

## Orbiter Mesh Tools for Blender 2.81 – Simple Tutorial

December 14, 2019

For this tutorial we will use Blender and the Orbiter Mesh Tools plug-in to create a simple 'cube' vessel that uses an Orbiter vessel configuration file. This vessel will not do anything, but it will introduce you to some concepts needed to build a vessel mesh file using Blender and the Orbiter Mesh Tools plug-in.

Assumptions:

- Blender is installed.
- Orbiter Blender Plugin is installed.
- Orbiter is installed in C:\Orbiter.

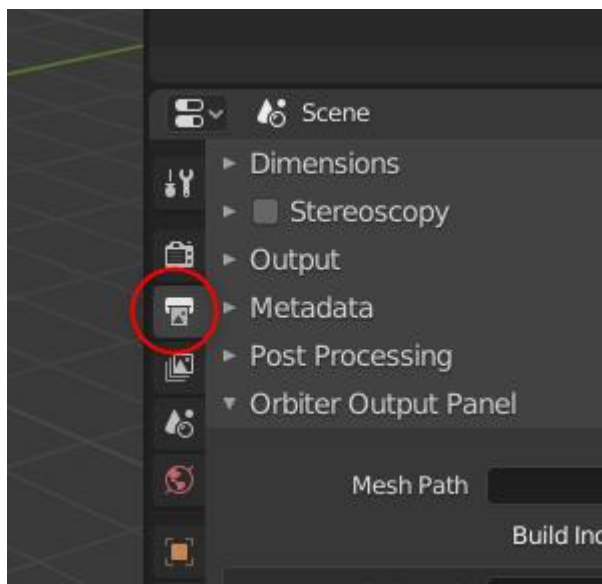
### Create a Basic Mesh

Create a folder C:\MyShip. This will hold our .blend file and any other files we may need.

Start Blender. The default Blender scene is comprised of a cube mesh object, a camera, and a light. To keep things simple, we will use the default cube as our initial object. You can remove the camera and light if you wish, but they will not interfere with our model so we will just leave them for now.

Before doing anything save the default Blender scene to your working folder. Select menu: *File » Save As*. Navigate to the C:\MyShip folder. Name the file *MyShip*. Blender will add the .blend extension. Your *MyShip.blend* file should now be in C:\MyShip. Before we can build the mesh file, we need to set some properties.

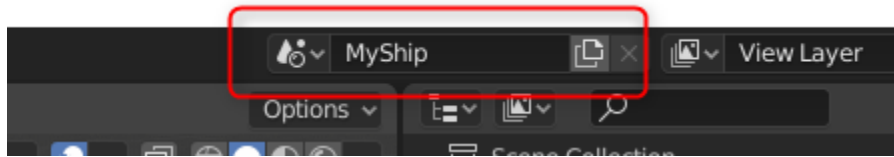
Select the *Output Properties* panel (the *printer* icon circled in red) and open the *Orbiter Render Panel*.



Set the Mesh Path: to C:\Orbiter\Meshes\.

Un-check *Build Include File*.

In the Blender *Scene* drop-down at the top of the window, rename the scene from *Scene* to *MyShip*.



You're now ready to build your first mesh file. Press *Build Mesh* to build the mesh file. If everything worked, you will see a *Build Mesh Done* message appear briefly at the bottom of the Blender window.

At this point you should have a very simple *MyShip.msh* file in your Orbiter *Meshes* directory. Orbiter Mesh Tools will build a separate mesh file for every scene in the .blend file. We have a single scene named *MyShip*, so we have just one mesh file.

Our ship will be based on a configuration file rather than a DLL so its functionality will be limited. We will setup the vessel configuration file next.

In *C:\Orbiter\Config\Vessels* create a new text file named *MyShip.cfg*.

Using Notepad (or any other text editor) edit *MyShip.cfg* and put the following lines in:

```
; === Configuration file for vessel MyShip ===  
MeshName = MyShip  
Size = 1
```

Save and close the config file.

Next, we will need a scenario file that will use our ship. Our scenario will be very simple and will put our ship on a landing pad at Brighton Beach.

In *C:\Orbiter\Scenarios* create a new folder called *MyShip*.

Inside the new *MyShip* folder create a text file named *First.scn*. Edit *First.scn* in Notepad and enter the following:

```
BEGIN_DESC  
MyShip parked at Brighton Beach  
END_DESC  
  
BEGIN_ENVIRONMENT  
System Sol  
Date MJD 52006.7491805055  
END_ENVIRONMENT  
  
BEGIN_FOCUS  
Ship MyShip-01  
END_FOCUS
```

```

BEGIN_CAMERA
  TARGET MyShip-01
  MODE Extern
  POS 35.43 -21.13 -26.51
  TRACKMODE TargetRelative
  FOV 50.00
END_CAMERA

BEGIN_HUD
  TYPE Surface
END_HUD

BEGIN_MFD Left
  TYPE Launch
  NAV 0
END_MFD

BEGIN_MFD Right
  TYPE Map
  REF Moon
  BTARGET Brighton Beach
END_MFD

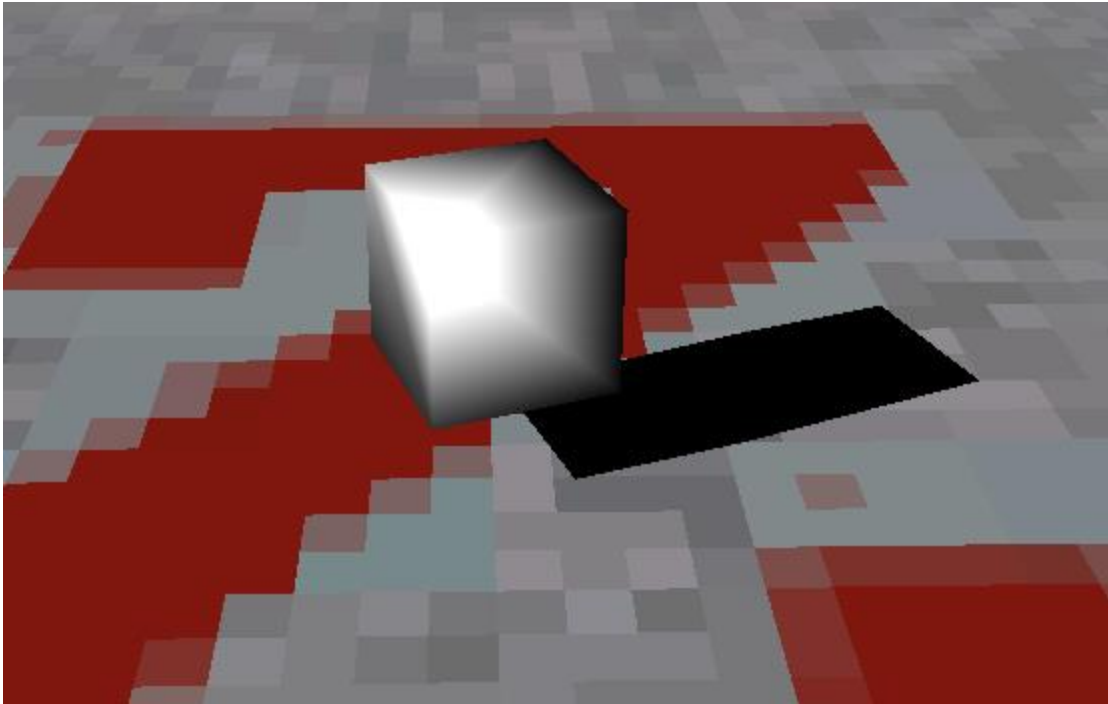
BEGIN_SHIPS
MyShip-01:MyShip
  STATUS Landed Moon
  BASE Brighton Beach:2
  POS -33.4450804 41.1217033
  HEADING 220.00
END
END_SHIPS

```

Save the scenario file.

We are now ready to run Orbiter and see our *Cube* ship at work.

Start Orbiter and load the *First* scenario we just created. You should see something like this:



This is a good start, but it doesn't look right. We will fix that next.

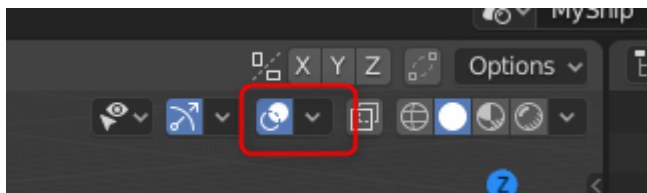
### [Understanding Normals and Shading](#)

Exit Orbiter and go back into Blender. We are going to edit our Cube object.

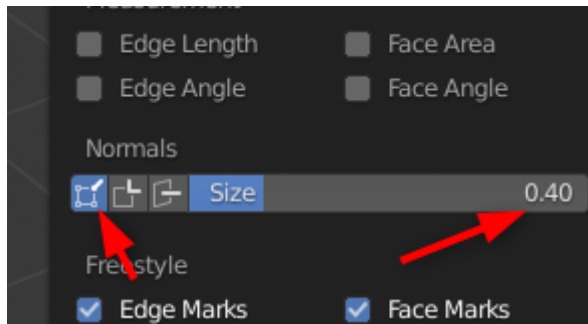
Select the cube (left click) and then press *[TAB]* to go into edit mode.

Enable Normals overlay:

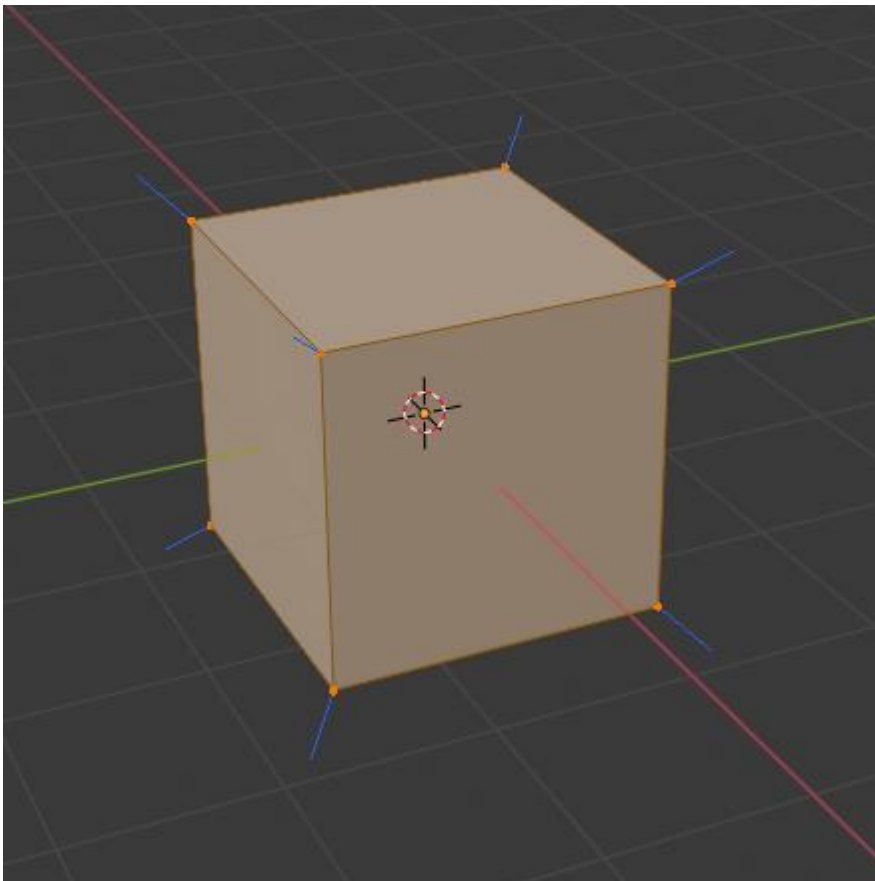
In the upper-right of the 3D viewport select the Overlays dropdown:



In the bottom of that panel, enable the 'Display Vertex Normals' as shown below. Increase the size to make them easier to see.

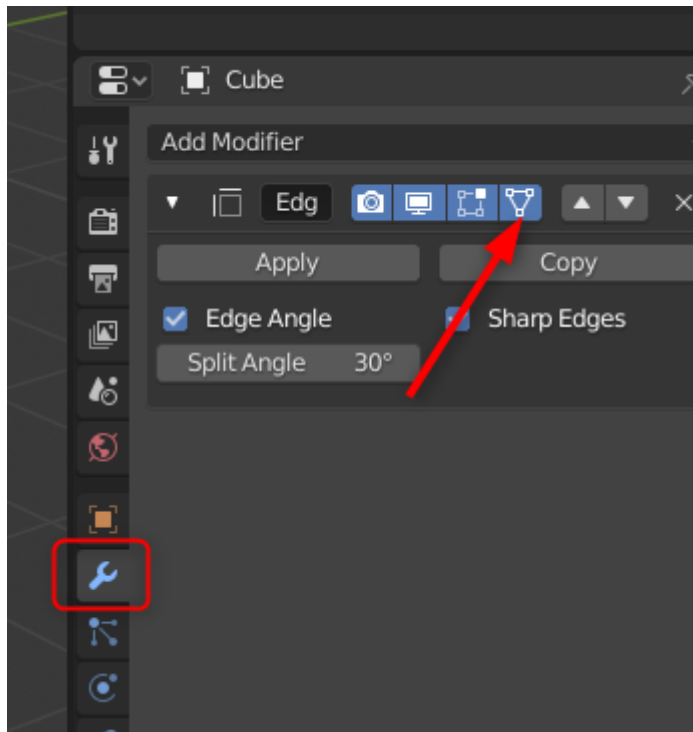


Your cube should look like this:

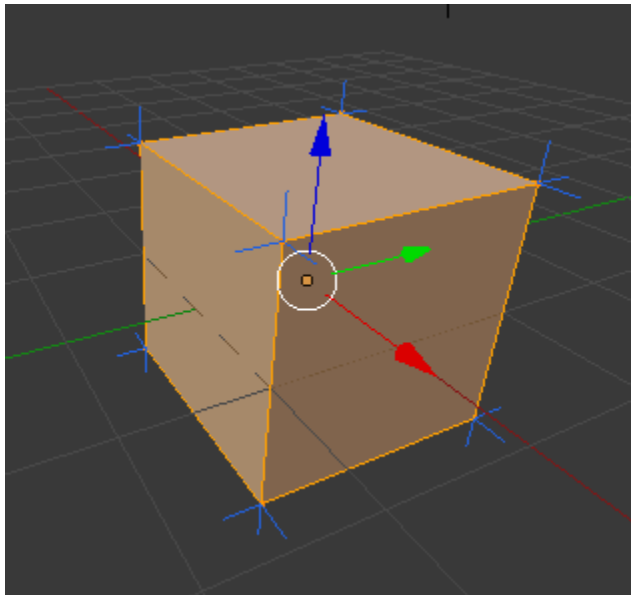


The blue lines represent the settings for the vertices in the cube which by default will be an average of the faces of the cube. This makes for smooth shading from face to face and is why our ship looks odd. To create a hard edge in Blender you need to 'split' the edge. You can do that for each edge, or you can apply a modifier that will do it for you. The modifier is more flexible so that's what we will do.

Select the Blender *Modifiers* property window (the wrench circled in red below) and select *Add Modifier*. From the drop-down menu select *Edge Split*. You should end up with a modifier window that appears below:



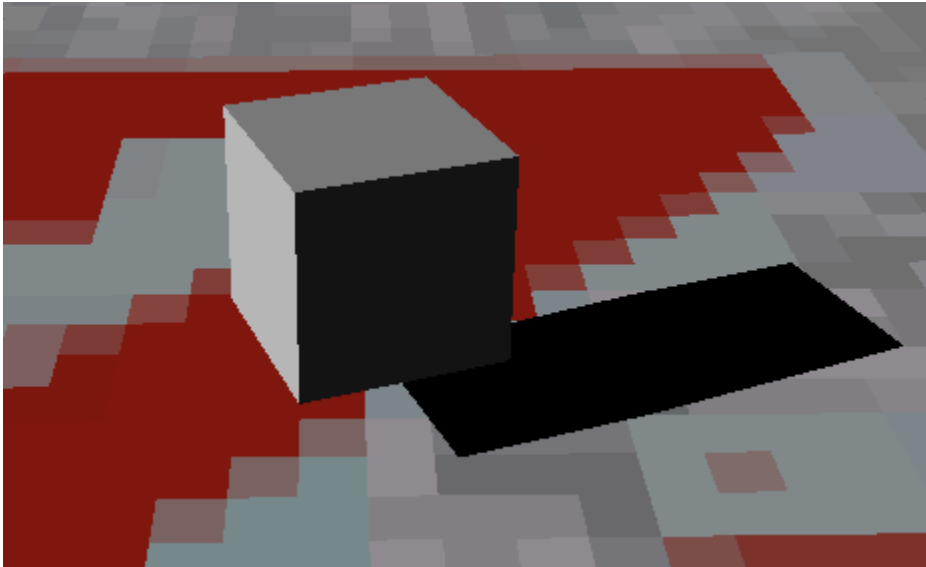
Click on the white triangle box (arrow) to see the effects of the modifier on your cube:



You will notice that each corner (vertex) now has three normals associated with it. This means the shading will 'break' at the edges rather than transition smoothly.

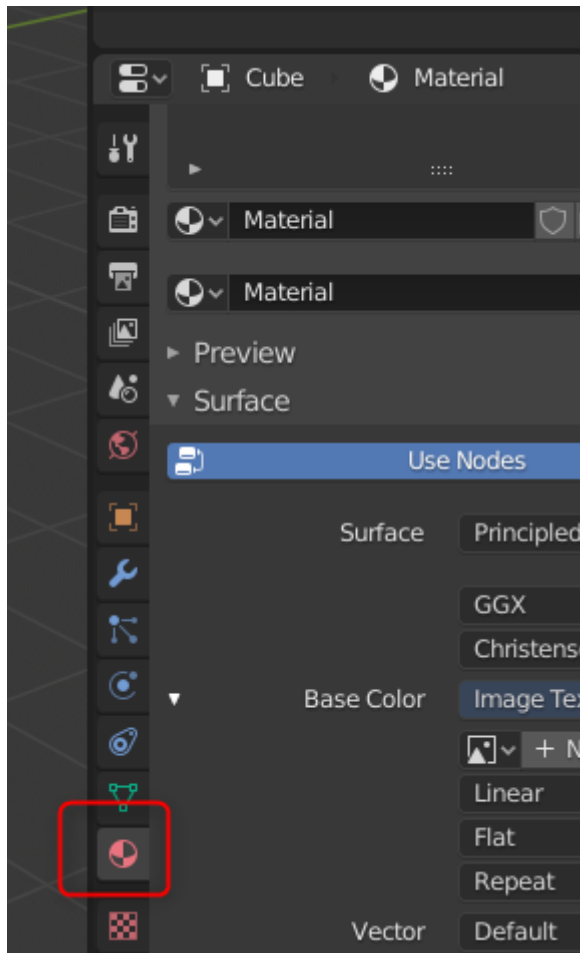
Object modifiers can be applied to an object, or left un-applied as we have done here. All modifiers will be applied when the mesh is built so a recommendation is to leave them un-applied while building your mesh as that will give you greater flexibility in modifying the effects it will have on your mesh.

Now, save *[Ctrl-S]*, build (Render panel, *Build Mesh*), and run Orbiter to see the results. You should get something like this:

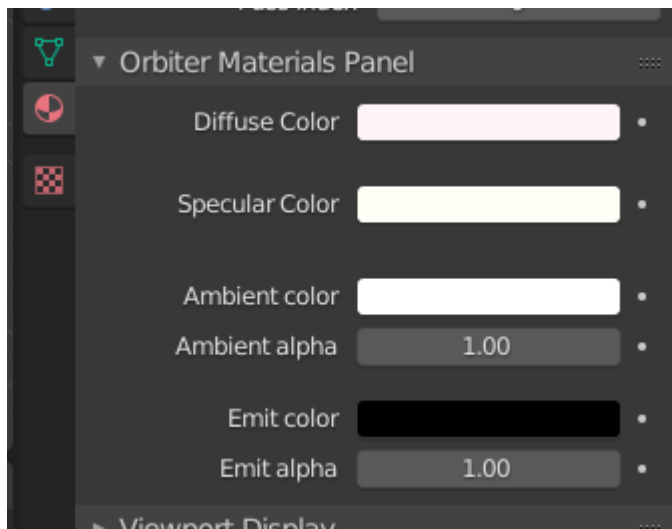


### Materials and Textures

Materials and textures will both be applied through the Materials tab on Blender's Properties view:



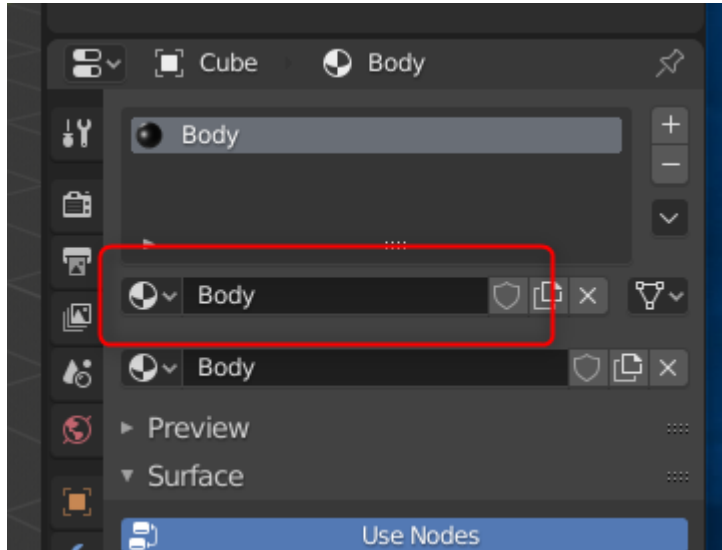
Materials control various properties that effect how the render code interacts with an object. You can create multiple materials in Blender, but the Orbiter Tools plugin will only use the first material for an object. The colors Orbiter uses for a material can be set in the Orbiter Materials Panel at the bottom of the Materials property view:





Other than 'Diffuse Color', you will not see the effect of that color property in Blender, but you will see its effect in Orbiter.

For our sample panel, lets create a 'Body' material with a blue hue. At the top of the Materials property window, find the box circled below, and change 'Material' to 'Body':

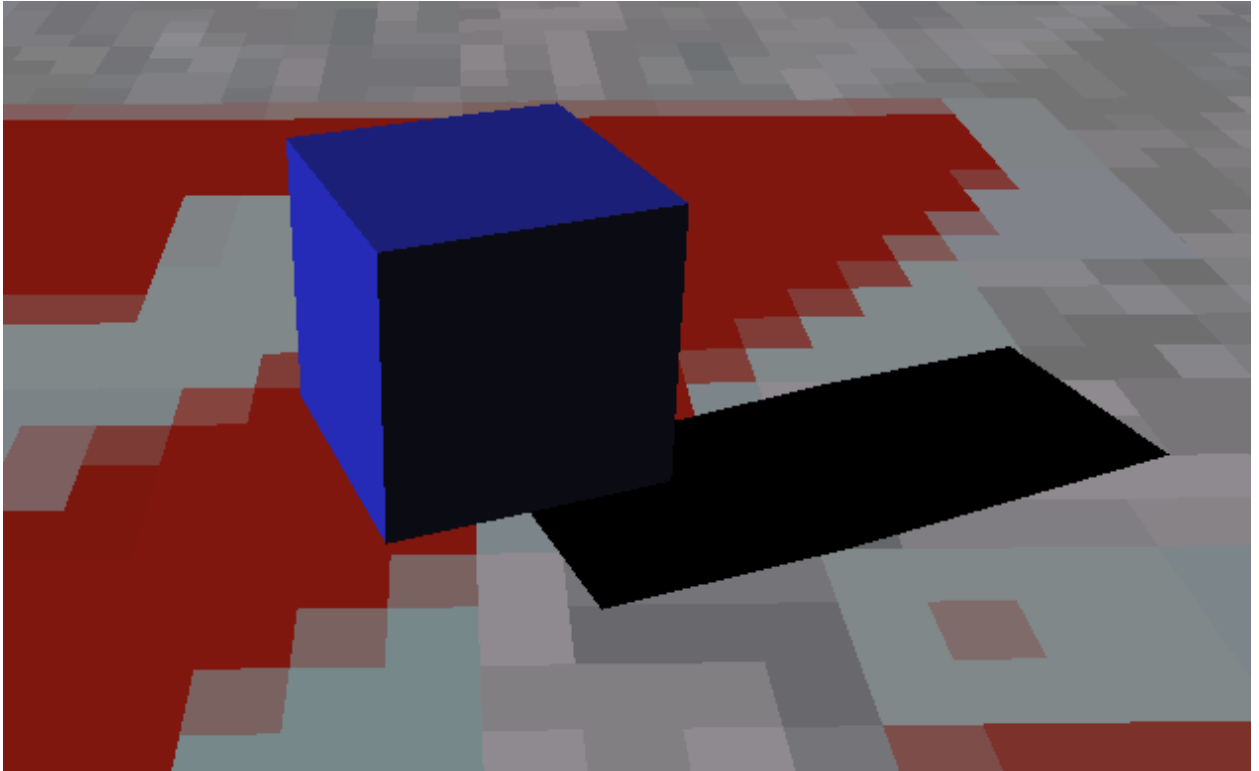


Now, click on 'Diffuse Color' in the Orbiter Materials Panel and select a shade of blue from the color wheel that appears.

You have created a blue material that will be used for the cube object. You can select the same 'Body' material for other objects you create in Blender.

By default, the Mesh Tools plugin will set Diffuse, Specular, and Ambient colors to white (full-on) and Emit to black (full-off). See the Orbiter SDK for a full discussion of these values.

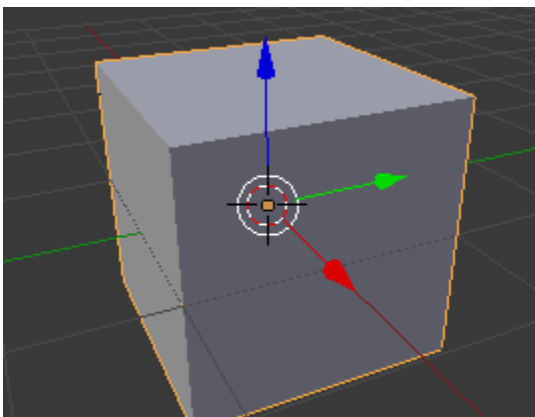
Save, build and run:



### Handling Transparency

Now we are going to add a second object that will be similar to a window on our vessel. To keep things simple, we will add it as a *plane* above our cube.

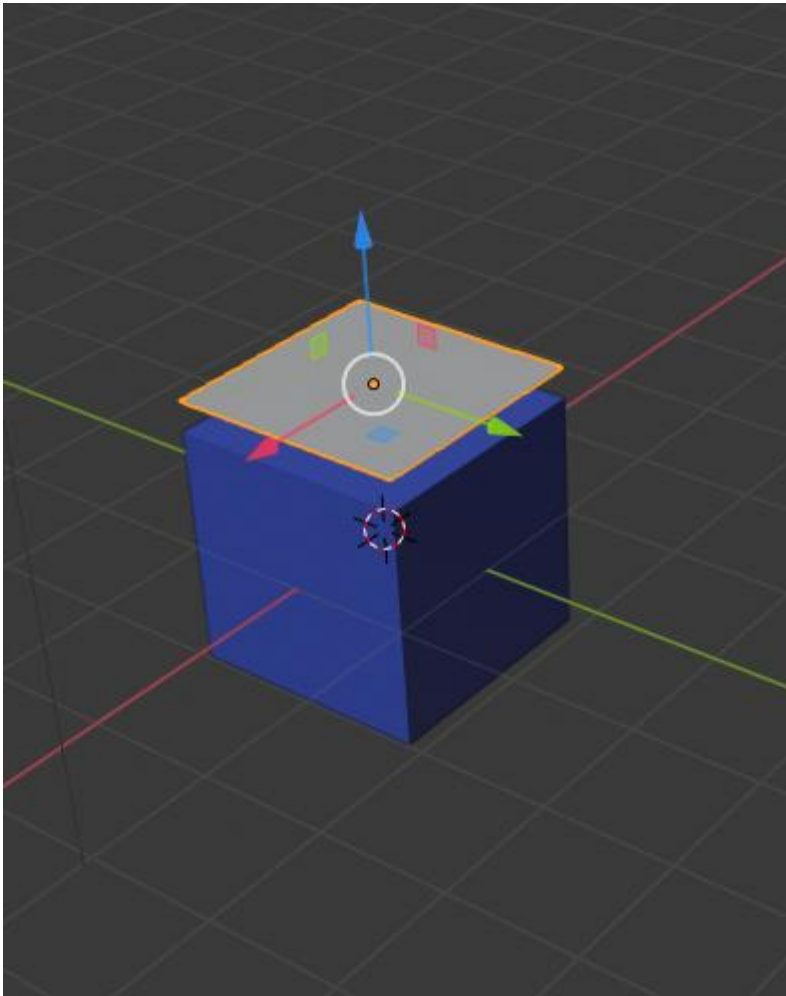
If you have not already, exit Orbiter and go back to Blender. We are going to add a new object to our scene. Blender adds new objects at the location of the 3D cursor, which is the white and red circle in the 3D View.



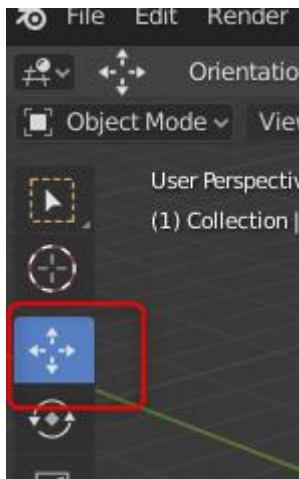
The cursor should be at the center of the X,Y,Z axis. If not, press *[SHIFT-S]* and from the *Snap* menu that appears select *Cursor to World Origin*.

Press *[SHIFT-A]* to add a new object. From the *Add* menu select *Mesh » Plane*. This will put a new Plane object in the middle of our cube.

Click on the blue Z axis arrow and drag it up until our plane object is just above our cube.

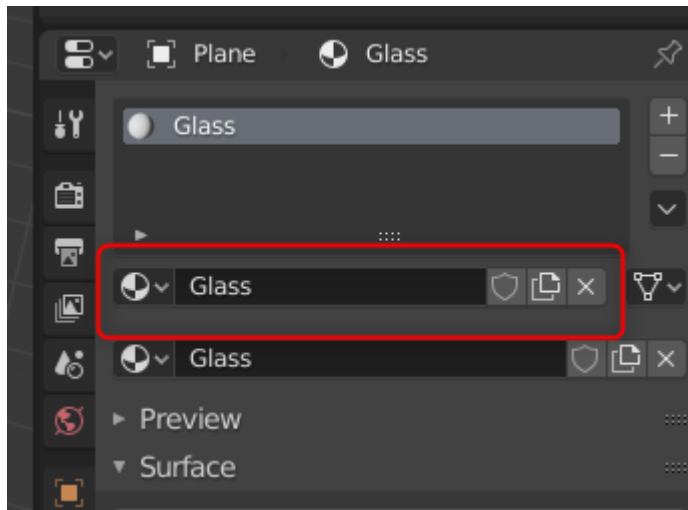


If you don't see the *Move* arrows, you can enable them from the left toolbar:

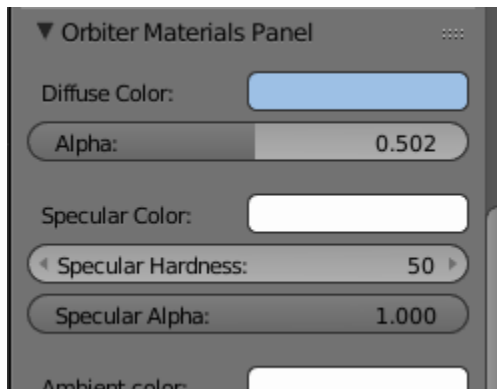


Now we are going to add a *Glass* material for this object.

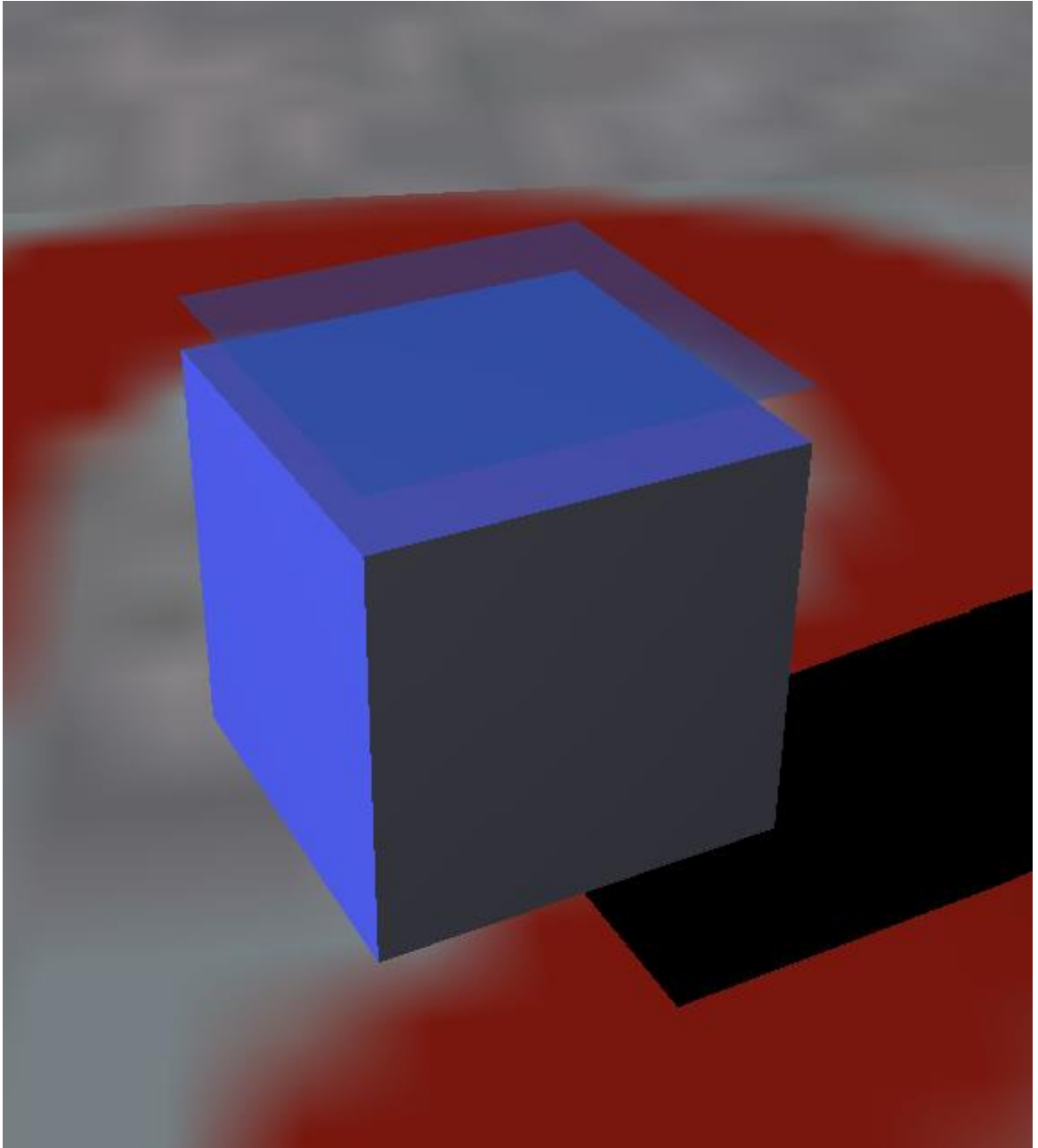
Select the *Materials* property page and click on the *New* button to create a new material. In the material name type *Glass*.



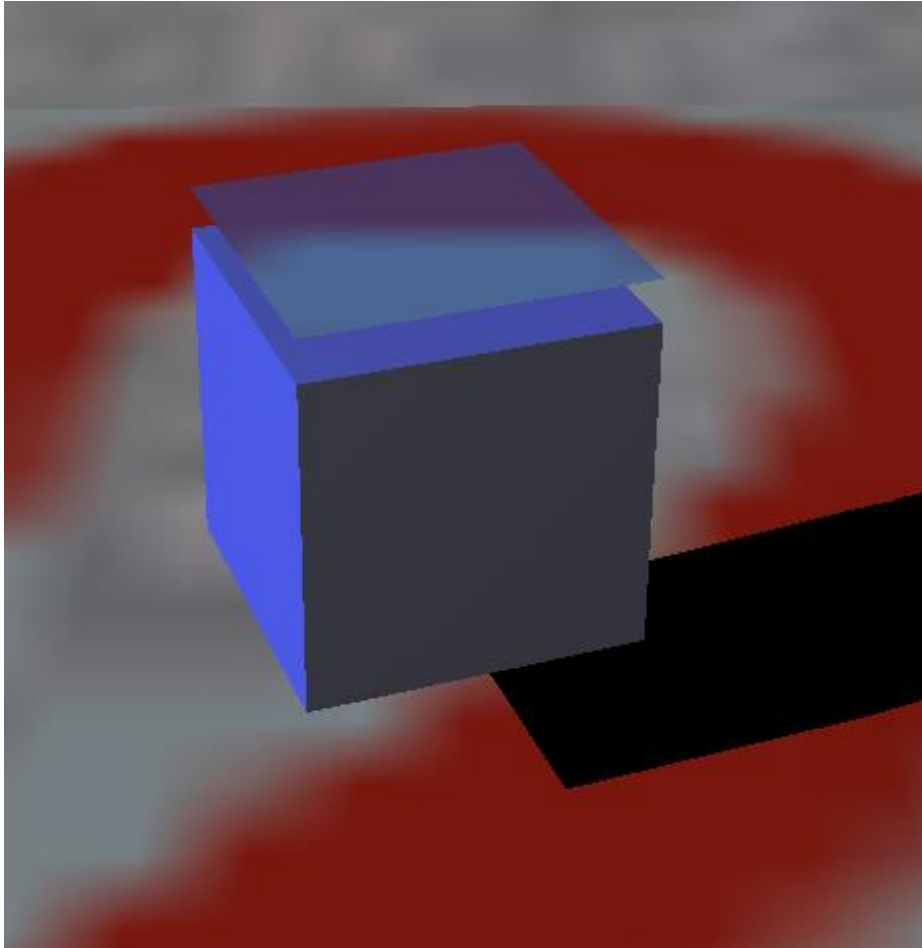
Scroll down to the Orbiter Materials Panel and select a light blue color for 'Diffuse Color:', then slide the Diffuse Color 'Alpha' selector to 0.5 (or thereabouts).



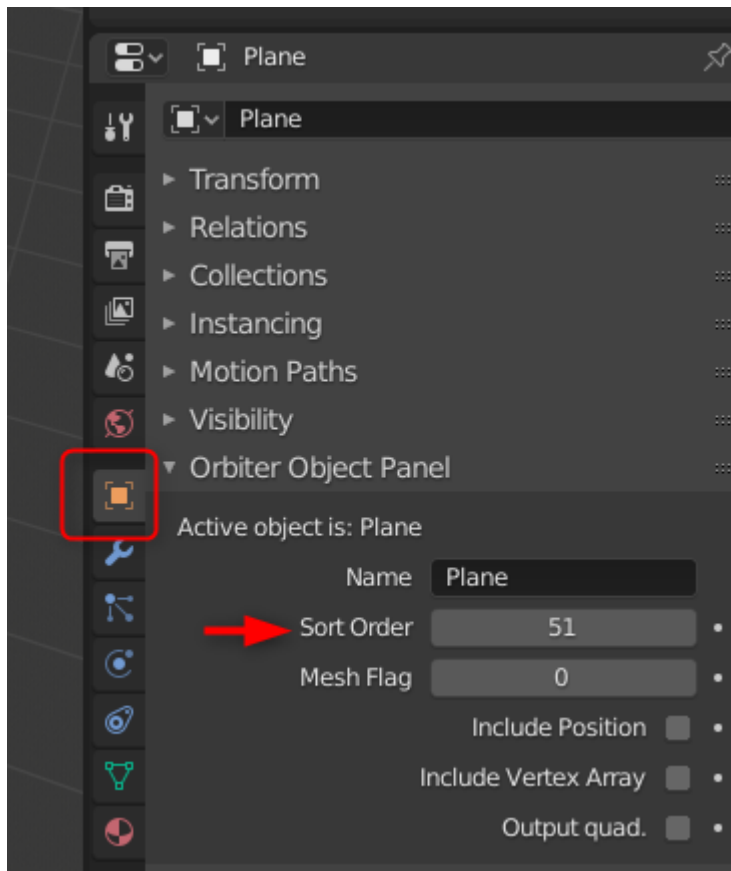
Now Save, Build and Run in Orbiter. You should see something like this:



It's also possible you are seeing something like this:



Here, you can see the landing pad through the cube itself. To get transparency correct, Orbiter expects objects with transparency to render after objects which may be visible through the transparent object. Render order is controlled in the Object properties panel in Blender:



In the Orbiter Object Panel you will see the Sort Order control. All objects start with a default sort order of 50. Objects with transparency should have a higher sort order than opaque objects. Set the sort order for our window to 51, build and run in Orbiter. The window should not look correct.

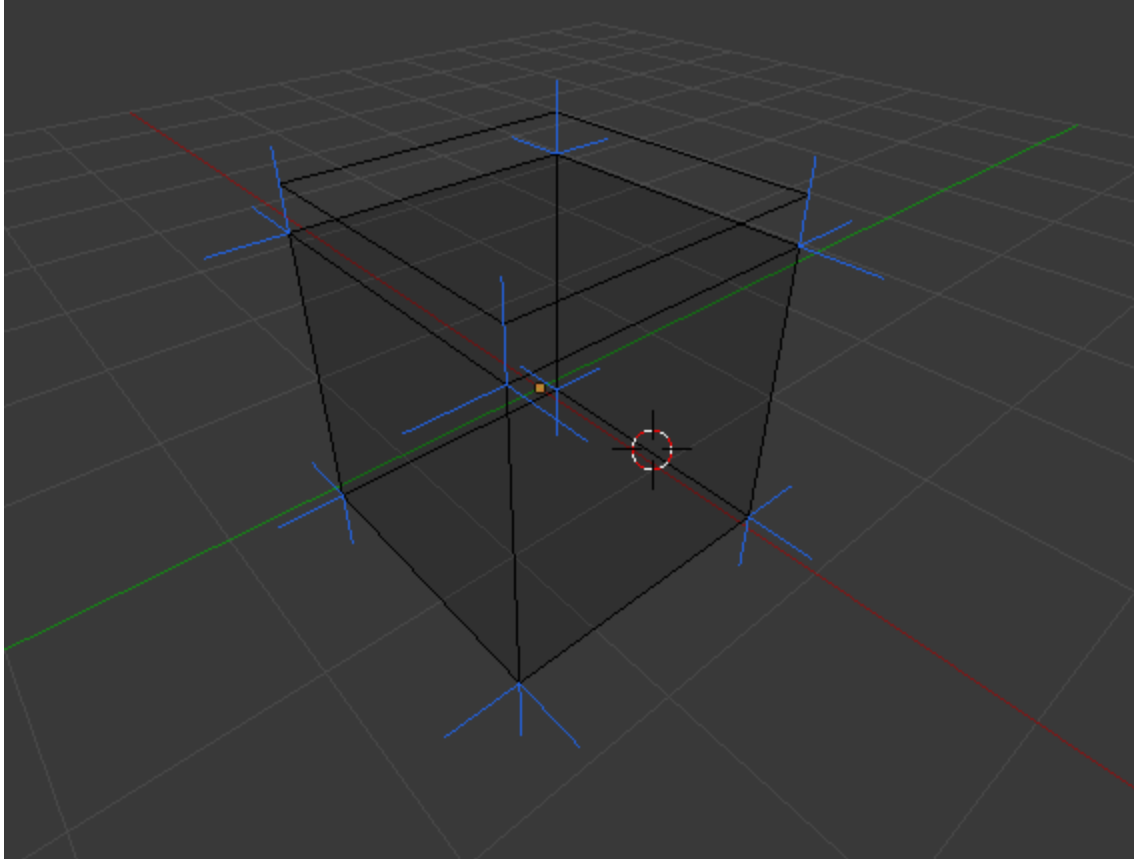
## Texturing

Adding a texture to an object gives it visual detail that cannot, or should not be added using modelling or materials. We will add a very simple texture to our cube that will indicate the top, bottom, front, back and sides of our cube vessel. To keep this walkthrough simple, I have provided a simple texture to use. It's called CubeShip.dds and should be in the same folder as this tutorial. To use it, copy it into C:\Orbiter\Textures.

If you are still in Orbiter, exit and return to Blender.

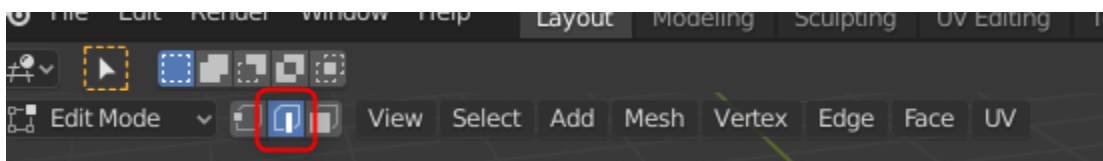
Unlike our model, which is 3D, a texture is only two dimensional, so we will need to 'wrap' the texture around our model. We do that by 'un-wrapping' our model so that the planes of the model can lay flat. This is called UV un-wrapping.

In Blender, select the cube, then press **[TAB]** to go into edit mode, and then press **[Z]** to go into wireframe mode (Z brings up the view Pie menu, from that menu select 'wireframe'). You should see something like this:



If you turned off the *Normals* display you won't see the blue lines, it doesn't matter for this.

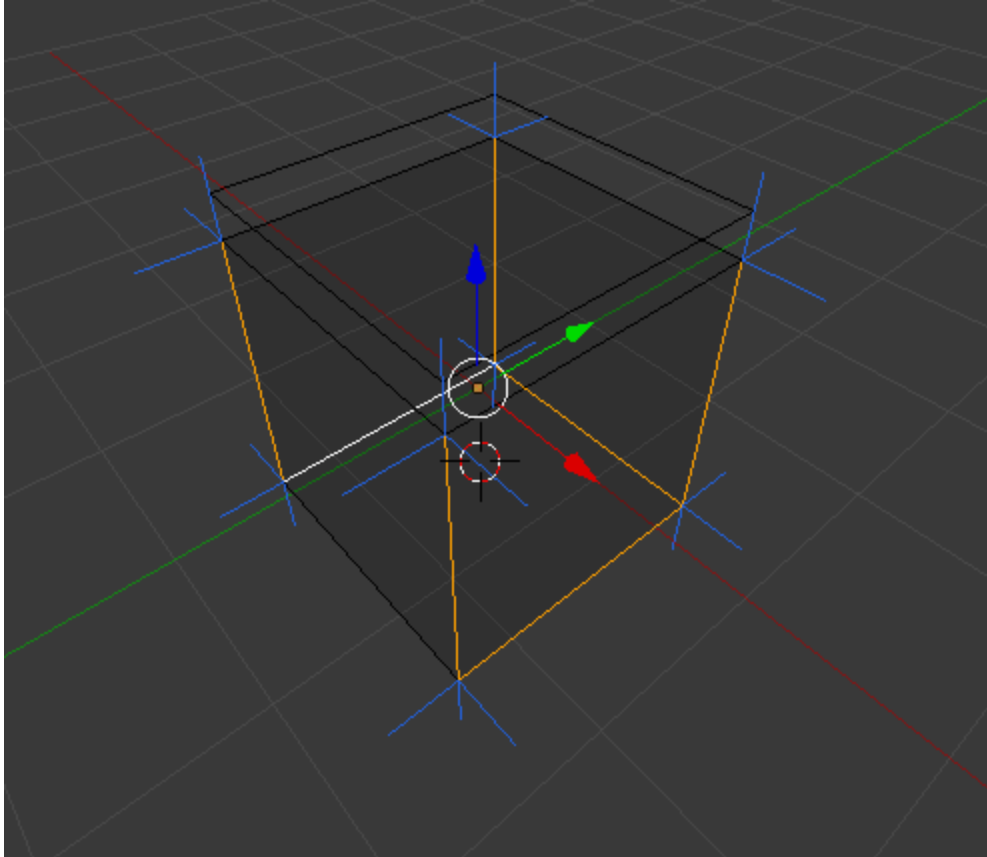
In the tool bar above the window select the *edge select* mode, circled in red below:



We need to mark which edges are the 'seam' edges for our model. When we un-wrap our model, these are the edges that will separate in order for our model to lay flat.

Select the edges as shown below, holding down the *[Shift]* key to select multiple edges, then press *[Ctrl-E]* to bring up the *Edge* menu and select *Mark Seam*.



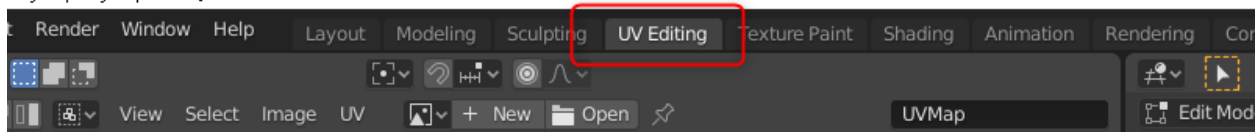


The seam edges should now be marked in red.

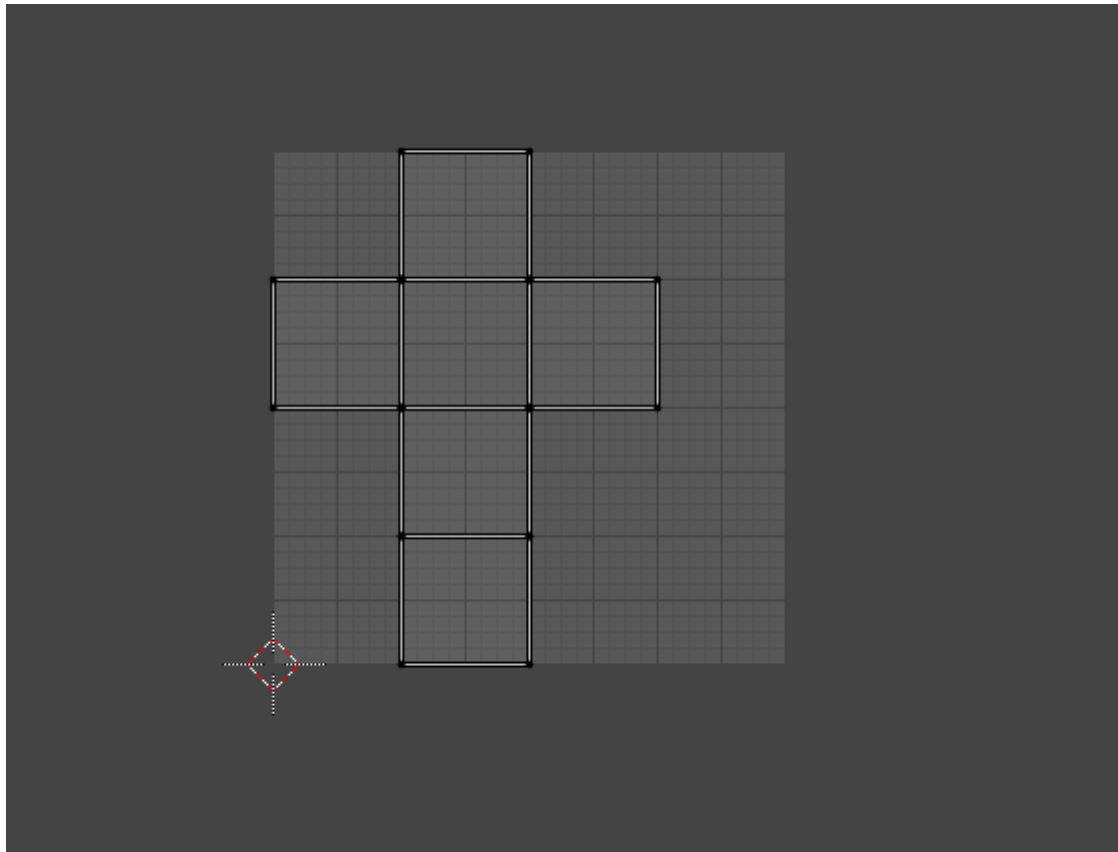
We now need to unwrap our model. Press *[A]* twice to select the entire object. *[A]* is *select all* so basically you press *[A]* until your cube is all orange. Press the *[U]* key to open the *UV* menu and then select *Unwrap*.

Now, in your view tabs at the top of the screen, select 'UV Editing'

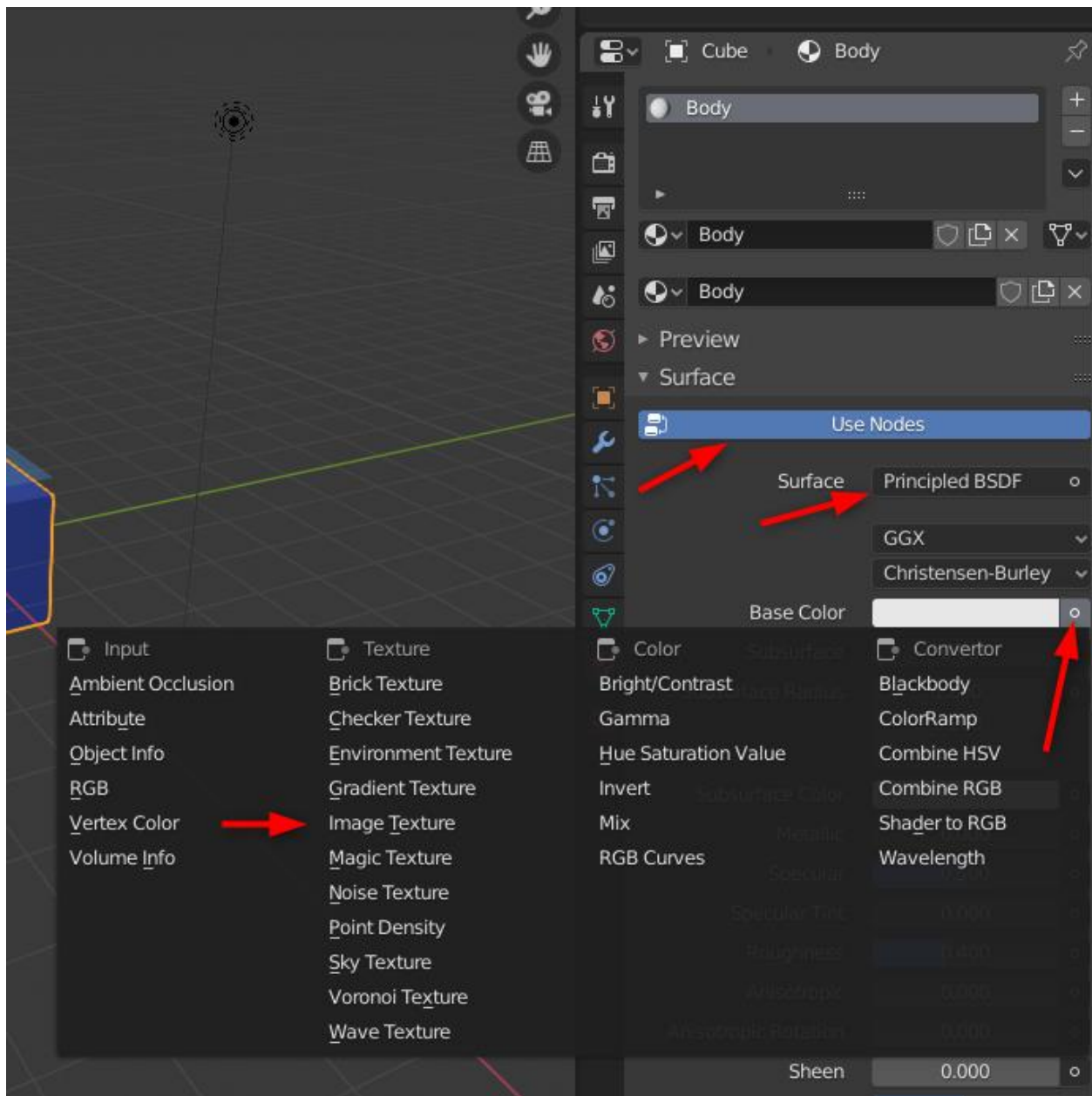
\\MyShip\\MyShip.blend]



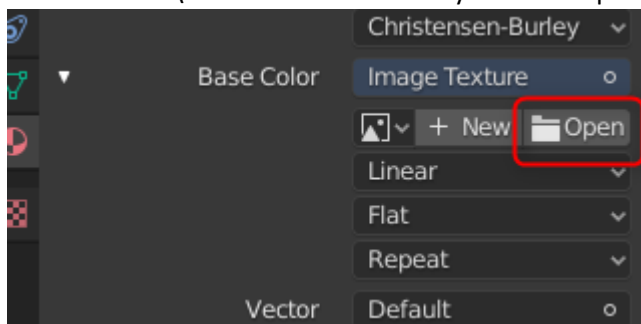
You should see your box 'unwrapped' in the left windows, like this:



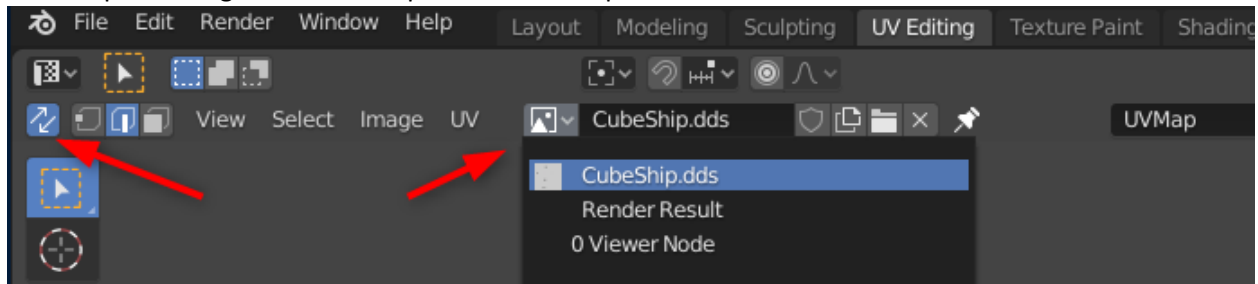
Now, we need to tell this material to use a texture. Open the 'Materials' property pane in Blender. Our 'Body' material should be selected. In Blender 2.81, textures are managed through Nodes. Fortunately, we can get what we need without using the full nodes editor. In the Materials panel, make sure the 'Use Nodes' object is selected (it will have a light blue background). For Surface select 'Principled BSDF'. Now, next to Base Color click the little white circle. See below:



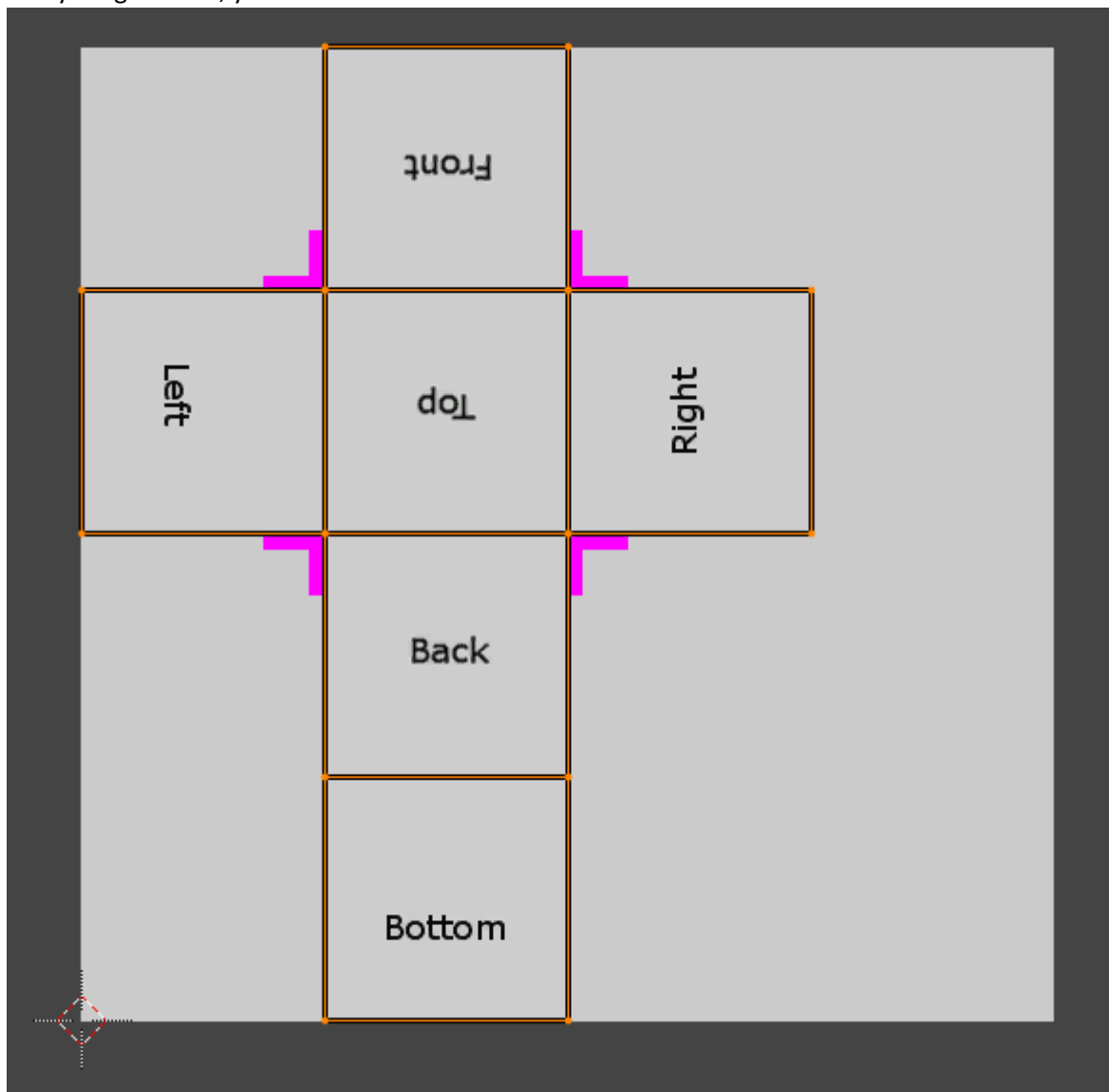
This will tell Blender to expect a texture as the base color. Select 'Open' below Base Color, and navigate to the Orbiter\Textures folder where you have copied the CubeShip.dds file.



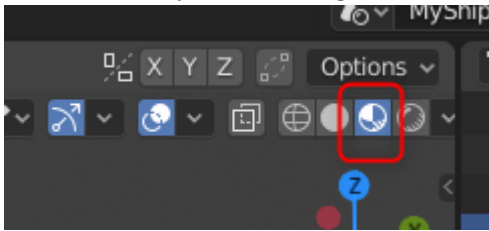
Now, make sure the cube is in edit mode. Press TAB if it is not. In the left window (UV Editor) select the CubeShip.dds image from the drop down at the top of the window:



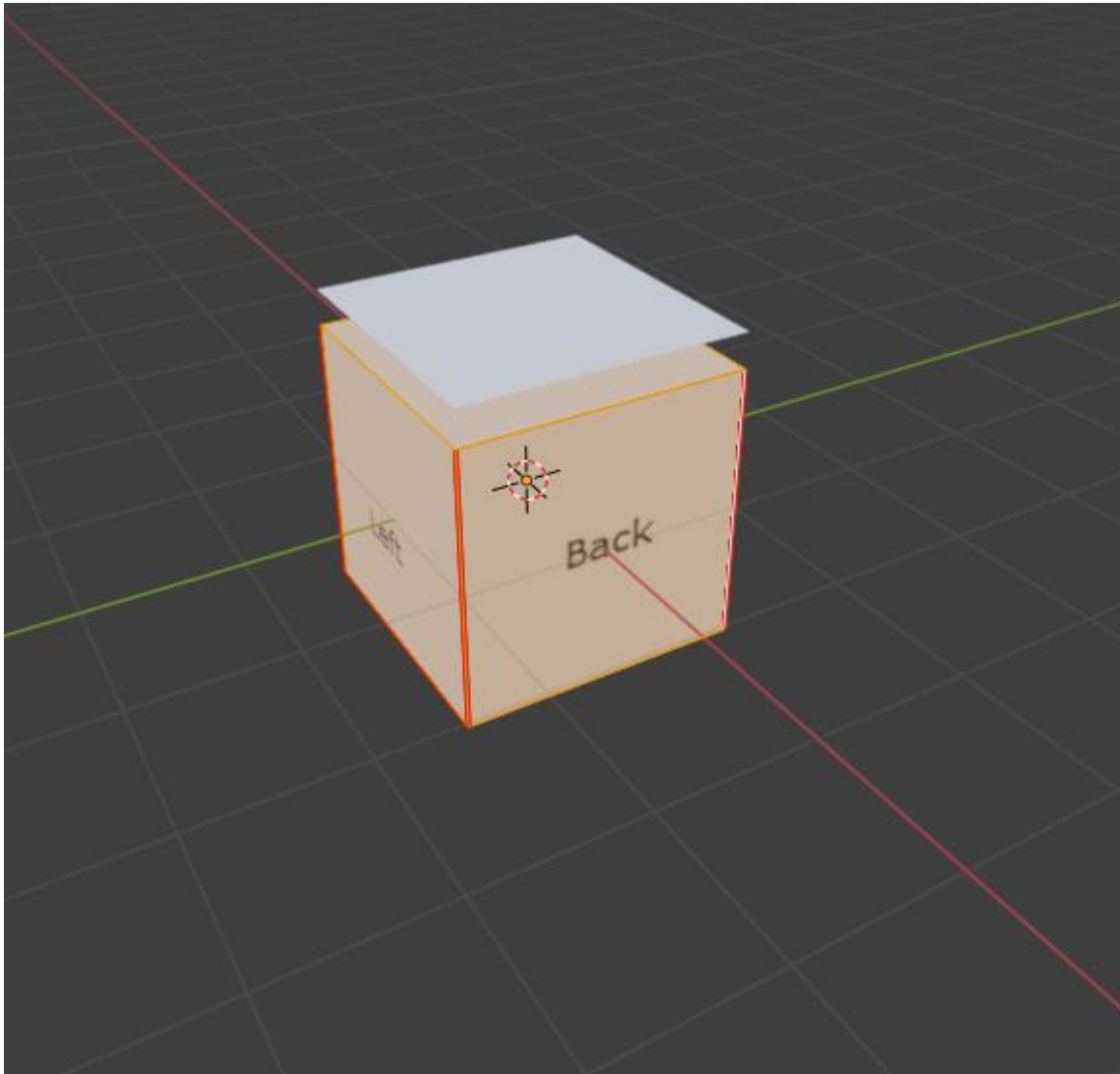
While you are in that window, make sure the box at the left (arrowed with two arrows) is also selected. That will keep the selected vertices between the two windows in sync while you are working. If everything worked, your UV window should now look like this:



In the 3d Viewport on the right, select the viewport shading option (upper right) as shown:

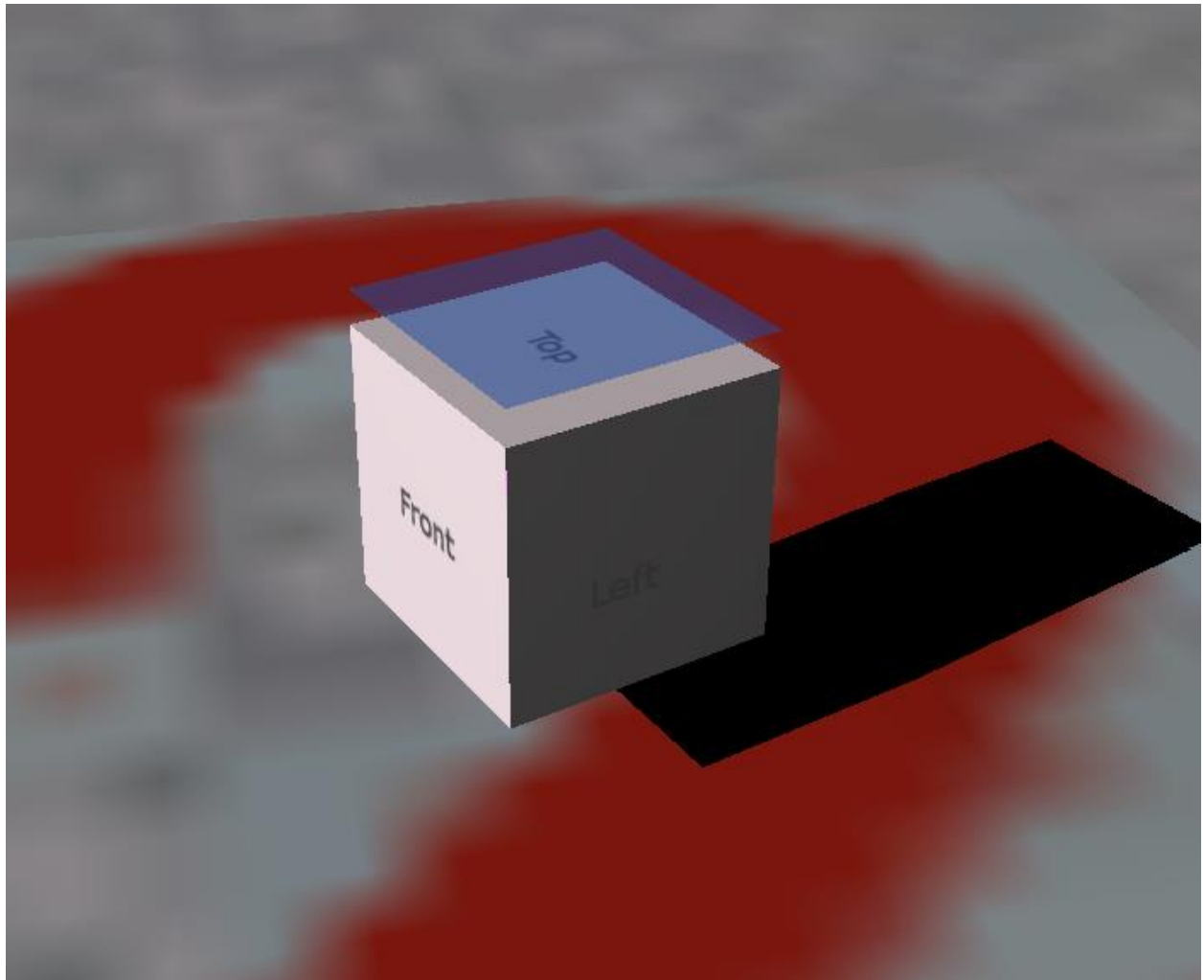


You should now see the texture applied to the cube.



Before we build, go back to the *Materials* property and set the *Diffuse Color* back to white.

Now save, build, and then run in Orbiter, you should see this:



Congratulations! You just created your first modelled and textured Orbiter vessel.