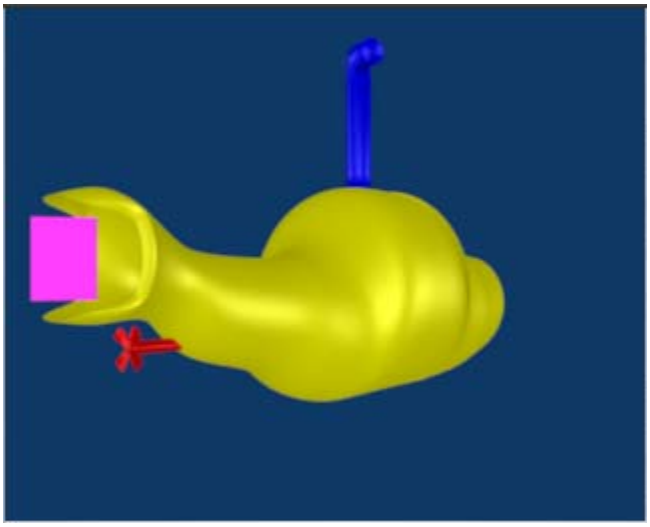
Course: 3D Design
Title: First Animated Model – Yellow Submarine
Dropbox File: YellowSubmarine.zip
Blender: Version 2.41
Level: Beginning
Author; Neal Hirsig (nhirsig@tufts.edu)

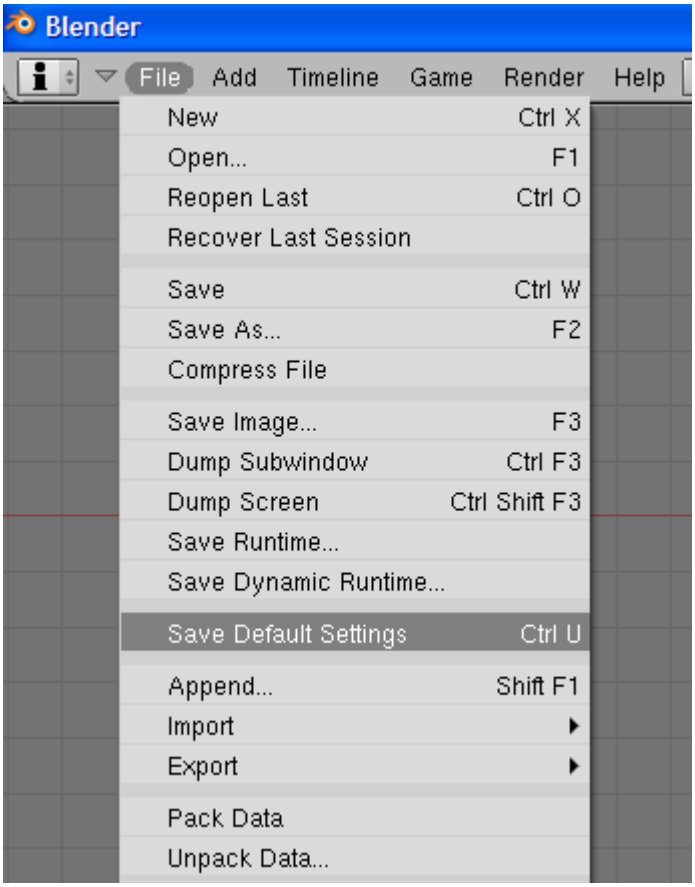
First Animated Model – Yellow Submarine



Most of you are perhaps too young to remember the Beatles song “Yellow Submarine”. In this tutorial we will create a simple animated model of a yellow submarine.

Open the BlenderBase file located in the YellowSubmarine.zip file. This is a good starting point for any tutorial or project. It has in preset the Timeline window (used in animation), the Outline Window (used to see the names of all of your objects) and 3 “Hemi” lights that will completely illuminate the scene no matter where the objects are located.

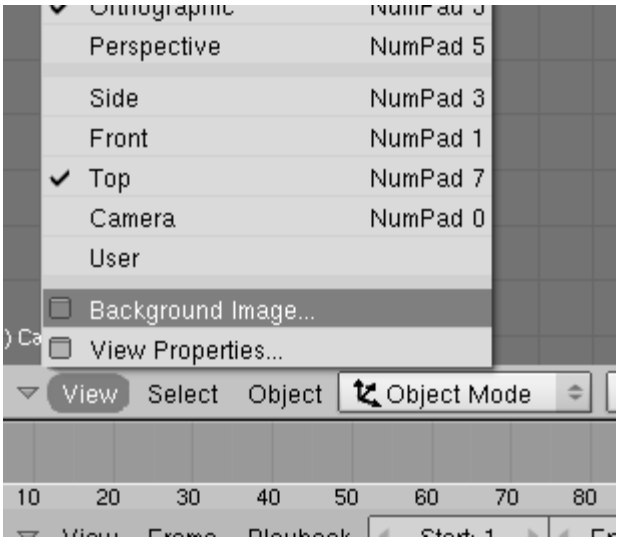
After opening the BlenderBase.blend you might want to make this your default blender file (the one that automatically opens when you open Blender). To do this, go to File / Save Default Settings.



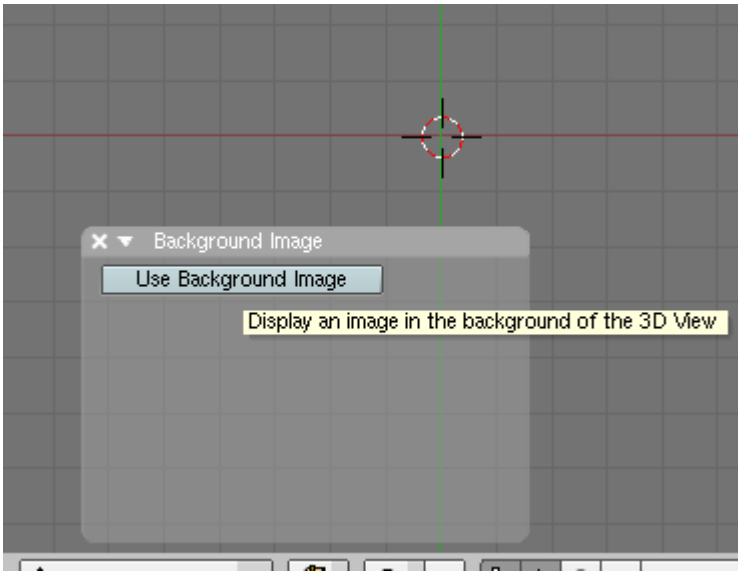
The BlenderBase file will now open each time you open Blender.

We will use a Background image taken from the Beatles album cover. This image file called Yellowsub.jpg is located in the YellowSubmarine.zip file. Download the zip file to your computer and unzip the contents.

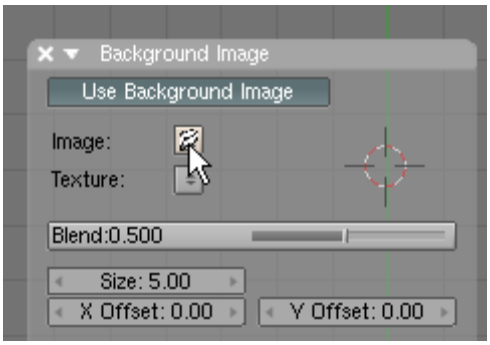
This image will serve as a guide to the shape of the submarine. To load this background image press View / Background Image.



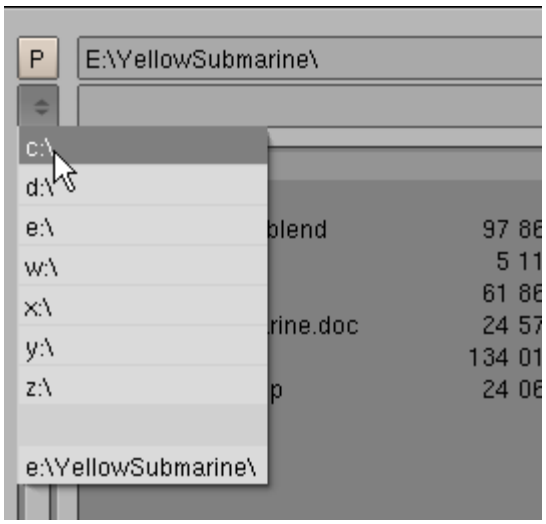
This will display the Background Image panel on your display. Press the Use Background Image button.



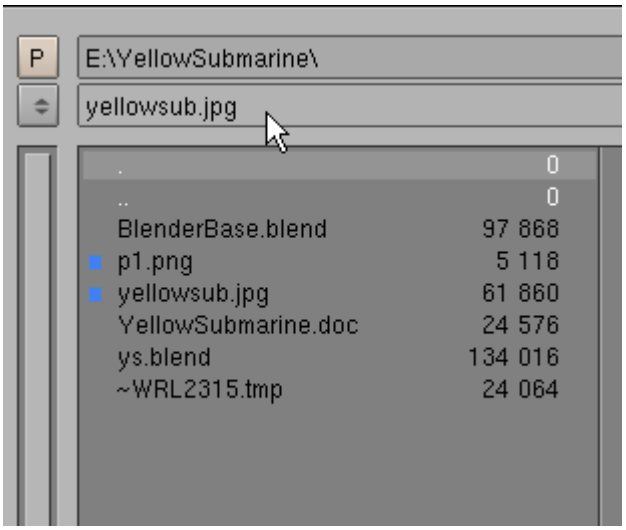
This displays the Background Image controls. Click on the small icon to the right of “Image:”



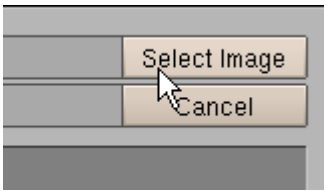
This displays Blender's file locator. Click on the double arrow on the top left to locate the drive where the Yellowsub.jpg file is located.



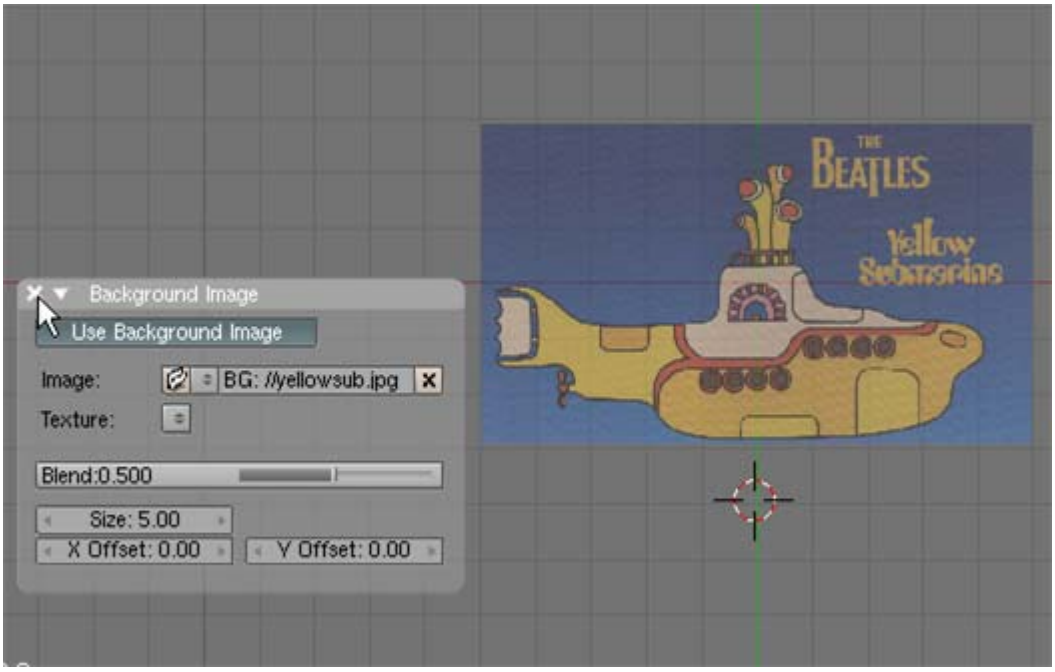
Locate the file on your computer and select it.



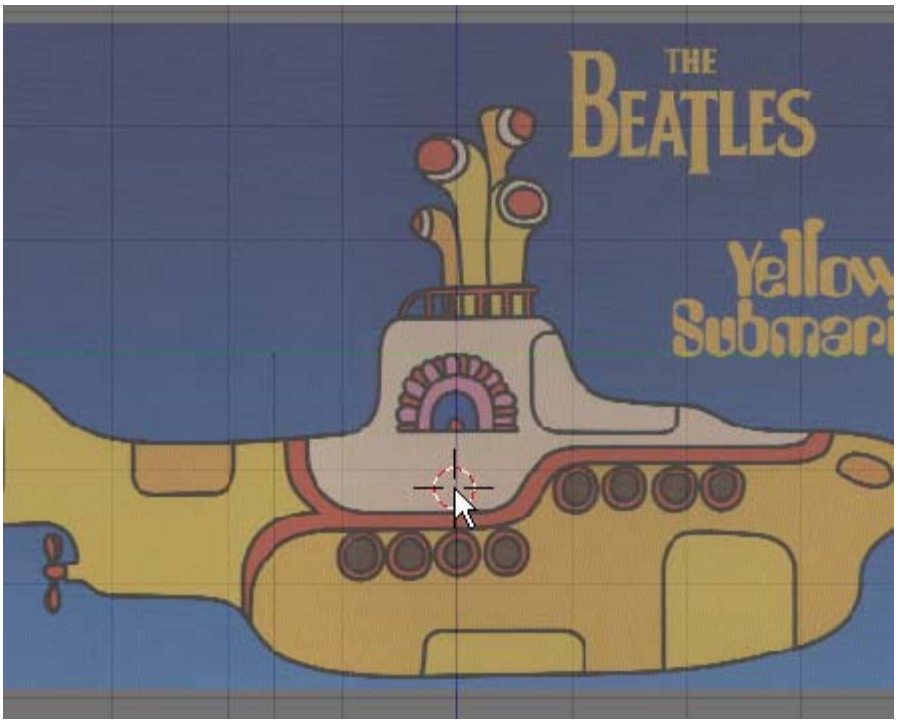
Press the Select Image button.



This will display the image in the background. You can “X” out the Background Image Panel.

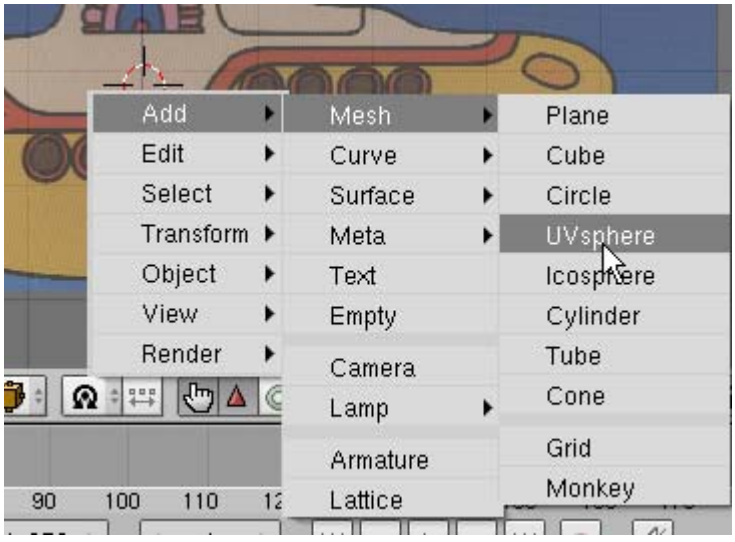


The background image will not render. It is used only as a guide. Zoom in a bit by scrolling your center scroll wheel or clicking the **NUM+** key. Switch to Side View (**NUM3**) (at this point you will notice no difference in the display). Place your 3D cursor in the center of the image as shown (to do this just place you cursor and left-click)

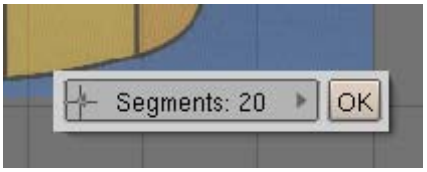


Before we model the submarine we will create a UV sphere objects and look at some of Blender's basic tools.

Press Space / Add / UV Sphere.



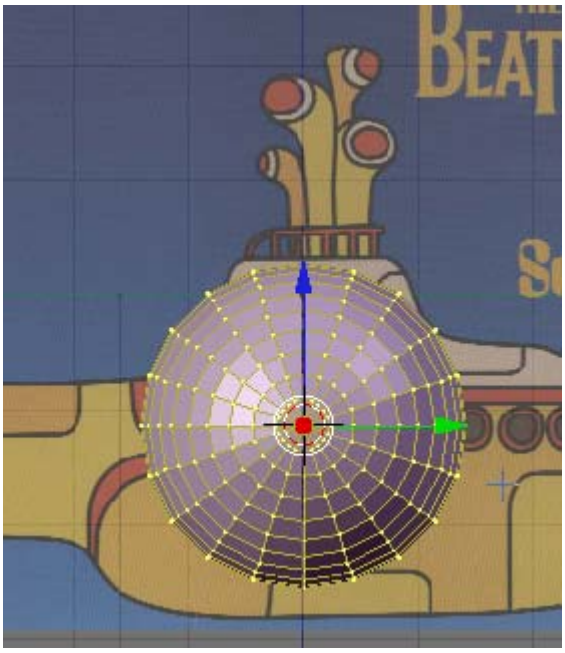
Click on the arrow to the left of the default 32 segments and make it 20 segments.



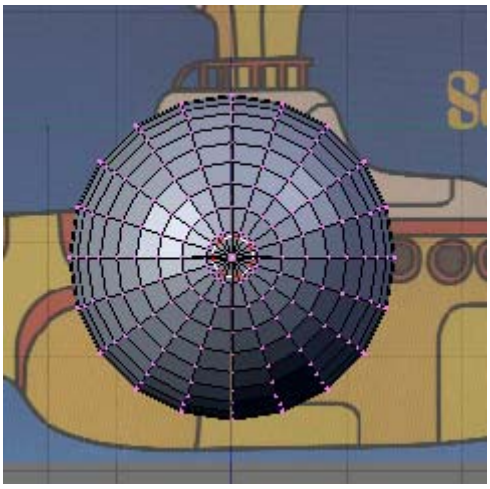
Click on the arrow to the left of the default 32 rigs and make it 20 rings.



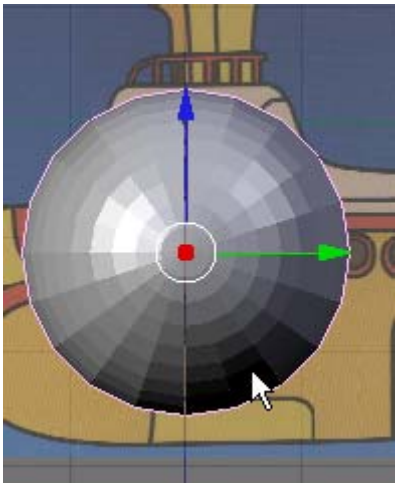
A UV sphere object will be displays at the point on the display where you placed your 3D cursor.



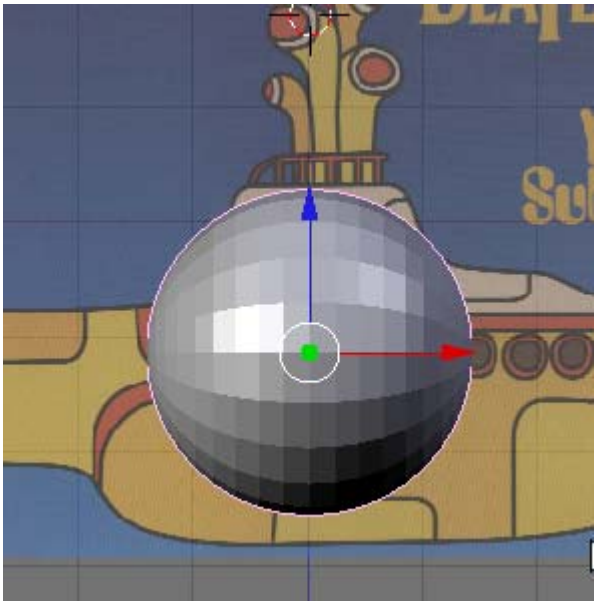
By default the new object is displayed in **EDIT MODE**. That is all of the vertices are available for editing. (The yellow dots). First deselect all of the vertices by clicking on the **AKEY**. The **AKEY** toggles select all / select none.



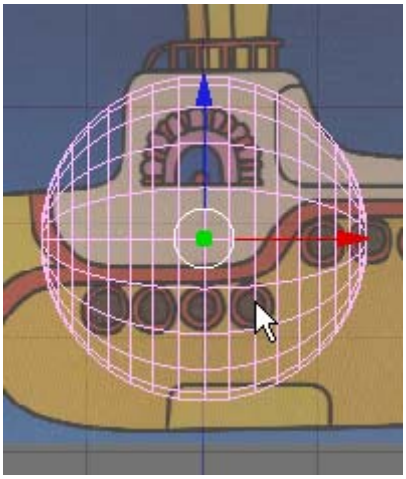
Now press the **TAB** Key. This will exit **EDIT MODE** and return to **OBJECT MODE.** The **TAB** Key toggles between Edit Mode / Object Mode. (Notice the vertices are no longer displayed)



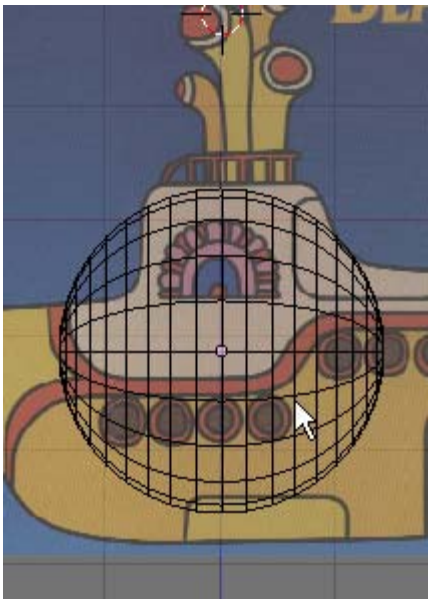
Switch to Front View (**NUM1**). (Notice the background image remains the same no batter if in front, top or side view).



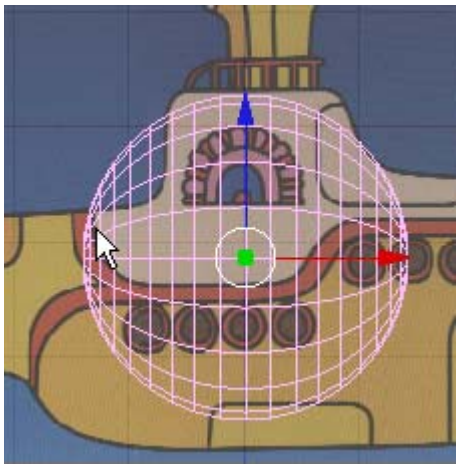
By default the UV sphere is in shaded mode (you can see all of the objects faces). Press the **ZKEY** to enter wireframe view. The **ZKEY** toggles between Wireframe / Shaded mode.



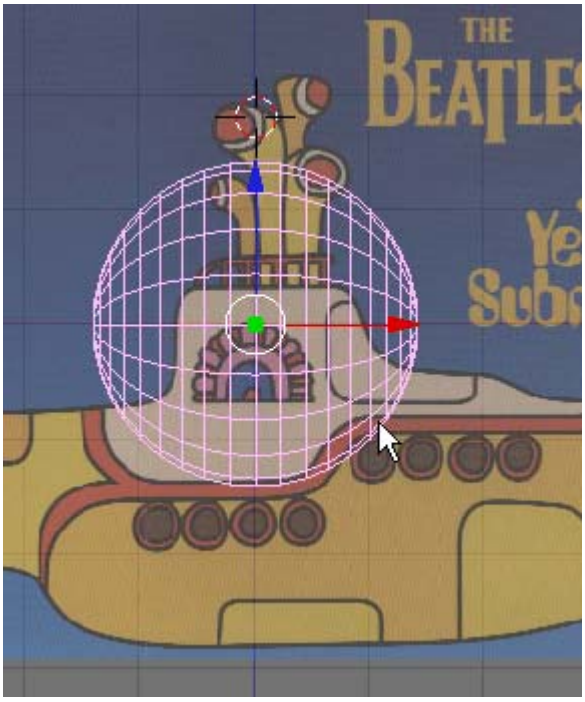
The UV sphere is still selected. Press the **AKEY** to deselect it.



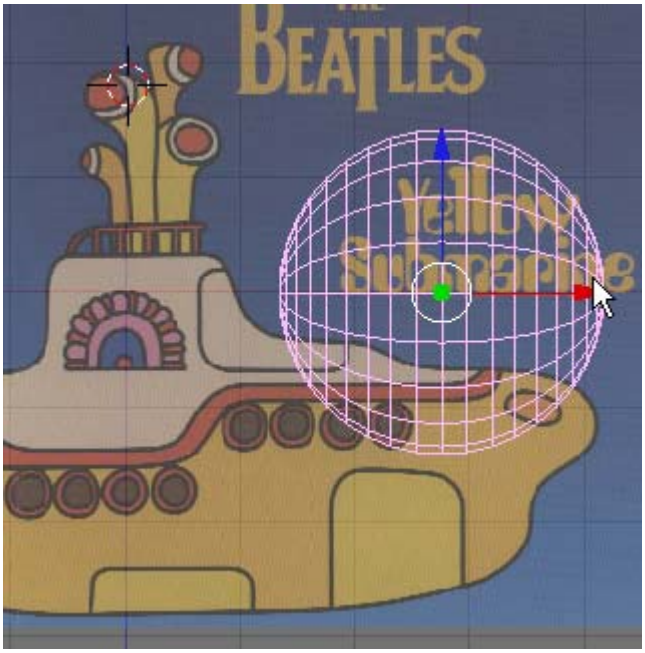
To reselect the sphere (or any object), right-click on the object.



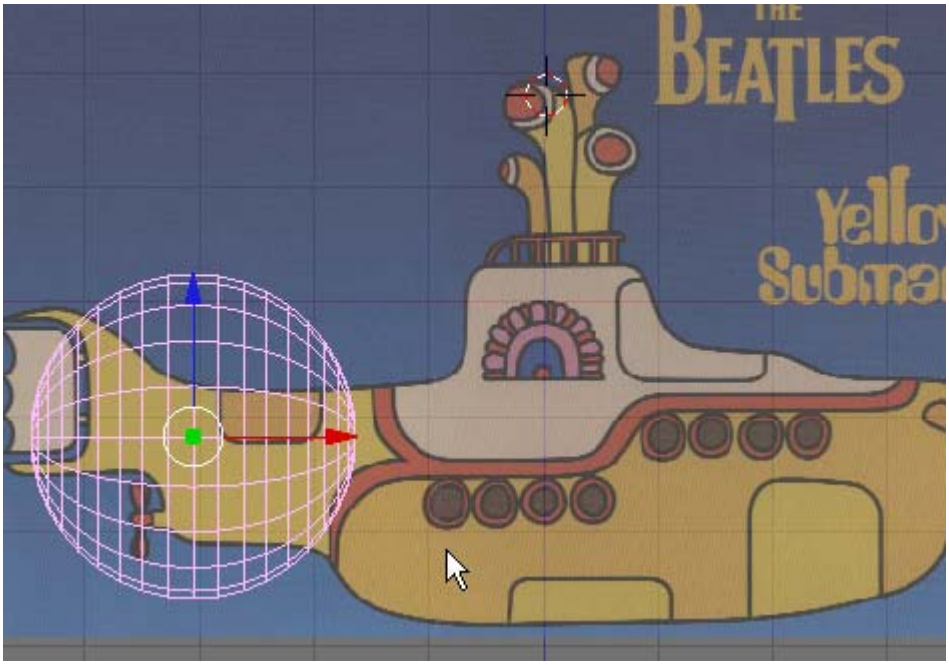
With the Sphere selected left-click on the Blue widget arrow and drag the sphere up (or down).



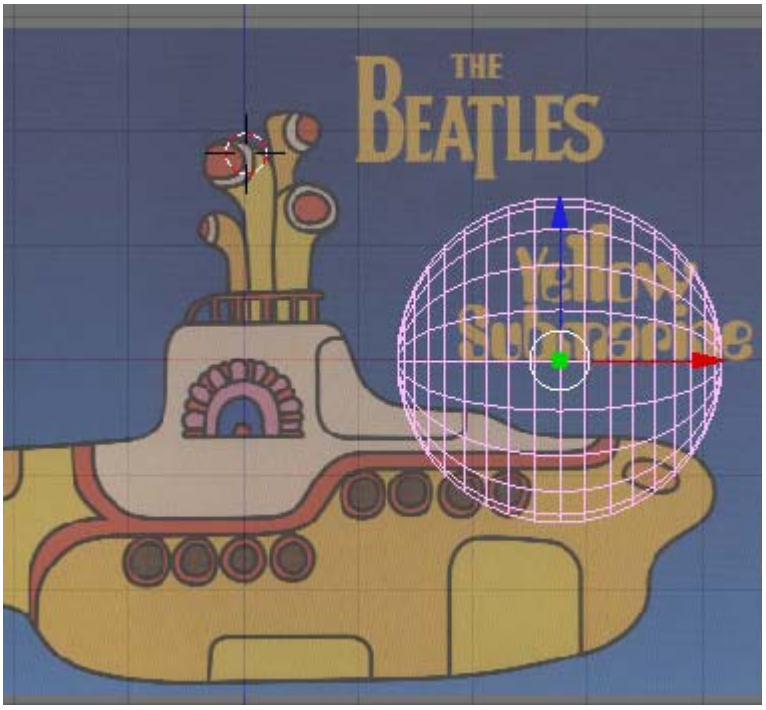
Left-Click on the Red widget arrow and drag the sphere to the right (or left).



Press the **GKEY**. This places the selected object into “grab” mode. Move your cursor about and the object will follow. To place the object when in grab mode, left-click.

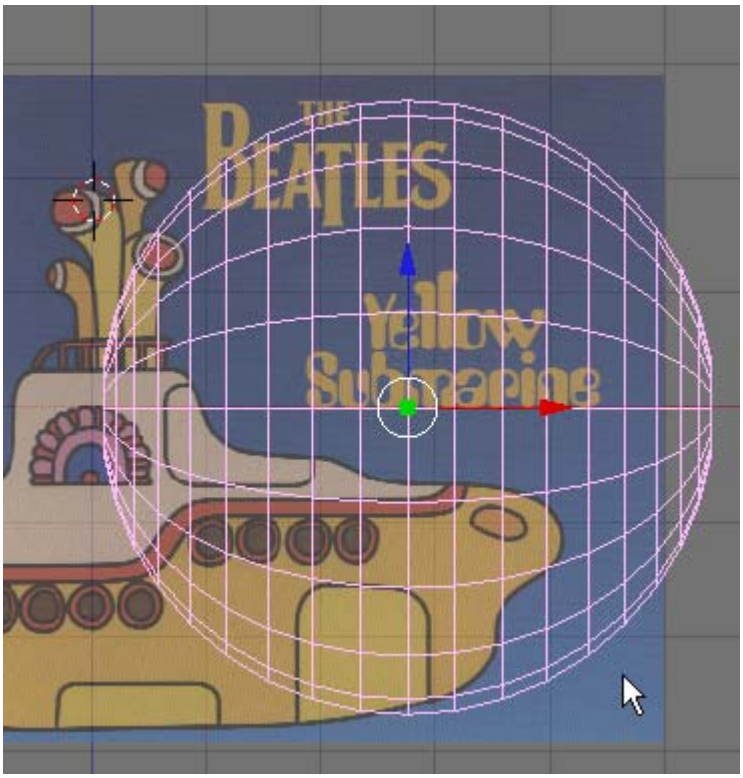


Press **CTRL-Z**. This is Blender's UNDO. The sphere will return to the last position.



Most of Blender's operations can also be canceled in the middle of the operation. Press the **GKEY** and grab the sphere and move it about. Instead of left-clicking to place it, press the **ESC** (Escape) Key. This cancels the grab operation.

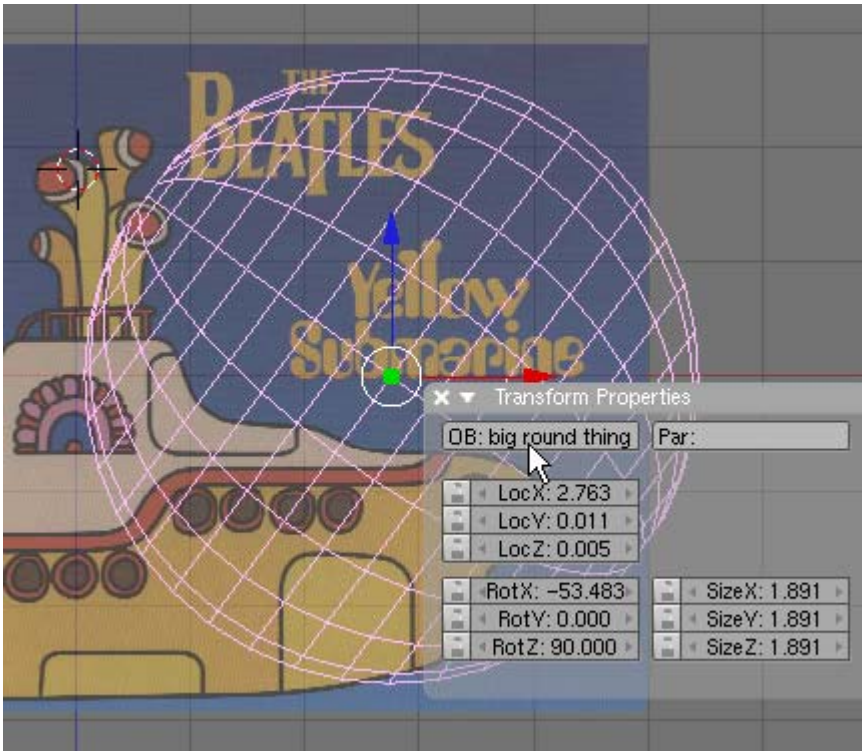
Press the **SKEY** (Scale). Move your cursor toward the object's center to scale it down or away from the object's center to scale it up. Left-click to place the scale.



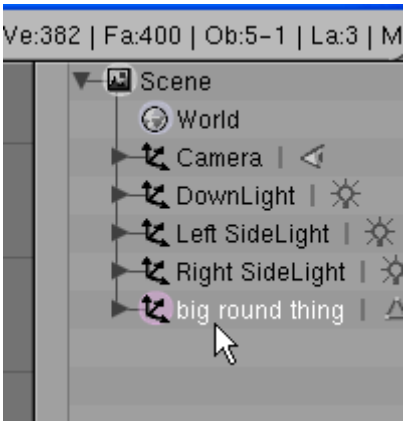
Press the **RKEY** (Rotation). This places the object in Rotation mode. Move your cursor in a circular pattern and the object will revolve with it. Left-click to place the rotation.



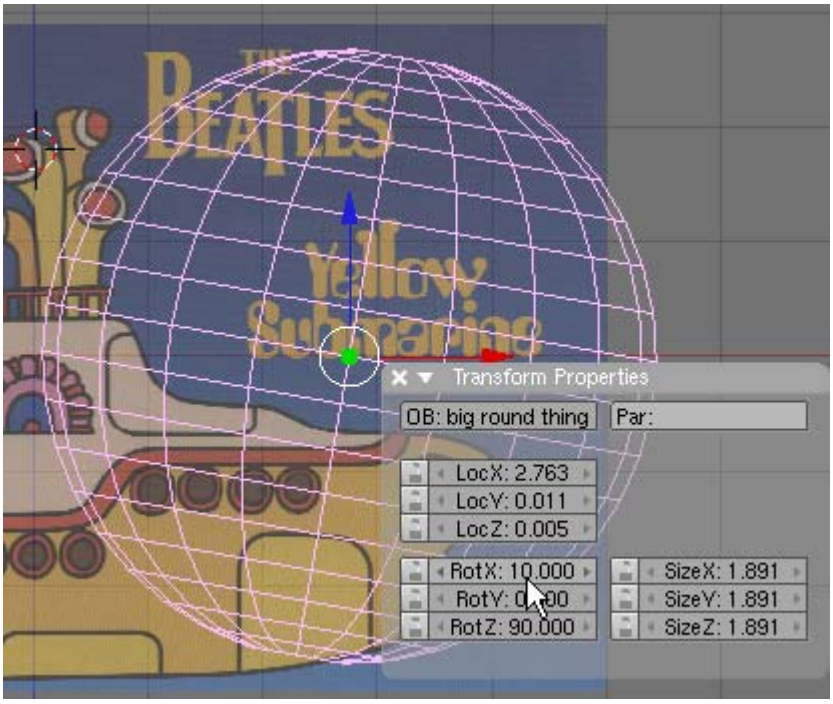
Press the **NKEY** (Notation). This displays the Transform Properties Panel for the object. Click in the Object name area and change it to “big round thing”. Press enter when done typing.



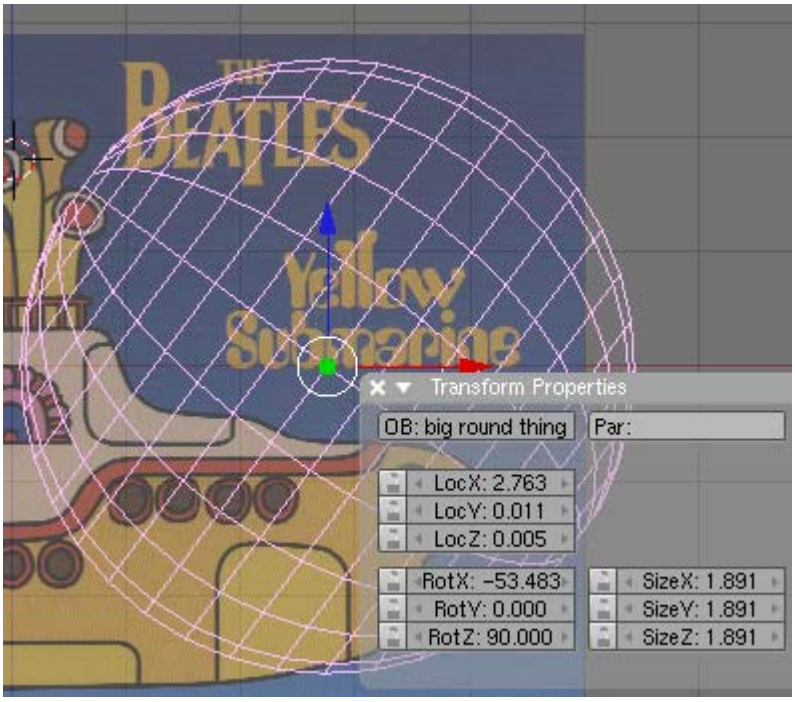
Note that the name “big round thing” also appears in the Outliner Window.



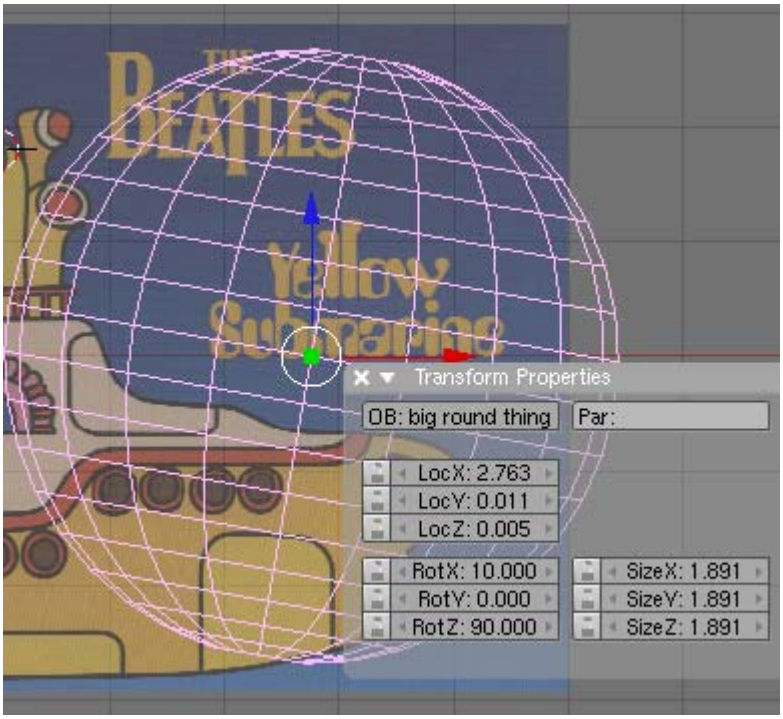
The transform Properties panel also allows for changing the object’s Location, Scale or Rotation (Transforms) numerically. Click on the arrow button to the right or left of the ROTX entry or click on the number and type in a new one. (Press enter when done typing)



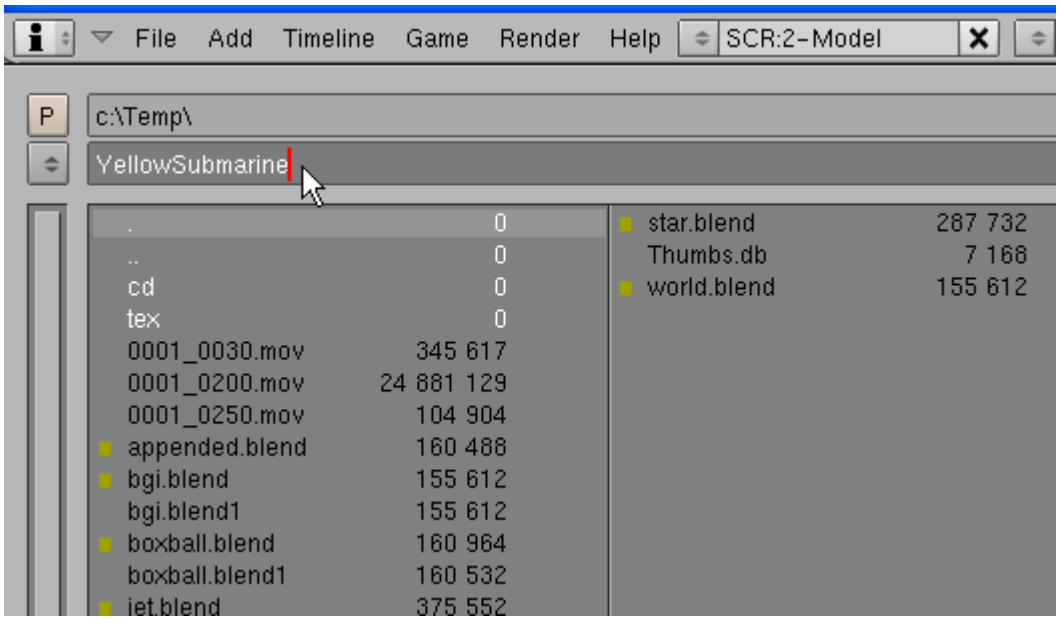
Press **CTRL-Z** to Undo.



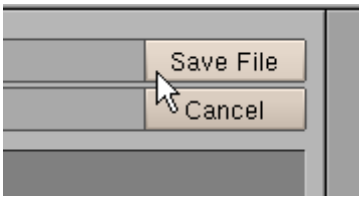
Press **CTRL-Y** to Redo.



Press F2 (Save). Browse to the directory and folder you want to save your file and name it YellowSubmarine.



To save the file, press the Save File Button.

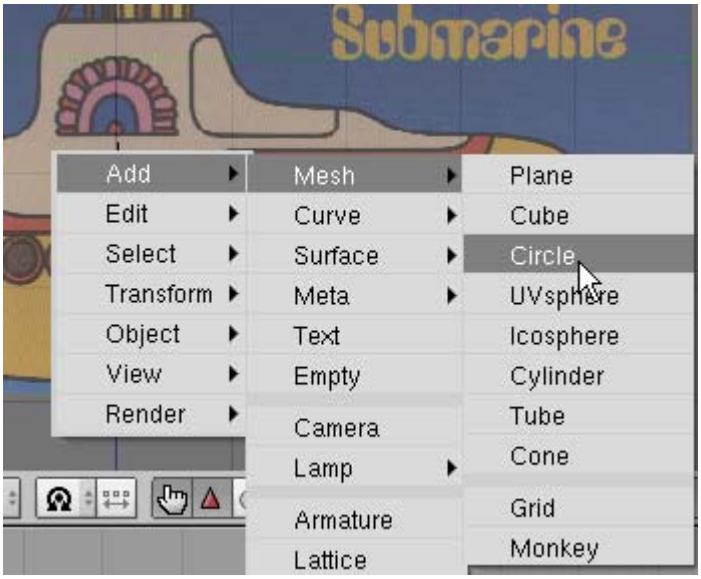


Note that Blender adds the file extension .blend automatically. Once a file is saved once you can use the shortcut **CTRL-W** to save your file.

With the UV sphere selected press the **DELETE** button on your keyboard. A dialog box appears. Click on “Erase Selected Objects”.

These are most of the basic Blender tools you will need to model the submarine. We can now get down to the real modeling.

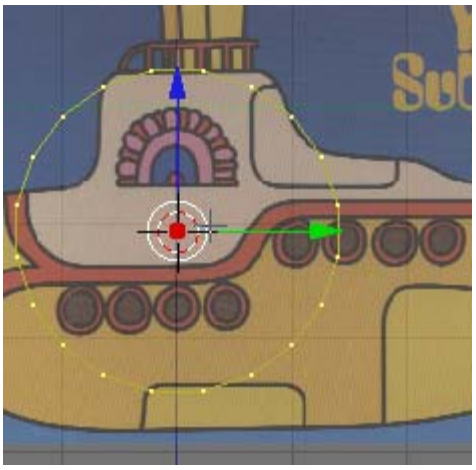
Press **NUM3** to switch to side view. Place your 3D cursor in the center of the submarine background image. Press **Space / Add / Mesh / Circle**.



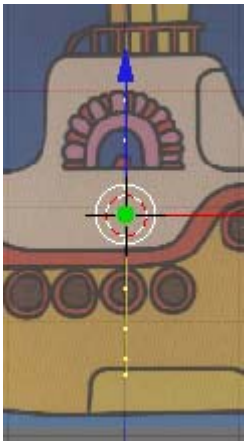
Choose 20 Vertices.



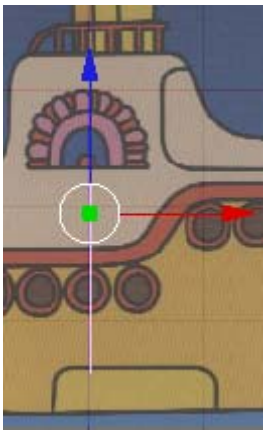
This places a mesh circle in the side viewport. By default the circle is in **EDIT MODE** with all of the vertices selected.



Press **NUM1** to switch to Front View.



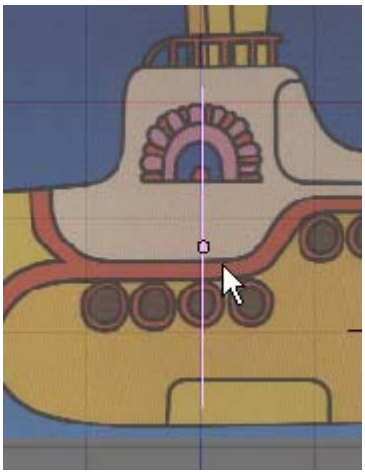
Press the **AKEY** to deselect all of the vertices. Press the **TAB** key to Exit Edit Mode. The circle (because it was created in side view and we are now in front view) looks like a straight line.



The Transform Widget (the red and blue arrows) sometimes gets in the way of seeing clearly. Turn off the display of the widget by clicking on the Transform Manipulator

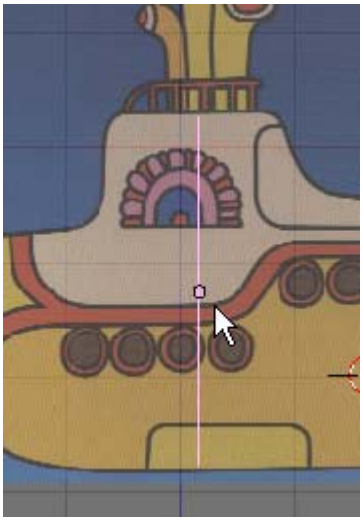
button (or press **CTRL-SPACE**). This hotkey (CTRL-SPACE) toggles the 3D Widget on /off.



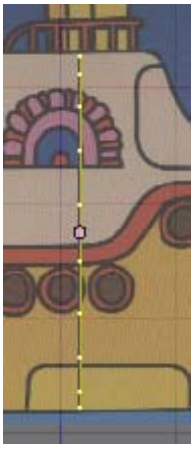


Notice that there is a blue dot in the center of the circle. This is the objects center. When scaling or rotating an object Blender will, by default, scale or rotate the object about this center point.

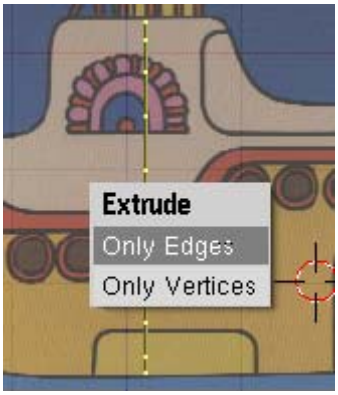
Scale (**SKEY**) and Grab (**GKEY**) the circle object so that it looks as shown below (you probably have to scale it and move it just a small bit).



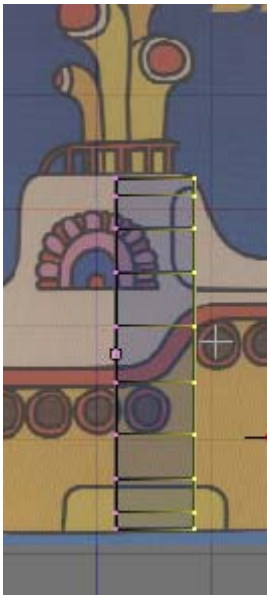
Press the **TAB** Button to enter **EDIT MODE**. Press the **AKEY** to select all of the vertices.



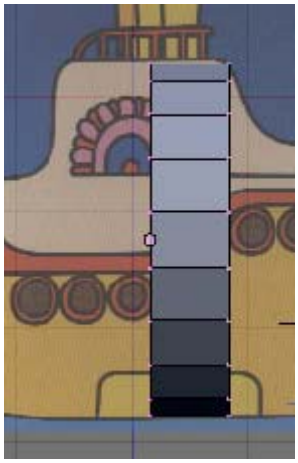
Press the **EKEY** (Extrude) and select “Only Edges”.



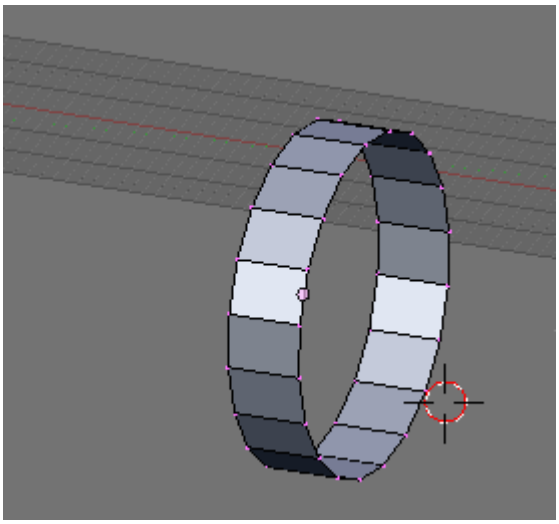
Move your cursor to the right a bit and Left-click to place the extrusion as shown.



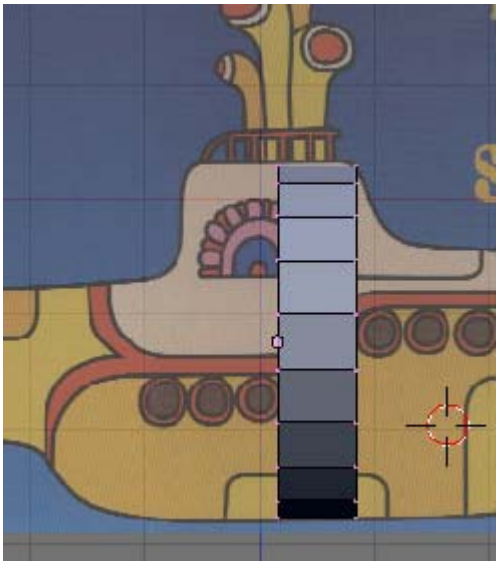
The extrusion function creates a new set of vertices and allows that new set to be positioned, scaled or rotated. It is perhaps the most used tool in 3D modeling. Press the **AKEY** to deselect the vertices. Press the **ZKEY** to enter shading Mode.



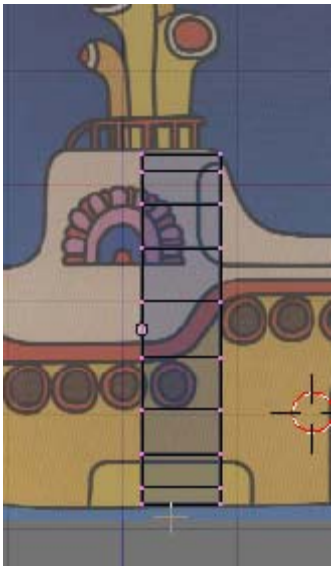
Hold you Middle Mouse Button (**MMB**) down and drag a bit to orbit your view to 3 dimensions.



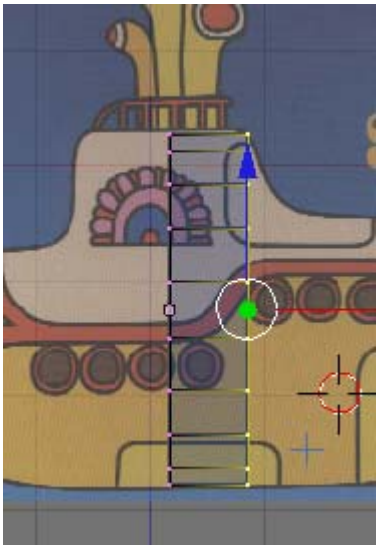
Notice that the background image does not display in a rotated dimensional view. Press **NUM1** to return to front view.



Press the **ZKEY** to return to wireframe mode. Press **CTRL-SPACE** to enable the Transform Widget. (It will not appear because no vertices are selected).

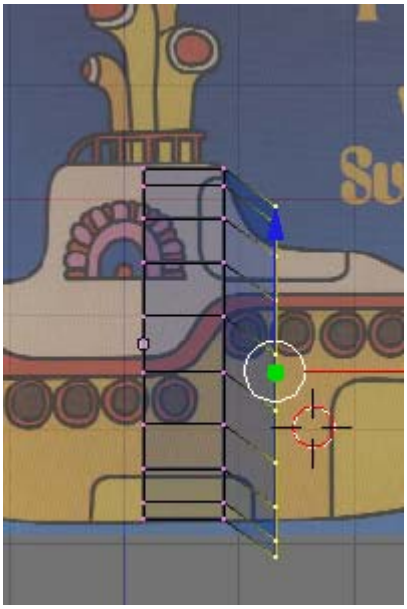


Press the **BKEY** (Box/Border Select) and drag a box around the right set of vertices to select them as shown.

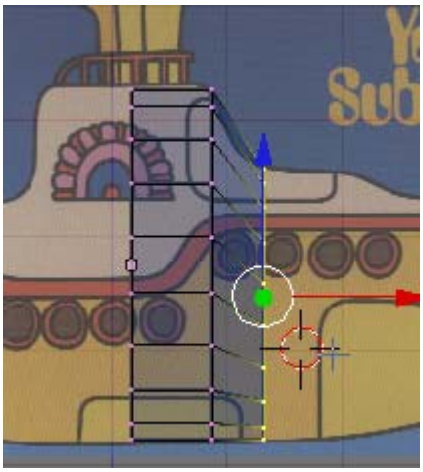


Note: Box selecting a group of vertices as we have done above in wireframe mode selects not only the vertices we can see but also the vertices located directly behind (thus the whole circle of vertices is selected). By default this only works in wireframe mode. If we had done the same box select in shaded mode only the vertices we can see (in the front) would have been selected.

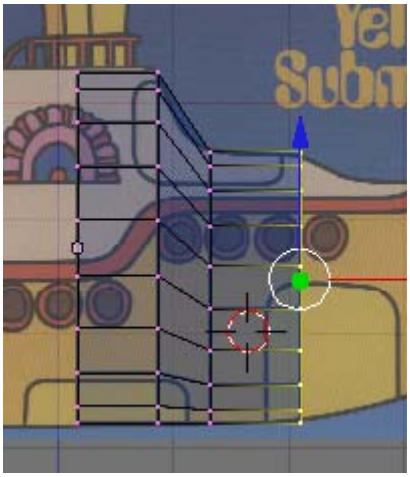
Press the **EKEY** (Extrude) and Region Extrude the new set of vertices to the right as shown below. (You may now have the option to “Region” extrude. This is the same as “Edge” extrude.)



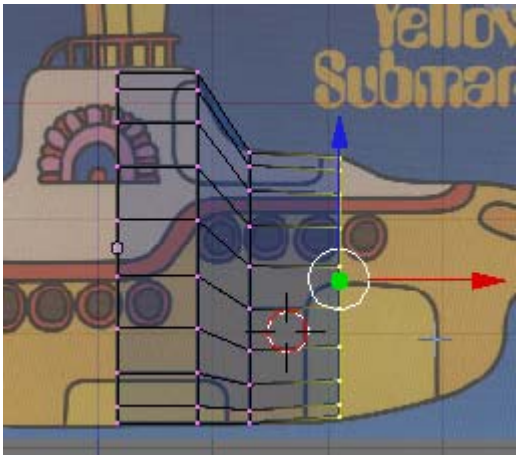
Press the **SKEY** and scale these vertices down a bit then grab them (**GKEY**) and position them as shown.



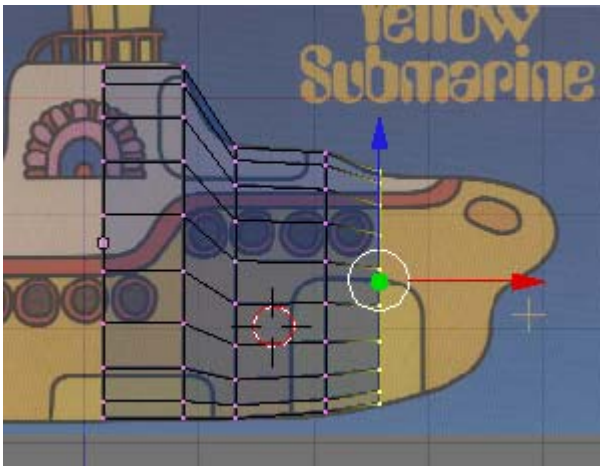
The new set of vertices remain selected so we can continue without having to reselect. Press the EKEY (Extrude) and Region Extrude the vertices to the left as shown.



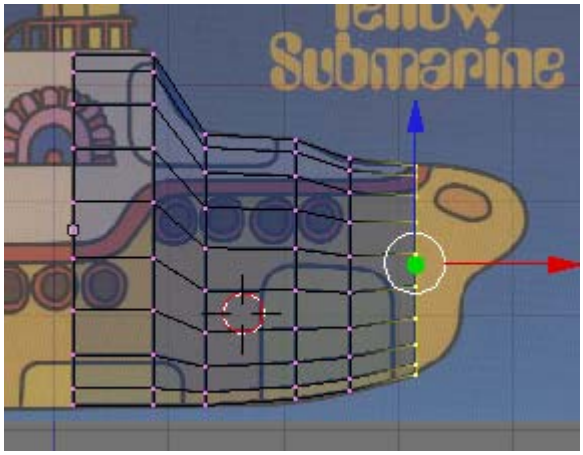
Scale them a slight bit (**SKEY**) and Grab them (**GKEY**) and move them (if needed) into position as shown.



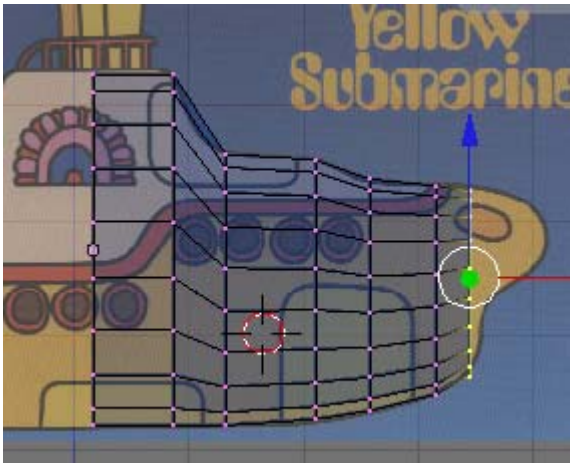
Repeat the process again as shown **(EKEY (Region Extrude) / place / Scale (SKEY) / Grab (GKEY) / place)**.



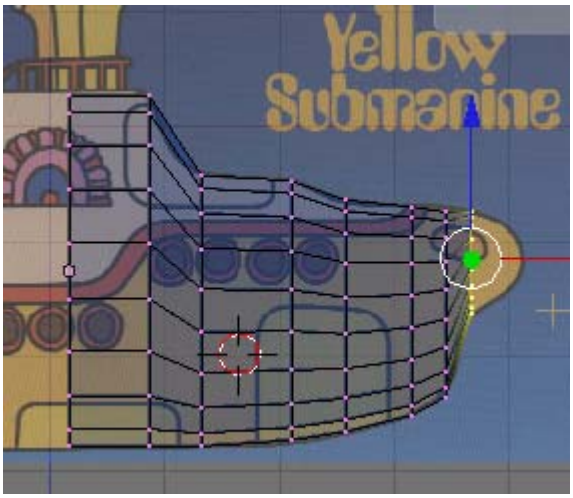
And again.



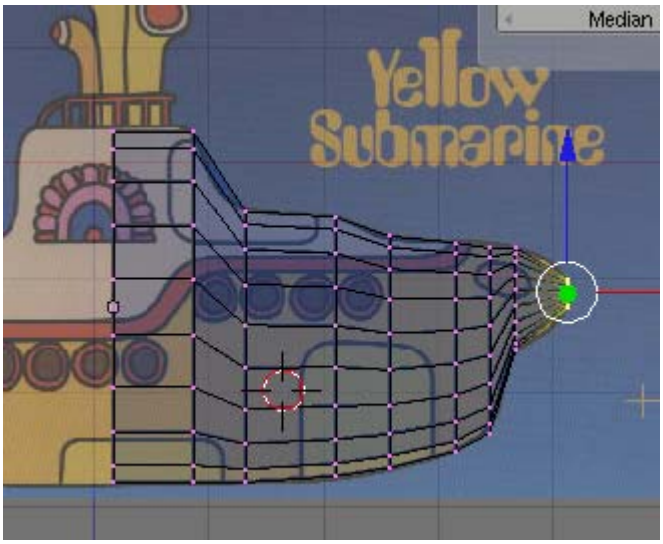
And again.



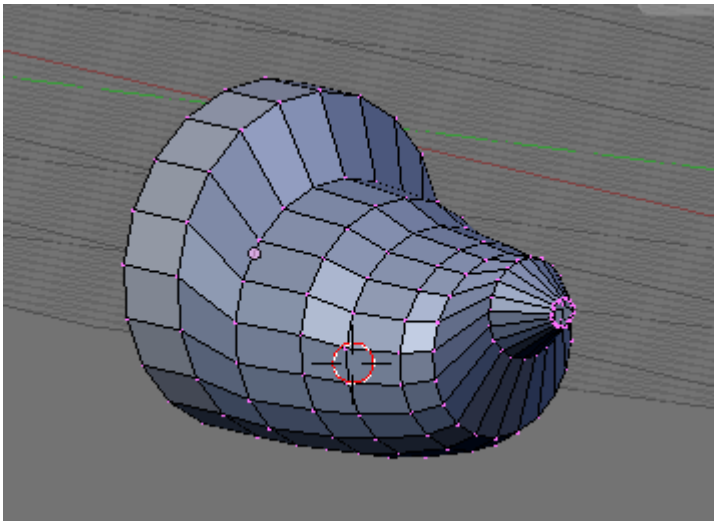
And again.



And again.

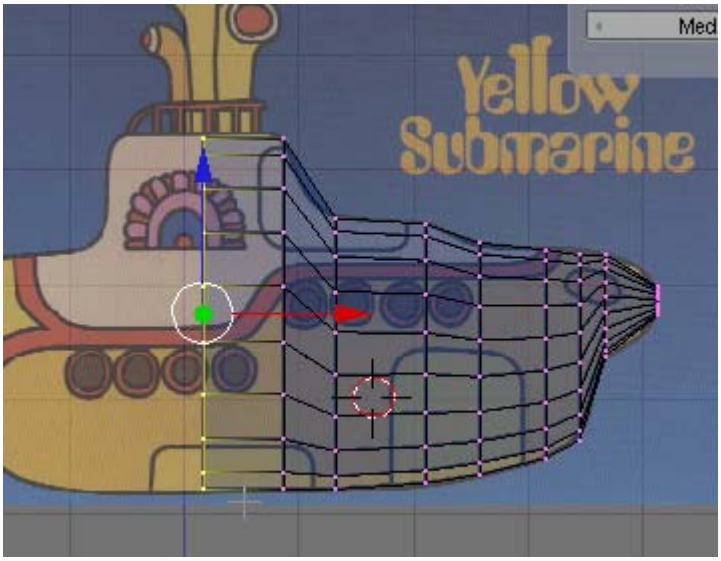


Press the **AKEY** to deselect the vertices. Press the **ZKEY** to enter shaded mode. **MMB drag** to orbit your view a bit to 3 dimensions.

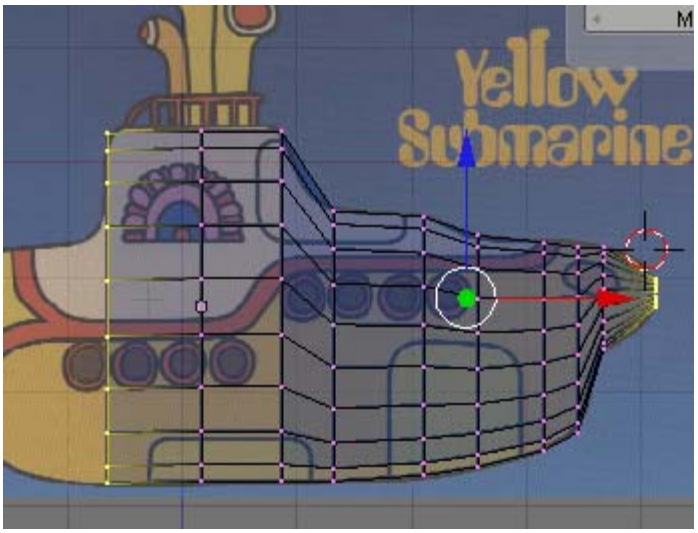


Save your file **CRTL-W**

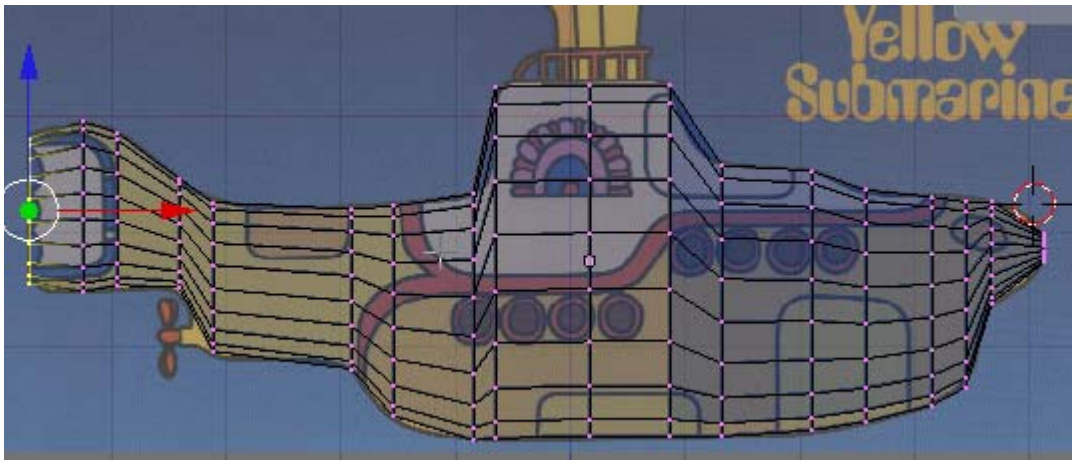
Press **NUM1** to return to Front View. Press the **ZKEY** to enter wireframe mode. Press the **BKEY** and box select the group of vertices on the left as shown.



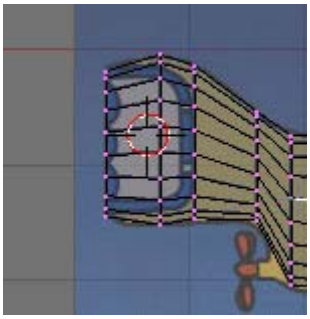
Press the **EKEY** and extrude this set of vertices to the left as shown.



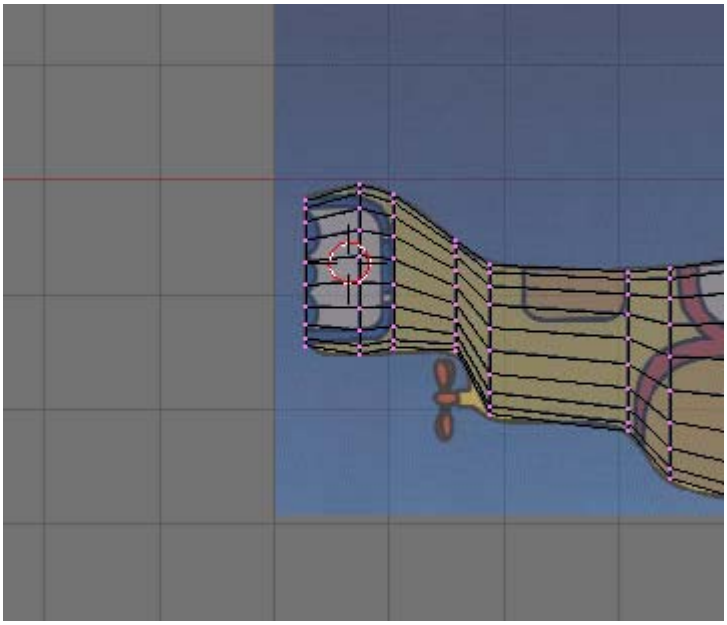
Perform the next 8 Extrude / Scale / Grab modeling steps as shown.



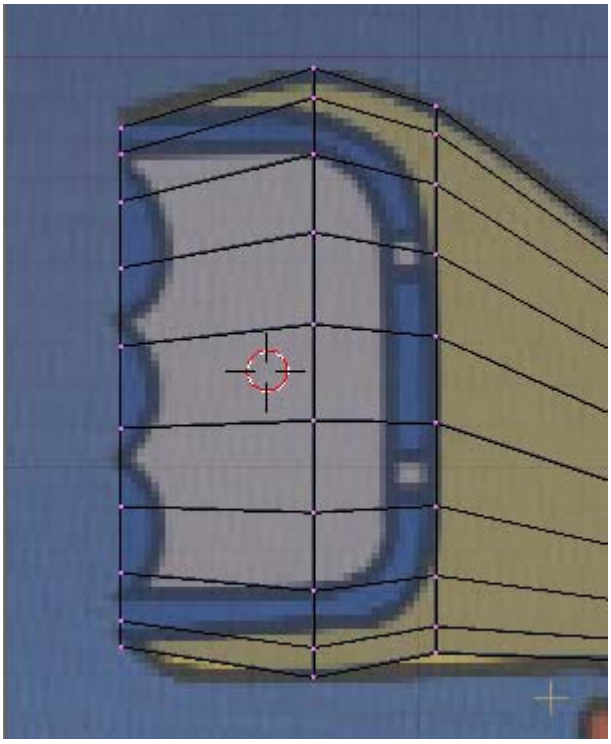
Press the **AKEY** to deselect the vertices. Place your 3D cursor on the rudder of the submarine by left-clicking there.



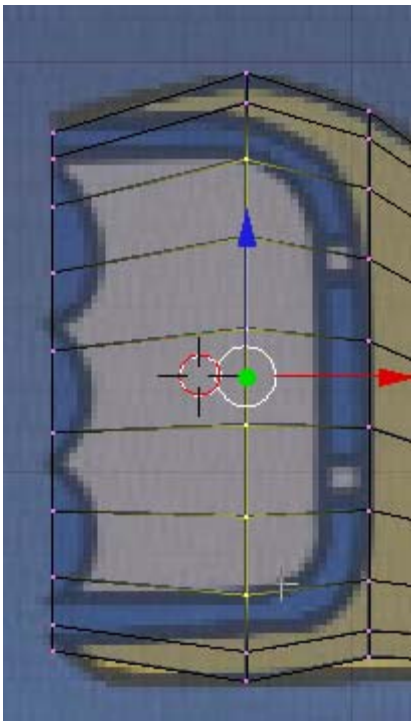
Press the **CKEY** (Center). This centers the 3D display to the 3D cursor.



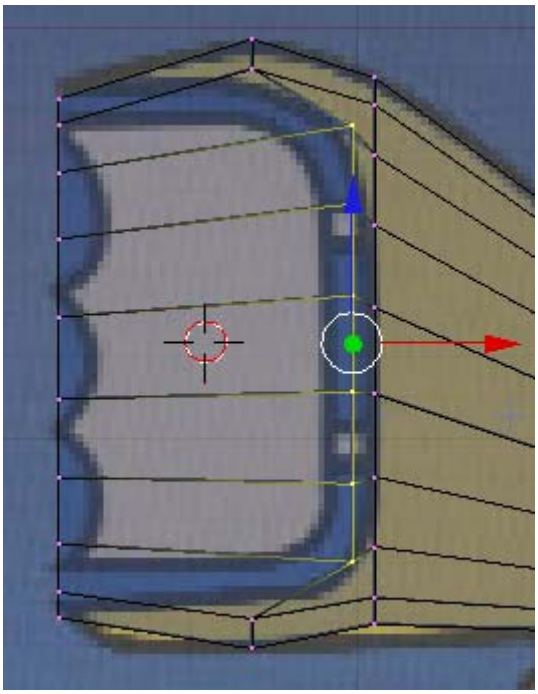
Now zoom in on the rudder using your **Middle Scroll Wheel** or **NUM+** Key.



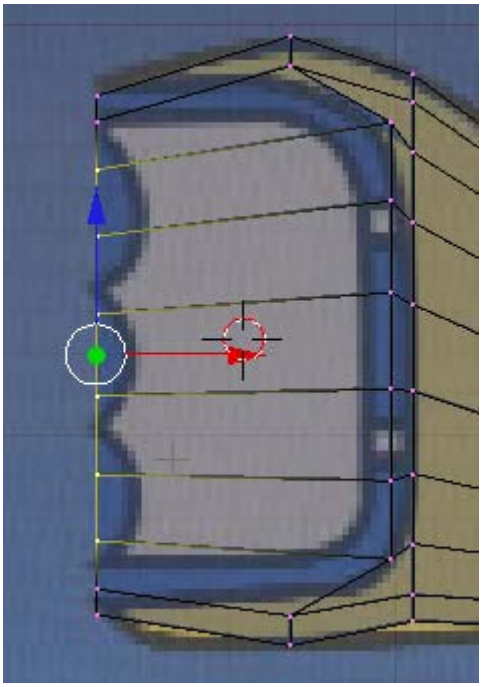
Box select (**BKEY**) the middle set of vertices as shown.



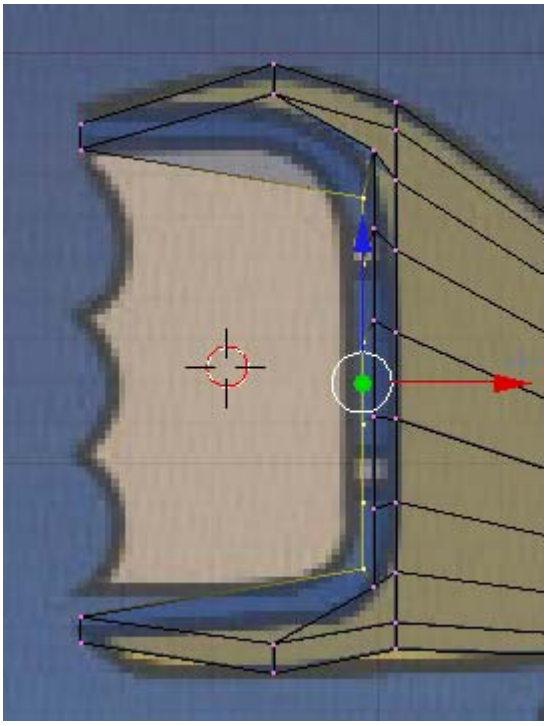
Use the Transform Widget red arrow to drag these vertices to the right as shown.



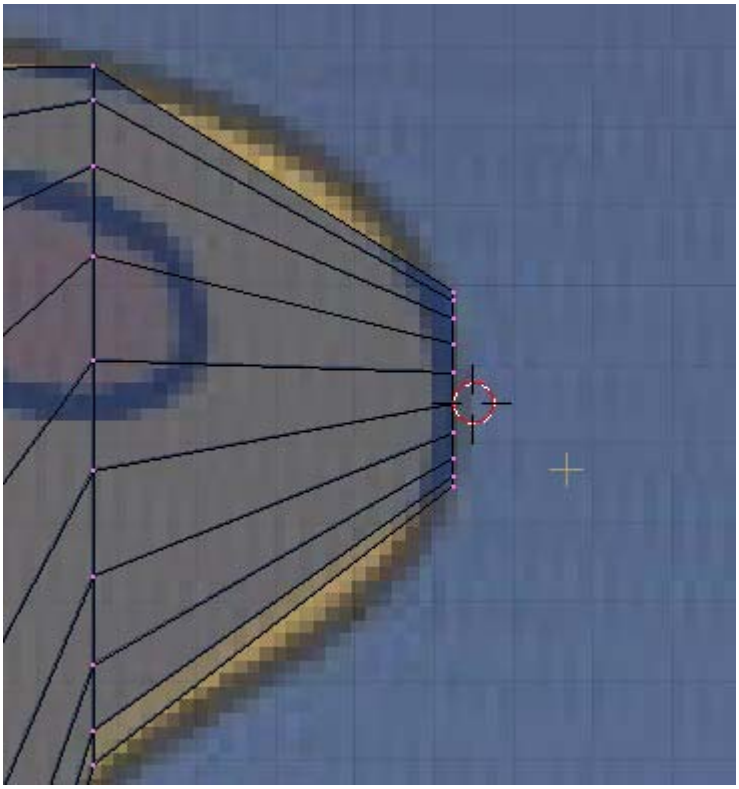
Press the **AKEY** to deselect the vertices. Box select middle set of vertices on the left as shown.



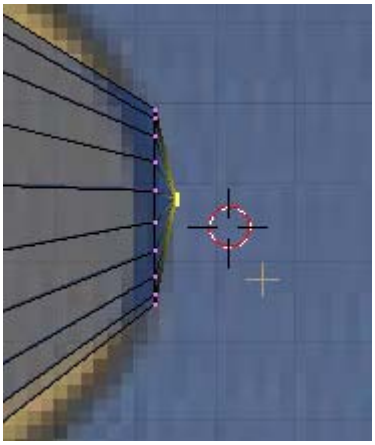
Move these to the right as shown.



Press the **AKEY** to deselect the vertices. Zoom out to see the whole submarine. Place your 3D cursor on the nose of the sub and press the **CKEY** to cent it in the display. Zoom in on the nose.



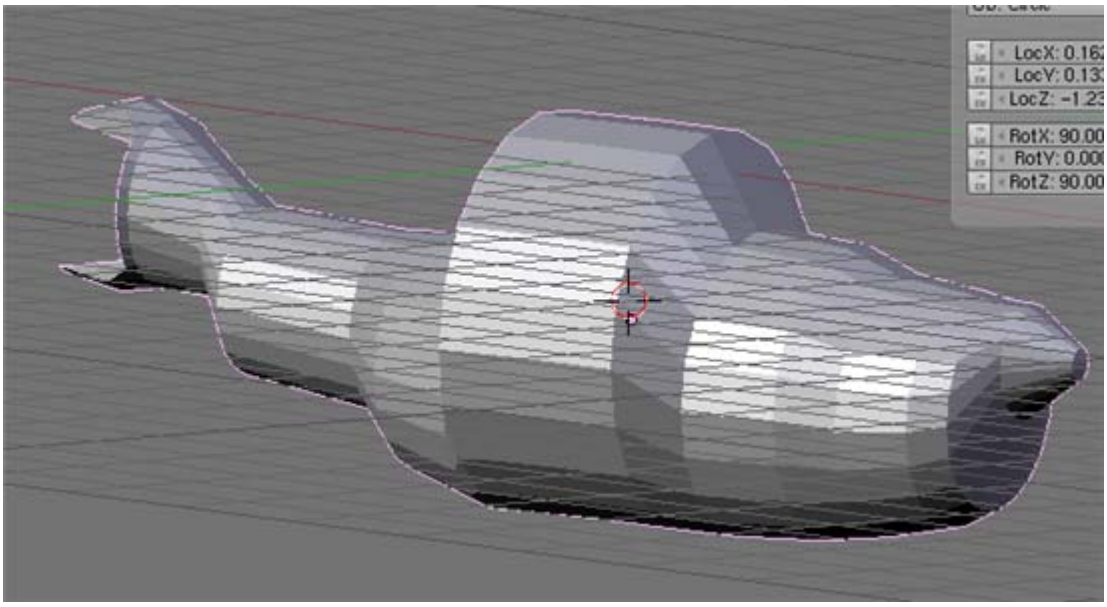
Box select the far right set of vertices. Extrude them slightly to the right then scale the set down to a single point.



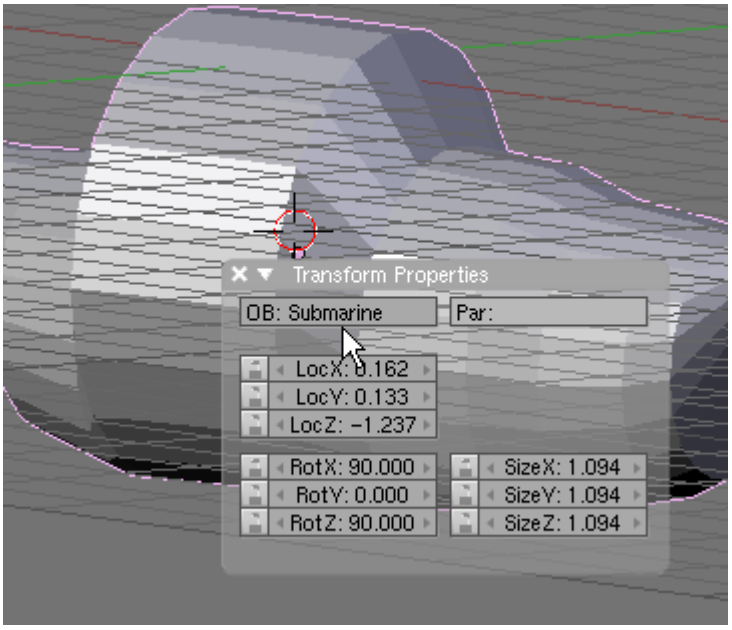
With the vertices still selected, press the **WKEY** (Specials Menu). Choose “Merge” from this menu. In the following dialogue box select “At Center” This will merge the selected vertices into one vertex. A message should be displayed saying that in the process 37 vertices have been removed.

Press the **AKEY** to deselect the vertex. Zoom out a bit. Place your 3D cursor in the center of the submarine. Press the **CKEY** (Center) and zoom back in a bit to see the

whole submarine. Press the **TAB** Key to **Exit Edit Mode**. Press the **ZKEY** to enter shaded mode. **MMB drag** to orbit your model to a 3D view.



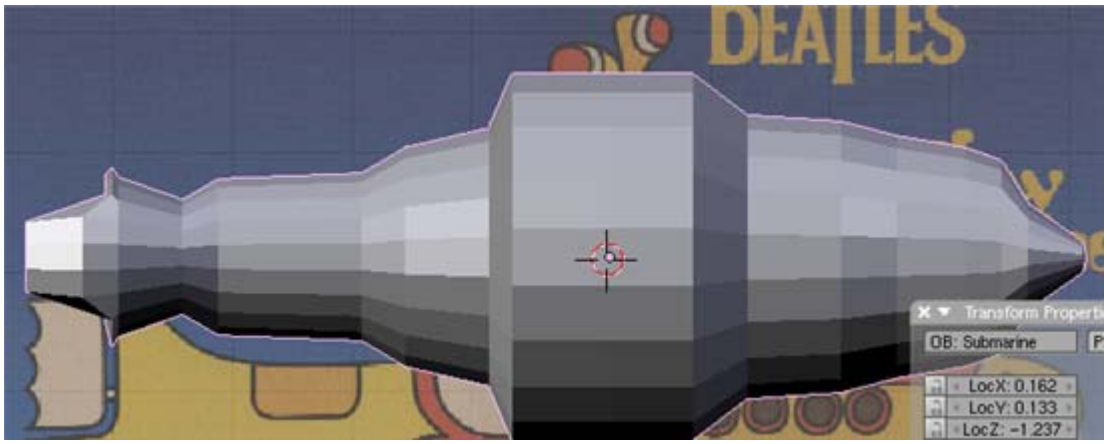
In the Transform Properties Panel (Pres the **NKEY** if not already displayed) name this object Submarine.



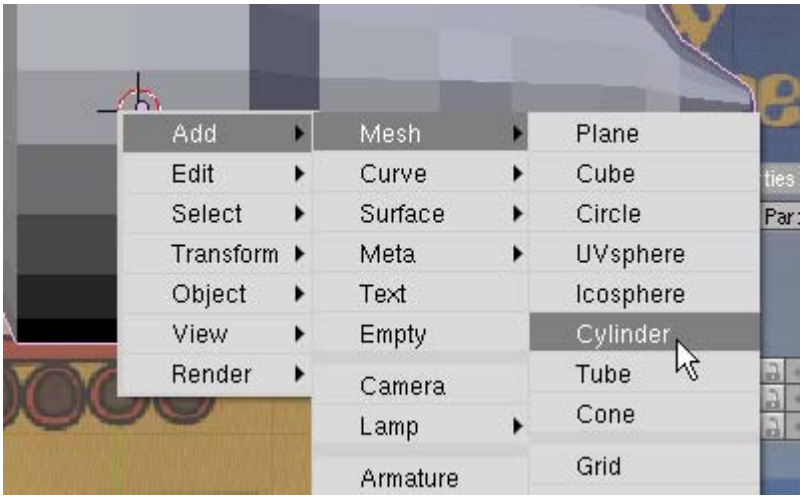
Always name your modeled objects!!!!!

Save your file **CTRL-W**.

We now need to add a few more elements. Press the NUM7 to switch to Top View. Place your 3D cursor as shown in the middle.



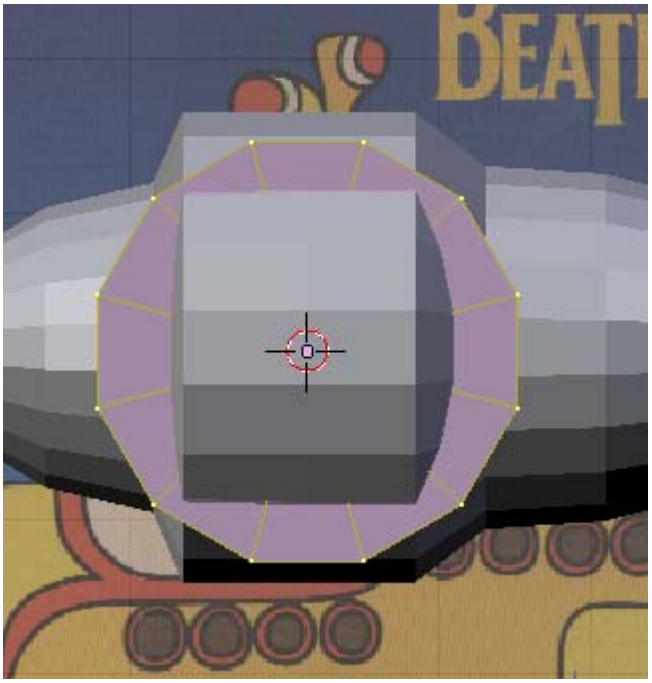
Press Space / Add / Mesh / Cylinder.



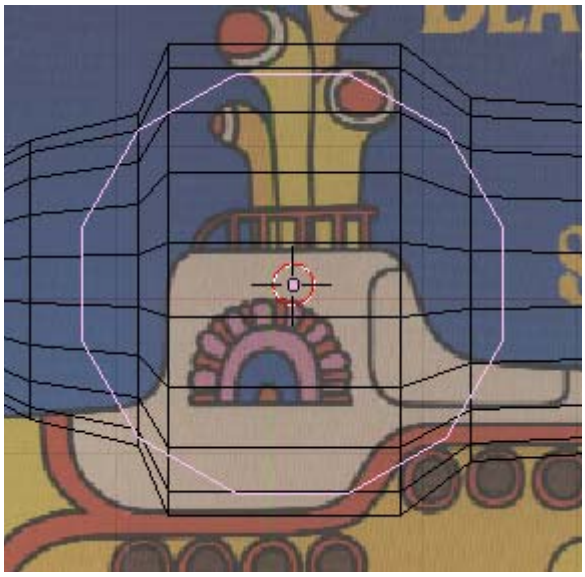
Set the vertices down to 12 and press ok.



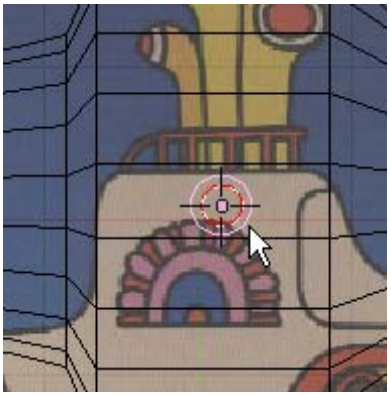
A cylinder object in **EDIT MODE** with all of the vertices selected is placed on the display at the point of the 3D cursor.



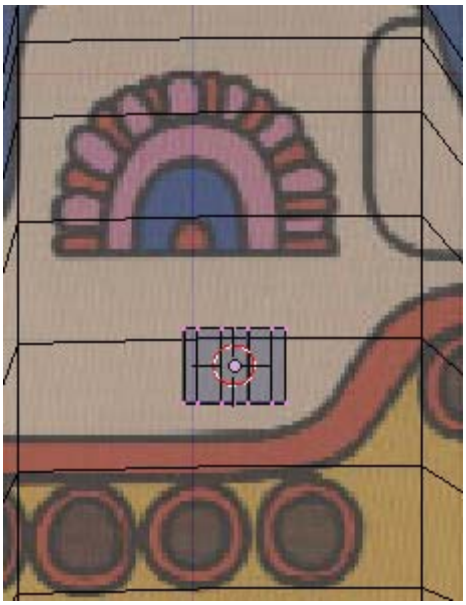
Press the **AKEY** to deselect the vertices. Press the **ZKEY** to enter wireframe mode. Press the **TAB** Key to exit EDIT MODE.



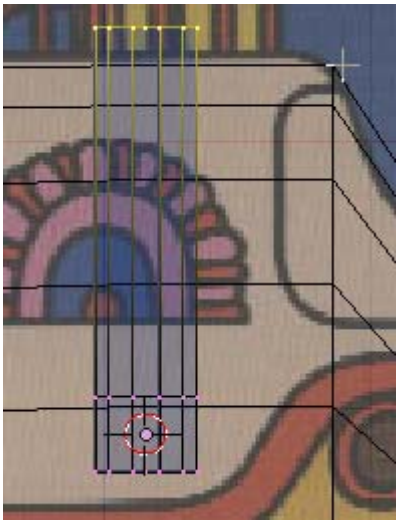
Press the **SKEY** (Scale) and scale the cylinder down quite a bit as shown.



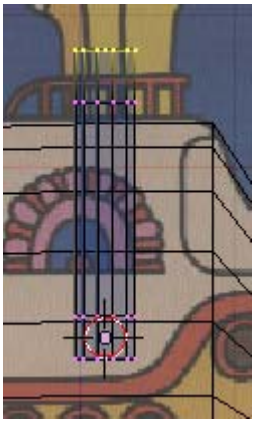
Press **NUM1** to switch to Front View. Press the **TAB** Key to enter **EDIT MODE**. Zoom a bit for a better view of the cylinder.



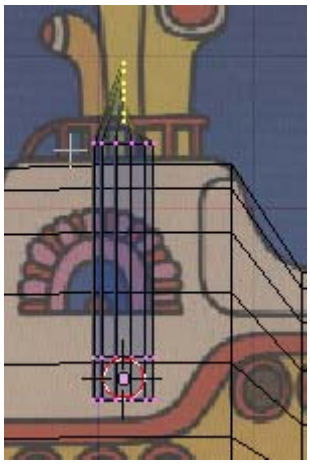
Box select the top set of vertices and extrude them up as shown.



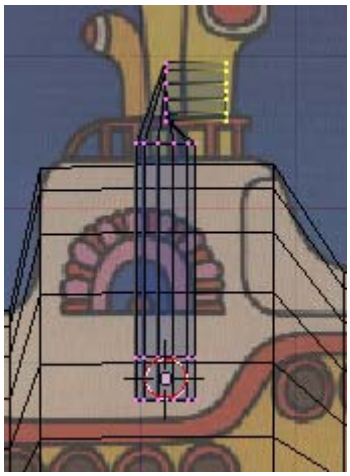
Zoom out a bit and extrude the new set of vertices again upwards a bit as shown.



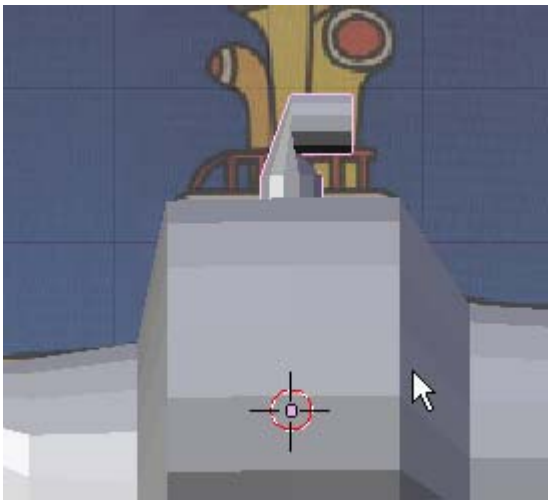
With the vertices still selected press the **RKEY** and rotate them about 90 degrees as shown.



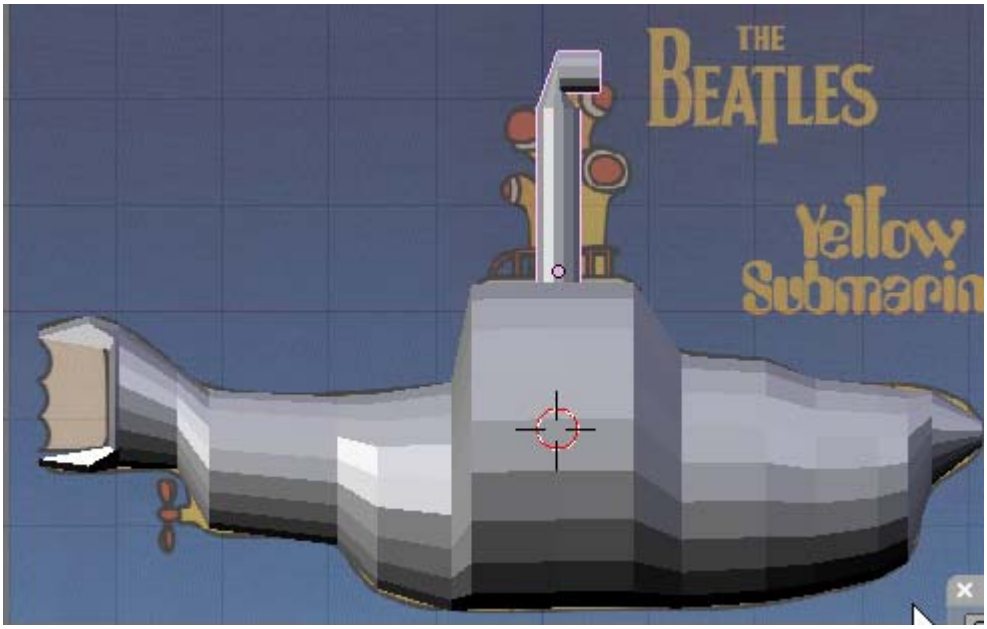
Now extrude the vertices a bit to the right as shown.



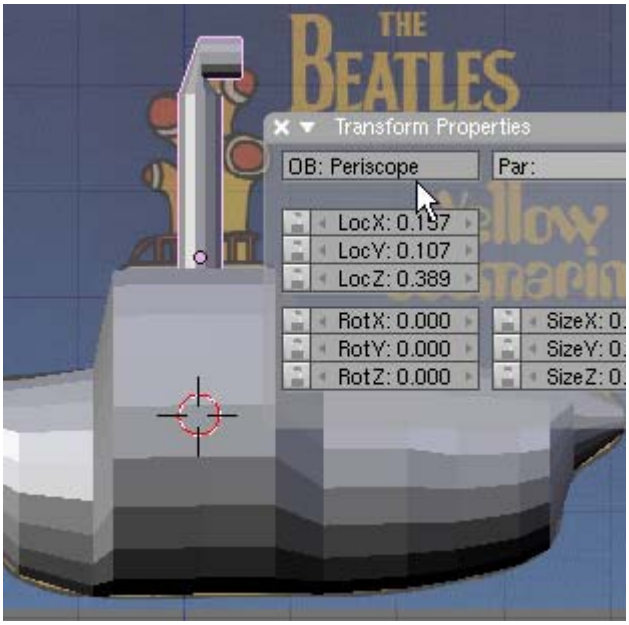
Press the AKEY to deselect the vertices. Press the TAB Key to exit EDIT MODE. Press the ZKEY to enter Shaded Mode.



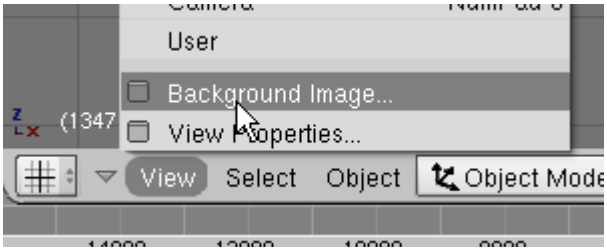
This object will be the sub's periscope. Zoom out a bit and grab it and place it on top of the sub. Check the Side View (**NUM3**) and the Top View (**NUM7**) to make sure it is centered on the top.



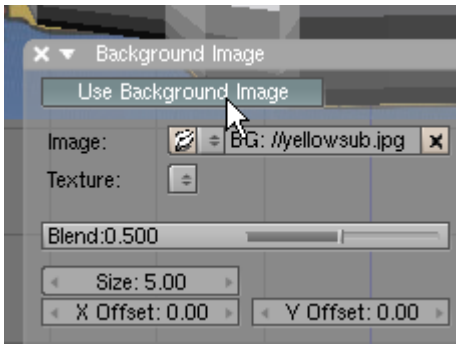
Name this object periscope in the Transform Properties Panel.



We no longer need the background image. Select View / Background Image

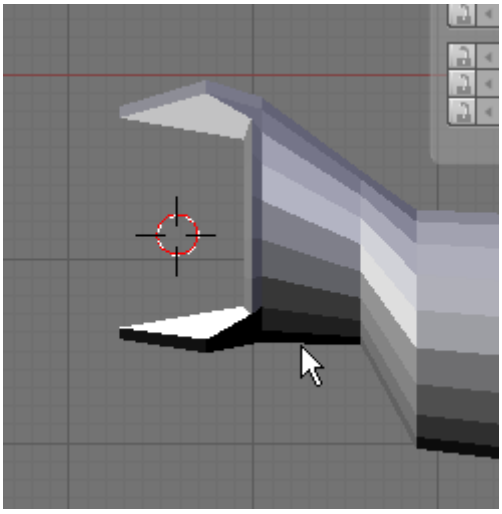


Click on the “Use Background Image” button to turn it off.

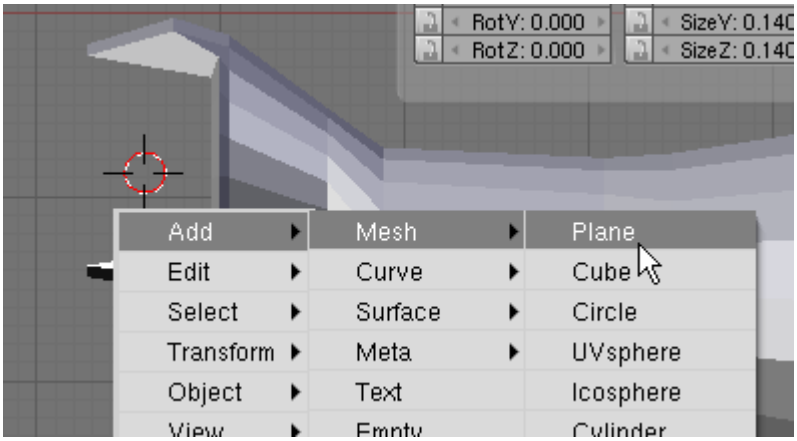


Save your file **CTRL-W**.

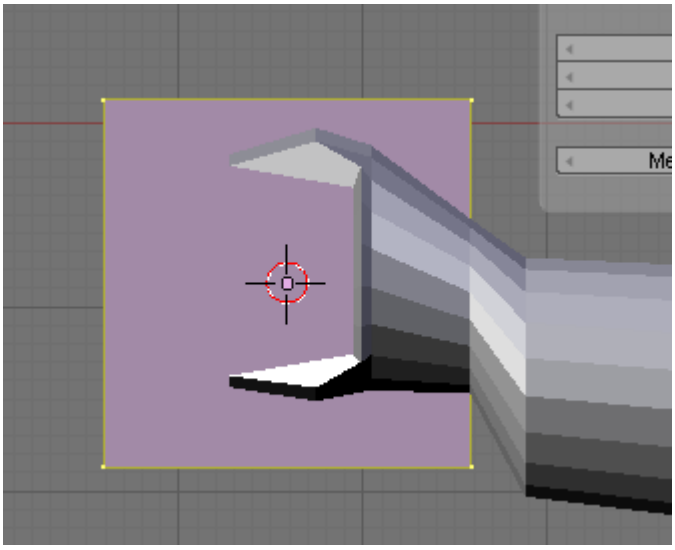
Make sure you are in Front View (**NUM1**). Zoom in a bit on the sub’s rudder area and place your 3D cursor as shown.



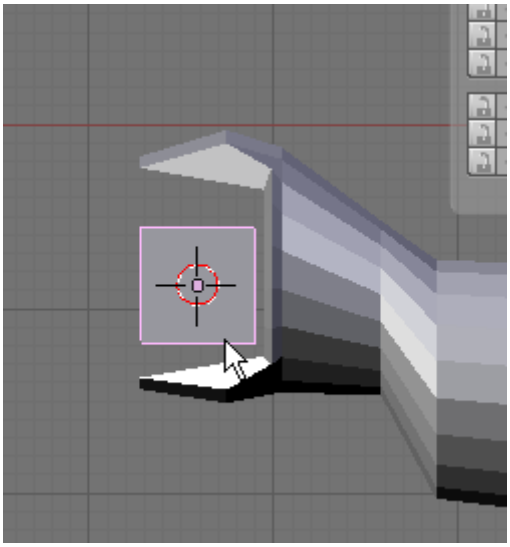
Press Space / Add / Mesh / Plane.



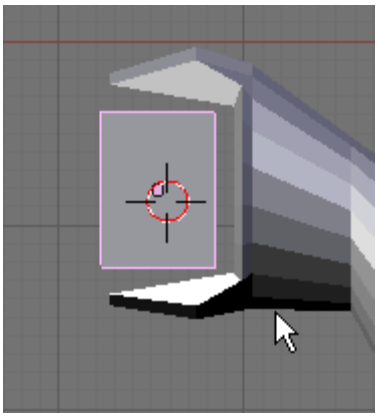
This adds a simple plane object in **EDIT MODE** with all of the vertices selected to the position of the 3D cursor.



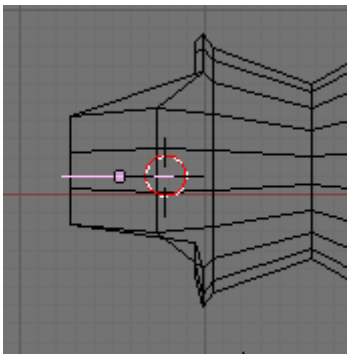
Press the **AKEY** to deselect the vertices. Press the **TAB** Key to exit EDIT MODE. Pres the **SKEY** and scale the plane down as shown.



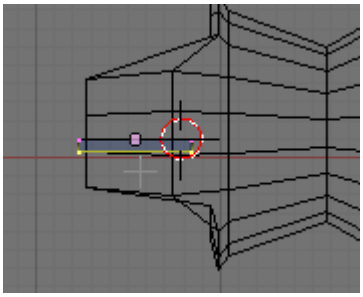
Now press the SKEY followed by the ZKEY. This will allow you to scale the object in the Z Axis only. Scale the plane along the Z Axis then Grab it (GKEY) and position it as shown.



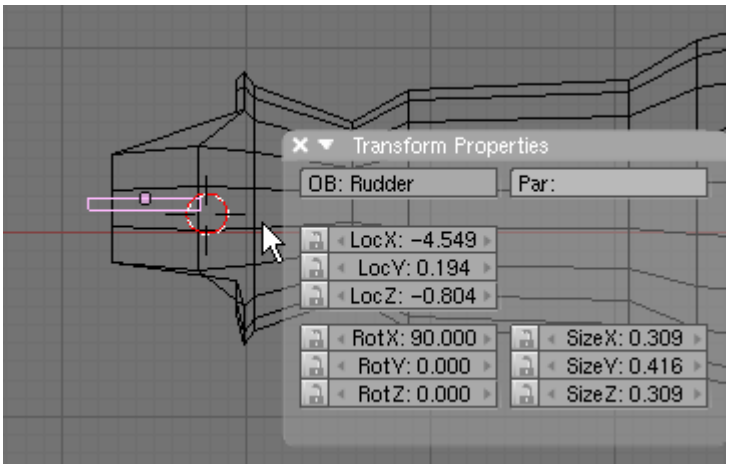
Press the **ZKEY** to enter wireframe view. Press **NUM7** to switch to Top View.



Press the **TAB** Key to enter **EDIT MODE**. Press the **AKEY** to select all of the vertices. Extrude them out just a slight bit as shown.

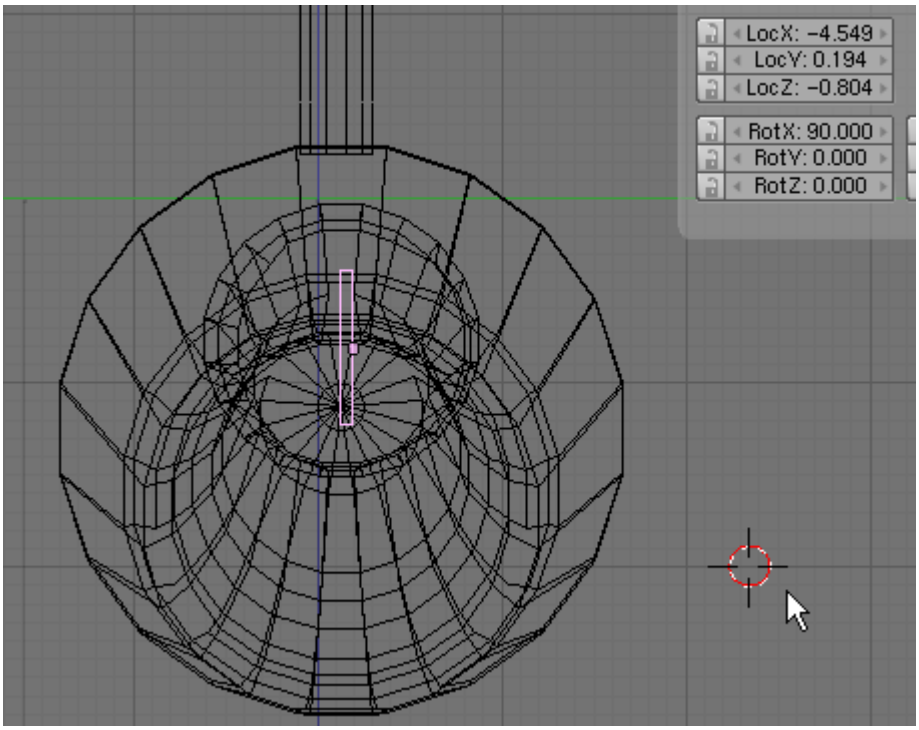


This is the sub's rudder. Deselect the vertices, exit edit mode and grab the rudder and position it as shown. Name this object Rudder.

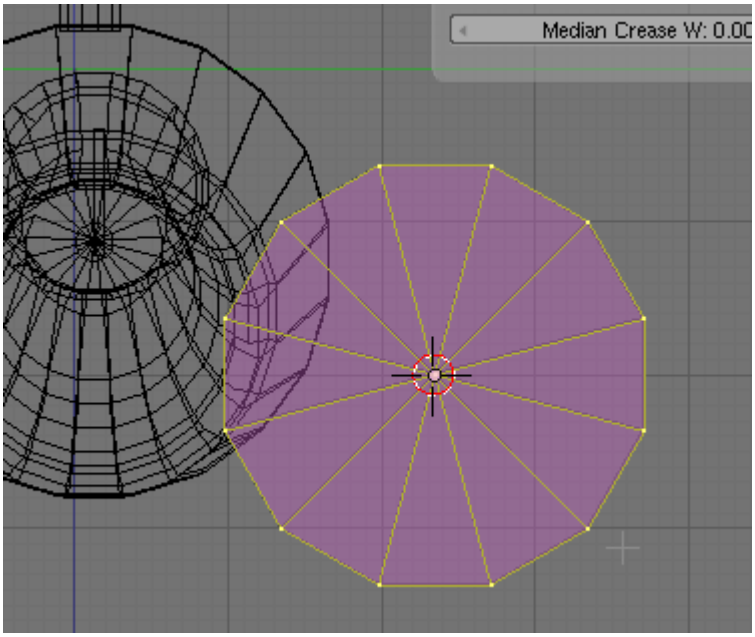


Save your file **CTRL-W**

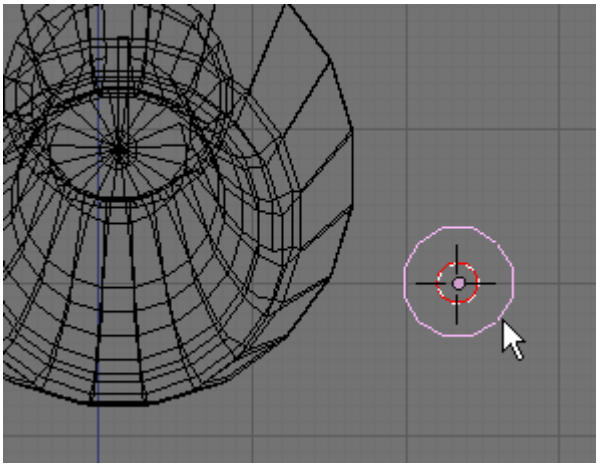
Press **NUM3** to switch to side view. Place your 3D cursor to the side of the submarine as shown.



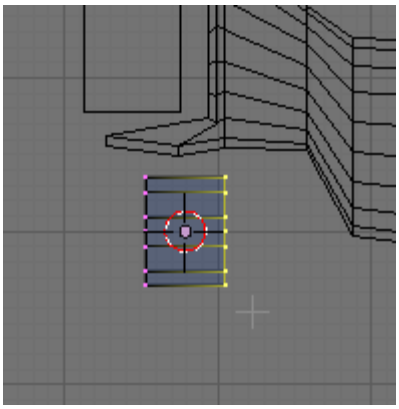
Press **Space / Add / Mesh / Cylinder**. **Set the vertices at 12**. A cylinder object in EDIT MODE with all of the vertices is placed on the 3D display at the position of the 3d cursor.



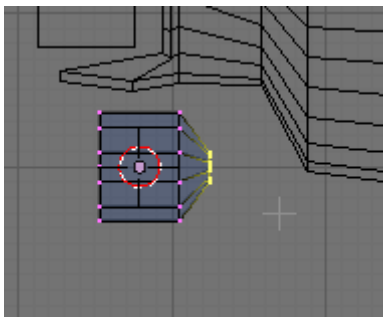
Deselect the vertices, **TAB** out of EDIT MODE and scale the cylinder down as shown.



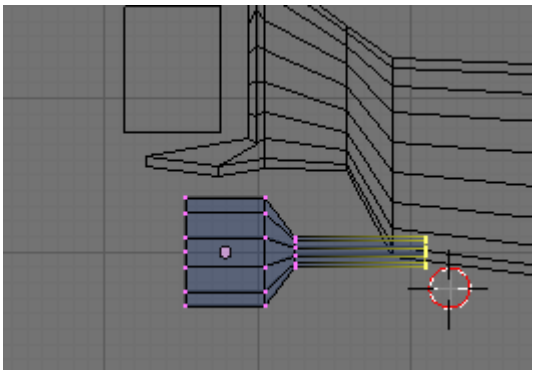
This will be the sub's propeller. **TAB** into EDIT MODE. Switch to Front View **NUM1**. Box select the right set of vertices as shown.



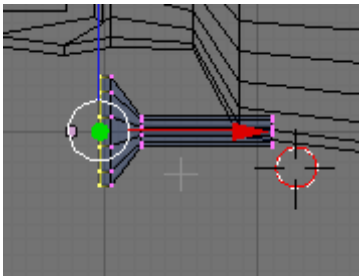
Extrude them a short bit to the right, then scale them down as shown.



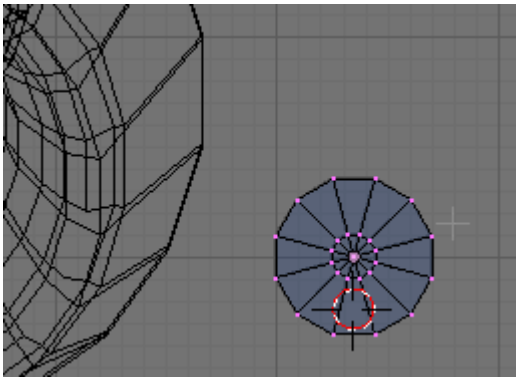
Now extrude the selection to the right again as shown (this is the propeller's shaft).



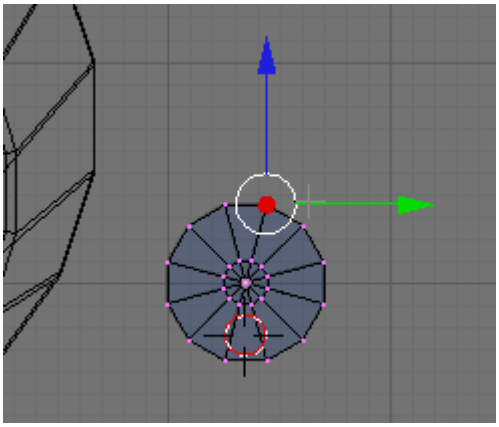
Press the **AKEY** to deselect the vertices and then box select the vertices on the left of the object and move them to the right as shown. (You may want to turn on your 3D widget if it is off)



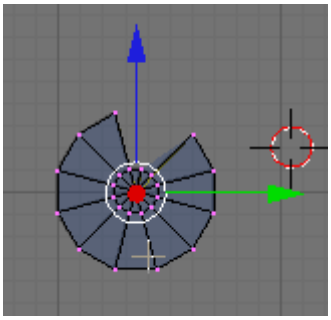
Deselect all of the vertices and switch to Side View (**NUM3**)



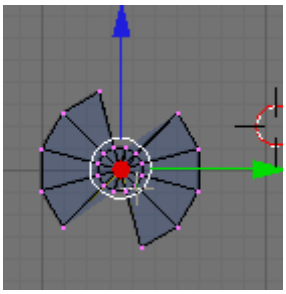
Box select one of the top vertices as shown. (Note that since we are in wireframe mode the vertex directly behind the selected vertex is also selected.



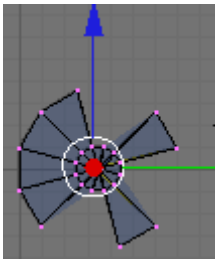
Grab (**GKEY**) this vertex (actually 2 vertices) and move it to the center as shown.



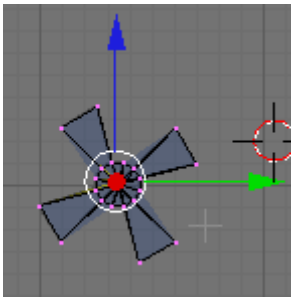
Press the AKEY to deselect the vertices. Box select the vertices directly opposite of the first and grab them and move them to the center as shown.



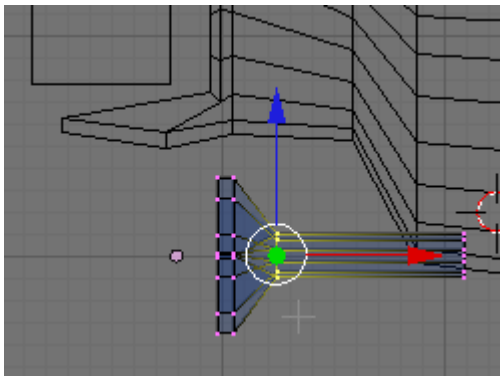
Press the **AKEY** to deselect the vertices and make a new Box selection as shown and grab the vertices and move them to the center.



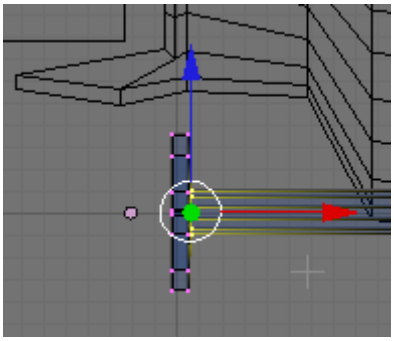
Press the **AKEY** to deselect the vertices and make a new Box selection as shown and grab the vertices and move them to the center.



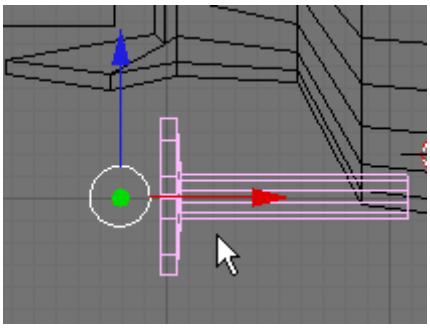
Press the **AKEY** to deselect the vertices. Press **NUM1** to switch to Front View. Box select the center vertices as shown.



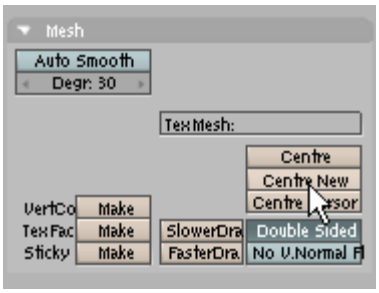
Move them to the left as shown.



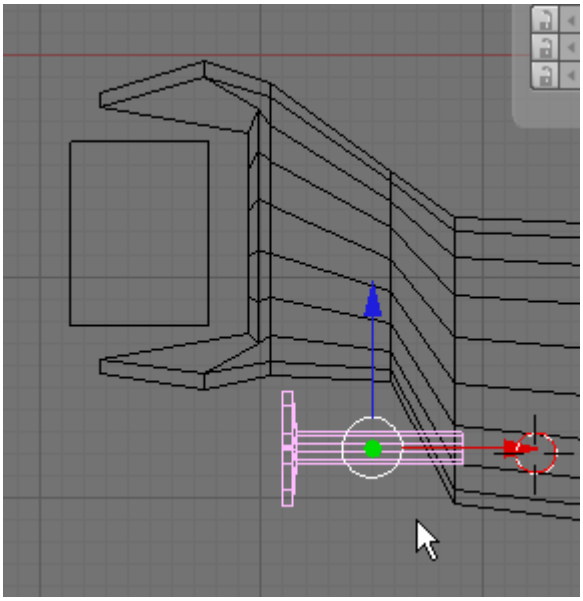
Press the **AKEY** to deselect the vertices. Press the **TAB** Key to exit Edit Mode.



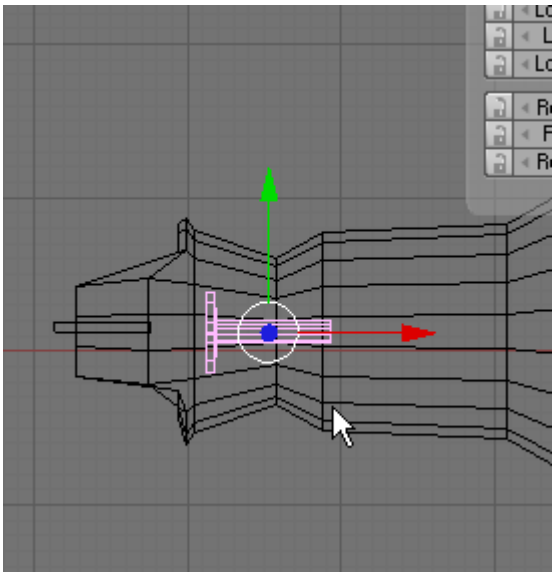
Notice that the center point of the object is now outside of the object. This is a result of all of the EDIT MODE manipulation of the vertices. Look in the Editing Buttons Window below the 3D Viewport. In the Mesh Panel press the Centre New button. This will re-center the objects center point. (Note: if the Editing buttons are not present press F9)



Grab the object and place it on the sub as shown (Note: You may have to scale it a bit).

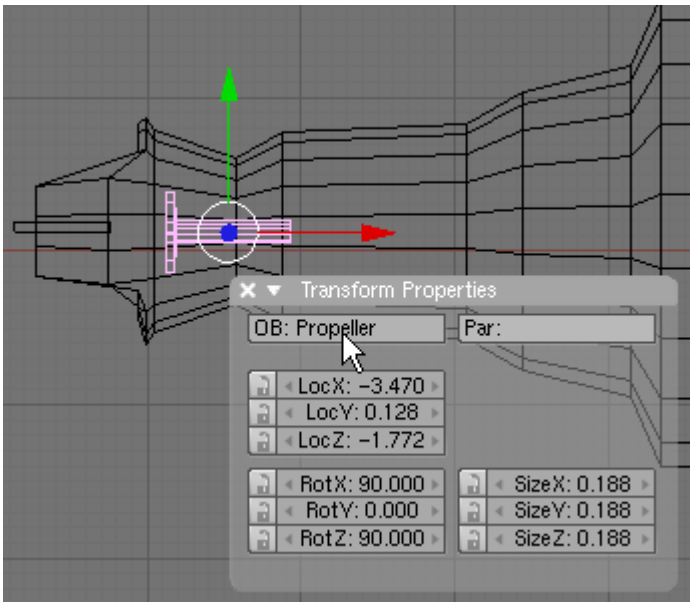


Switch to Top View (NUM7) and make sure it is in the correct position. (Move it if needed).



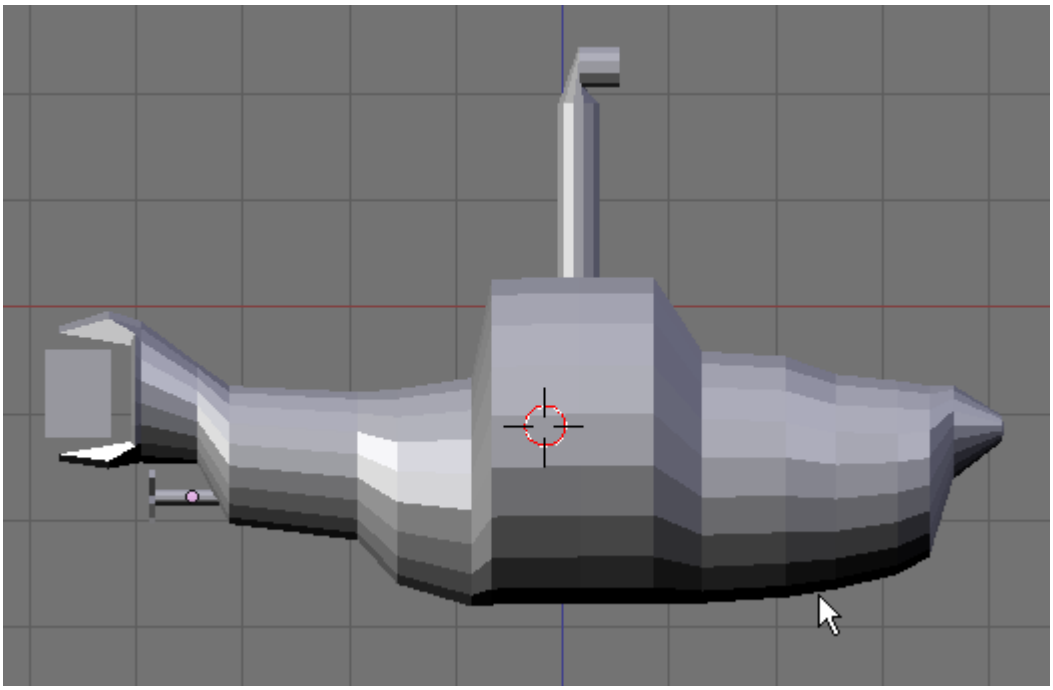
Whenever you are positioning an object in 3D modeling always check the other views to see if it is in the correct 3D space.

Name this object Propeller.

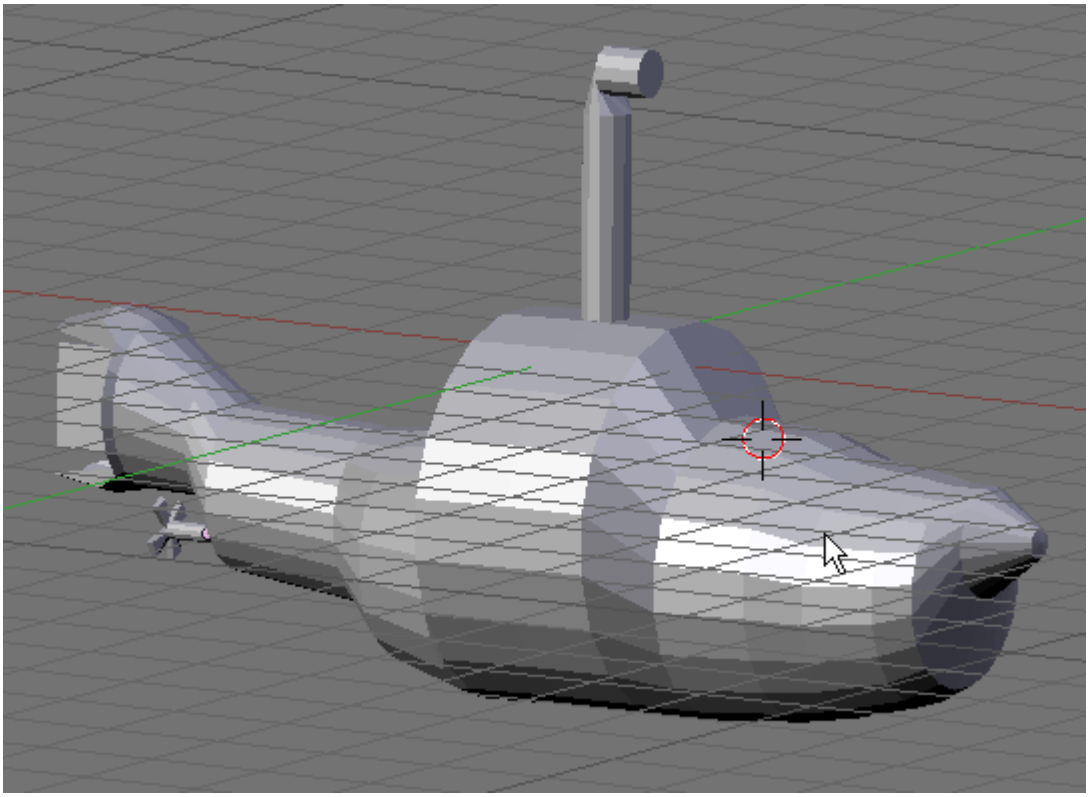


Save your file **CTRL-W**.

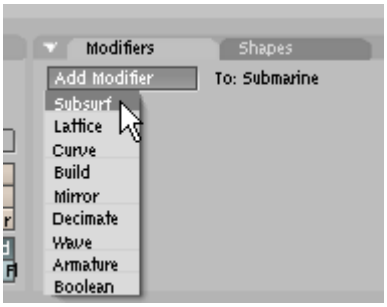
Switch to Front View (**NUM1**). Press the **AKEY** to deselect the propeller object. Center you sub in the view and press the **ZKEY** to enter shaded mode.



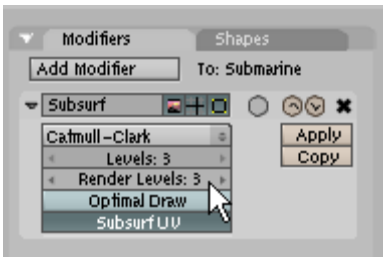
We will now do a bit of smoothing of the objects. **MMB Drag** to see your sub in a 3D perspective.



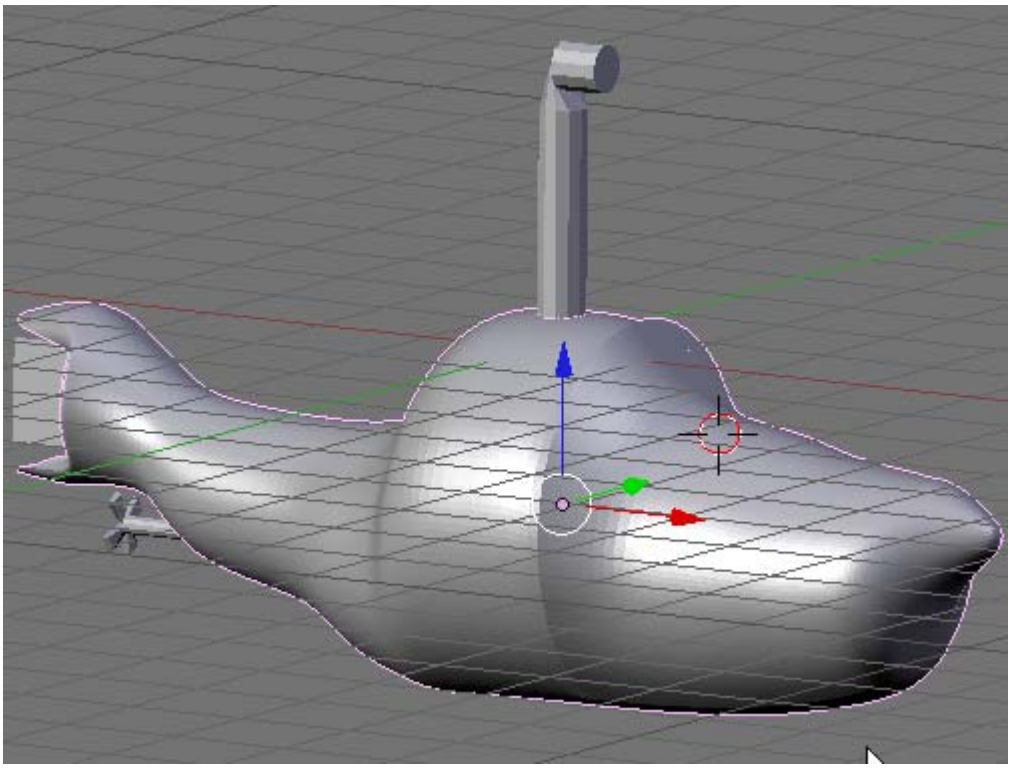
Select the submarine object alone by right-clicking on it. In the Editing Buttons Window / Modifier Panel press on the “Add Modifier” dropdown button and select “Subsurf”.



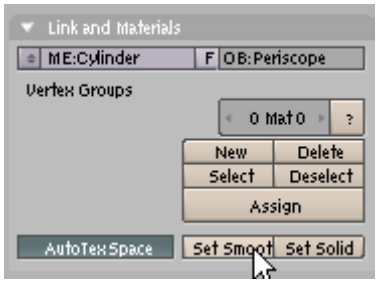
This adds a powerful smoothing modifier to the submarine object. In the Subsurf panel set the level to Levels to 3 and the Render Levels to 3.



The sub is now very smooth and will render very smooth.



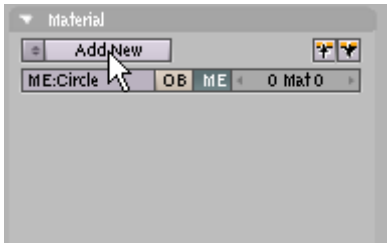
Right-click the periscope to select it. We will not add a Subsurf modifier to it but will use a simple “set smooth” function. In the Editing Buttons Window / Link and Materials Panel click on the “set smooth” button.



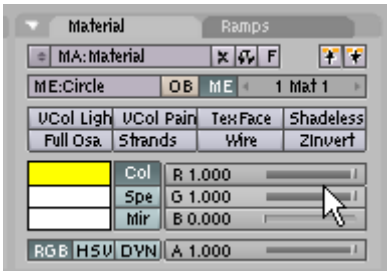
Select the propeller object and do the same.

Save your file **CTRL-W**.

We will now add some colored materials to the objects. Select the Submarine object. Press F5 (Shading) in the Material Panel press the “Add New” button.



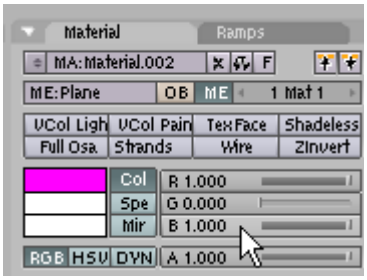
This displays the material controls for the Submarine object. In the Material Panel drag the red and green color sliders full to the right and set the blue color slider to 0 creating a yellow color.



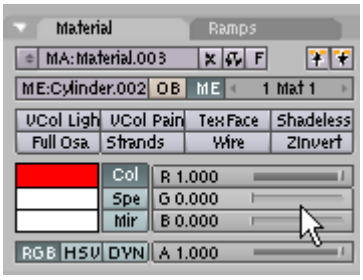
Select the Periscope object. Press the Add New button in the Shading Window. Set the red and green color sliders to 0 and set the blue color slider to full creating a blue color for the periscope.



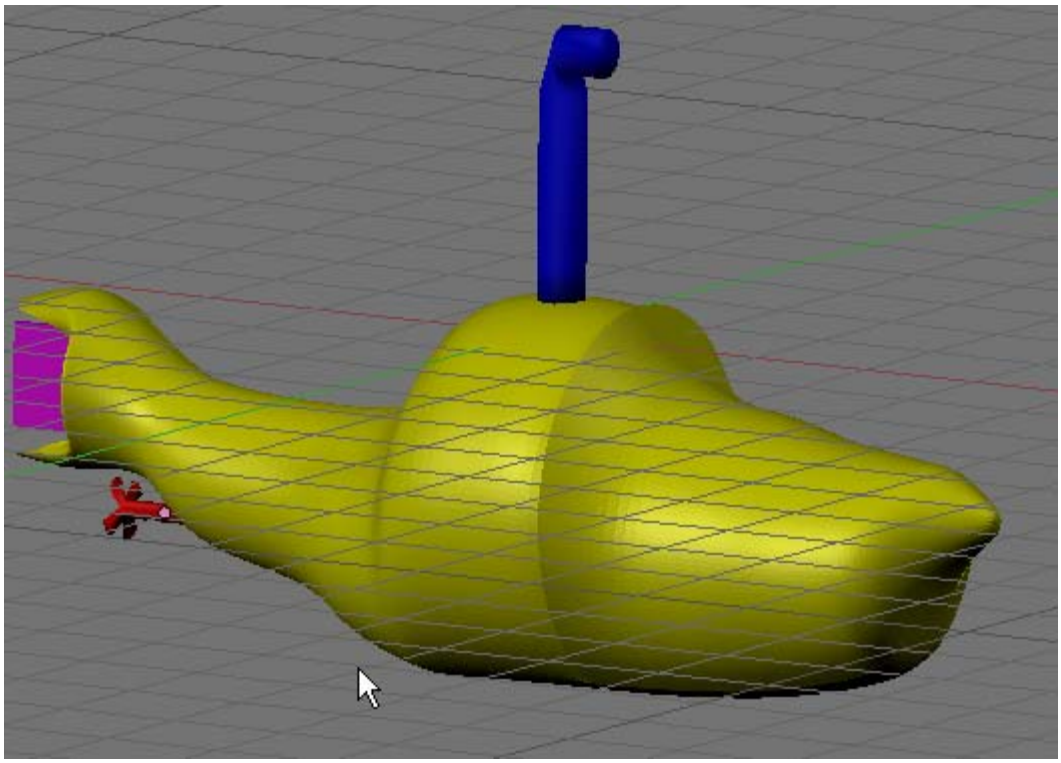
Select the Rudder object. Press the Add New button in the Shading Window. Set the red and blue color sliders to full and set the green color slider to 0 creating a magenta color for the rudder.



Select the Propeller object. Press the Add New button in the Shading Window. Set the red color slider to full and set the green and blue color sliders to 0 creating a red color for the propeller.



Press the AKEY to deselect the propeller. Your submarine should now look like the one shown below.



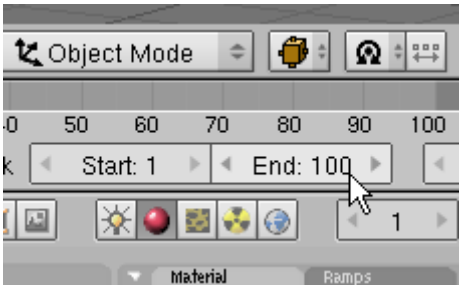
Save your file **CTRL-W**.

We now need to link the objects together so they move as one unit. We will make the Submarine object a “Parent” to the other objects. To do this we must create a sequential selection with the Submarine object being the last item selected.

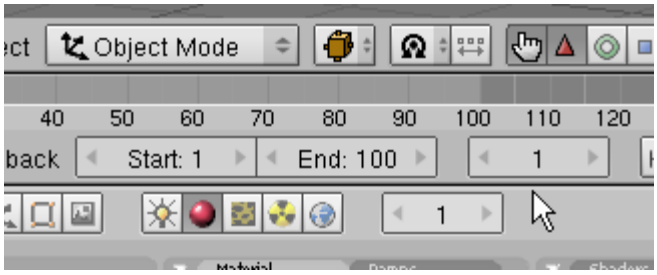
Select the Periscope alone by right-clicking on it. Hold your SHIFT Key down and right-click the Rudder object. This adds the rudder to the selection. Hold down the SHIFT Key and right-click on the propeller adding that to the selection. Finally, hold down the SHIFT Key and right-click on the Submarine object adding it last to the selection sequence. The last object added to a selection sequence is called the “active” object. Now press **CTRL-P** (Parent) and make the Submarine object a parent to the rest of the objects.

Press the **AKEY** to deselect the objects. Now select the Submarine object and grab it, and move it about. All the other objects will follow it. Wherever a parent object moves the child objects move with it. However, as in real life, the child object can move on its own without affecting the parent object.

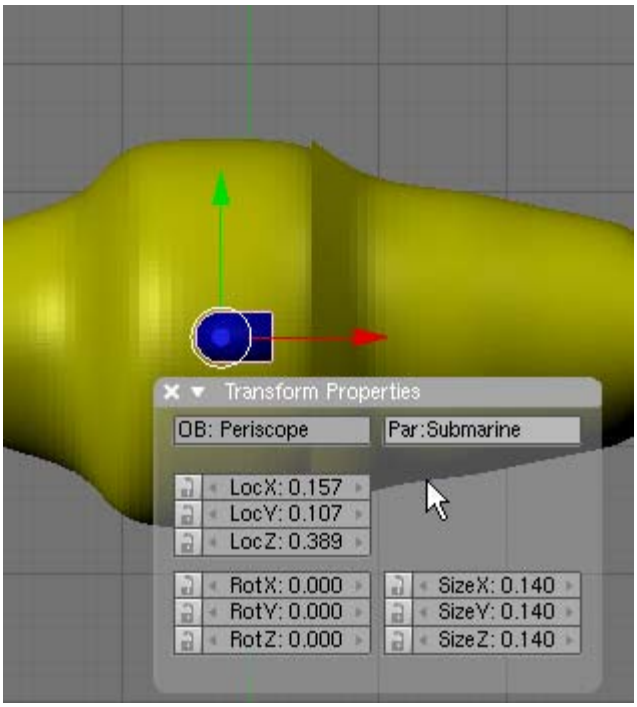
We will now add some animation to the Periscope, Rudder and Propeller objects. First we need to set the animation length. In the middle Timeline window set the animation END to 100 frames. (Make sure the start is set at 1)



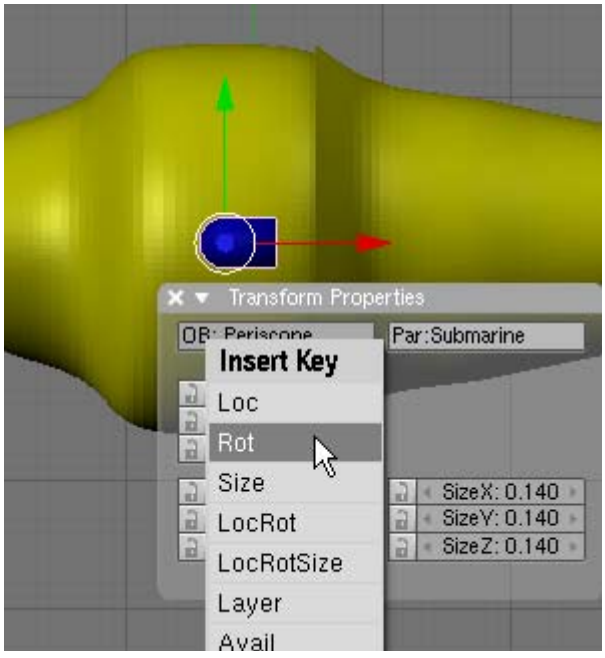
Make sure you are in frame 1 of the animation.



Switch to top View (**NUM7**). Select the Periscope Object. Press the **NKEY** (if the Transform Properties panel is not displayed).

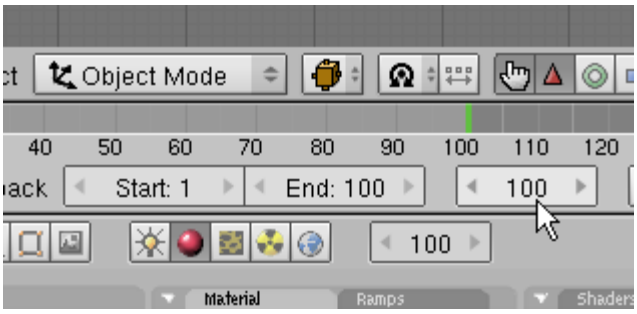


While in frame 1 with the periscope object selected we will add an animation keyframe. Press the **IKEY** (Insert) and select a ROT (Rotation) keyframe.

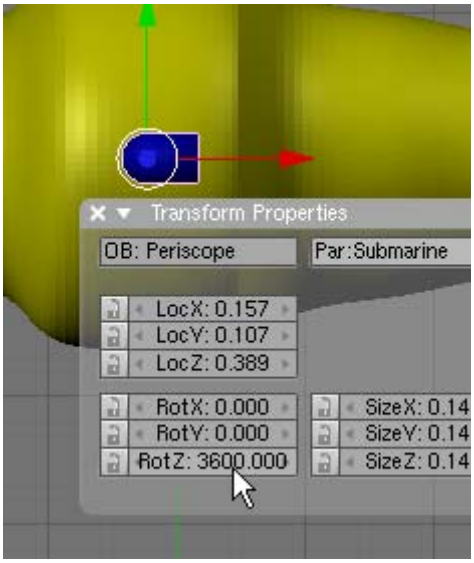


This records the current rotation of the periscope object in frame 1 of the animation. The Transform Properties Panel says that the rotation is ROTX=0, ROTY=0 and ROTZ=0.

Use your arrow keys to advance to frame 100 (or just type it in the box and enter).

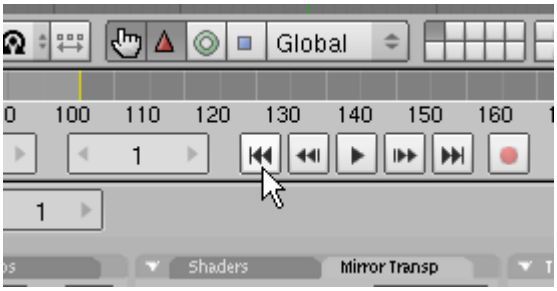


In the Transform Properties Panel set the ROTZ to 3600 by clicking on the 0 and typing in the new number.

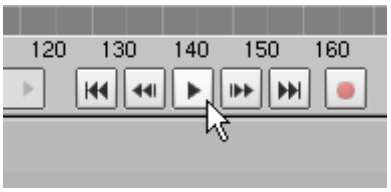


This means that in frame 100 the periscope should have revolved around completely 10 times (10 x 360 = 3600). Press the **IKEY** and insert a ROT keyframe for the Periscope object for frame 100.

Press the skip to first frame button on the timeline window.



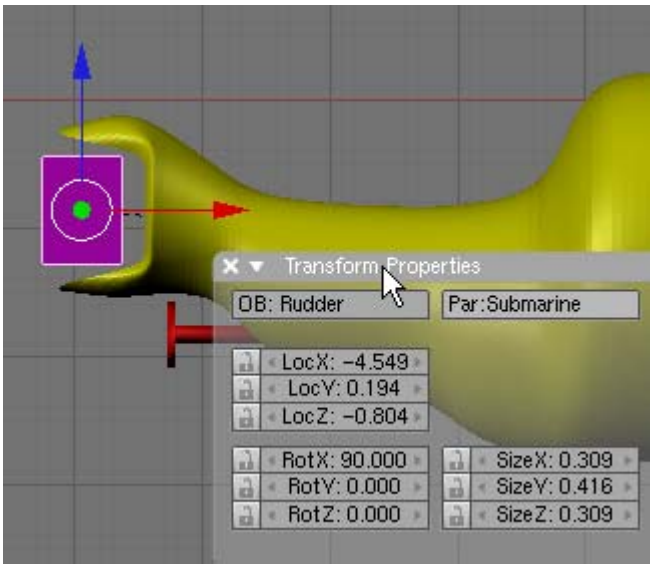
Now press the play button.



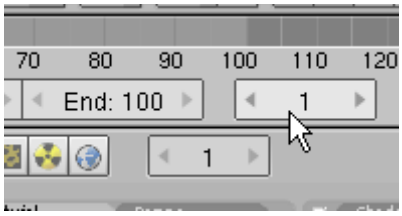
The animation plays (and replays) from frame 1 to 100 and as it does the periscope revolves around the Z axis.

Press the stop button or **ESC** (Escape) to stop playing the animation.

Switch to Front View (**NUM1**). Select the Rudder object (alone).

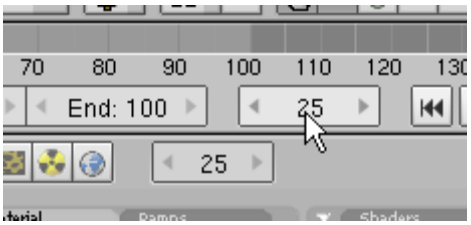


Make sure you are in frame 1.

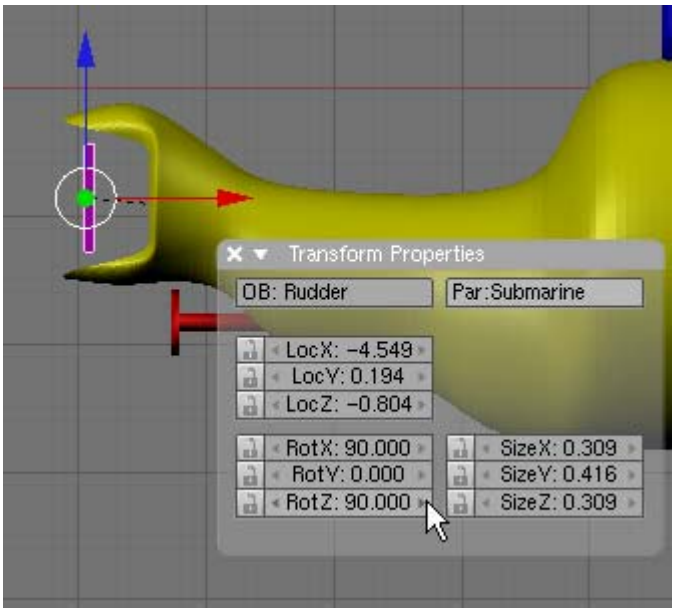


Press the **IKEY** (Insert) and insert a ROT (Rotation) keyframe for the rudder in frame 1 of the animation. Currently in frame 1 the rudder has a ROTX=90, ROTY=0 and ROTZ=0) (Note the ROTX=90 is there because we created this in front view).

Advance to frame 25.

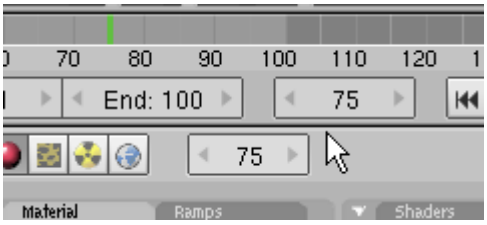


In the Transform Properties Panel set the ROTZ for the rudder to 90 degrees

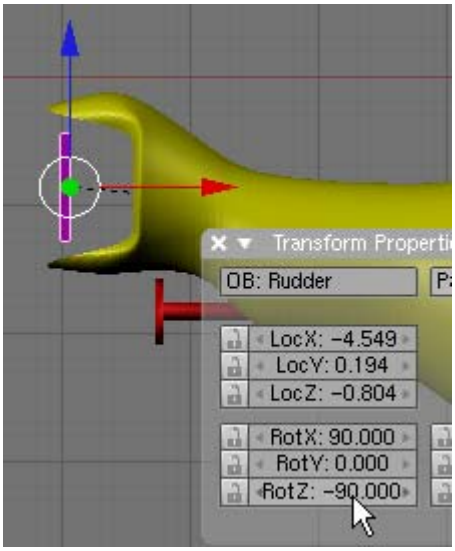


Press the **IKEY** (Insert) and insert a ROT keyframe recording this rotation for the rudder in frame 25.

Go to frame 75.



In the Transform Properties Panel set the ROTZ for the rudder to -90 degrees.

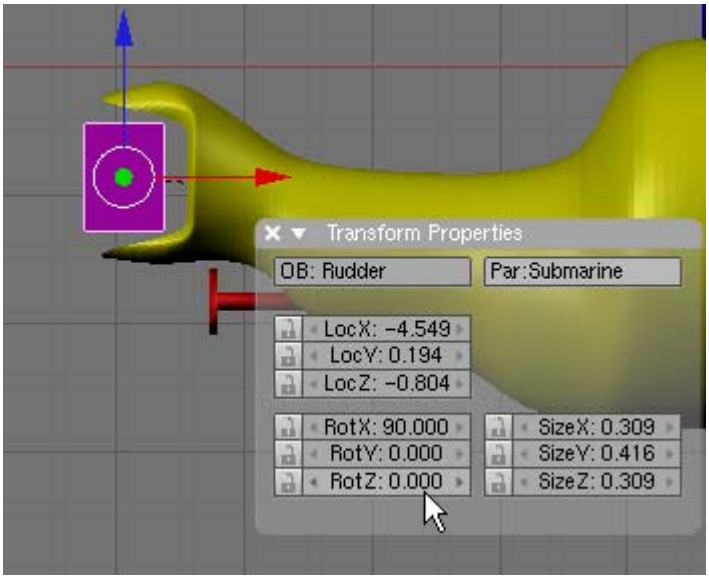


Press the **IKEY** (Insert) and insert a ROT keyframe recording this rotation for the rudder in frame 75.

Go to frame 100.



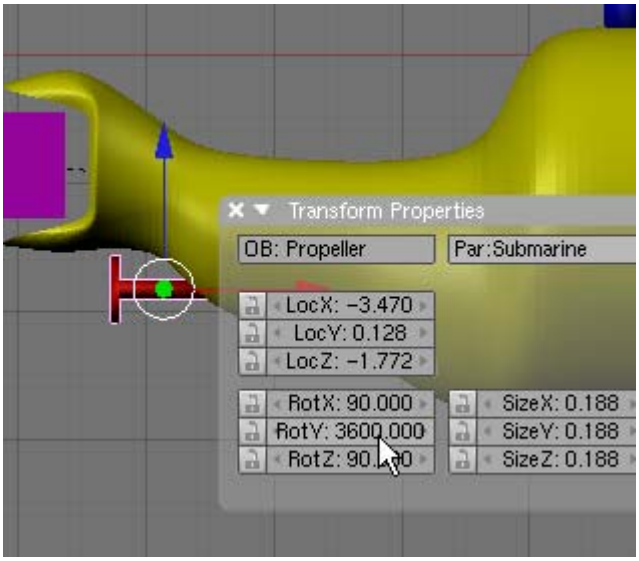
In the Transform Properties Panel set the ROTZ for the rudder to 0 degrees.



Press the **IKEY** and insert a ROT keyframe for the rudder rotation in frame 100.

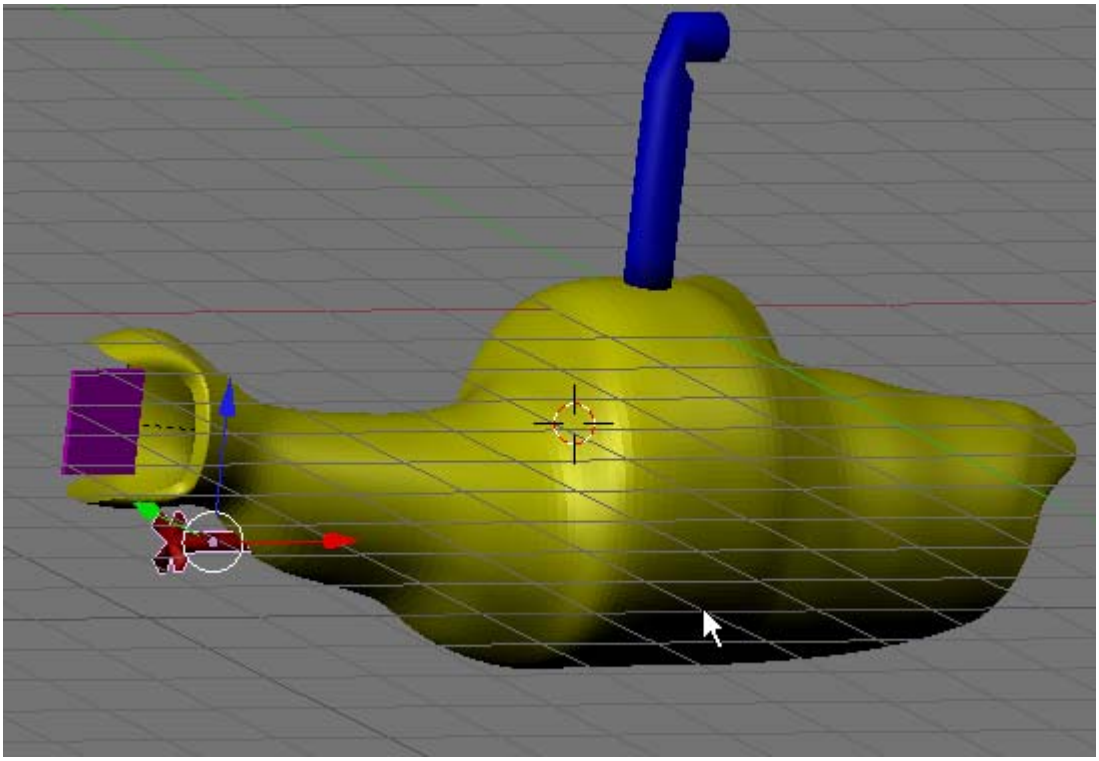
Play the animation. The rudder goes to the right, then left and then back to its starting point in 100 frames.

Stop the animation and go to frame 1. Select the propeller (alone). Press the **IKEY** and inset a ROT (Rotation) keyframe for it at frame 1. Advance to frame 100. In the Transform Properties Panel set the ROTY to 3600 degrees.



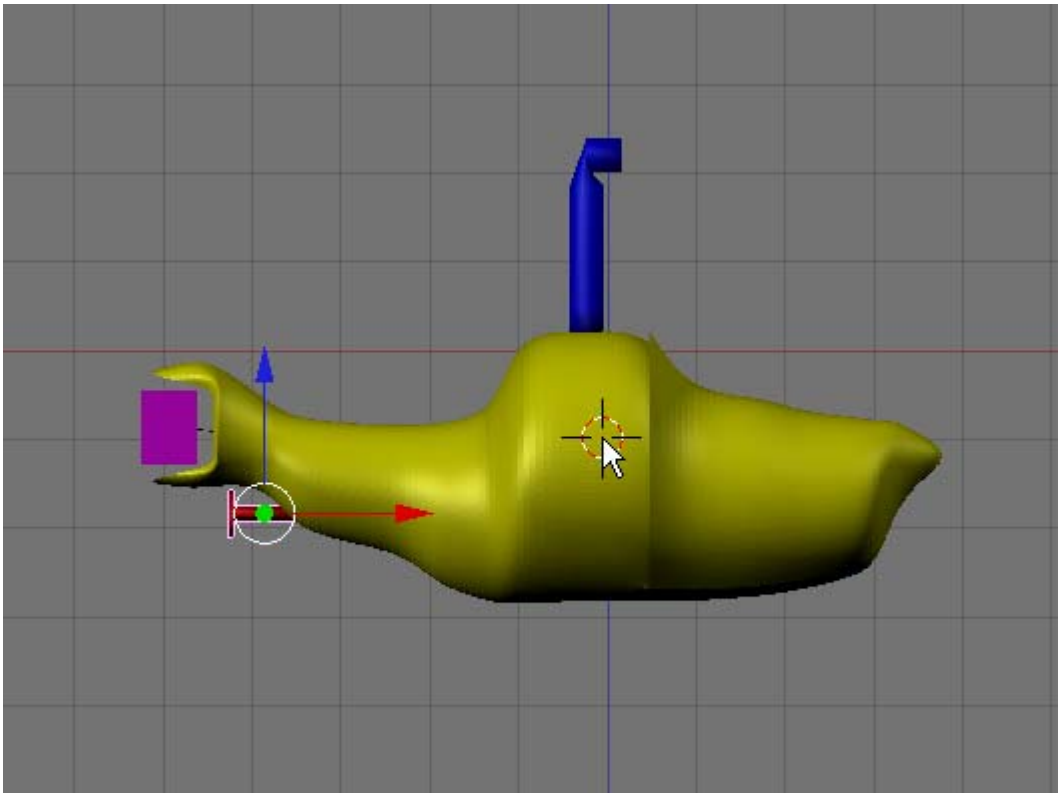
Press the **IKEY** and insert a ROT keyframe for the propeller rotation in frame 100.

MMB-Drag and orbit your model into a 3D perspective. Play the animation. The periscope revolves, the rudder moves left and right and the propeller revolves.

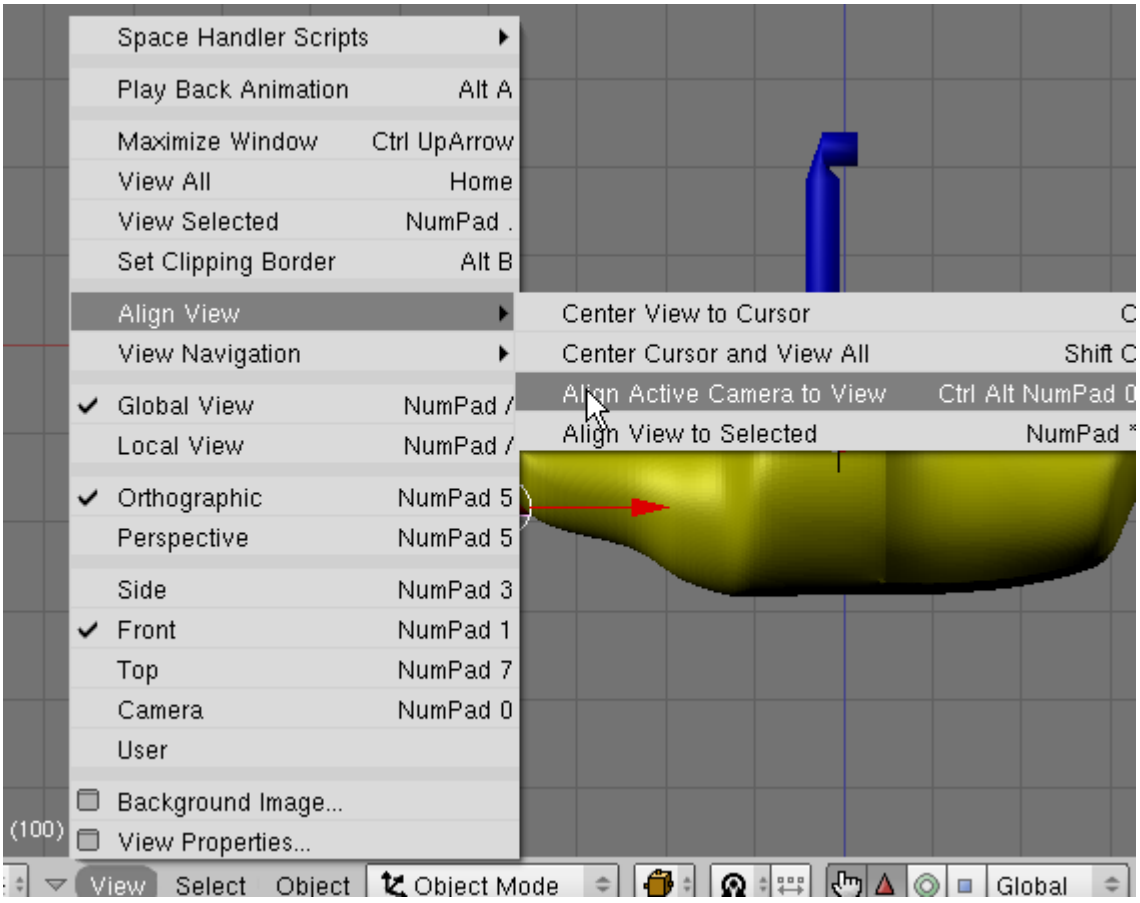


Save your file **CTRL-W**.

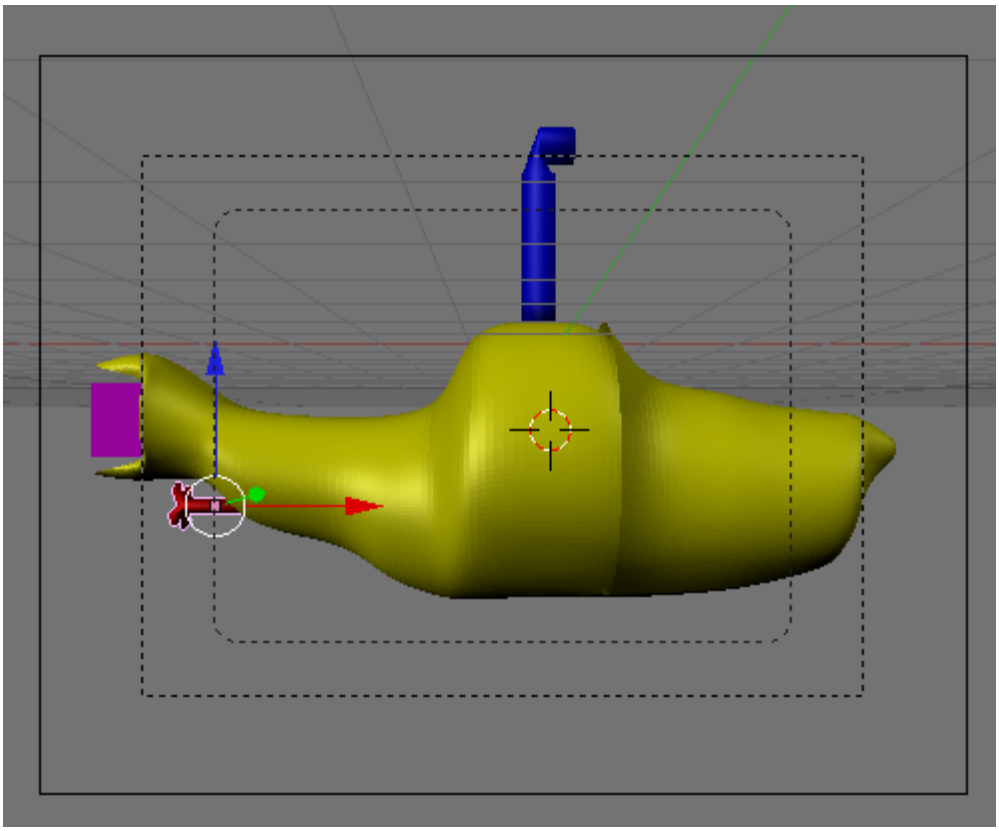
We will now animate the submarine. Switch to Front View (NUM1). Center your sub in the view as shown.



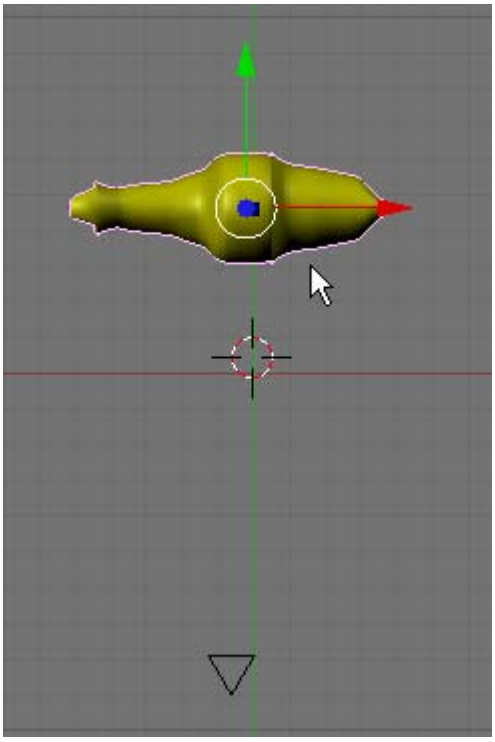
Press View / Align View / Align Active Camera to view.



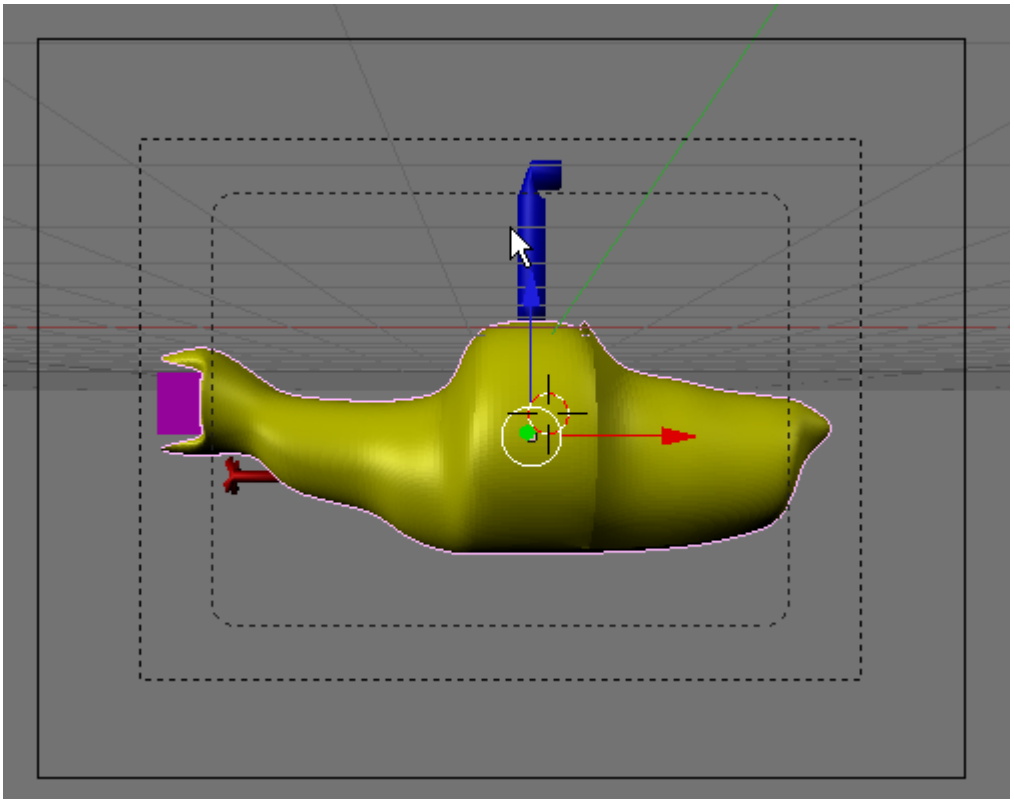
This aligns the camera to the view.



We want to get the sub completely in the center of the first set of dotted lines. If yours is like mine switch to Top View (NUM7) and move the submarine a little bit further from the camera.

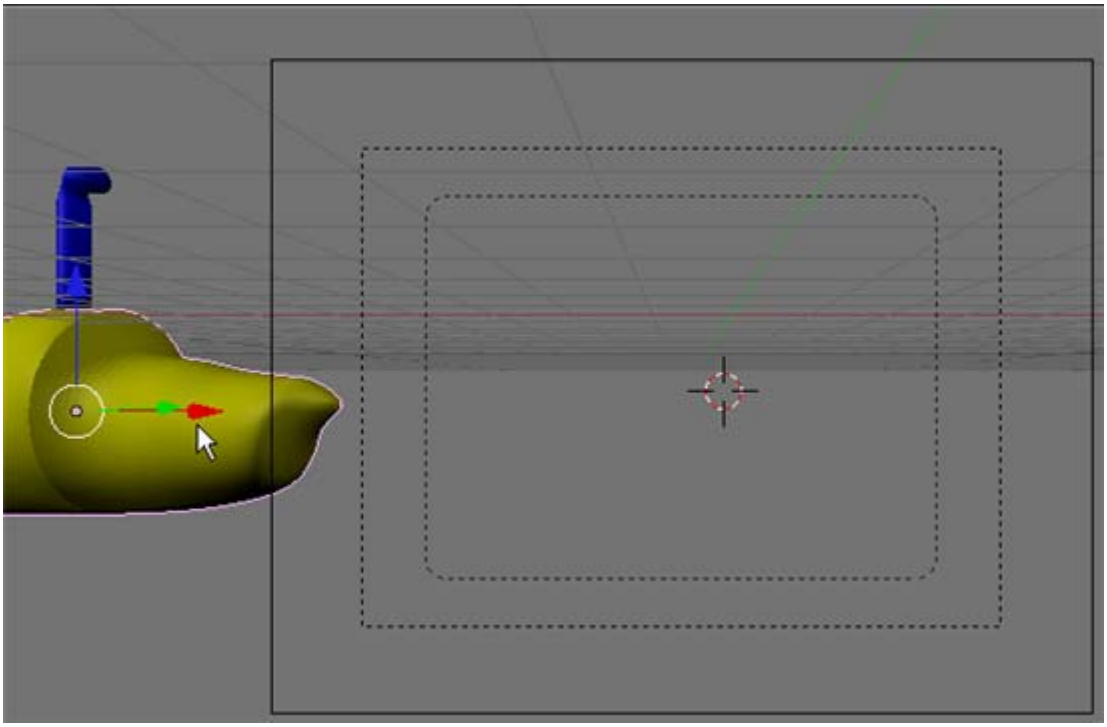


Go back to Camera View (NUM0).



Repeat this adjustment until the sub is totally within the outer dotted lines in camera view as seen above.

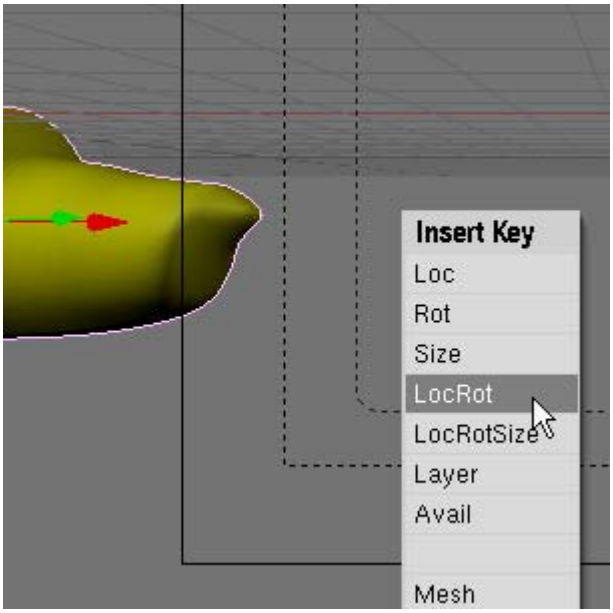
Now select the submarine and move it just off camera to the left.



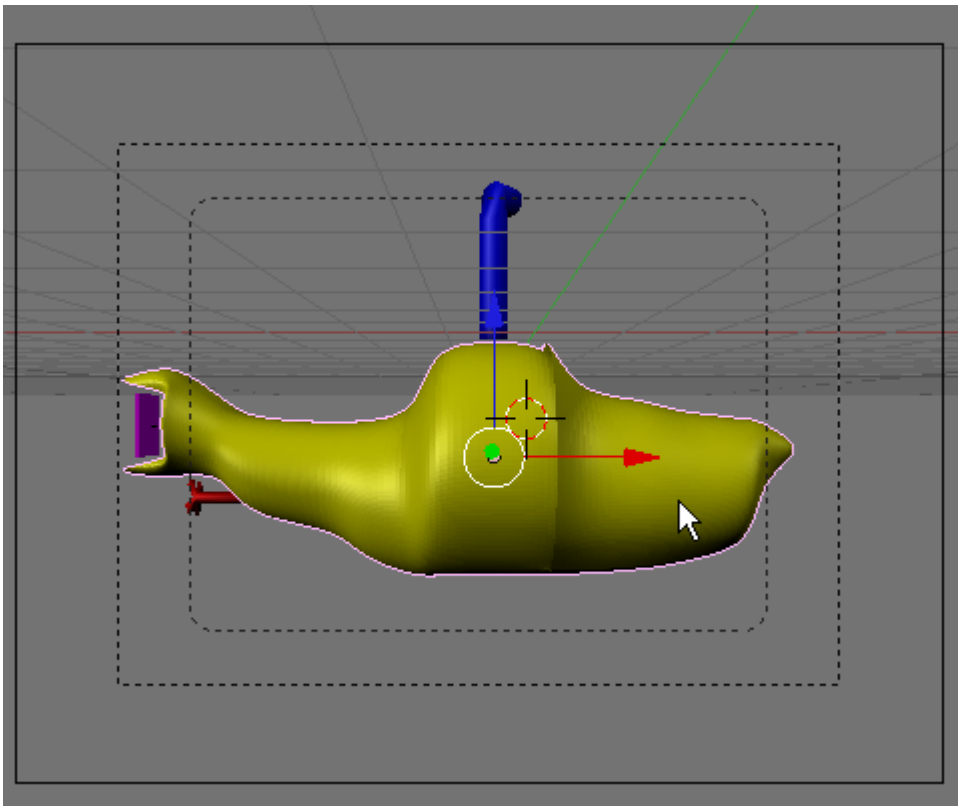
Make sure you are in frame 1.



Press the **IKEY** (Insert) and insert a LOC/ROT (Location/Rotation) keyframe for the submarine in frame 1. NOTE: This allows us to add both a location recording and a rotation recording in one keyframe.

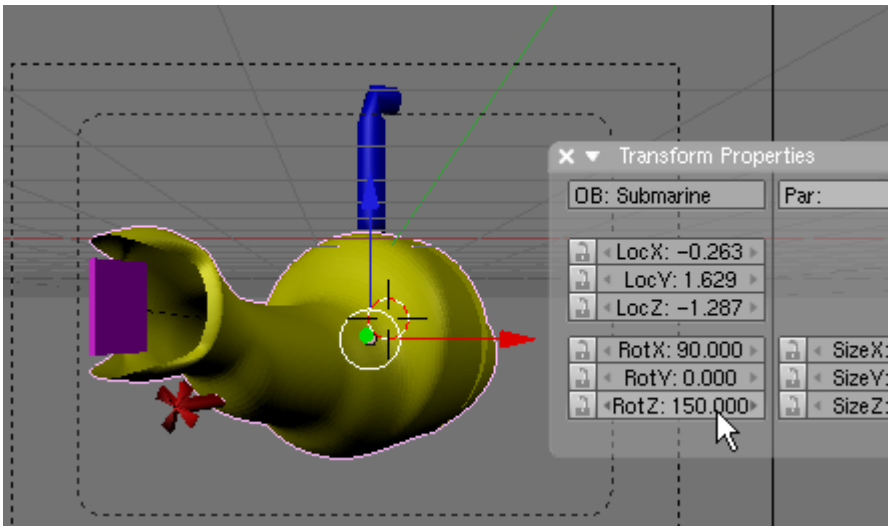


Advance to frame 35. Move the submarine to the center of the Camera View.



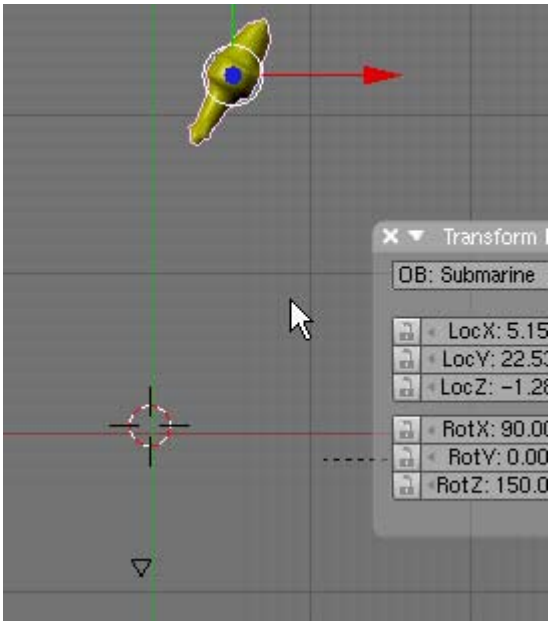
Press the **IKEY** (Insert) and insert a LOC/ROT (Location/Rotation) keyframe for the submarine in frame 35.

Advance to frame 65. In the Transform Properties Panel for the Submarine object set the ROTZ to 150 degrees.

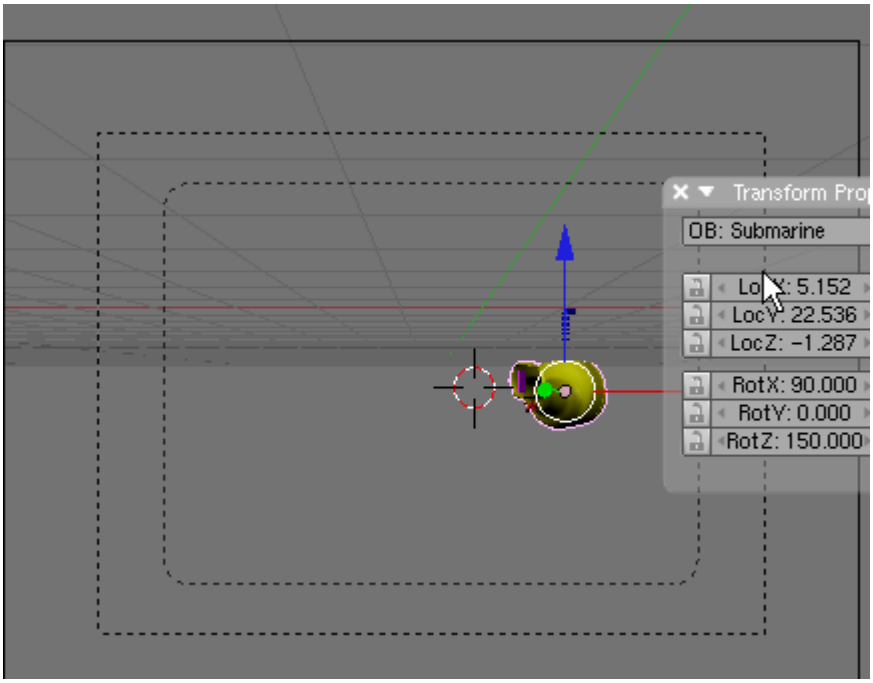


Press the **IKEY** (Insert) and insert a LOC/ROT (Location/Rotation) keyframe for the submarine in frame 65.

Advance to frame 100. Switch to Top View (**NUM7**). Move the submarine off away from the camera as shown



You can check what this looks like in camera View by pressing **NUM0**.

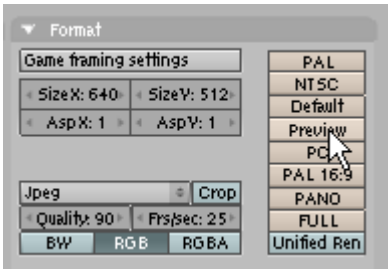


When you are satisfied with the view press the **IKEY** (Insert) and insert a LOC/ROT (Location/Rotation) keyframe for the submarine in frame 100.

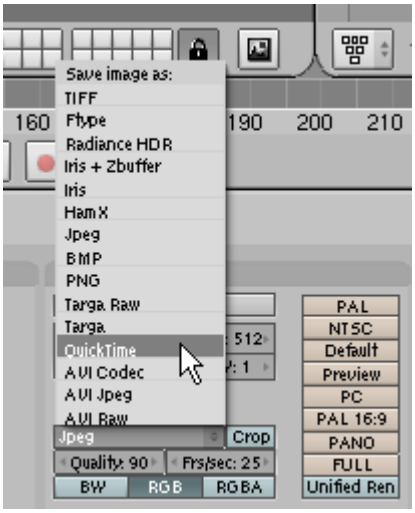
Play the animation. The sub comes in from the right, turns and sails away to the distance. All of the other objects retain their animation.

Save your file **CTRL-W**.

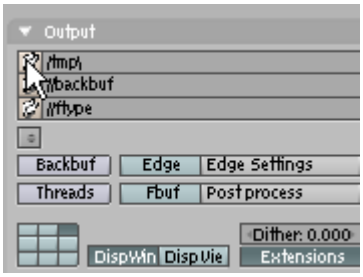
We will now create a QuickTime video file of the animation. Press F10 (Scene). In the Format panel press the “Preview” button.



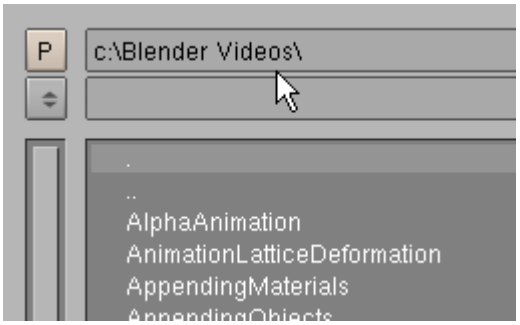
This sets the output movie to 50% of 640 x 512 pixels (320 x 256 pixels). In this same Format panel click n the arrows to the right of “JPEG” and choose QuickTime from the dropdown list.



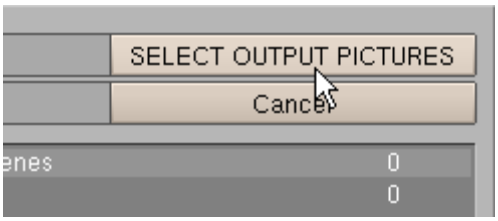
A QuickTime dialogue window will open. Accept all of the default settings. In the Output Panel press on the small icon to the left of /temp.



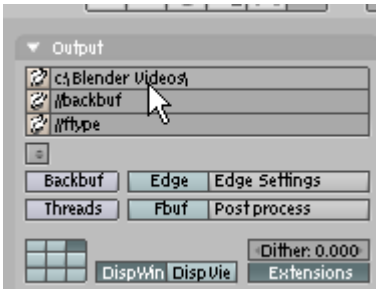
This will display Blender's file locater. Select the folder on your computer where you want the QuickTime video file to be saved. I have chosen the Blender Video folder located in my C: drive.



After selecting the output destination folder press the Select Output Pictures button.

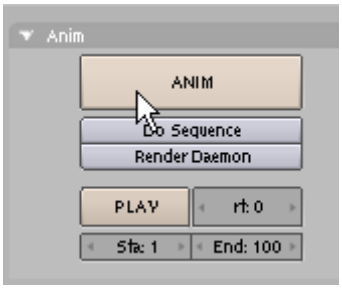


The QuickTime video file will be place in this directory. Notice that the pat is now listed in the output box.



By default Blender will name this file 0001_0100.mov (because it is 100 frames long) and place it in the output directory.

In the Animate Panel press the “Animate Button”. Blender will render all 100 frames of the animation.



When the animation is completely rendered, you can play it back in Blender by pressing the “Play” button.



You can locate the video file in the output directory and play it in your QuickTime movie player.



A completed copy of this .blend file named YellowSubmarineComplete.blend is located in the YellowSubmarine.zip file.