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

MA3320-L

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@szaje

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Class summary

- 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.

Key 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

Sites where information can be found

- 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

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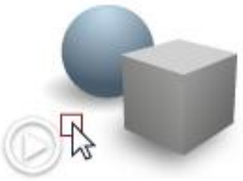
- Getting Started
- Tutorials
- Alias Help Topics
- ICEM Transition Guide
- Rhino Transition Guide
- Autodesk Cross Product Workflows
- Direct Connect Help
- Installation and Licensing

Welcome to Alias Learning

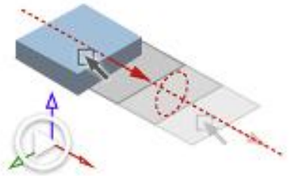
Here you can acquire essential skills through video tutorials and much more. Search or browse from the navigational panel on the left or simply start with the essentials below.

Essential Skills Videos

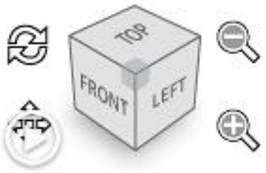
Discover the User Interface



Create and Edit Objects

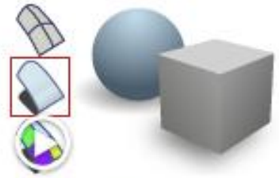


Transforming Objects



View Manipulation

Picking Objects



Visualization

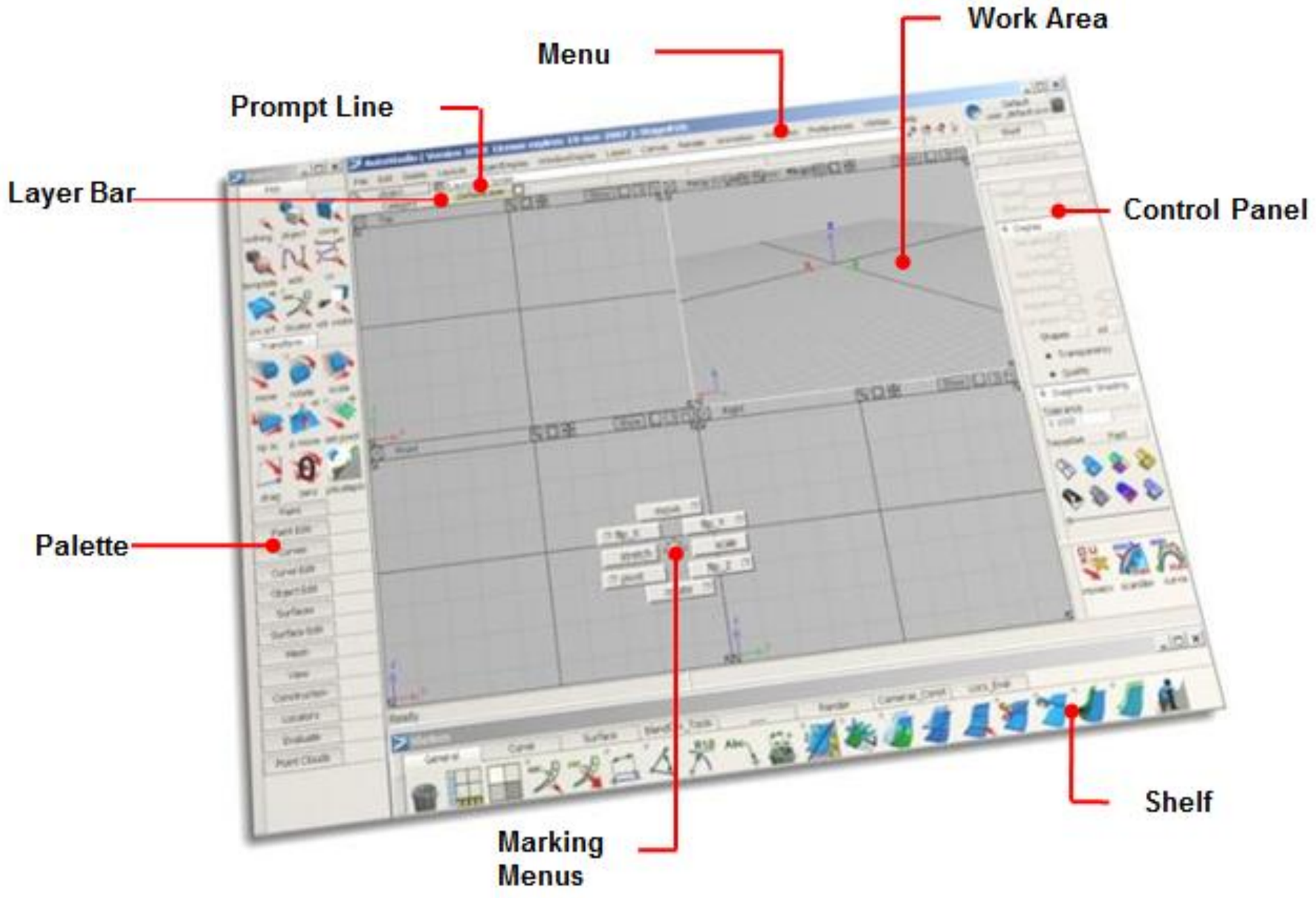
Learn about Alias

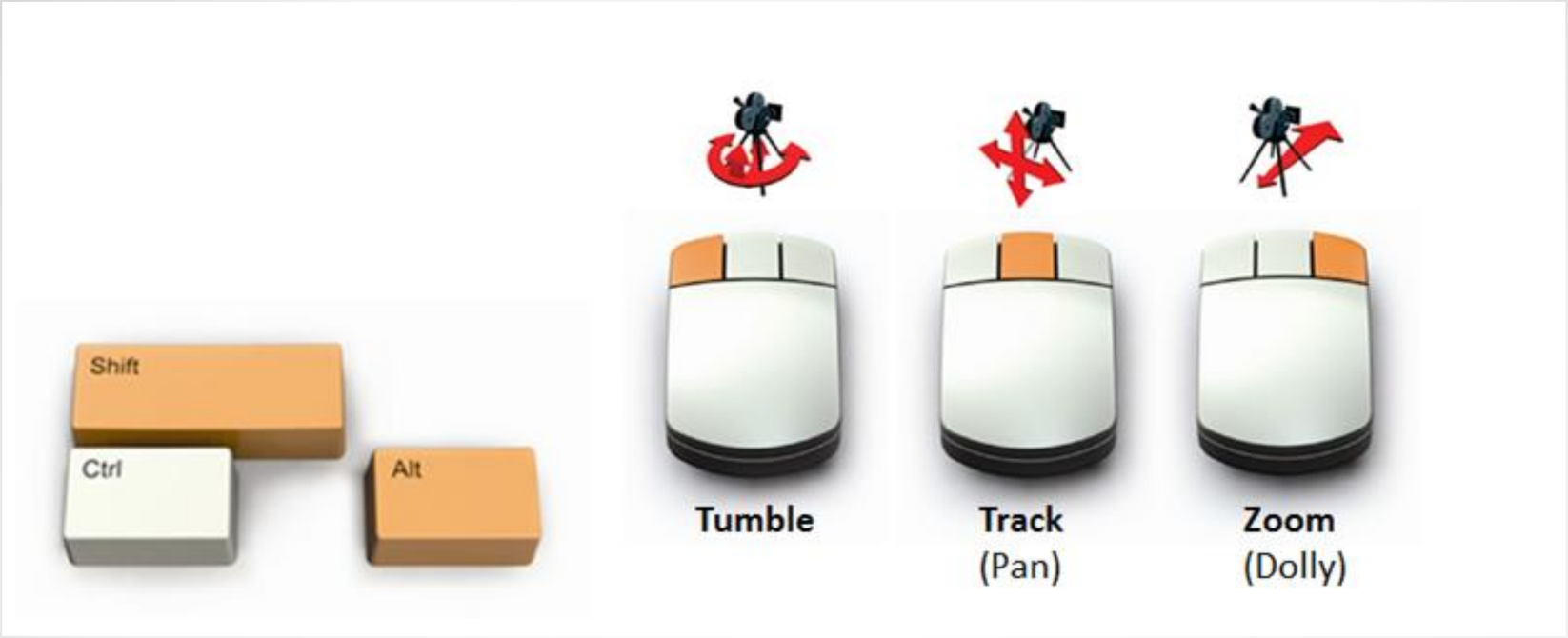
What's New
Getting Started
Tutorials
Help Topics

Additional Resources

Autodesk.com
Mosaic Community
Autodesk Labs

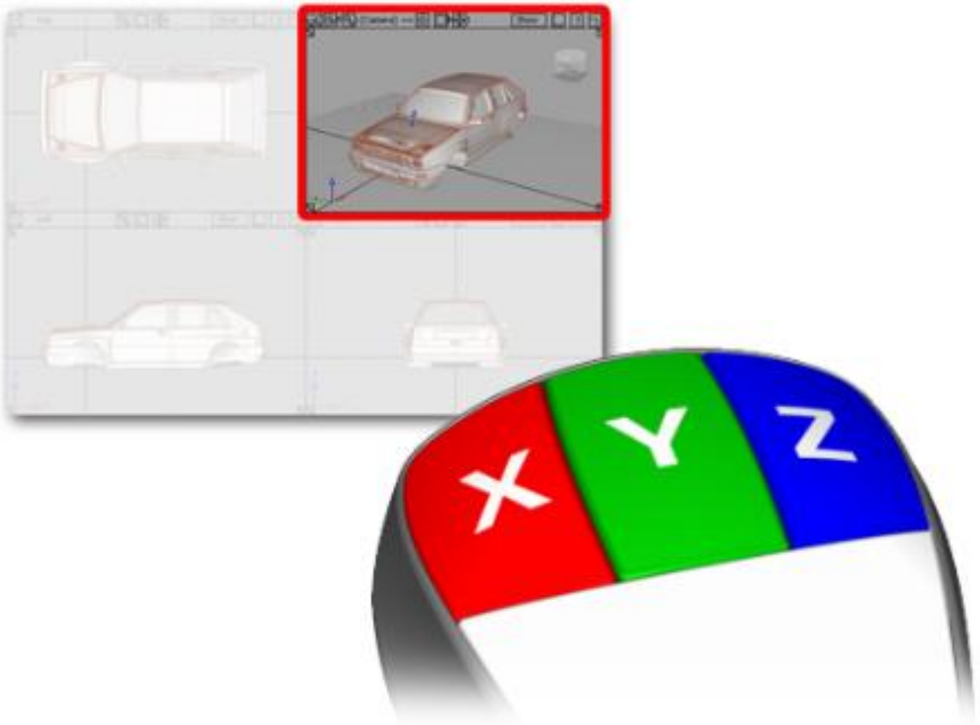
Section 1: Create Basic and advanced curves


Work Area
Menu
Prompt Line
Layer Bar
Control Panel
Palette
Shelf
Marking
Menus

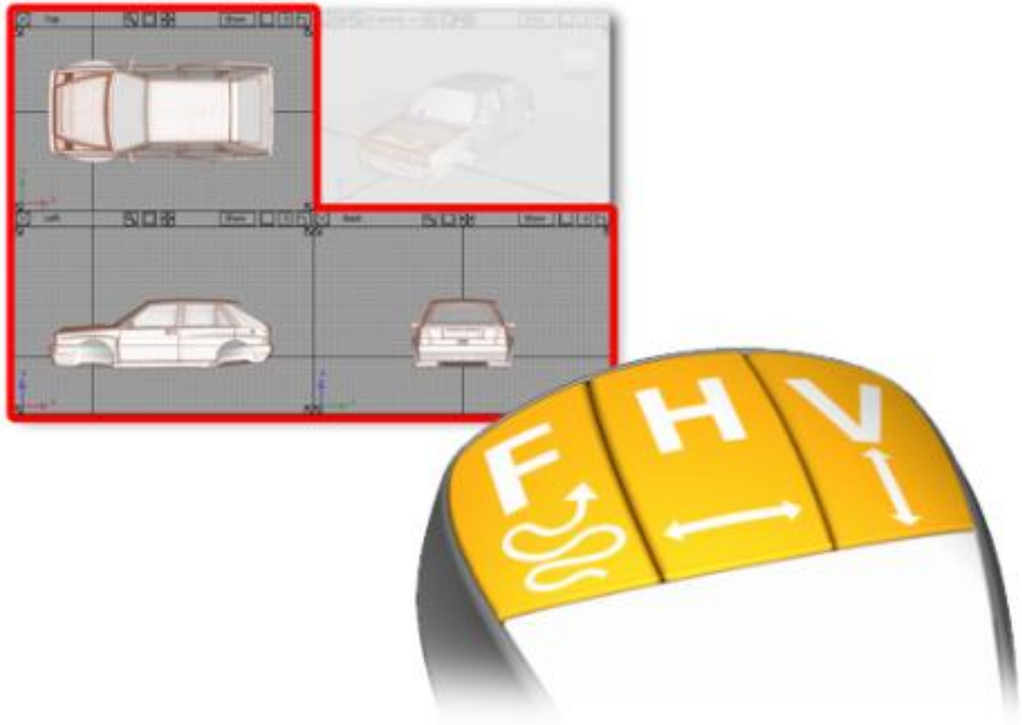

Shift
Ctrl
Alt
Tumble
Track
(Pan)
Zoom
(Dolly)

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

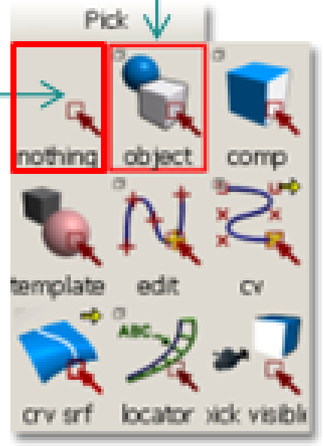
3D View : X,Y,Z directions



2D Views : Horizontal & Vertical

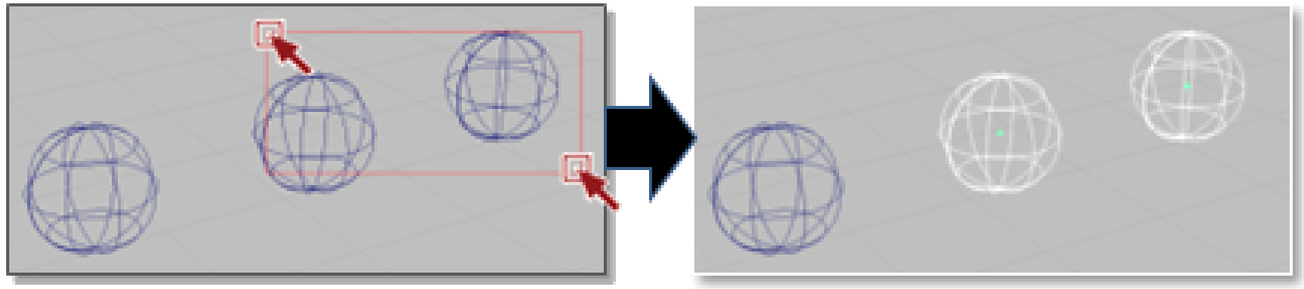


Pick → Object

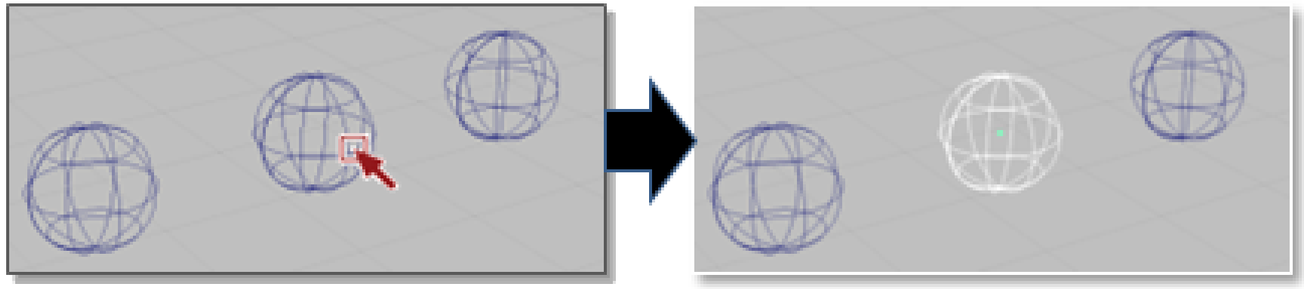


Pick → Nothing
De-selects all objects

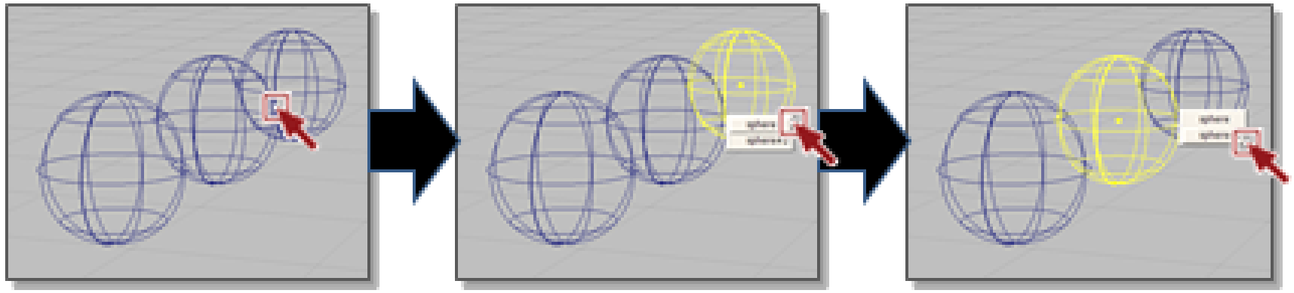
Click/Drag



Single Click (unambiguous selection)



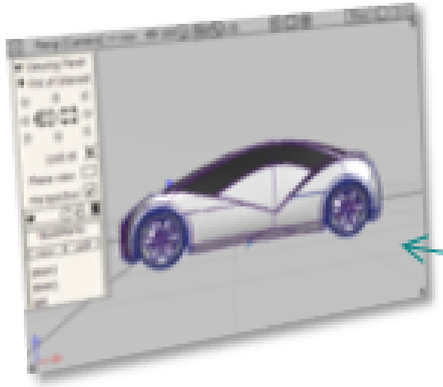
Single Click (ambiguous selection)

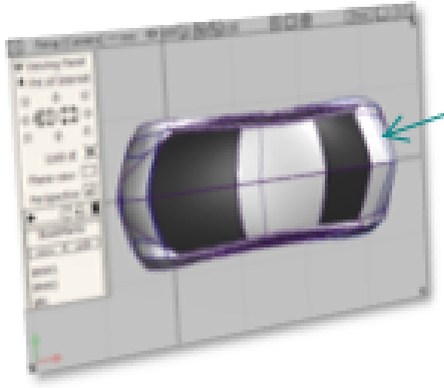


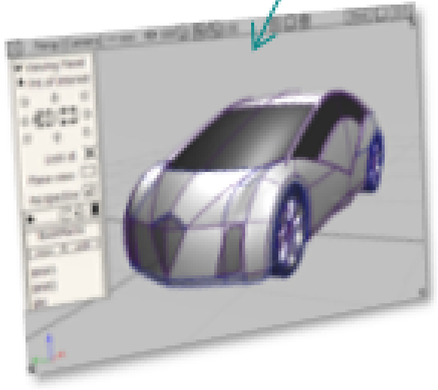
Pick Chooser
Keep the mouse button held down and move between the selections on the list. Release when you have found the right one.

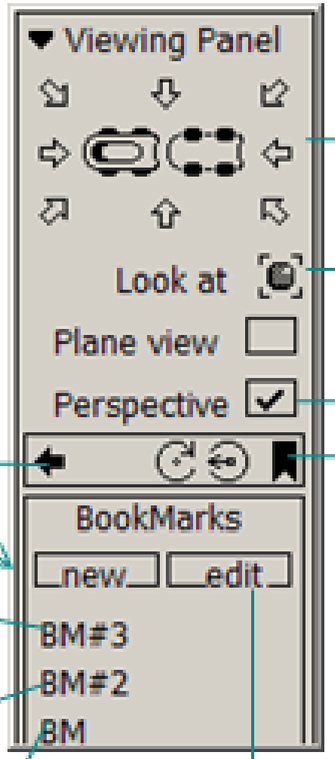
Click **new** to save a view and create a new **bookmark** for it.

Return to the previous view







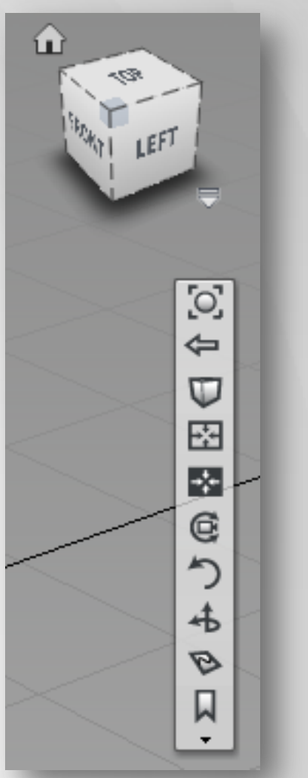


Preset Views
Top, bottom, and all sides, plus the 3/4 views.

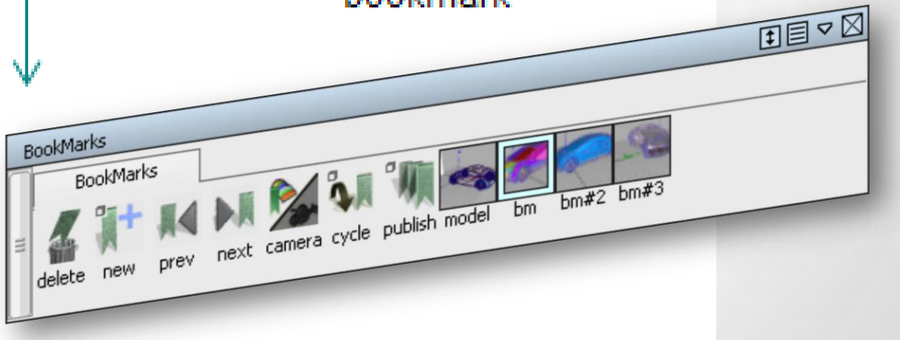
Look at selected objects.

Enable/disable perspective

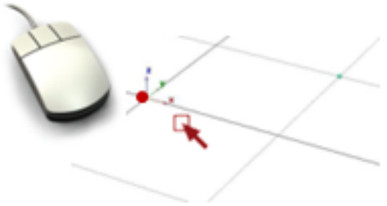
Open BookMarks list...



BookMarks Editor
Use ctrl and double-click to re-name a bookmark



Snap to **grid**

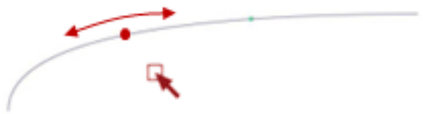


Hold down the Alt key, and click ***close to*** a grid

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

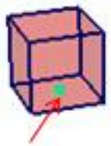
Unambiguous Instruction

Tools

Techniques

Instruction 1:

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



Set Pivot
Center Pivot

Snapping

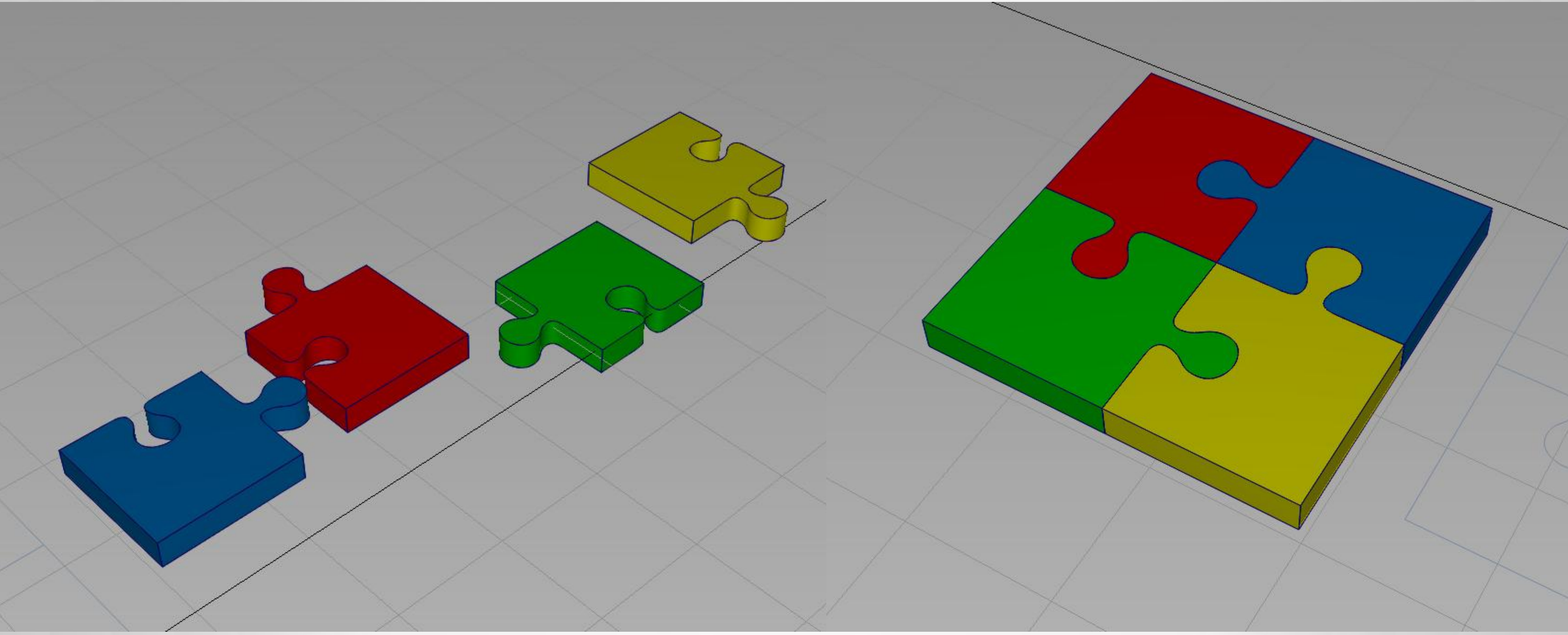
Instruction 2:

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

Move

Snapping

Unambiguous Result



Section 2: Create and manipulate surfaces and control their flow

AUTODESK ALIAS AUTOMOTIVE

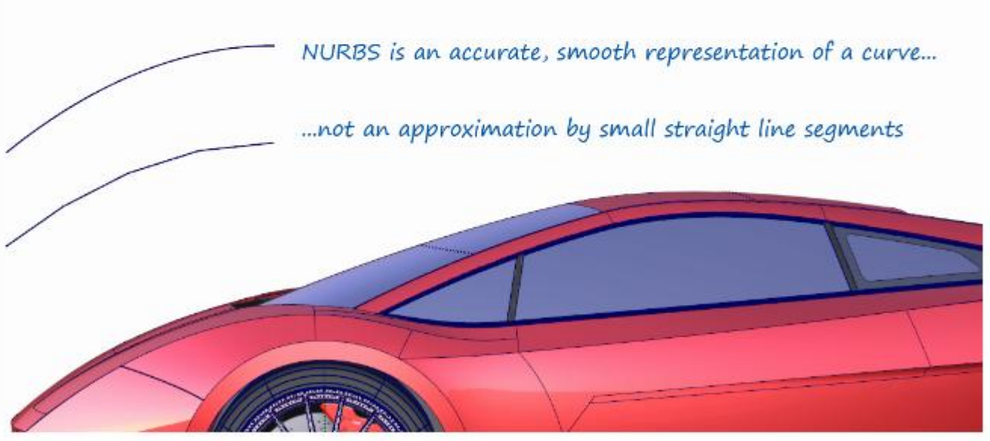
Theory Builder

Understanding NURBS

Non-Uniform Rational B-Splines (NURBS) and is simply the name for the mathematics that is used to create the geometry in Alias, and in many other CAD systems.

Luckily, no understanding of the math is required to become an expert Alias user. There are a few technical terms that are used for controlling the shapes we design, but they are simply learned as each tool is learned, and don't need to be understood in a mathematical way. (If you are interested however, a useful overview of NURBS modelling and mathematics is given by Stephen M. Hollister.)

The key benefit of NURBS is that it isn't an approximation of a smooth shape. The math calculates an accurate definition of the surface shape which is still smooth however closely the surface is examined.



(Note: For speed of interaction, the smooth NURBS curves will be **displayed** as straight-line approximations on the screen, but the **actual** underlying math, and the resulting product that is manufactured from the data will be smooth.)

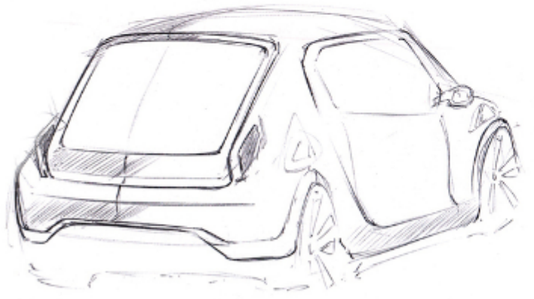
AUTODESK ALIAS AUTOMOTIVE

Theory Builder

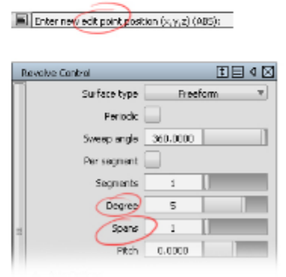
Introduction

As you use the tools in Alias to create your designs, you will need to use the NURBS terminology to specify what you want. We, as human designers, can imagine or sketch shapes with a pencil or even by waving our arms around in the air, but the software needs more explicit, compact instructions.

This theory-builder shows you how the mathematical terminology relates to the shapes you want to create.



Loose specification through a sketch



Using precise terms to specify NURBS geometry

AUTODESK ALIAS AUTOMOTIVE

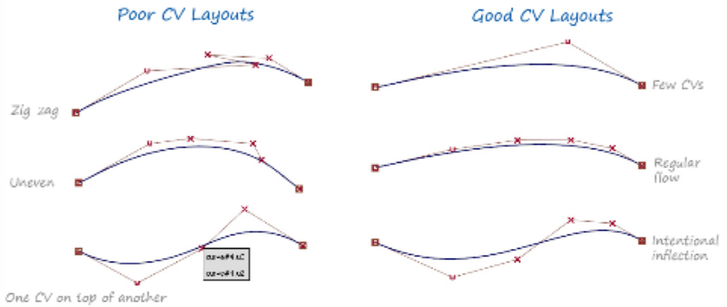
Golden Rules

Rule 1: Pay attention to the 'Flow' of the CVs

A smooth and regular 'flow' of CVs will ensure that your curves have:

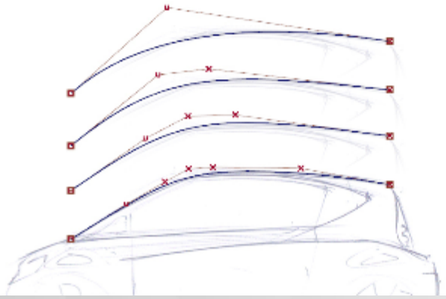
- Smoothness - no unwanted 'kinks'
- Good Acceleration - a consistent change of curvature giving good highlights.
- No unwanted inflections

Most users simply judge the flow of CVs and Hulls to be 'regular and disciplined', or not, by eye.



Applying the Rule

The easiest way to ensure a good flow of CVs is to start with a minimal curve, say a single-span degree 2 or 3. Try to match your design shape, and only increase gradually until you get just enough CVs to achieve your shape.



Starting with a 2 or 3 degree curve means that you start to get the distribution of CVs right early on.

Gradually increase the number of CVs until you can achieve the shape you want

AUTODESK ALIAS AUTOMOTIVE

Golden Rules

Rule 2: Use the Minimum Number of CVs

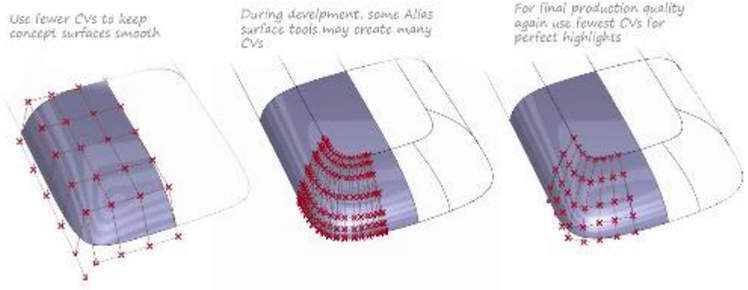
When creating curves and surfaces in Alias, we always try to aim to use as few CVS as possible. The main reasons for this are:

- Each CV takes hard work to get into the right position. Fewer CVs means **less work**.
- With fewer CVs, your curves and surfaces will be naturally **smoother** - and this is normally something we want in our designs.

Applying the Rule

There are two situations when applying the rule will give you the most benefit:

- Early concept modelling - you don't need to put extra effort into worrying about smooth surfaces. If you use the minimum number of CVs to create the shape, the surface will be naturally smoother.
- Later on, when creating detailed models for production, some of the Alias surface tools may create surfaces with many CVs. Spending extra time rebuilding these with fewer CVs will improve the smoothness and continuity. For Class A work, it is normal to limit surfaces to being single-span, to ensure perfect smoothness. (See Golden Rule 3)



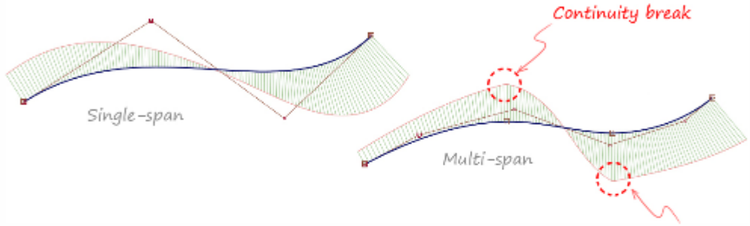
AUTODESK ALIAS AUTOMOTIVE

Golden Rules

Rule 3: Single-Span is Inherently Smooth

A single span curve or surface is always smooth, wheras multi-span can have a continuity break between the spans.

This can be seen by applying a curvature comb using **Evaluate → Curve Curvature**.



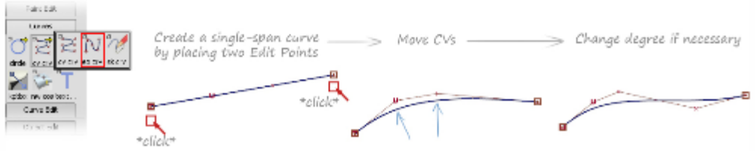
A 'continuity break' is any deviation from a smooth curvature comb plot. To be more precise, you need to understand what continuity level you are aiming for. More technical information on this can be found in the Evaluate Continuity Theory Builder.

In practice, we use our visual judgement to notice a 'smooth' or 'lumpy' curvature plot.

Applying the Rule

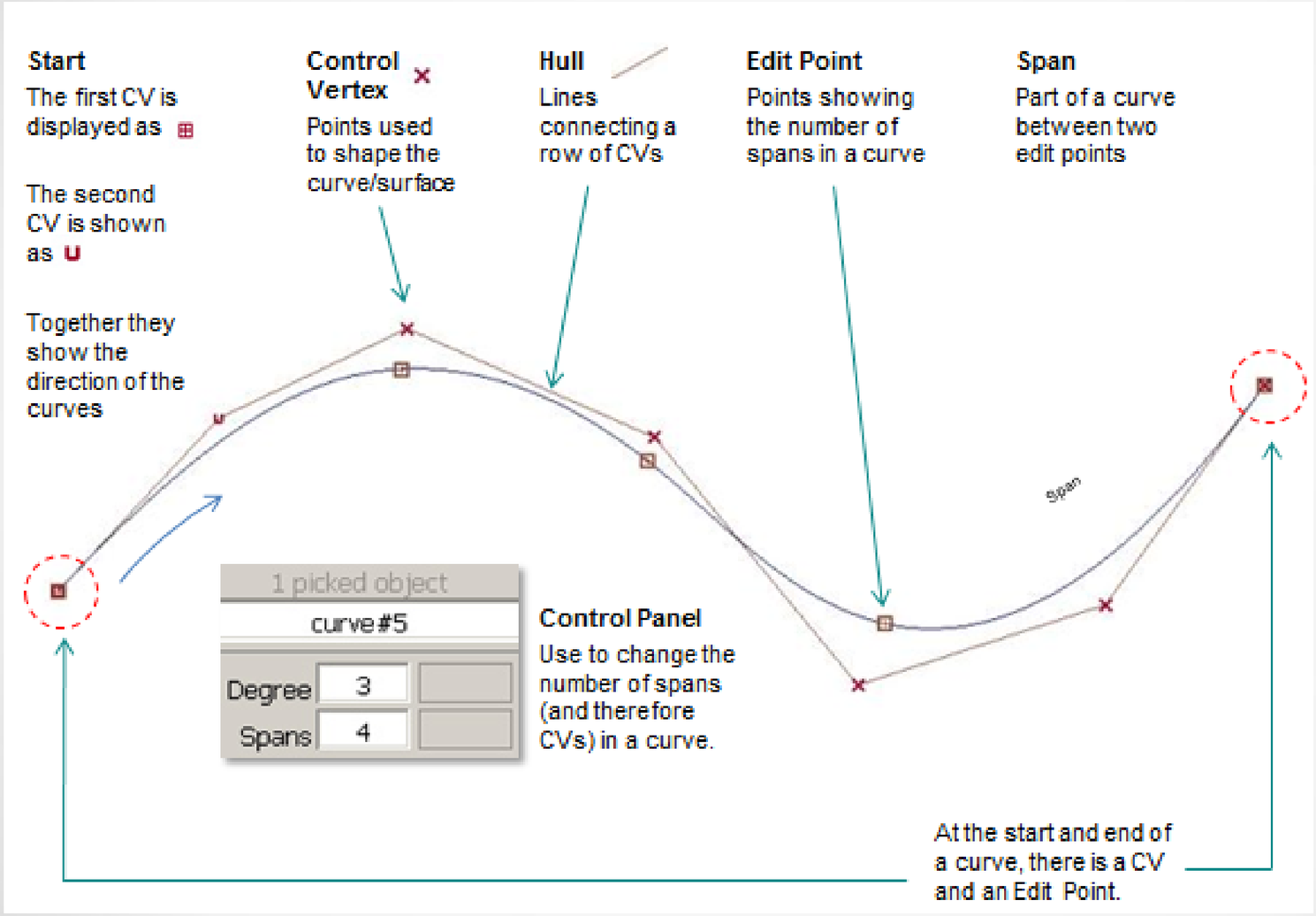
Most experienced users get into the habit of starting with single-span curves by placing the start and end Edit Points:

- Use **Curves → New Curves → New Edit Point Curve**
- Click in two positions, once for the start and once for the end of the curve
- Pick and move CVs to the desired shape
- Modify the **Degree** to change the number of CVs if you need more controls

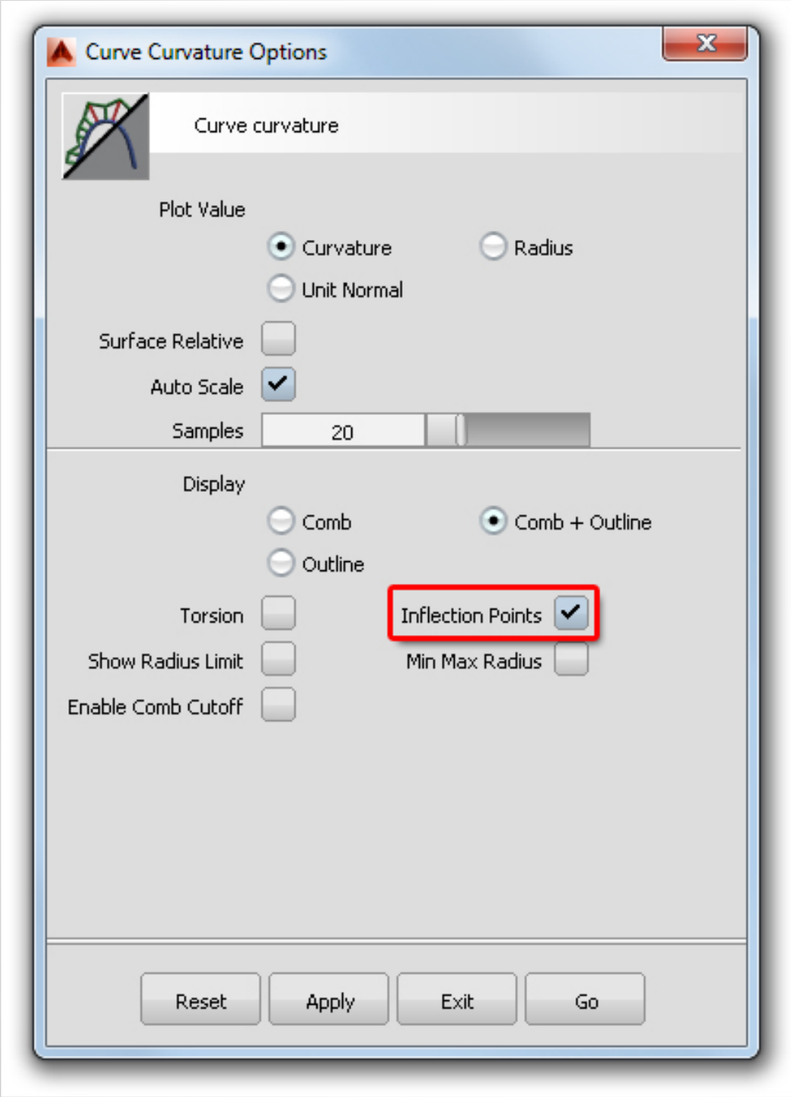


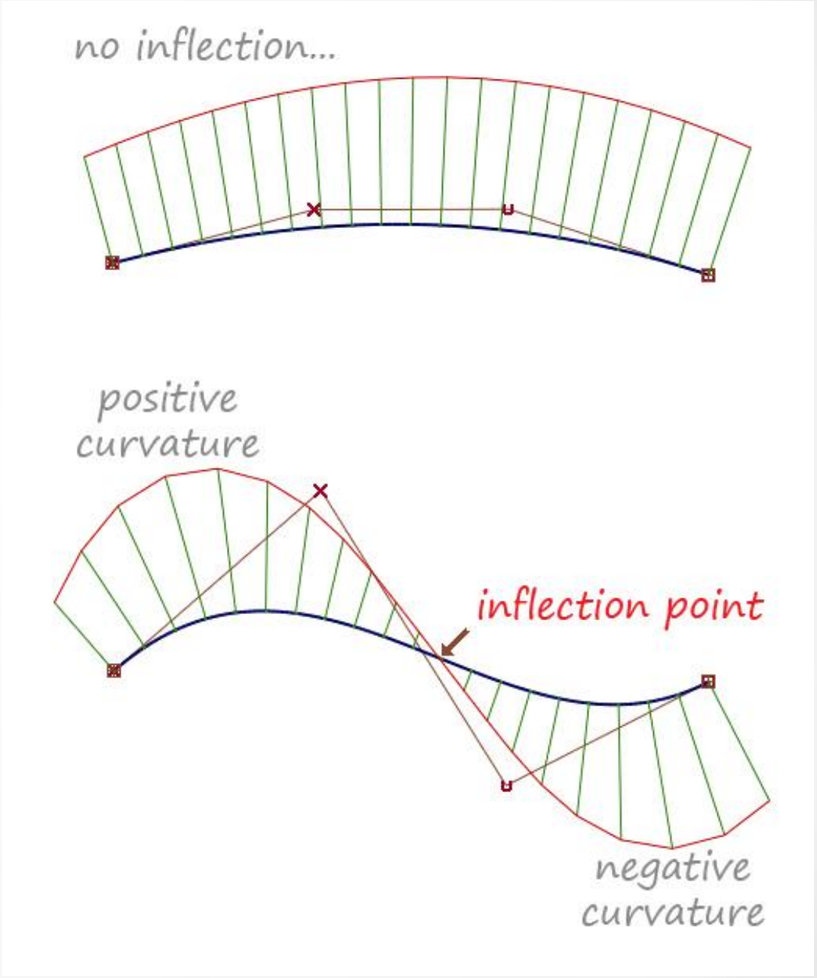
If you prefer to use the CV creation method, you can use the **Progressive Degree** setting which automatically increases the Degree instead of the Spans as you place additional CV positions. Setting the maximum **Curve Degree** to 7 allows up to 8 CVs.

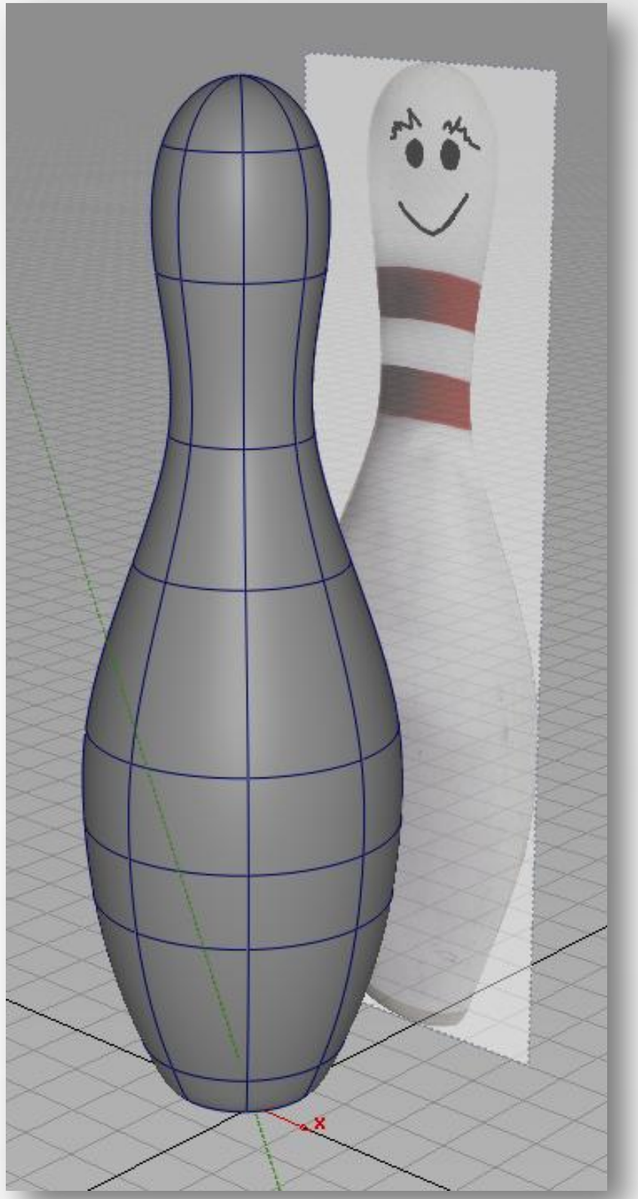
Freeform Curves Terminology

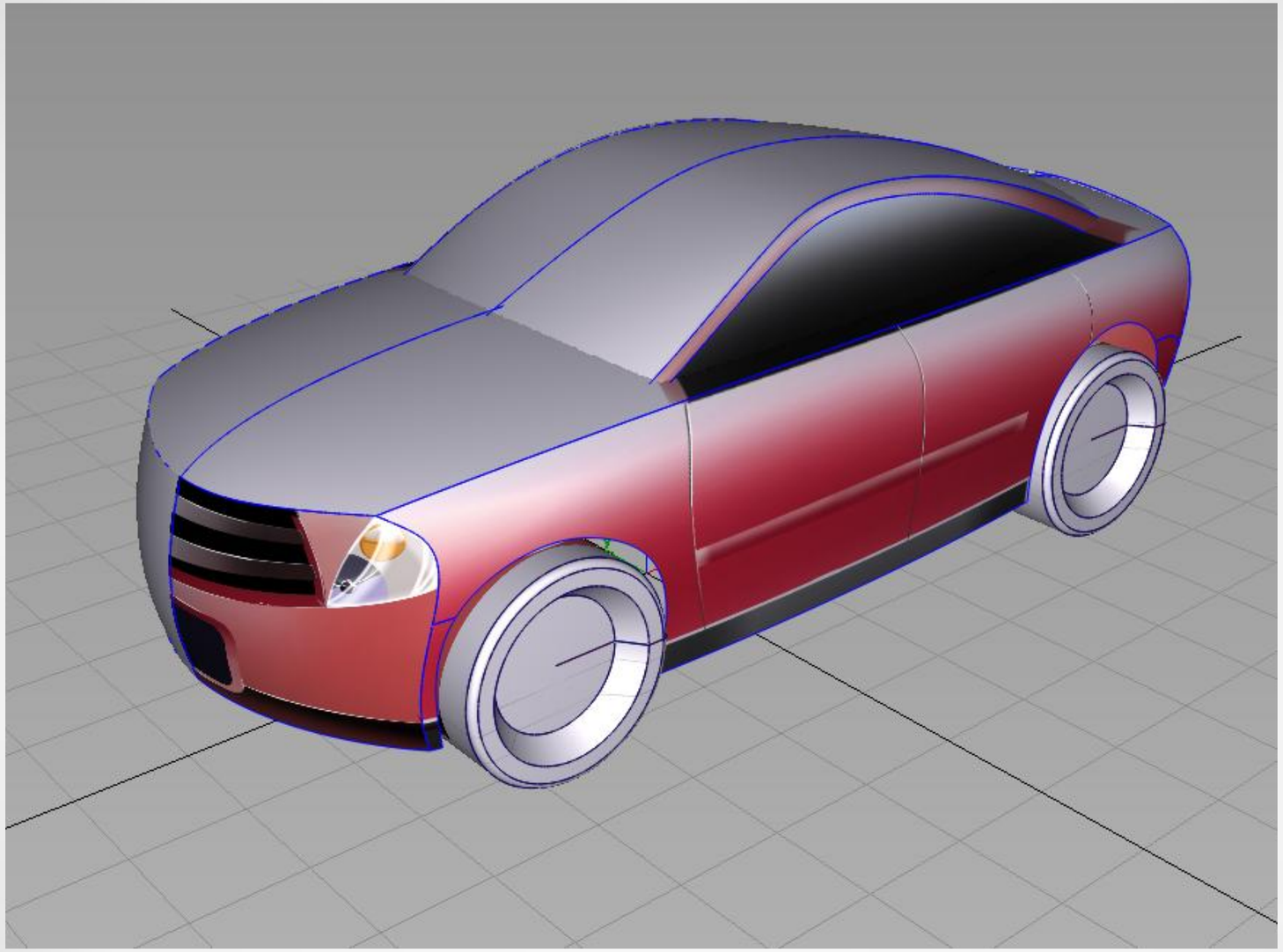


Inflections

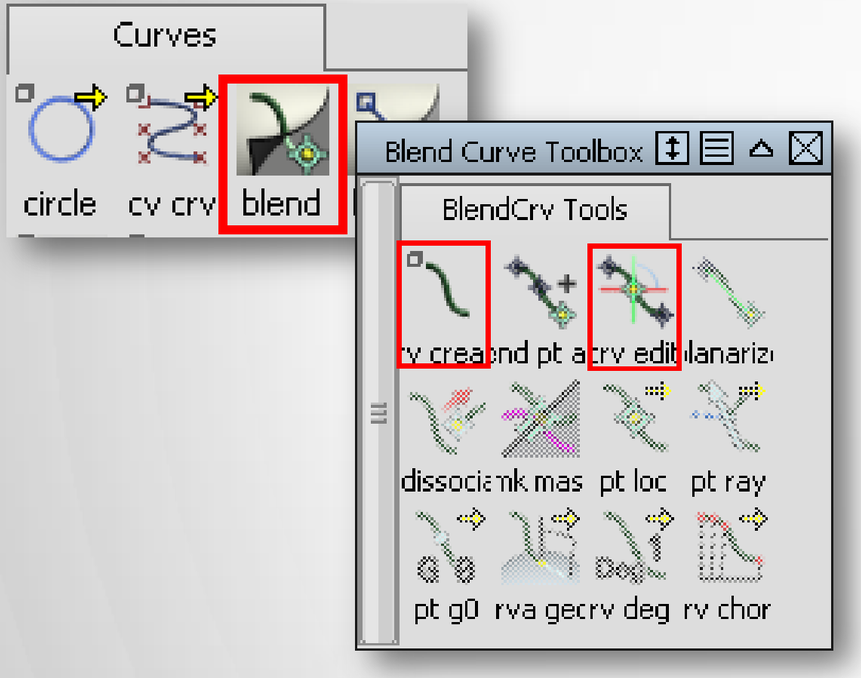


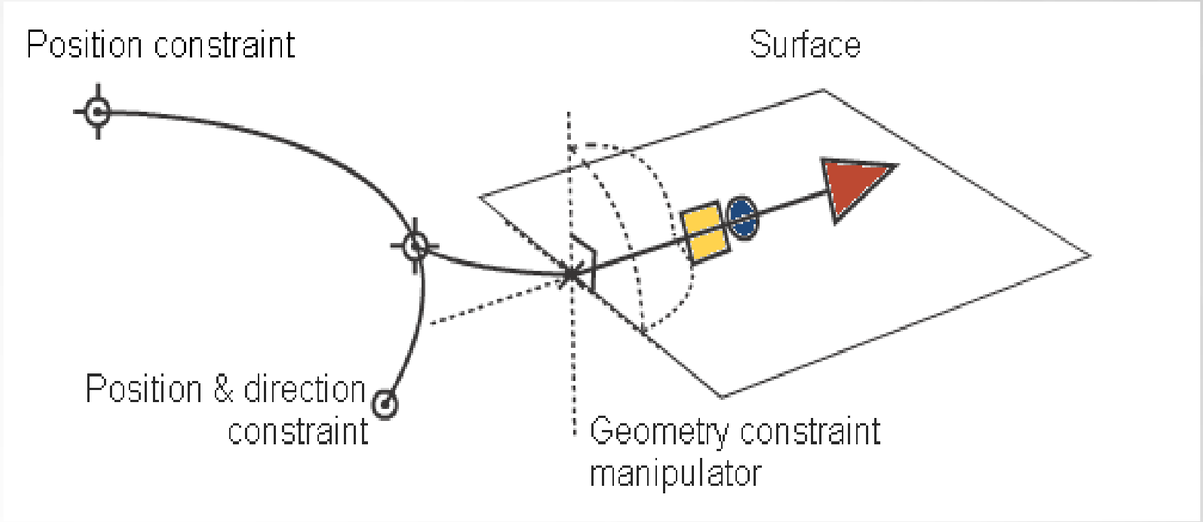






Introduction to Blend curves.











cottage in the oaks












Single Lever Ball Faucet Exploded View









38

8:55








Susan






Section 3: Use Autodesk Alias tools to modify your design and create design variations

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