Space Teams University
Mars City Design Competition
March-April 2024

GETTING STARTED GUIDE

COMPETITION

Welcome to Space Teams University and the Mars City Design (MCD) Competition sponsored by NASA Texas Space Grant Consortium (TSGC), Texas A&M University (TAMU), SimDynamX LLC, and MarsCityDesign. This competition aims to engage undergraduate and graduate students to think about the design and concept of operations (ConOps) for advanced habitats on other worlds (Mars in this case). Utilizing the Space Teams PRO (STP) platform, it is possible to envision, model, simulate and virtually experience future concepts for deep space operations with high fidelity models of the mission elements as well as the intended space or planetary environment. External software, such as CAD, FEM, or Engineering tools like Matlab, can be used to design or analyze components of your overall system design. Physical, analytical, or behavioral (agent/AI) models of any system can be incorporated into Space Teams PRO simulations. STP includes the entire solar system, and mission models can likewise be anywhere performing their function - for example, orbiting satellites at Mars could relay signals back to Earth. Orbiting vehicles, landers, rovers and assets scattered around a planet can all be part of a mission concept. In this competition, the focus is on a future surface colony on Mars, but other related assets can be included elsewhere if desired. Emphasis should be placed on the novelty and innovations for the habitat/colony/city itself, the ConOps for sustainability and operations within the colony, and the simulation and realism of typical ongoing activities. Among your first tasks should be to decide where on Mars you would like your colony to be, and request higher resolution surface data for that region. Your goal is to create a sensible architectural and engineering design of your colony assets and systems, and as much as possible demonstrate these systems visually, and in action if possible, to bring your city to life. Judges will examine your design by performing a VR tour of your city, as well as reviewing your Concept of Operations (ConOps) document.

Important Dates:

March 1st	Applications Open
March 11th	Competition Begins
March 22nd	Applications Close
April 28th	Submissions Due
May 10th	Winners Announced
May 13th	VR Public View of Designs

Competition Rules:
- Team composition: 1-10 Texas undergraduate and graduate students
- Submissions must be made on the ST PRO Platform by midnight Central Time on Sunday, April 28th. All judging will be done by examining and experiencing city designs in virtual reality (plus ConOps document).
- Team members can be changed with permission, but the max remains 10.
- Judging is administered by Texas Space Grant and results are final. Up to (maximum) of 5 teams will be awarded $2000 for the winning designs.

SOFTWARE

There are two parts to the Space Teams platform. The dashboard is the website where user accounts and team management is performed. From here you can also download the STP Application. This is the primary interface for creating and running simulations (on screen or in VR). From a development point of view, you will interface with this platform primarily through a SimConfig file and from Python.

At its core, STP begins with a baseline simulation of the entire solar system. For demonstration purposes, you will find some assets already located in various places. One of these is on Mars, called the Reference Design. We will continue to improve this Reference Design throughout the course of the competition - in effect, competing with you, but giving you ideas and showing you how (by example code) how to get various capabilities working. Your questions will somewhat guide the elements of our Reference Design.

In the same folder as this document, you will find a number of Getting Started videos. Watch them all. These are designed to give you a basic understanding of setting up accounts, using the platform, and beginning to interact with it to fabricate your overall mission design.

It is reasonably straightforward to import CAD models and place them within the STP environment. Animations created outside the platform, such as in Blender, can also be included. A SimConfig file is used to define all aspects of any simulation, including all assets, initial conditions, environmental and analytical models, and events that may occur. More complex asset behaviors and event sequences or algorithms can be programmed and included via python. Some examples might include: solar panels tracking the sun, communication antenna pointing, automated or teleoperation of robots or rovers, operations of other equipment, power, thermal, life support systems, production/utilization/storage of resources, sensor data processing, guidance/navigation/control of spacecraft, etc.

More information on the software and how to create and operate simulation elements of all kinds is provided in the links below.

LINKS/HELP

Welcome Video, Getting Started Document, Basic ST PRO Getting Started Videos
https://drive.google.com/drive/folders/1oHmSmnrCKvTe_IlqCCJyR1-pIzJx6A4A?usp=sharing

Account Creation and "Org" (Organization/Team) management, as well as a place to download Space Teams PRO. Make an Org for your competition team.
 https://www.spaceteamspro.com/

Public-facing website for technical user documentation, discussions, and bug tracking for Space Teams PRO. Come here to learn about the Space Teams platform.
https://github.com/SimDynamX/SpaceTeamsPRO

Rules & Info for this competition, with a comments section for questions.
https://github.com/SimDynamX/SpaceTeamsPro/discussions/7

Q&A channel for questions about the competition. The other channels can also be used.
https://github.com/SimDynamX/SpaceTeamsPRO/discussions/categories/mars-city-design-competition-q-a

Written technical documentation for general Space Teams PRO usage. Includes installation and setup guides.
https://github.com/SimDynamX/SpaceTeamsPro/wiki

Email to Team - Not for Technical Q&A
support@SimDynamX.com

SUBMISSION

Team submissions will be in the form of files dropped in a Google Drive folder per Team. This will include SimConfig files, asset models, Python code, ConOps Document, etc. More details on this will be provided closer to the end of the competition.

JUDGING

Rubric:

20%	Architectural Design/Innovation/Form & Function
40%	Engineering Design - Sizing, System Design, ISRU, Life Support, Integration with Martial Environment, Resource Management
20%	Demo Experience - Activity, Fidelity, Realism
10%	Novelty, Ingenuity
10%	VR Capable Demo - Judges can examine and experience in VR

PRIZES

- Up to 5 winning teams - Up to $2000 per winning team
- Qualifying Designs to be showcased online for public viewing/experience/sharing