NASA × HCI!
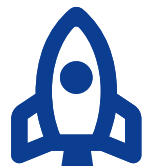
Space Race Manual

Introduction

Congrats, astronauts! Your crew has been selected as finalists for the first mission to Mars! NASA has prepared this final task to surface the most prepared crew. Your team will be in charge of a small spacecraft in which you will have to manage resources essential to your mission success and survival. Can you successfully manage the critical systems and take the spacecraft further than any previous crew?

How to Play

Objective
You will have **5 minutes** to take the spacecraft as far as possible (distance in km) before permanently losing any critical subsystems. There are 8 alarms, detailed below, that will turn on when a subsystem is in danger. Use the instructions throughout this manual to stabilize those subsystems before they fail.

Systems
There are two main system categories: **Power** and **Cabin**.

The Power system is responsible for controlling movement and maintaining power levels.
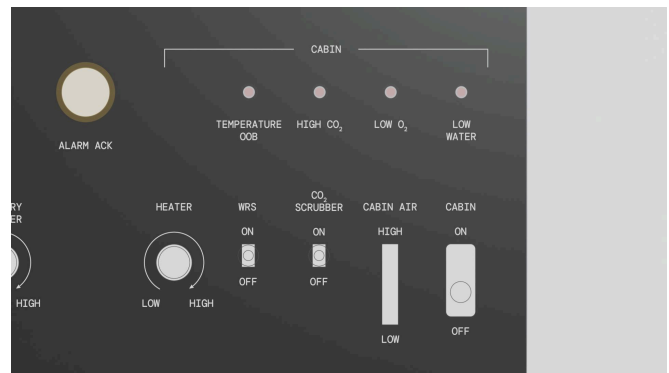
The Cabin system is responsible for maintaining crew survivability.

Each system can be powered on or off with their respective toggle switch that illuminates when turned on. **When the system is turned on, only then can the subsystems can be turned on.**

How to Play

Roles (if desired)

1. **Pilot (1 player)**
   The pilot is responsible for directly manipulating the critical systems. They may turn the switches on or off, turn the knobs, or manage any other physical controls. The pilot cannot view real-time flight data, but they are able to view the manual.
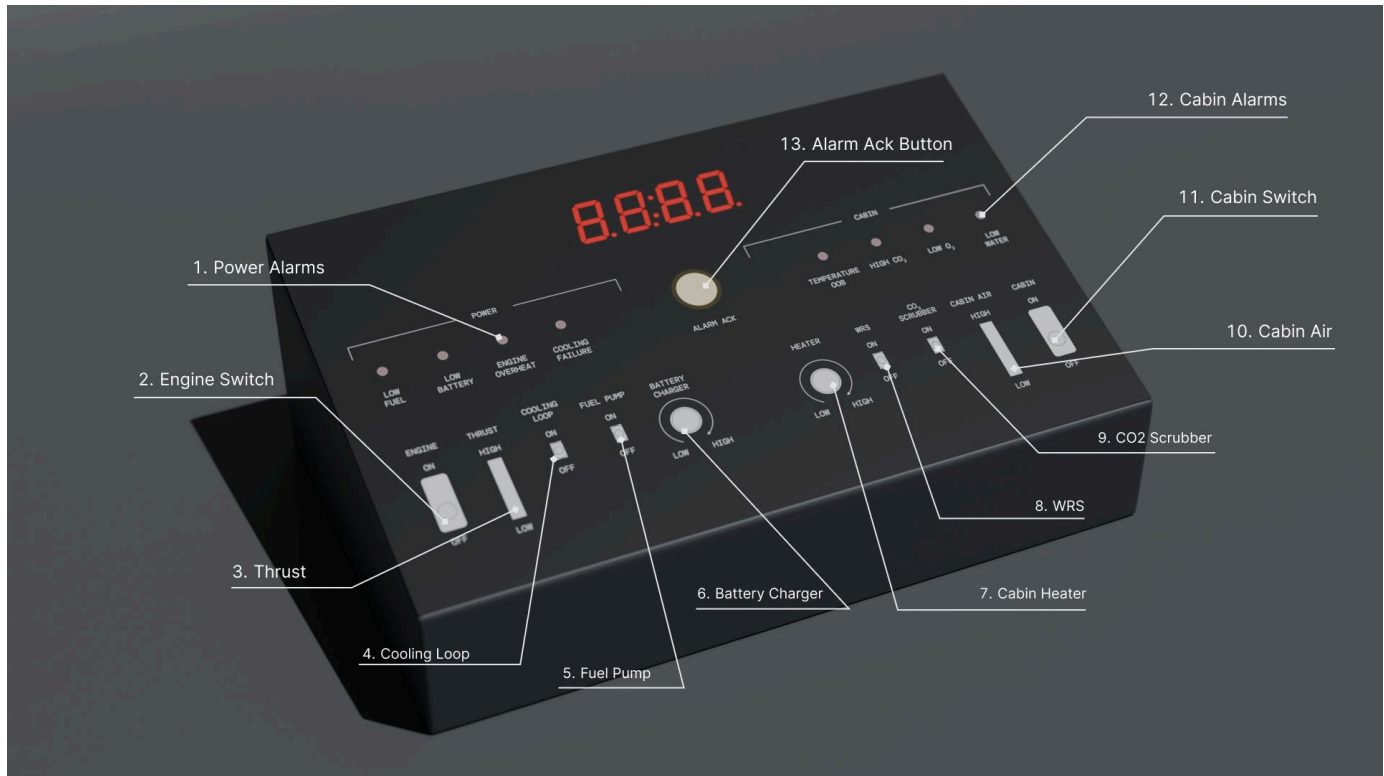
2. **Analyst (1 player)**
   The analyst is responsible for overseeing and communicating real-time flight data. They may intake the data, identify any incongruities, and communicate them to the other players. The analyst cannot manipulate any physical controls or view the manual.

3. **Engineer (1-2 players)**
   The engineer is responsible for assessing and communicating the relationships of the system outlined in the manual.

Relationships

1. Power Alarms
2. Engine Switch
3. Thrust
4. Cooling Loop
5. Fuel Pump
6. Battery Charger
7. Cabin Heater
8. WRS
9. CO2 Scrubber
10. Cabin Air
11. Cabin Switch
12. Cabin Alarms
13. Alarm Ack Button

1. Power Alarms
Indicate when power subsystems are at dangerous levels.

2. Engine Switch
Allows activation of power subsystems

3. Thrust
Increases distance
Increases engine temperature
Decreases fuel

4. Cooling Loop
Decreases engine temperature
Decreases battery

5. Fuel Pump
Increases fuel
Decreases battery

6. Battery Charger
Increases battery
Decreases fuel

7. Cabin Heater
Increases cabin temperature
Decreases engine temperature

8. Water Recovery System (WRS)
Increases water
Decreases battery

9. CO₂ Scrubber
Decreases CO_2
Decreases battery

10. Cabin Air
Increases oxygen
Decreases cabin temperature
Decreases battery

11. Cabin Switch
Allows activation of cabin subsystems

12. Cabin Alarms
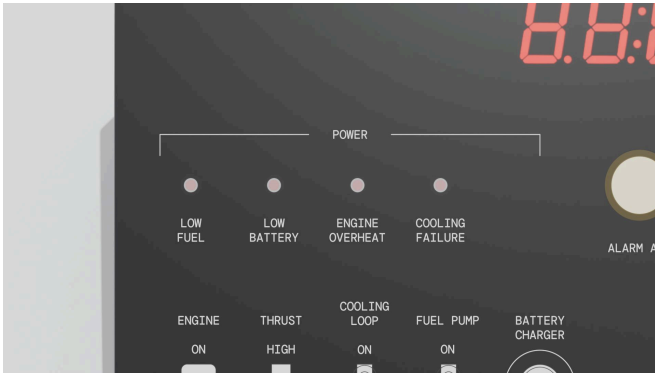Indicate when cabin subsystems are at dangerous levels

13. Alarm Ack Button
Hold to silence the active alarms

Alarms

Alarms will trigger when ranges are within the below thresholds. **If an alarm LED flashes 3 times, that subsystem has failed.**

Power System

Low Fuel
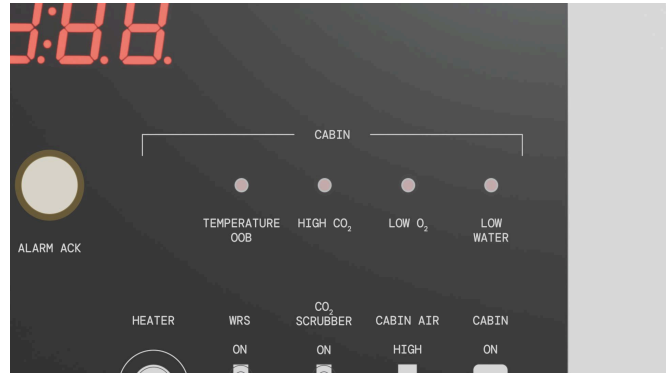Fuel ≤ 20%

Low Battery
Battery ≤ 20%

Engine Overheat
Engine Temperature ≥ 40°C

Cooling Failure
Cooling loop has failed
Disable cooling loop to prevent excess CO_2 in cabin

Cabin System

Temperature Out of Bounds (OOB)
Cabin temperature ≥ 40°C
Cabin temperature ≤ 0°C

High CO_2
CO_2 ≥ 80%

Low Oxygen
O_2 ≤ 20%

Low Water
Water ≤ 20%

Meteors

A meteor is indicated by 3 high pitch beeps from the speaker.

If the spaceship does not have enough thrust for an extended period of time, it is more susceptible to being hit by a meteor. If hit by a meteor, players will have to diagnosis the damage outlined below.

If struck by a meteor, one of three events will occur:

1. **Engine Overheat sensor fail**
   Indicates the engine is overheated when it may not be

2. **Cooling Loop failure**
   Breaks the cooling loop and may cause leakage of toxic fumes. Diagnosis per the Cooling Loop failure protocol highlighted on the 'Alarms' page

3. **Water leak**
   Illuminates the Low Water alarm and water will gradually deplete