Get Smart Designs with Autodesk® Alias®: From Curves to Surfaces

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MA3320-L

In this hands-on lab, discover how to create intelligent and interactive curves and surfaces with Autodesk Alias industrial design software. Create your models and design alternatives quickly using the power of Autodesk Alias and Autodesk® Product Design Suite. We will cover the different types of curves and the design approach to use them accurately and creatively. Create better surfaces right from the start of your designs.

Learning Objectives

At the end of this class, you will be able to:

- Create basic and advanced curves
- Create and manipulate surfaces and control their flow
- Use Autodesk Alias tools to modify your design and create design variations
- Describe an Autodesk Alias workflow and explain its capacity for conceptual modeling

About the Speaker

Sebastian Zaje has been a Multi-Product Technical Sales Specialist with Autodesk for more than 5 years. He has assisted users of different countries, industries and languages, focusing on their needs to solve business challenges by using Autodesk Technologies and solutions. He has more than 15 years of experience in the Autodesk Business. He began working with an Autodesk reseller, later with our local distributor, and had several interactions with channel partners and companies across Latin America. This experience enriched his knowledge in Autodesk products making him an advance user of some of our technologies and solutions.

Prior to entering Autodesk, Sebastian acquired automotive manufacturing know how as an advance surface modeler using Alias, which included working in the industry for and in Italian companies. He also has a background in designing and developing plastics products.

He was also the dean for the industrial Design Program at the DuocUC in Chile.

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Section 1: Create Basic and advanced curves

Introductionn

In the following AU LAB we will see Autodesk Alias, probably not completely as it is very extensive and full of tools, but the idea (my goal) is to leave you with an overview of the application and what you can expect to do with it and without the fear of it. I hope this LAB motivates you to take your first steps, or to those who already know Alias, further steps into this Software at the end of this LAB.

For those who already know something of Autodesk Alias, might find something new or also different ways and approach of doing things to get the same better results.

In 3D modeling environment, there are multiple ways to create a model and different ways to achieve the same result. (More or less easy or more or less working hours)
At this AU LAB I want to experience some of these forms, from the perspective of a user, using a learning method that translates to mastering this tool from another user´s experience; by working with it through ways that sometimes are not "by the book" but done according to job requirements in order to deliver company's requirements as I have had to do in places I had worked in the pass.

Today the idea is that you can begin to become familiar with Autodesk Alias, we will indicate some sites where you can (after this class), continue to get information about Autodesk Alias, and go in deep with your Alias and 3D modeling knowledge. Also some of the information on this LAB was taken from these sites.
So from here on, the idea is to have a good time and enjoy getting to know Autodesk Alias.

Some of those sites you can't miss are:

http://wikihelp.autodesk.com

http://help.autodesk.com/view/ALIAS/2014/ENU/

http://wikihelp.autodesk.com/Alias/enu/2012/Help/0109-Tutorial109/0110-Learning110

http://mosaic.autodesk.com/autodeskalias
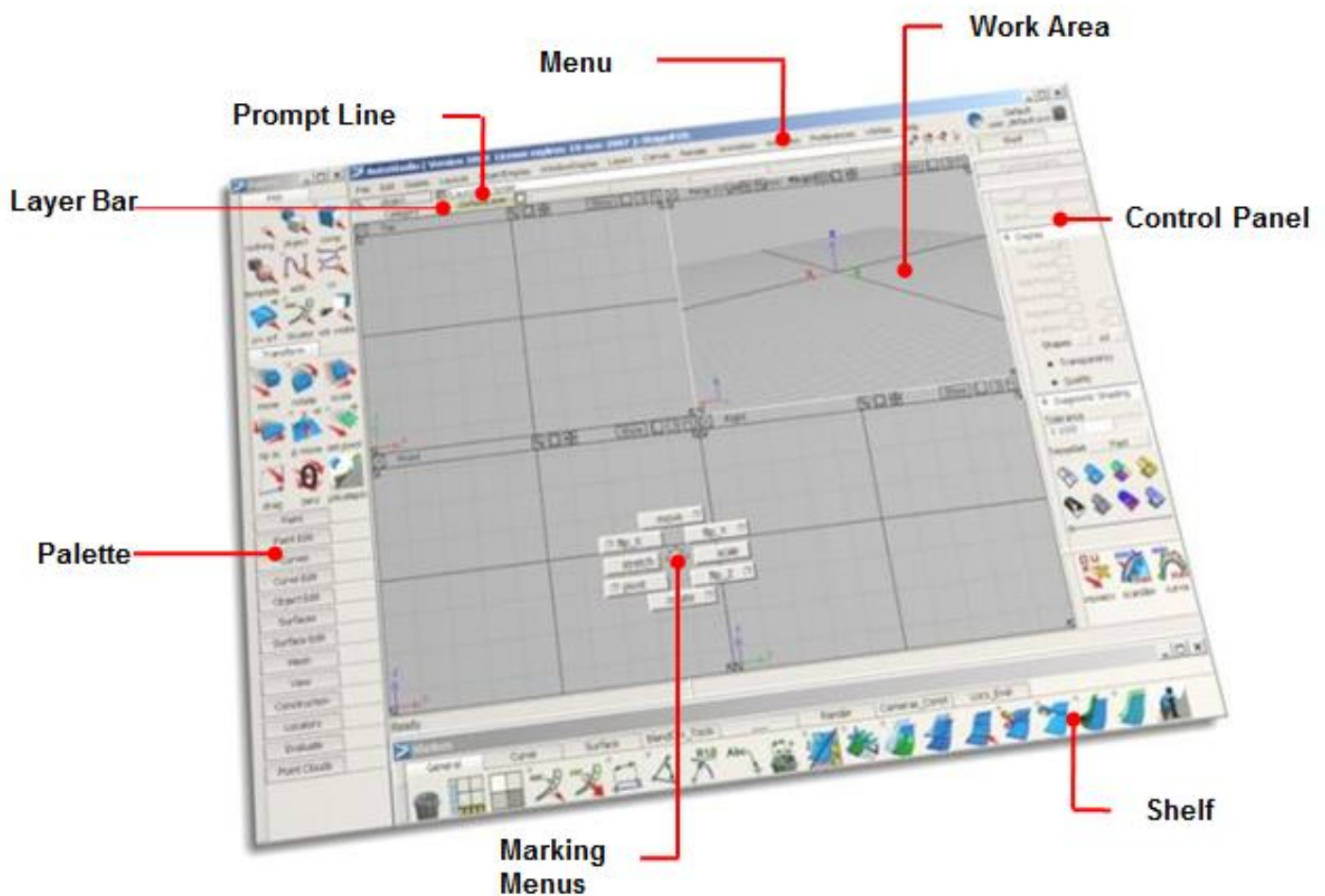
http://students.autodesk.com/?nd=alias_curriculum

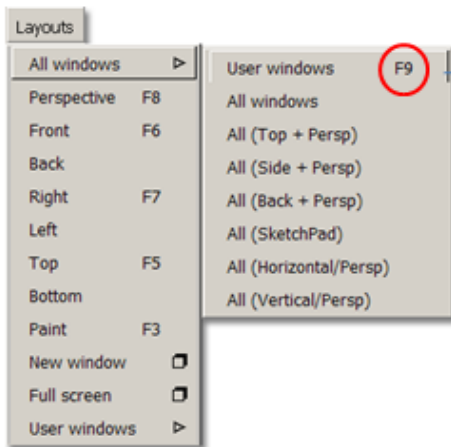*Interface, manipulating menus and items*

For those who are not familiar with Alias, Autodesk Alias interface is unusual from the aesthetic point of view and with some differences compared with other Autodesk applications.

Many histories are heard on the subject, the origin of Alias (Unix) the programming language among others.
The truth is it can be a little rough at first, as if compared with other Autodesk ribbon based applications.
Today the invitation is for you to know more and know how to move in the interface and the elements of the scene.

Layouts

Layouts		
All windows ▷	User windows (F9)	
Perspective F8	All windows	
Front F6	All (Top + Persp)	
Back	All (Side + Persp)	
Right F7	All (Back + Persp)	
Left	All (SketchPad)	
Top F5	All (Horizontal/Persp)	
Bottom	All (Vertical/Persp)	
Paint F3		
New window ❏		
Full screen ❏		
User windows ▷		

The Layouts Menu offers different pre-set arrangements of the modeling windows. The most commonly used arrangement of four windows is given the **hotkey F9** – use this to quickly return to viewing the four windows at any time.
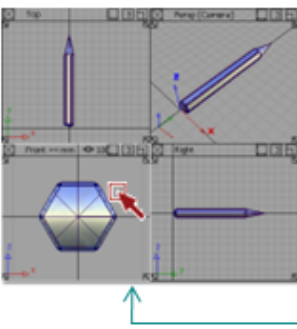
Active Window

Shown with a white border instead of a black one.

Close Box

Maximize Box
Title Bar

Window Icons

Resize Corners (4)

Navigating Views

Shift

Ctrl

Alt

Tumble

Track
(Pan)

Zoom
(Dolly)
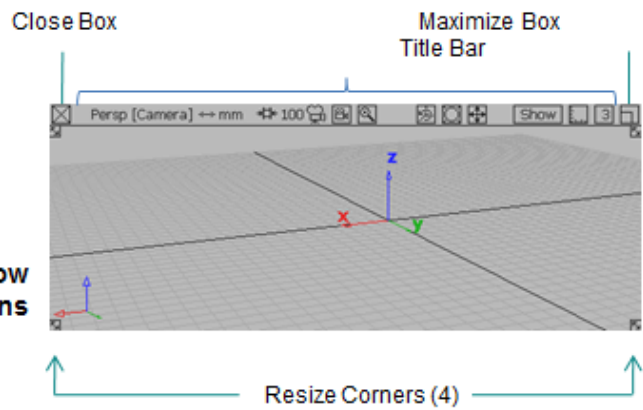
Mouse Keys – Transform Constraints

The mouse keys constrain transforms differently in the 3D and 2D modelling views:

3D View : X,Y,Z directions

2D Views : Horizontal & Vertical
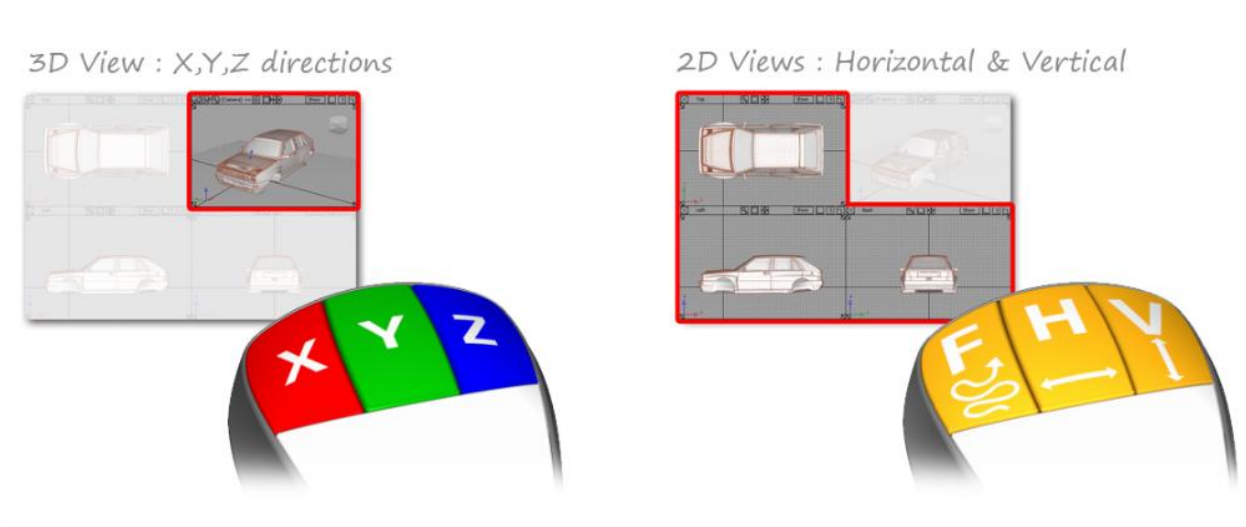
Pick Nothing, Pick Object

(Open the following file: 1-Select_View_Objects.WIRE)

Pick → Object

Click/Drag

Single Click (unambiguous selection)

Pick → Nothing
De-selects all objects

Single Click (ambiguous selection)

Pick Chooser
Keep the mouse button held down and move between the selections on the list. Release when you have found the right one.
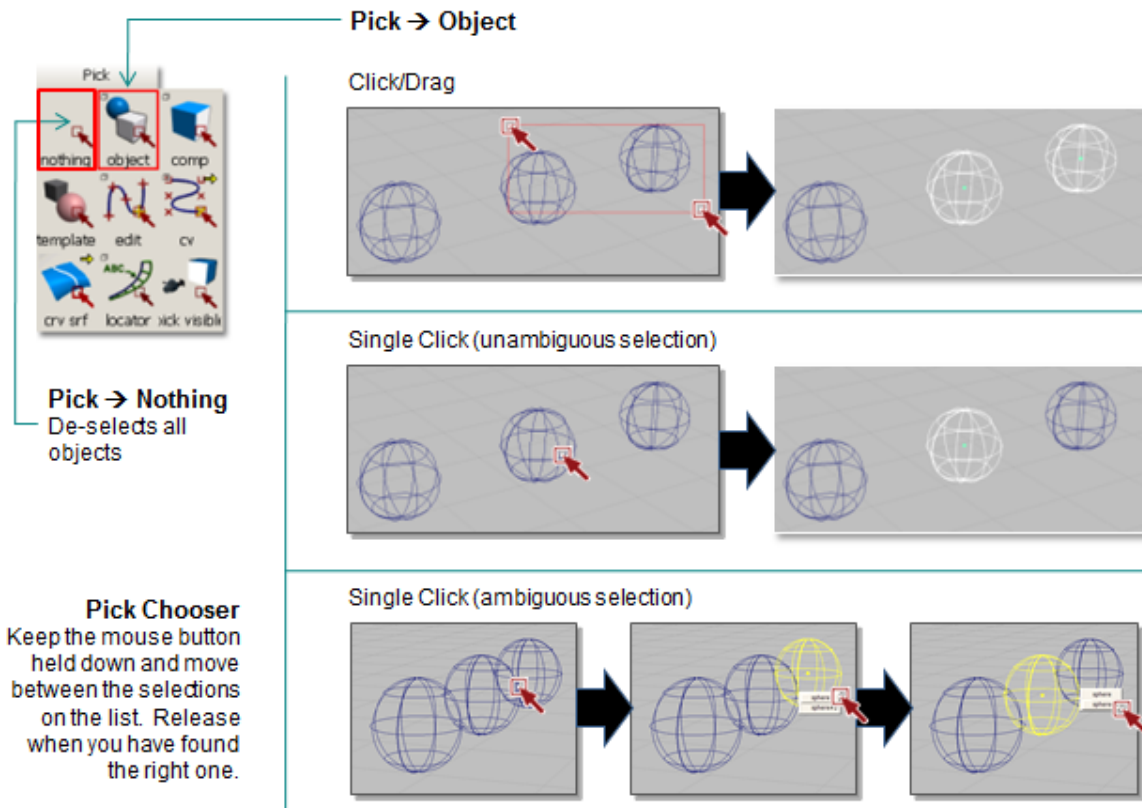
Control Panel: Diagnostic Shading

Surface Quality
A tolerance of 0.01 will be more accurate and smooth. Use the slider to modify.

Diagnostic Shading
Shade Off/Shade On

Pick → Nothing
All objects will be shaded/unshaded

Pick → Object
Selected objects will be shaded/unshaded

Fast / Accurate
Use **Accurate** only if you get poor shading results from **Fast**. **Accurate** can be very slow on large models.

Not all options are available...
It depends which version of Alias Studio you have.

Click on the ➡️
To open the Color selector

Use this to create different colors for different parts of the geometry.
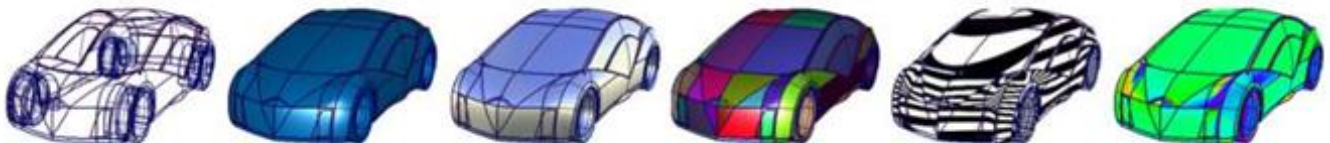
Perspective Window: Viewing Panel Vs. View Cube

Click **new** to save a
view and create a
new **bookmark** for it.

Return to the
previous view

Preset Views
Top, bottom, and all sides,
plus the 3/4 views.

Look at selected objects.

Enable/disable perspective

Open BookMarks list...

BookMarks Editor
Use ctrl and double-
click to re-name a
bookmark
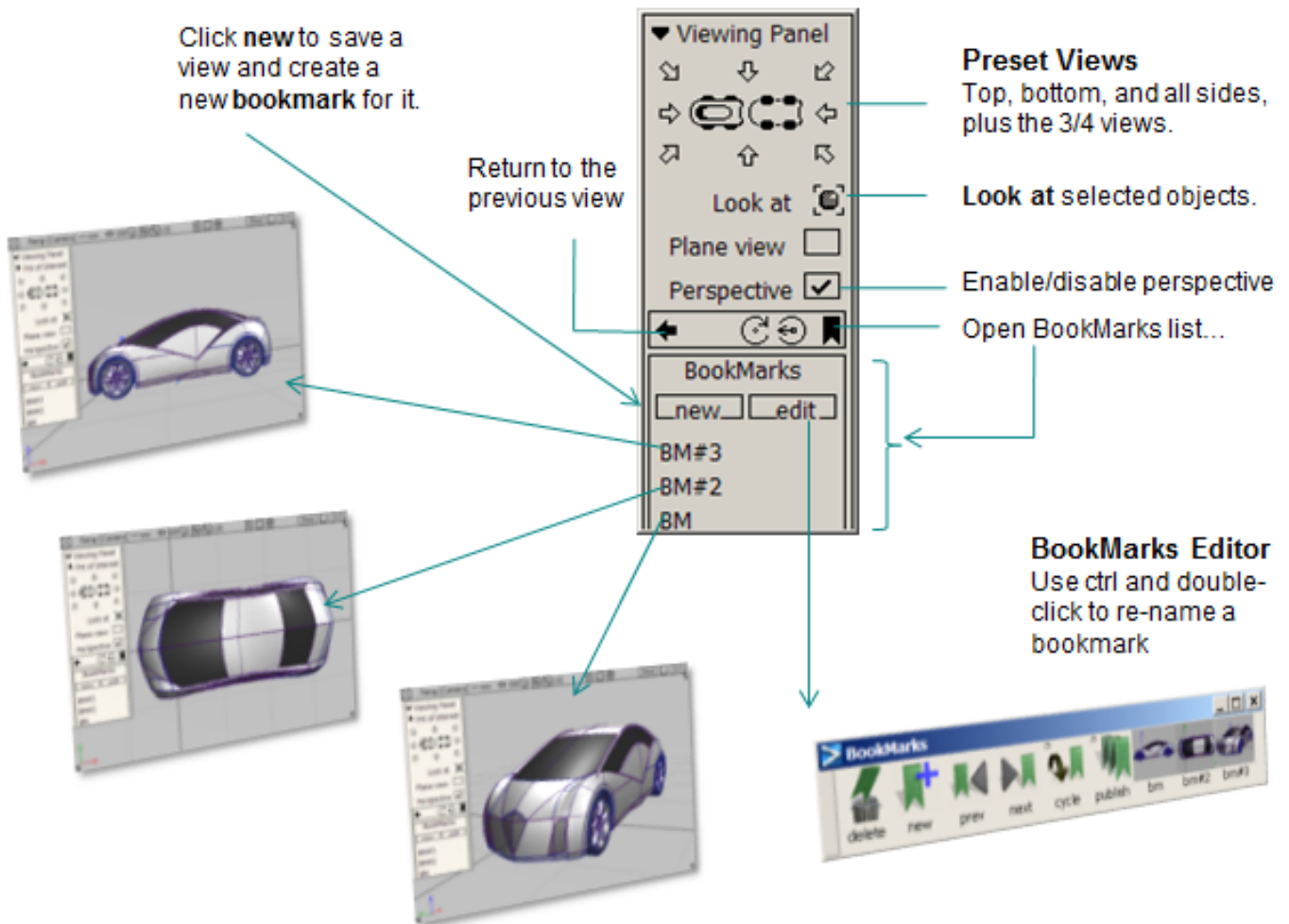
Tip: *To get used to zoom into elements, and if you are lost in
navigation, you can get back to your model in different ways.*

- Use the home Icon in view Cube.
- Use Look at Button on viewing panel.
- Use the "Look At" hot key by pressing ALT + L
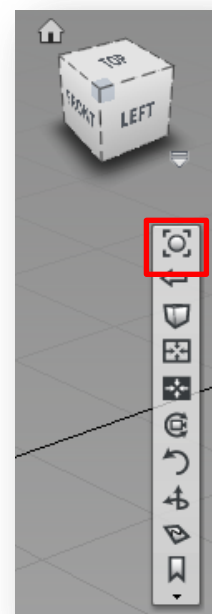
BookMarks Editor, How to manage them
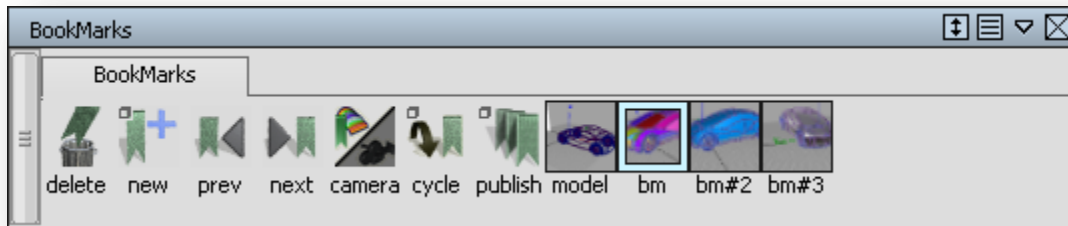
Positioning Objects Accurately

Open the following file: 1-Duplicate_ Objects.WIRE)

Snapping: Accurate Placement

Snap to **grid**
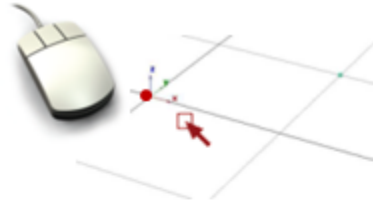
Hold down the Alt key, and click *close to* a grid

Snap to **points**

Hold down the Ctrl key, and click *close to* a point

Snap to **curves**

Hold down the Ctrl + Alt key, and *click and hold on* to a curve or surface line and drag along the curve/line

Two Steps to Position an Object Accurately

Unambiguous Instruction

Tools

Techniques

Instruction 1:

Put the *center of the base of the box* ....

Set Pivot
Center Pivot

Snapping

Instruction 2:

...exactly on the *near, right-hand corner of the table* ....

Move

Snapping

Unambiguous Result

9

Curves and CV's (Control Vertex) "What are those and How to manage them"

Is essential in Alias and at any modeling NURBS based software the use of "curves".
The use of them is elemental to generate geometry; this is the bases for everything that comes after. (Surfaces, new forms, etc. etc.)

At this point, I suggest reviewing the excellent material developed by "Kerry Kingston", detailing the theory of the construction of NURBS curves *(**N**on-**U**niform **R**ational **B**-**S**plines)*

NURBS 1: Introduction
http://www.kerrykingston.co.uk/theoryBuilders/nurbs1.htm

NURBS 2: Terminology
http://www.kerrykingston.co.uk/theoryBuilders/nurbs2.htm

Also Kerry Kingston learning materials include Autodesk Alias Golden Rules, once again I recommend you to take a close look at. (first 3 rules)

http://www.kerrykingston.co.uk/goldenRules/rulesCVLayout.htm

http://www.kerrykingston.co.uk/goldenRules/rulesFewerCVs.htm

http://www.kerrykingston.co.uk/goldenRules/rulesSingleSpan.htm

Two Types of Curves

Freeform Curves

cv crv   ed pt crv   circle

Curves
circle   cv crv   blend
new cos   line   arc
line tan   line-arc   text...

Keypoint Curves

line   circ   arc

Curve shape controlled by CVs

Curve shape controlled by keypoints

How to activate Control Vertex points

Display
Deviation ✔
Cv/Hull ✔
Edit Points ✔
Blend Points ☐
Isoparm U ✔   V ✔
Curvature U ☐   V ☐
↓ Transparency
↓ Quality
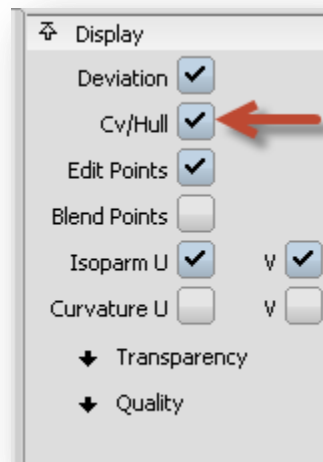
Freeform Curves Terminology

Start
The first CV is
displayed as ⊞

The second
CV is shown
as **U**

Together they
show the
direction of the
curves

Control Vertex ×
Points used
to shape the
curve/surface

Hull ╱
Lines
connecting a
row of CVs

Edit Point
Points showing
the number of
spans in a curve

Span
Part of a curve
between two
edit points

Span

1 picked object

curve #5

| Degree | 3 |
| Spans | 4 |

Control Panel
Use to change the
number of spans
(and therefore
CVs) in a curve.

At the start and end of
a curve, there is a CV
and an Edit Point.

Where to Position CVs

If you want a constant, regularly changing
curve shape, then the CVs should be
evenly spaced, and you should have as
few CVs as possible.
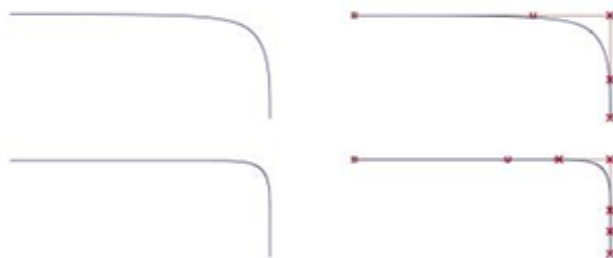
If you need to create a strong change in the
direction of a curve, you'll need to **bunch
up** extra CVs to control the shape.

This method is OK for quick, concept
modelling but not for high quality,
controllable surfaces – see the technique
below.

Curve 1   Curve 3

Curve 2

One of the skills you will develop is to judge
when a shape should be made out of a
single curve or from **separate curves**
joined together.

Open the following files:
2-Create_Basic_Curves.WIRE
2-Door_Knob.WIRE

Inflections

Inflections occur when a curve changes direction from a 'positive' to a 'negative' curvature. Inflections can be highlighted by applying a curvature comb using **Evaluate → Curve Curvature** and selecting the **Inflection Point** display.
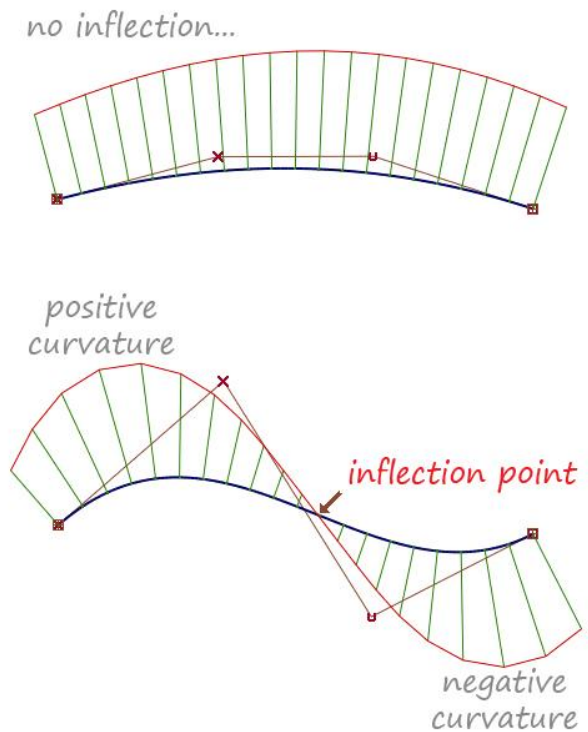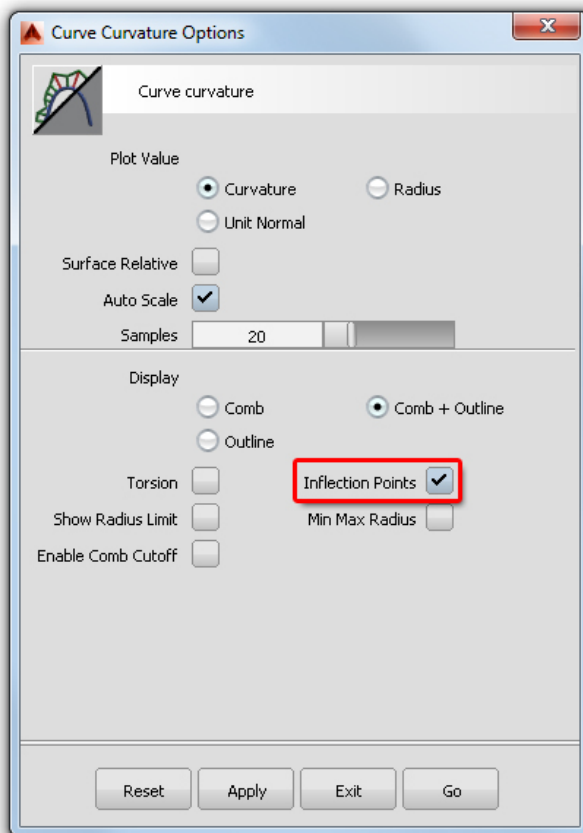
Also Kerry Kingston learning materials include Autodesk Alias Theory Builders, once again I recommend you to take a close look at.

http://www.kerrykingston.co.uk/theoryBuilders/evaluateComb.htm

Curve Tools: Curve Section
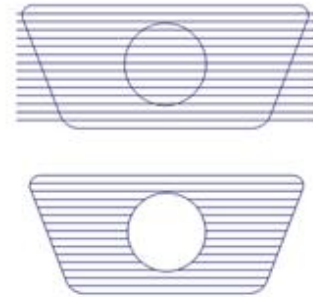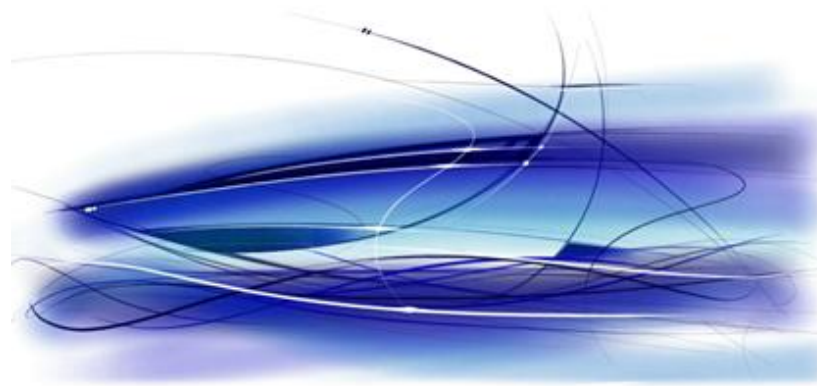
In this sketch, curves are drawn across each other.

Even when drawing accurate curves, it is sometimes easier to draw overlapping curves, and then trim them to create the final design.

Curve Edit → Curve Section

This function can be used to trim or split curves where they cross.

crv sctn

Global Curve Intersect

This is a Plug-in which is useful for complex layouts such as numeric keypads.

jblcrvisec

Open the following file:
2-Curve_Section.WIRE
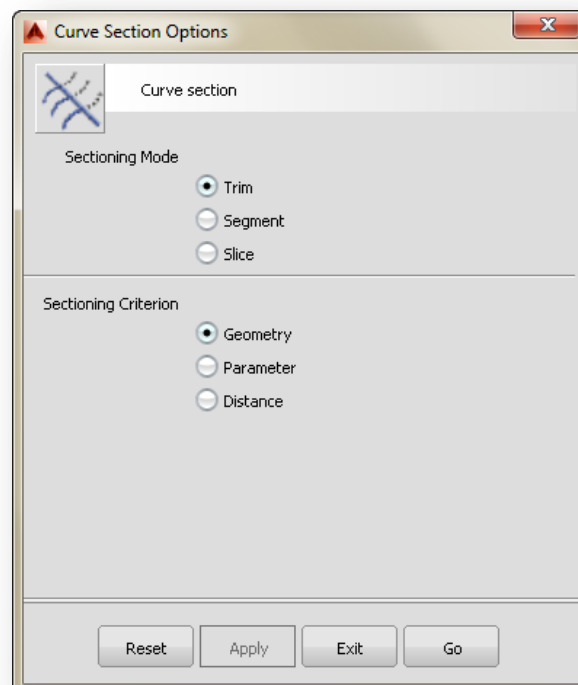
Handling CVs

In the following exercise we will understand the methodology of handling CV points and how to do it in an organized way with the Move, Pivot, Pivot center command.

Open the following file:
2-Bowling_Pin_CV.WIRE
2-Sketch Project Demo.WIRE
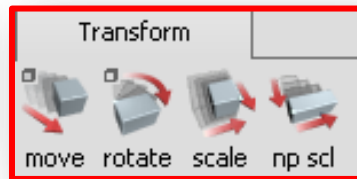
To insert more isoparms go: **Object Edit → Insert**

Insert

Inserts a new isoparm and hence a new span

Choose the direction (u or v) of insertion by selecting an isoparm in the right direction.
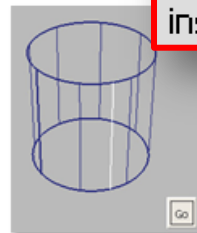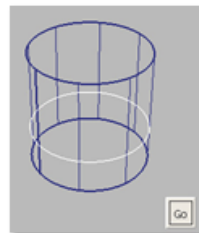
To project images onto the surfaces you need first activate "**Hardware Shade**" on the WindowsDisplay pull down menu, then "**Project Sketch**" options in the Canvas pull down menu.
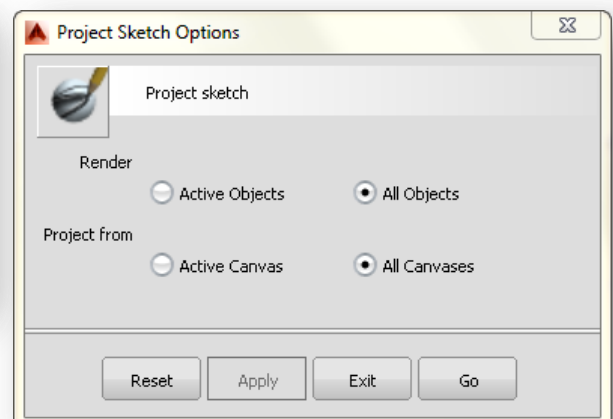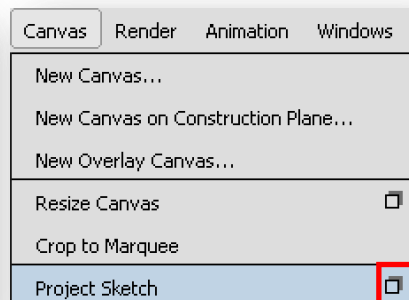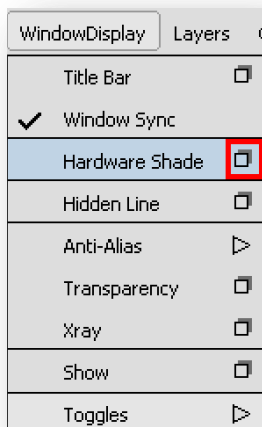
Section 2: Create and manipulate surfaces and control their flow

Surface introduction.
Now we are going to explore Surfaces, and some of their alternatives.

Skin Command

Open the following file:
3-Skin_Surface.WIRE

Using the **Surface → Skin** command
(note you will see two skin icons)
you create surface alternatives by interpolating curves.
By double clicking the "Skin12" Icon you can alternate
between open or closed surface topology.
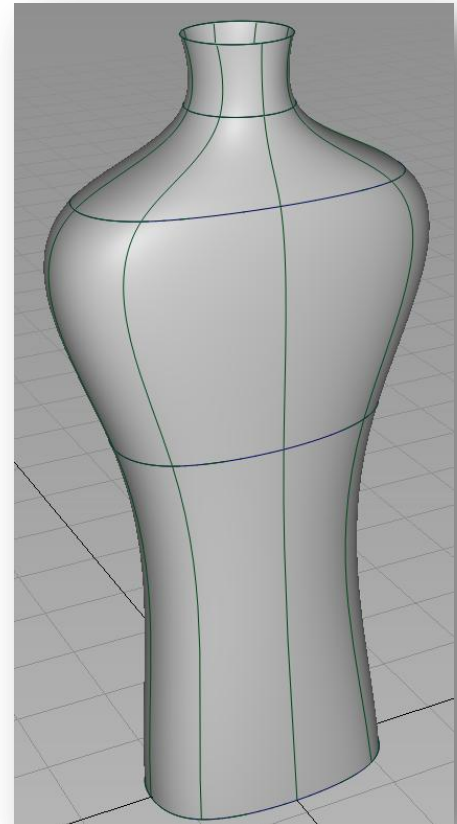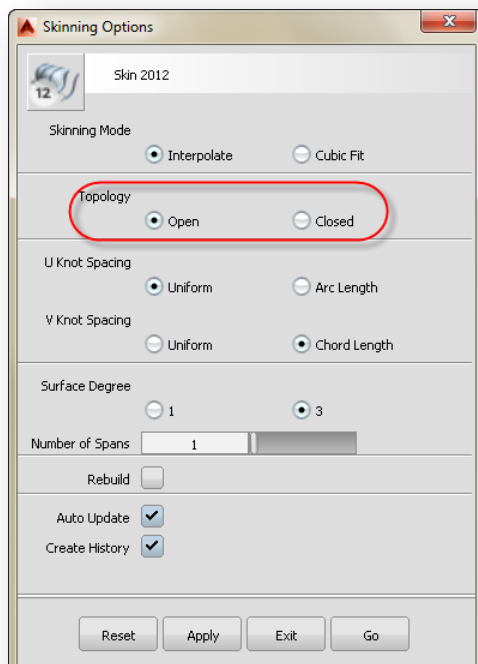
Trimming Surfaces

Continuing with the previous simple model let's explore the TRIM methodology to cut surfaces in Alias.
The cut surfaces the "**Trim**", "**Untrim**" and "**Divide**" command allows select parts of surfaces you want to keep or discard it with simple clicks.

Prior to cutting the surfaces you need to project curves that will guide the cut. This is possible with the command "Project" by selecting the curve we want to project and the area where it will be projected. This will create new Curves on the Surfaces also known as COS (Curve On Surface).
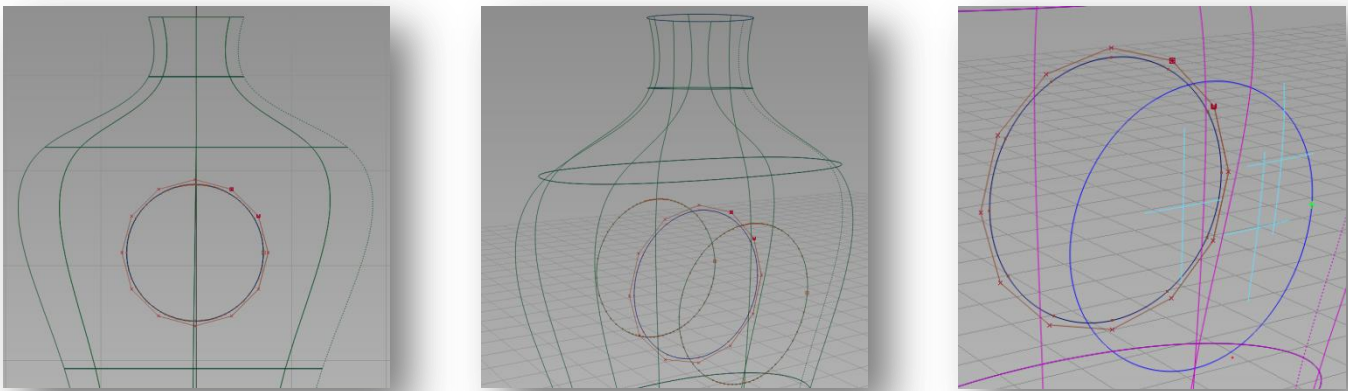
Note: you will see Project and Trim Icon and their options by double clicking
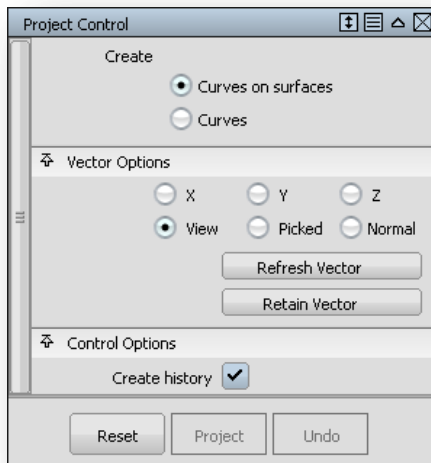
Also Kerry's materials include Autodesk Alias Theory Builders, once again I recommend you to take a close look at. (Trimming surfaces)

http://www.kerrykingston.co.uk/theoryBuilders/trim.htm

Using the "Brail" Command

In this section and using the **brail** command you can explore the surface behavior by changing parameters. By double clicking the "**brail**" Icon you can see options.
Note we will also use the "**query**" command to see Surface construction History once and again.

Open the following file:
3-Query_Edit_Sink.WIRE
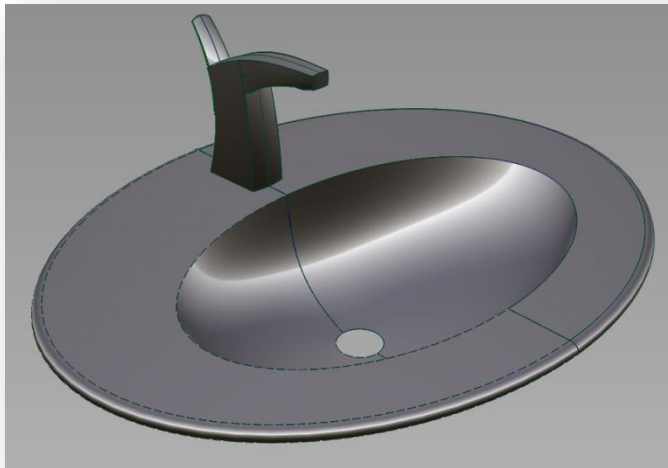
Note: you will see selecting windows once you click on surface edge.
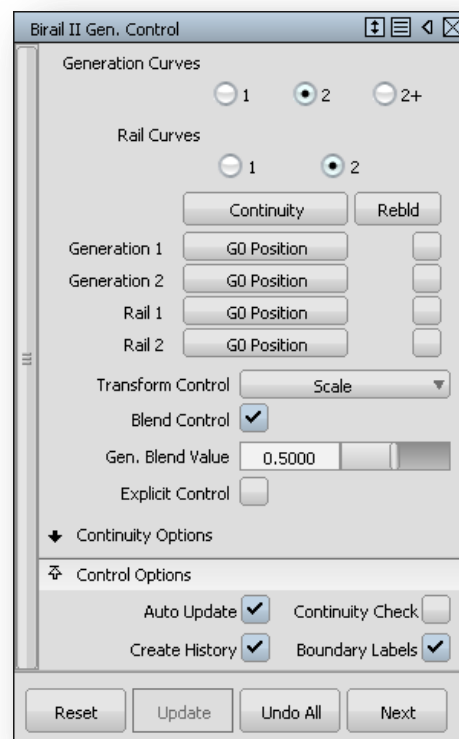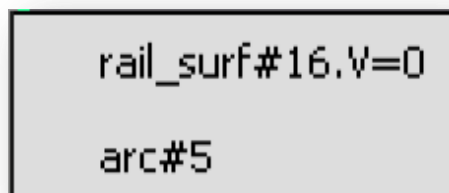
Also Kerry's materials include Autodesk Alias Theory Builders, once again I recommend you to take a close look at.

http://www.kerrykingston.co.uk/theoryBuilders/continuity1.htm

G0
Position

G1
Tangent

G2
Curvature

G3
Curvature
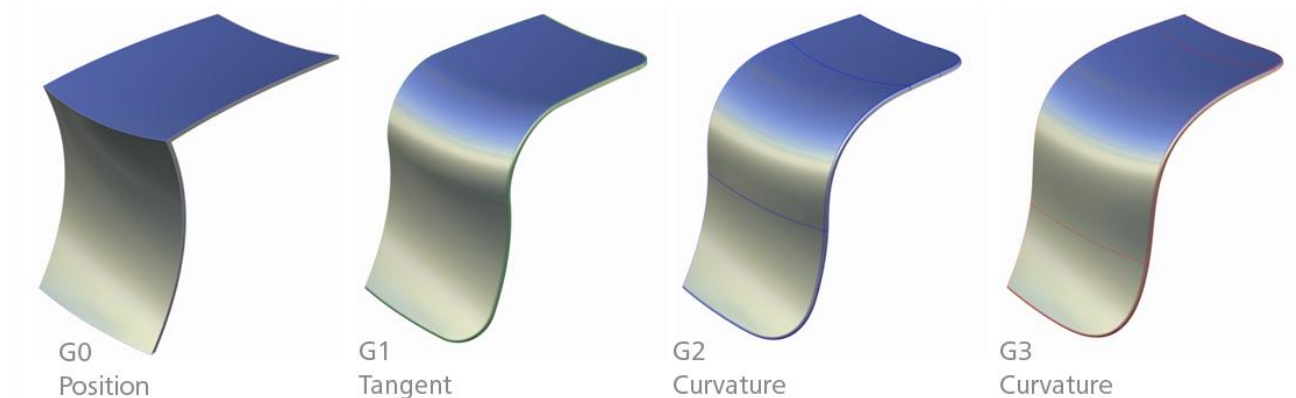
Introduction to Blend curves.

In the following hands on Lab, you have seen some types of curves and some of its creation and manipulation alternatives. Now is the turn of a special type of curves which have special intelligence.
Such curves can generate high-level transitions, with a simple method of handling.

Some people use Blend Curves just for specific transitions or special situations of blending, some other don't even know how to use Blends Curves.

From the beginning of a conceptual phase, Blend Curves allow additional control of the curve shape and therefore the geometry to create (surfaces). This makes them more friendly and easy to use; not only for transitions but also to set the initial start point of a model in Autodesk Alias.

From the technical side, those types of curves have large number of parameters that might be set, and allow Blend curves be very complete as an Autodesk Alias tool.

You will now explore some of the alternatives to handle them and use them to create a model.

Blend curves are normal NURBS curves with more construction history: you can use all the normal curve tools on blend curves, and when you are not using blend curve tools, they look like any other curve.

Blend curves are controlled by blend points acting as constraints:
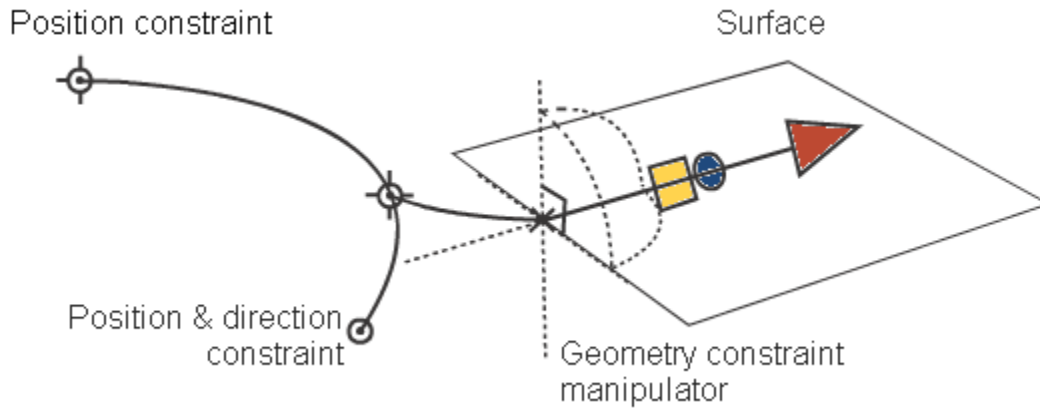
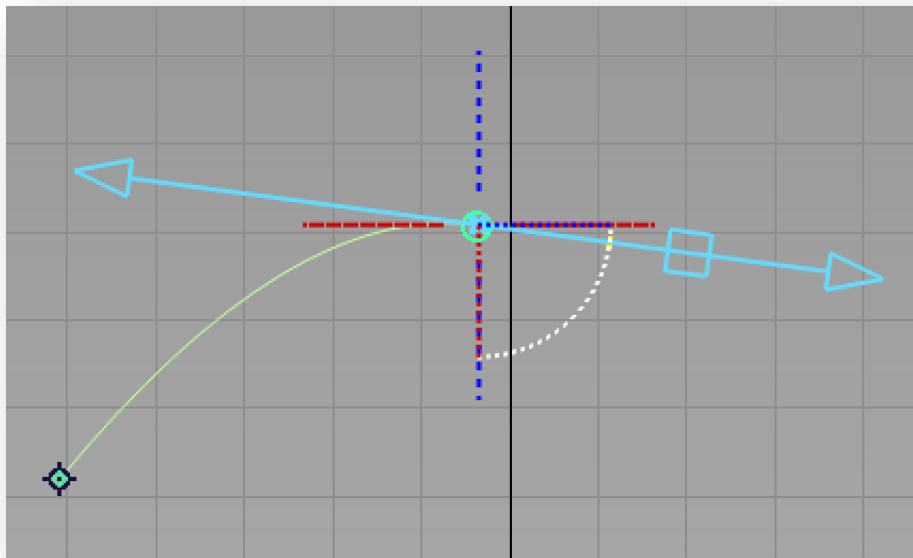| Type	Not attached	Attached to blend curve	Attached to regular curve
Location			
Direction			

Note: you can access to **Blend Curve Toolbox** by clicking the Icon in the Palette tool.
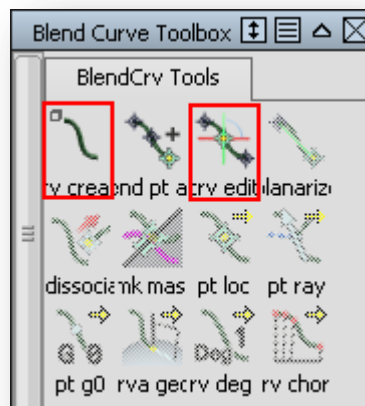
To select a Blend point you need to do it with its own selection Icon go **Palette → Pick**
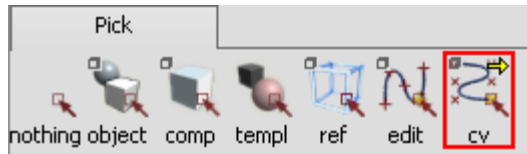
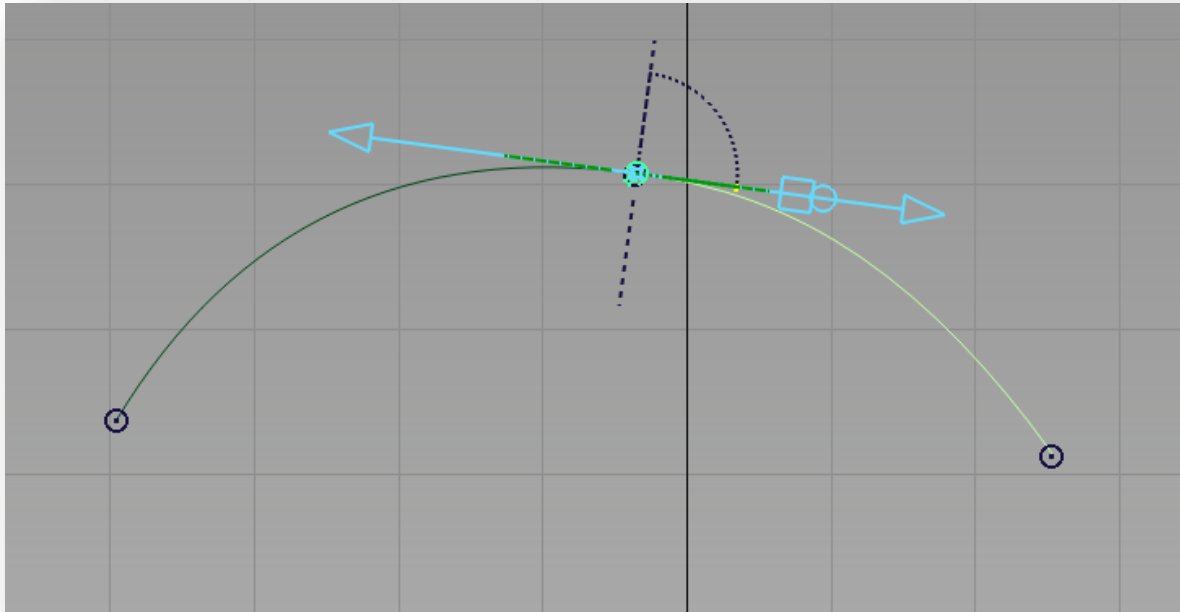Take a note how **manipulator** looks in 2D and 3D once you activate it in Blend Curve Toolbox
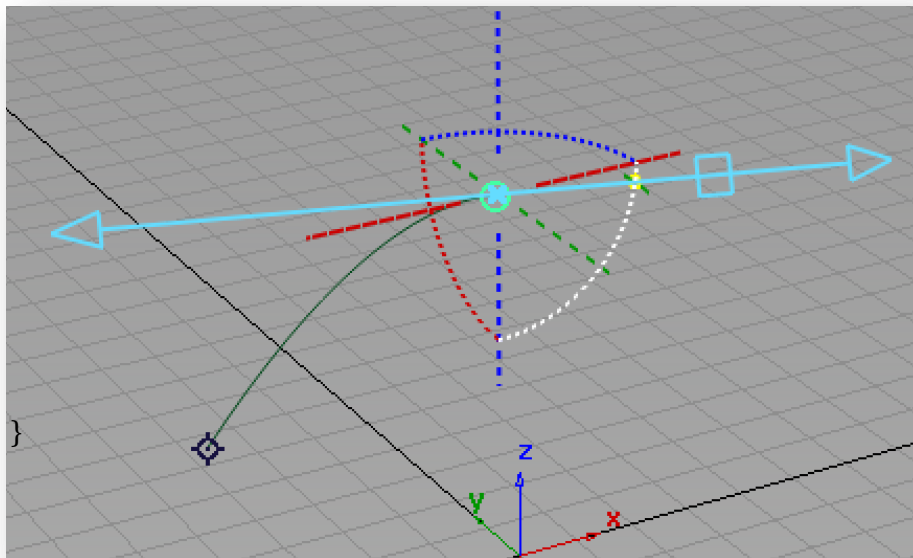
Once you have connected two Blend curves, these get a smart relation where one depends on the position of the other.
Blend Point and the manipulator change their color and shape as the second curve attached to the first one.

Also the second curve changes to purple indicating the established relation.
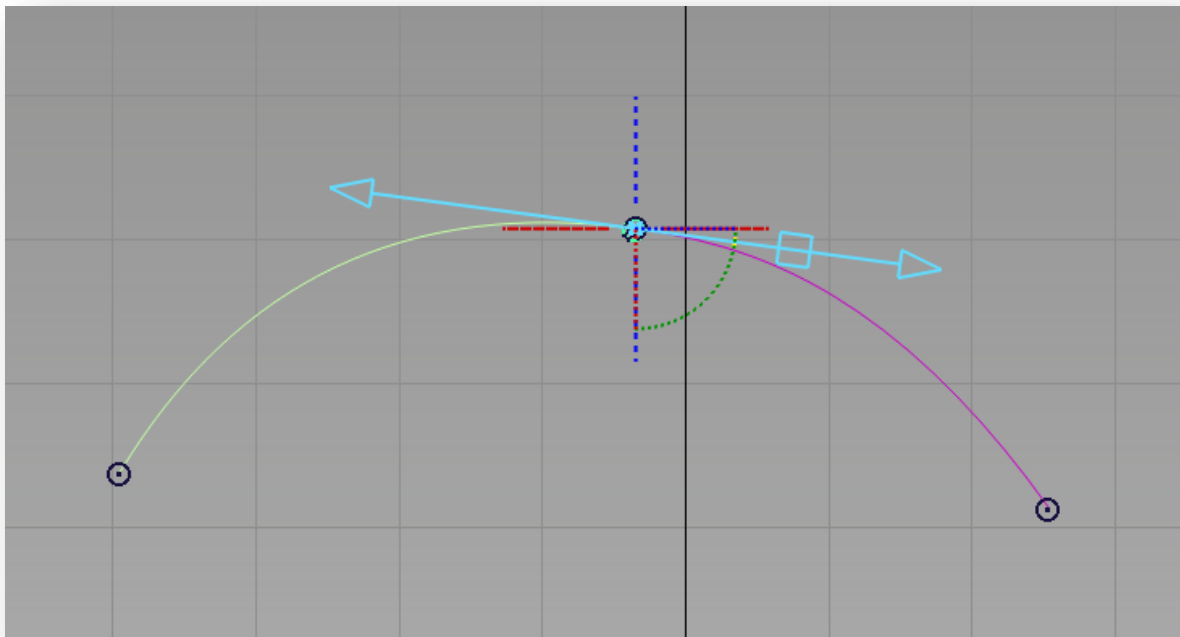
Point continuity and curve shape will be modified by the relation of the Blend point.
You can select these relations by changing the second curve Blend Point selecting G0, G1, G2, G3 and G4 in the Blend Curve Toolbox.
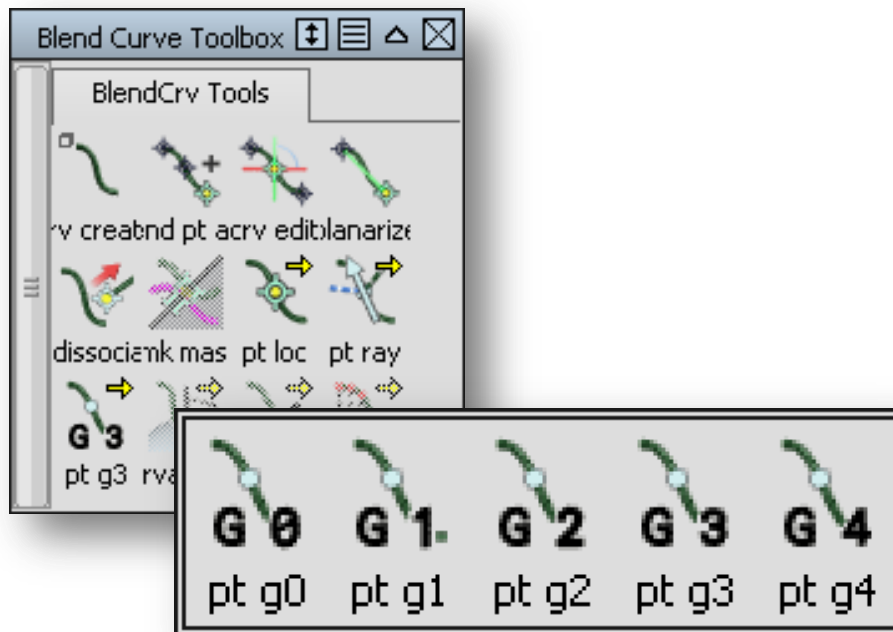
Note the changes in the manipulator indicator (Square, Circle, Small circle)
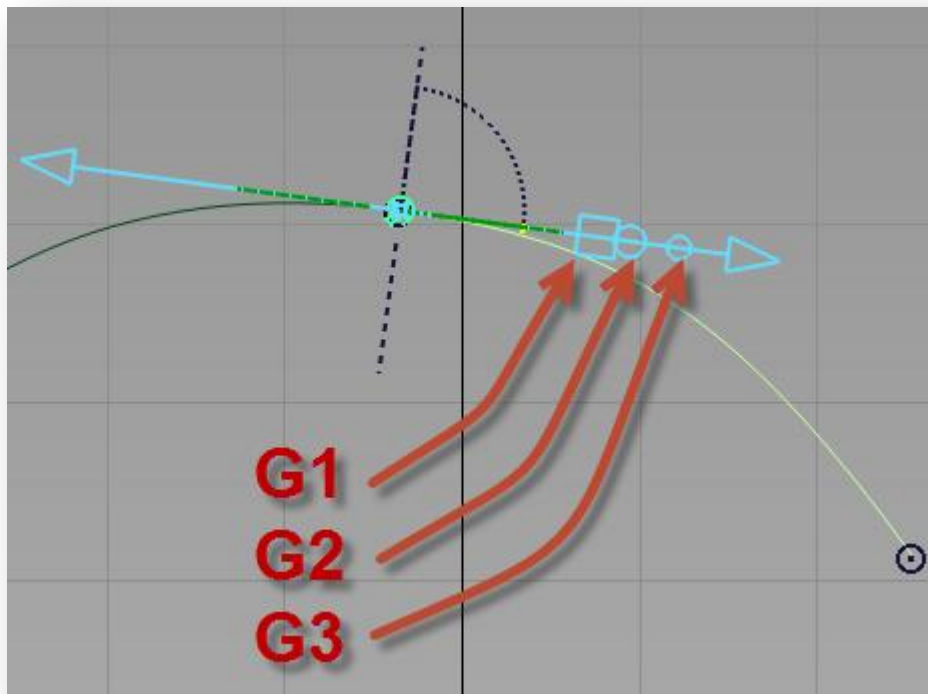
Remember to use the Curvature Plot to evaluate the curve and the acceleration of it.
Is also recommended activate the CV's of the curves.
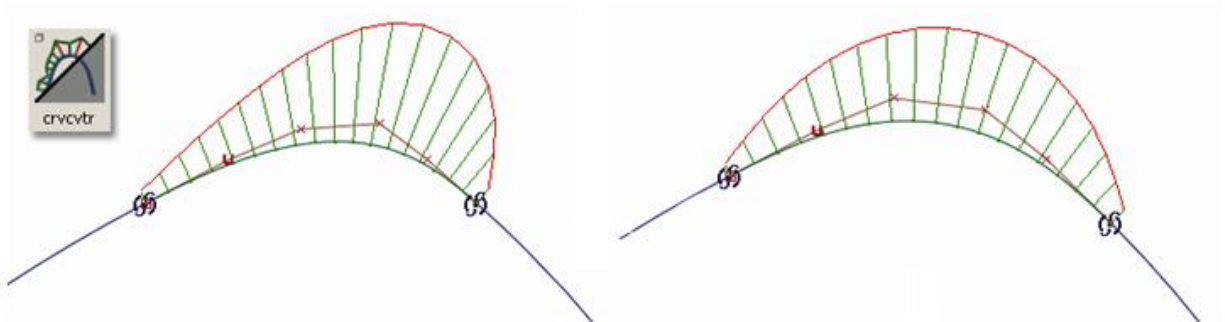
Note that if you move one of this CV's the curve history will be lost

Take a look to the CV's distribution by changing their position automatically activating the Uniform or Chord orientation in the Blend Curve Toolbox
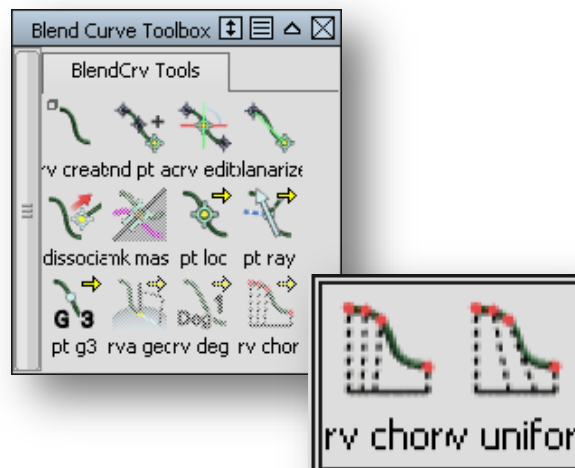
Modeling with Blend Curves

In the following exercise you will create a simple Faucet model using only Blend curves.
You will explore one alternative for concept creation starting with an back image plane.
You can drag and drop the image onto the Autodesk Alias screen.
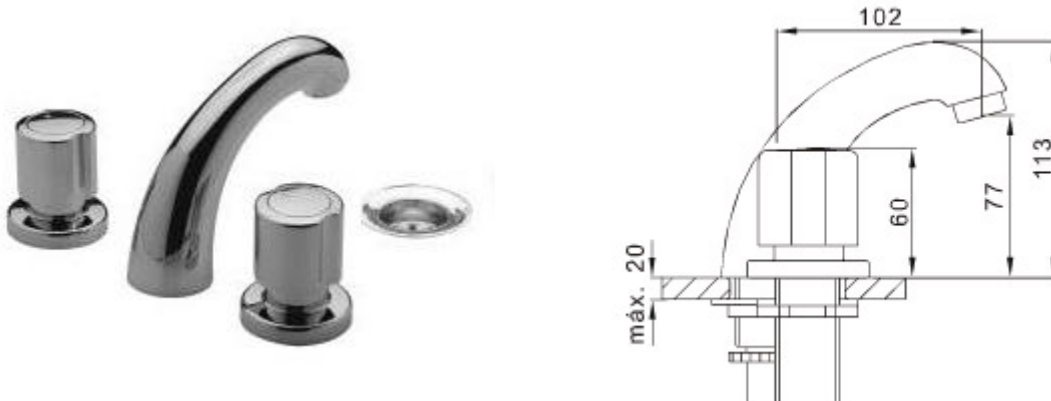
Open the following file:
1-Faucet-Image.WIRE

You can see the image and control its opacity by using the Canvas Layer Editor.
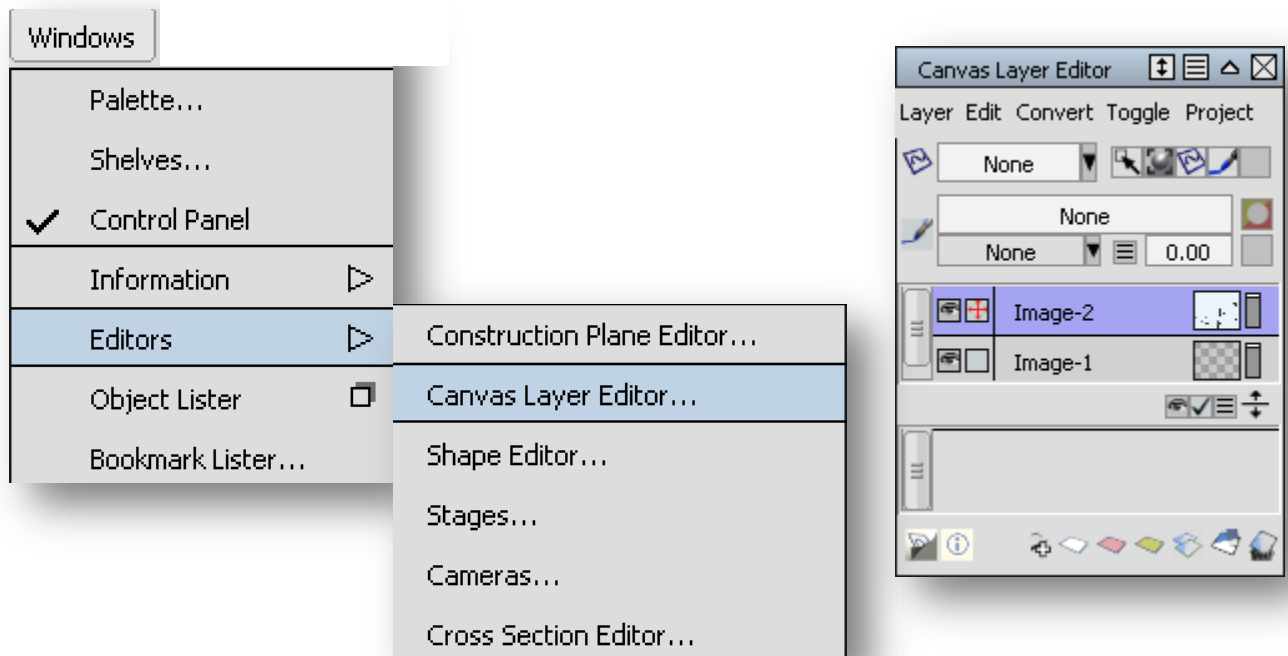
Blend Curve Creation

You can create the model starting with two point Blend curves, and then once you have the 2D geometry set, you will be able to start developing the 3D curve by adding a 3RD Blend point into the Blend curve and being sure the manipulator shows that this curve goes perpendicular from the "X" plane. (Change the view to top using F5 to verify)
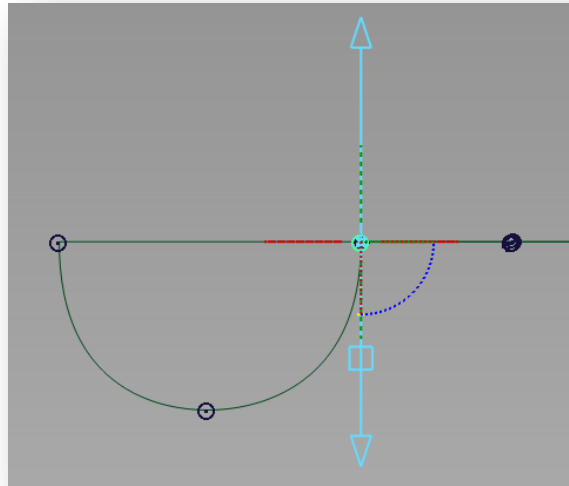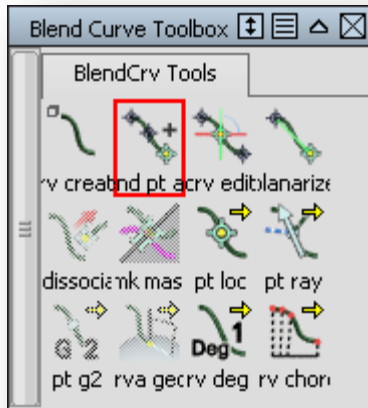
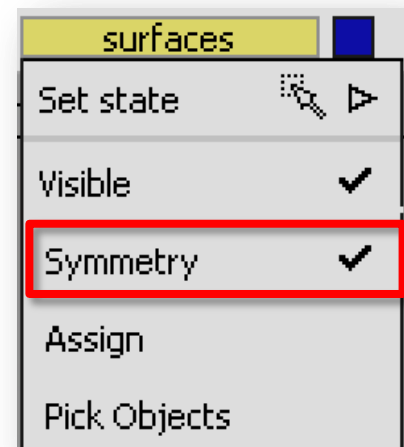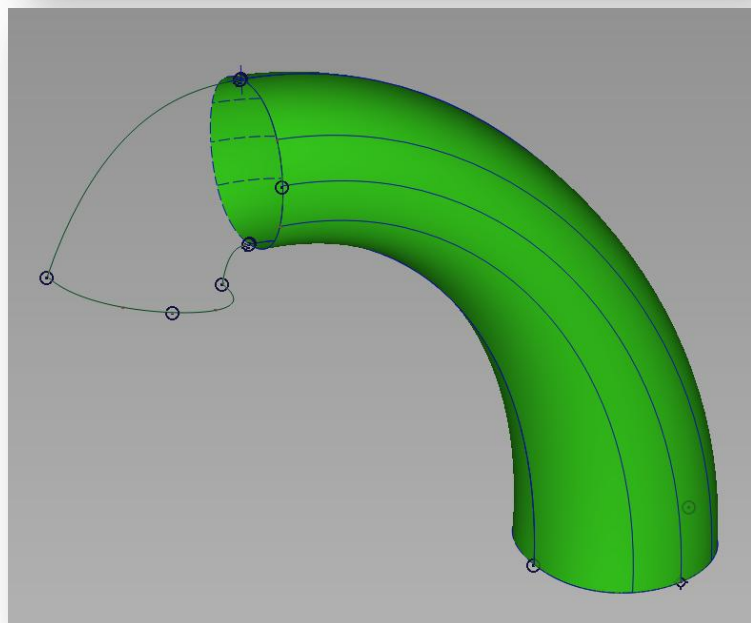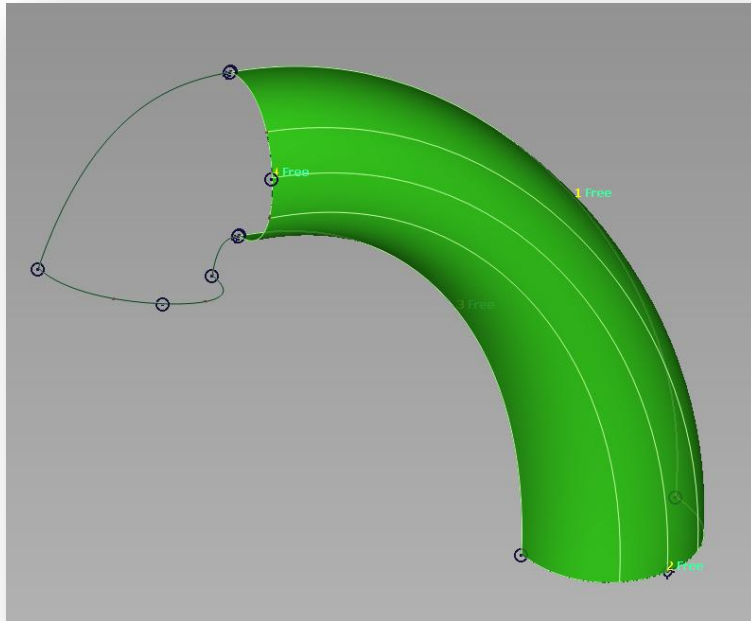*To see the finished model open the following file:*
2-Faucet-Curves.WIRE
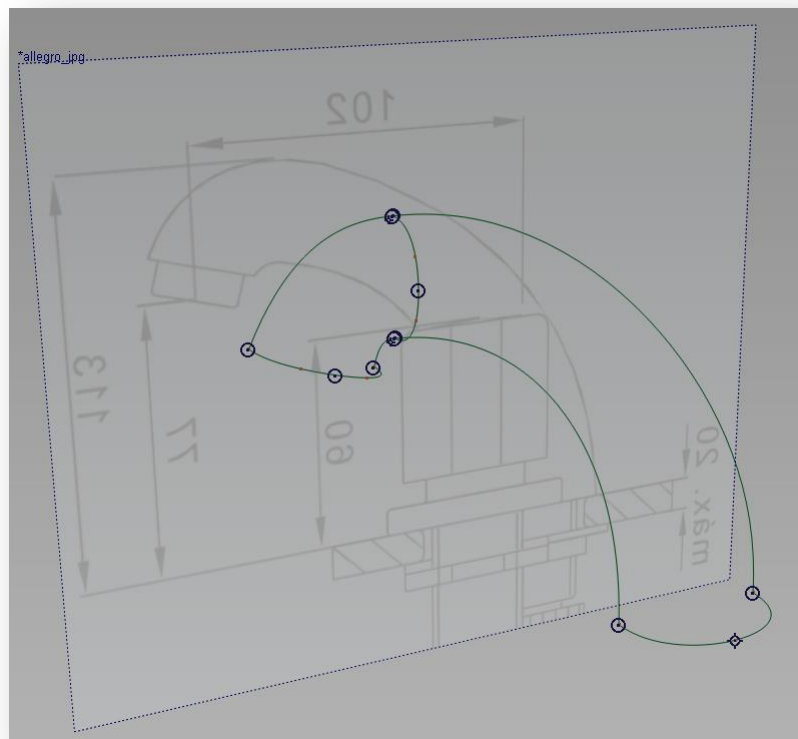
Surface Creation

Note that you have built half of the model, and now you begin to build surfaces over the blend curves you have created.
You will use the "Square" command from the "**Surface Toolbox**" and select four boundaries in order.
Using the symmetry of the layers you will see the complete model.

A square surface allows you set some control parameters such as Continuity, Blend Type, Explicit Control of the surface and more. Again you can access by double clicking on the "**Square Surface**" icon.
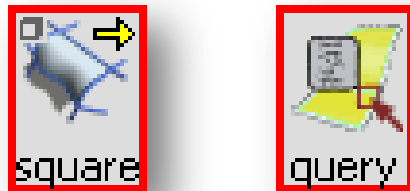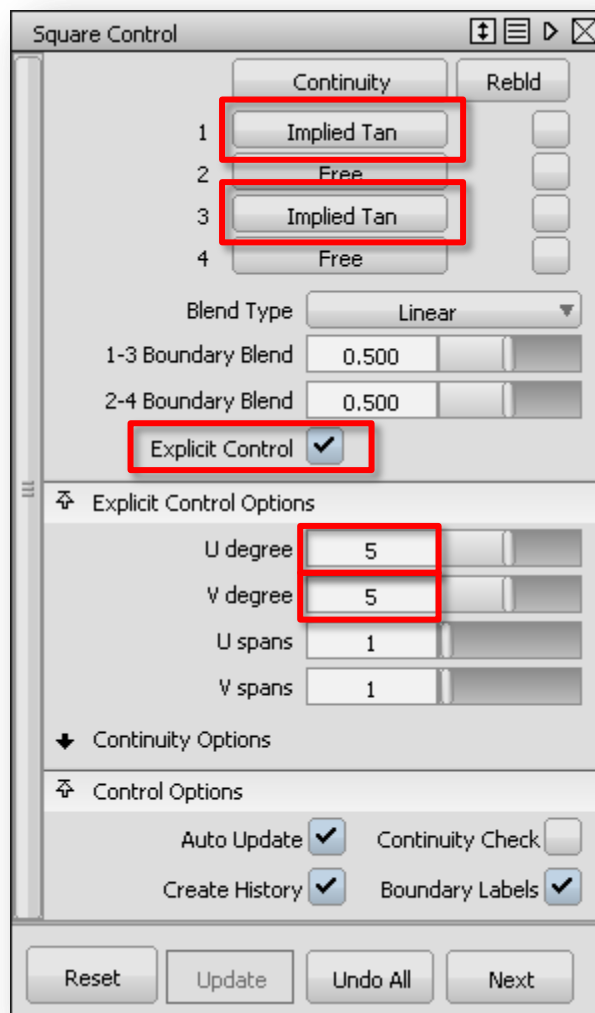

Work in this first Square surface and then modify this applying the following settings

Boundary 1 = Implied tangent
Boundary 3 = Implied tangent

Check Explicit Control and move setting to 5 X 5 U and V degree.

Also Kerry Kingston learning materials include Autodesk Alias Golden Rules, once again I recommend you to take a close look at.

http://www.kerrykingston.co.uk/goldenRules/rulesFourSided.htm

Final result looks like this and when you use layer symmetry you will be able to see a complete and nice surface flow model, check it with the Zebra Stripes, in the Diagnostic Shades.
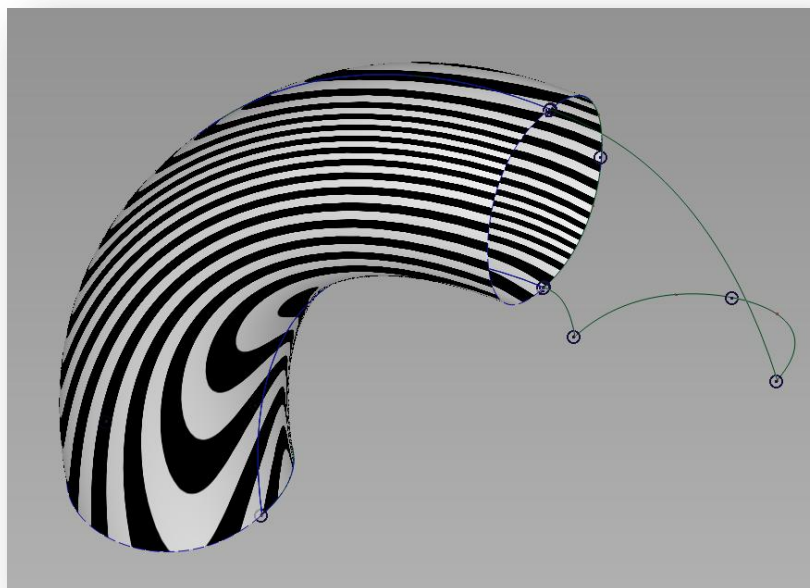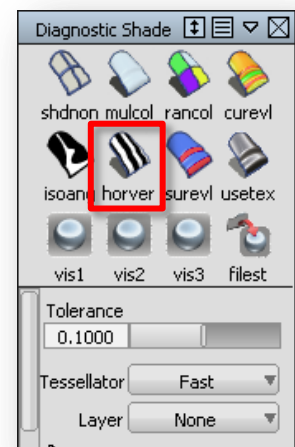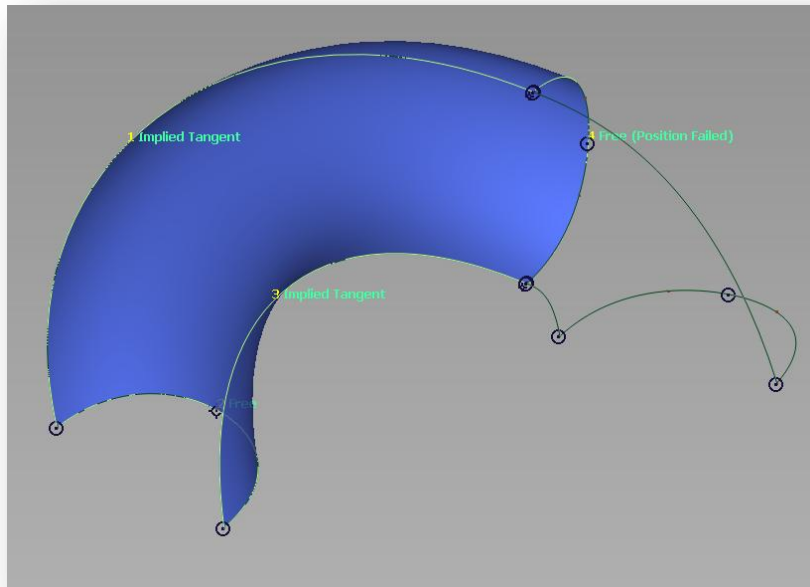
Create a second Square Surface but now, pay attention to use the first surface boundary instead of using the curve and set this to a "curvature" or "tangent" continuity relation.
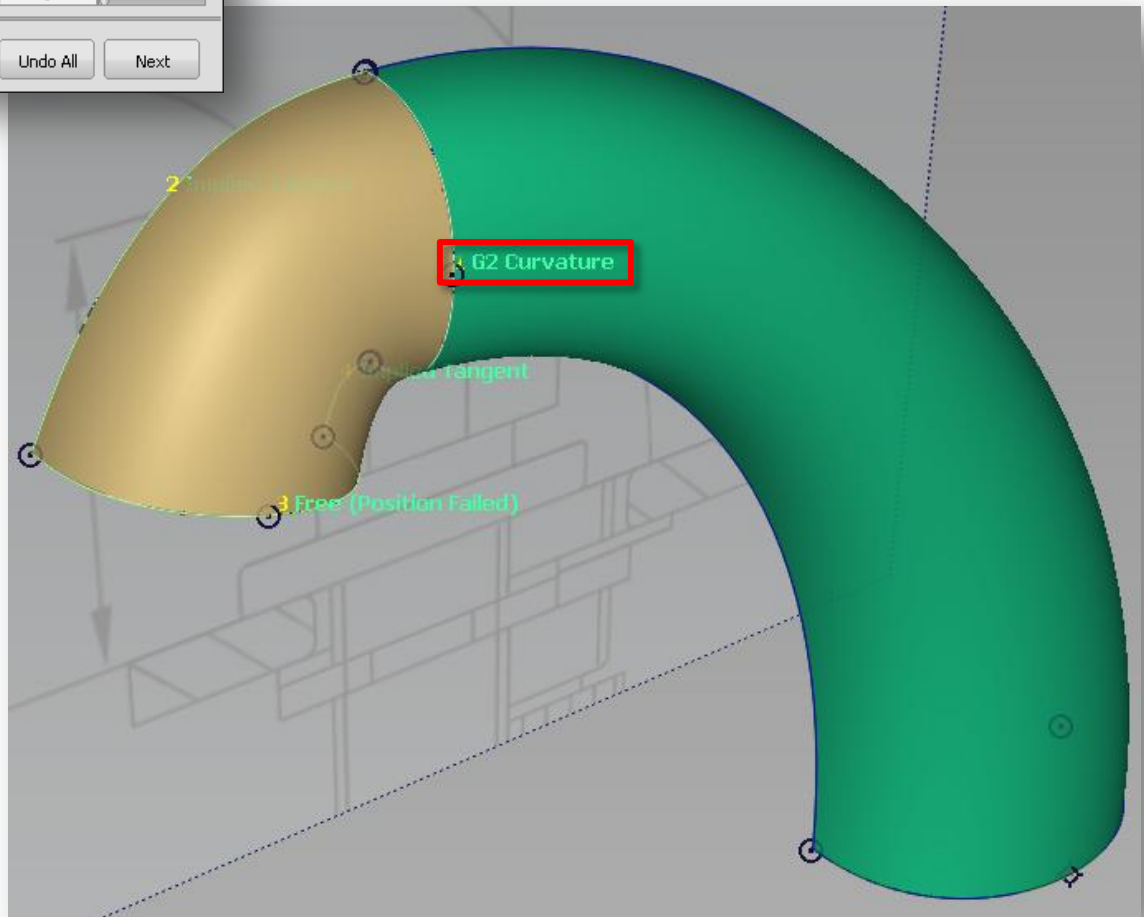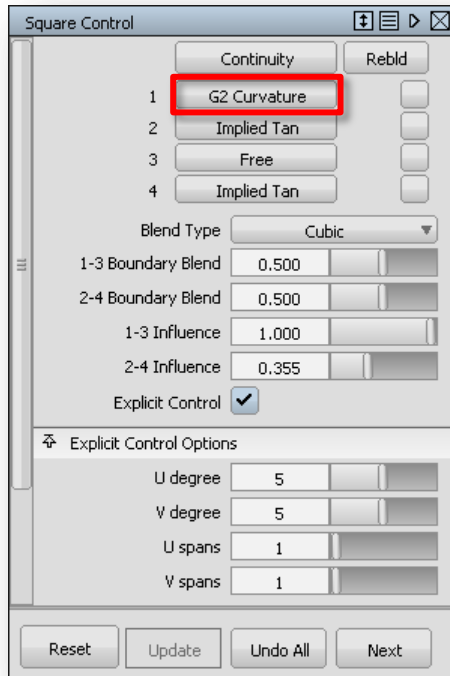
Finally with this full "Blend Curves" and "Square Surface" model, you can explore multiple alternatives by moving the blend points or adding more blend point to the boundary curves and change the shape

Some alternatives might look like this.
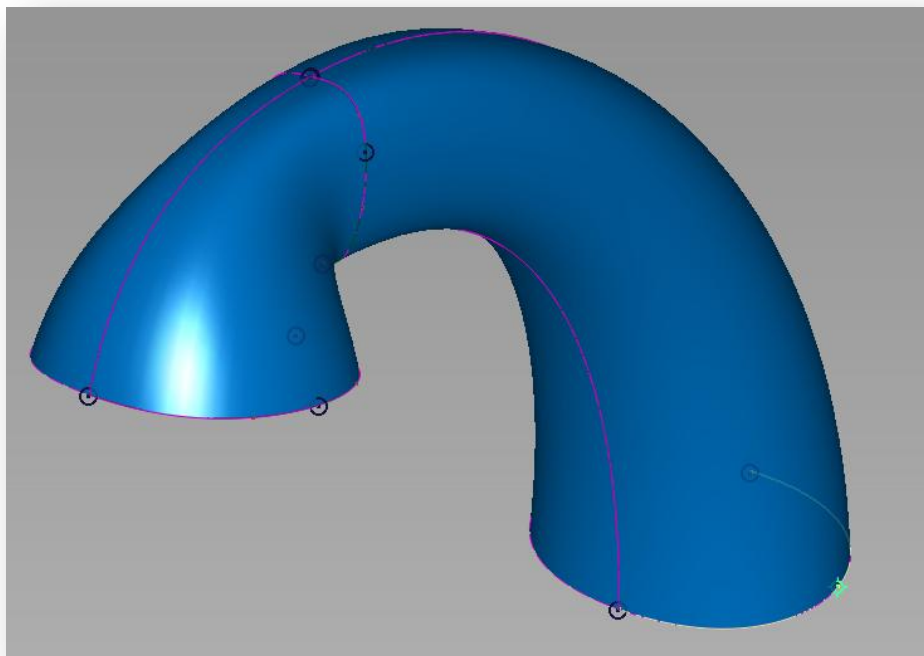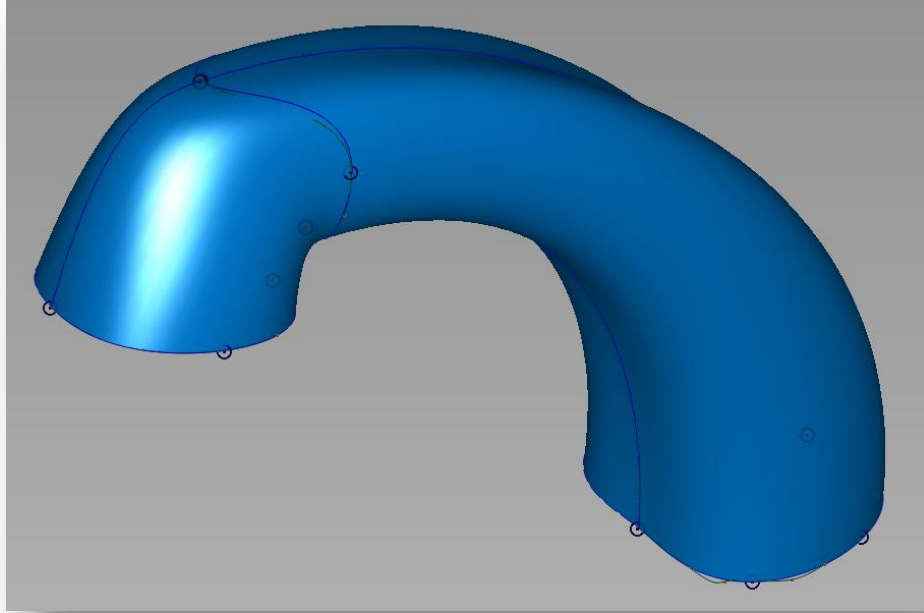
Section 3: Use Autodesk Alias tools to modify your design and create design variations

In this section you will get familiar with some semi-automated tools to create different interactions with Autodesk Alias.
Those tools were developed a while back and are still great tools that allow surfaces and object control for concept modeling and final models.
The models and videos of this section are part of the Autodesk Alias official demo data set.
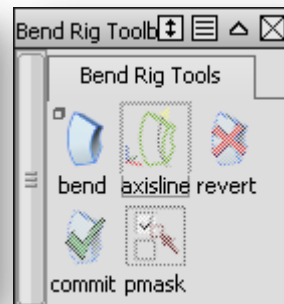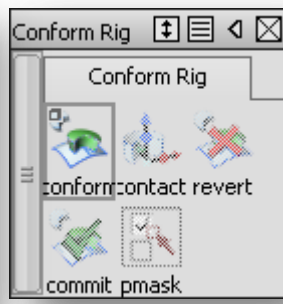
Note: In the dataset for this class, you will find some step by step videos in .FLV format just drag and drop them in your web browser to watch them.

To access to this tools go to **Palette → Object Edit** **1** and **Transform → Path Array** **2**, to find these tools.
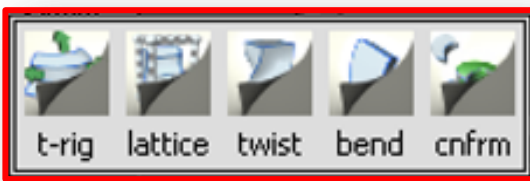
To see these models open the following files:
7-Bend.WIRE
*7-Conform Relief .WIRE*
7-Twist.WIRE
7-DuplicatePlace 2.WIRE

Section 4: Describe an Autodesk Alias workflow and explain its capacity for conceptual modeling

In this section you will be able to watch some specific tools to manage already made geometry and create or modify interactions easily

The lattice tools will provide a complete solution with historical update of the geometry.
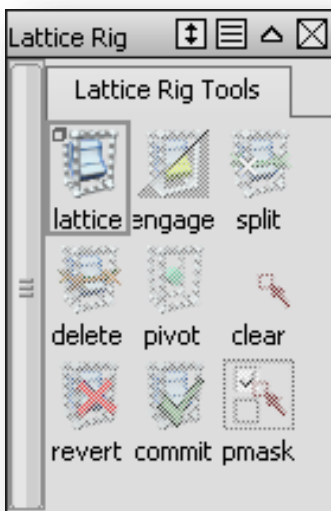
Pay attention to Kerry Kingston learning materials Lattice Video

http://www.kerrykingston.co.uk/movies/W1_Lattice.mp4

Autodesk Cross Product Workflows

Take a look of a full documented workflow for the most popular Autodesk Solutions that commonly interact with Autodesk Alias.

Alias and Autodesk 3ds Max interoperability
http://help.autodesk.com/cloudhelp/2014/ENU/Alias/files/GUID-4EDFB9D1-C2C6-48FB-AA38-6AF02F711908.htm

Alias and Inventor
http://download.autodesk.com/us/alias/2014help/AliasInventor_WP_US_v4.pdf

Alias and Maya
http://help.autodesk.com/cloudhelp/2014/ENU/Alias/files/GUID-ABFC4DD6-FDB4-40B5-BCD9-C6D474FC75D6.htm

Alias and Showcase
http://help.autodesk.com/cloudhelp/2014/ENU/Alias/files/GUID-C21DA4E4-4DB9-4CAD-A7AF-2FAB809D2606.htm

Conclusion

You've had an opportunity to get a quick look at some of the things that are important in Autodesk Alias.

you can make substantial productivity gains in your work, and learn how to get more with all the information and links provided. Autodesk Alias has lot of tools, some of them were covered in this LAB document and remember in 3D modeling environment, there are multiple ways to create a model and different ways to achieve the same result.

Thanks for attending.