Single Person Spacecraft

Key Design Features

SLS Dashboard
Streamlined, Adaptable, & Sleek Design
Simple & Elegant Carbon Fiber Wrap

Arm Cameras
Maximized User Visibility & Control
Multi-Purpose & Multi-Operator Functions

Foot Restraint
Simple & Unencumbered Design
Foldable, Expandable, & Secure

Internal Stowage
Modular & Customizable Light-Weight Fabric
Spaces for Tools, Food, Water, & Supplies

Fire Suppression
CO2 Extinguisher & Personal O2 Supply
Easy Access & Use for Rapid Deployment

Tested Elements
Military, Aerospace, & Nautical Parts
Rugged & Temperature Resistant
Single Person Spacecraft

Detailed Isometric

- Overhead Interior Lights
- Overhead Interior Camera
- Comms Switches
- Overhead LED Strip Lights
- Overhead Speakers
- Emergency Switches (L)
  - Comms / Systems Reboot
  - All Manipulator Disconnect
  - Propulsion System Shutdown
- Flexible Utility Light (L)
- Sun Shield Visor Controls
- Main Circuit Breaker Panel
- Adjustable Air Vents
- Air Ducts
- Structural Grab Bar
- Restraint Belt Connections
- USB Connections
- CO2 Fire Extinguisher
- Air Handler Filter Stack
- Carbon Fiber Dashboard
- Personal O2 Tank
- Aluminum Structure
- EggBeater Clips
- Foot Restraint Boom ‘A’
- Overhead Lighting Switches
- Overhead Air Vents
- Multi-Function Camera Feed
- Joystick Settings Switches (L)
- Left Joystick
- Emergency Systems Display
- Task-Related Info Display
- Flight & Propulsion Display
- Operator Camera & Mic
- ECLSS Systems Display
- Manipulator Switches
- Right Joystick
- Multi-Function Camera Feed
- Joystick Settings Switches (R)
- Temperature Control
- Emergency Switches (R)
  - Atmosphere Purging & Recirculation
- Protective Plastic Cover
- Flexible Utility Light (R)
- Systems Control Switchboard
- Fabric Stowage Containers
- Foot Restraint Structural Rail
- Foot Restraint Boom ‘B’
Orthographics

The human figure shown represents the 95th percentile male body dimensions.
Single Person Spacecraft
Dimensions & Restraint Function

Aluminum Foot Restraint
Lightweight & Adjustable
Simple & Secure
Rapid Deployment
USABILITY

Fundamentally, the design concentration has been adaptability, not only to dynamic environments and task requirements, but also to advances in technology and operator skills sets. For example, the panels have been designed to accommodate both the rugged, radiation hardened displays utilized by current spacecraft and the flexible, full-touchscreen displays of future spacecraft. The panel is sleek, simple, and scalable, allowing ample potential for customization to accommodate the technological advances.

Since the SPS features a cold gas thruster system that mimics that of the MMU, the control system also emulates that of the MMU, featuring joysticks for translational and rotational control as well as attitude and altitude hold buttons for optimal positioning control. Therefore, operator training can be easily adapted from the current programs.

The manipulators can be controlled either with the same joysticks used for propulsion control or through a gamepad-style controller. Each manipulator features a camera and lights to maximize the user’s control and visibility.

SIMPLICITY

The design features many systems and parts included in the SPS demo mission. Additional parts and systems have been sourced from providers of marine, military, and nuclear equipment, thereby minimizing the upgrades required to adapt the products to space application. Two exceptions exist. The restraint system utilizes foot restraints derived from an all-terrain bike pedal designed by the bike equipment provider Crank Brothers. The pedal employs a clever system in which the user, wearing corresponding footwear, can quickly snap into the pedal and just as quickly (by simply angling the foot) disconnect from the system. Both the pedal and the adjustment system are lightweight aluminum. Secondly, the design proposes a modified gamepad controller. Although the controller requires alteration and testing to achieve a space-rated status, the potential of the part for both present and future applications is immense. As newer generations of astronauts take over, the likelihood that they have both familiarity and skill with gamepads becomes increasingly high. Additionally, gamepads are both fully and easily programmable and offer excellent precision and control. Furthermore, many robotic systems have been and continue to be developed with gamepad-controlled operation, which contributes to the craft’s adaptability and interfacing capability.

MAINTAINABILITY

To increase maintainability, the craft interior features paneling that maximizes accessibility throughout the cabin. Also, there is optimal stowage space for tools, replacement parts, and multimedia devices. This capacity can reduce mission abort scenarios and alleviate data management issues. In addition, the craft possesses ample space for USB interfacing to accommodate software and firmware updates and simplify data transfer for collecting and storing usage data.
Since the craft is designed for operation in an extremely hostile, perilous environment, operator comfort is of paramount importance. In order to maximize operator comfort, all displays and controls have been positioned in reference to a common viewpoint, and the restraint system ensures this common viewpoint is accessible to the full range of astronauts from the 5th percentile female to the 95th percentile male body type. Additionally, all critical systems information has been positioned within the NASA-STD optimal viewing peripheral (30°), and all displays have been angled to accommodate the altered viewing angle of an operator in the neutral body posture.

**DAY/NIGHT OPERATIONS**

The frequent change in visibility has been combatted by the use of sunlight readable, backlit displays as well as illuminated buttons and switches. Additionally, adjustable overhead lights and mid-level utility lights provide additional illumination throughout the cabin. Furthermore, each manipulator possesses a camera and lighting system that provides increased visibility at the work site.

**AIR HANDLING**

The air handling system employs six single and two double vents that circulate air throughout the cabin. The air supply is routed to each vent through a simple network of ducts, each of which can be restricted by closing a simple valve. This will contribute both to the maintainability of the craft and to the the preference of each user. Additionally, the front double vents have been angled to direct air flow toward the mid-upper chest of the user to prevent the formation of a CO2 bubble near the face without directing air into the eyes.

**ZERO-G RESTRAINT**

After observing astronaut activity in microgravity, primarily that of Sunita Williams in her ISS tour video, it is apparent that only minimal restraint will be required aboard the SPS. The restraint system we've designed immobilizes the user's feet and waist, leaving the upper body, which will be heavily involved in the craft's operating, unencumbered and free to rotate. The system utilizes lightweight, adjustable materials designed for use in all-weather, all-terrain environments in order to minimize both the weight requirement and the upgrades necessary to adapt it to space application.

**ANTHROPOMETRY**

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Single Person Spacecraft

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Interior Design Competition
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*Featured Parts*

*Single Person Spacecraft*
# Single Person Spacecraft

## Full Parts List

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