

Project Registration Form

1. Project Title

This is the name of your project. Preferably a catchy acronym.

[Hackerspace Earthship \(HAESH\)](#)

2. Project Description

This is where you describe your project. It should include a summary of everything below.

This project is aimed at building a closed cycle habitat for human habitation. Although they have been studied extensively in the past, closed cycle habitats have seen a decline in popularity amongst the space research community. Using modern advances in technology we hope to construct a closed cycle habitat for one person. Modern LEDs, microcontrollers, sensors, and other technologies will be used to upgrade legacy hardware and miniaturize it as much as possible. Whereas previous habitats such as Biosphere 1 and 2 sought to replicate and artificial nature on a landscape scale, the HAESH project seeks to use technology to biomimic nature's processes in a confined space similar to the sizes found in current and planned space habitats. Each hardware module will also be useful on earth as a sustainable home technology.

3. Relevance to Space Exploration

Here you justify your project's relevance to space exploration. This does not have to be explicitly some type of space hardware, it only needs to be moving in the direction of space exploration. Examples include but are not limited to educational tools, habitats, urban food production, sustainability technology, small scale industrial processing, water purification, wastewater treatment, algae farming, environmental monitoring tools, advanced manufacturing, etc. If you do it on earth you need to do it in space on a smaller scale and open source.

In space there is no oceans or forests to absorb your CO₂, no aquifers to pump water from, no soil to grow your crops, and no dump to throw your waste. Earth is its own massive space ship and to travel beyond it we must extract its secrets and replicate it on a much smaller scale. This project seeks to directly develop space hardware for use in extraterrestrial habitats, i.e. urban food production, sustainability technology, small scale industrial processing, water purification, waste treatment, algae farming, environmental monitoring tools, advanced manufacturing, etc. These are areas of space hardware development that are in the grasp of a hackerspace, makerspace, or community workshop. Together we hope to stitch these separate technologies into a viable one man closed cycle habitat.

4. Scope

This is where you describe what you plan on doing; the work that needs to be accomplished to deliver a product, service, or result with the specified features and functions. Explain how your

project fits into the realm of human endeavors and comparisons to similar projects. Also tell us what sets your project apart from other projects.

The scope of this project is to create prototype modules that could be used together to create a closed cycle habitat. Each module will be open source and publicly documented via a series of instructables. Each module will be interconnected with a centralized system that can monitor and control the subsystems. The following is a list of subsystems planned but may expand or contract as budget allows.

Urban Food Production

- Alternative protein farm (crickets, worms, black fly larvae)
- Aeroponics food production
- Integration with the algae bioreactor (algae for consumption)
- Integration with the biogas reactor (effluent, iron sulfide, and co2)

Water Management

- Biogas production and separation for methane, effluent, hydrogen sulfide and co2
- Biological and mechanical waste water processing and filtration
- Drinking Water Treatment

Environmental Systems

- Atmospheric gas monitoring suite (O2, CO2, CH4, ethers, CO, temp, humidity, etc.)
- Algae Bioreactor for O2/CO2 transformation, effluent cleaning, and food production
- Air conditioning for for water production and temperature control.

Control System

- Each module will have sensors which return data to a centralized station
- Data displayed graphically via lab view
- Will use open source hardware when possible such as arduino/raspberry pi.
- Shells for each systems will be sealed mylar tents.

5. Methods and Implementation Plan

This is the portion of the proposal where you'll clarify objectives, assign tasks with deadlines, and chart your progress in reaching goals and milestones.

a. Objectives

The overall objective of this project is to create a modular system of integrated technologies that create a closed cycle environment for a human.

1. Develop resource flow chart
2. Design prototype modules
3. Construct prototype modules
4. Test prototype modules
5. Design control system

- 6. Integrate control system with modules
- 7. Install module network into closed habitat.
- 8. Test for as long as possible with live human...

b. Tasks and Timeline

Tasks	Month	1	2	3	4
Develop resource flow chart		X			
Design prototype modules		X			
Construct prototype modules		X	X		
Test prototype modules			X	X	
Design control system		X			
Integrate control system with modules			X	X	X
Install module network into closed habitat					X
Documentation and Instructable		X	X	X	X

7. Budget

\$ 20,000

<https://docs.google.com/spreadsheets/ccc?key=0Apf5Wv5bg-bTdHdIOGJxNVBkSUI0VmcwQ0ExcHhkaIE&usp=sharing>

8. Project Deliverables

Deliverable is a term used to describe a tangible or intangible object produced as a result of the project that is intended to be delivered to SpaceGAMBIT and the public. A deliverable could be a report, a document, a video, an instructable, hardware, software or any other building block of an overall project. A deliverable may be composed of multiple smaller deliverables. Deliverables section should also include a timeline.

- 9+ opensource space projects that are replicable by other enthusiasts and educators shared via instructables.
- Network of modules that constitute a prototype closed cycle habitat for space environmental research.

9. Resource Flow Chart

