

GFE Exercise

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September 2017

GFE Exercise

- Exercise
 - Maintain necessary fitness to perform critical mission tasks
 - Minimize physiological health and performance losses
 - Provide behavioral health countermeasure

	BAA Hab Prototype	Orion	Deep Space Gateway	Deep Space Transport
Device	<ul style="list-style-type: none"> Hybrid Ultimate Lifting Kit (HULK) 2 Hopper 	Flywheel	<ul style="list-style-type: none"> Advanced Twin Lifting and Aerobic System (ATLAS)* (Potential European Device)* 	TBD
Isolation	Universal Vibration Isolation System (VIS) mockup	N/A	Broad Range Active VIS Element (BRAVE)* VIS = Vibration Isolation System	TBD
Hardware Location	VR Sim Preferred, Hardware not available until test	Stays in Orion	Stays in Habitat	TBD
Exercise Time	1 hour block per crew member	1 hour block per crew member	TBD	TBD
* Hardware in development				

FACT SHEETS

For BAA Hab Prototype Testing

HULK 2, Hopper, VIS mockup

Hybrid Ultimate Lifting Kit (HULK) 2 Design Specifications

Stowed Size	
	<ul style="list-style-type: none">Width: 48 in.Depth: 27 in.Height: 7 in.
Working Space	
	<ul style="list-style-type: none">Maximum operational volume based on user performing an overhead press 92" (height) x 41" (radius)
Weight	
	<ul style="list-style-type: none">215 lb.
External Communication	
	<ul style="list-style-type: none">Standard Laptop
External Power requirements	
	<ul style="list-style-type: none">120 VAC plug or 28V DC50 Watts peak

The Hybrid Ultimate Lifting Kit 2 (HULK 2) is a concept hybrid pneumatic/servomotor-based exercise device for resistive and aerobic training, designed to accommodate long-duration missions. The operator will be generating energy during aerobic rowing activities. The energy generated during operation is both stored and used power fans that dissipate heat in the exercisers area. The HULK 2 system has two sources of electrical power. The HULK 2 system’s primary power source is a 28V, 9 Amp-Hour battery bank that is created from a series connection of two PowerSonic PS-1290F2 sealed lead acid batteries. The HULK 2 has a connection to 28V power to draw up to 10A (280W) to both recharge the battery bank and power the system during exercise. This power source would behave much like a laptop power adapter, which both powers the laptop and recharges its battery when plugged in. Note the HULK 2 system is completely operable on the battery bank alone. The HULK 2 does not need to be plugged into 28V power to operate, provided that there is charge remaining in the batteries. The HULK 2 system is controlled using specific software which is loaded onto the laptop. A universal vibration isolation system mockup will be provided for use in the habitat.

Note: HULK2 is only to be used as a ground device but it is the approximate footprint for what is being developed for Deep Space Gateway.



Grasshopper Exercise Device

Stowed Size

- Width: 47 in.
- Depth: 35.4 in.
- Height: 35.8 in.

Working Space (for 6'6" tall user with clearance added around for safety)

- Width: 47 in.
- Depth: 49.2 in.
- Height: 88.6 in.

Weight

- 175 lb. (estimated)

External Communication

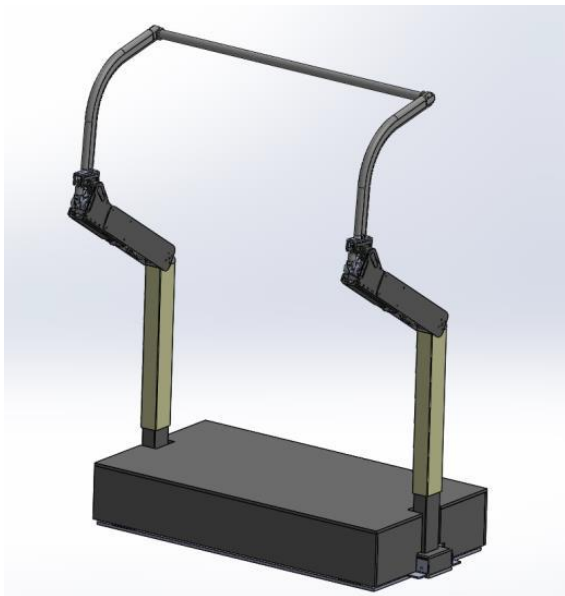
- Ethernet port (RJ45)

External Power requirements

- 120 VAC @ 20A
- 2500 watts peak

The Hopper is a prototype exercise device intended to allow for aerobic and anaerobic exercise routines. The device has two servo-actuators that work in conjunction with rigid arms. The arms transfer loads down to the Hopper base. Hopper has a single power cable and a single communication cable that provides power and data to and from the exercise device's base unit. A separate laptop is used as a control console for operating the exercise device. A separate 120VAC connection is required for the control console. A mockup of a universal vibration isolation system will be provided for use in the habitat.

Note: Grasshopper is being used for an engineering evaluation. It is currently not slated for flight.



Universal Vibration Isolation System (VIS)

Working Space (std. ISS rack size volume via SSP 50827)

	• Width: 40.74 in.
	• Depth: 31.28 in.
	• Height: 75.47 in.

Weight

	• Undetermined
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External Communication

	• N/A
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External Power requirements

	• N/A
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VIS for the BAA Hab testing will be a mockup. Data for loads imparted on the vehicle for existing International Space Station exercise devices and estimated data for the Orion flywheel is available if required at this time. Data for loads for deep space gateway will be gathered after hardware developed.
Note: VIS mockup dimensions – 52” x 31” x 7”

Questions to date

- Is there a leading contender for DSG exercise equipment?
 - Not yet. Devices are in development for down select to determine what will be tested on ISS.
- What is the current status of research?
 - N/A
- What should mass, power, volume placeholders be?
 - Refer to Fact Sheets for HULK, HOPPER, and VIS.
- Is there a plan for isolation or is that up to us? Any inputs?
 - NASA will provide isolation. Need from habitat provider what we need to protect on your habitat.
- What is the sparing plan (mass/volume)?
 - Unknown
 - What stays and what comes up every mission?
 - Devices stay onboard habitat
- If the device fails on day 1 of the mission is it LOM?
 - Not necessarily. Depends on failure and mission.
- What is the plan for utilization of ROCKY Orion during DSG missions?
 - ROCKY is not being developed.
- Is there ever a case where exercise would not be required for the trip to and from the DSG?
 - No
- Is there a prototype unit available that you would want to install into the HGTA at KSC?
 - No, at this time plan to use VR Simulation. Plans still in work with BAA Hab leadership.