Table of Contents

Introduction

Hello, and thank you for downloading our flight training package!

In order to help those who are having trouble with movement in OpenSpace or who desire practice in doing so, we have created a set of files meant to be used in conjunction with each other to make a flight training path, rings to fly through included, much like what you may find in some video games.

This package contains:

- A folder labelled "documentation" containing:
    - This PDF, "Introduction and How to Make Your Own."
    - An mp4 file labelled "Flight Example"
- A folder labelled “assets” containing:
    - A folder labelled "data" containing:
        - A CSV file labelled “grand-canyon-flight-coordinates.csv”
        - A txt file labelled “grand-canyon-start.txt”
        - A CSV file labelled “la-guardia-airport-flight-coordinates.csv”
        - A txt file labelled “la-guardia-airport-start.txt”

        - A CSV file labelled “mt-elbert-flight-coordinates.csv”
        - A txt file labelled “mt-elbert-start.txt”
        - A CSV file labelled “valles-marineris-flight-coordinates.csv”
        - A txt file labelled “valles-marineris-start.txt”
    - A folder labelled "models" containing:
        - A mtl file labelled "ring.mtl"
        - A obj file labelled "ring.obj"
    - An ASSET file labelled “flight-training-earth-la-guardia.asset”
    - An ASSET file labelled “flight-training-earth-mt-elbert-asset”
    - An ASSET file labelled “flight-training-earth-grand-canyon.asset”
    - An ASSET file labelled “flight-training-mars-valles-marineris.asset”
- A folder labelled “profiles” containing:
    - A profile file labelled “grand-canyon-flight.profile”
    - A profile file labelled “la-guardia-airport-flight.profile”
    - A profile file labelled “mt-elbert-flight.profile”
    - A profile file labelled “valles-marineris-flight.profile”

Below you can read not only about how to use this package after downloading it but also how to create your very own flight training path using the code that this package provides as a base so you can practice anywhere you want!

Have fun and happy training!

How to Use After Downloading

1. Make sure that you have OpenSpace downloaded on the computer you wish to use this on. This was created with version 0.18.0. Earlier versions may not work properly.
2. Move all the files and folders in "assets" into your user folder of your OpenSpace version (e.g., OpenSpace-[your version number]/user/assets).
3. Move all the files in "profiles" into your user folder of your OpenSpace version (e.g., OpenSpace-[your version number]/user/profiles).
4. Open your OpenSpace software and choose a flight training profile as your profile with whatever window option of your preference, then start the program. Depending on which you have selected, you will begin in front of a ring on Mars or Earth.
5. To best perform flight training, turning off rotation friction with the “F” button (if you are using default keybinds), which allows you to keep on moving in a direction even while you turn to go through the targets. This means you don’t have to stop to turn every time.
6. Fly through the hopes using OpenSpace’s camera movements. There are no rules on *how* to complete this training course—quickly, slowly, steadily—complete it at your own pace!

The Code and How to Make Your Own Flight Training Path

Here are instructions on how to edit these files to create your own flight training path and, in conjunction, what some of the code means and where to find information relating to the data, going in

order from the files listed above. For how to make your own, we will be using the Valles Marineris-related files.

These files can all be edited with a text editor like atom.

valles-marineris-flight-coordinates.csv

What is in This File and What Does It Mean?

This file contains the information about the location and rotation of each ring model that is placed. Each new line is a new ring. It is a CSV (comma separated values) file, a file that can effectively be turned into a table or spreadsheet; all separations by commas and lines are important and, on a table/spreadsheet, represent columns and rows, respectively.

This file can also be opened in programs like Microsoft Excel and Google Sheets.

"**Lat**" stands for latitude and "**long**" stands for longitude; both of these pieces of data can be found directly on OpenSpace without making any changes to the value.

"**alt**" stands for altitude, which is measured in kilometres; this information may vary slightly from what is given in OpenSpace, as OpenSpace details you the height from see level (or sphere level) while this code uses the height map.

"**label**" is simply the label for the object that can be changed as you please.

"**roty**" and "**rotz**" are the angles in degrees in which the ring models are turned on the y- and z- axes, respectively.

You can also add information regarding rotation along the x-axis here by adding such a column and reflecting that information in the flight-training-mars-valles-marineris.asset.

Changing It to My Preference

1. For longitude, latitude, and altitude, use OpenSpace to move around and record that information into the CSV file.
2. For label, it can easily be left as is or changed.
3. Changing the rotations are a bit of a trial and error as you make small changes to your flight training, as it is difficult to determine how much you want it rotated without seeing it for yourself.
    a. That is to say, changing the rotations to your preference in OpenSpace when the models are loaded in works best. This information can be found here in the GUI (Graphical User Interface) folder for each TargetModel:

These values are in radians. In order for it to work in your code, you must convert it into degrees; any manner of converting works.

4. If you renamed the CSV file or created an entirely new one, make sure to change the file name in the respective profile.

Things to Note:

- The coordinates that you put are the location refer to of the *centre* of the ring.
- The importance of the decimal places in the latitude/longitude vary depending on how close or far away you are from the focus object. Several decimal places are very important for small or close-to-the-ground rings; for rings that are very large or are very far away from the object, the decimal places further a long tend to make little difference in the ring's location.

valles-marineris-start.txt

What is in This File and What Does It Mean?

This is a text file that contains the exact information about the location and the camera, and can be used as the starting point of a profile.

To find this information, when OpenSpace is open and a profile is selected, click on the "~" key on the keyboard. This opens up a menu. Type in "openspace.navigation.saveNavigationState('')". In between the two single quotes, type in the name you want to call your file followed by ".txt", the file type, using hyphens instead of spaces if necessary. It will save this information into the **bin** folder of the OpenSpace folder of your version. Move the file you created to wherever you placed all of the other assets related to this in and viola. These can be wherever you want.

This file can be opened in any program that can open txt files, including but not limited to NotePad, Microsoft Word, and Google Docs.

Changing It to My Preference

1. Save a new navigation state using the method above.
2. Move this navigation state txt file from the "bin" folder to the "asset" folder.
    a. While this means that you can only load the navigation state while using the profile it's in, this is necessary to start in front of your rings when creating your profile.

flight-training-mars-valles-marineris.asset

What is in This File and What Does It Mean?

This is an asset file, a special file type for OpenSpace that uses C++ code. This file contains all the information about the models that is not covered by the coordinate txt file, including but not limited to the coordinate file itself, the models, and information on how the models are placed, rotated, scaled in OpenSpace.

Starting from **line 37**, the code describes the models. The matchstring information in **line 38** and **line 39** are directly related to the CSV information that is input in valles-marineris-flight-coordinates.csv, specifically the titles of each column.

From **line 54** to **line 75**, it contains specific information where exactly the models are, how they are rotated, and their scale from the original model size. "Globe" refers to where the object is focused at the start. It also contained "long," "lat," and "alt" as from the CSV file. This is where those titles are utilised.

Changing It to My Preference

1. If your camera focus is not Mars, you must change the information in in **line 3**, **line 56**, and **line 61** for the correct object. **Line 3** requires the path for said object, and **line 56** and **line 61** require the identifier, which is often of the set up: "[lower case name].[capitalised name].Identifier".
2. **!!IMPORTANT!!** – Neglecting to change the following if it applies may result in a fatal error. In **Line 7**: if you changed the file name of the CSV file or created a new one of a different name, the file name of the local resource asset must be changed in accordance.
3. **!!IMPORTANT!!** – Neglecting to change the following if it applies may result in a fatal error. **Line 10**: *If* you decided to change the name of the model folder, you must also change the name of it in line 10 in accordance.
4. If you are adding more information to the CSV, like x-axis rotation, add another ", (.-)" to the end of **line 38** before the "$" symbol and add the name you chose for that column in **line 39**. It must correspond with the order of your CSV file's column titles.
    a. If you added x-axis information, you must also change the "0" in **line 106** into "math.rad()" with the name of the column title you chose in the parenthesis.
5. You may change the scale of the ring in **line 75**.

    a. How big you may want the rings is often dependent on how close to the ground you are and how much leeway you want to leave to pass through. The higher off the ground you are, the bigger you often want the rings to be.
6. **Line 85** and **line 127** contain the path for where the information for the models are located in the GUI, which can be changed as you see fit.
7. **!!IMPORTANT!!** – Neglecting to change the following if it applies may result in a fatal error. In **line 113**, if you changed the name of the "models" folder or changed the name of the object (i.e., the 3D model) that you are using, the paths in line 113 must be changed in in accordance.

valles-marineris-flight.profile

What is in This File and What Does It Mean?

This is a profile file, a special file type for OpenSpace that uses C++ code. This file brings together all of the data from above and additional information into a prolife that you can select in the OpenSpace starting menu.

Line 29 automatically pauses the time progression when you open up this OpenSpace profile, which is useful in conjunction with the content of **line 109** and **line 110**.

Line 30 contains the path the saved navigation state. This is what enables you to start your profile exactly where you want it at the camera angle that you want it to be.

Line 32 starts with the list of assets, one of which, as seen in **line 35**, is the flight training asset path.

Line 37 starts with the location that the profile starts in, including the anchor or focus in **line 39** as well as the longitude and latitude in **line 40** and **line 41**, respectively. The altitude is left as default, as it doesn't matter despite the saved navigation state; the longitude and latitude are marked similarly to where the saved navigation state is loaded.

Line 109's "absolute" forces this to be the exact time that you set the value of **line 110**. **Line 110** contains the exact time of OpenSpace in the GMT time zone. It follows the format of [four digit year]-[two digit month]-[two digit day]T[hour]:[minutes]:[seconds], where the hours are the 24-hour period.

Changing It to My Preference

1. **!!IMPORTANT!!** – Neglecting to change the following if it applies may result in a fatal error. In **Line 30**: if you changed the name of the LoadState file, created a new one of a different name, or have it in a folder in /user that is not labelled “assets”, the file path of the loaded Navigation State must be changed.
2. **!!IMPORTANT!!** – Neglecting to change the following if it applies may result in a fatal error. In **Line 35**: if you changed the name of the flight training file, created a new one of a different name, or have it in a folder in /user that is not labelled “assets”, the file path of the training targets must be changed.

3. Make sure that **line 39,** the "anchor," contains the object that is the focus of the camera, usually where the models are, whether it be a planet, moon, or something else.
4. It is also advised that you change the latitude and longitude of **line 40** and **line 41**, respectively, to the approximate coordinates of your saved navigation state.
5. If you want it to always be a certain time (e.g., if you want a certain time of day or celestial body alignment), change the value of the time in **line 110** with the year, month, day, and time in GMT that you desire.

Glossary

GUI – Stands for Graphical User Interface. It is the black bar at the bottom of the OpenSpace window that contains things like "Scene" and "Focus."