SPACE TEAMS

KNOWLEDGE BASE

Contents

Getting Started

Information Package

- Information Package: For detailed information regarding daily activities and the overall program, refer to: *The Space Teams Information Package*

Countdown to Launch Checklist

- Countdown Checklist: For a step-by-step process of everything you need to do before Day 1, refer to: The Countdown to Launch Checklist

Detailed Schedule

- Detailed Schedule: For a more detailed account of the day-to-day schedule of the program, refer to: *The Space Teams Detailed Program Schedule*

SpaceCRAFT Dashboard

How to Use SpaceCRAFT Dashboard

What is Space Teams Dashboard? The Dashboard is where you can download the SpaceCRAFT software, chat with other participants, form teams, compare your team's score to other teams, invite mentors and submit tickets to Space Teams Support.

1. Navigate to the dashboard website: https://dashboard.spacecraft-vr.com/
2. Login to your SpaceCRAFT account
3. Verify you are signed into the Dashboard Website by looking for your username on the top right corner.

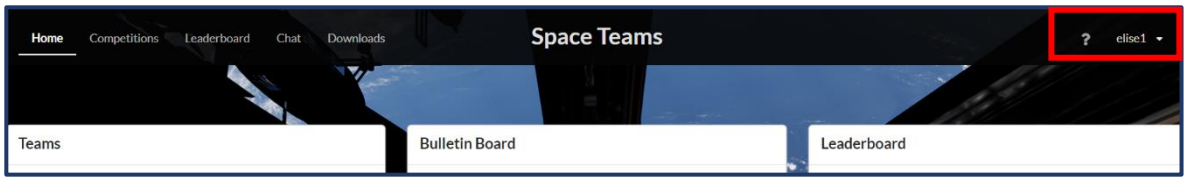

Figure: Where to find your username if logged in to Dashboard site

Home Screen Overview

On the Home Screen, there are 5 different areas of focus: Teams, Bulletin Board, Leaderboard, Tabs, and Your Account.

- Teams: The Teams area gives you access to joining/leaving a team or viewing your teammates.

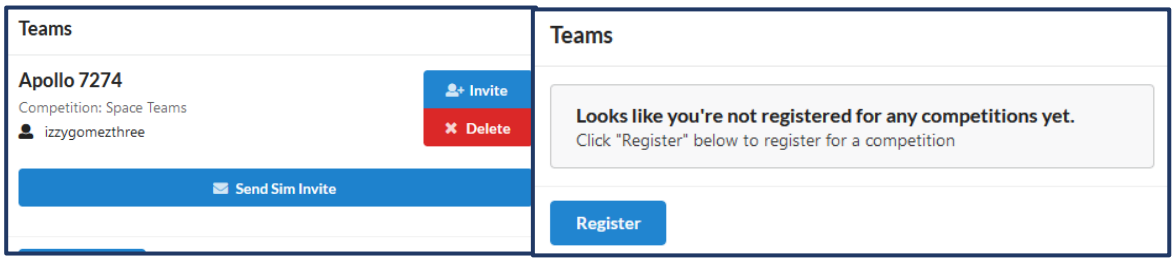

Figure: Teams section of the SpaceCRAFT Dashboard for “on a team” and “not on a team” states

- Bulletin Board: The Bulletin Board area shows important announcements.

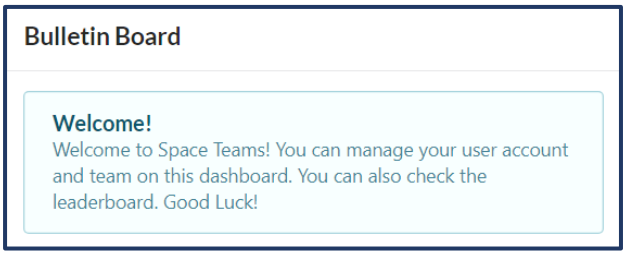

Figure: Bulletin Board section of the SpaceCRAFT Dashboard

- Leaderboard: The Leaderboard area shows you the number of points each team has, including your own team; each team's points are ranked compared to others in your competition. Note: The scores are not final and can continue to change until the end of the competition!

Figure: Leaderboard section of the SpaceCRAFT Dashboard

- Your Account: The “Your Account” section takes you to an area where you can change your username, email, and password.

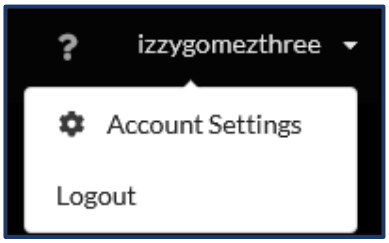

Figure: Tabs section of the SpaceCRAFT Dashboard

- Tabs: The “Tabs” area takes you to different sections of the website where you can do multiple things such as downloading the Spacecraft application and chatting with others.

Figure: Tabs section of the SpaceCRAFT Dashboard

- What Each Tab Does:
  - The “Home” tab takes you to the Home Screen on the Dashboard website
  - The “Competitions” tab takes you to a section that shows what competition(s) you are registered for.
  - The “Leaderboard” tab takes you to a section that shows the number of points each team has, including your own team; each team's points are ranked compared to others in your competition.
  - The “Chat” tab gives you a platform to chat with others from your team
  - The “Downloads” takes you to the download link for downloading the Spacecraft Application.

SpaceCRAFT Dashboard Account Creation

- SpaceCRAFT Account: To create your SpaceCRAFT Dashboard Account, please follow: *The SpaceCRAFT Account Creation Guide*

SpaceCRAFT Dashboard Account Settings

1. Navigate to the dashboard website: https://dashboard.spacecraft-vr.com/
2. Login to your SpaceCRAFT account
3. To access your Account Settings, click your user name in the top right corner, and then click on “Account Settings”

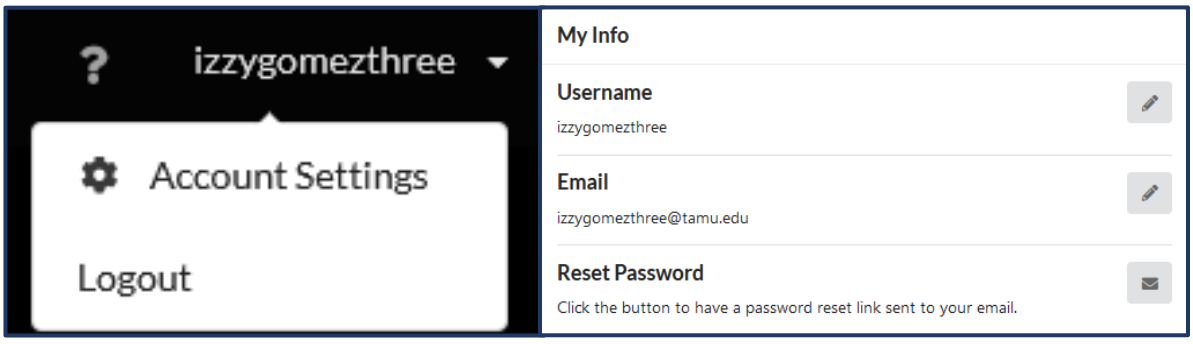

Figure: SpaceCRAFT Dashboard Account Settings

4. Here, you can change your username, change your email, and reset your password

SpaceCRAFT Application Setup and Installation

- SpaceCRAFT Application: To install and setup SpaceCRAFT, please follow: *The SpaceCRAFT Setup and Installation Guide*
- Note: The software will be available for download on the dashboard website within 24 hours prior to the beginning of the competition

SpaceCRAFT Team Creation

- Team Creation: To create or join a team, please follow: *The SpaceCRAFT Team Creation Guide*

Contacting Space Teams Support

- Space Teams Support: To submit a "help" ticket to Space Teams Support, please follow: *The Contacting Support Guide*

SpaceCRAFT Application

Starting the SpaceCRAFT Application

1. Double click or "Run" the SpaceCRAFT Application

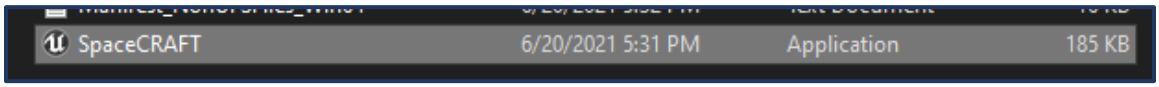

Figure: SpaceCRAFT Application in File Explorer

2. Once the application is started, you should be able to log in using the same username and password that you set up from the Dashboard.
   - Logging in also means choosing a team to join. Mentors may have more than one team to choose from.
3. Main Menu-All activities are accessed from the main menu.
   - Graphics resolution and other settings may be adjusted in Settings
   - Voice communication with your team is on immediately when joining the main menu. Start speaking to see if anyone else from your team is there!
4. A chat icon will bring up the text chat window for communication with your team. You can leave messages here and your teammates will see them.

SpaceCRAFT Activities

Planet Builder

- Activity Description: This activity allows you to create a planet by modifying a variety of parameters and seeing how they affect the planet's appearance in real time. You can then embark on the planet's surface and explore by controlling a flying drone.

- Planet Designer: The planet you are creating is displayed on the right side of the screen. The controls for manipulating the planet's properties are on the left, with each tab on the far-right side of the screen accessing a different panel. The top bar includes the ability to name your planet, save/load planets, load preset planet configurations, and other options. The location you will embark is indicated by a green circle on the planet's surface; if this is not visible it is possible that your embark location is currently on the other side of the planet.

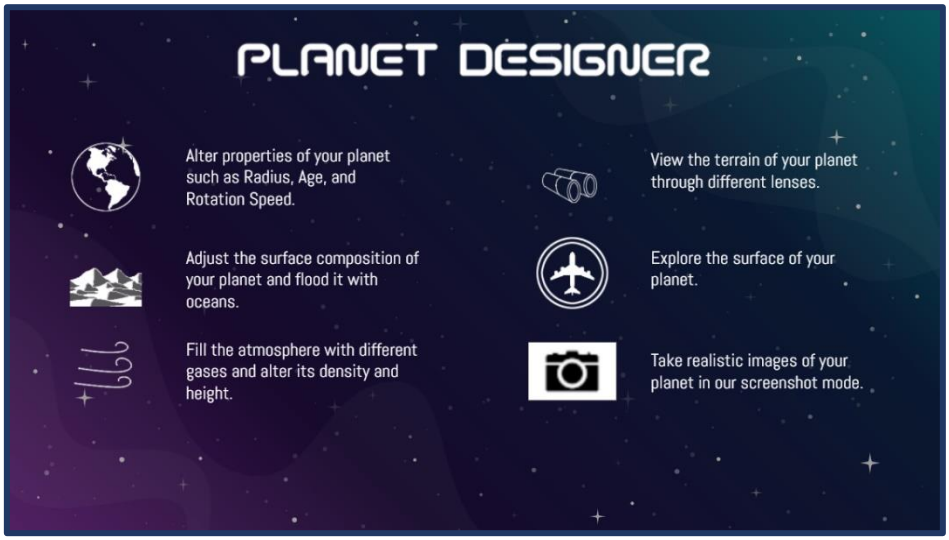

Figure: Planet Builder – Planet Designer User Interface

- Planet Embark: Upon spawning in you will possess a flying drone. Move by using the WASD keys. Right click to gain control of the camera and change the direction your drone is looking. Scroll up on the mouse wheel to increase maximum speed and scroll down to reduce it. Your current maximum speed is listed on the bottom left of the screen. Ascend by pressing the spacebar. Descend by pressing the Ctrl key.

- How to Strive for Highest Score: This activity is not scored.

- Hints: Try some random planets to quickly see a range of planet types. The properties of your planet are based on the physics that relates your choice of parameters. Temperatures impact whether an ocean of a certain material would be liquid or frozen, for example, colors correspond to the composition of the surface and the atmosphere. Consider studying a known actual exoplanet and entering parameters that match the conditions of that planet.

Spacecraft Builder

- Activity Description: In this activity, you design and build a vessel that will carry four crew members to another planet in the solar system and keep them alive over the year-long journey.

- User Interface & Controls:
  - The "Build" panel gives you access to a wide assortment of parts.
  - The "Edit" panel allows you to see what resources each part contains and at what rates they are produced or how much of them each part can store; if you're confused about how to improve your oxygen, water, or food scores, right-click a part and bring up this menu to see if that part contributes any oxygen, water, or food to your spacecraft
  - The "Stats" panel shows you which parts are required and gives you a lot of useful information about your spacecraft
  - The "Scoring" panel gives you real-time updates on your score, and is where you actually submit the score
  - The "Simulate" panel allows you to perform a sustainability analysis to determine if your crew can survive for a year on board your spacecraft

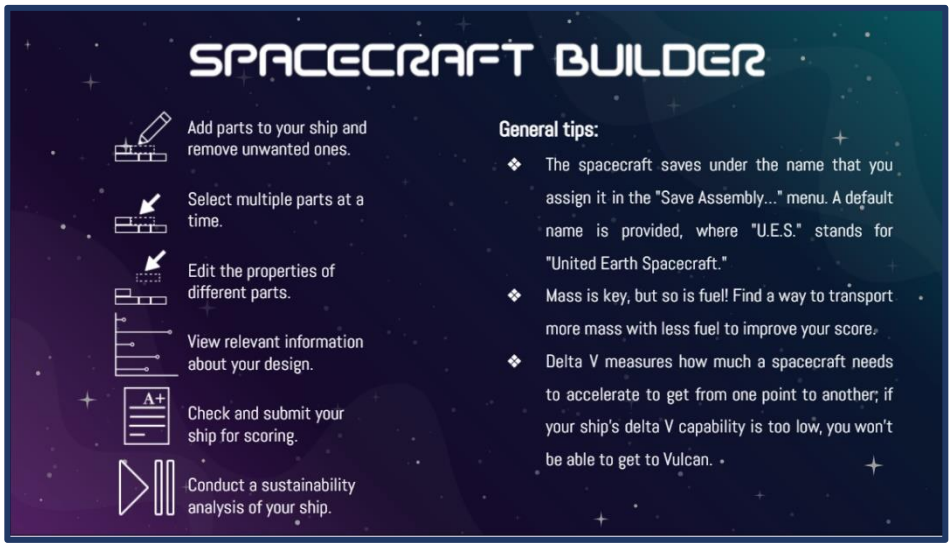

Figure: Spacecraft Builder – Spacecraft Builder User Interface

- How to Strive for Highest Score: Minimize total spacecraft mass and maximize ratio of cargo mass to total mass. Try each kind of engine to determine which ones give you the best delta V scores. Explore the "Edit" panel of different parts to find out what resources they contribute to your overall spacecraft. Add science equipment to your spacecraft!

- Hints:
  - Some parts require an adaptor part to install them.
  - You'll want to come back to this activity once you've designed your habitat for Vulcan, because you'll need to carry enough mass to fit all those parts within the cargo landers. When you first do this activity, you do not know how much mass to carry to Vulcan. Bring at least one cargo lander.
  - Your ship needs to have enough fuel to achieve the delta-V for your mission (delta-V is the sum of speed changes needed for your mission). The more mass you have, the harder it is to reach that delta-V.

- Run sustainability tests to see which resource (water, oxygen, food, fuel, etc) you will run out of first. Then, go redesign your ship to fix this and test it again. You want all your resources to last long enough for the entire mission.
- You can fly your ship out of space dock if you restart the activity using the option “Fly Your Spacecraft.” Be sure to select Pilot as your role.

Trajectory Designer

- Activity Description: In this activity, you design and build a vessel that will carry four crew members to another planet in the solar system and keep them alive over the year-long journey.

- User Interface & Controls:

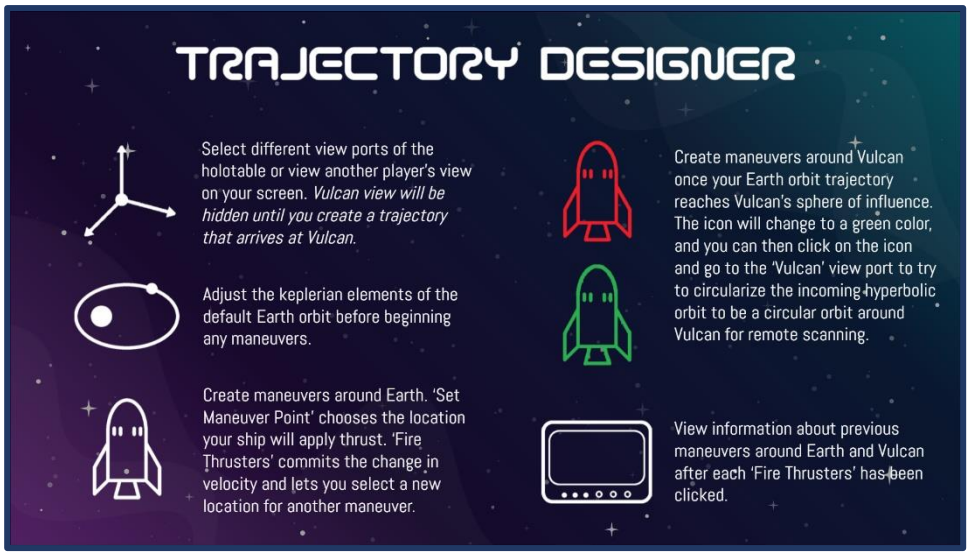

Figure: Spacecraft Builder – Spacecraft Builder User Interface

- How to Strive for Highest Score: Minimize the amount of delta-V used to make burns - experiment with different directions and angles because some are more efficient than others. Use multiple burns - you can make a trajectory more efficient by using different burns at different places. For the scanning orbit - you need to be far enough away that your orbit gets a larger scan view, but not too far so that the scanner has a good enough signal to collect data from the planet’s surface.

- Hints:
  - Use different views to help you see what happens as you change the orbits. It’s easier to see your maneuver burns in the Earth view, but once you have an orbit that leaves Earth and moves through the solar system, it is easier to see this using the Solar System View.

- You cannot access the Vulcan view until your trajectory gets close enough to Vulcan for an arrival maneuver. As you adjust your trajectory, watch for the indication that Vulcan was reached.
- A good sensor scan of Vulcan needs to be an orbit that is inclined (tilted) compared to the direction that Vulcan spins. This causes the ground track to cover more territory and reveals the best location on the planet for a landing. But tilting the orbit costs fuel, so be careful of when you do a maneuver to tilt the orbit. Hint - it costs more fuel if you burn while closer to the planet.
- A landing site that is close to all of the resource types will give you a higher score.

Orbital Descent

- Activity Description: In this activity your goal is to land on the surface of Vulcan. You will start in orbit and you will need to fire your thrusters opposite your initial direction of motion in order to maneuver towards the final landing target.

- User Interface & Controls: The thrust is located on the right-hand side of the screen. The instruments are located on the left-hand side of the screen. The panel in the top right corner of the screen controls your pitch and rotation. In the bottom right-hand corner is the fuel gauge.

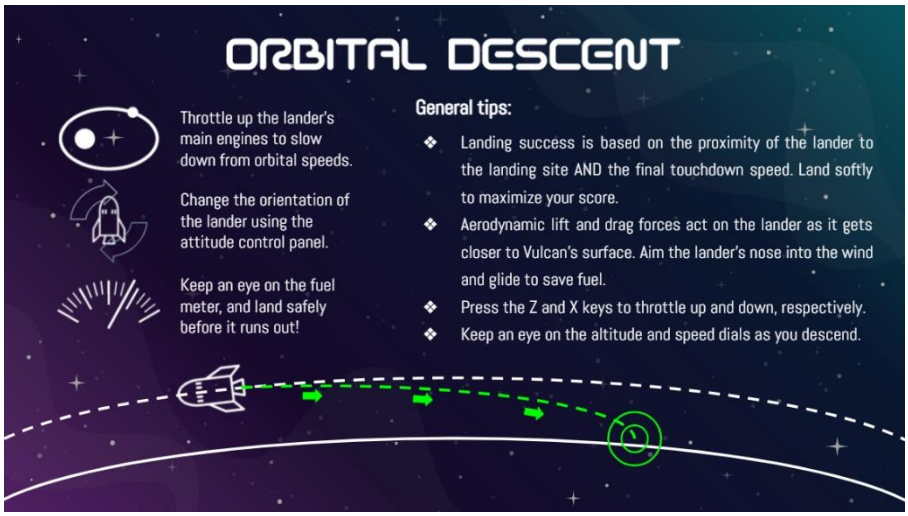

Figure: Orbital Descent – Orbital Descent User Interface

- How to Strive for Highest Score: Fire your thrusters opposite your initial direction of motion in order to de-orbit. Follow the rings to the ground and be sparing with your fuel! Gravity and air resistance will begin to affect the shuttle the closer you get to the ground, so watch your downward velocity as you get closer to the surface. Try to land in the highlighted landing area at a safe speed.

- Hints:
  - Only one person is the pilot, so if you join the simulation as a team, the others can watch and talk to the pilot, but they cannot take the controls.
  - There is no problem with running this simulation independently. Whoever gets the highest score will set the new high score for the whole team.
  - Flying a spacecraft is different than flying an aircraft. When up high you need to use thrusters, when much lower the aerodynamics (effects of air on the motion) are much stronger. You will use less fuel if you take advantage of this at lower altitude.
  - Save some fuel to make a soft touchdown.

Habitat Builder

- Activity Description: In this activity you will construct a habitat on the surface of an alien planet. The habitat needs to support 4 crew members for two years, keeping them alive, healthy, and able to perform surface operations.

- User Interface & Controls:
  - The "Build" panel gives you access to a wide assortment of parts.
  - The "Edit" panel allows you to see what resources each part contains and at what rates they are produced or how much of them each part can store; if you're confused about how to improve your oxygen, water, or food scores, right-click a part and bring up this menu to see if that part contributes any oxygen, water, or food to your habitat
  - The "Stats" panel shows you which parts are required and gives you a lot of useful information about your habitat
  - The "Scoring" panel gives you real-time updates on your score, and is where you actually submit the score from
  - The "Simulate" panel allows you to perform a sustainability analysis to determine if your crew can survive for 2 years inside your habitat

Figure: Habitat Builder – Habitat Builder User Interface

- How to Strive for Highest Score: Match as closely as possible with your cargo mass from the spacecraft you created in the Spacecraft Builder activity. Ensure all of your necessary resources are being generated to a level that is self-sustaining and will allow the crew to survive for the entire duration of their stay. Explore the "Edit" panel of different parts to find out what resources they contribute to your overall spacecraft. Add science equipment and resource extraction equipment to your habitat!

- Hints:
  - Run the sustainability analysis to see which resource you will run out of first and adjust the design until all your resources last long enough for the mission. You will add some resources in the Surface Operations activity.
  - You may need to go back and improve your ship design to carry another cargo lander so that you have enough mass on Vulcan for the habitat that you need. (If your habitat has more mass than your ship could carry, you are losing points).
  - Be sure to save and submit your design so that it can be used in the next activity - Surface Operations.

Surface Exploration

- Activity Description: In this activity, the goal is to find as many resources as possible on the surface of the rogue planet Vulcan. Samples of resources around your base will be taken by both astronauts and a teleoperated rover.

- User Interface & Controls:

Figure: Surface Exploration – Surface Exploration User Interface

- How to Strive for Highest Score: Try to find as many different types of resources as possible. Split up so that each astronaut crewmember can explore a different area. Someone should be operating the rover because it can collect samples much faster than the humans. You have 10 minutes to gather the most resource samples that you can. In real life you would have days or weeks, and then the real mining and processing of those resources would begin. Once you are done, check your sustainability to see how long your habitat can survive on Vulcan. You can improve your score by either changing your habitat design (activity 5) or trying to do another Surface Operations excursion.

- Hints:
  - Run the sustainability analysis to see which resource you will run out of first and adjust the design until all your resources last long enough for the mission. You will add some resources in the Surface Operations activity.
  - It takes 3 or 4 people to optimize the resource scanning effort. If you have 4 people then two people can be suited astronauts, one can control the rover taking samples, while a 4th person perhaps watches the holographic map to tell everyone where to go. If you have one person, drive the rover to get the best score
  - Scores are scaled based on the number of players, so the team size should not determine who can win.
  - You cannot sample too close to a previously sampled location, so figure out how far you need to go before another sample gives you more points.
  - Sampling a large amount of one resource will award less points than sampling an equally divided amount of all four resources, so try to sample resources that your team hasn't sampled much of yet.
  - Some resources are further away from the habitat than others, so it may be beneficial to plan a route to make sure you can collect all the different types of resources before the timer runs out.
  - Run the sustainability analysis to see how well you are doing in terms of which resource runs out first.