

# An Approach to Content Creation for Trainz

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**Part 6**

**GMax Basics**

(Updates and sample files available from <http://www.44090digitalmodels.de>)

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## Foreward

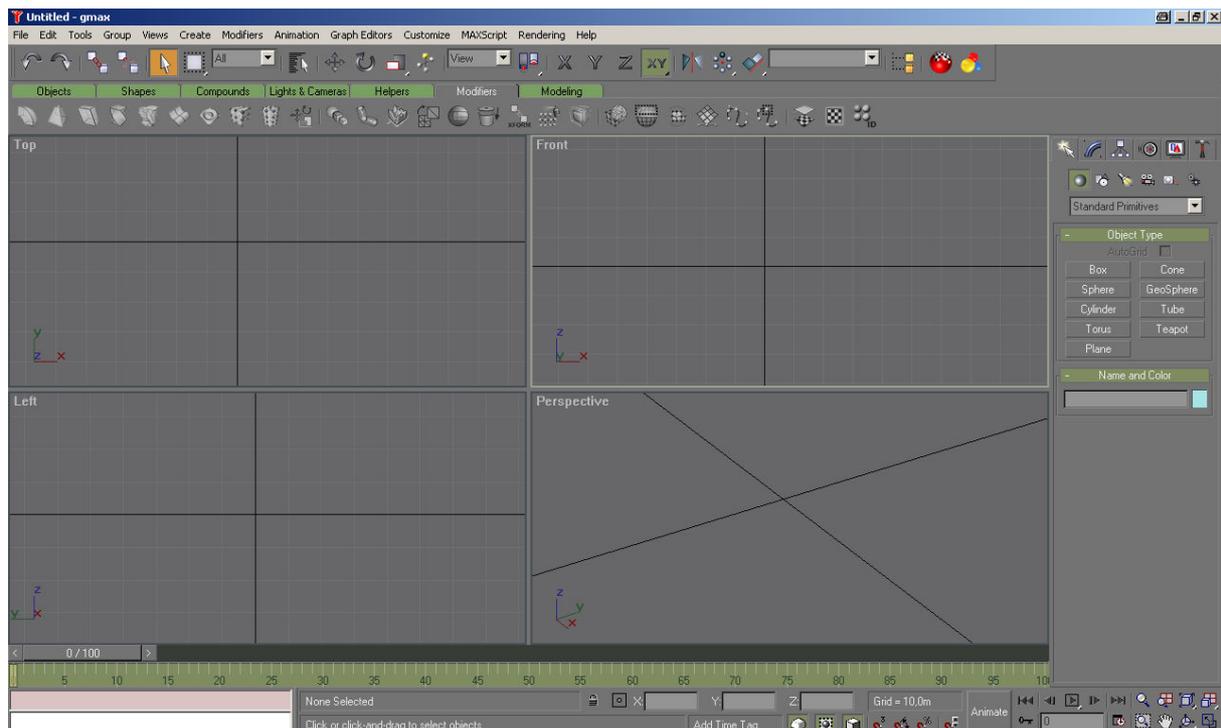
I'm going to assume that you've read Part 1 on how to set GMax up... In this tutorial we are going to have a look at certain basic operations in GMax as a preparation for creating a first simple loco model (which will follow when I've written it).

It is possible to learn GMax the way I did which was simply to build a loco and figure everything out as you go, but having a grasp of the principles of 3D modelling certainly wouldn't hurt.

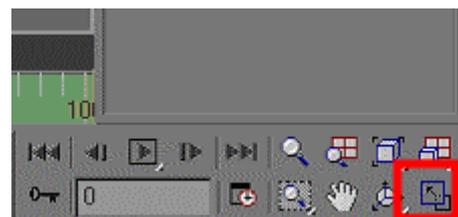
GMax is a large and complex program with many, many functions. Luckily you can get away with mastering about 20% of it, of the other 80% half is no use to man nor beast in this context and the other half might indeed make your life easier – I don't know as I only use the 20% part that is useful...

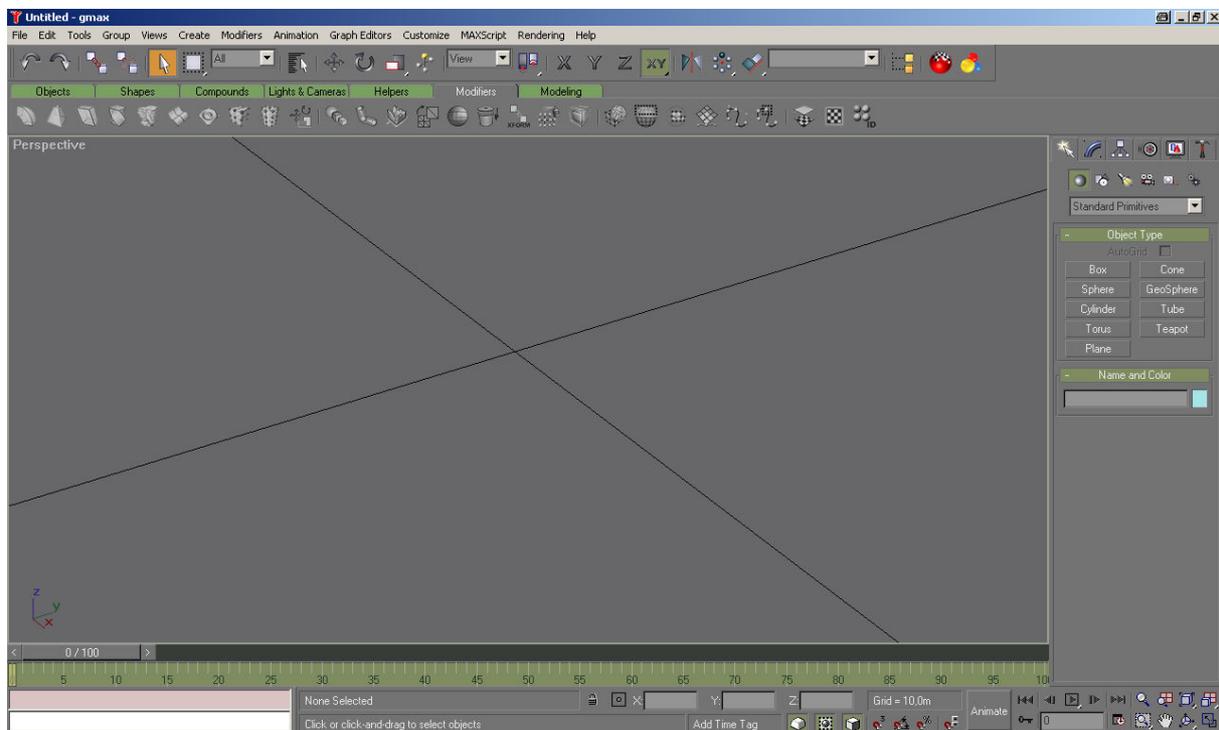
## The Interface

As explained in Part 1 I set up GMax so that starting it via the 'Trainz Asset Creation Studio' is not needed. If you've done the same start GMax now and we'll have a look at the interface.



Usually GMax starts up with four windows onto the 3D space – effectively cameras looking in different directions. I change that straight away as I'm used to working with CAD programs that have one main window and I also like to see what I'm doing. Click somewhere in the 'Perspective' window to activate it and then choose the 'min/max' toggle icon down in the bottom right of the screen.





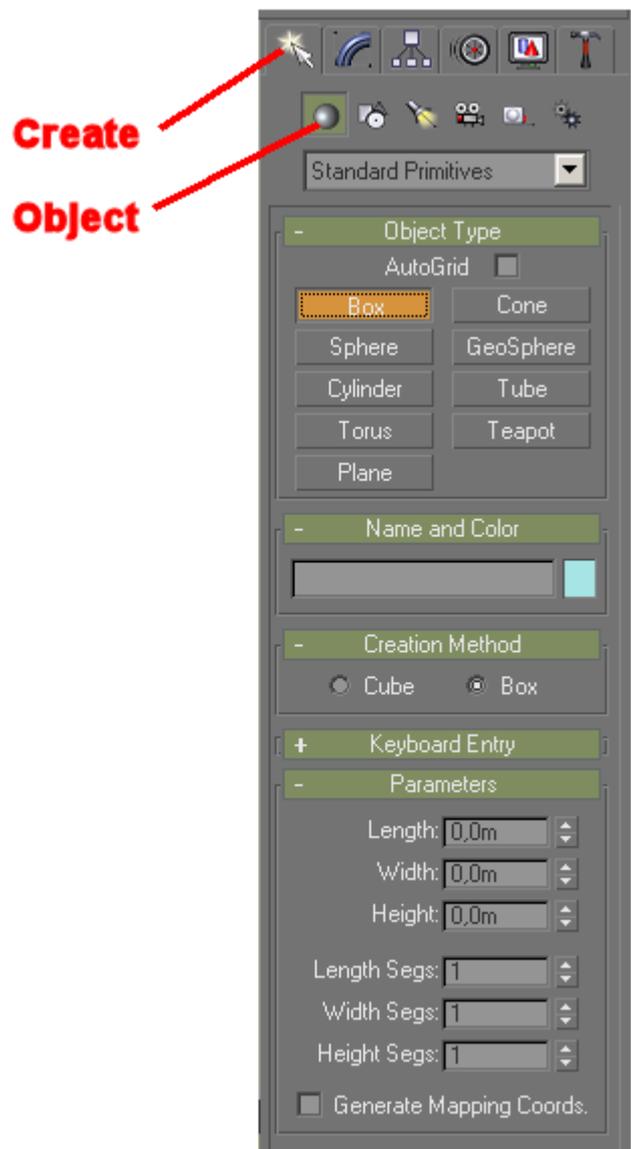
The crossing point of the two black lines is the 0,0,0 point of the 3D space, that is the point with the coordinates  $X=0$ ,  $Y=0$  and  $Z=0$ . The axis in the bottom left of the window shows which direction  $X$ ,  $Y$  and  $Z$  are. This is important as for a model of a piece of rolling stock the front of the vehicle must be in the  $-Y$  direction, i.e. positive  $Y$  coordinates lie in the rearward half of the vehicle, negative in the forward half.

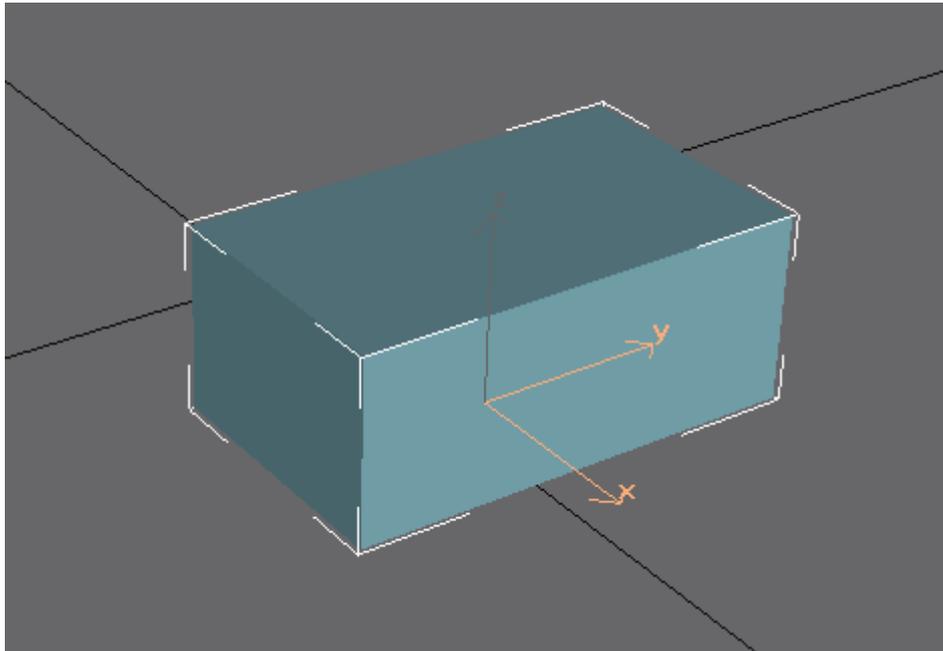
Likewise left side is  $+X$ , right side is  $-X$ . It is a convention that left and right are determined by looking from the driving position towards the front of the vehicle.

A GMax model is made up of faces which each have three coordinate points. Obviously to make an accurate model the points have to be in right place, these are measured relative to the 0,0,0 point in 3D space.

## Making a Box Object

OK, time to jump in and add an object to the scene, so go to the 'Create' tab, select 'Object' and choose 'Box'. Now click somewhere in the main window and drag out a box in three dimensions. To do this you click and hold the left mouse button while dragging out the box in two dimensions, then release and click the left button again to drag the box in the third dimension. Finally click





the left button again to set the height.

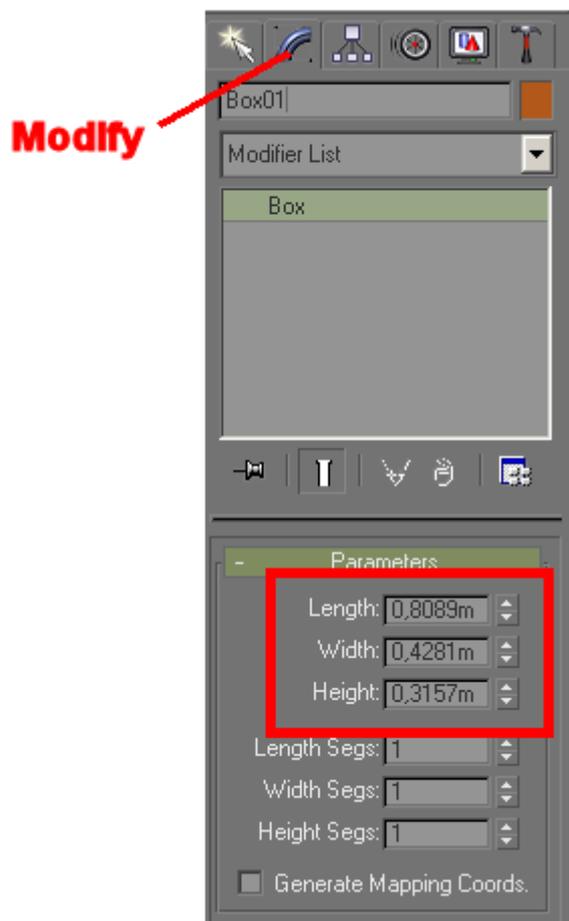
The box should have been created as shown. The white brackets around the box are the selection indicators, denoting that the object is selected. These can be toggled on and off with the 'J' key.

## Modifying the Box

We've created a box object which can now be resized and manipulated using the 'Modify' tab. Here the name of the object can be changed as well as its dimensions and the number of segments. Working with 'primitives' as boxes, cylinders, spheres and planes are called is not actually as useful as it appears and I hardly ever use them.

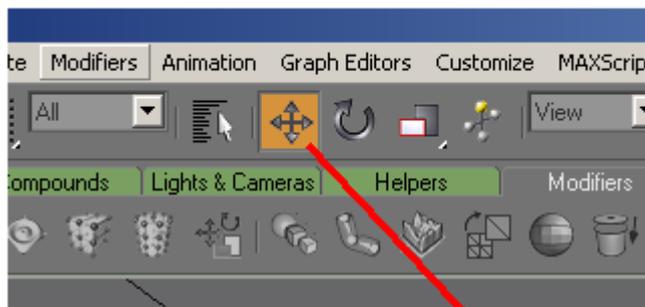
The problem is that can only modify the parameters of a primitive, in this case the length, width and height. To create a locomotive for example we need a lot more control over the shape of the objects.

Luckily GMax provides this control if we change the object to an 'editable mesh'. To do this right click over the text 'Box' and choose 'Editable mesh'.

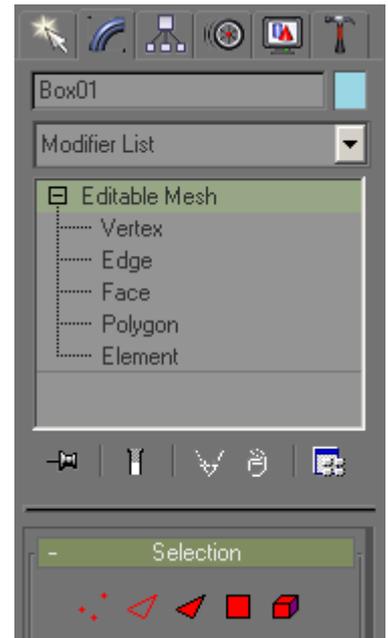


The name of the object is still 'Box01', but the type is now editable mesh. If we click on the '+' next to 'Editable Mesh' then the tree opens to display the things we can manipulate for this object.

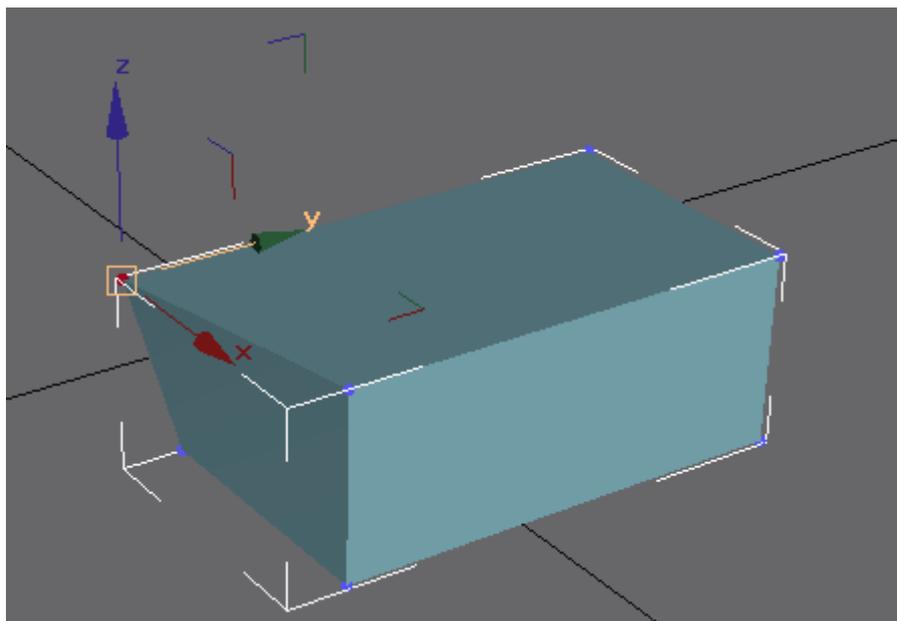
At the moment the object ('Editable Mesh') is selected, and a 'Move' for example will affect the whole object. However, if we select 'Vertex' and then we can move each individual corner point of the mesh. Try this out and then hit CTRL-Z to undo the action.



**Select and Move**

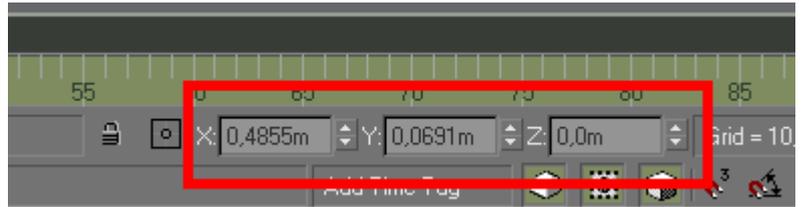


Note that you can constrain the movement in X, Y and Z by clicking and dragging on the axis display for the vertex point. In a similar manner you can move edges, faces and polygons. When working with edges it's a good idea to turn off shading with 'F3'. It can be turned back on again by pressing 'F3' again.



When the 'Move and Select' tool is active the coordinates can be seen at the bottom of the GMax window as can be seen here. Note that if the whole object is selected the coordinates are those of the 'Pivot Point' of the object – this is the local 0,0,0

point of the object itself which can be relocated, a fact that we can use to our advantage. Also of interest is the small square icon just to the left of the 'X' – this is 'Offset/Absolute' switch. In the state shown the coordinates are 'Absolute', i.e. relative to the 0,0,0 point of the 3D space. When it is selected the coordinates are relative to the current position, which allows us to move an object, polygon or vertex a particular amount in a particular direction.



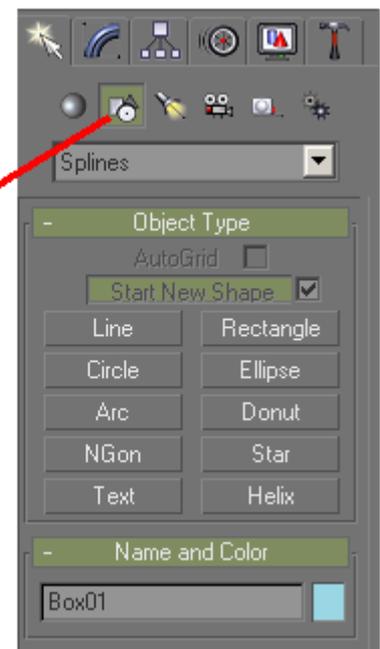
A handy tip is that right clicking over the arrows to the right of the X,Y and Z fields sets that field to 0.

Have a practice now and be absolutely sure that you've understood the foregoing as the whole art of 3D construction is getting the vertexes in the right place.

## Making 3D Objects from Splines

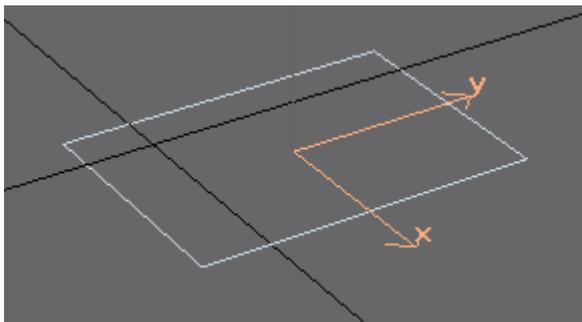
As I said before I don't build models with primitives generally, there is a better option that we will look at now, splines. A spline is a 2D or a 3D curve that can be used to create polygons of any shape.

**Shapes**



You'll find the splines under 'Shapes', the icon is shown on the right.

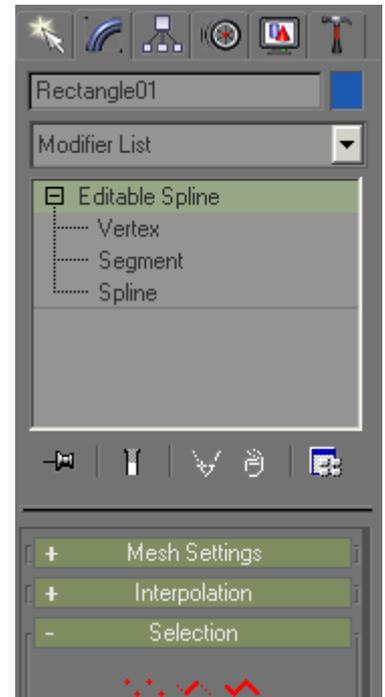
Click on 'Rectangle' and drag out a shape like this:



Again this is an object, a Rectangle with parameters for length, width and corner radius as you can see if you click on the 'Modify' tab. This object can also be edited as an 'Editable Spline', right click on the name of the object in the modifier stack to convert it.

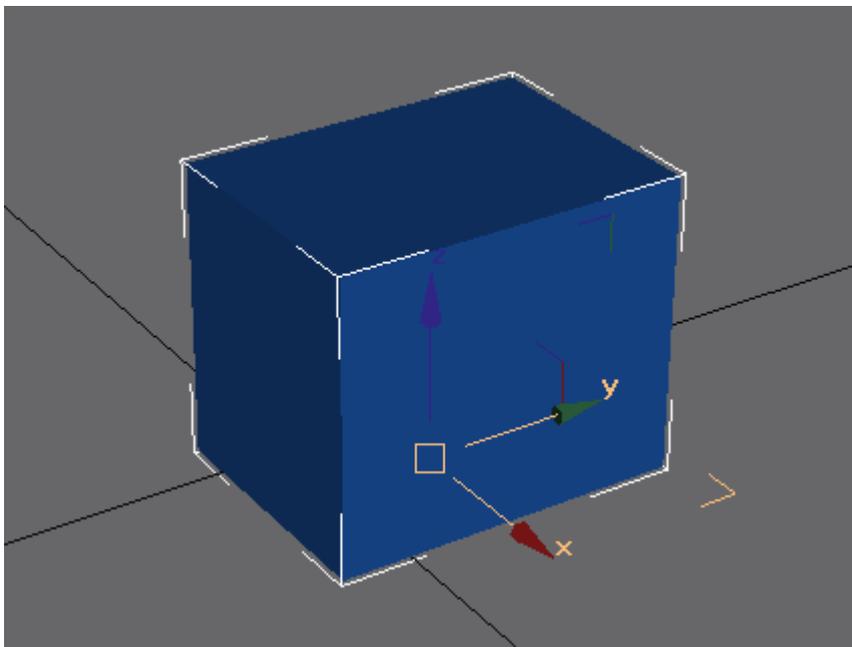
The 'Modifier Stack' by the way is the tree display underneath the 'Modifier List'. Now it is possible to move vertexes in the same way that we did for the box primitive.

This shape can be made into a mesh by adding an 'Extrude' modifier from the 'Modifier List'. Click on the arrow next to the 'Modifier List' and choose 'Extrude'.

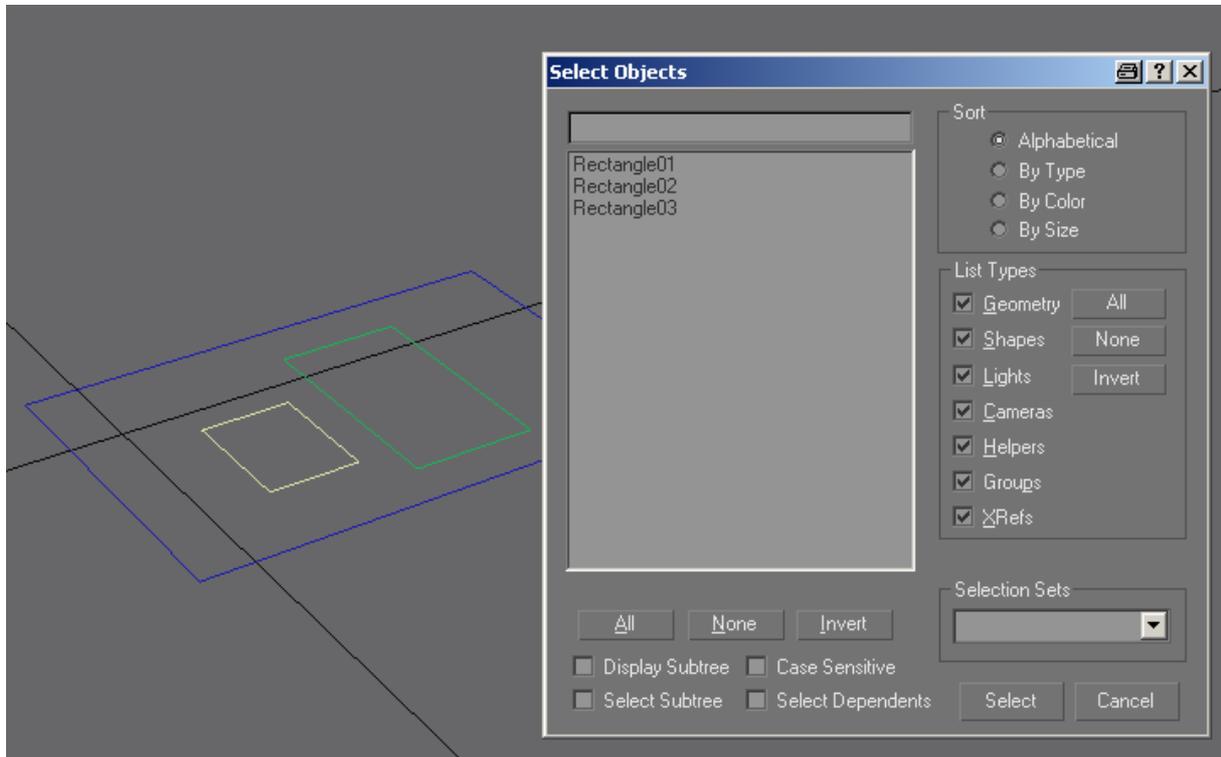


The 'Extrude' modifier has its own parameters such as 'Amount' (the distance to extrude by) and whether or not to cap the start and end faces. There is no parameter for direction, this is always at right angles to the profile (or at least what GMax thinks is at right angles to the profile, this may be different to your thinking on the matter).

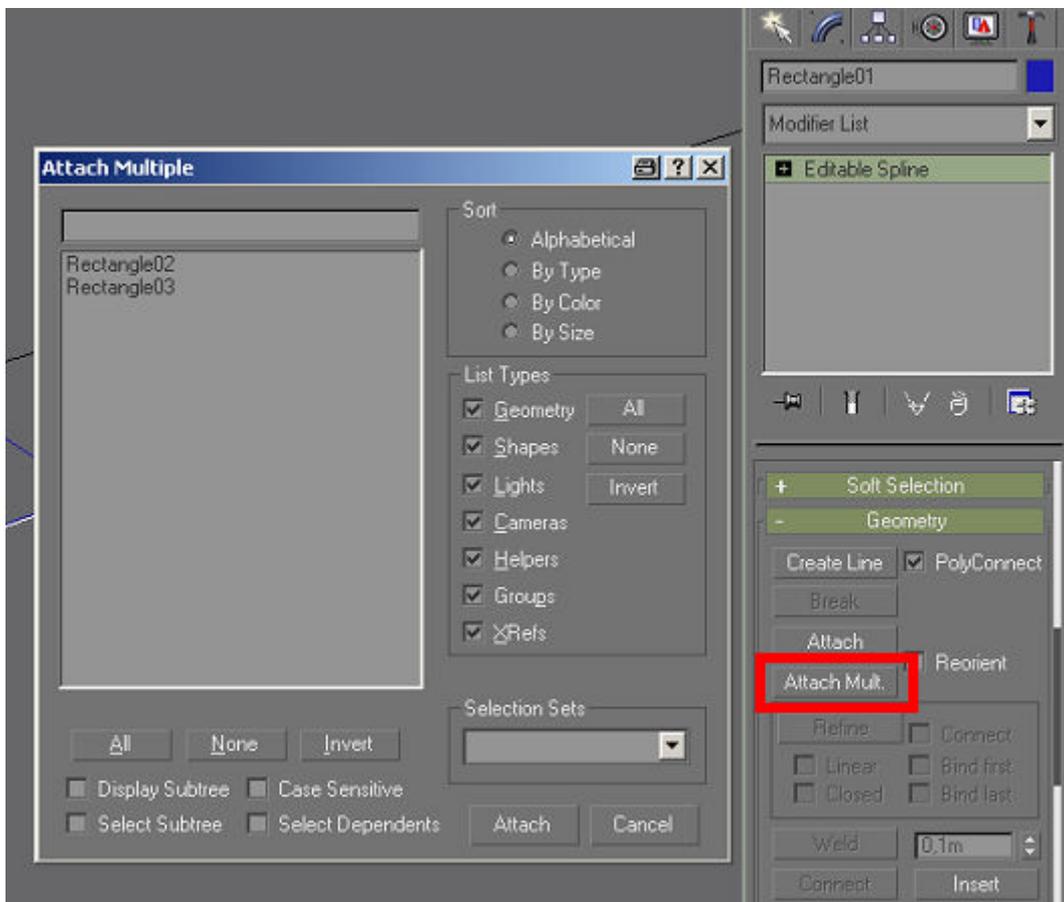
The result looks like this:



From the point of view of Trainz this is exactly the same as creating a box. Things get more interesting when we start combining splines together to create more complex shapes, for example a rectangle with two other rectangles inside it.

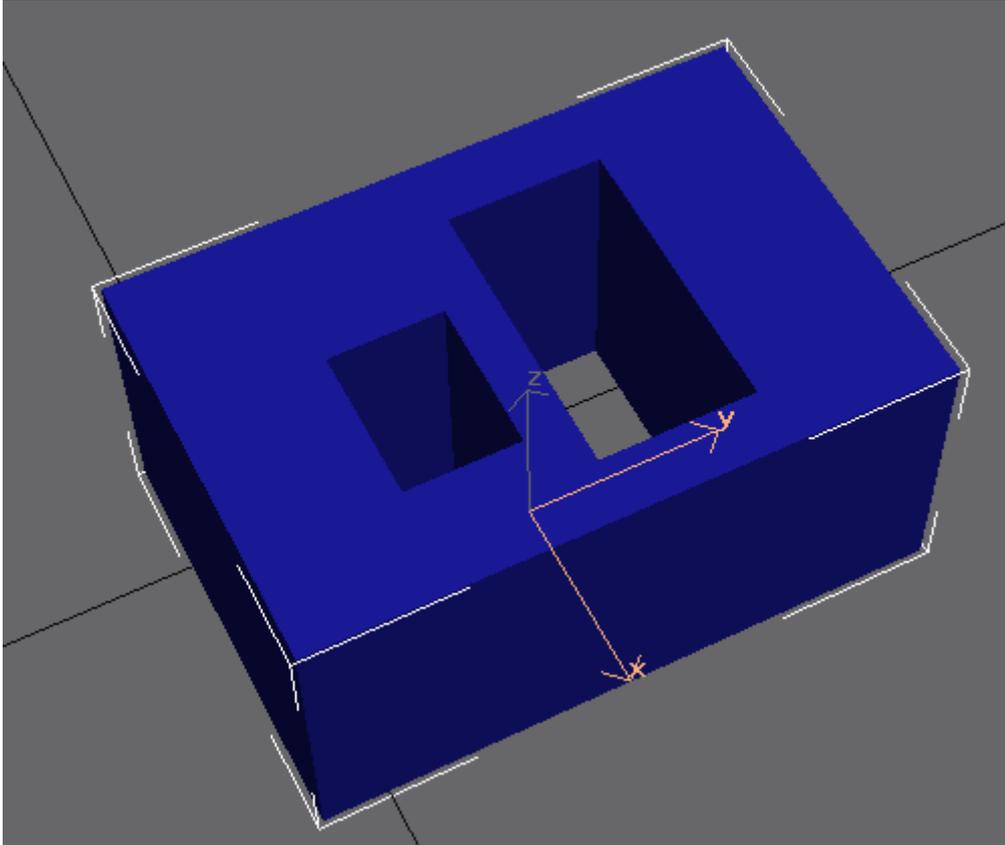


Here I've created three rectangles and opened the 'Select Objects' dialog box by pressing 'H'. As you can see, we have three separate objects. Select 'Rectangle01' and go to the 'Modify' tab. Convert 'Rectangle01' to an editable spline and scroll the window under the modifier stack down until you can see the 'Attach mult.' icon and click on it.



Another dialog box opens where you can choose the objects you want to attach. Choose 'Rectangle02 and 'Rectangle03' and click on 'Attach'. We have now combined the three shapes into one.

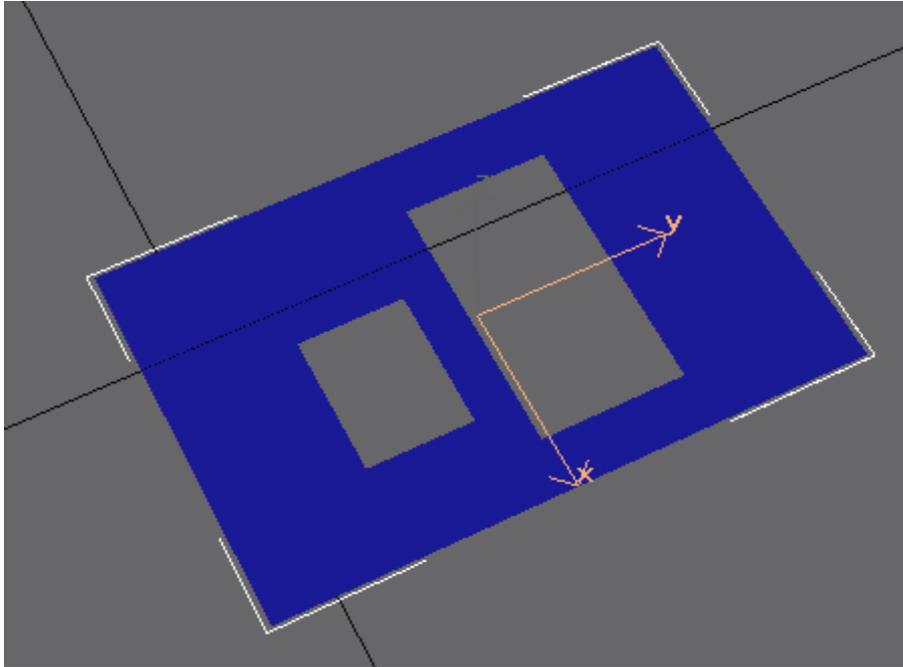
Add an 'Extrude' modifier to the stack and see what happens.



We have created a solid body without using something called a 'Boolean' which is bad news and something you should avoid using anyway. As the 'Extrude' is a modifier it can have its parameters changed at any time and can also be deleted or deactivated. To deactivate a modifier click on the light bulb next to the modifier in the stack. To reactivate it click on it again.

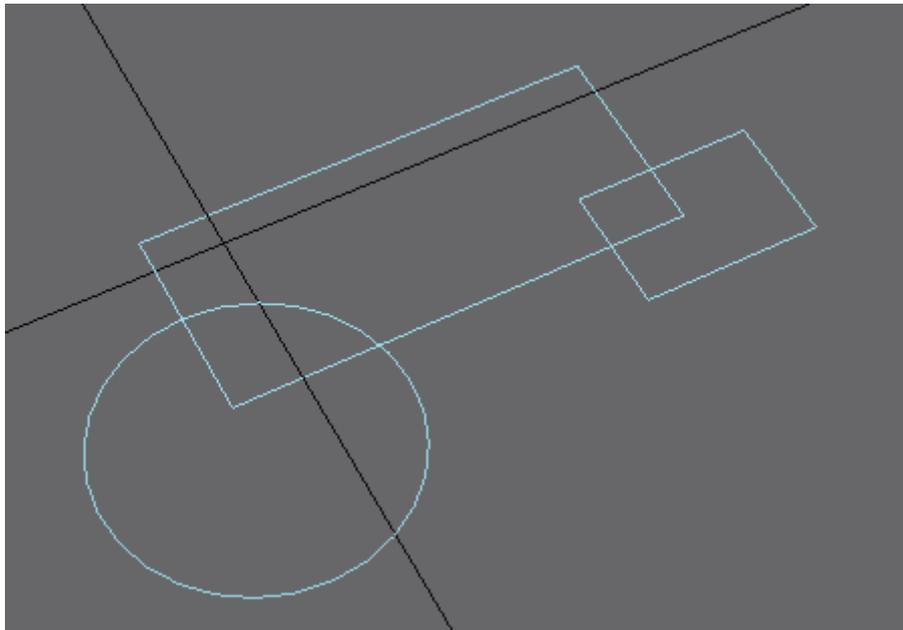
## Making 2D Objects from Splines

You can also create 2D meshes with splines, delete the 'Extrude' modifier and right click on the 'Editable Spline' text and convert it to an editable mesh.



## Creating Shapes with by Trimming Splines

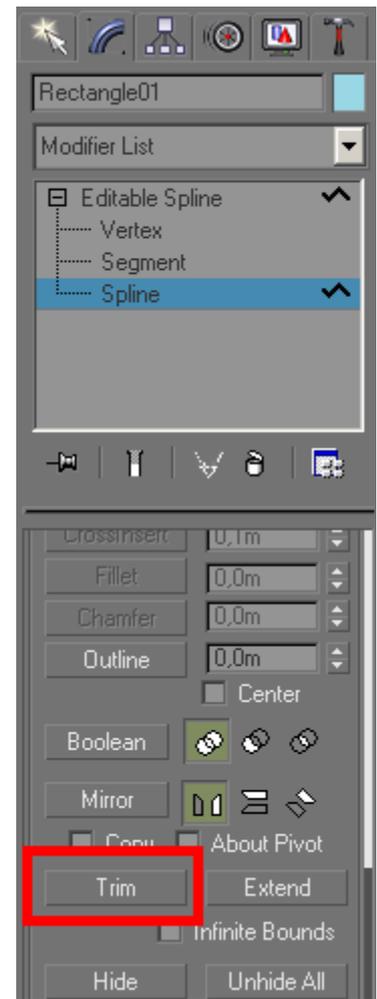
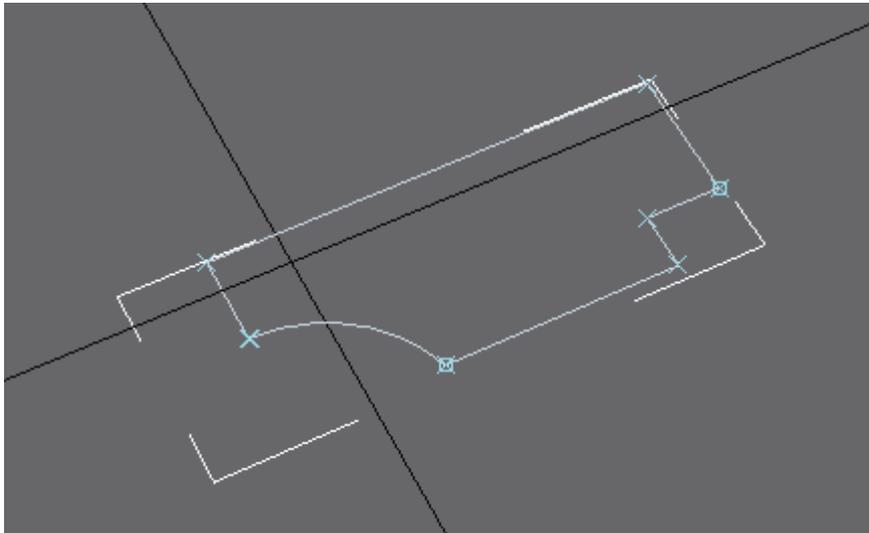
Even more interesting you can create shapes like this:



Again three objects that have been attached together to create one spline. This can now be trimmed using the 'Trim' icon(!) which is found under the 'Modify' tab.

**Note that in the modifier stack we have to have 'Spline' selected in order to see the 'Trim' icon.** This is because the window under the stack is context sensitive and changes according to what is selected in the stack.

With 'Trim' selected you can click on the portions of the shape that you want trimmed away to produce this result:



Again this shape can be extruded to produce a solid body or converted to editable mesh to make a 2D mesh.

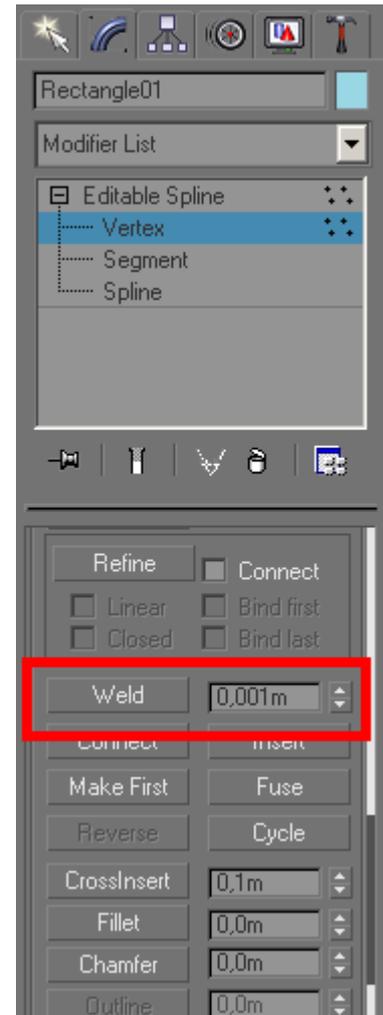
**Important! If you use curves to produce such shapes it is necessary to open the 'Interpolation' rollout in the window under the stack and to reduce the number of steps to keep the polygon count under control.** If we extrude this shape with steps=6 we would get 52 polys. With steps=2 only 36.

As you can see you can create virtually any shape needed for rolling stock in this way, especially steam locos which have a lot of flat surfaces.

You can also select a vertex and fillet or chamfer it using the icons found in the rollout.

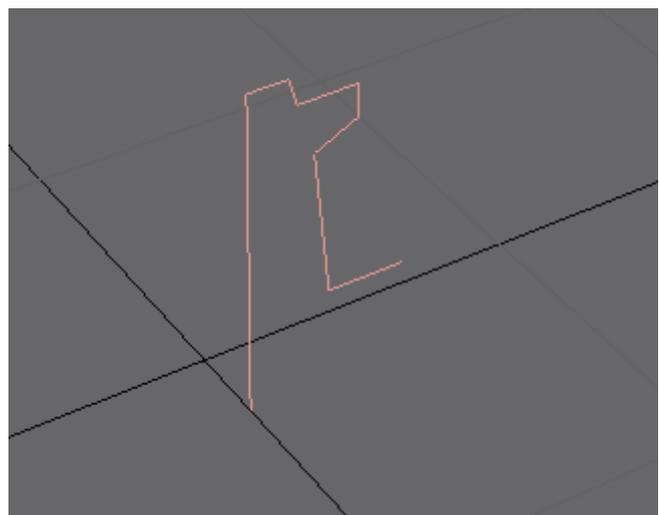
In fact extruding this shape will not give the expected result as the corners have not been welded together – only if the shape is welded will you get a solid body or a visible mesh. Here we have to select 'Vertex' to see the 'Weld' icon in the rollout. 'Weld' defaults to 0,1m which will tend to weld points that you don't want welded, distorting the shape. That's why I've entered 0,001m in the 'Weld' box.

Click on 'Weld' to actually perform the weld operation.

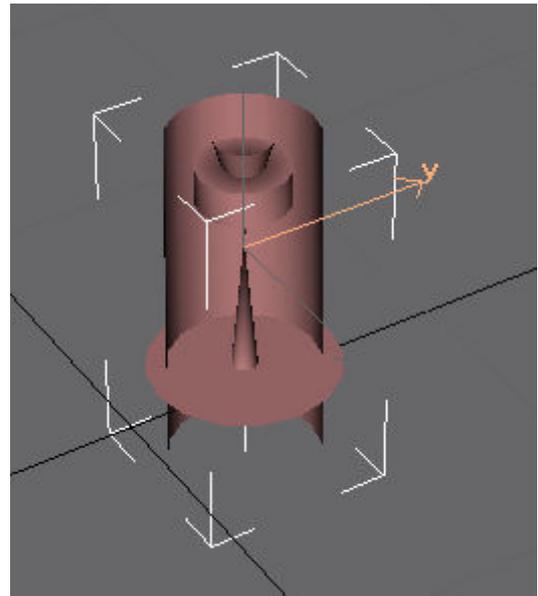


## The 'Lathe' Modifier (making objects by rotating splines)

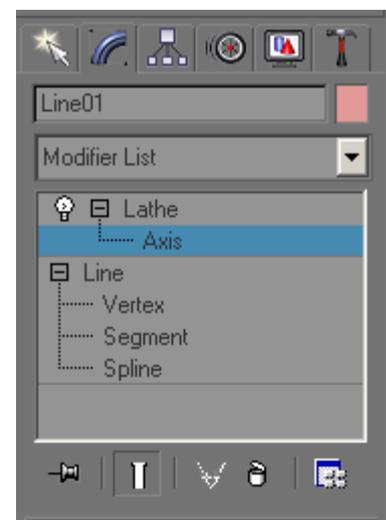
Actually we just need to cover making round stuff and you'll have enough to get started. Here I've sketched a shape using a line object – we can make this into a round object by using the 'Lathe' modifier.



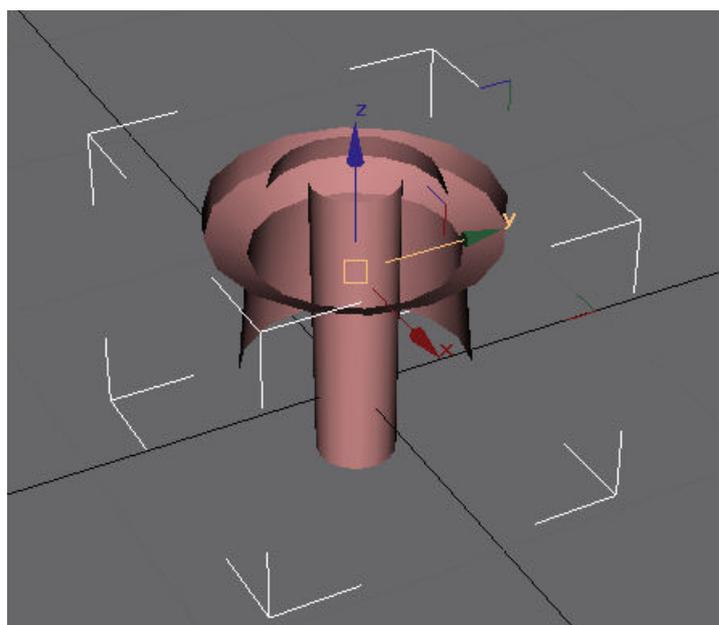
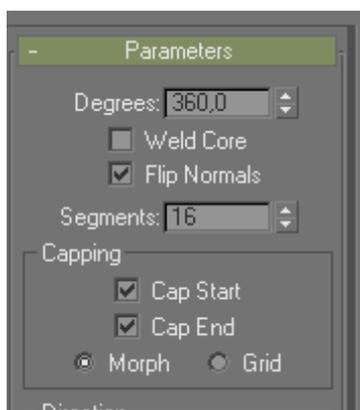
This is the result after applying 'Lathe' – looks all wrong but this is only because the centre point of the 'Lathe' modifier needs moving.

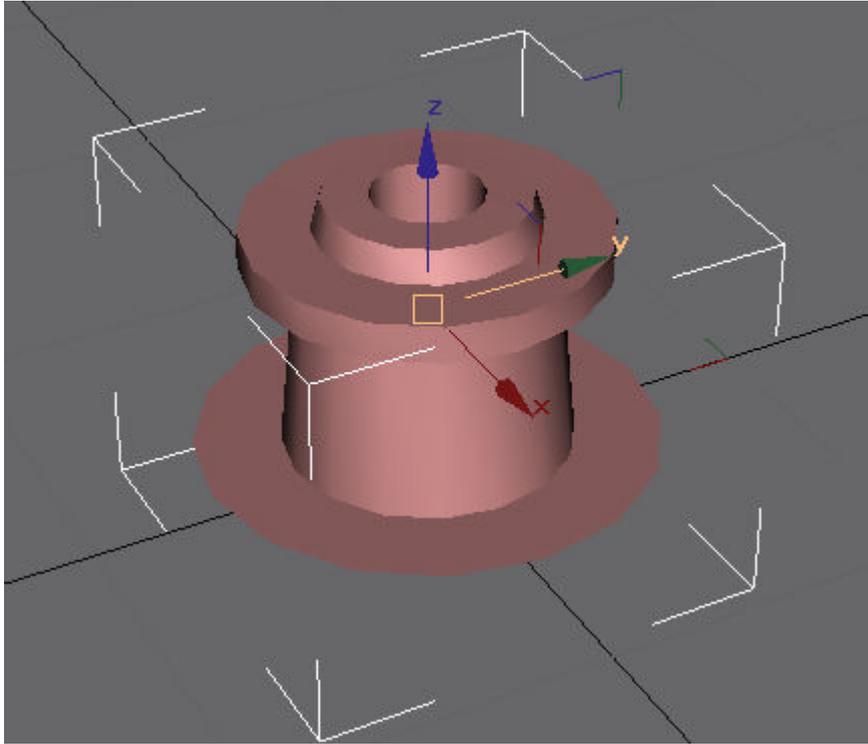


Open the 'Lathe' modifier and select 'Axis'.



Drag the axis to modify the lathed shape. At some point it will turn inside out, the select 'Flip normals' to reverse this effect



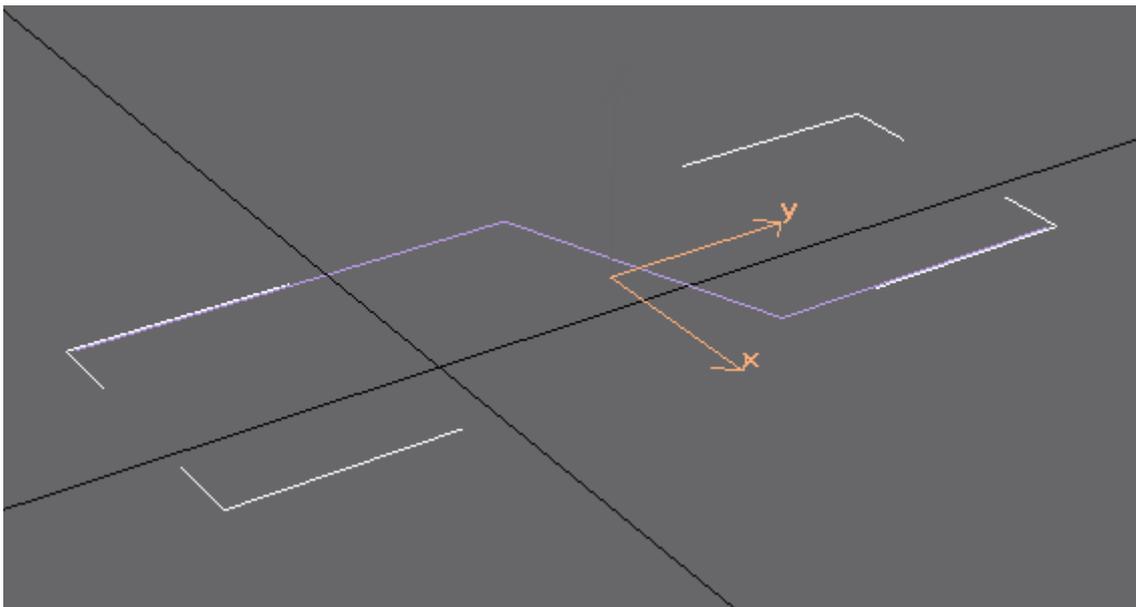


**Important! The number of segments has a huge effect on the poly count. Keep this as low as you can.**

Using 'Lathe' you can create chimneys, domes, buffers etc.

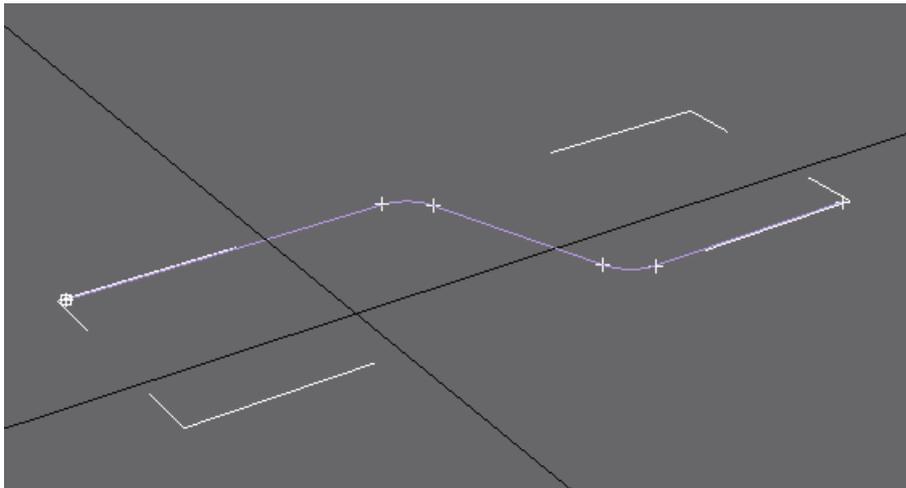
## Creating Pipes and Handrails

Another technique that is often needed is to create pipework or handrails which are basically the same thing. GMax also makes thing very easy as you can create a mesh that sweeps along a spline. To demonstrate this we'll sketch a simple shape like so:

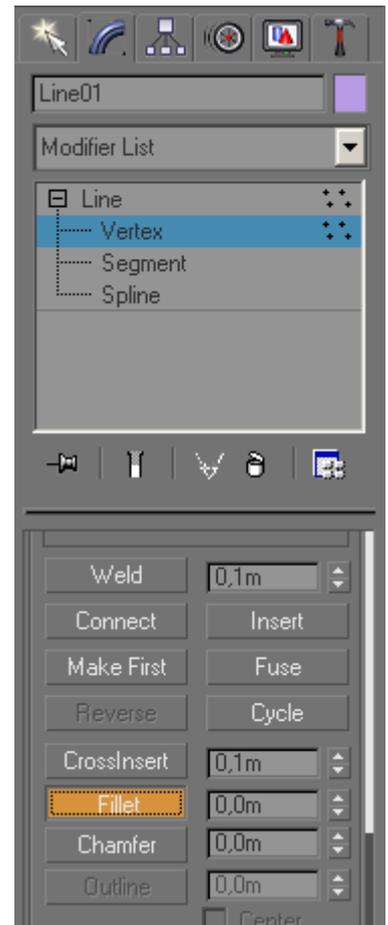


We'll add some rounded corners as well by selecting the vertexes and choosing 'Fillet' in the parameters rollout.

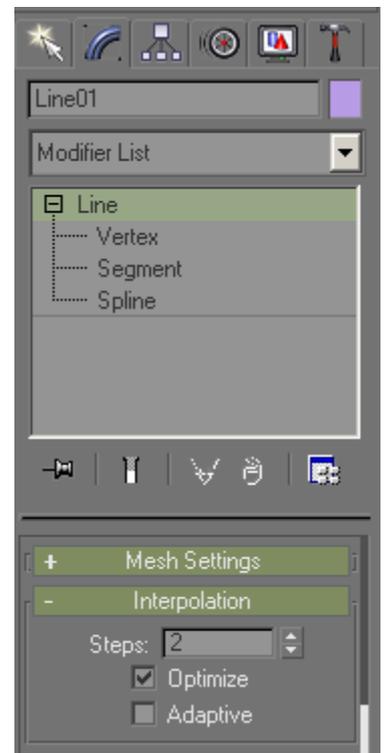
By dragging the vertexes we can fillet the corners.



Then select the 'Line' text in the stack and reduce the interpolation value to 2 or 3 (this reduces the poly count of the mesh).

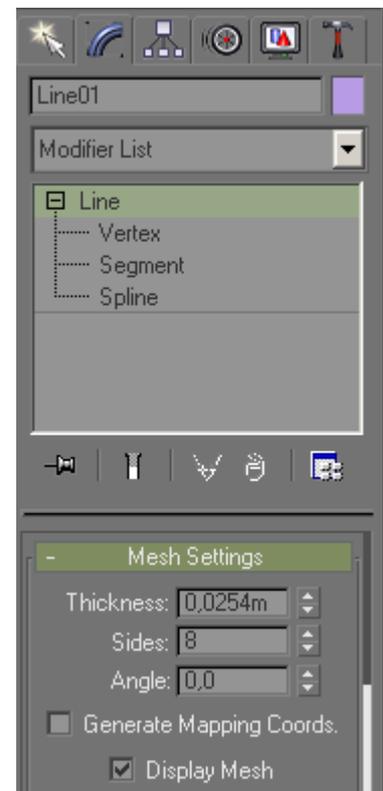
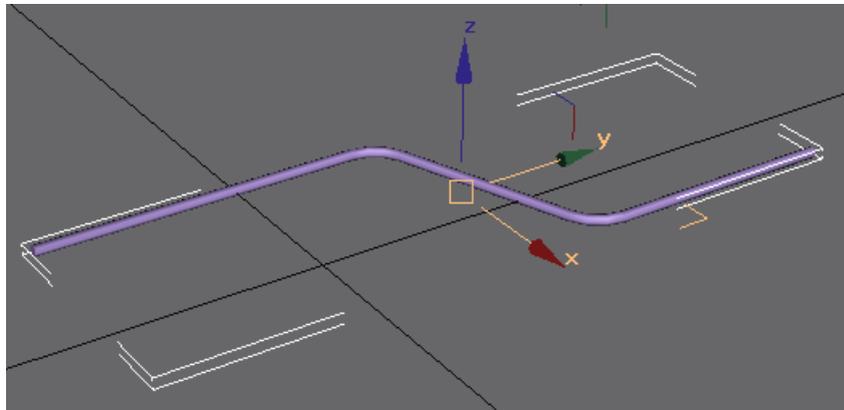


And now note the 'Mesh Settings' rollout. Click on the '+' sign to open it.



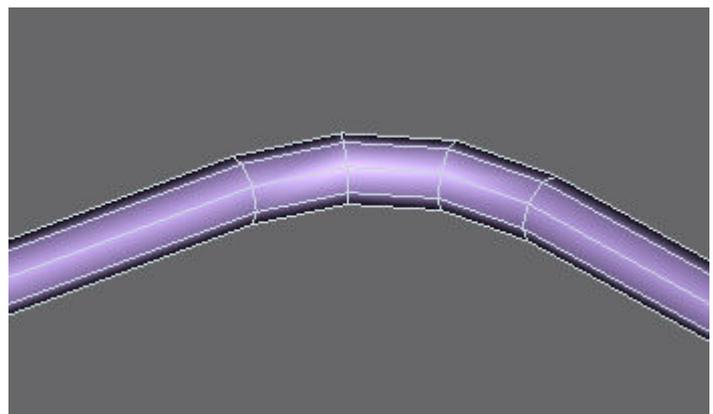
'Thickness' is the diameter of the mesh, 'Sides', well how many sides it has. A typical handrail would be something like 32mm diameter, 5-6 sides should be plenty for this diameter.

'Display Mesh' turns the mesh on.



Looking more closely at one of the radii, you can see there are potentially a lot of polys there.

The number of sides and the interpolation setting can cause the poly count to explode on such meshes.



The mesh as shown here has 156 polys. Increasing the number of side to 12 increases the poly count to 236. With 12 sides and interpolation steps of 6 we get 428(!). Each bend multiples the problem. So, keep the number of sides and the interpolation steps as low as possible. Simplifying the pipe run by leaving out a few bends will also save a lot of polys.

By the way the trick with pipe runs is to create the whole run in 3D with sharp corners, adding the fillets last.

## Postscript

Perhaps surprisingly once the basic technique of creating, extruding and lathing splines has been mastered you don't really need much else to get started with content creation. There are some other things that make life a little easier but are not essential. Maybe we'll cover these another time.

Hopefully this document will encourage more of you to have a go – it's not as hard as it looks!

Any questions, requests for more explanation or corrections needed – please mail me at [paul.hobbs@web.de](mailto:paul.hobbs@web.de)