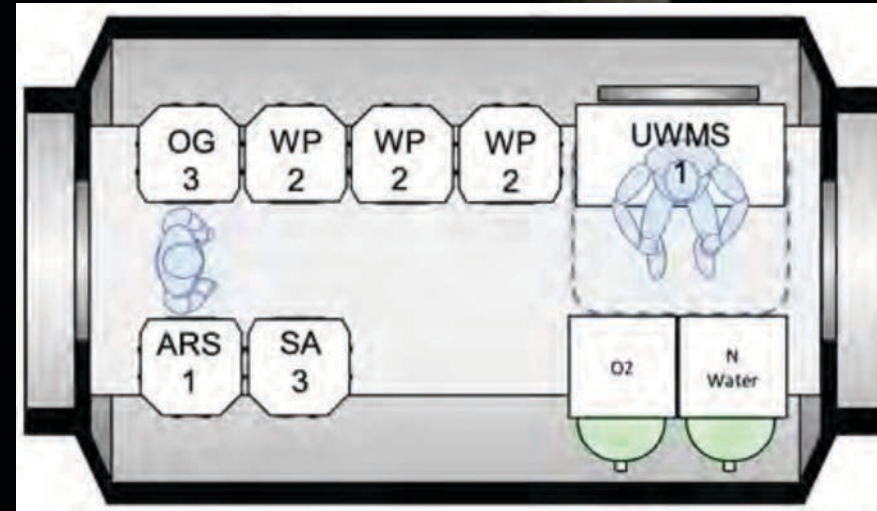




PHASE 2-3					
FUNCTION	TASK NUMBER	TASK	SUBTASK NUMBER	SUBTASK	POSITION/MOTION
REMOVAL of bed bunk #2	A.01	Module entry	A.01.1	Unlock module door	
			A.01.2	Open door	
			A.01.3	Lock door opened	
	A.02	Uninstall bed bunk #2	A.02.1	Unscrew furniture from the wall	
	A.03	Remove bed bunk #2 from module	A.03.1	Pull-out furniture perpendicular to wall	
			A.03.2	Slide furniture parallel to wall, out of the module	
INSTALLATION of 1 SA pallet	B.01	Module entry	B.01.1	Unlock module door	
			B.01.2	Open door	
			B.01.3	Lock door opened	
	B.02	Insert SA pallet into Module	B.02.1	Push WP #1 along the corridor	
	B.03	Locate SA pallet	B.03.1	Insert WP #1 in place towards wall	
	B.04	Install SA pallet	B.04.1	Bend down towards connectors box	
			B.04.2	Connect ducts	
REMOVAL of G pallet	C.01	Module entry	C.01.1	Unlock module door	
			C.01.2	Open door	
			C.01.3	Lock door opened	
	C.02	Uninstall G pallet	C.02.1	Bend down towards connectors box	
			C.02.2	Disconnect ducts	
	C.03	Remove G pallet from module	C.03.1	Pull-out G pallet perpendicular to wall	
			C.03.2	Slide G pallet parallel to wall, out of the module	
INSTALLATION OG pallet	D.01	Module entry	D.01.1	Unlock module door	
			D.01.2	Open door	
			D.01.3	Lock door opened	
	D.02	Insert OG pallet into Module	D.02.1	Push WP #1 along the corridor	
	D.03	Locate OG pallet	D.03.1	Insert WP #1 in place towards wall	
	D.04	Install OG pallet	D.04.1	Bend down towards connectors box	
			D.04.2	Connect ducts	

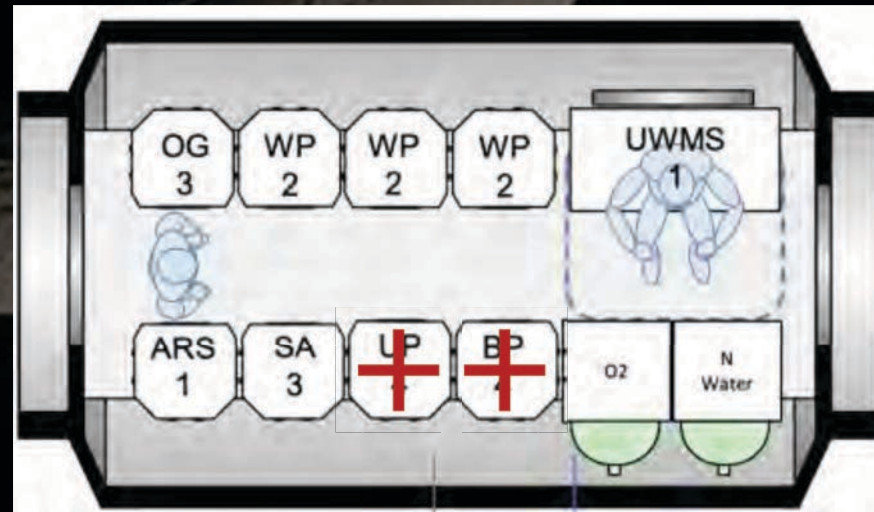
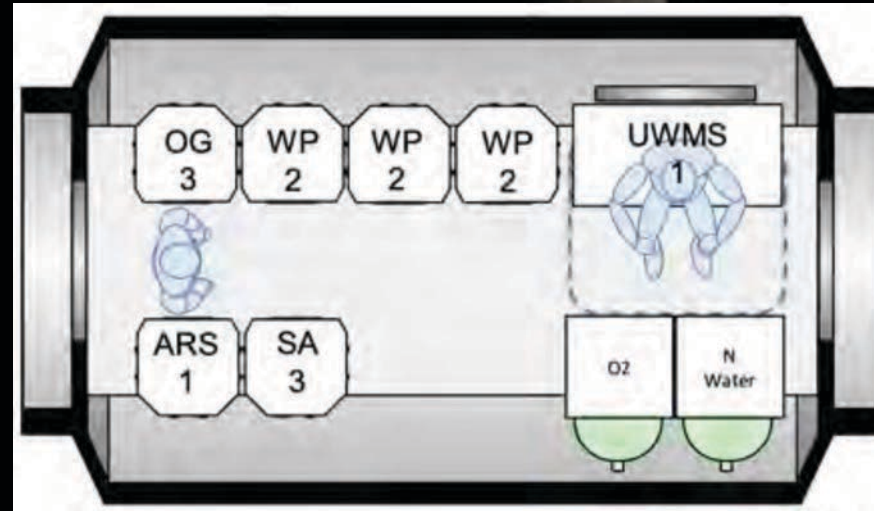
Transformation 3:

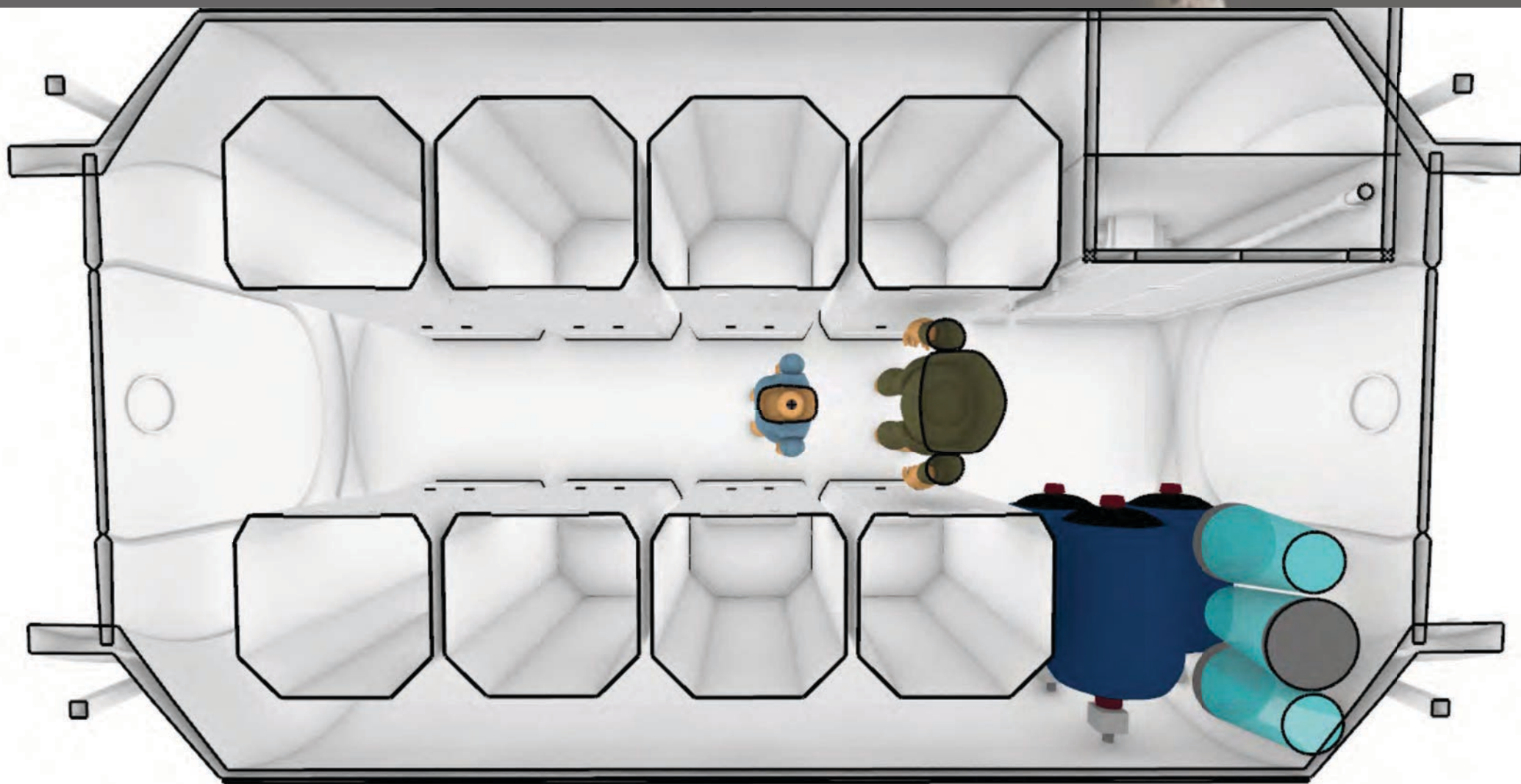
Phase 3 to Phase 4 is the addition of UP and BP pallets.



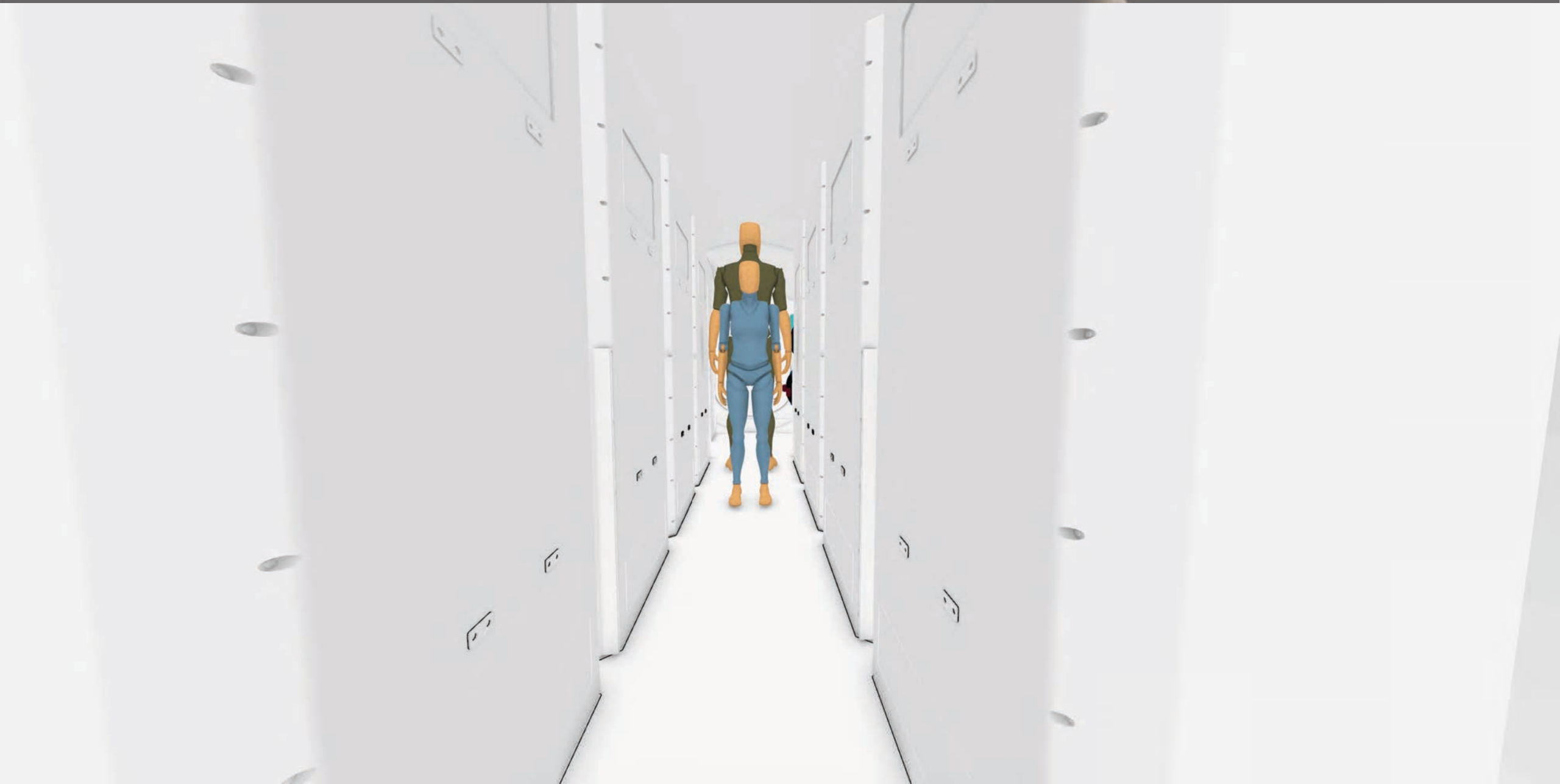
Transformation 3:

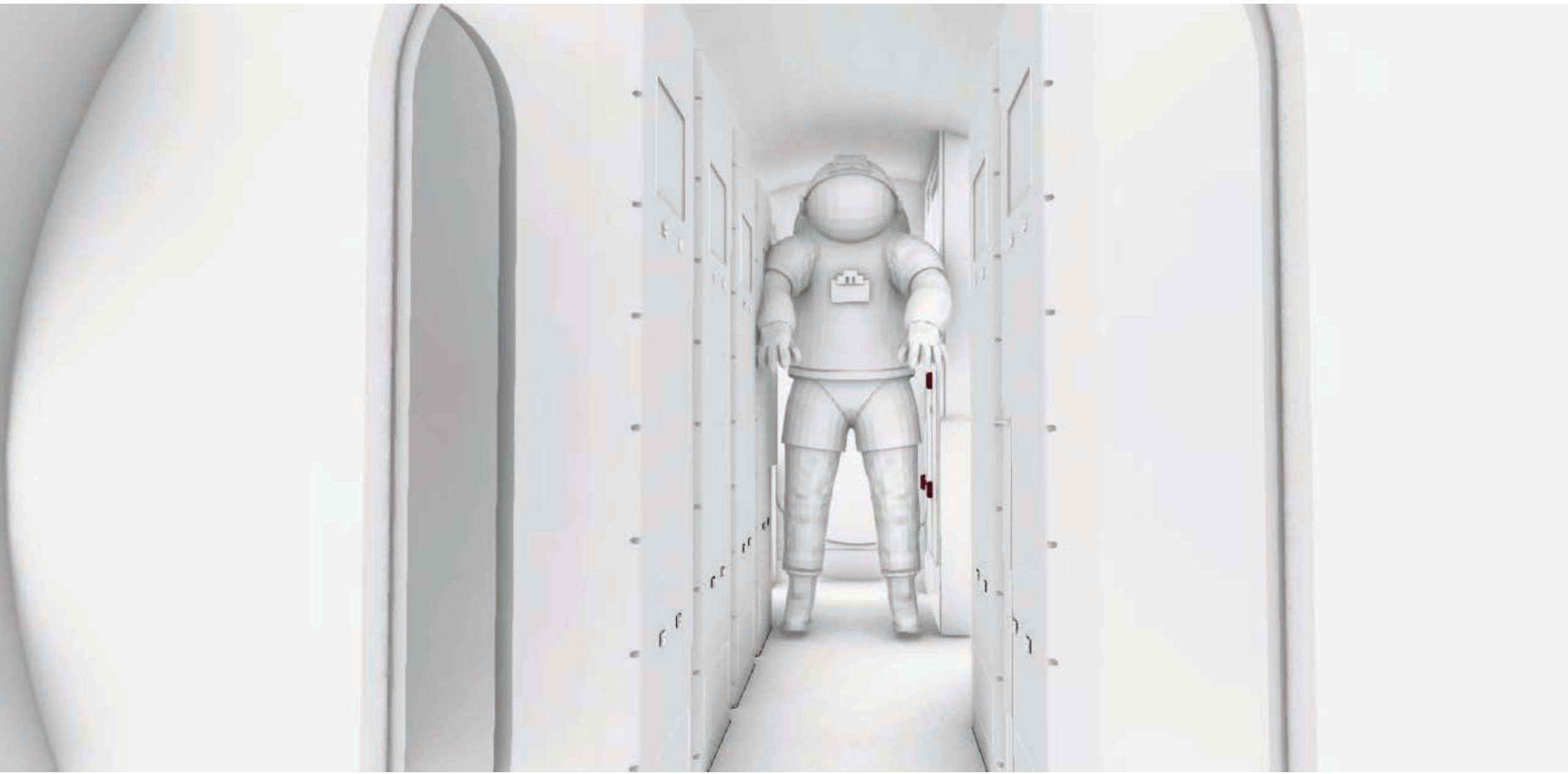
Phase 3 to Phase 4 is the addition of UP and BP pallets.

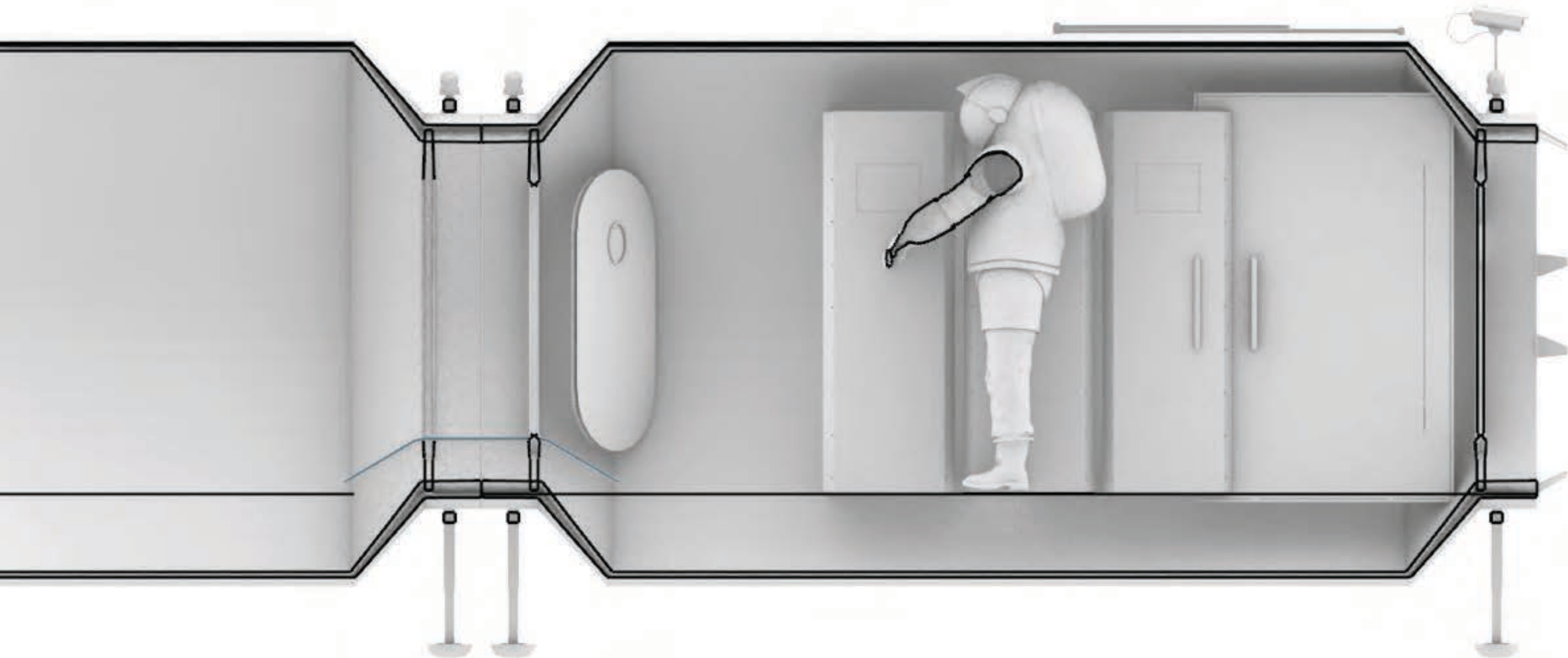














Cancel PHASE 3-4					
FUNCTION	TASK NUMBER	TASK	SUBTASK NUMBER	SUBTASK	POSITION/MOTION
INSTALLATION of UP	A.01	Module entry	A.01.1	Unlock module door	
			A.01.2	Open door	
			A.01.3	Lock door opened	
	A.02	Insert UP pallet into Module	A.02.1	Push WP #1 along the corridor	
	A.03	Locate UP pallet	A.03.1	Insert WP #1 in place towards wall	
	A.04	Install UP pallet	A.04.1	Bend down towards connectors box	
			A.04.2	Connect ducts	
INSTALLATION of BP	B.01	Module entry	B.01.1	Unlock module door	
			B.01.2	Open door	
			B.01.3	Lock door opened	
	B.02	Insert BP pallet into Module	B.02.1	Push WP #1 along the corridor	
	B.03	Locate BP pallet	B.03.1	Insert WP #1 in place towards wall	
	B.04	Install BP pallet	B.04.1	Bend down towards connectors box	
			B.04.2	Connect ducts	

ALL RECOMMENDATIONS:

1. Rearrange the position of the tanks to permit the hatches to open and close sliding behind the tanks.
2. OR Create custom shape water, nitrogen and oxygen tanks to fit the area allocated and optimize volume usage.
3. Design a bi-folded hatch that can open without obstructing nearby compartments.
4. Consider extending the length and the diameter of the ECLSS module.
5. Install rollers at the bottom of the ECLSS pallets for easy transport from its initial placement.
6. Utilize transformable beds with similar width dimensions as the ECLSS pallets in order to maintain an adequate width and clearance of the pathway.
7. A ramp between modules is needed to transport the components from module to module.
8. Install rollers at the bottom of the beds for easy transport from its initial placement.
9. Utilize a dolly to move the ECLSS pallets and the beds from module to module. The dolly must be able to hold the total weight of the components through a cot-type system to evade crew injury.



Mobile Lab Mockup

Construction Preparation | Collaboration with EV74



Advanced Concepts Office

Space Architect, Paola Gonzalez Marquez

Mentors: Sr. Space Architect, David Smitherman

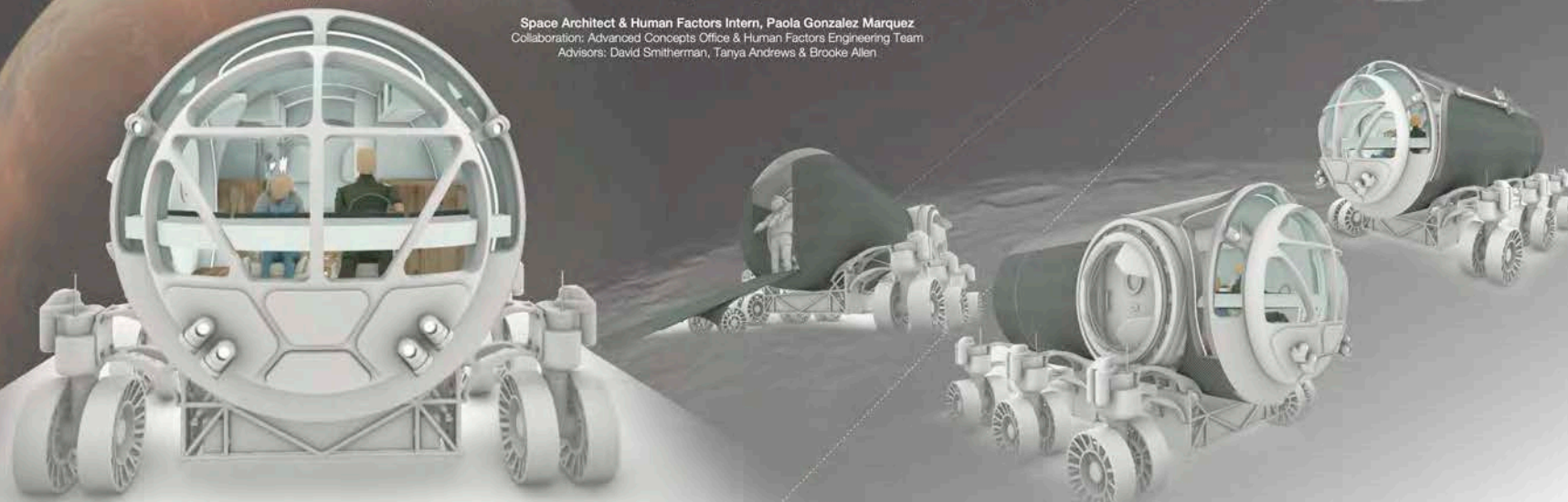
Human Factors Engineer, Tanya Andrews



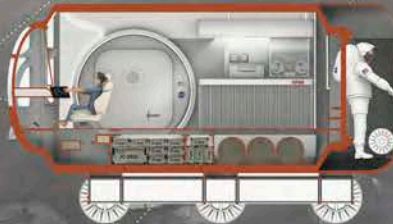
MOBILE LAB

VISION | Permanent human settlement on the Moon and Mars.
MISSION | Support all human exploration and science research studies, by continuing the work for the development of surface systems for the Moon & Mars.

Space Architect & Human Factors Intern, Paola Gonzalez Marquez
Collaboration: Advanced Concepts Office & Human Factors Engineering Team
Advisors: David Smitherman, Tanya Andrews & Brooke Allen



Sleeping Area
2 crew members, 2 bunks, 1 table



Lab Area
2 crew members, 2 tables, 1 storage



Driving Station
2 crew members, 2 seats, 1 control panel



Galley/Wardroom
2 crew members, 2 seats, 1 table

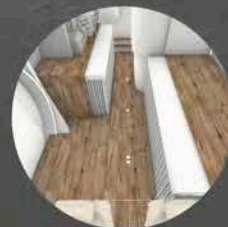
Medical Emergency Station
2 crew members, 2 seats, 1 table

Area for Miscellaneous Activities
2 crew members, 2 seats, 1 table

Hygiene/Waste Management
2 crew members, 2 seats, 1 table

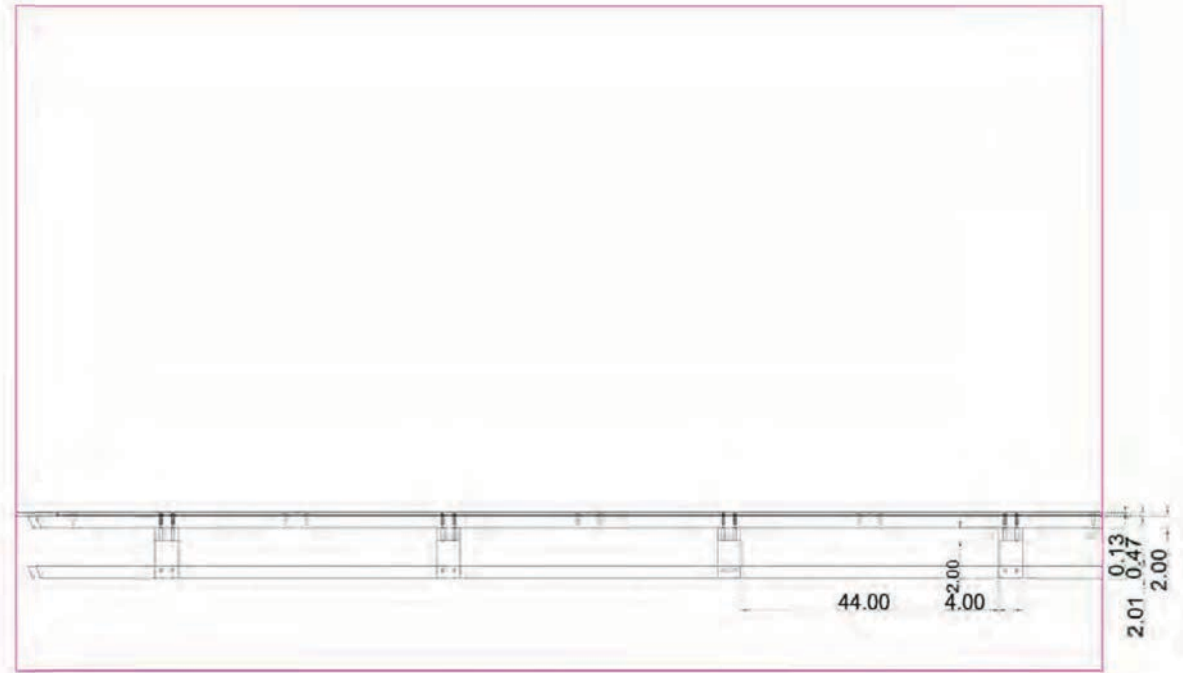
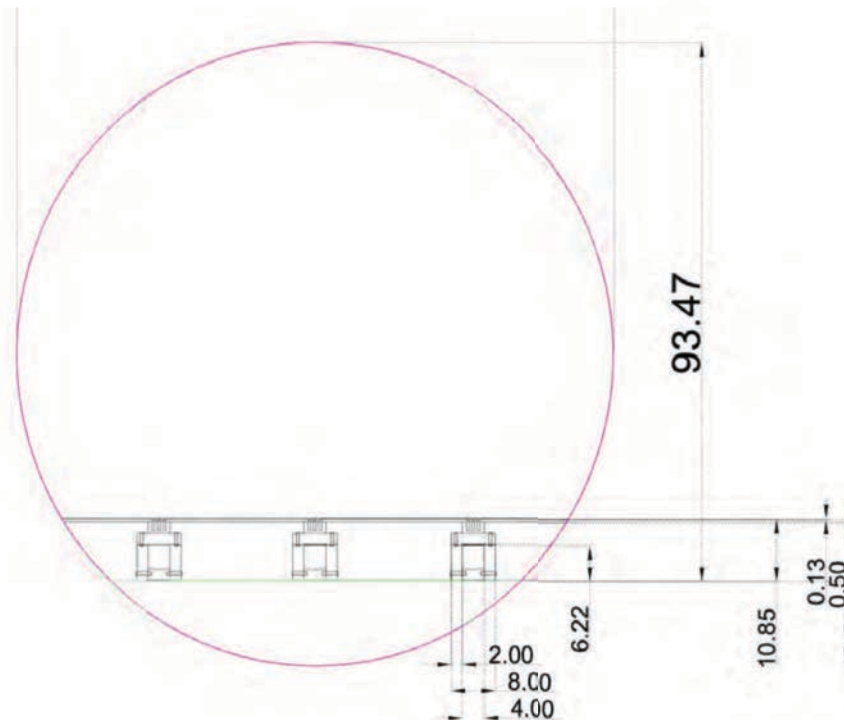
Life Support
2 crew members, 2 seats, 1 table

Egress/Ingress
2 crew members, 2 seats, 1 table

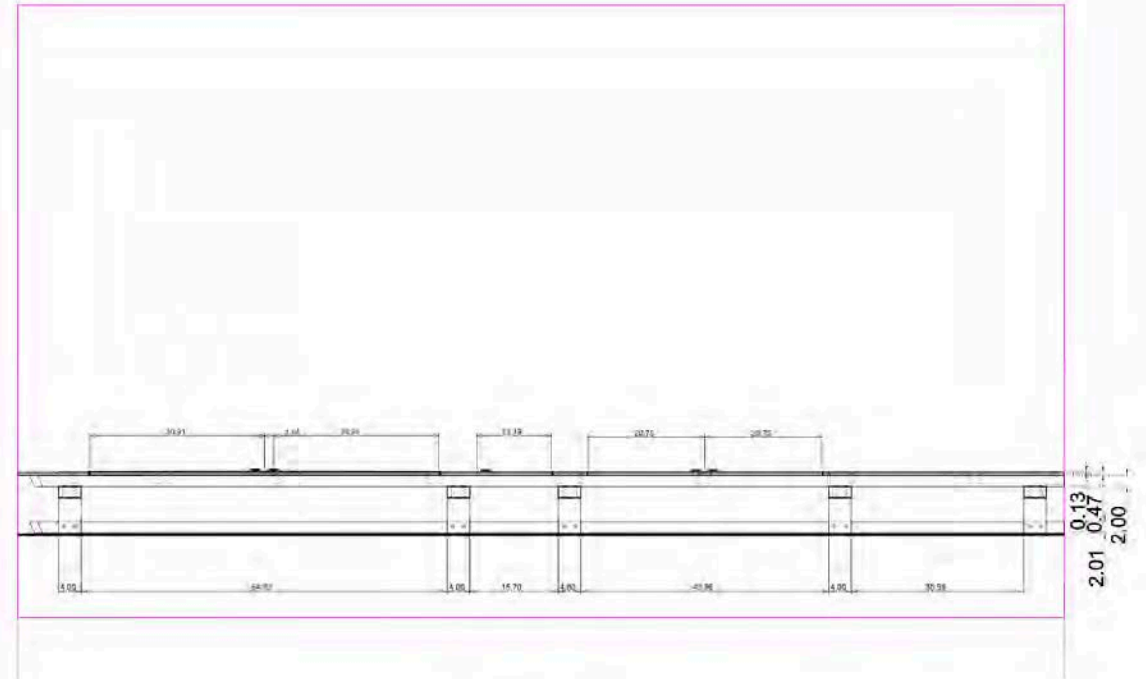
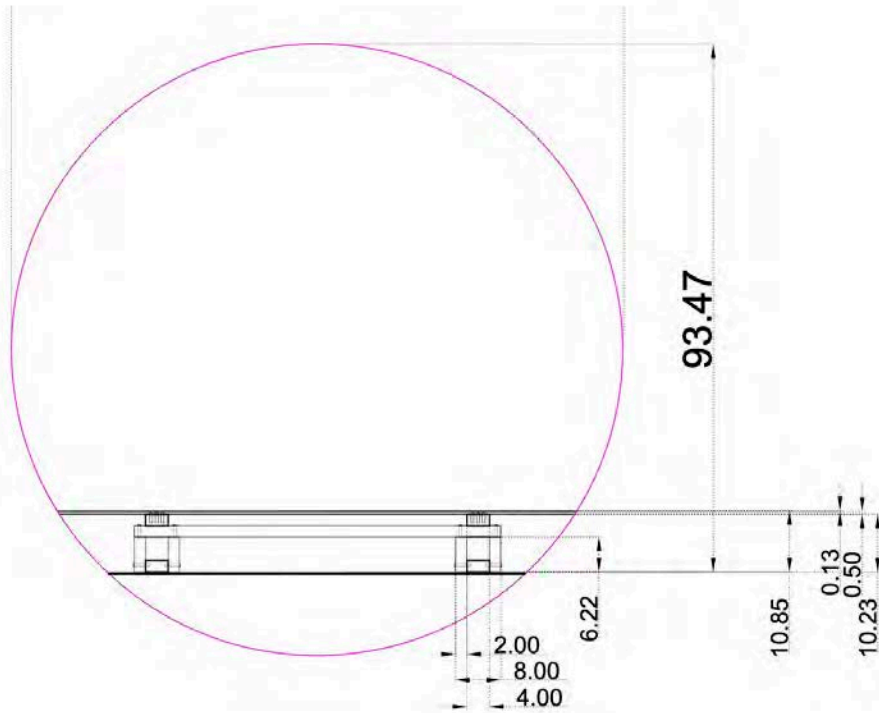


Technical Drawings I Under-floor Construction

ITERATION 1

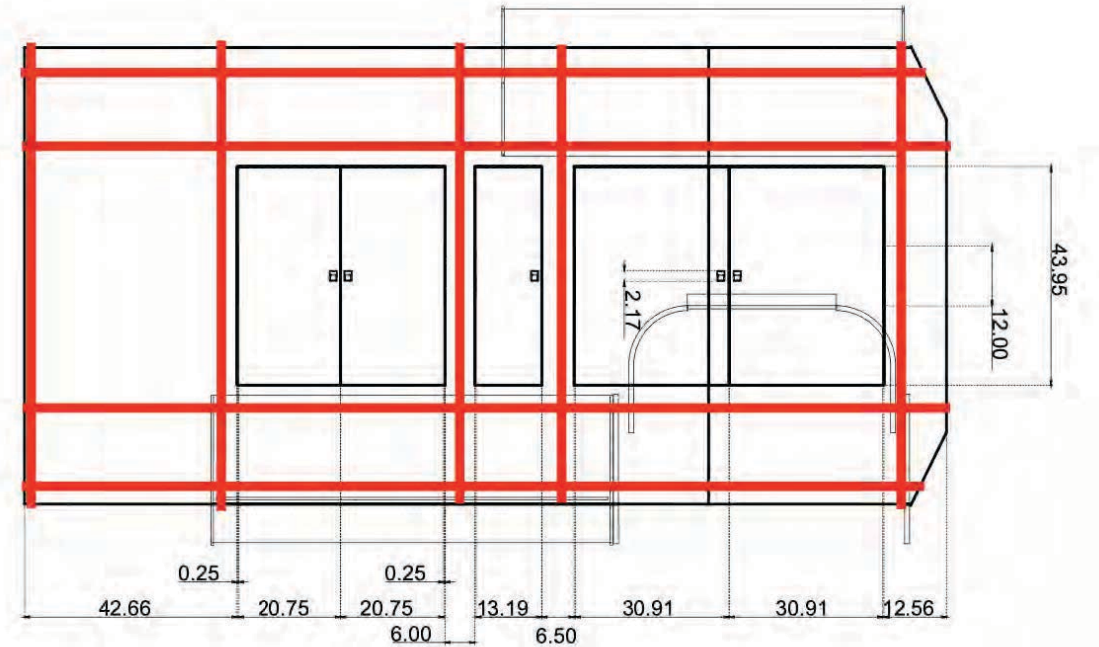
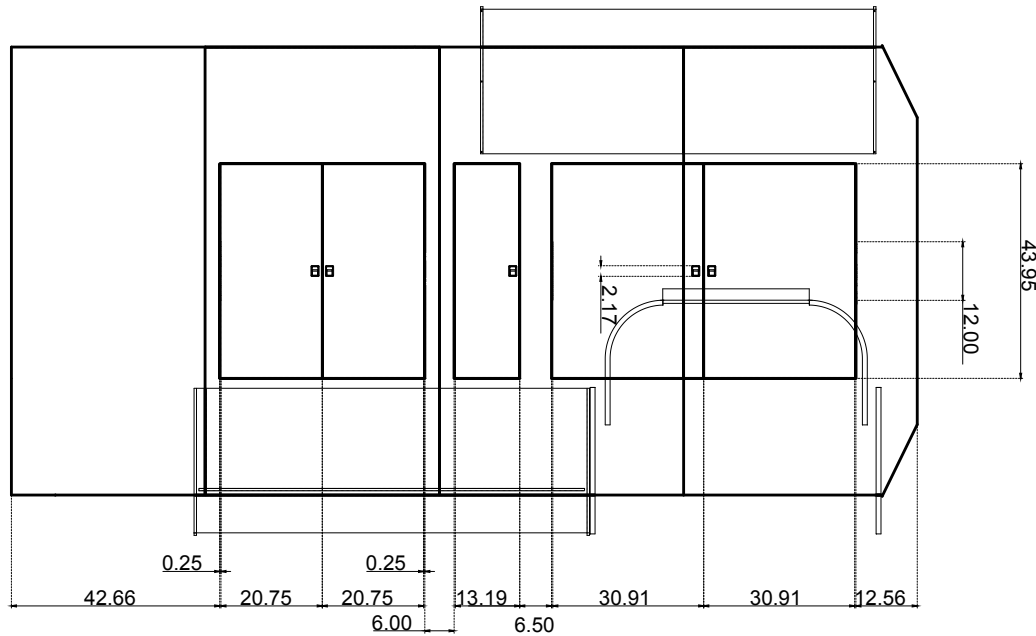


Technical Drawings I Under-floor Construction ITERATION 2



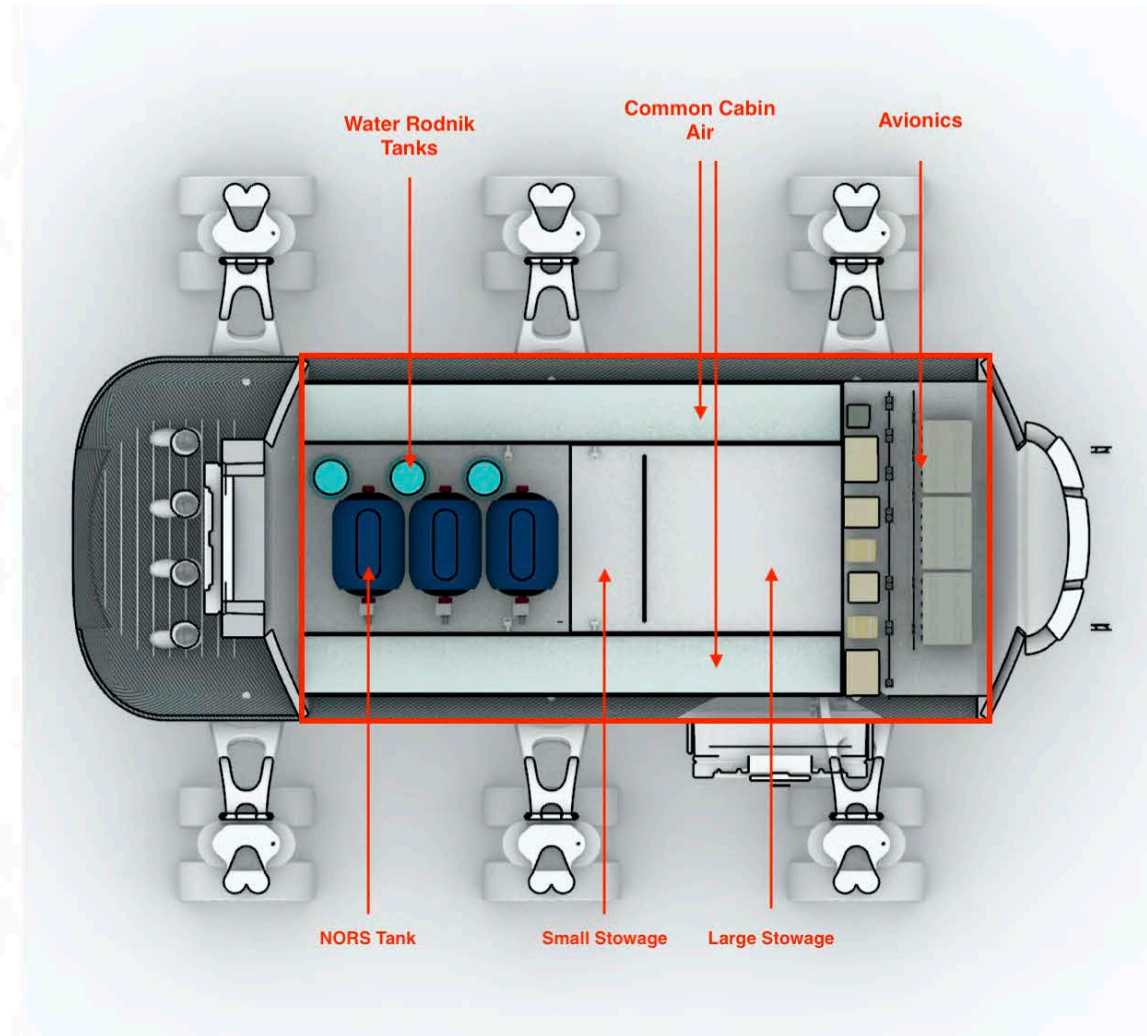
Adjusted according to the floor compartments

Technical Drawings | Floor Compartments (Storage & ECLSS)



Creation of Images | Representation of Systems in Mockup

(Nors Tanks, Rodnik Tanks, Stowage bags, Avionic Systems)



Contact Vendors



W+W

Ref. 893020..1



Wall-hung vitreous china WC and basin

Basin mixer included
Basin without overflow

Dimensions / Basin / Height (mm): 280
Dimensions / Basin / Length (mm): 340
Dimensions / Basin / Width (mm): 500
Dimensions / Toilet / Height (mm): 410
Dimensions / Toilet / Length (mm): 520
Dimensions / Toilet / Width (mm): 500

Finish / Mixer: Chrome
Installation type: Wall-hung
Material / Basin: Vitreous china
Mixer type: Single-lever
Progressive cartridge
Recommended for public spaces
Sustainable product
Toilet flushing system: Washdown
Toilet flushing type: Dual flush 6/3 litres

Colours and finishes

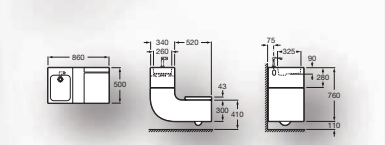
How to obtain the reference number
Replace the "-" with the desired finish code from the list below

00 White

Dimensions

Length: 660 mm.
Width: 500 mm.
Height: 760 mm.

Technical drawings



Innovation and technology join forces for the benefit of sustainable progress. This concept is synonymous with saving water and optimising space. Its innovative system filters the wash-basin water so it can be reused in the toilet. A unique, distinct and original design that brings elegance and sustainability to the bathroom. This product's innovative technology is totally sustainable.

Designed by
Gabriele & Oscar Buratti

In 1991, architects Gabriele & Oscar Buratti, together with engineer Ivano Battiston, created the agency BURATTI + BATTISTON ARCHITECTS, which designs offices, shops, apartments and villas, as well as everything connected with the architecture of stands and exhibitions, not to mention different types of objects.

Alpha Murphy Beds
Contact Distributor

There was a problem with your submission. Errors have been highlighted below.

Paola
gon_marquez7@live.com
7873687269

This field is required.

Hello to whom it may concern,

I am writing to ask how much would be the total cost including the shipping to Huntsville

StudyBed Weight Capacity

JR Judy Robinson <judy@studybed.co.uk>
Tue 11/25/2020 2:23 AM
To: You
Cc: enquiries@studybed.co.uk

StudyBed Brochure v1.pdf
960 KB

Hello Paola

Thank you for your enquiry.

There is no maximum weight limit for the bed. When the StudyBed is in bed mode the full weight of the bed and any occupants rests on the floor, so in that respect it's just like any standard bed.

On the desk, we recommend a maximum of 25kg (evenly spaced).

Please do not hesitate to get back to me if you have any further queries.

Kind regards
Judy Robinson
Sales Controller

The StudyBed Company
Tel: 01844 214484
www.studybed.co.uk

StudyBed - Desk and Bed combination - Deskbed

A StudyBed is a clever variation on a Wall Bed. It combines a full-size bed with a very large desk and converts quickly and easily in just a few seconds without the need to remove any items off the desk nor any of the bedding.

Research Material Suppliers/Selection of Materials

Everbilt

14 in. Self-Closing Bottom Mount Drawer Slide Set

SELF CLOSE

With the Self Close mechanism, as the drawer gets within approximately 1" of being fully closed, the design of the slide uses gravity to pull the drawer in to the final closed position. This helps



22 in. Full Extension Ball Bearing Drawer Slide

Steel construction for high durability. Full extension feature for easy access to the contents. Supports up to 100 lbs. weight per pair.

\$7.12



VELCRO Brand

7/8 in. Sticky Back Squares (12-Pack)

Buildable for hanging signs, posters, and small objects. Flat and sticky design for easy application. Ideal for smooth surfaces.

\$2.98



T&E Excess Cordage

#4 1/8 in. x 600 ft. Duck Cotton Shade Cord Spool

Save up to \$140 on your qualifying purchase. Apply to Excess Cordage Shade Cord Spool.

\$31.92

Sports & Outdoors > Outdoor Recreation > Camping & Hiking > Sleeping Bags & Camp Bedding > Sleeping Pads



ZOOBELIVES Extra Thickness Inflatable Sleeping Pad with Built-in Pump, Most Comfortable Camping Mattress for Backpacking, Car Traveling and Hiking, Compact and Lightweight - Airlive2000

by ZOOBELIVES

★★★★★ 604 ratings | 38 answered questions

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Color: NightShadow Gray

\$33.99

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\$33.99

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Legit Camping Mat

by Legit Camping

★★★★★ 199 ratings | 13 answered questions

Price: \$29.97 & FREE Shipping. Details & FREE Returns

Get \$20 off instantly: Pay \$9.97 upon approval for the Amazon.com Store Card.

Color: Grey

\$29.97

\$29.97

\$29.97

Add to Cart

Buy Now

Sold by Legit Camping LLC and Fulfilled by Amazon.

Add a Protection Plan:

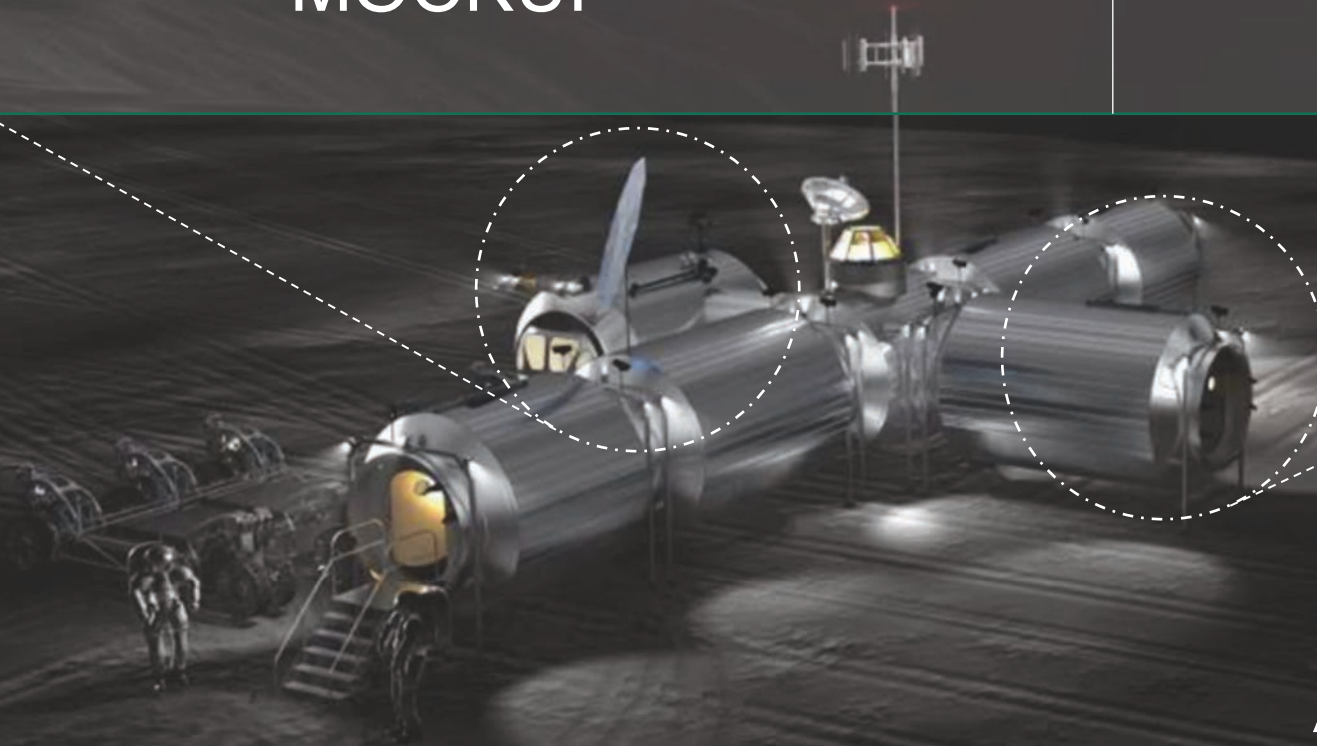
- 2 Year Sporting Goods Protection Plan for \$1.99

Add gift options

New & Used (2) from \$25.00 + FREE Shipping

CONSTRUCTION PREPARATION | MOBILELAB MOCKUP

HUMAN FACTORS ASSESSMENT | ECLSS MODULE



Paola Gonzalez Marquez, Space Architect
Advisor: David Smitherman, Sr. Space Architect
Tanya Andrews, Human Factors Engineer
Summer Internship 2020