Lesson 1a: Basic Modeling

Goal
To introduce you to tools and methods for creating basic polygon meshes as well as build experience using Maya's interface.

Prerequisite Exercises

- Intro to the UI
- Camera Control
- Basic Selection
- Basic Manipulation
- Polygon Selection
- Polygon Editing

Resources

- Demo Outline
- Demo Handout

⊞ Relevant Hotkeys/Tools

Menu Navigation

Spacebar - Holding down this hotkey will bring up the "hotbox". The hotbox is all of Maya's menus in one place relative to the center of your mouse. This allows you to bypass having to switch menu sets every time you want to access certain functionality.

Camera/Viewport

- **Alt + Left-click and drag** - Rotate the camera.
- **Alt + Right-click and drag / Scroll Wheel** - Zoom the camera in and out.
- **Alt + Middle-click and drag** - Pan the camera.

- **f** - Focus camera on the selected object. The camera will now rotate around that object.
- **4** - Display objects as wireframe.
- **5** - Display objects as solid.
- In four panel view: Hover mouse over viewport and press **Spacebar** to jump in and out.

Object/Component Selection

- **q** - Select Tool. Also useful for "canceling" out of another tool.
- **F8** - Object selection mode.
- **F9** - Vertex selection mode.
- **F10** - Edge selection mode.
- **F11** - Face selection mode.
- While doing either a single click or marquee selection: Hold **Ctrl** to deselect, hold **Shift** to toggle selection, or hold **Ctrl + Shift** to select without deselecting other components or objects.

Edge Selection

- Double click an edge to select the corresponding edge loop.
- Click first edge, hold **Shift**, then double click the second edge to select that part of the edge loop.

Object/Component Manipulation

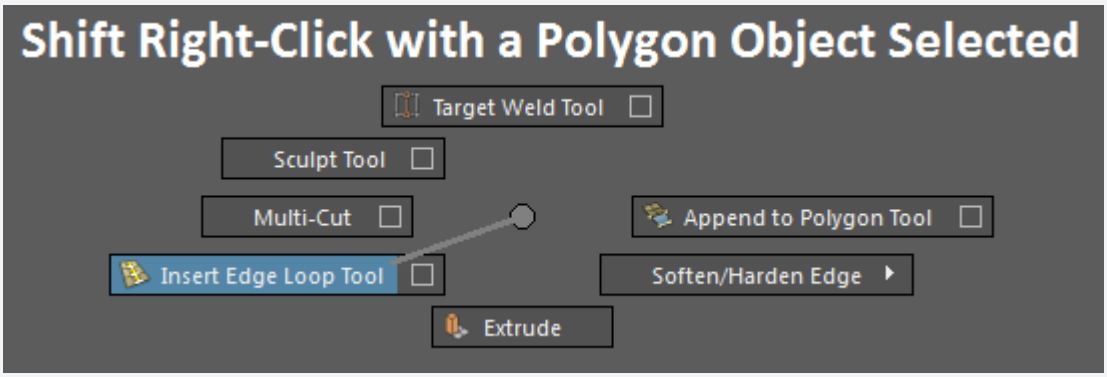
- **Red** tool handles correspond to the x-axis, **green** to the y-axis, and **blue** to the z-axis. Remember this color scheme, as it is used consistently throughout Maya for easy axis identification.
- **w** - Move Tool
- **e** - Rotate Tool

- **r** - Scale Tool
- **+** *(the plus key)* - Makes the tool size larger (affects all manipulation tools). Bigger tool handle sizes make small adjustments easier.
- **-** *(the minus key)* - Makes the tool size smaller.
- **x** - Snap to grid. Hold while using the Move Tool to snap the selected component or object to a location on the grid.
- **v** - Snap to vertex. Hold while using the Move Tool, and hover the mouse over a vertex to snap the selected component or object to that vertex's position. Works for both single-axis and multi-axis movement.

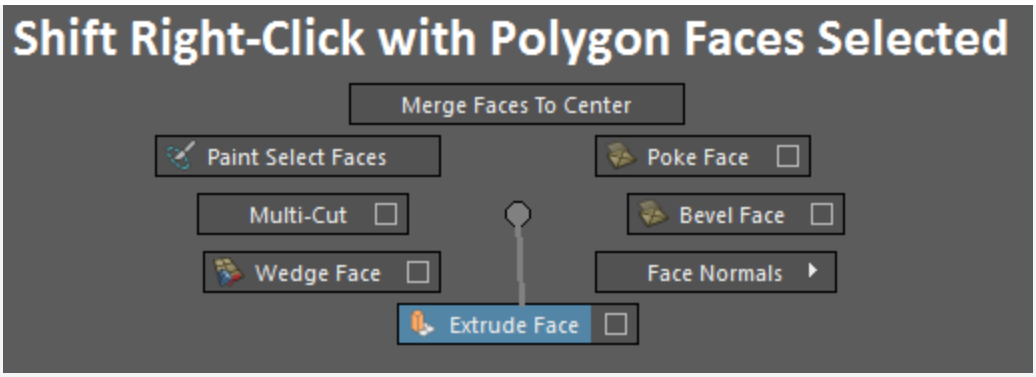
Mesh Editing Tools

- **Insert Edge Loop Tool** - Inserts a continuous loop of edges perpendicular to the edge specified. Left click, hold, and drag to choose where exactly the new loop goes.

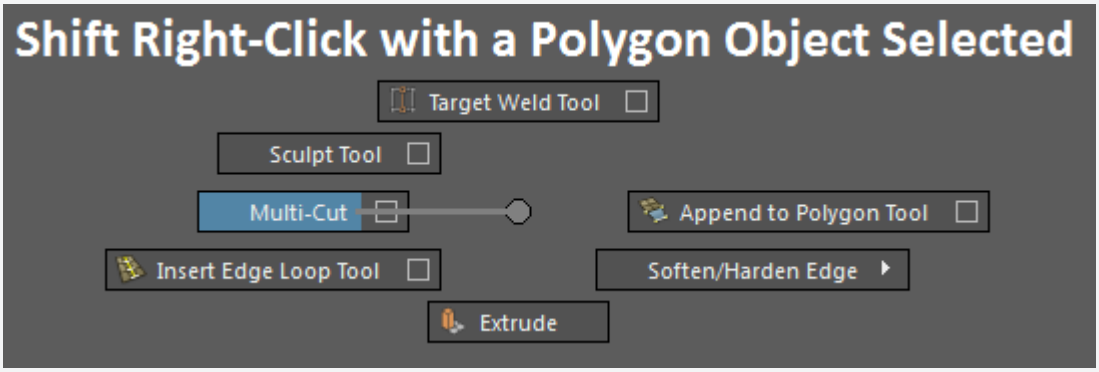
  ***DO NOT HOLD SHIFT** - Maya will modify the edge loop you insert in unwanted ways.



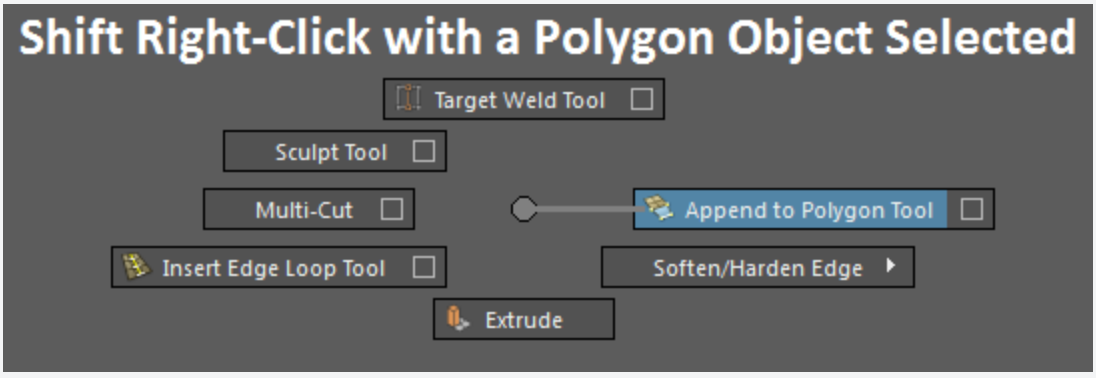
- **Extrude Face** - "Extrudes" a face or set of selected faces . Be careful not to extrude a face more than once without moving the extruded face first, as that will result in overlapping faces and tricky to fix geometry. There is also an equivalent for extruding edges.

- 

- **Multi-Cut Tool** - Select points on vertices, edges, or faces themselves to define where to cut edges into polygons. While the tool is active you can hit **Delete** to go back one and right click to finalize.

- 

- **Append to Polygon Tool** - Connects two edges together with a new face. The edges being connected must be open (adjacent to a hole, not on a closed surface) and part of the same object.

- 

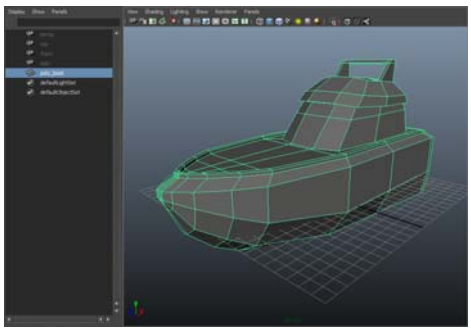
- **Ctrl + d** - Duplicate the selected objects.

- **Mesh → Combine** - Combines the selected meshes into one. Disconnected pieces of geometry will stay disconnected, but they will still count as part of the same object.

The Most Important Hotkeys You Will Ever Learn ...Ever!

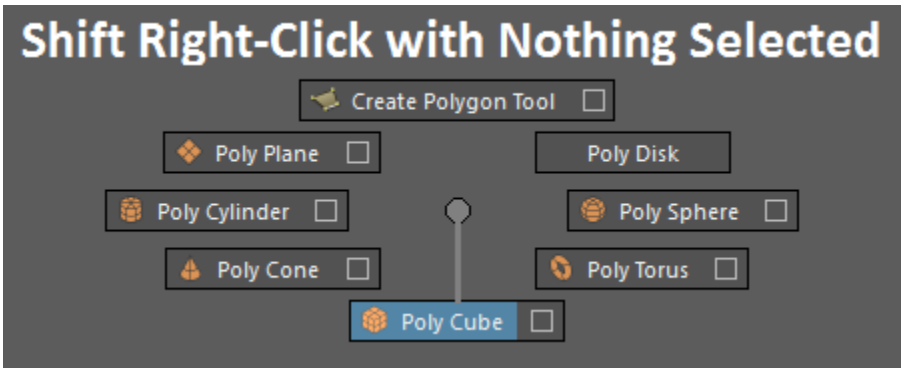
- **z** - Undo. Undoes the last thing you did. Applies to selections and de selections as well. Does *not* apply to camera movement by default. Maya's undo queue is initially set to only allow 50 undos in a row, so go to **Window → Settings/Preferences → Preferences**, select **Undo** from the list, and set the Queue Size to something like 500. You can set it to Infinite, but that may increase the likelihood of Maya crashing. Note for later in the year: importing resets the undo queue, so be careful.
- **Z** *(Shift + z)* - Redo. Undone things are reverted. Be careful not to select or deselect anything if you are doing of bunch of redos, as that will reset the redo queue.
- **g** - Repeat last action. If you need to perform a single action multiple times (such as extruding) but do not want to repeatedly dig through Maya's menus, just hit the **g** key.

In this project we will create a boat using a polygon mesh. Shown below is our reference image as well as the final output. Create a new Maya file to begin.

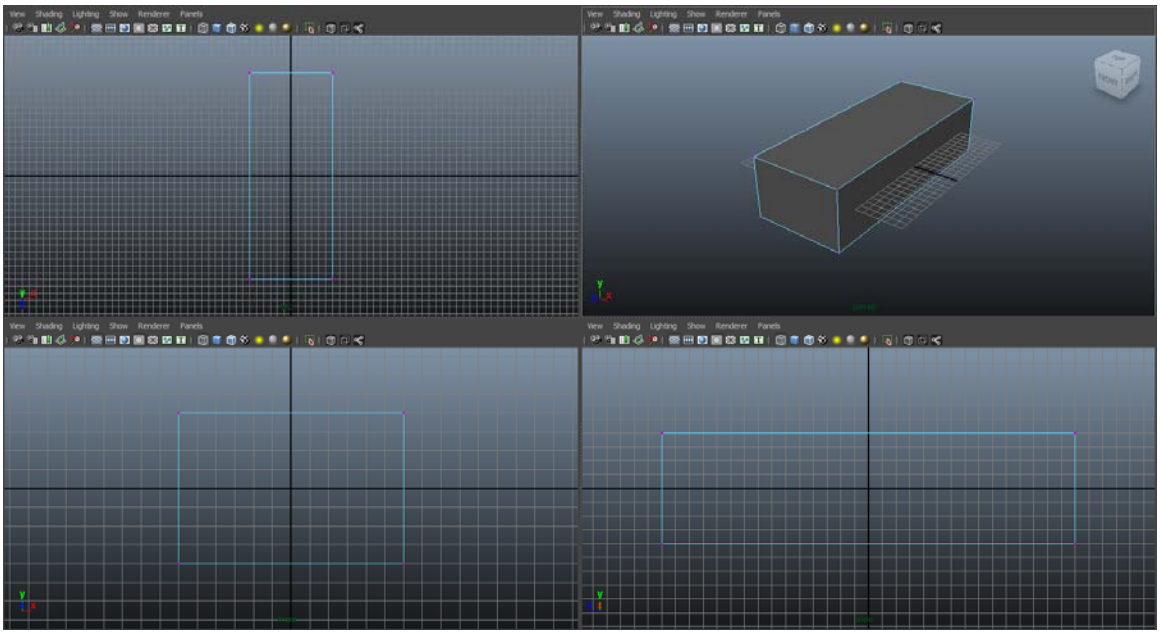



Before you start, make sure you are using the "Modeling" menu set, as you will sometimes use commands from this menu set.

1. Create a cube.



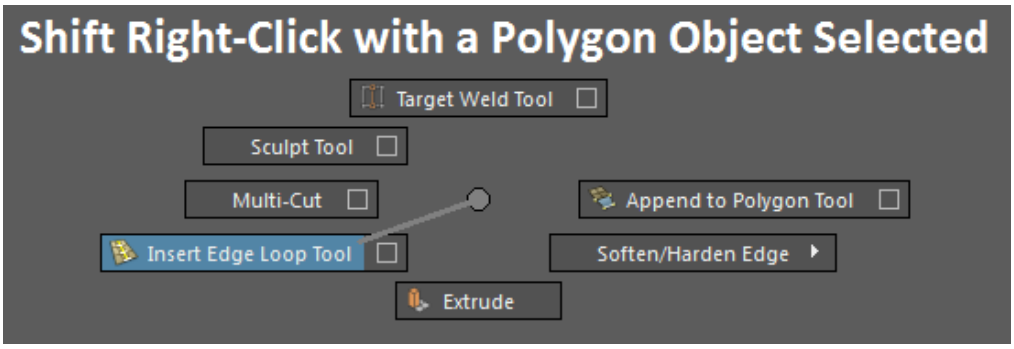
Move and scale the cube so that it resembles the cube below.

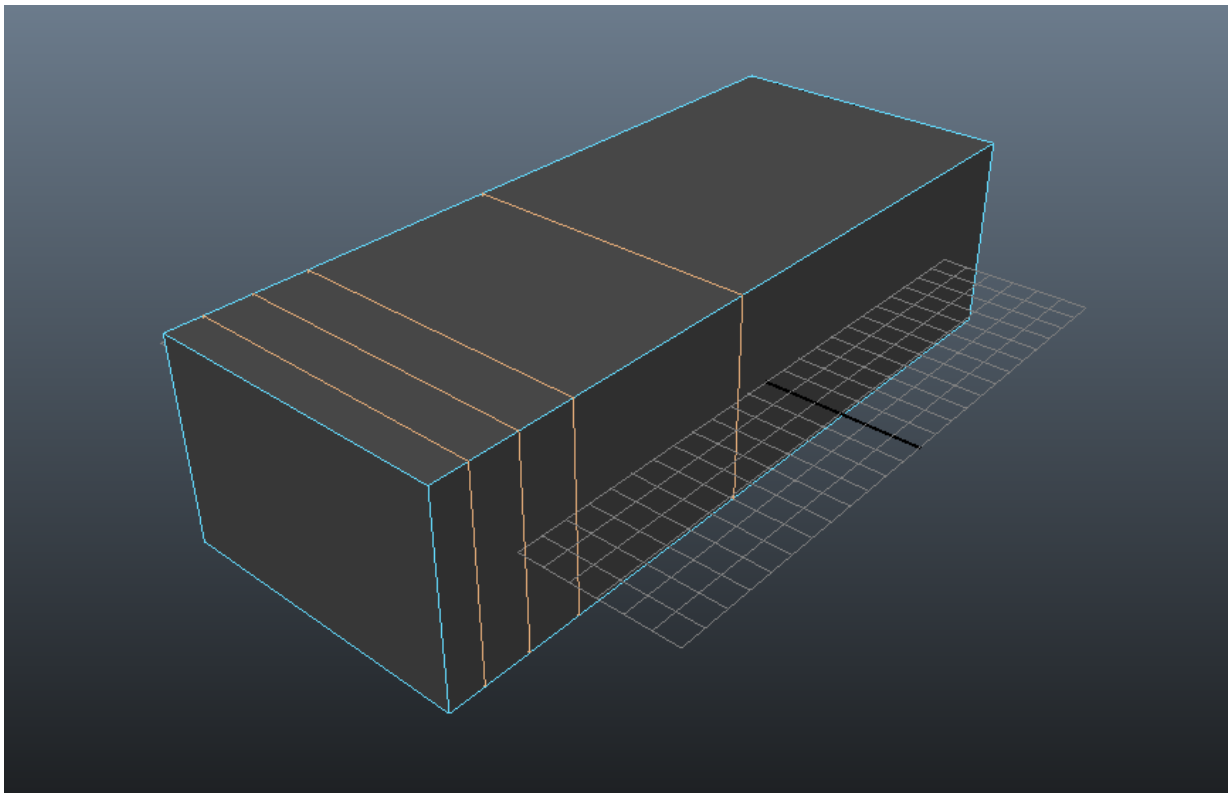


Start by centering the cube in the scene. Hit '**w**' to activate the Translate Tool. Next, hold '**x**' to enable grid snapping. Then, while continuing to hold **x**, drag the center tool handle to the origin of the grid and the cube will snap to there.

Now you can hit '**r**' to activate the Scale Tool and resize the cube. You don't have to exactly match the size to the image, but be sure to approximate the relative proportions.

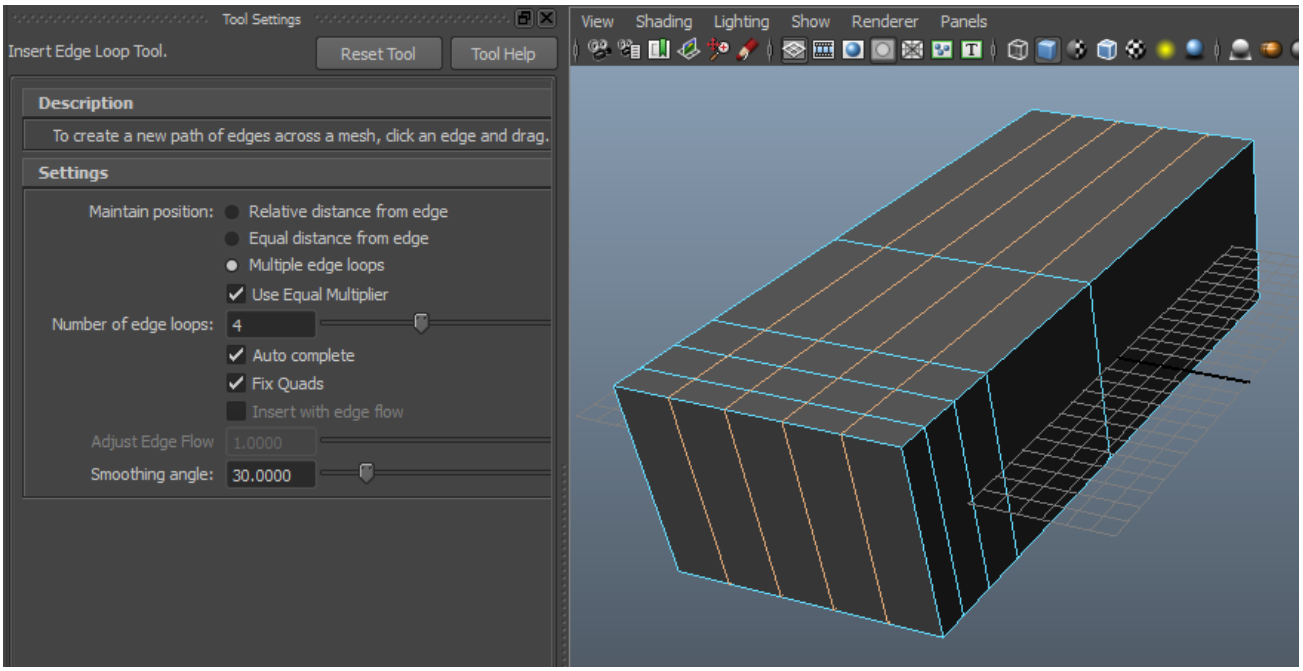
2. Add the indicated edge loops by activating the Insert Edge Loop Tool and clicking on one of the edges going down the length of the boat. When accessing this tool through the marking menu make sure you are in Object Mode and the box is selected first.





3. Add four edge loops down the length of the boat.

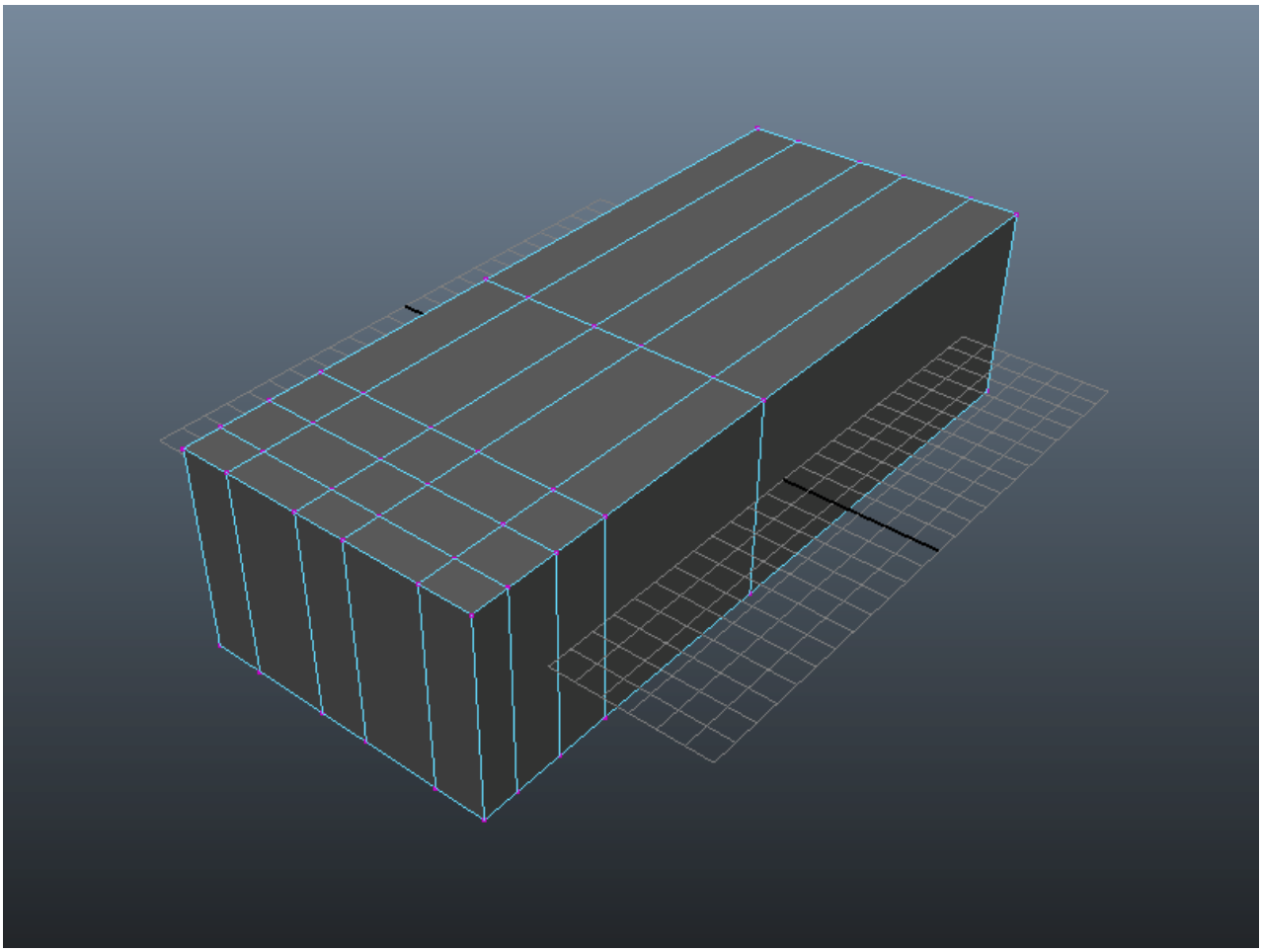
You will want to insert all of them at once so they are evenly spaced. With the Insert Edge Loop Tool active click the Tool Settings button ( ) at the top right of the interface. Change the settings to what is shown below then insert the loops.



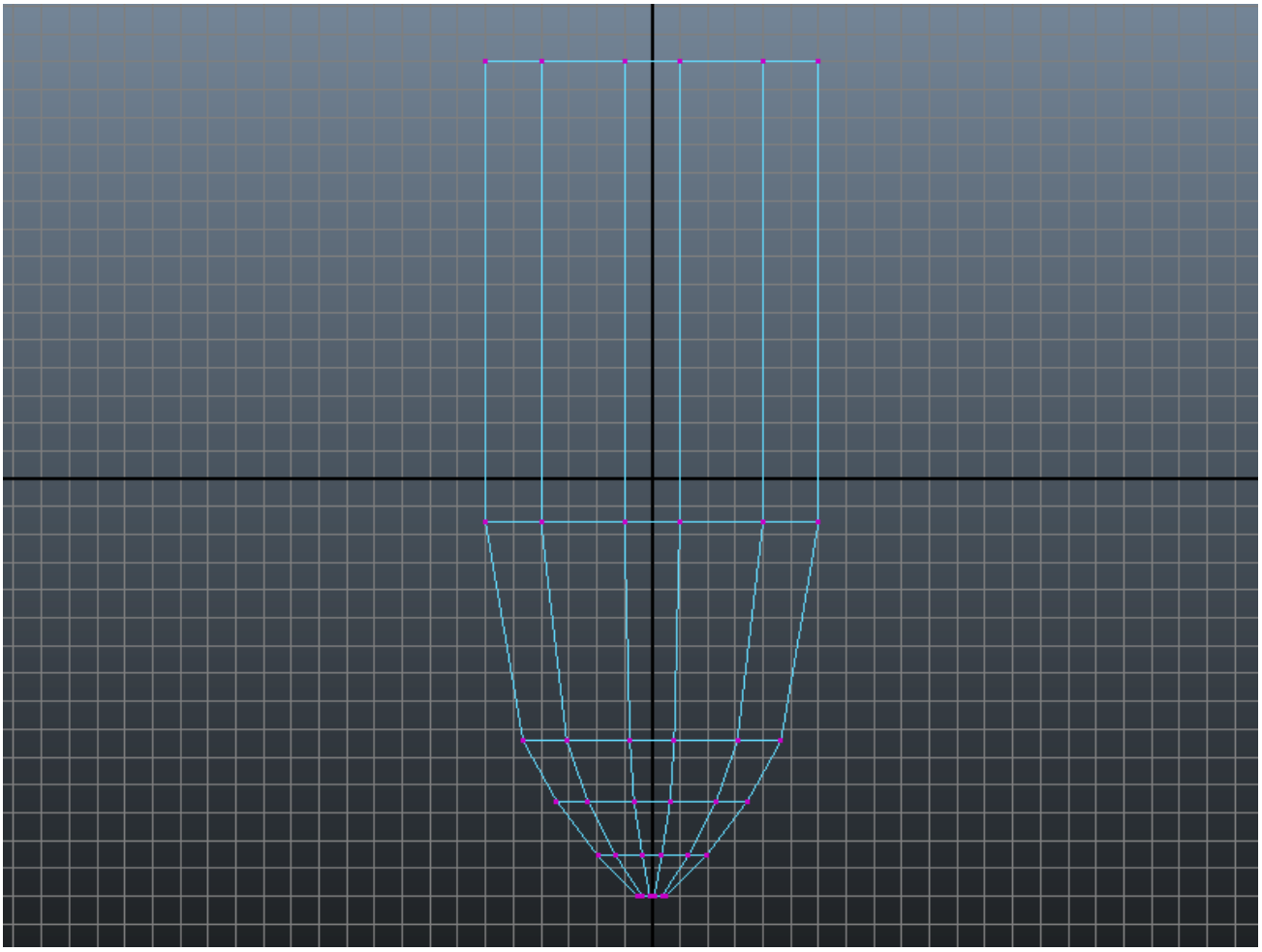
Click "Reset Tool" after you are done to revert the settings back to normal.

Now select the middle two edge loops of the four you just added and use the Scale Tool to shrink them inwards symmetrically. In Edge Mode you can double click an edge to select its loop, and then hold **Shift** and double click another edge to add its loop to the selection.

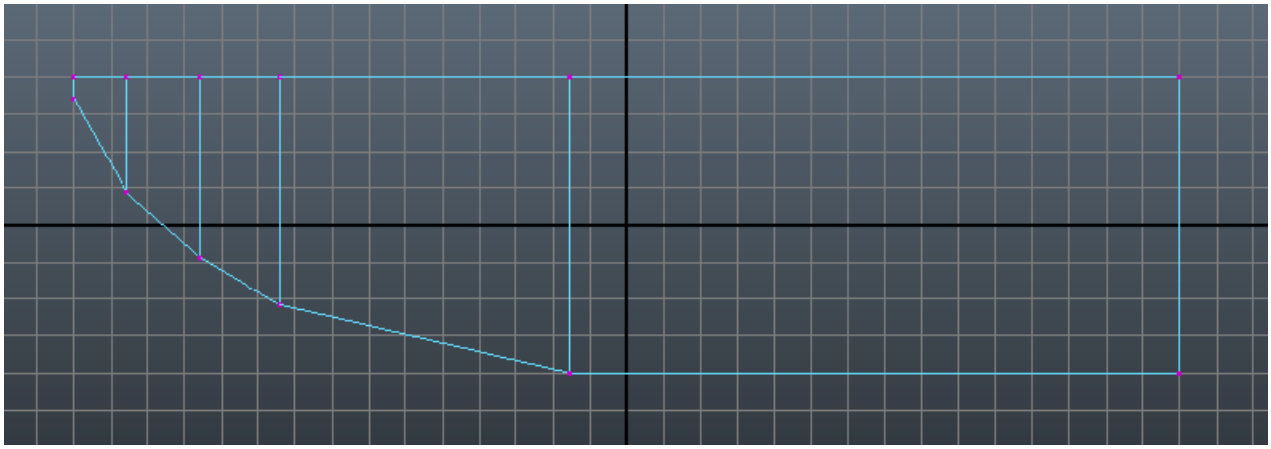
Similarly, select the outer two edge loops of the same four and use the Scale Tool to expand them outwards symmetrically.

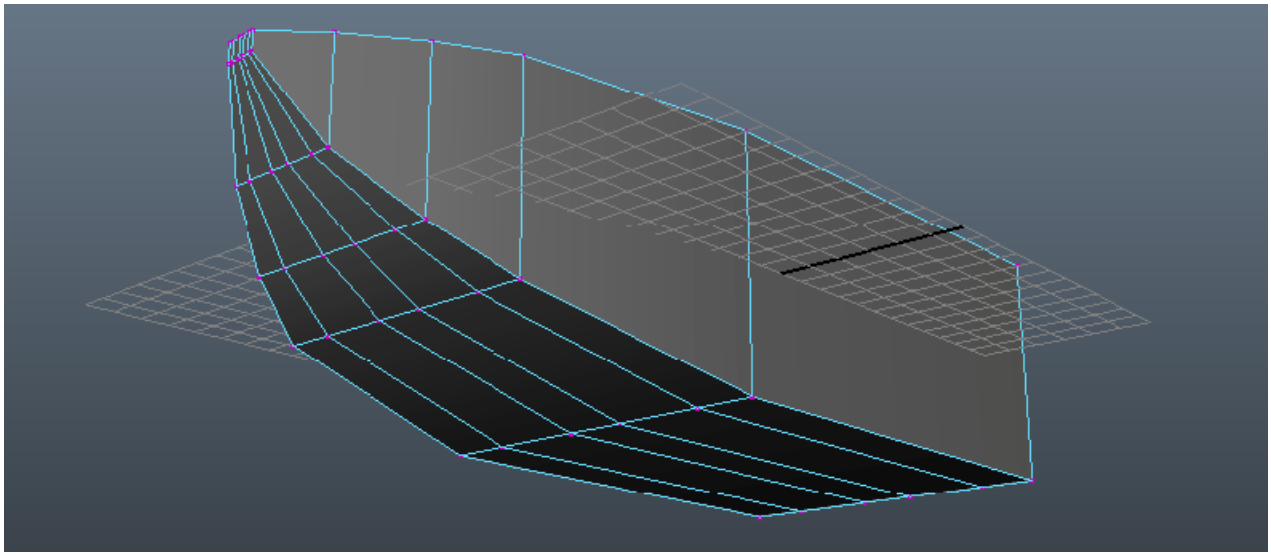


4. Go to the top camera to view the boat from above. Select each row of vertices in the front of the boat and scale them inward to create a tapered point.

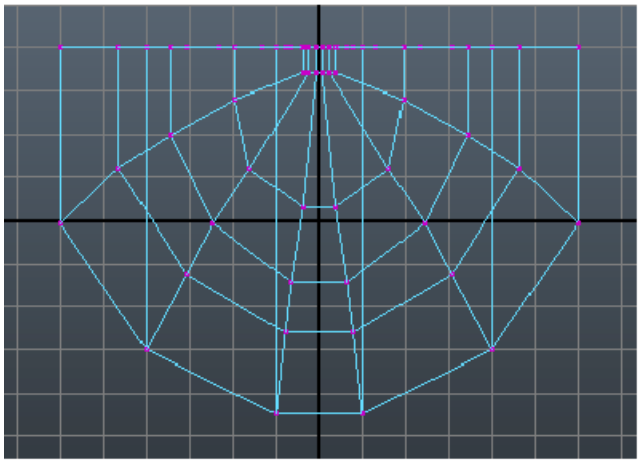


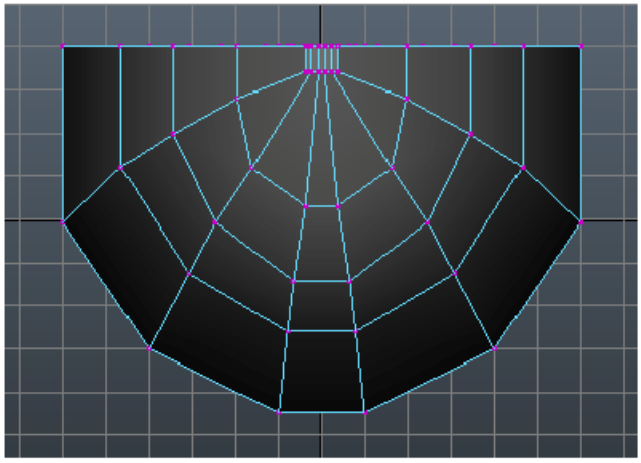
5. Go to the side camera. Select the bottom vertices and move them up to create the slope of the hull in the profile.

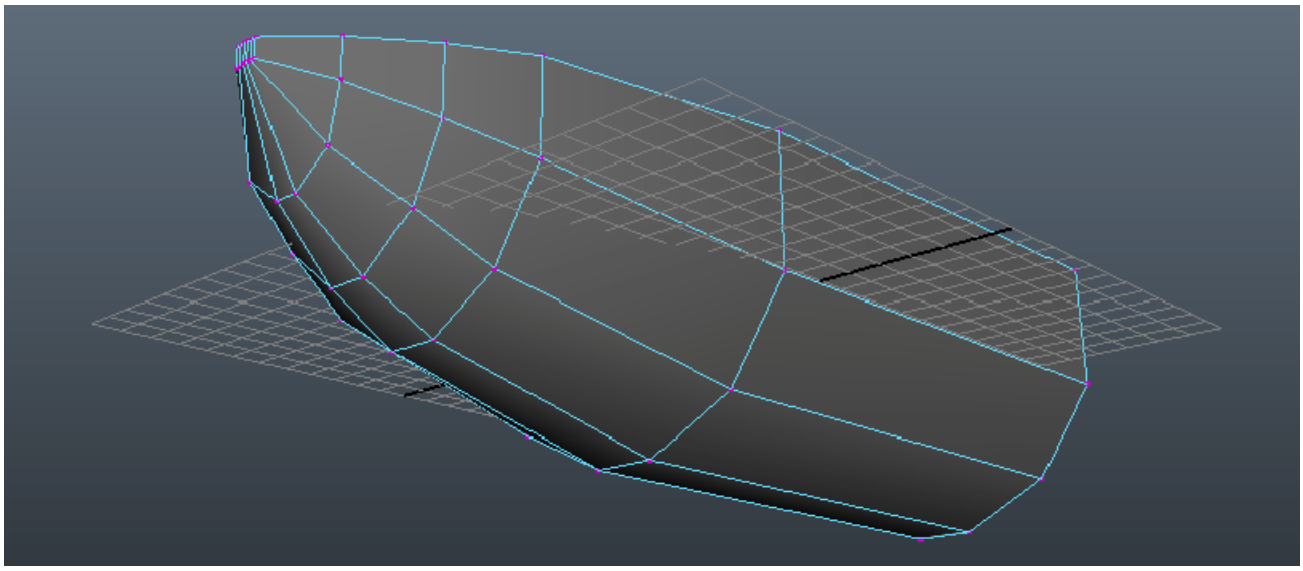




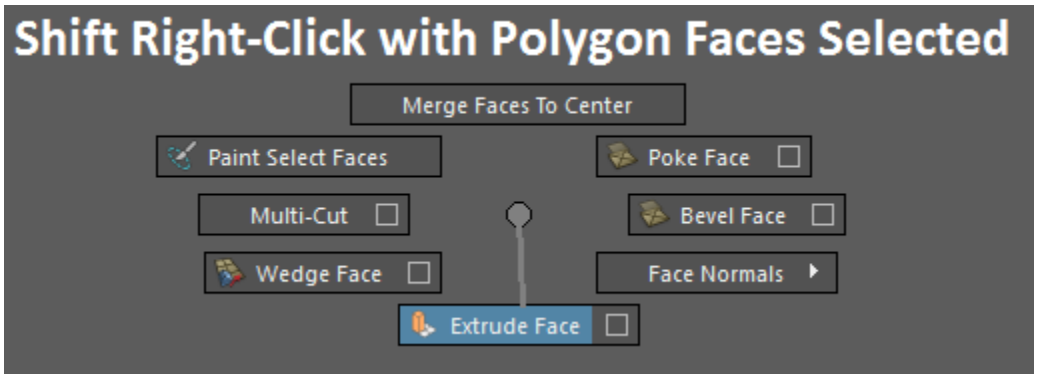
6. Right now the hull will only appear curved from the top and side views. However, the perspective view reveals that there are very sharp creases going down the sides of the boat. Using a combination of the perspective and front views select the edges along the bottom of the boat and move them up to create a curved hull.



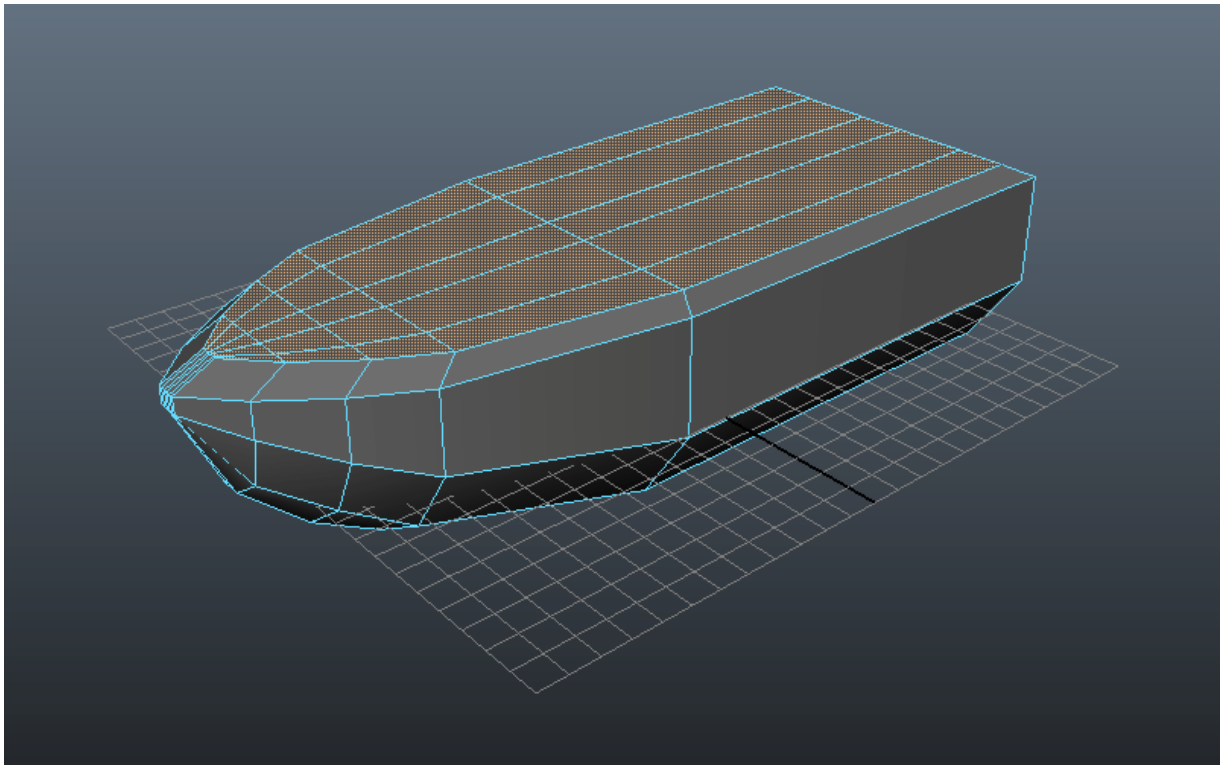




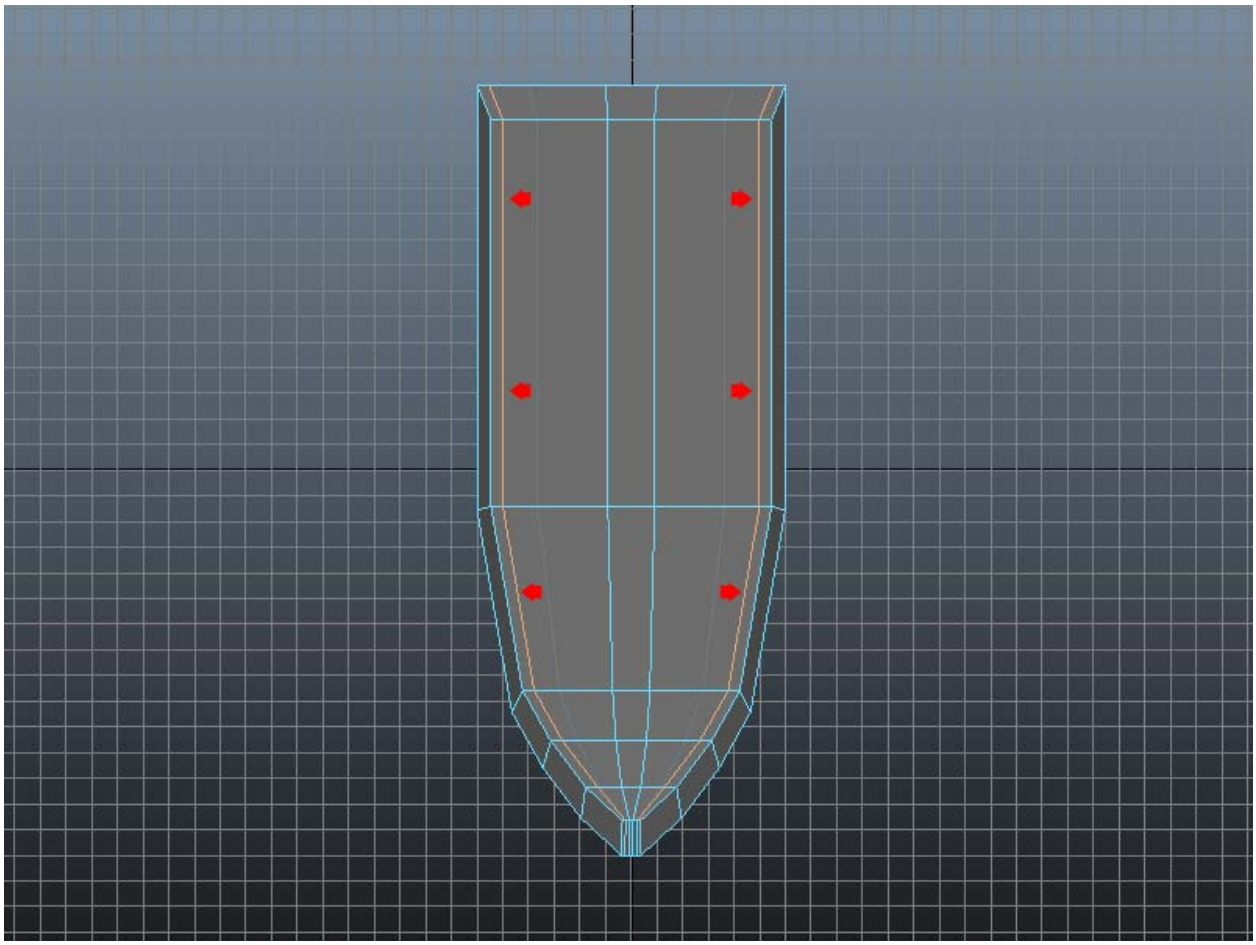
7. Select all of the top faces of the hull and extrude them upward.



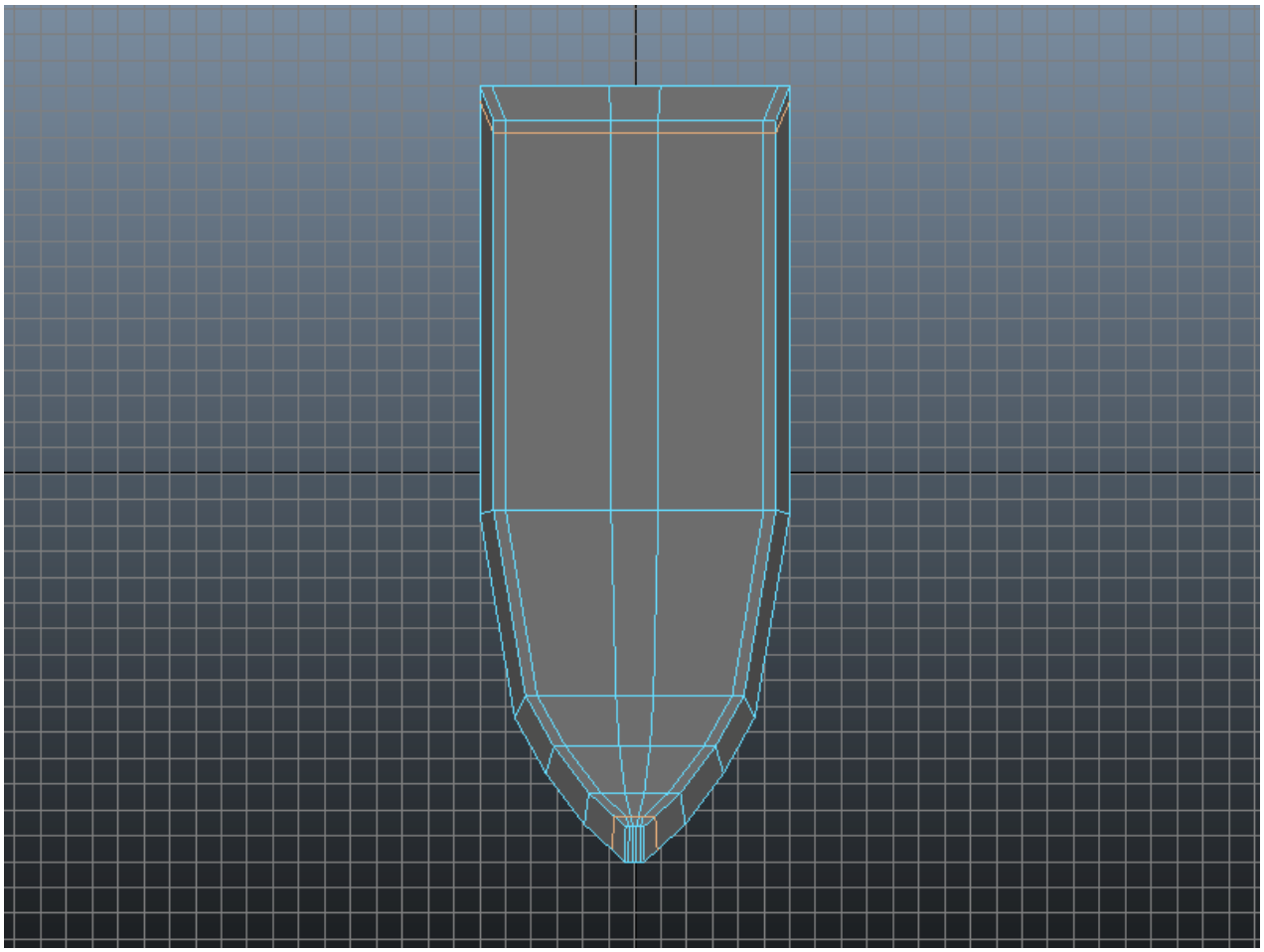
Immediately after extruding, use the Scale Tool to shrink them inward and then move them up slightly to create the deck of the boat.



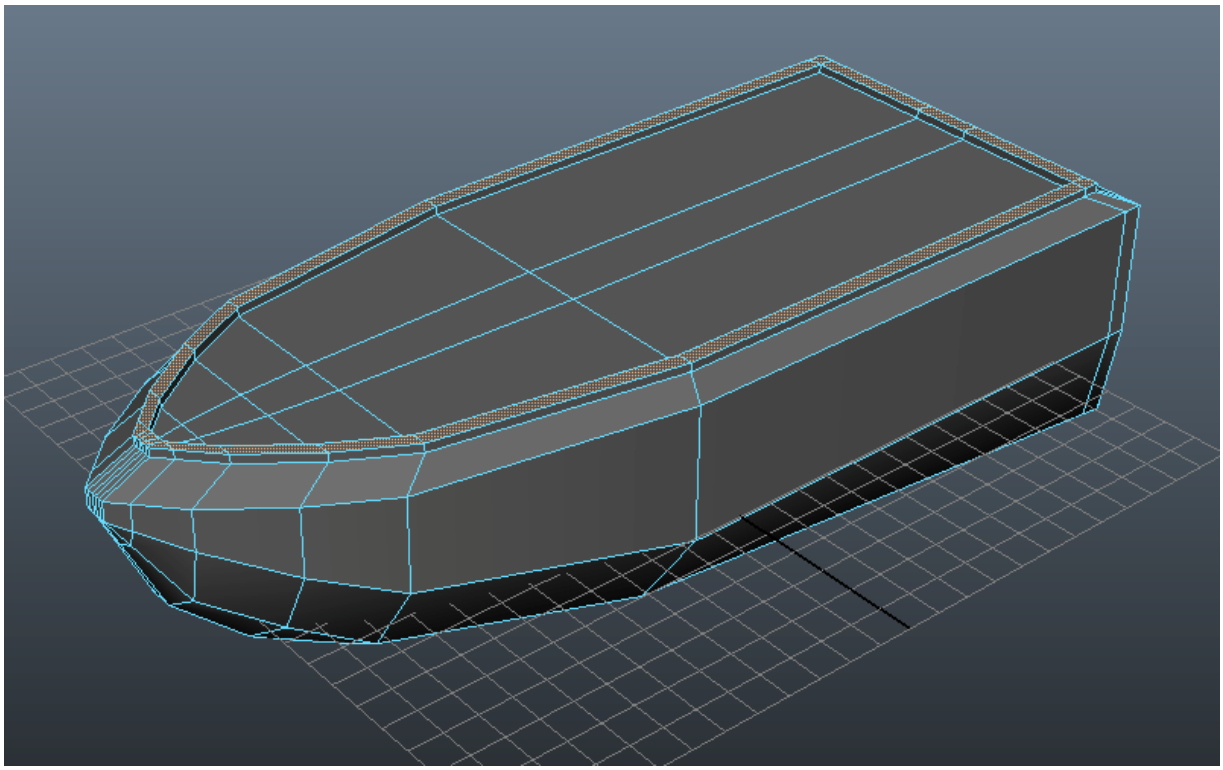
8. In the top view, move the edge loops specified in the picture outward so they create a border of uniform width on the sides of the deck.



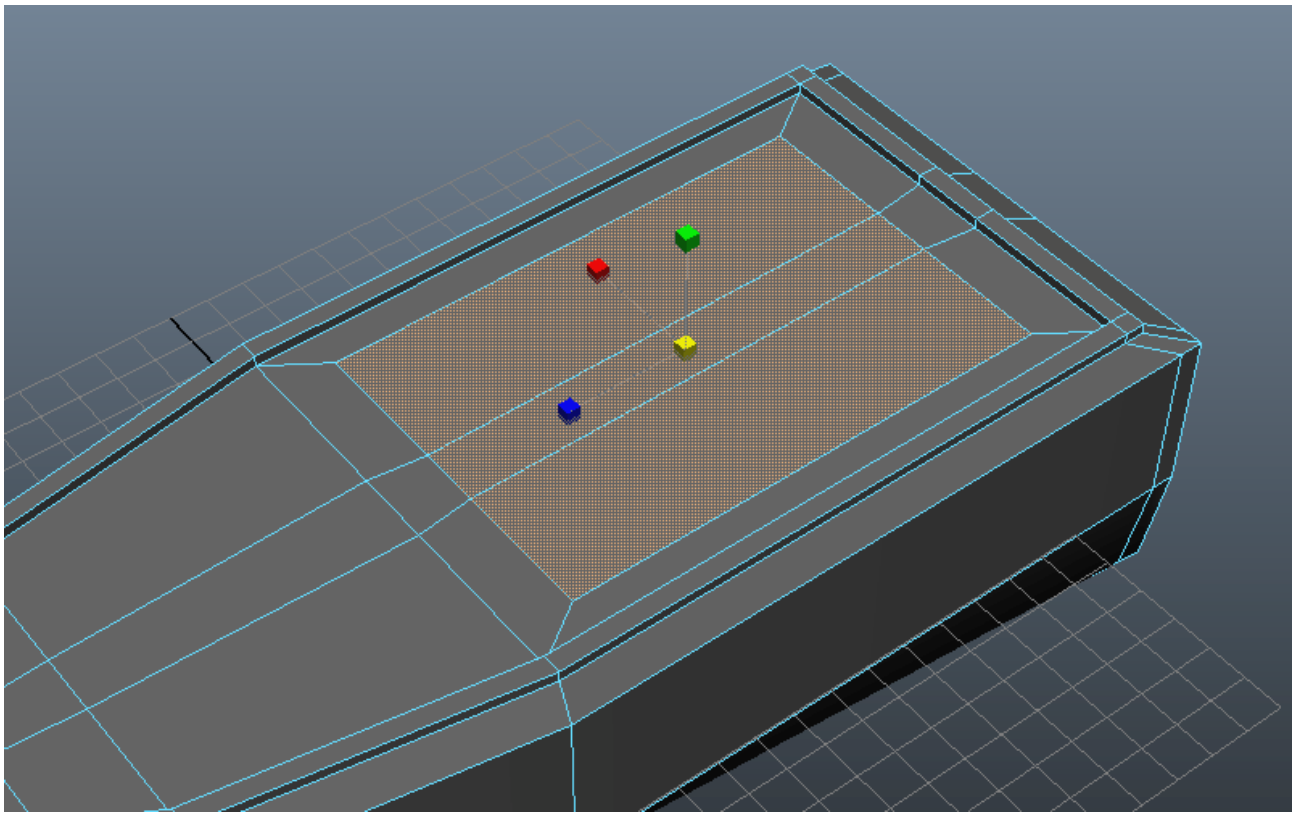
9. Add an edge loop to the front and back of the deck to complete the border.



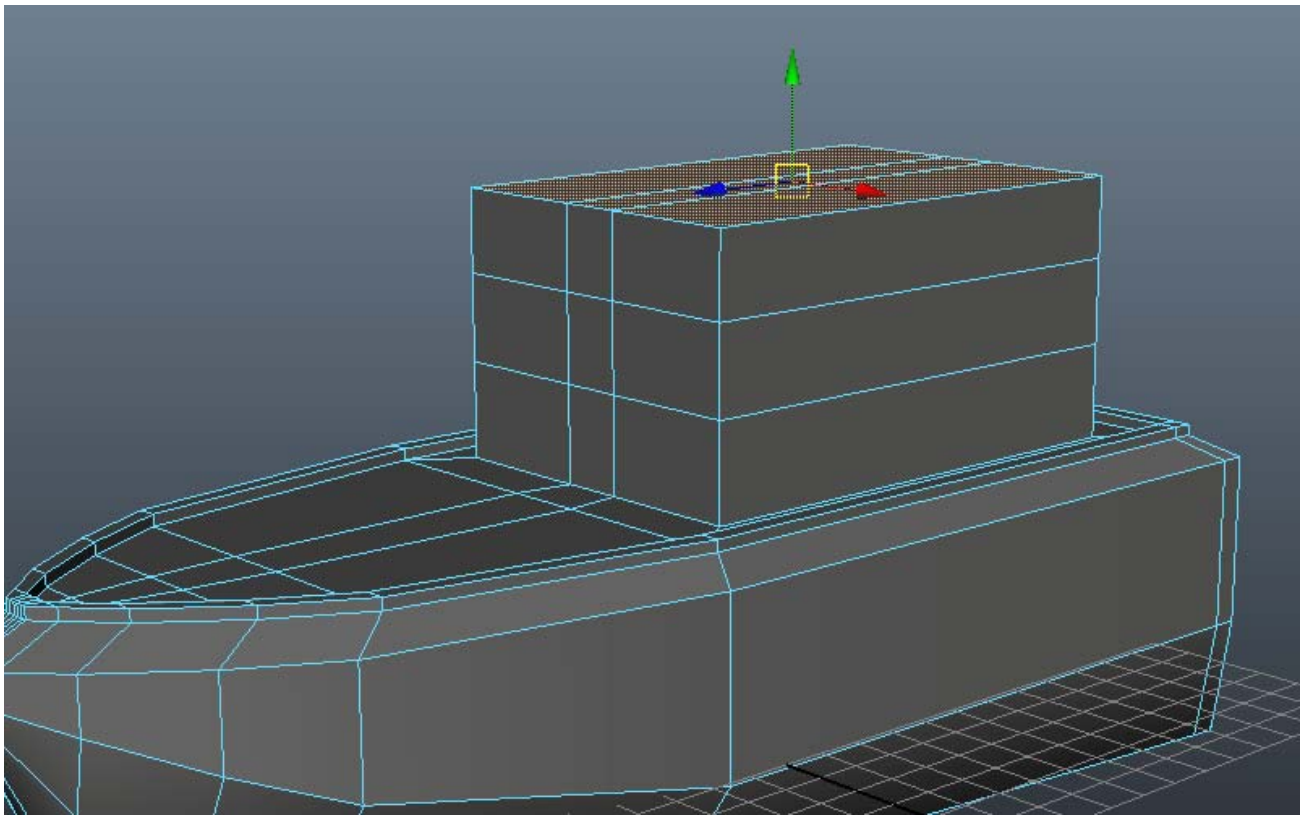
10. Select all the faces in the border and extrude them straight up slightly to create a rim around the deck.



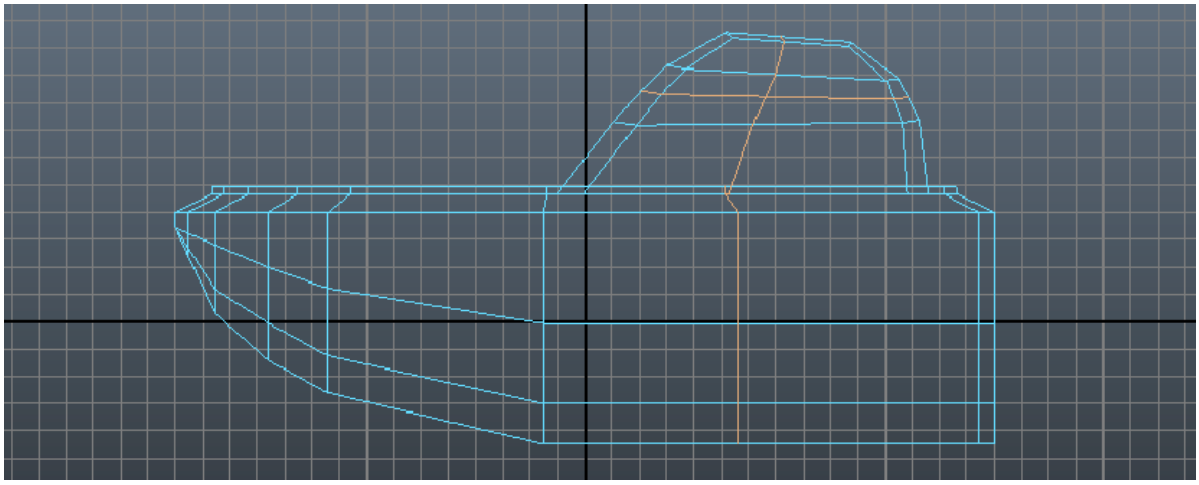
11. Select the faces toward the back of the deck and extrude them, then scale them inward.

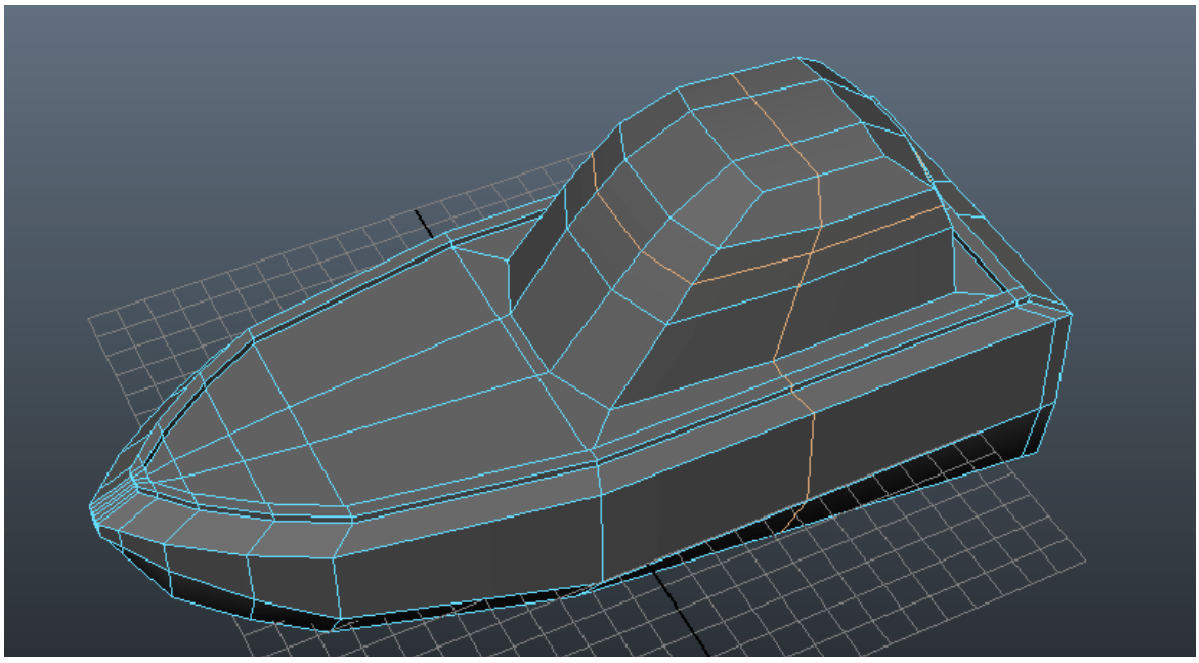


12. With the same faces selected, extrude them upward three times to create the cabin. However, before doing so, you should be introduced to a *very* important and useful hotkey if you have not been already: the **g** key. This hotkey activates the last action/tool used so you do not have to repeatedly navigate the menus. Use the **g** key to complete the extrusions.

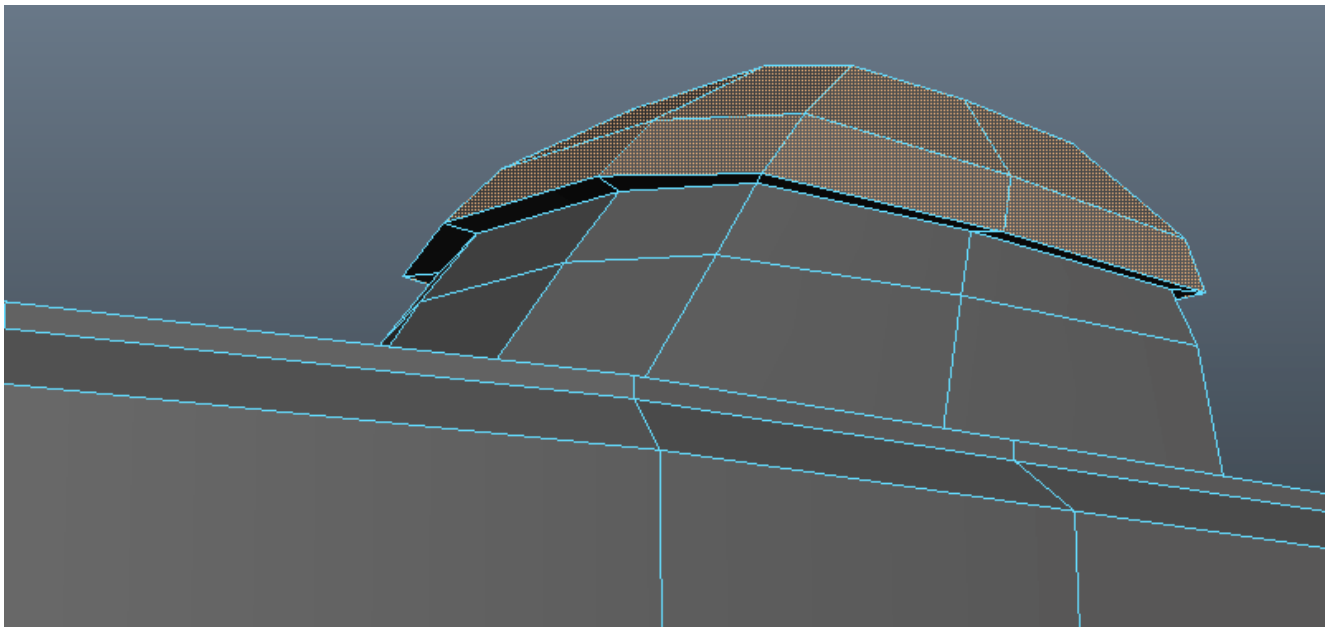


13. Using a combination of the scale and move tool adjust the vertices to give the cabin a sleeker look. The front faces of the cabin should slant and curve backwards. Add the edge loops shown in the picture once you are done.

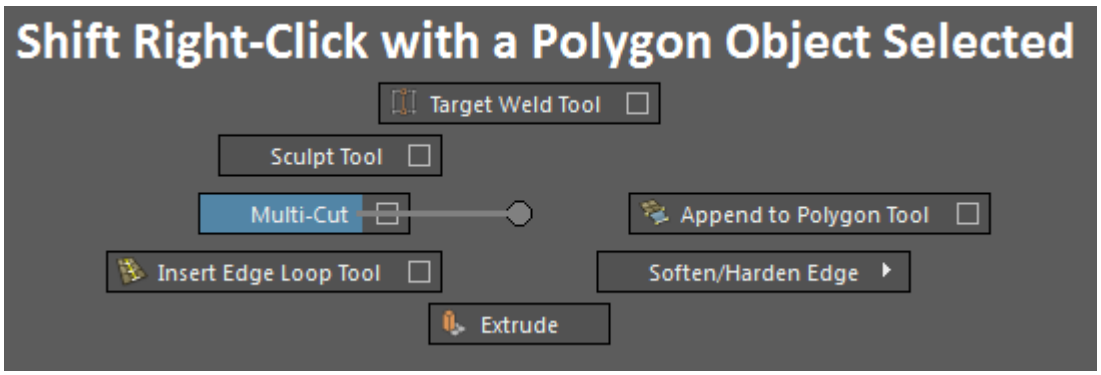


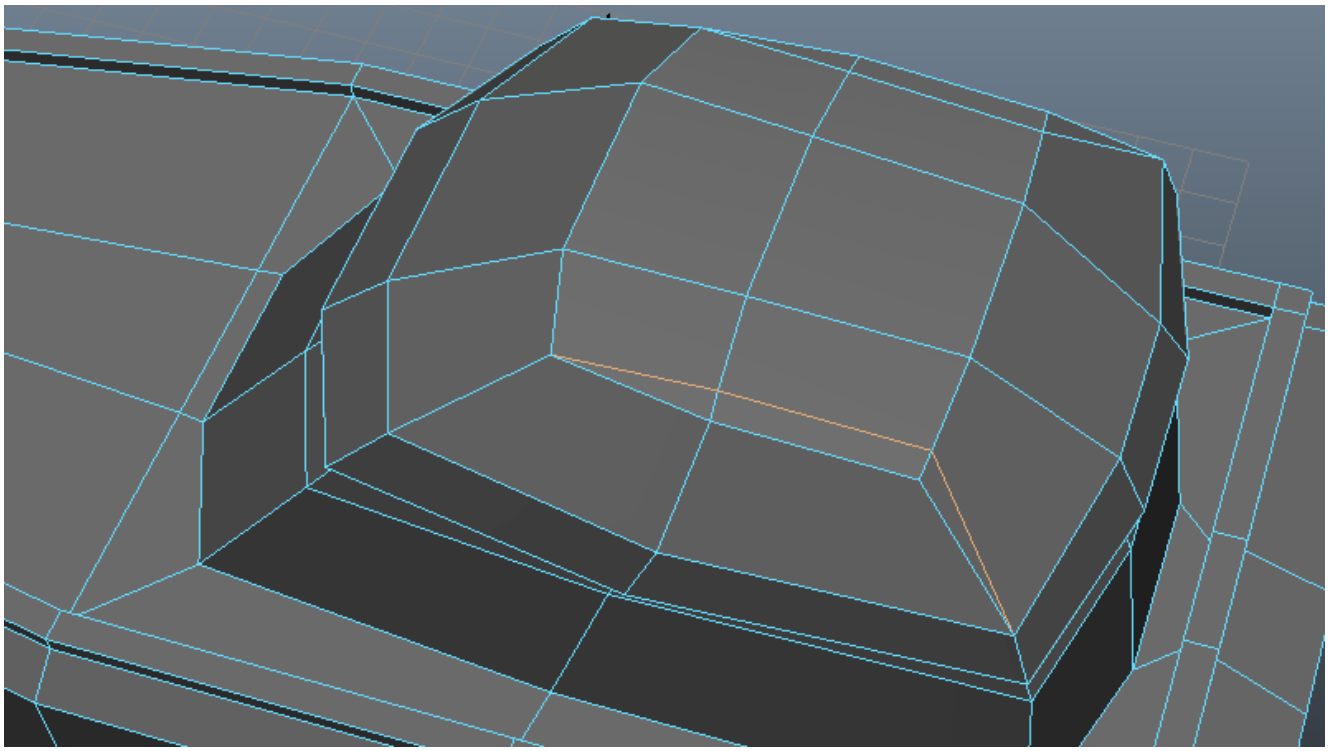


14. Select the top faces of the cabin, extrude them out and then move them down as necessary to create the lip of the roof.

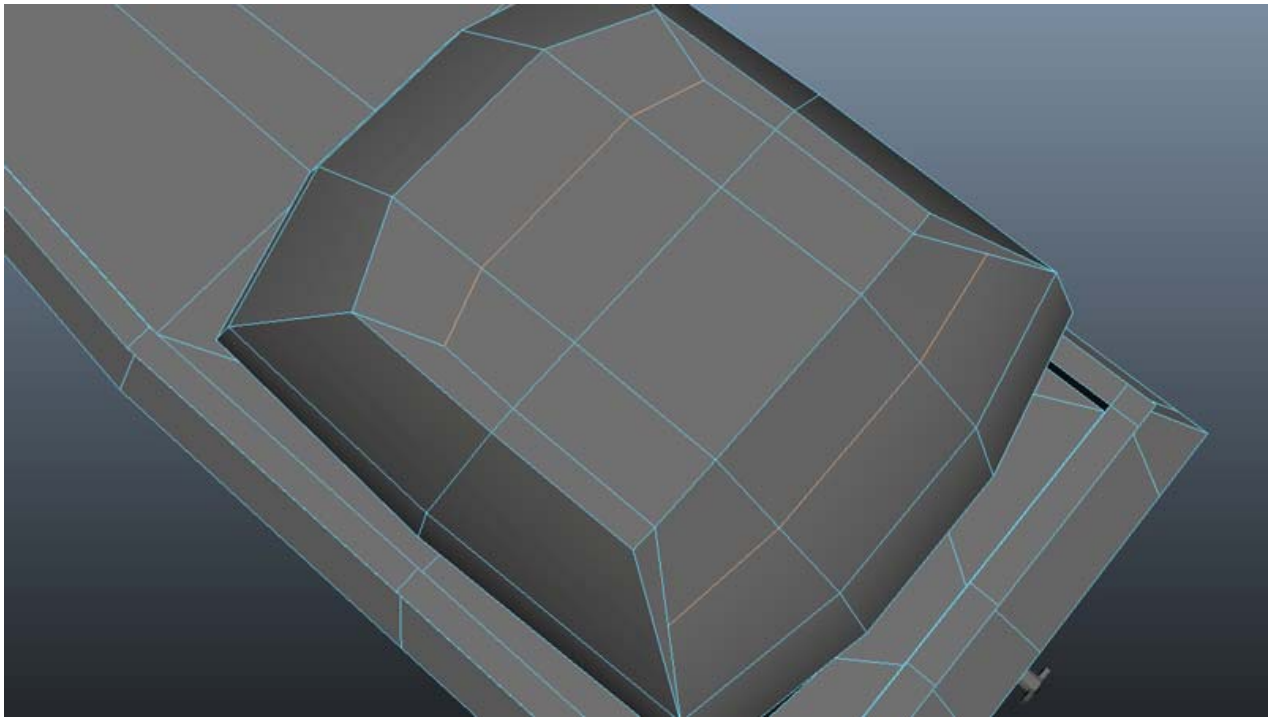


15. Use the Multi-Cut Tool to create the lines shown in the picture on each side of the cabin roof.

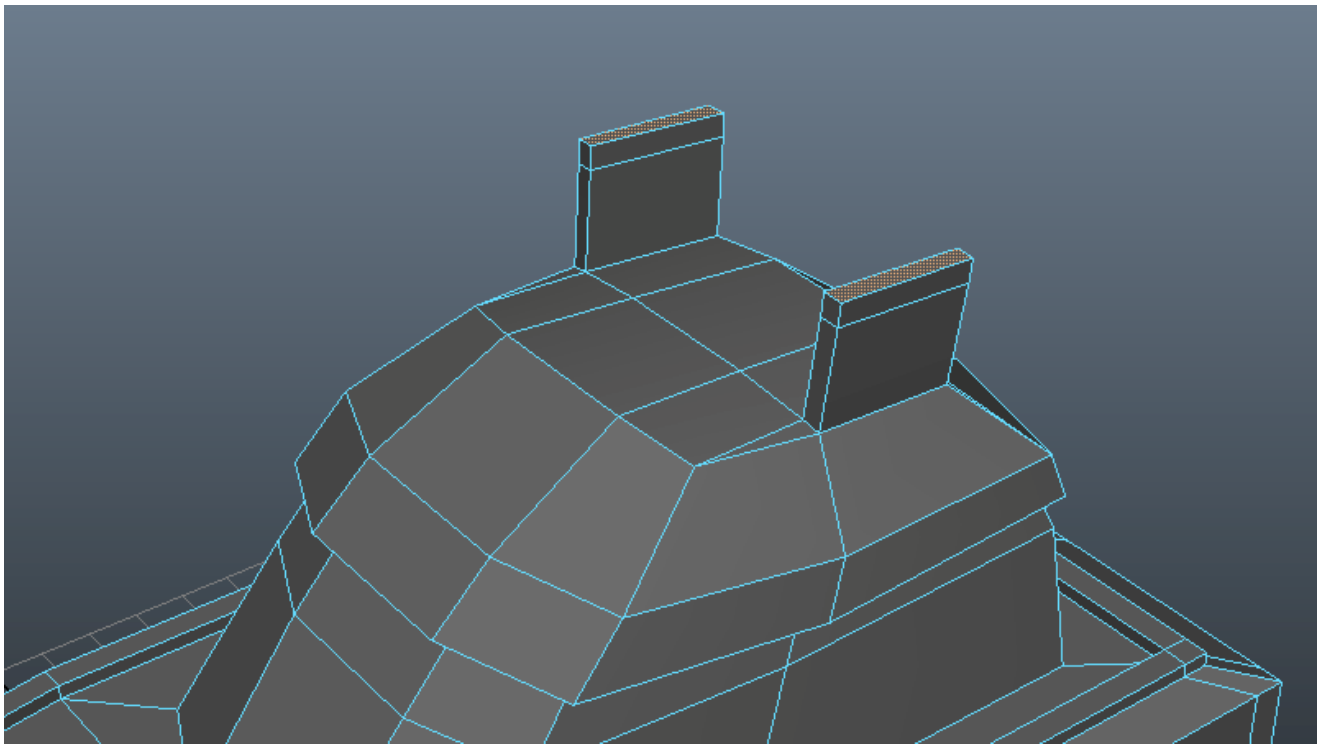




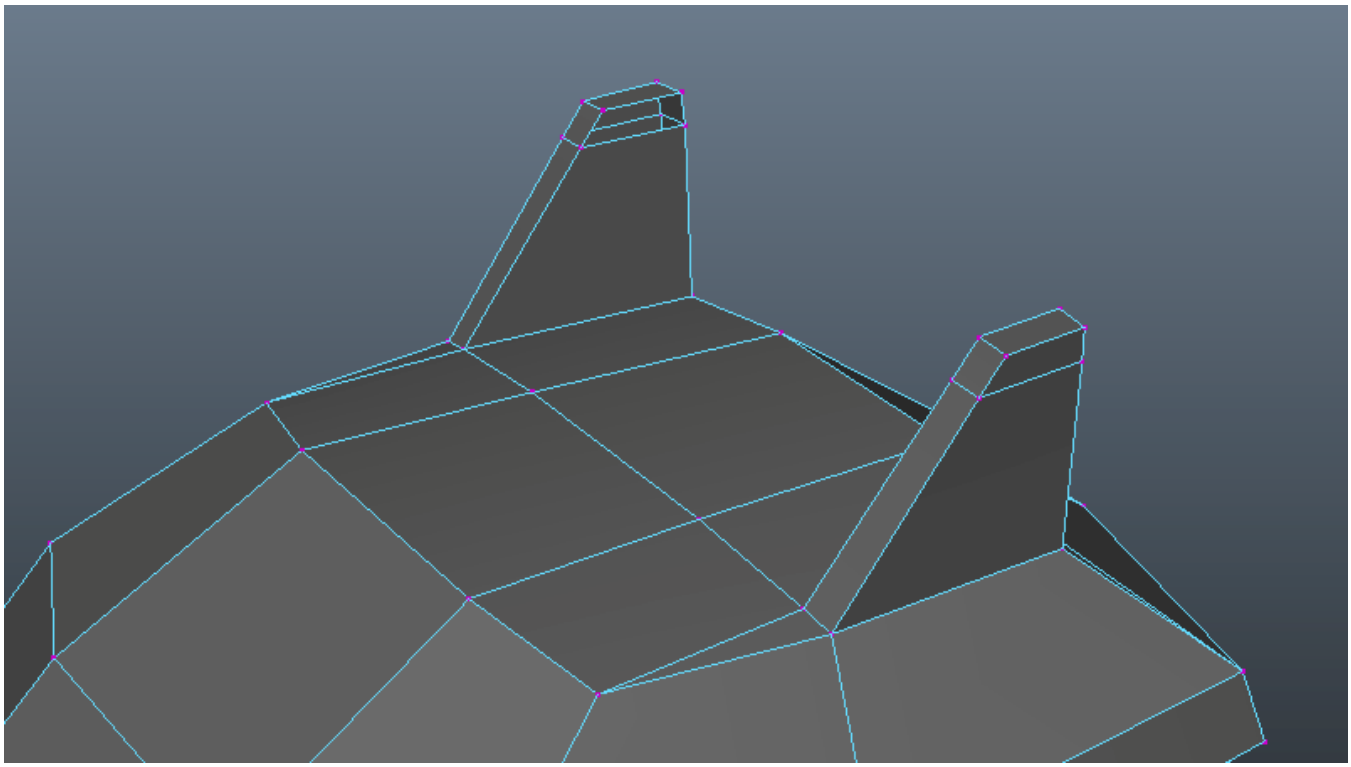
16. Since the previous step created triangular polygons, create the following highlighted lines so the mesh stays in quads. (Note: These lines do not show up in subsequent tutorial images, but make sure they are there!)



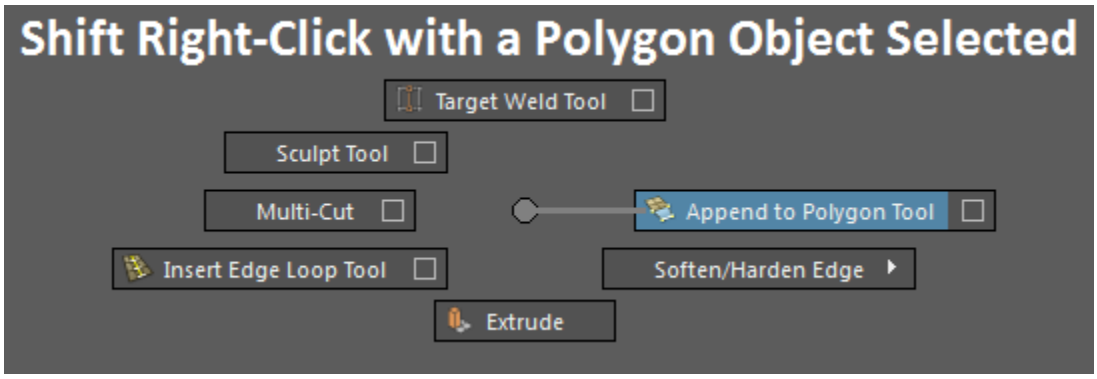
17. Extrude the newly created quads up twice and slant them slightly backwards.



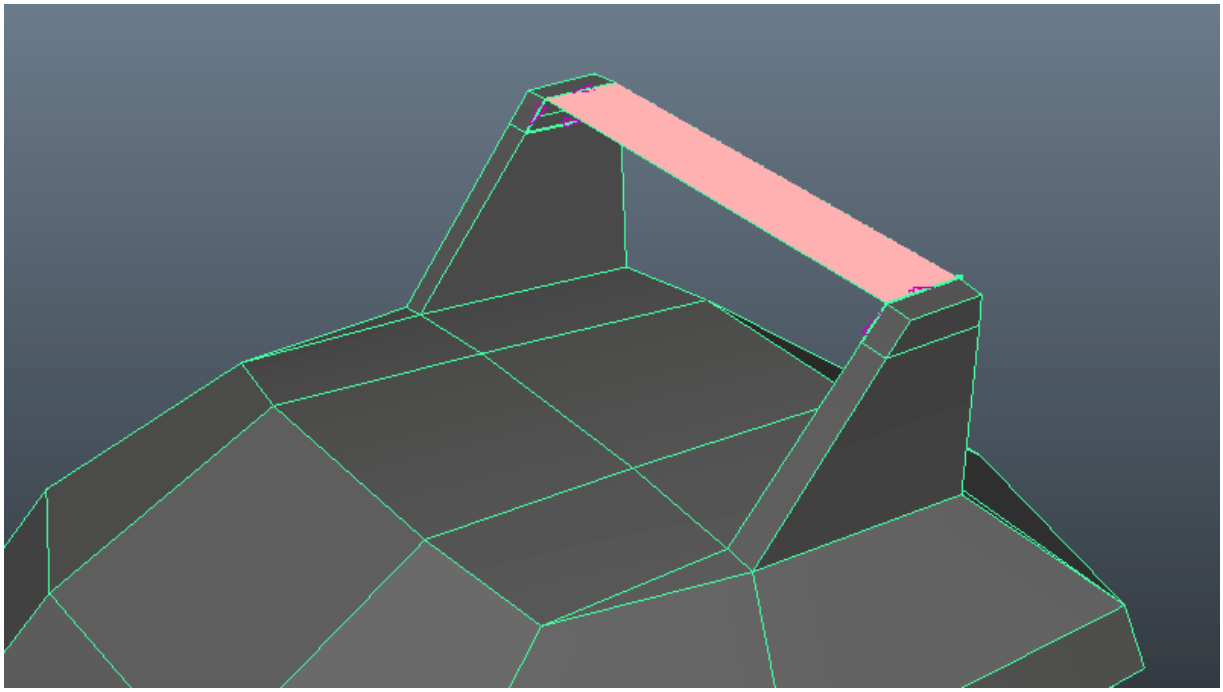
18. Scale and move the vertices as shown and then delete the inside faces of the fins.



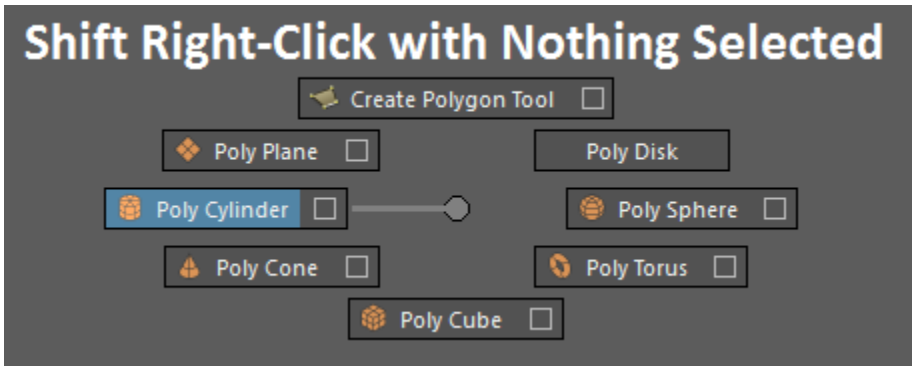
19. Activate the Append to Polygon Tool.



Select one of the edges on the border of the deleted face, then select the corresponding edge on the other fin. This should create a face that bridges the gap. Do this for the other 3 edges.

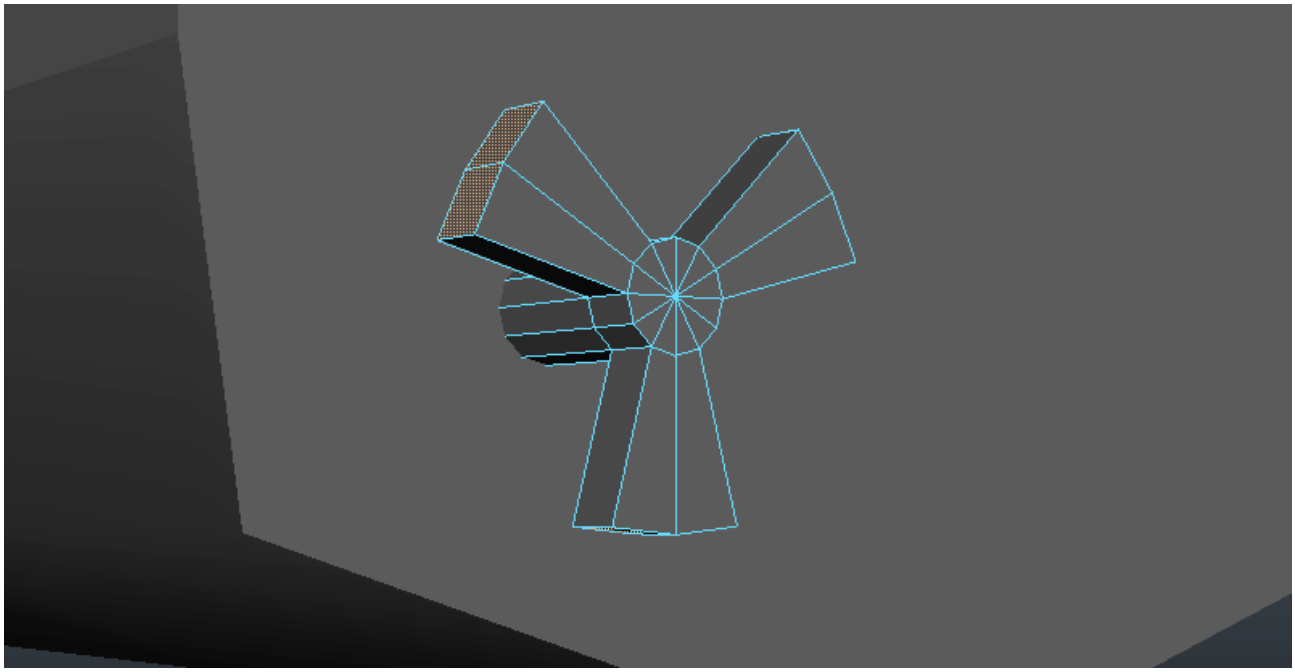


20. Create a cylinder.

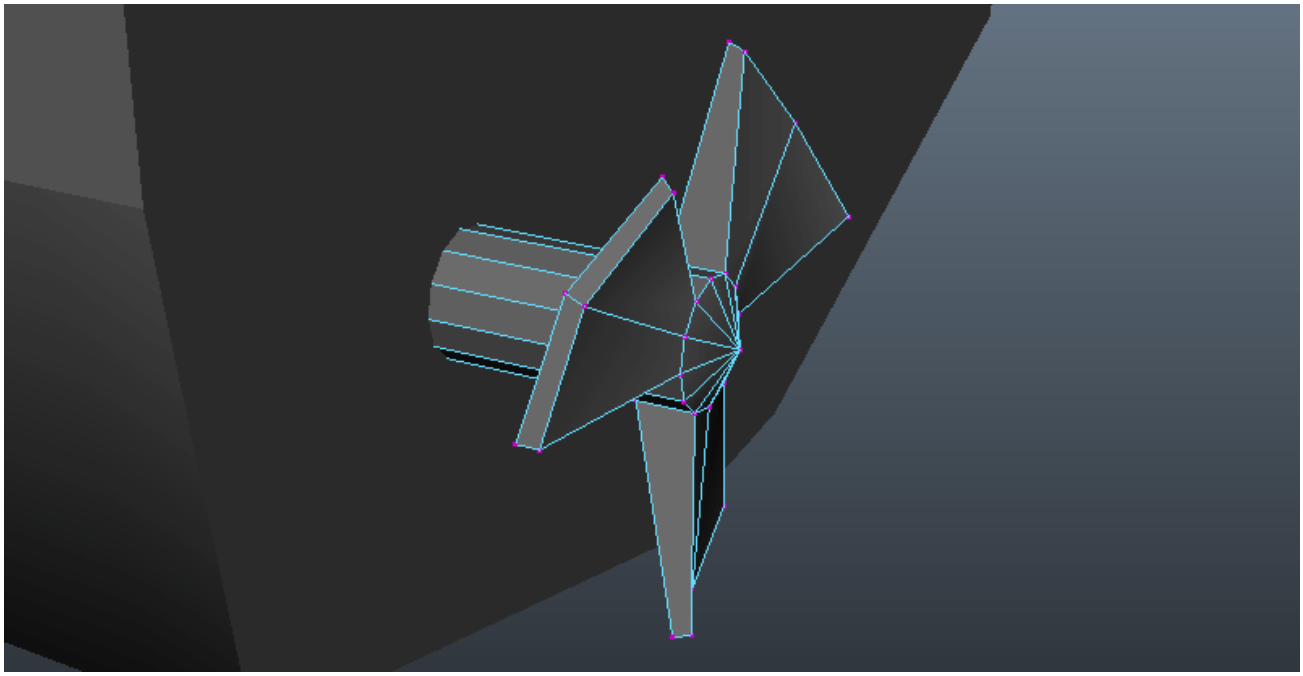


Move, scale, and rotate the cylinder until it is in the shown position. In the Channel Box, click polyCylinder1 in the Inputs section and make sure "Subdivisions Axis" is equal to 12.

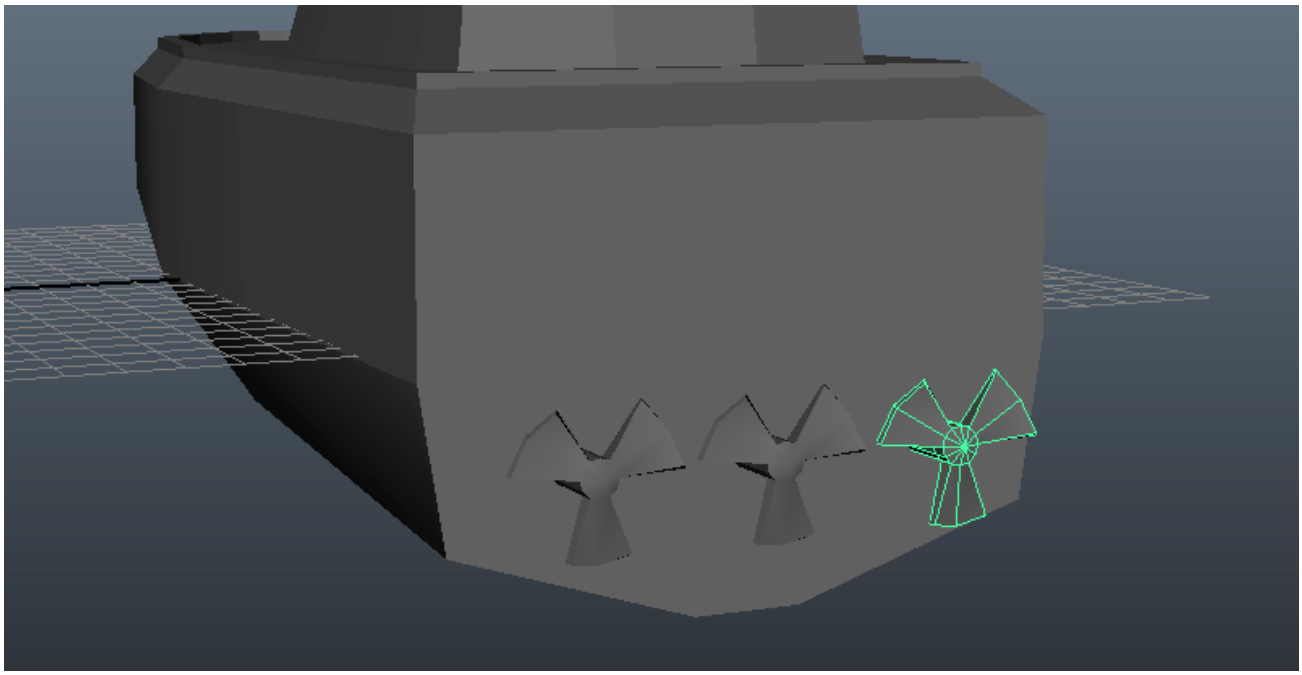
21. Using the Insert Edge Loop Tool, add an edge loop toward the end of the propeller shaft. In groups of two, select every other group of faces and extrude them outward to create the basic propeller shape.



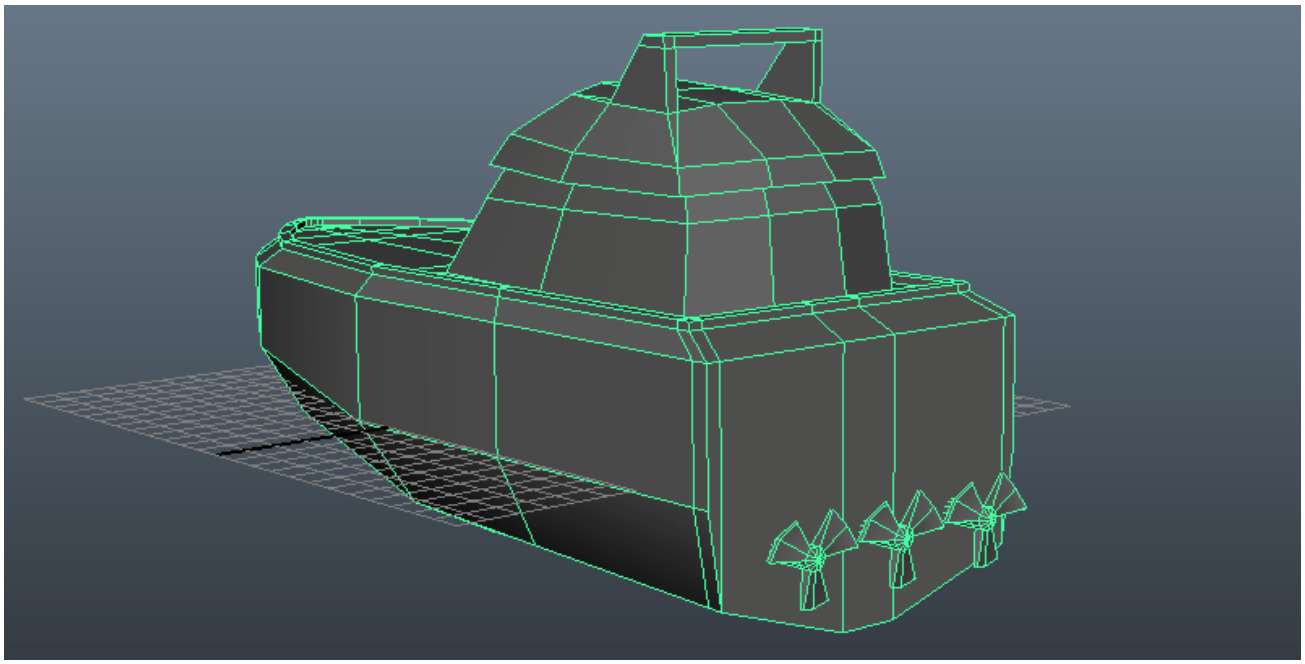
22. Scale and rotate the vertices on the edge of the propeller blades to give them a more turbine-like shape.



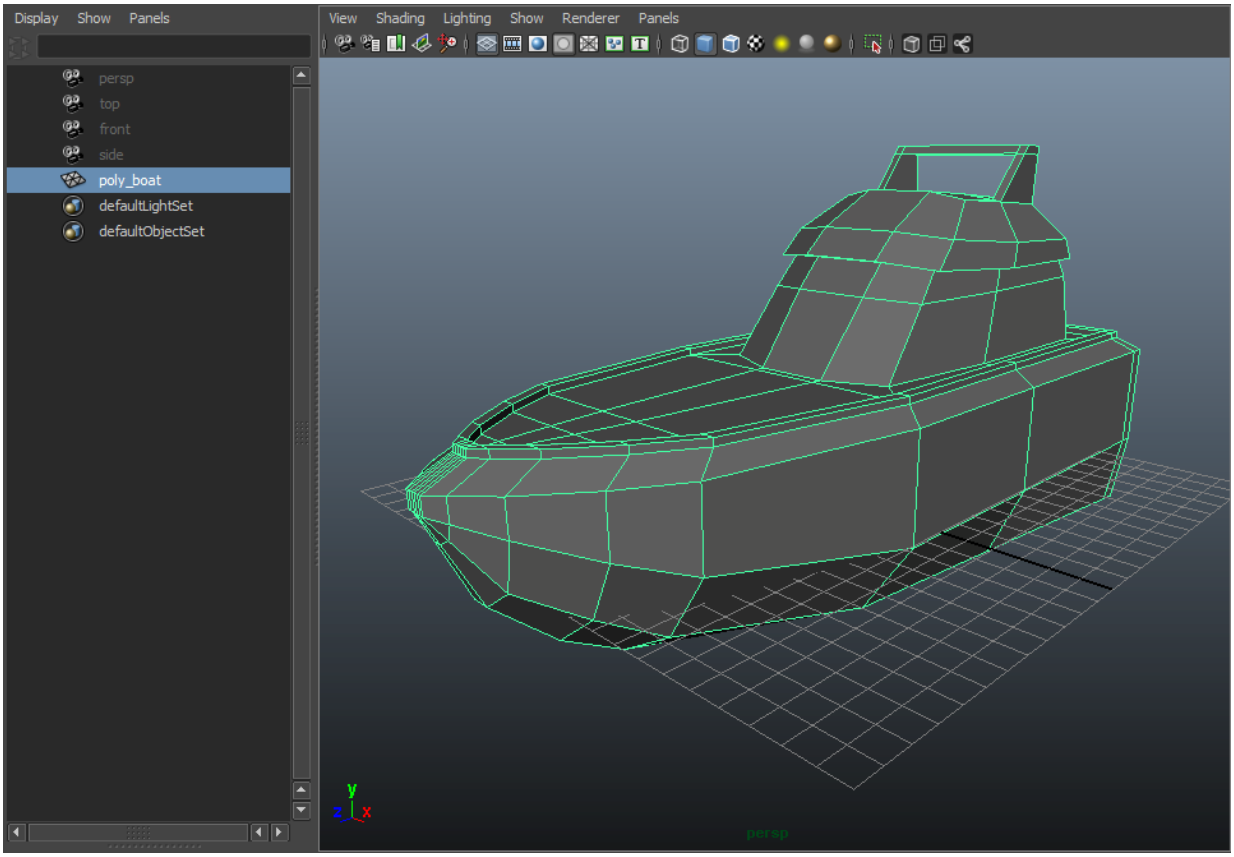
23. Select the newly created propeller and duplicate it (**Edit → Duplicate**). Move the new propeller over. Do this one more time so you have 3 propellers.



24. In object mode select all three propellers and the ship. Combine all four objects into one mesh to create the final boat model. (**Mesh → Combine**).



1. Now for a bit of clean up. With the boat selected, delete its History (**Edit → Delete By Type → History**). In the Outliner or Channel Box, rename the boat to "poly boat". You can change its name by double clicking on its current name, which should be something like "polySurface1".



With that, you should be finished.

Turn In:
You will be graded on the following:

- Following Instructions
- Resemblance to tutorial boat
- Contains all the specified pieces: Hull, Deck, Cabin, Fins, Propeller
- All quads (except for the cylinder caps on the propellers)
- Clean Outliner, deleted History
- Turn in the following into your tutorial project folder: A Maya file containing your finished model: **project1a.ma**