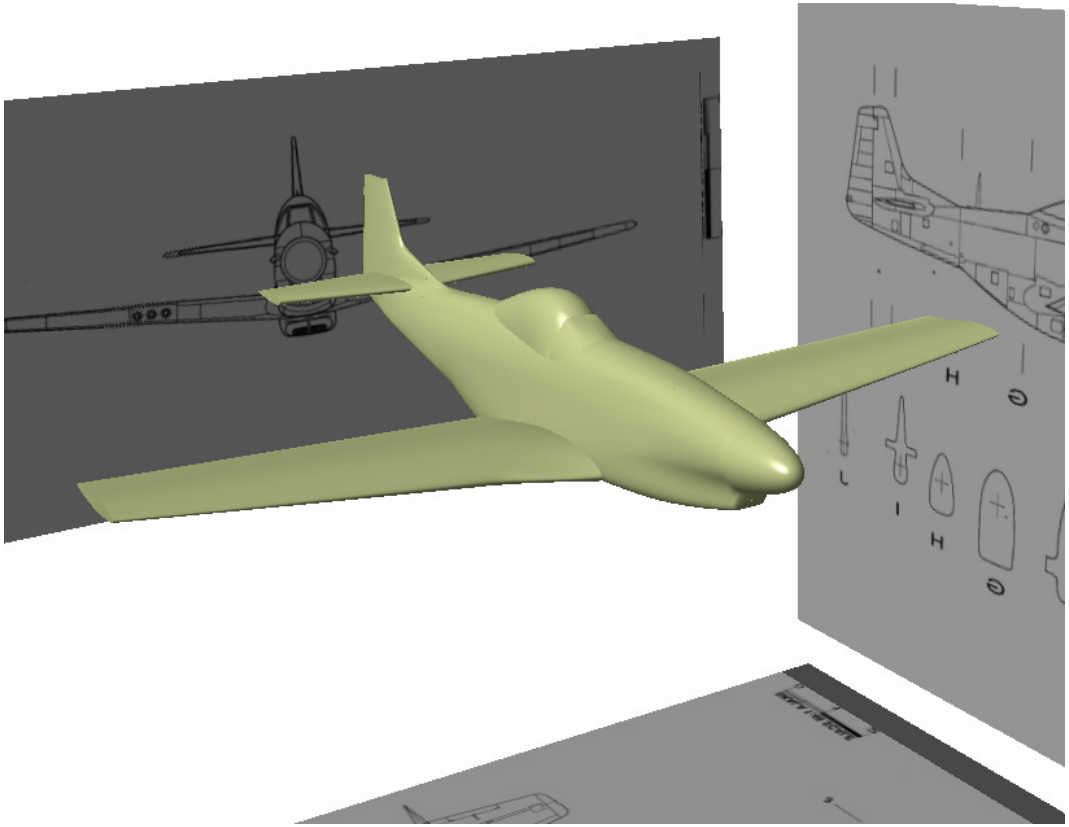
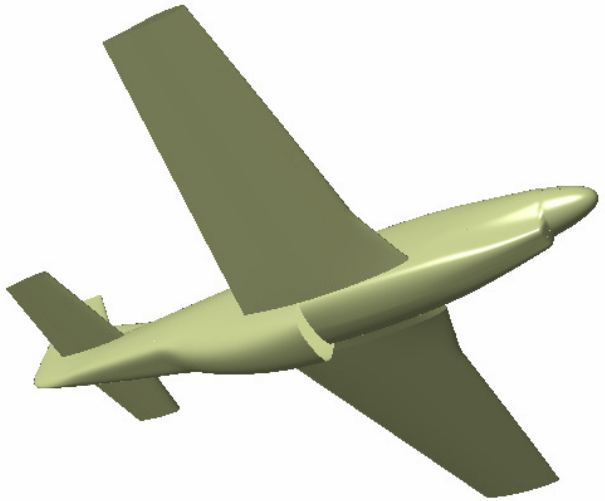
CATIA V5 Freeform Surfaces

(Tutorial 4 – Rebuild P51 Mustang)





Infrastructure

Sketcher

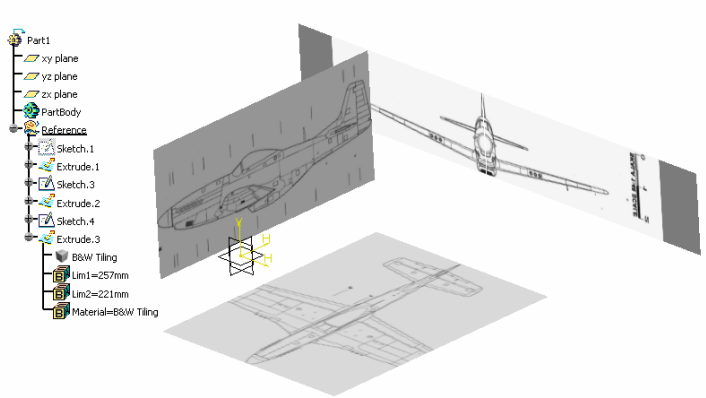
Freestyle (Surface-modeling)

By Dickson Sham (ME Dept, HKPU)

CATIA Freeform Surface-modeling

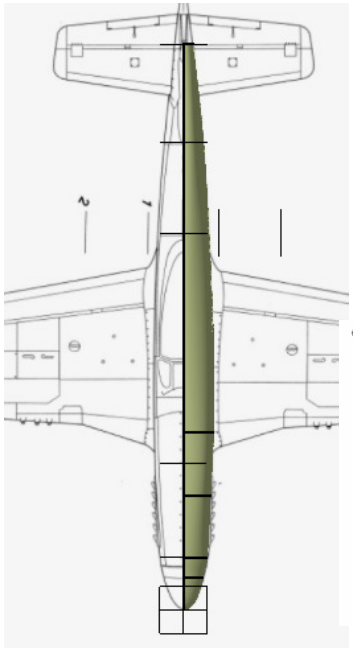
Tutorial 4A

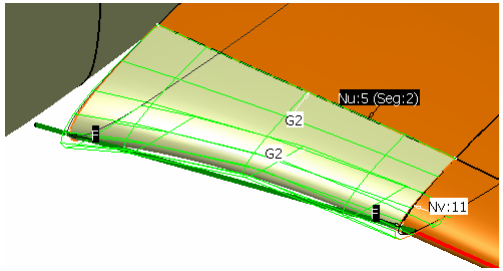
- Create three Extrude surfaces, offsetting from X,Y,Z planes
- Apply reference pictures onto the three surfaces
- Create a sketch for each cross-section and then relocate them to the corresponding positions

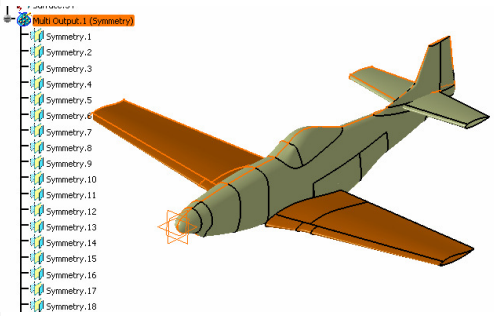


Tutorial 4B & 4C

- Create 3D curves, then create Freeform surfaces
- First create the Body, then the Wing, and finally the Tail
- Create a symmetric model by mirroring the resultant surfaces by a reference plane







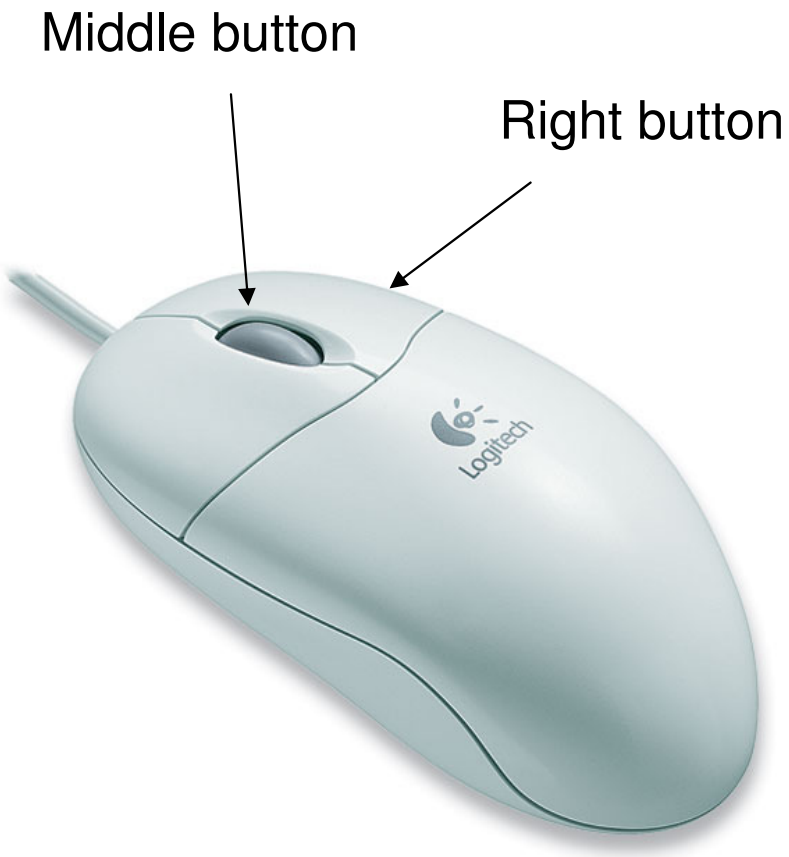
Please be reminded that this series of tutorials is designed to demonstrate a design approach with CATIA, rather than the command itself.

Change the view with the mouse

A. ***Panning*** enables you to move the model on a plane parallel to the screen. Click and hold the middle mouse button, then drag the mouse.

B. ***Rotating*** enables you to rotate the model around a point. Click and hold the middle mouse button and the right button, then drag the mouse.

C. ***Zooming*** enables you to increase or decrease the size of the model. Click and hold the middle button, then click ONCE and release the right button, then drag the mouse up or down.



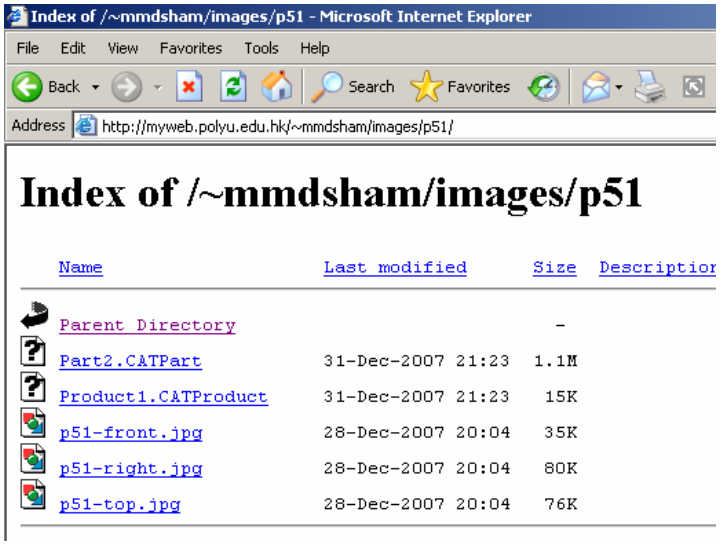
Tutorial 4A

- **Create a Project Folder (e.g. C:/P51)**
- **Download the reference pictures** from the web:

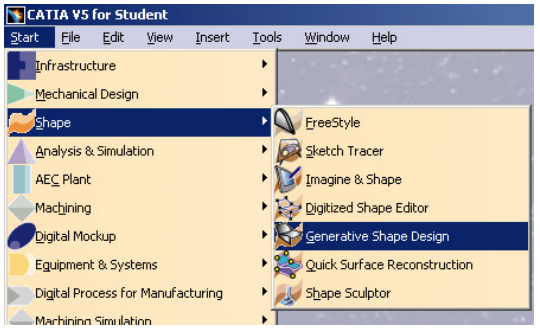
  http://myweb.polyu.edu.hk/~mmdsham/images/p51/

  - p51-front.jpg
  - p51-right.jpg
  - p51-top.jpg

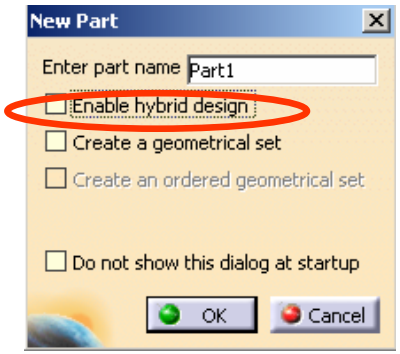
  (The pictures are square in shape, 1000x1000 pixels)
- Then **Save them into the project folder**



- Enter CATIA by double-clicking its icon on the desktop
- By default, a empty “Product” file is created. But now, you don’t need this, just select “**File/Close**” on the menu



- Select ‘**Start/Shape/Generative Shape Design**”on the menu bar

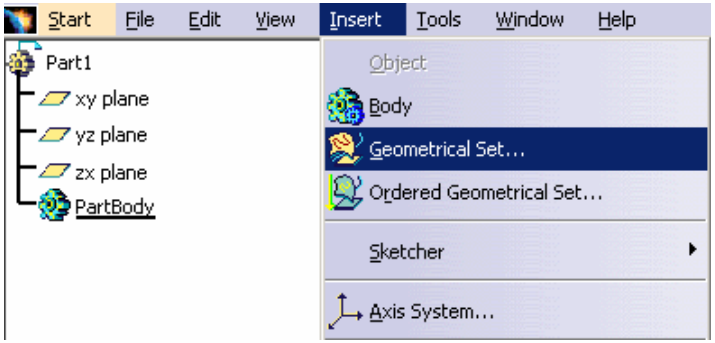


- Uncheck “Enable Hybrid Design” and then click “ok”
- (An empty part is now created on “Generative Shape Design” workbench.)

Tutorial 4A

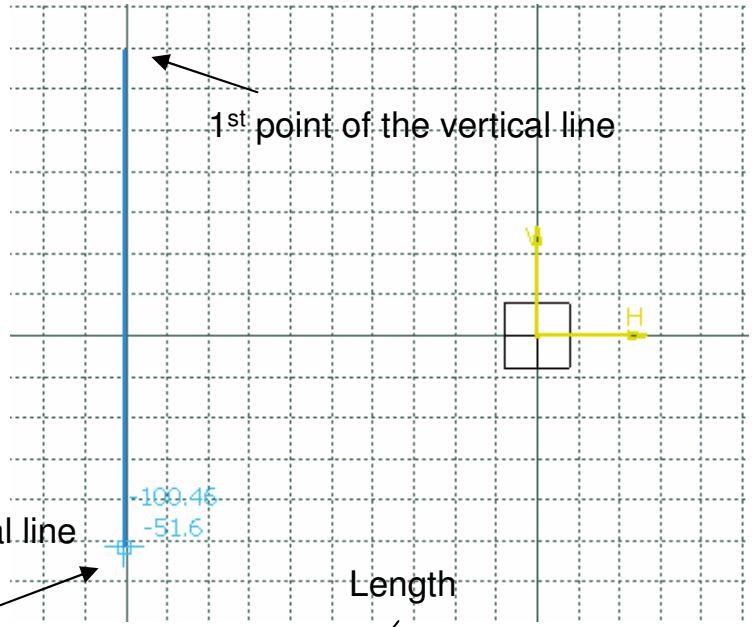
To create a Geometrical Set:-

- Select “Insert/ Geometrical Set” on the menu bar
- Type “Reference” as the name
- Click ok to complete



To create a Sketch:-

- Click “Sketch” icon and select “yz” plane
- Draw a vertical straight line on the left
- (Length ~ 120mm, Location ~100mm from origin)

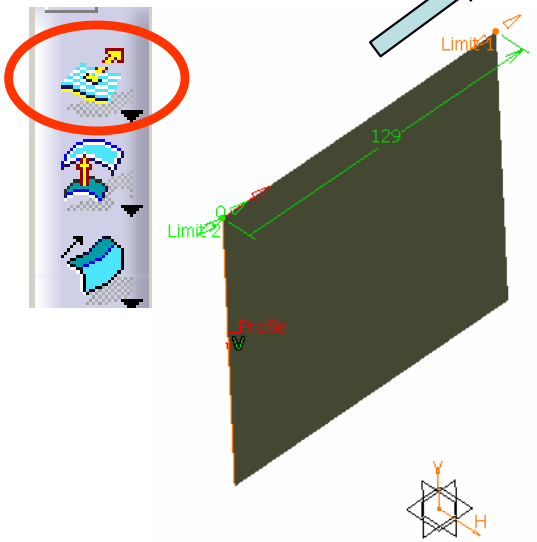


- (Before clicking the 2nd point, refer to the L value on the toolbar “Sketch Tools”)
- Click Exit to complete

Tutorial 4A

To Create an Extrude Surface:-

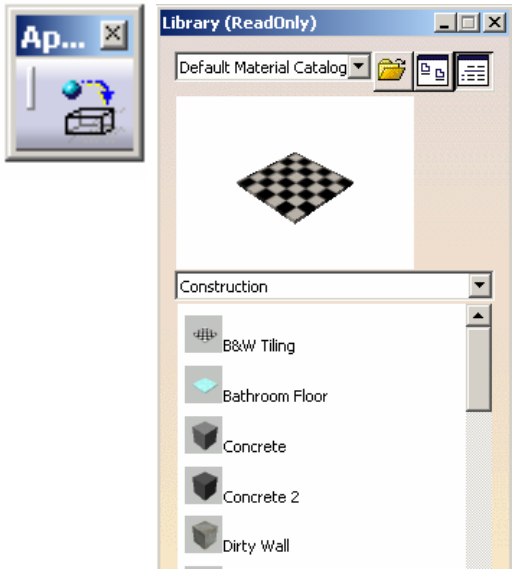
- Click “Extrude” icon
- Select “Sketch1” as profile, “yz plane” as direction
- Click “Reverse Direction”
- Push the mouse cursor onto Limit 1 and then drag it up to ~285mm
- Click ok to complete



Drag it up to ~285mm

To Apply a Texture material onto the surface:-

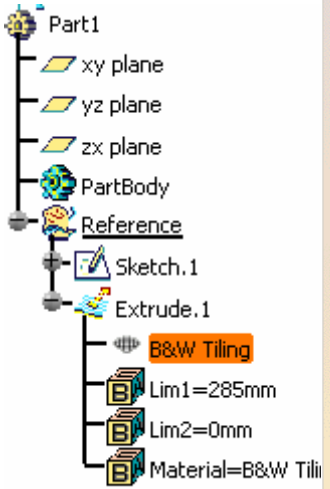
- Click “Apply Material” icon
- Select a Texture material, e.g. “B&W Tiling” on the list
- Click on the Extrude surface
- Click ok to complete
- To view the texture, click “Shading with material” icon

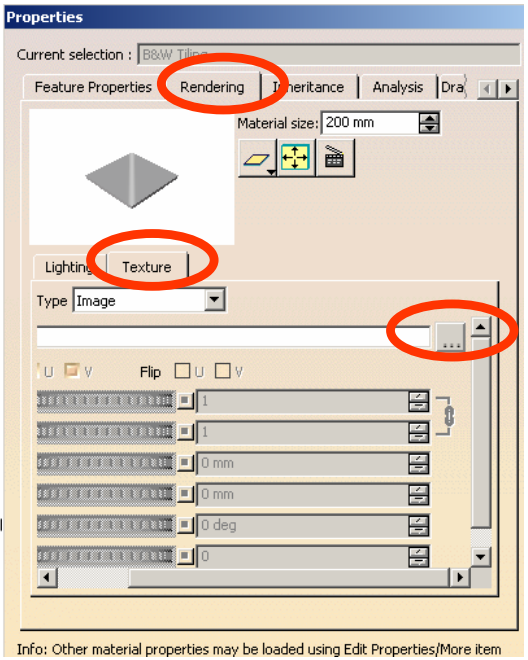


Tutorial 4A

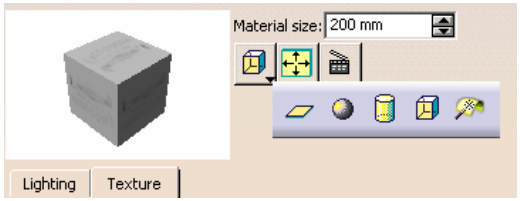
To replace the texture by a picture:-

- Double-click “B&W Tiling” on the tree
- Select the tab page “Rendering”
- Click on the sub-tab page “Texture”
- Select “Image” as type
- Click “…” icon to select a picture file
- Select the file “**p51-right.jpg**” in your project folder
- Click “Open”

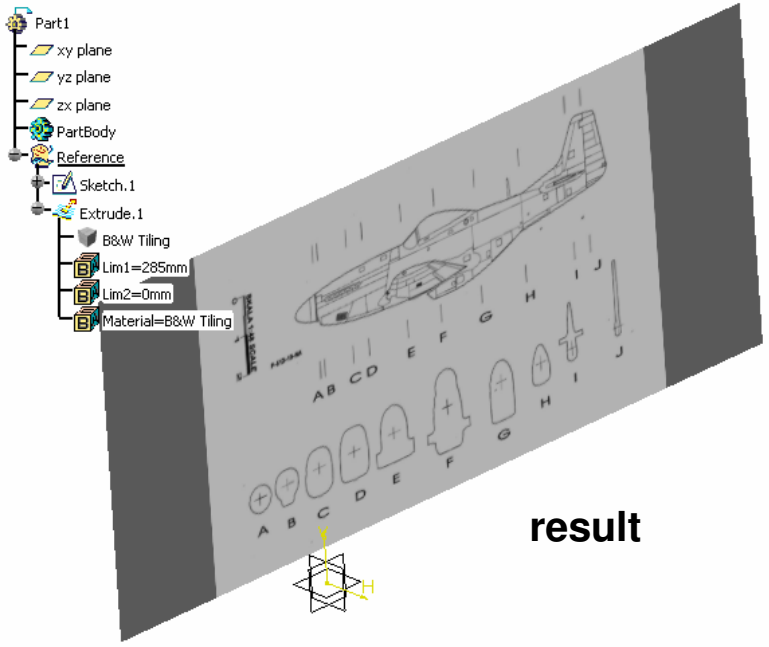




- (Now, the projection method is not correct to show the picture on the surface)
- Select “Cubical Mapping”



- Deselect U,V repeat
- Flip U
- Click ok to complete

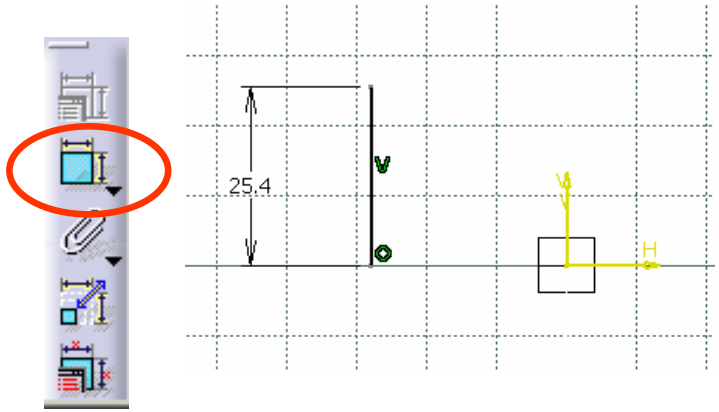


result

Tutorial 4A

To create another sketch:-

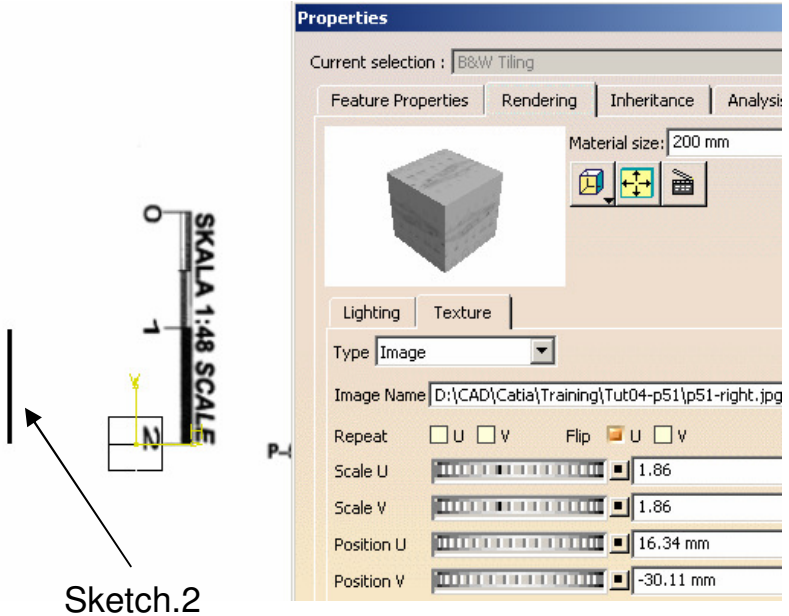
- Click “Sketch” icon, then select “zx plane”
- Draw a vertical line on the left
  (with one end touching x-axis)
- Click “Constraint” icon, then select the line
- Modify the length to 25.4mm (1inch)
- Click Exit to complete



To resize and relocate the reference picture:-

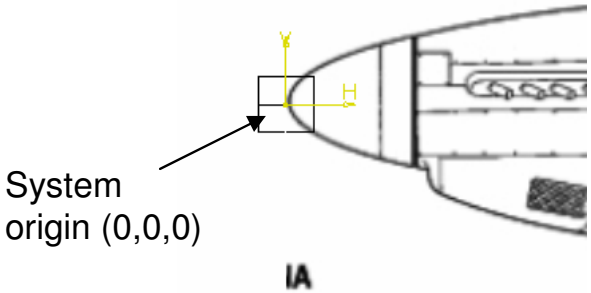
- Click “Right View” icon (or click “y” on the compass)
- Double-click “B&W Tiling” on the tree again
- Select the tab page “Rendering”
- Adjust the values “Scale U,V” and “Position U,V” until the scale 1-2 is nearly of the same height as Sketch.2

- Keeping the Scale unchanged, adjust UV positions so that the peak point of the image lies on the origin
- Click ok to complete



Sketch.2

(1 inch Line)



Tutorial 4A

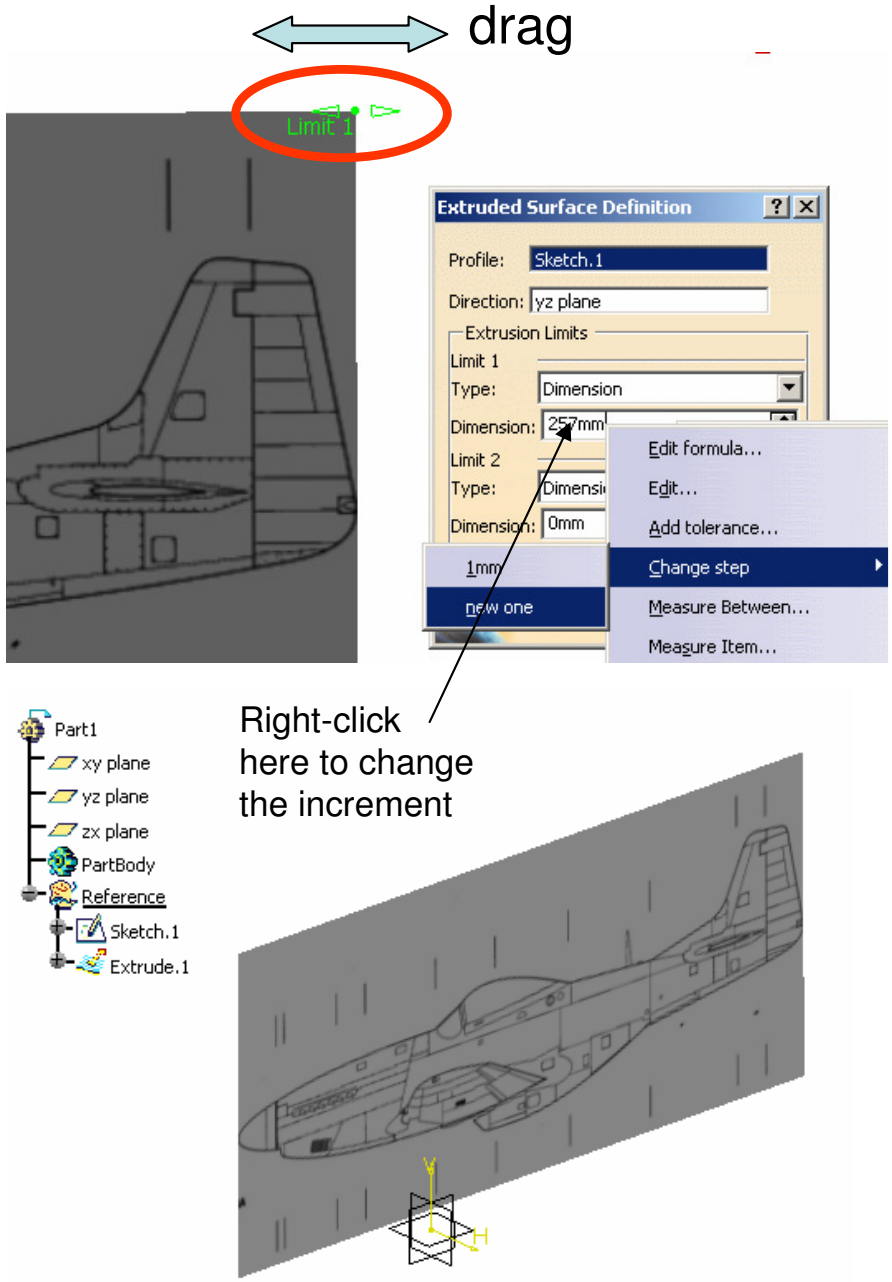
To delete Sketch.2:-

- Click “Sketch.2” on the tree
- Press “Delete” key on the keyboard
- Click ok to confirm

To resize the surface to fit the picture:-

- Double-click “Extrude.1” on the tree
- Drag “Limit.1” so that the surface edge is touching the tail of the image
- (optional) To change the increment, right-click on the entry box of “Dimension, Limit1”, then select “Change step/ new one”, enter 0.1mm, finally click ok
- Click ok to complete

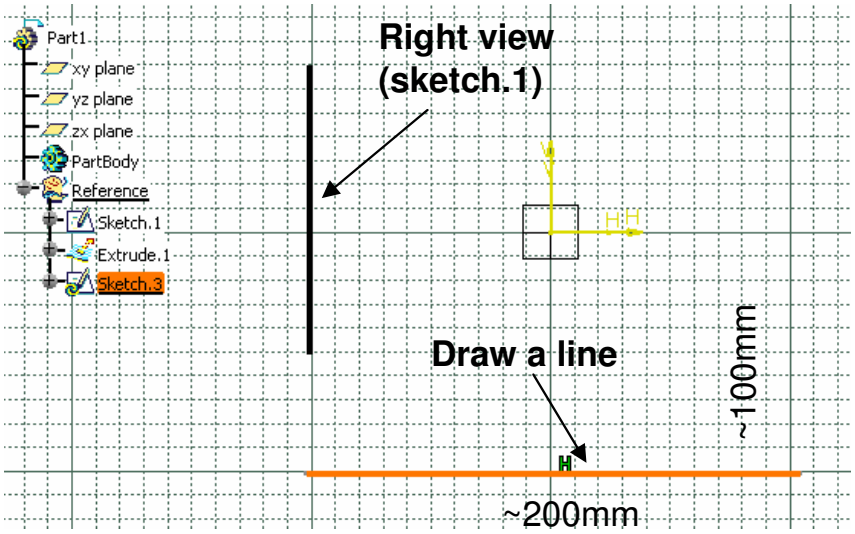
  (Now, the scale, the location & the size of the Right View image are correct)



Tutorial 4A

To create a sketch:-

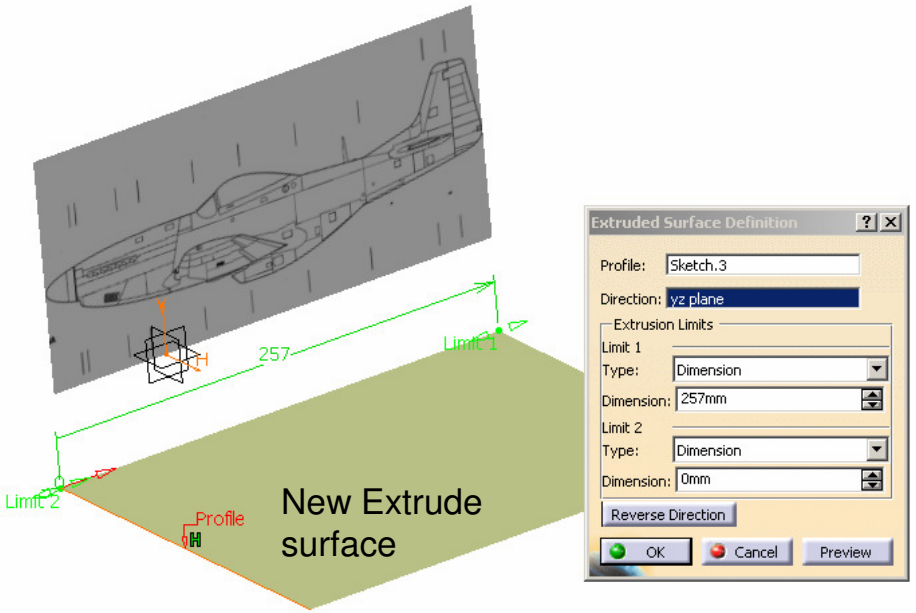
- Click “Sketch” icon and select “yz” plane
- Draw a horizontal line as shown
- (Length ~ 200mm, Location ~100mm under origin)



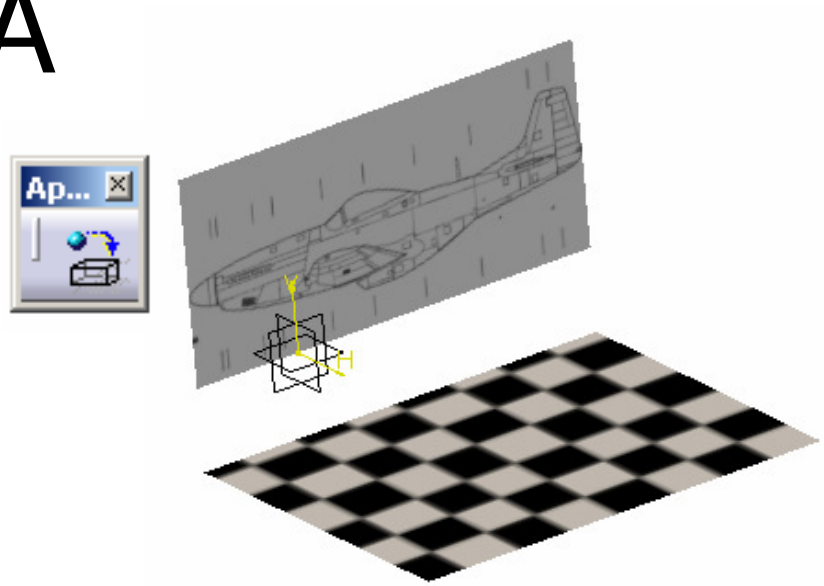
- (Before clicking the 2nd point of the line, refer to the L value on the toolbar “Sketch Tools”)
- Click Exit to complete

To create an Extrude Surface:-

- Click “Extrude” icon
- Select “Sketch.3” as profile, “yz plane” as direction
- Click “Reverse Direction”
- Keep the Dimensions UNCHANGED (which should be the same as Extrude.1)
- Click ok to complete



Tutorial 4A



To apply a Texture material onto the surface:-

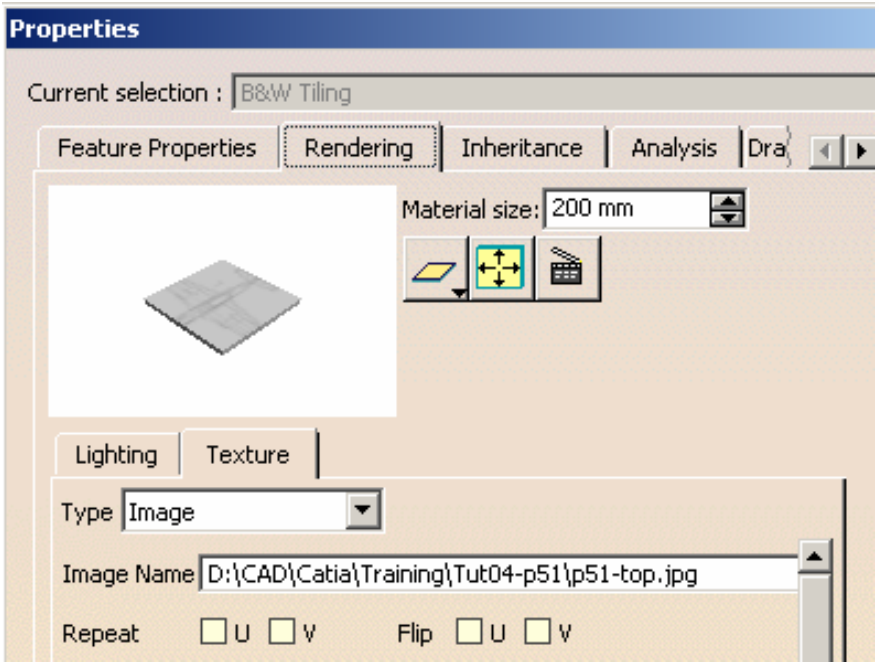
- Click “Apply Material” icon
- Select a Texture material, e.g. “B&W Tiling” on the list
- Click on the Extrude.2 surface
- Click ok to complete

To replace the texture by a picture:-

- Double-click “B&W Tiling” on the tree
- Select the tab page “Rendering”
- Click on the sub-tab page “Texture”
- Select “Image” as type
- Click “…” icon to select a picture file
- Select the file “**p51-top.jpg**” in your project folder
- Click “Open”

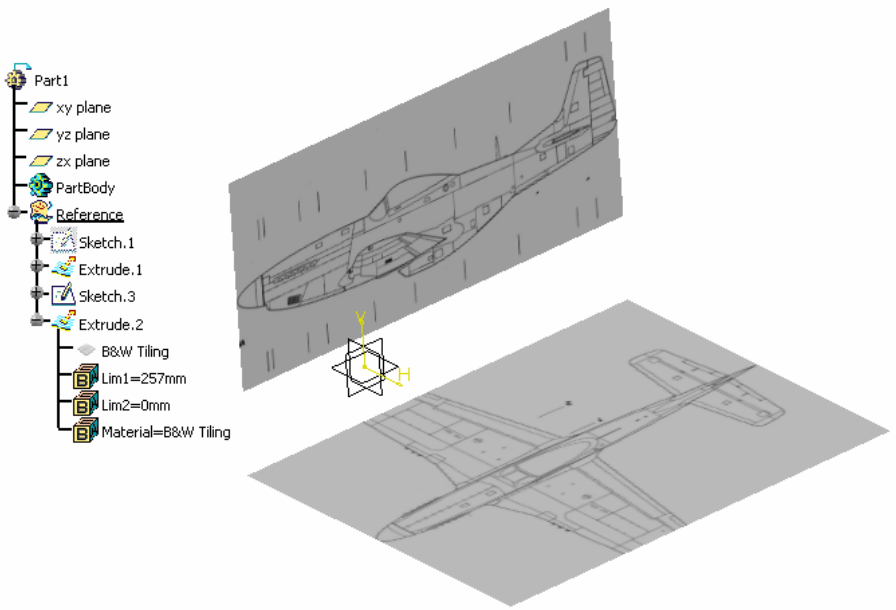
- (The projection method is correct to show the picture on the surface, so we needn’t change it)

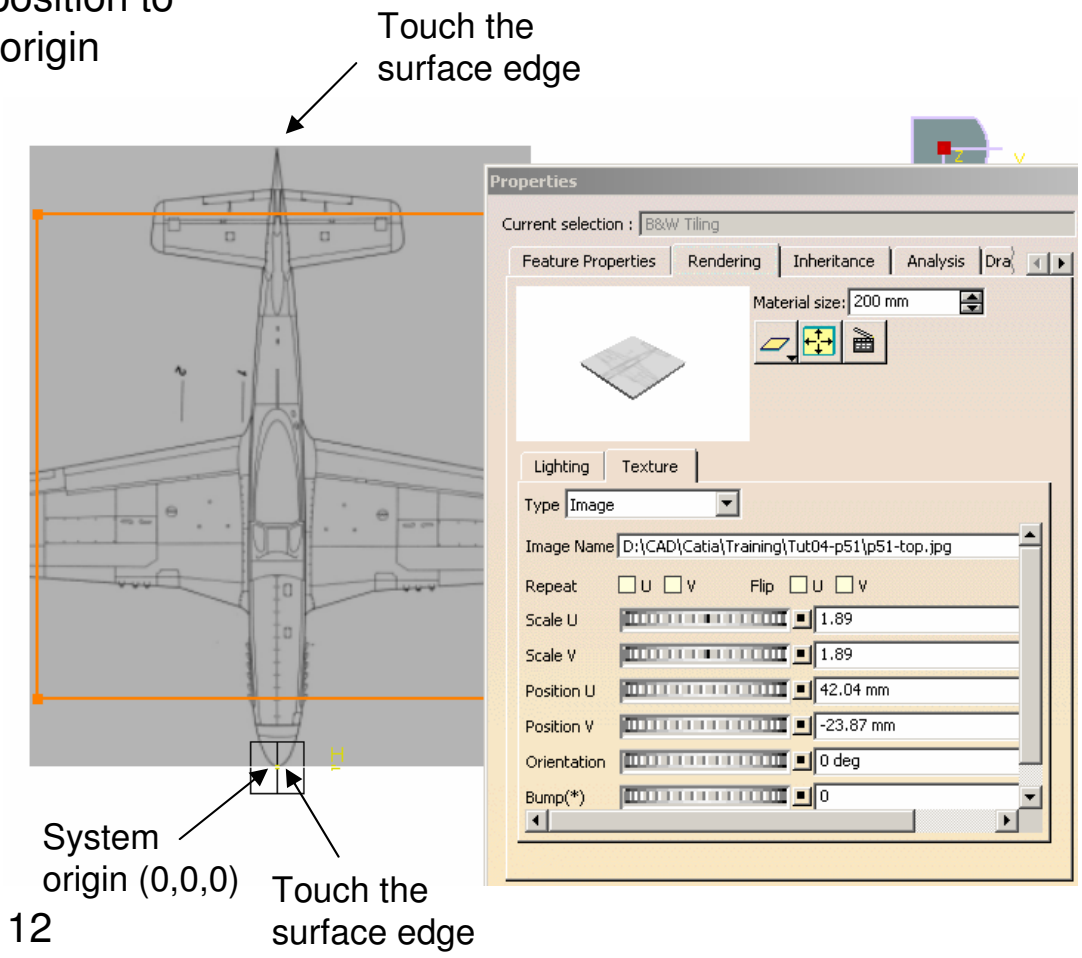
- Deselect U,V repeat



Tutorial 4A

- Click “Top View” icon (or click “z” on the compass)
- Adjust UV scales until the peak & the tail both touch the surface edge
- Keeping UV scales unchanged, adjust UV position to locate the peak point of the image onto the origin
- Click ok to complete

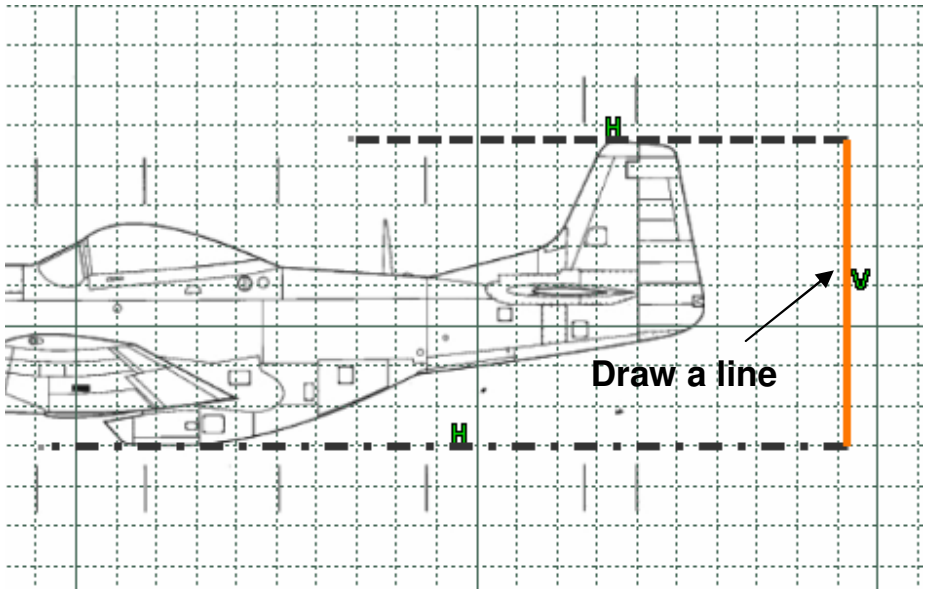




Tutorial 4A

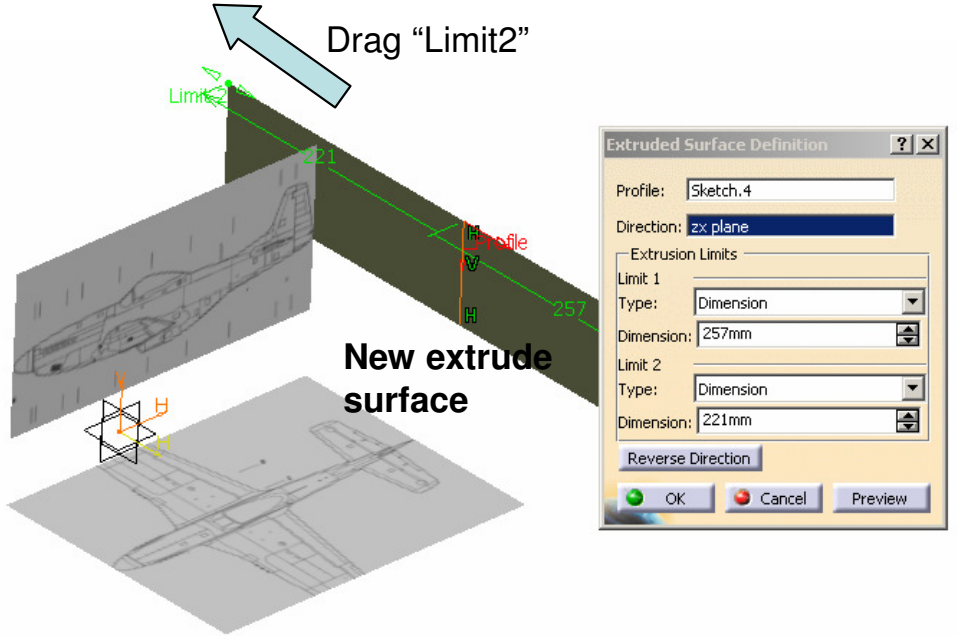
To create a sketch:-

- Click “Sketch” icon and select “zx” plane
- Draw a vertical line as shown
- Draw two horizontal axes as reference, then adjust the vertical line so that the two axes touch the maximum & the minimum points respectively
- Click Exit to complete



To Create an Extrude Surface:-

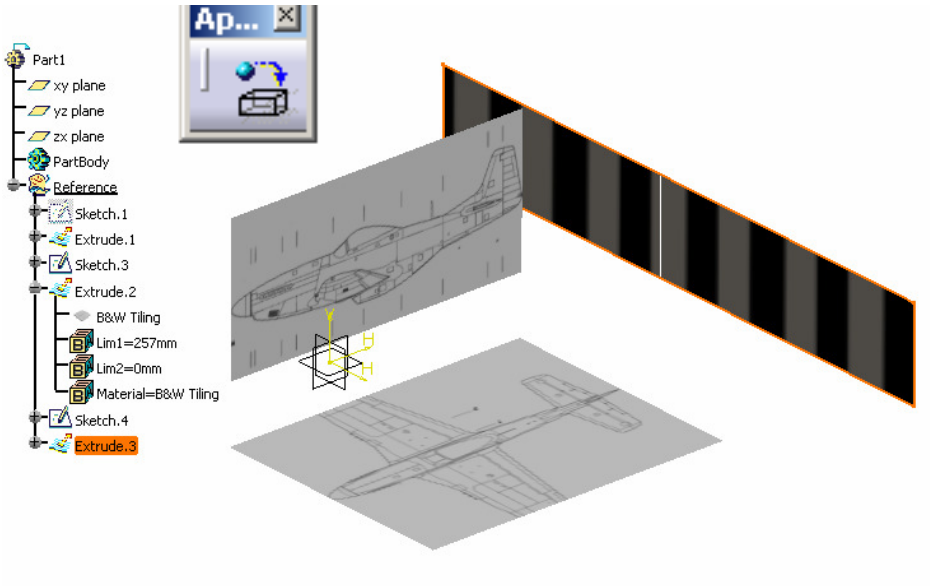
- Click “Extrude” icon
- Select “Sketch.4” as profile, “zx plane” as direction
- Click “Reverse Direction”
- Drag “Limit.2” so that the extrusion lengths in both directions are nearly the same
- Click ok to complete



Tutorial 4A

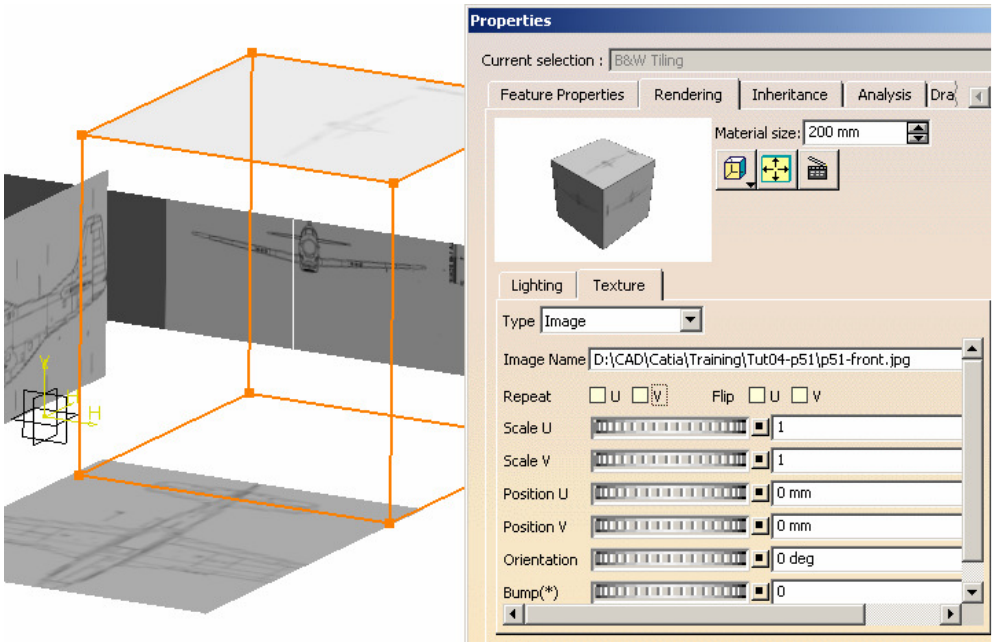
To Apply a Texture material onto the surface:-

- Click “Apply Material” icon
- Select a Texture material, e.g. “B&W Tiling” on the list
- Click on the Extrude.3 surface
- Click ok to complete



To replace the texture by a picture:-

- Double-click “B&W Tiling” on the tree
- Select the tab page “Rendering”
- Click on the sub-tab page “Texture”
- Select “Image” as type
- Click “…” icon to select a picture file
- Select the file “**p51-front.jpg**” in your project folder
- Click “Open”

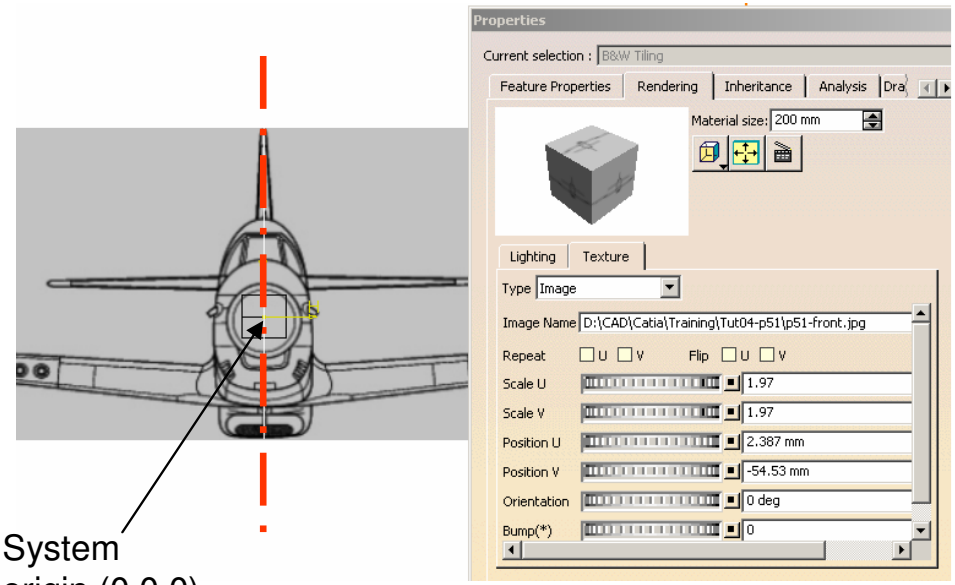


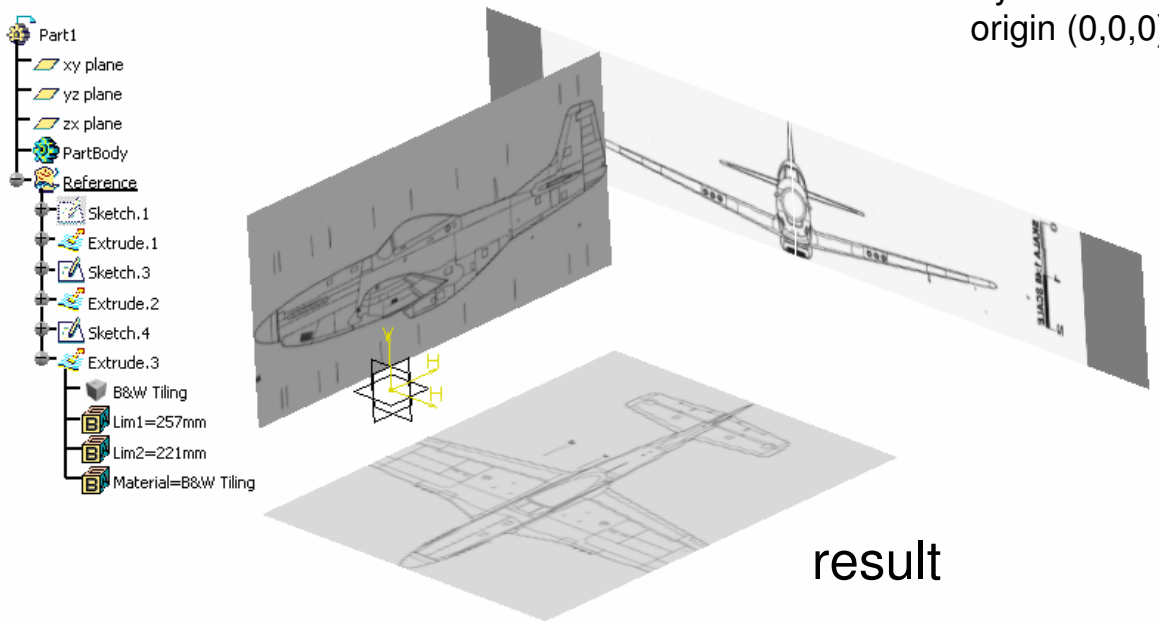
- (Now, the projection method is not correct to show the picture on the surface)
- Select “Cubical Mapping”

- Deselect U,V repeat

Tutorial 4A

- Click “Front View” icon (or click “x” on the compass)
- Adjust UV scales until the image extremums touch the surface edge respectively
- Keeping UV scales unchanged, adjust UV position to locate the centerline of the image onto the origin
- Click ok to complete



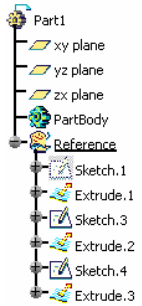


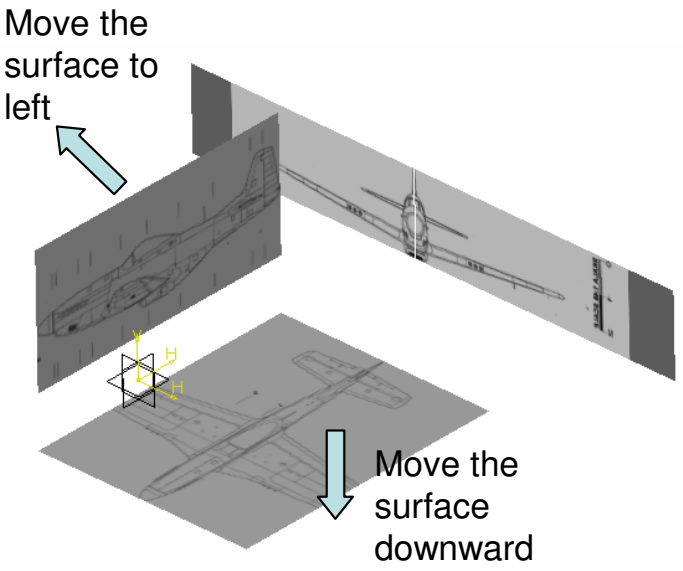
result

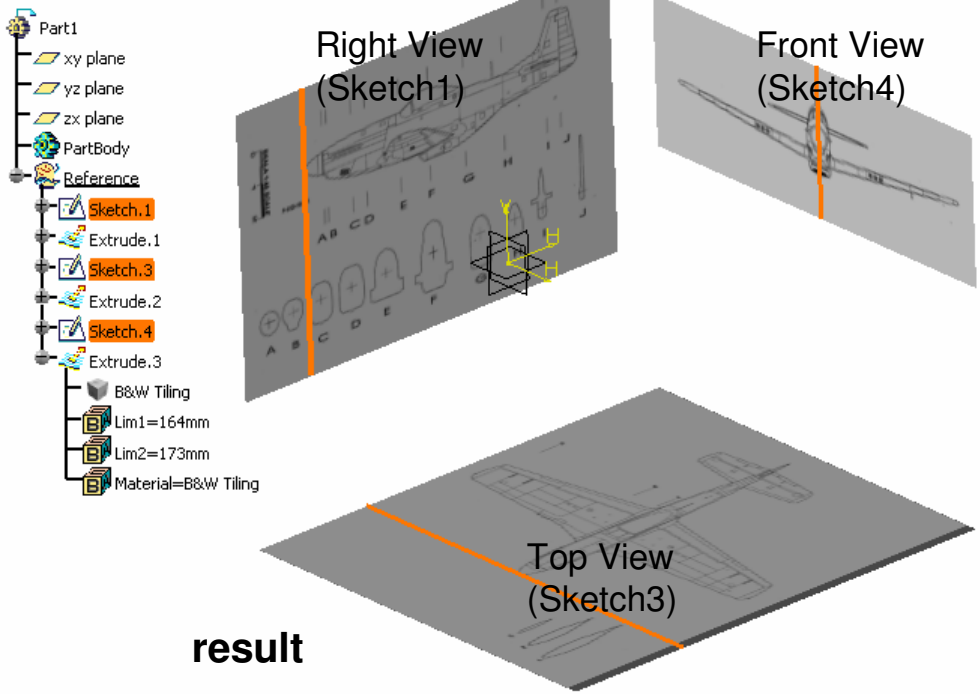
Tutorial 4A

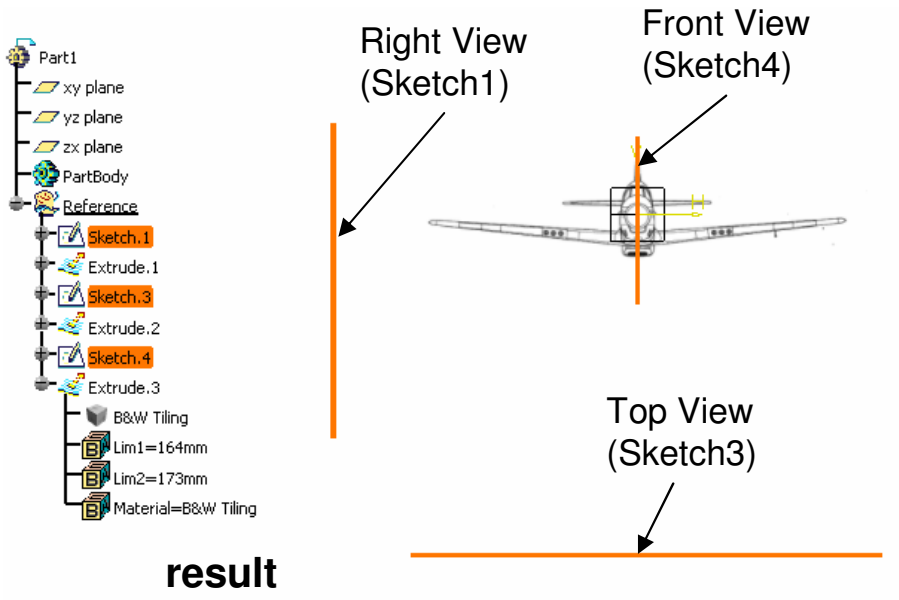
- (Now, all three views are aligned)

- Modify Sketch1, Extrude1 to adjust Right View
- Modify Sketch3, Extrude2 to adjust Top View
- Modify Sketch4, Extrude3 to adjust Front View
- (Remark: The three surfaces are just the projection screens. No matter how we change their positions or sizes, the three views are still aligned)



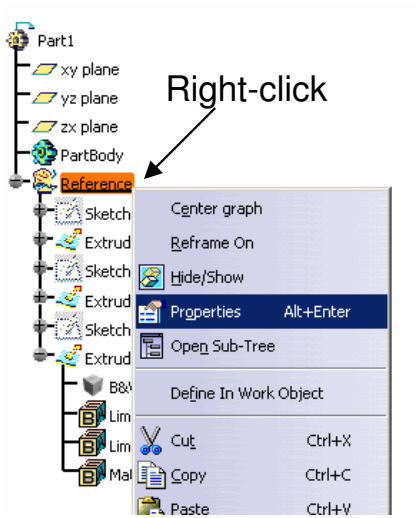


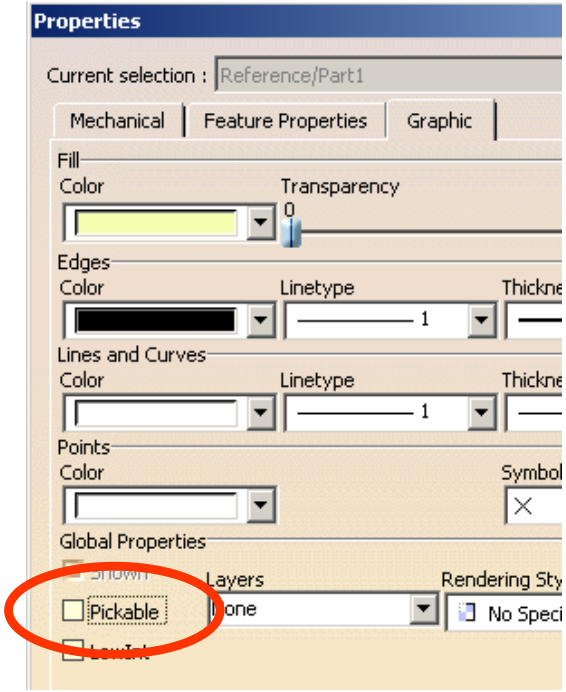




Tutorial 4A

Hide Sketch1, Sketch3 & Sketch4



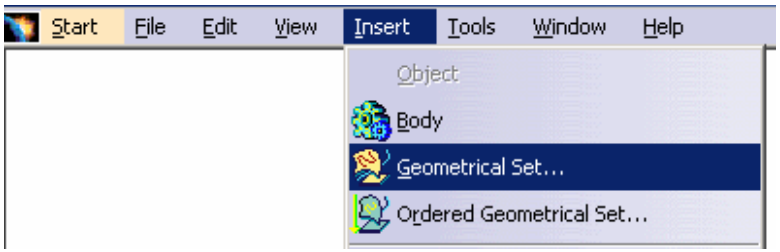


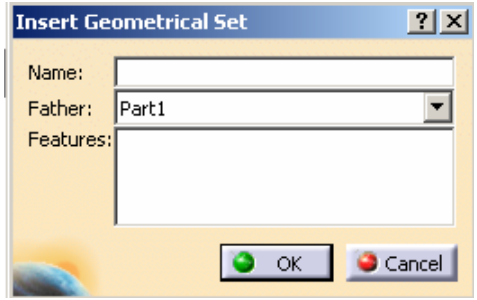
To make a geometrical set UnPickable:-

- Right-Click “Reference” on tree
- Select “Properties”
- **Deselect “Pickable”** and click ok to complete
- (Now all elements in “Reference” cannot be picked by the mouse)

To Create a Geometrical Set:-

- Select “Insert/ Geometrical Set” on the menu bar
- Click ok to complete

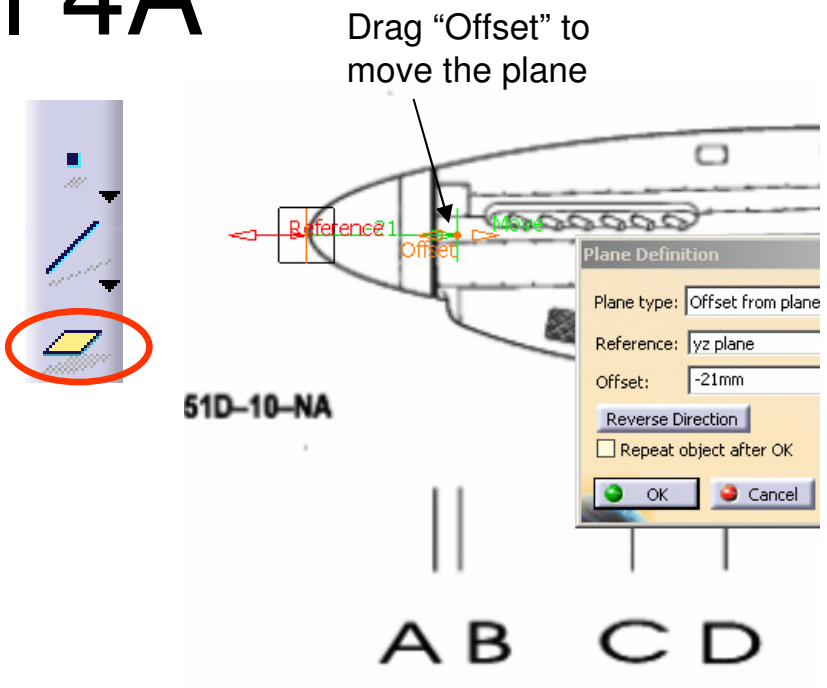




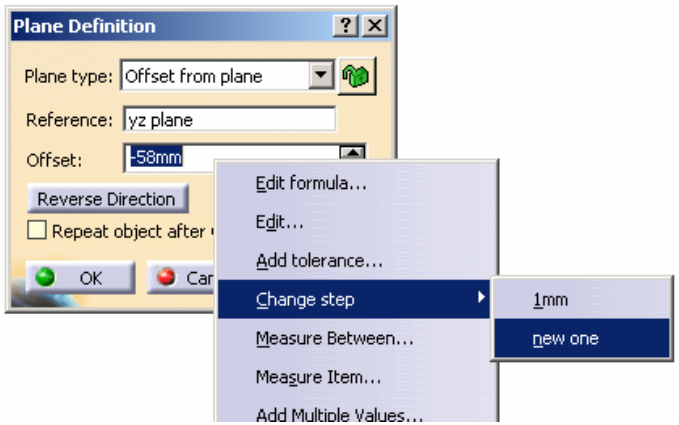
Tutorial 4A

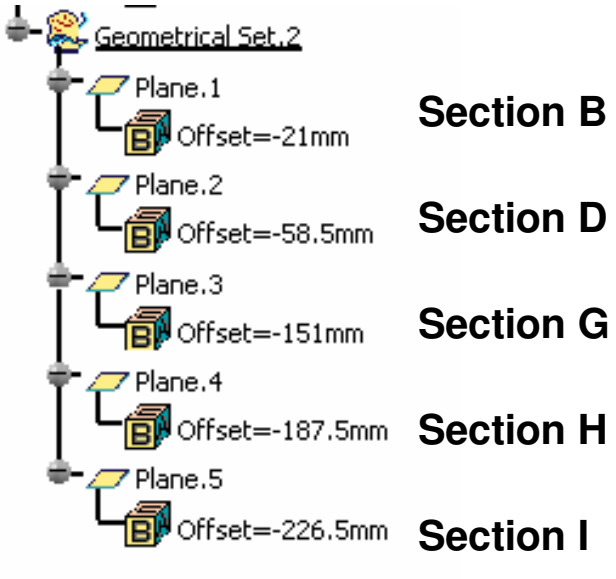
To Create Reference Planes:-

- Click “Plane” icon
- Select “yz plane”
- Click “Right View” icon (or click “y” on compass)
- Move the mouse cursor onto “Offset” (green color) and then drag it onto “section B” of the image
- (Offset value ~ 21mm)
- Click ok to complete



- Repeat the above steps for sections “D,G,H,I” of the image
- (optional: to change increment, right-click on the entry box of “Offset”, then select change step/ new one, and then enter 0.5mm; click  to fine-tune the offset value)





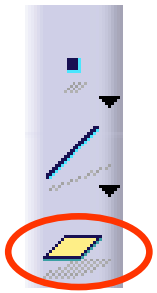
Tutorial 4A

To Create Reference Planes (Cont'):-

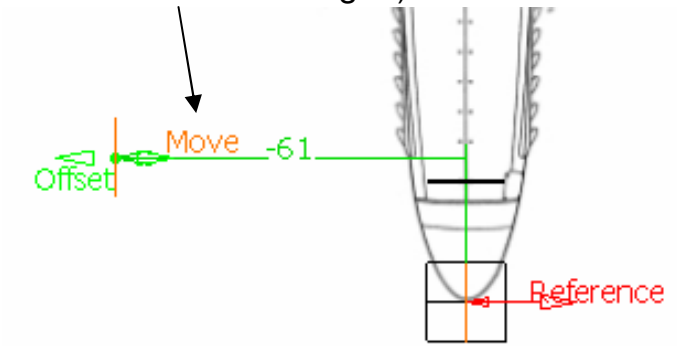
- Click "Plane" icon
- Select "zx plane"
- Click "Top View" icon (or click "z" on compass)
- Move the mouse cursor onto "Move" (green color) and then drag it near "section 1" of the image
- Move the mouse cursor onto "Offset" (green color) and then drag it onto "section 1" of the image
- (Offset value ~ 14mm)
- Click ok to complete

- Click "Plane" icon again
- Select "plane6" (the previous plane at section1)
- Enter 25mm as offset value (or drag "Offset")
- Click ok to complete

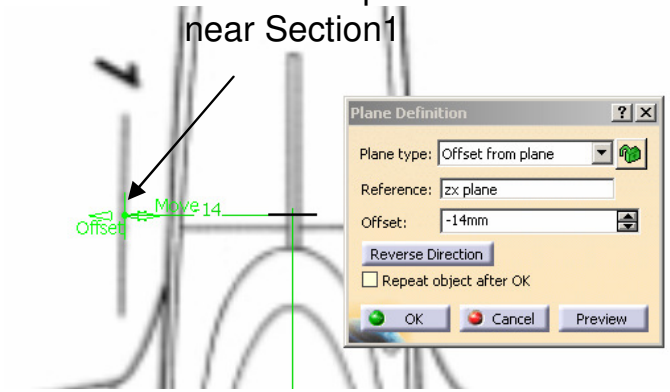
- Click "Plane" icon again
- Select "plane6" (the previous plane at section1)
- Enter 125mm as offset value (or drag "Offset")
- Click ok to complete

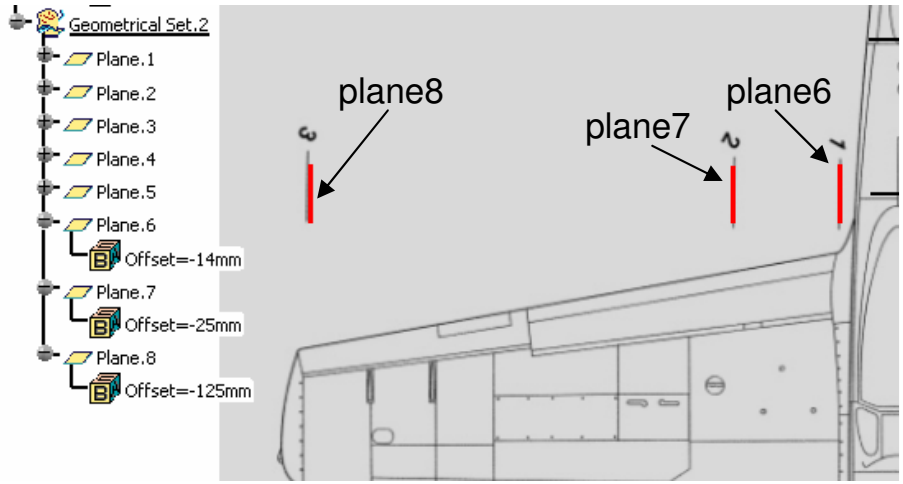


Drag "Move" to move the plane (Offset value will NOT be changed)



"Move" the plane near Section1





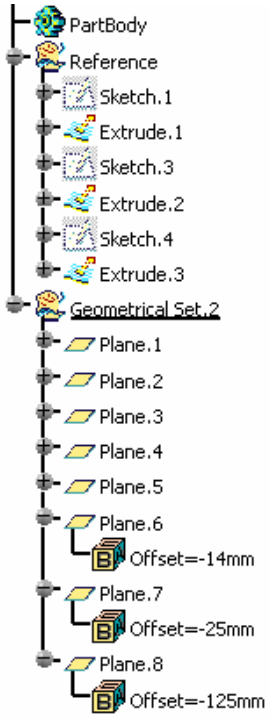
Tutorial 4A

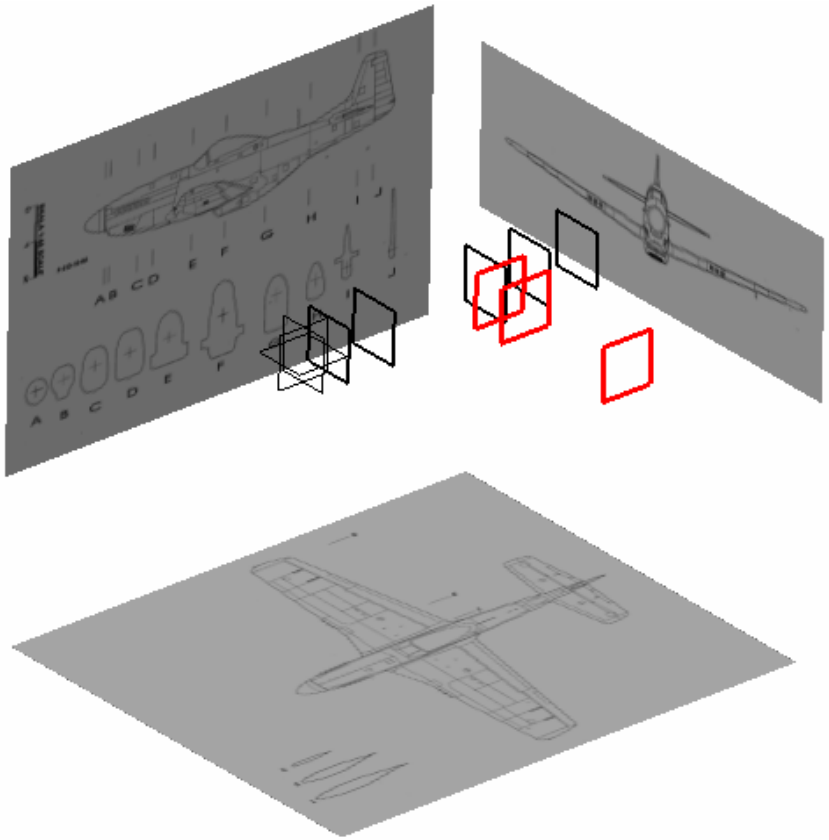
(Cont'):-

- Double Click Plane.6
- Click **"Reverse Direction"** icon
- Click ok to confirm

- Double Click Plane.7
- Click **"Reverse Direction"** icon
- Click ok to confirm

- Double Click Plane.8
- Click **"Reverse Direction"** icon
- Click ok to confirm



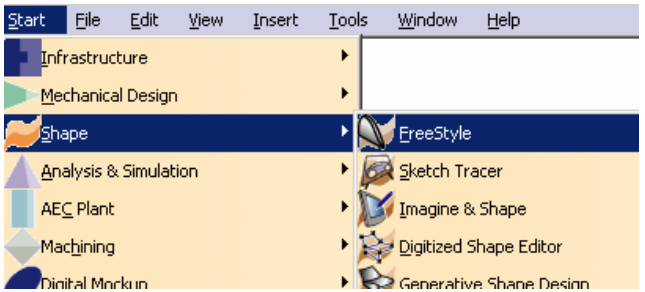


- (We are going to build the model on the Right-Hand Side, therefore we flip these 3 offset planes onto that side)

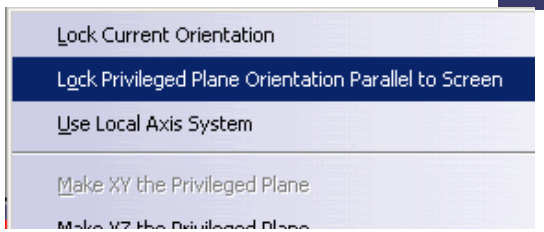
Tutorial 4A

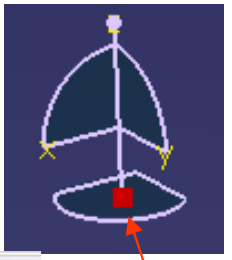
To Create a 3D Spline Curve (1st):-

- **Select 'Start/Shape/Freestyle" on the menu bar**



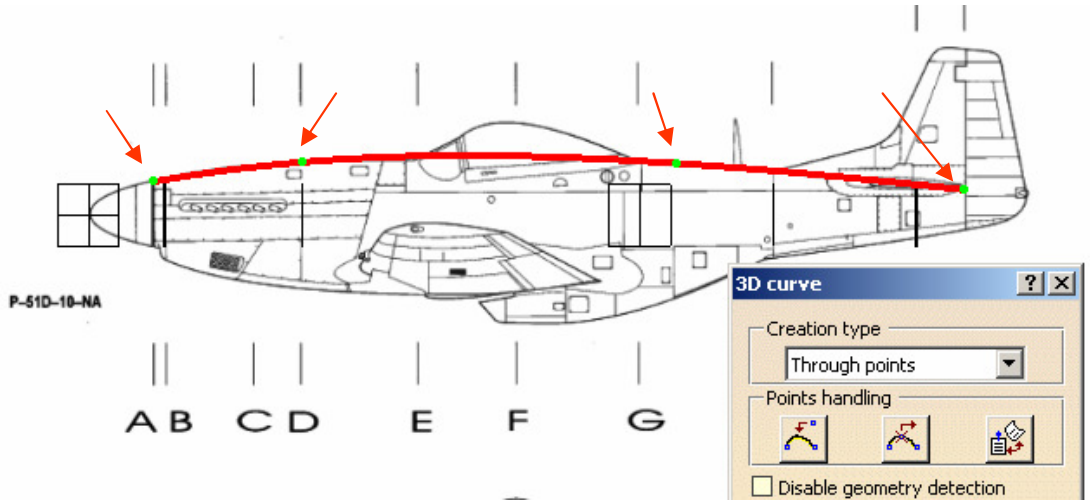
- Right-Click on the red dot of the compass, then select " Lock Privileged Plane Orientation Parallel to screen"

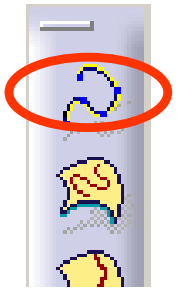


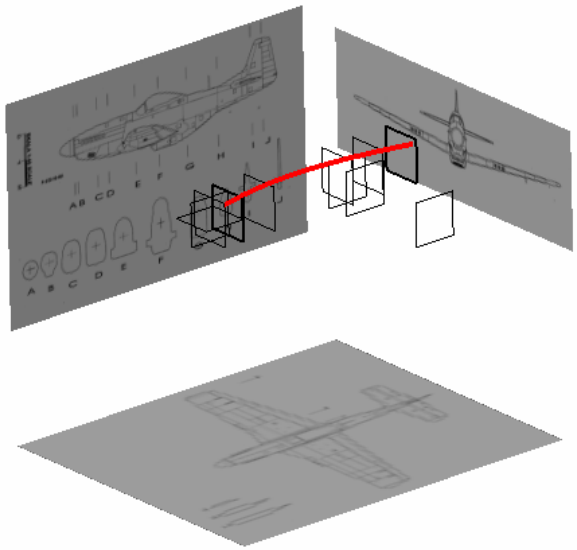


Right-click the red dot

- Click "Right View" icon
- Click "3D curve" icon
- Based on the picture, draw a 3D curve with four control points (as shown below)
- Click ok to complete



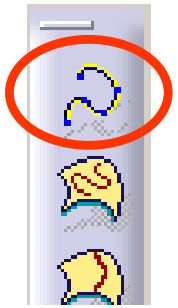


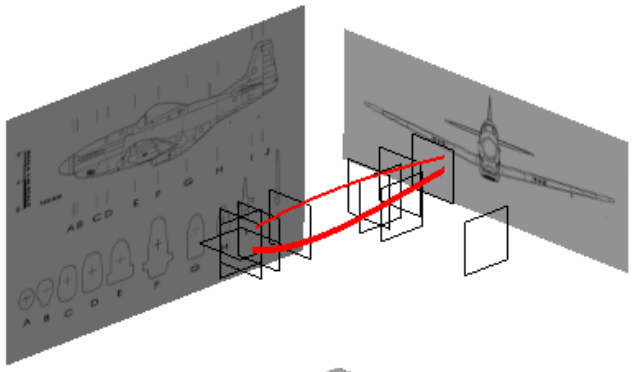


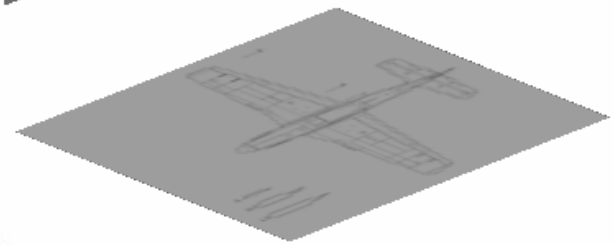
Tutorial 4A

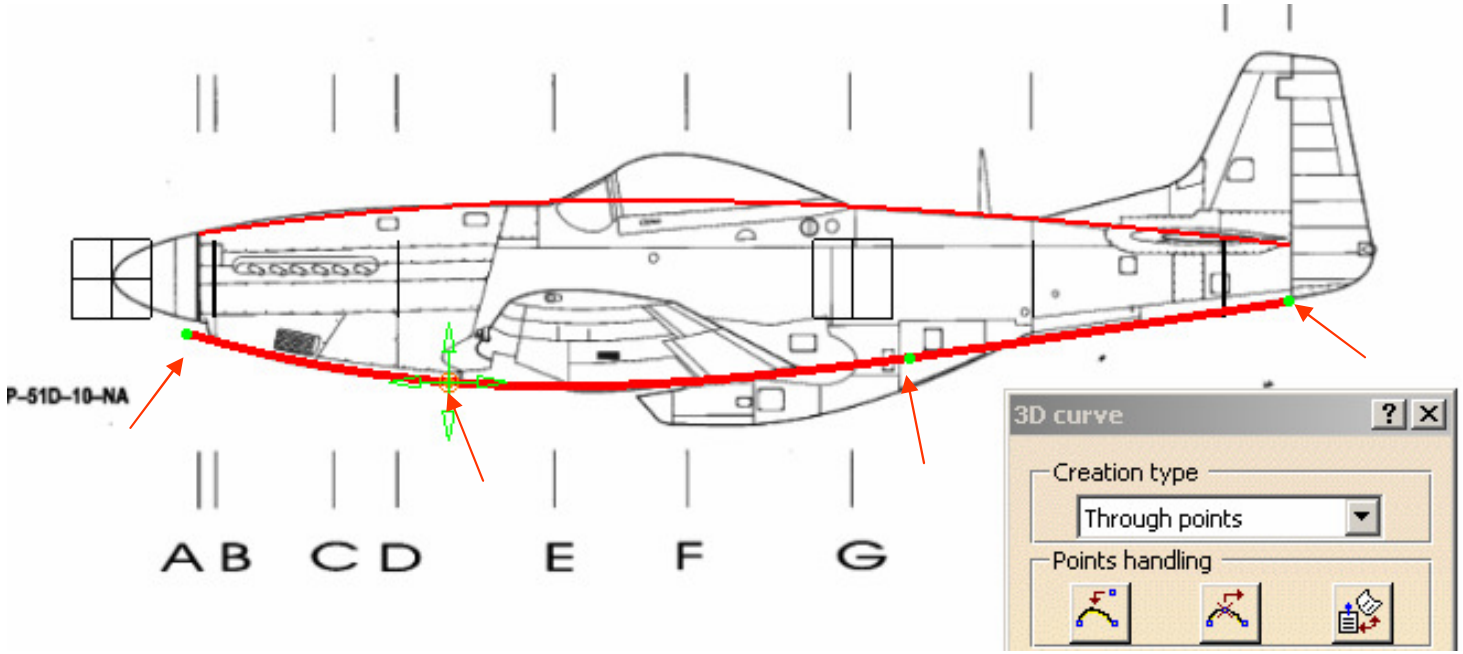
To Create a 3D Spline Curve (2nd):-

- (if needed) Click “Right View” icon again
- Click “3D curve” icon
- Based on the picture, draw a 3D curve with four control points (as shown below)
- Click ok to complete





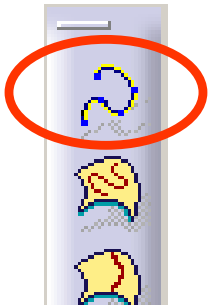


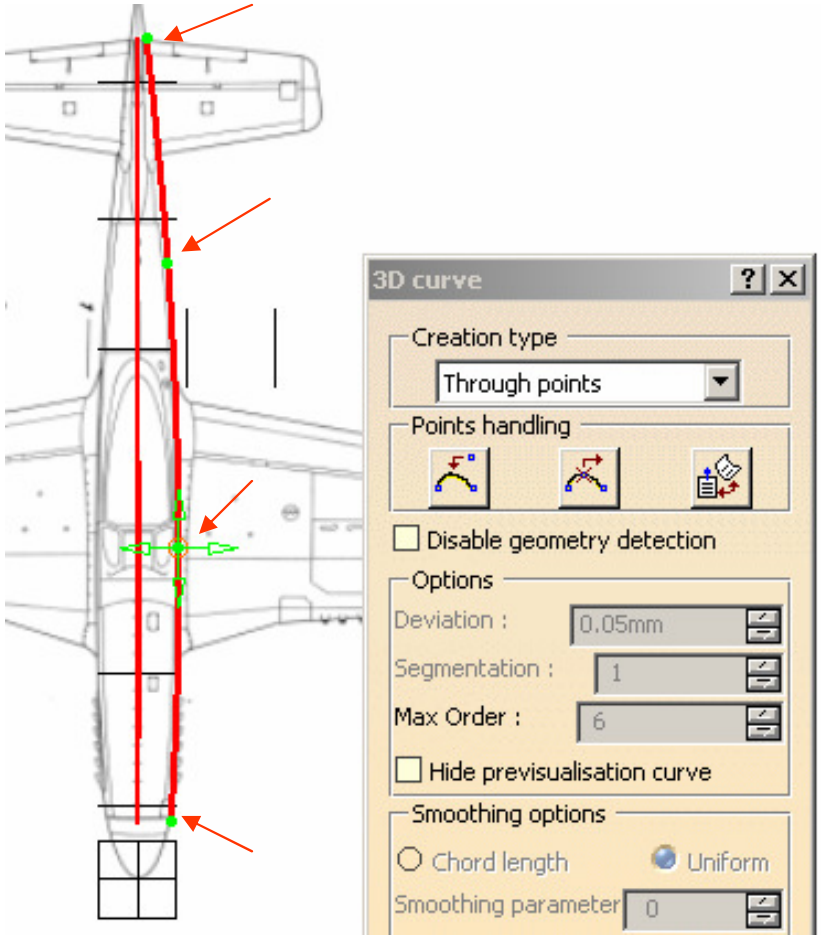


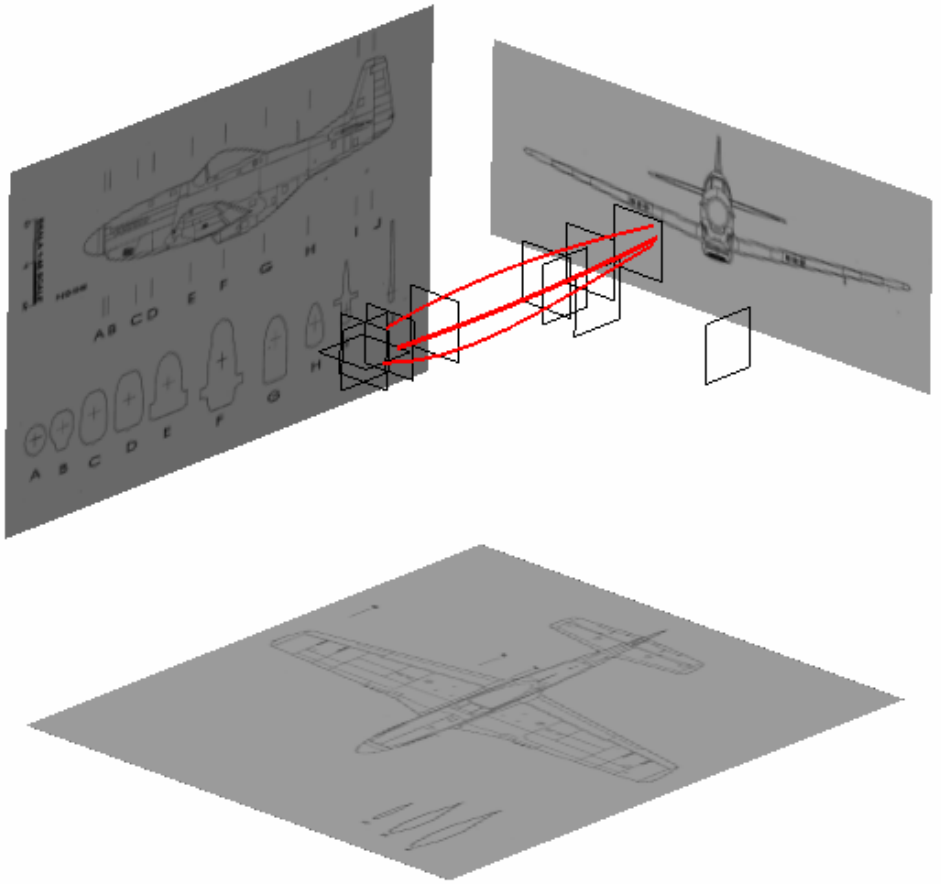
Tutorial 4A

To Create a 3D Spline Curve (3rd):-

- Click “Top View” icon again
- Click “3D curve” icon
- Based on the picture, draw a 3D curve with four control points (as shown below)
- Click ok to complete





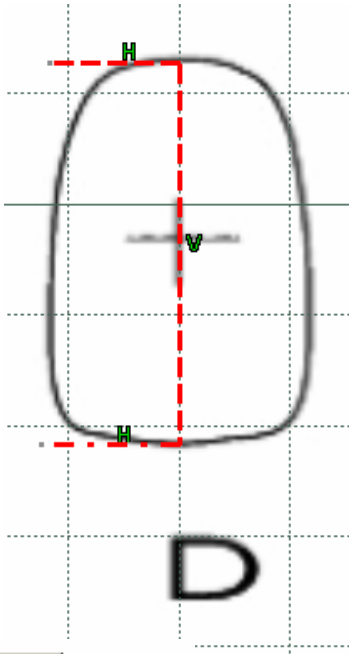


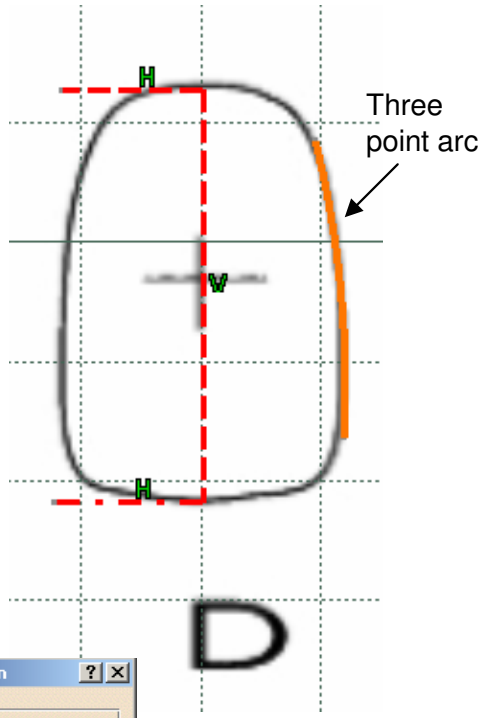
Tutorial 4A

To create a sketch on Section D:-

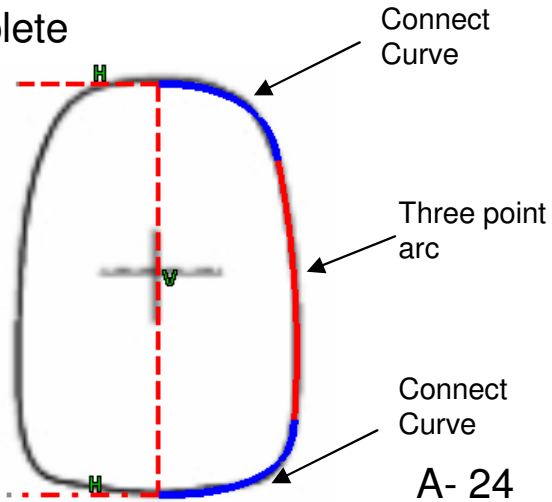
- **Select "Start/Shape/Generative Shape Design" on the menu bar**
- Click "Sketch" icon, select "zx plane"

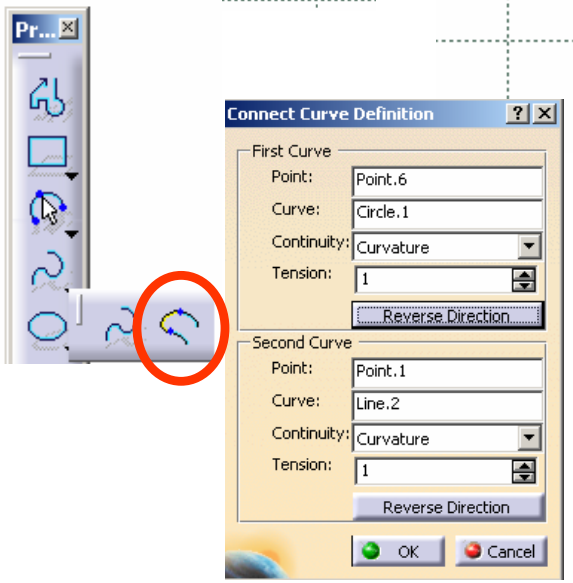
- Draw a vertical axis on Section D, going through its center
- Draw another two horizontal axes on Section D
- Draw an Arc (Three point arc starting with limits)
- Draw two Connect Curves (double click on it to change the tangential direction at the endpoints)
- Adjust the arc endpoints to finetune the profile to match the image





- Click Exit to complete

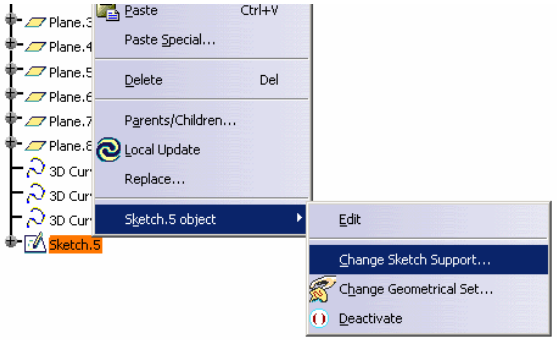


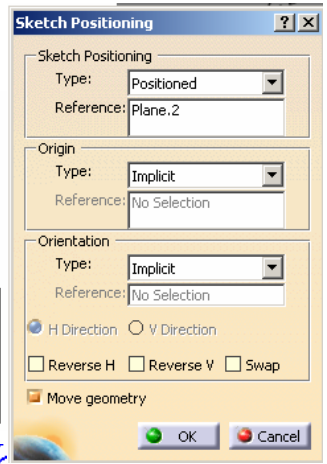


Tutorial 4A

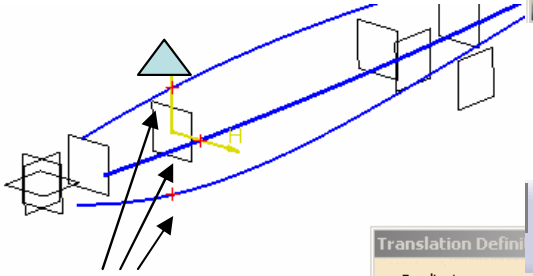
To reposition the sketch of Section D:-

- Right-click “Sketch5”
- Select “Sketch.5 object/ Change Sketch Support“
- Select “Plane2” (for section D)
- Select “Positioned” as Type
- Click ok to confirm

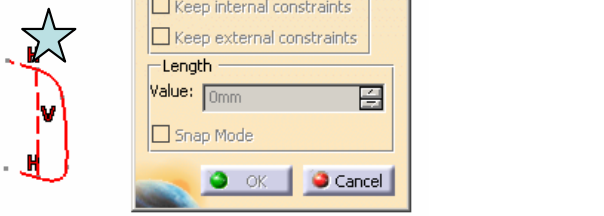




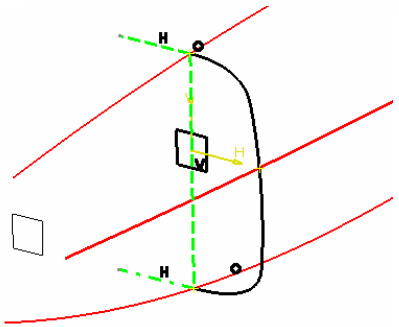
- Double-Click “Sketch5” to edit
- Multi-select “3D Curve1”, “3D Curve2” & “3D Curve3”
- Click “Intersect 3D elements” icon to get 3 intersection points



3 intersection points with sketch plane



- Select all curves & axes
- Click “Translate” icon
- Deselect “Duplicate mode”
- Click the point ☆
- Then click the point △

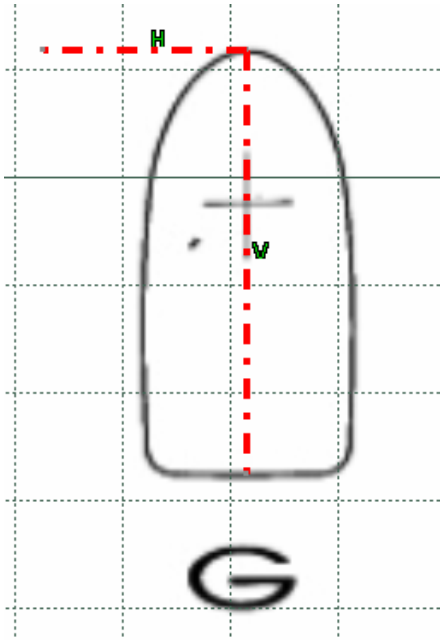


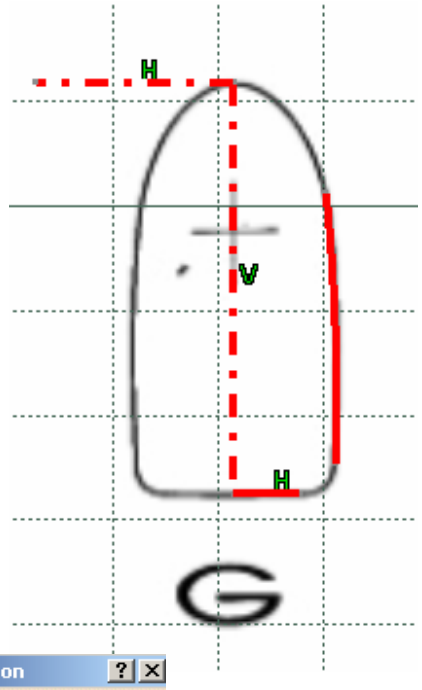
- Add three coincidence constraints to make the profile touch the three intersection points
- Click Exit complete

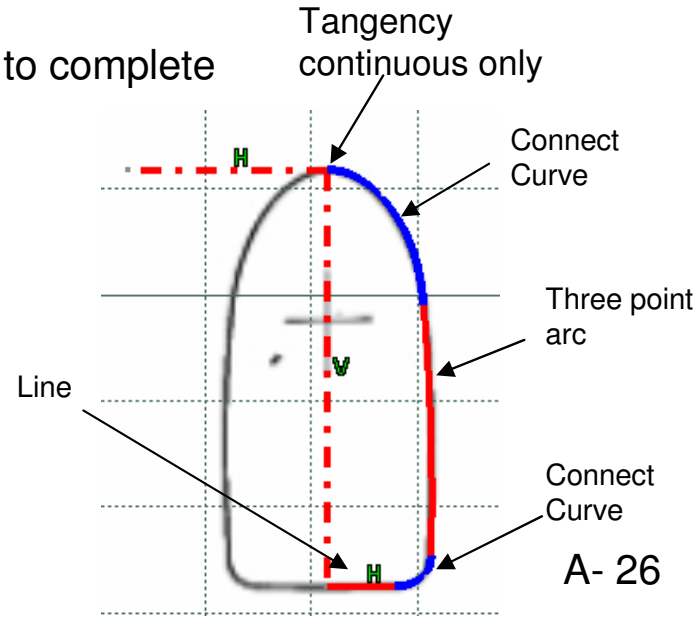
Tutorial 4A

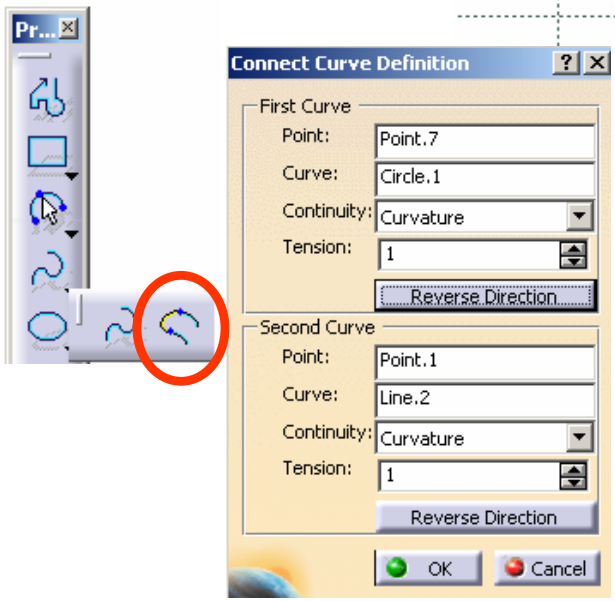
To create a sketch on Section G:-

- Click “Sketch” icon, select zx plane
- Draw a vertical axis on Section G, going through its center
- Draw another horizontal axis on Section G
- Draw an Arc (Three point arc starting with limits)
- Draw a horizontal line
- Draw two Connect Curves (double click on it to change the tangential direction at the endpoints)
- Adjust the arc endpoints to finetune the profile to match the image
- Click Exit to complete





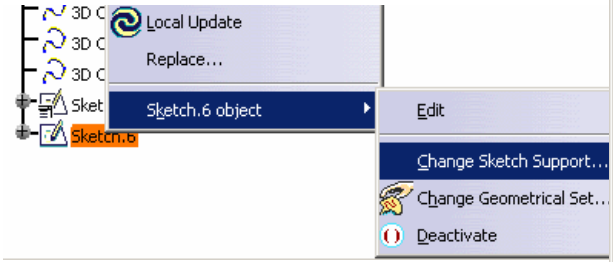


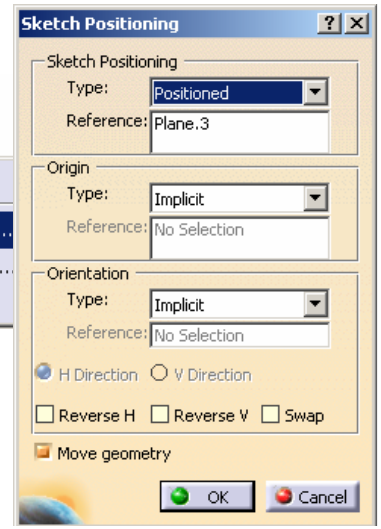


Tutorial 4A

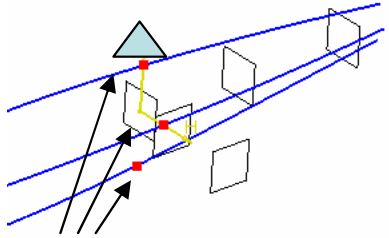
To reposition the sketch of Section G:-

- Right-click “Sketch6”
- Select “Sketch.6 object/ Change Sketch Support“
- Select “Plane3” (for section G)
- Select “Positioned” as Type
- Click ok to confirm

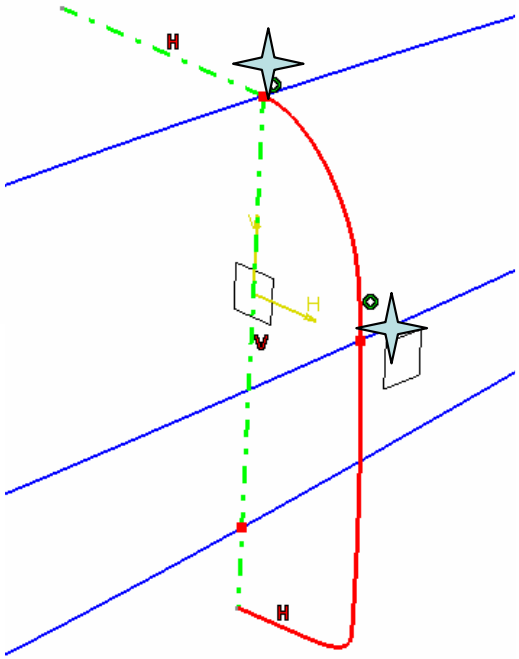




- Double-Click “Sketch6” to edit
- Multi-select “3D Curve1”, “3D Curve2” & “3D Curve3”
- Click “Intersect 3D elements” icon to get 3 intersection points



3 intersection points with sketch plane



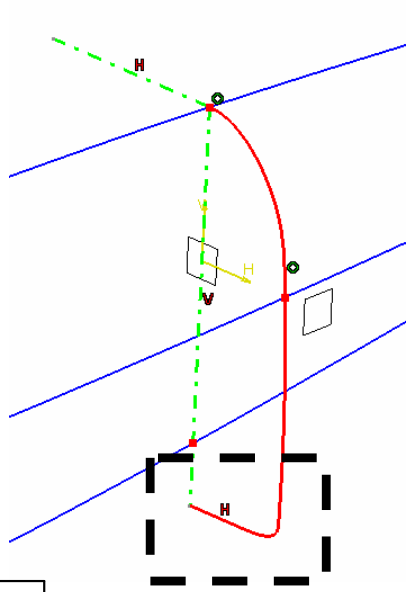
- Select all curves & axes
- Click “Translate” icon
- Deselect “Duplicate mode”
- Click the point ☆
- Then click the point △

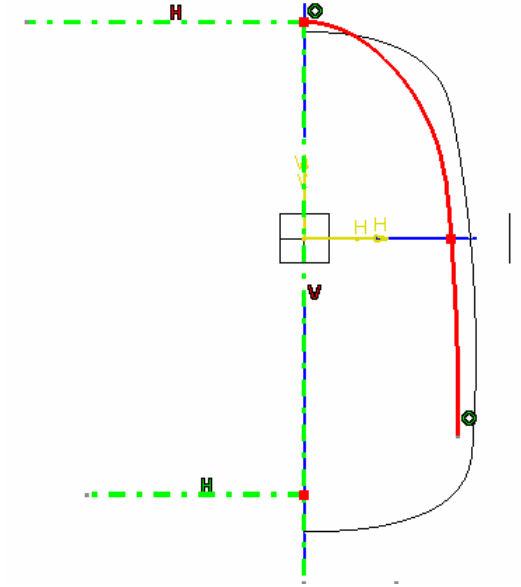
- Add Two coincidence constraints to make the profile touch these two intersection points ✦

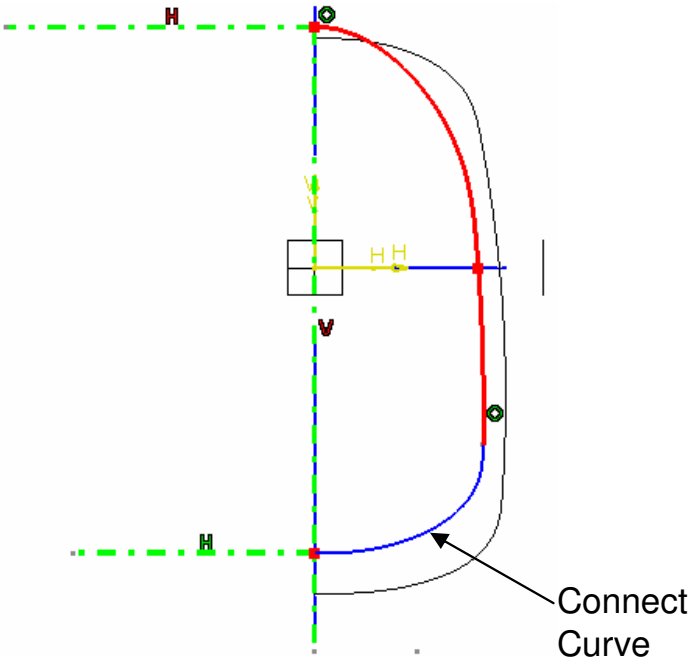
Tutorial 4A

(Cont'):-

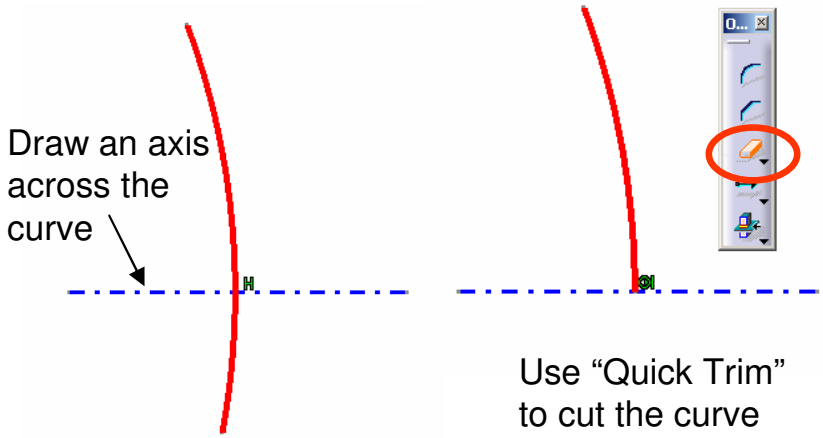
- Delete the portion as shown
- Draw a horizontal axis starting from the remaining intersection point
- Shorten the arc by dragging its endpoint
- Draw a Connect Curve between the axis and the arc
- Click Exit to complete







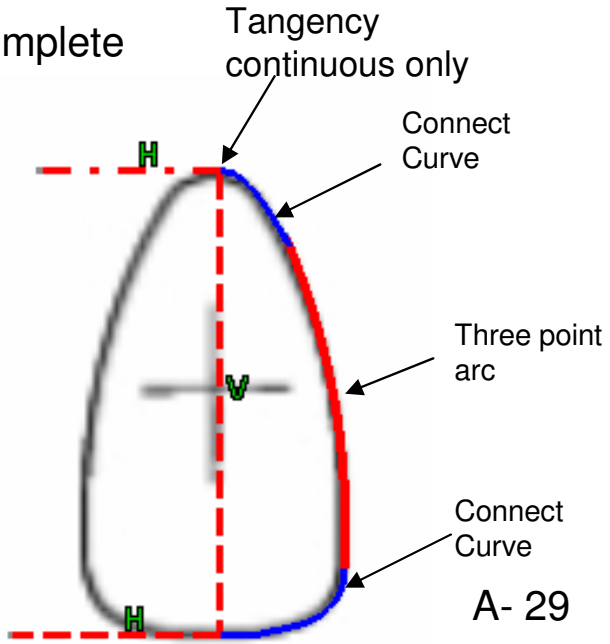
- (Remark: Here is the way to shorten a curve without changing its curvature…)

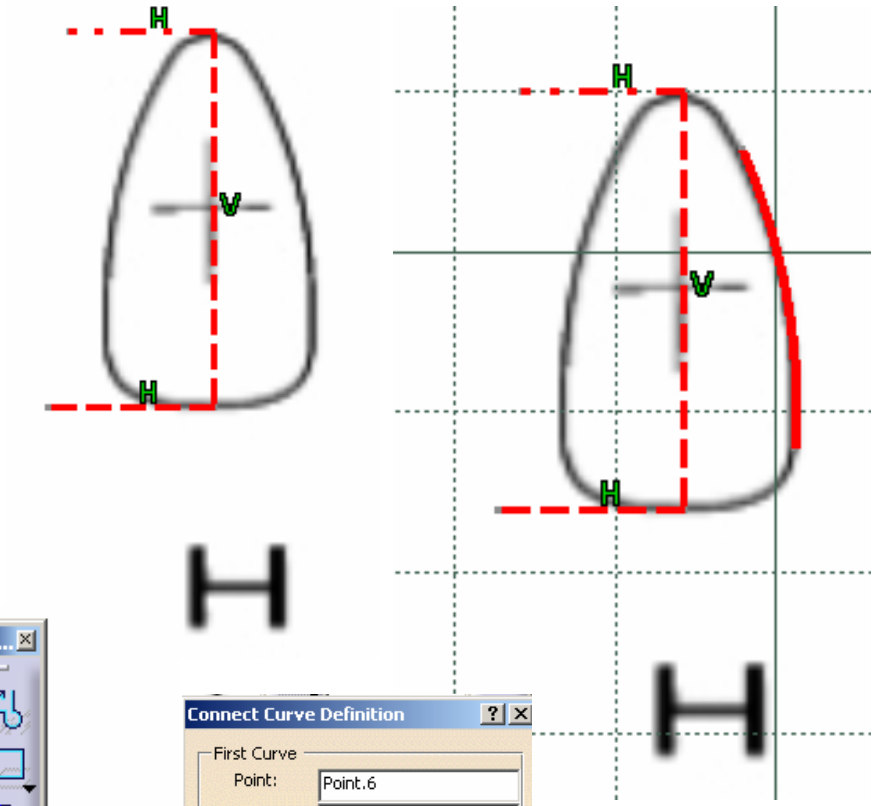


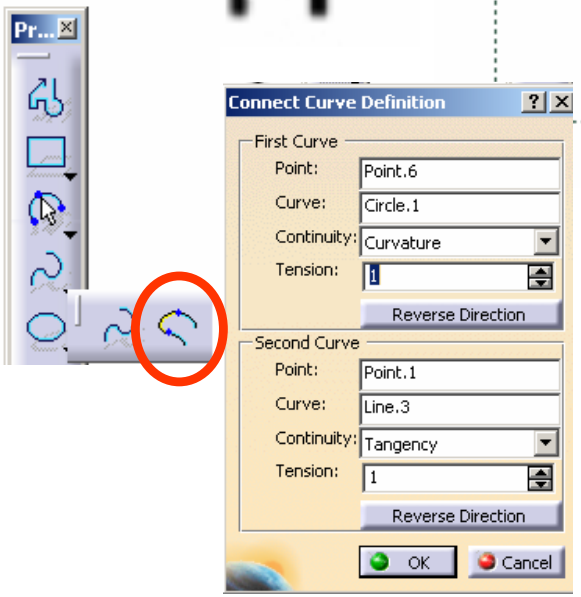
Tutorial 4A

To create a sketch on Section H:-

- Click “Sketch” icon, select zx plane
- Draw a vertical axis on Section H, going through its center
- Draw another two horizontal axes on Section H
- Draw an Arc (Three point arc starting with limits)
- Draw two Connect Curves (double click on it to change the tangential direction at the endpoints)
- Adjust the arc endpoints to finetune the profile to match the image
- Click Exit to complete



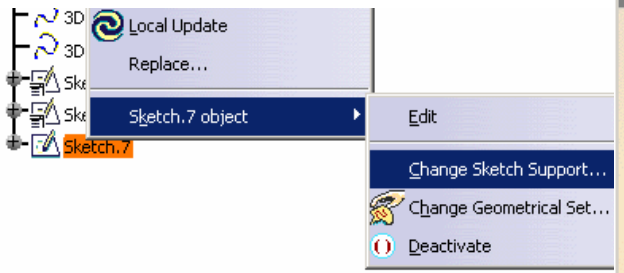


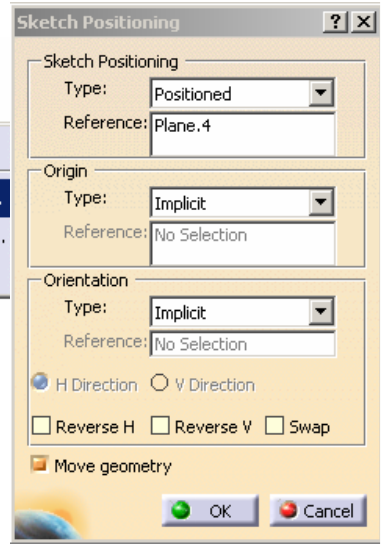


Tutorial 4A

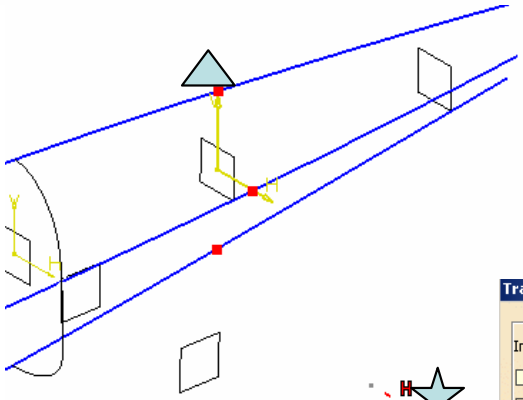
To reposition the sketch of Section H:-

- Right-click “Sketch7”
- Select “Sketch.7 object/ Change Sketch Support“
- Select “Plane4” (for section H)
- Select “Positioned” as Type
- Click ok to confirm

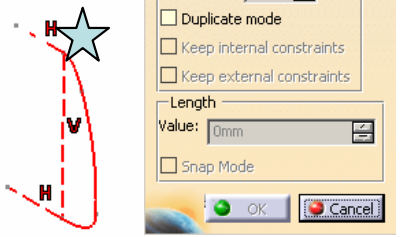


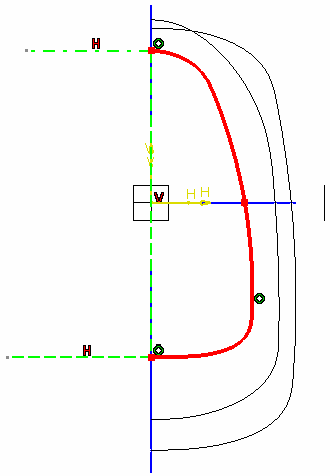


- Double-Click “Sketch7” to edit
- Multi-select “3D Curve1”, “3D Curve2” & “3D Curve3”
- Click “Intersect 3D elements” icon to get 3 intersection points



- Select all curves & axes
- Click “Translate” icon
- Deselect “Duplicate mode”
- Click the point ☆
- Then click the point △



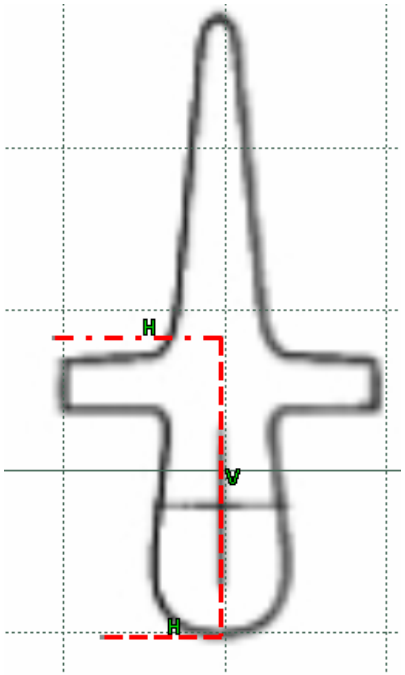


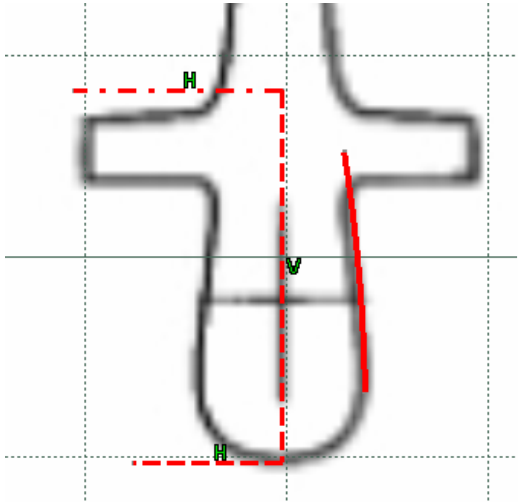
- Add three coincidence constraints to make the profile touch the three intersection points
- Click Exit complete

Tutorial 4A

To create a Sketch on Section I:-

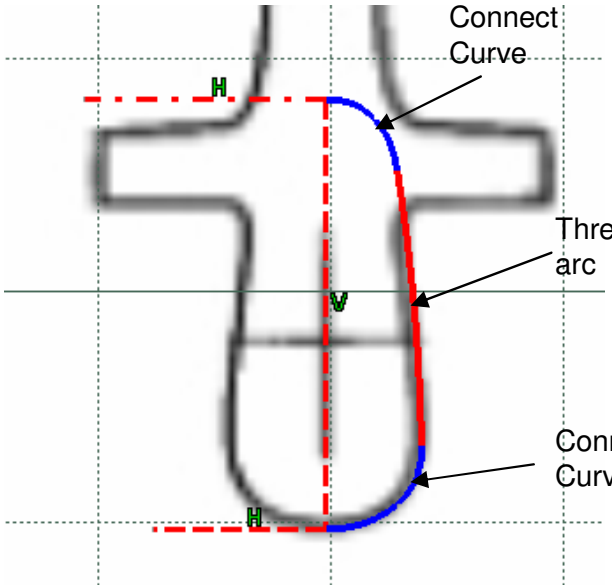
- Click “Sketch” icon, select zx plane

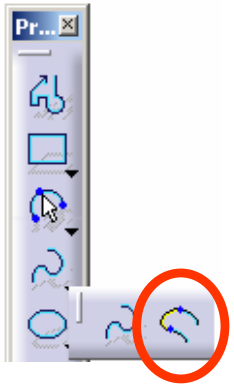


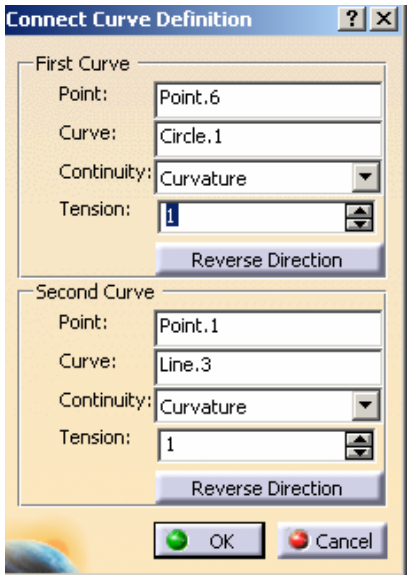


- Draw a vertical axis on Section I, going through its center
- Draw another two horizontal axes on Section I
- Draw an Arc (Three point arc starting with limits)
- Draw two Connect Curves (double click on it to change the tangential direction at the endpoints)
- Adjust the arc endpoints to finetune the profile to match the image

- Click Exit to complete



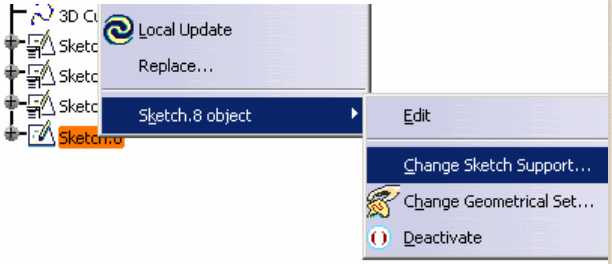


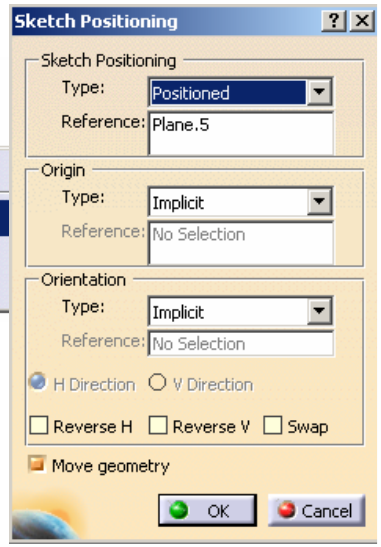


Tutorial 4A

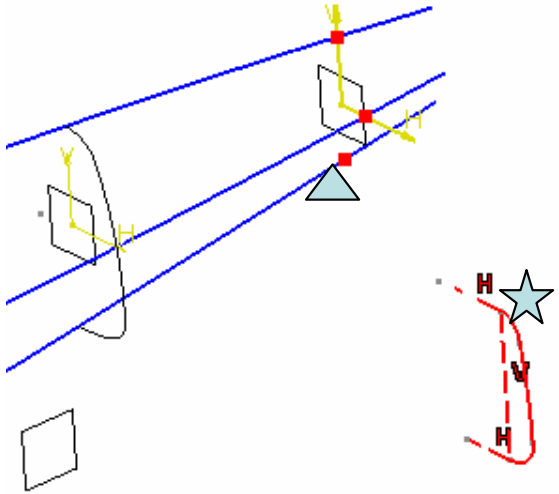
To reposition the Sketch of Section I:-

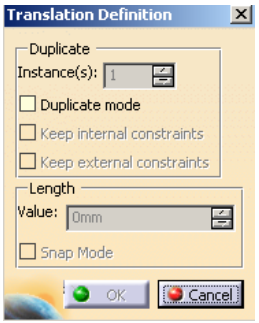
- Right-click “Sketch8”
- Select “Sketch.8 object/ Change Sketch Support“
- Select “Plane5” (for section I)
- Select “Positioned” as Type
- Click ok to confirm



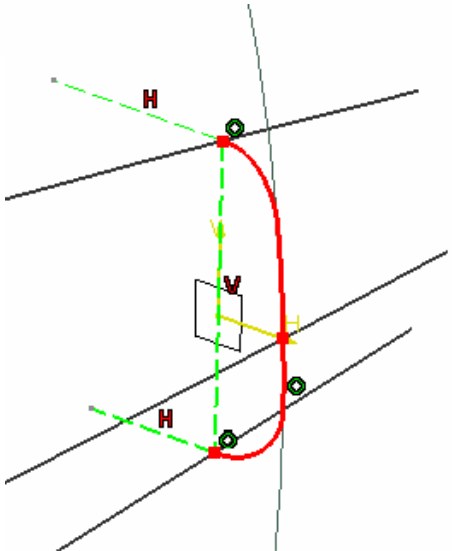


- Double-Click “Sketch8” to edit
- Multi-select “3D Curve1”, “3D Curve2” & “3D Curve3”
- Click “Intersect 3D elements” icon to get 3 intersection points





- Select all curves & axes
- Click “Translate” icon
- Deselect “Duplicate mode”
- Click the point ☆
- Then click the point △

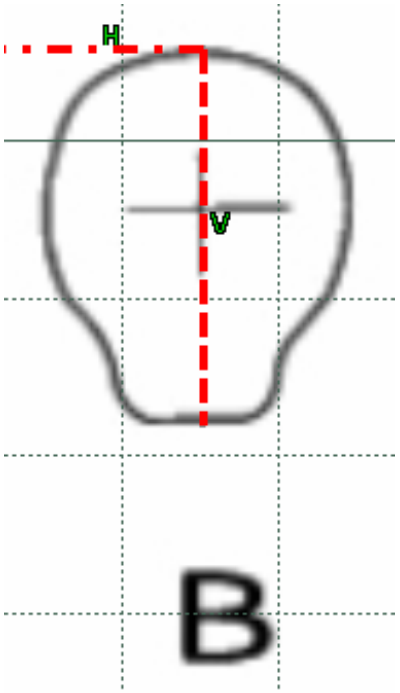


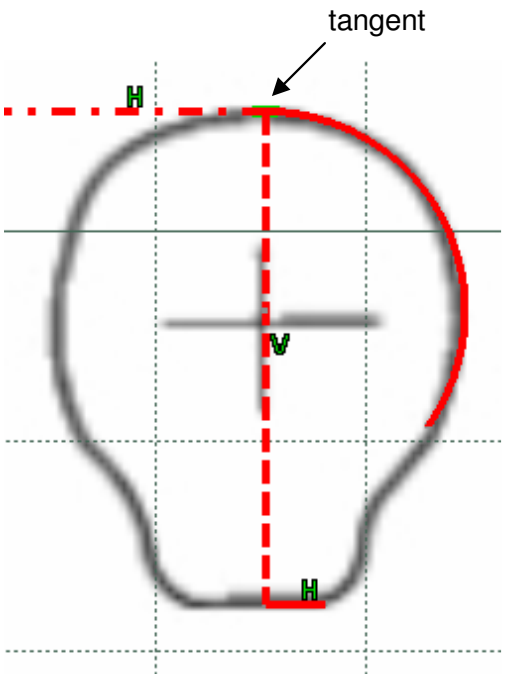
- Add three coincidence constraints to make the profile touch the three intersection points
- Click Exit complete

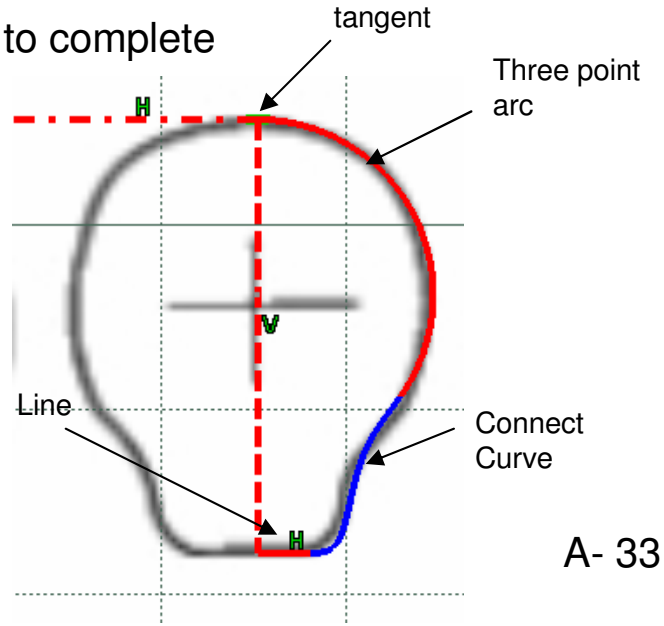
Tutorial 4A

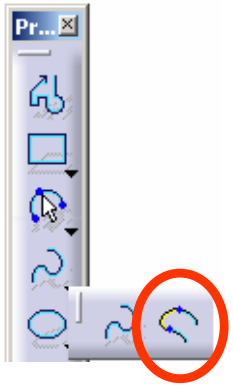
To create a sketch on Section B:-

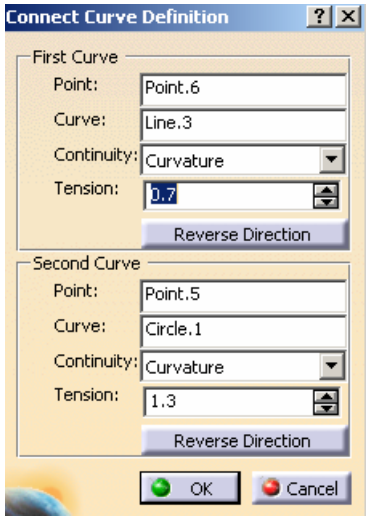
- Click “Sketch” icon, select zx plane
- Draw a vertical axis on Section B, going through its center
- Draw a horizontal axis on Section B
- Draw an Arc (Three point arc starting with limits)
- Draw a line
- Draw a Connect Curve (double click on it to change the tangential direction at the endpoints)
- Adjust the arc endpoints and/or adjust the tensions to finetune the profile to match the picture
- Click Exit to complete







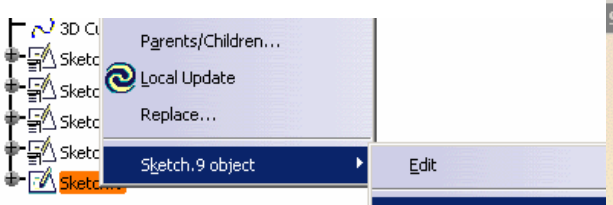


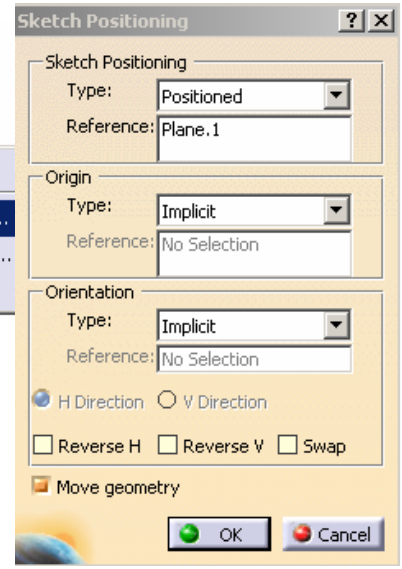


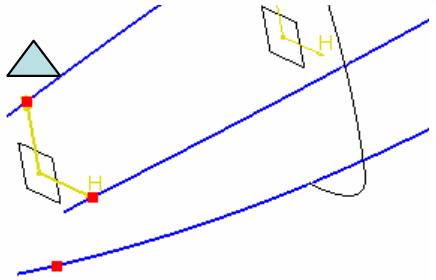
Tutorial 4A

To reposition the sketch of Section B:-

- Right-click “Sketch9”
- Select “Sketch.9 object/ Change Sketch Support“
- Select “Plane1” (for section B)
- Select “Positioned” as Type
- Click ok to confirm

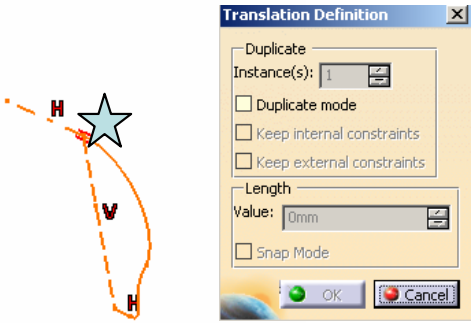


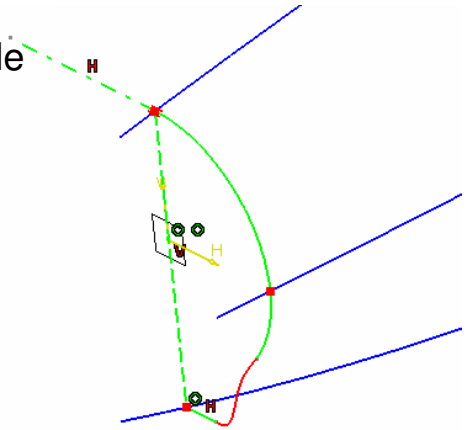




- Double-Click “Sketch9” to edit
- Multi-select “3D Curve1”, “3D Curve2” & “3D Curve3”
- Click “Intersect 3D elements” icon to get 3 intersection points

- Select all curves & axes
- Click “Translate” icon
- Deselect “Duplicate mode”
- Click the point ☆
- Then click the point △
- Add three coincidence constraints to make the profile touch the three intersection points
- Click Exit complete





Save the file as p51.CATpart

END of Tutorial 4A

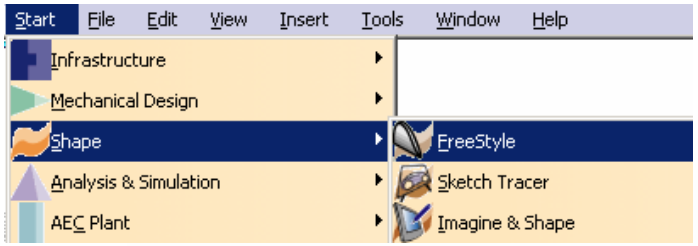
Tutorial 4B

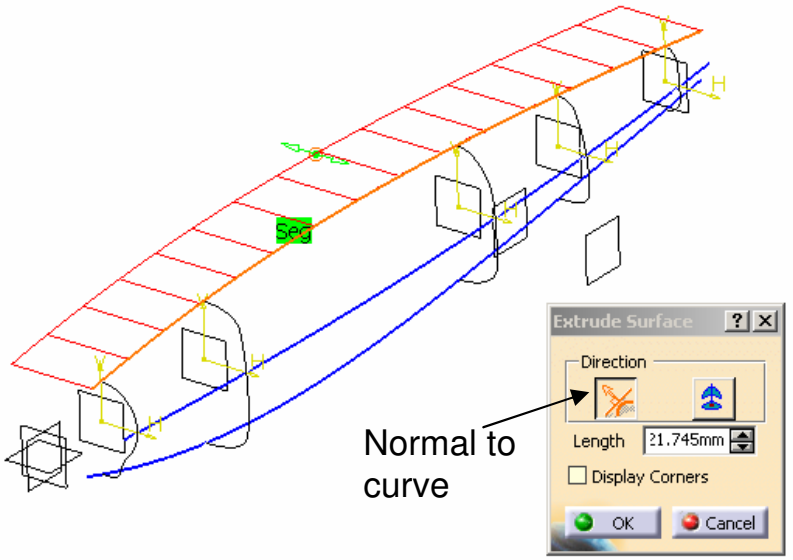
To create two Extrude surfaces:-

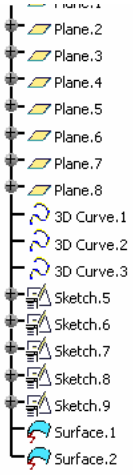
- **Select "Start/Shape/Freestyle" on the menu bar**
- Click "Extrude" icon
- Select "3D Curve.1"
- Select "Normal to the curve" as direction
- Drag on the double arrow on the preview surface to the left, up to ~20mm
- Click ok to complete

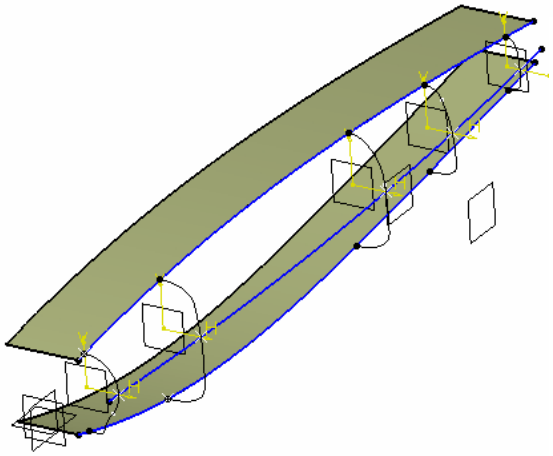
- Similarly, create another "Extrude" surface from "3D Curve.2"

Hide "3D Curve1" and "3D Curve2"





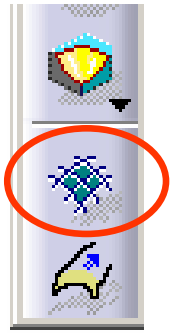


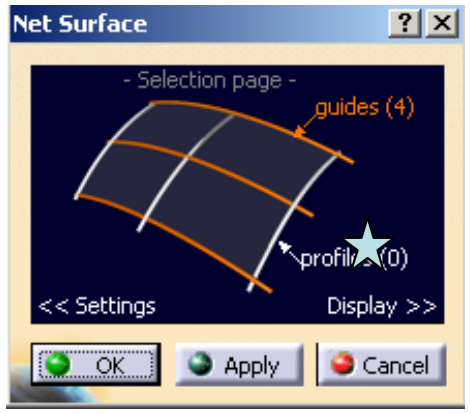


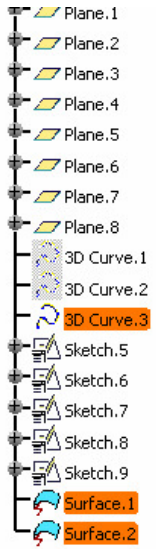
Tutorial 4B

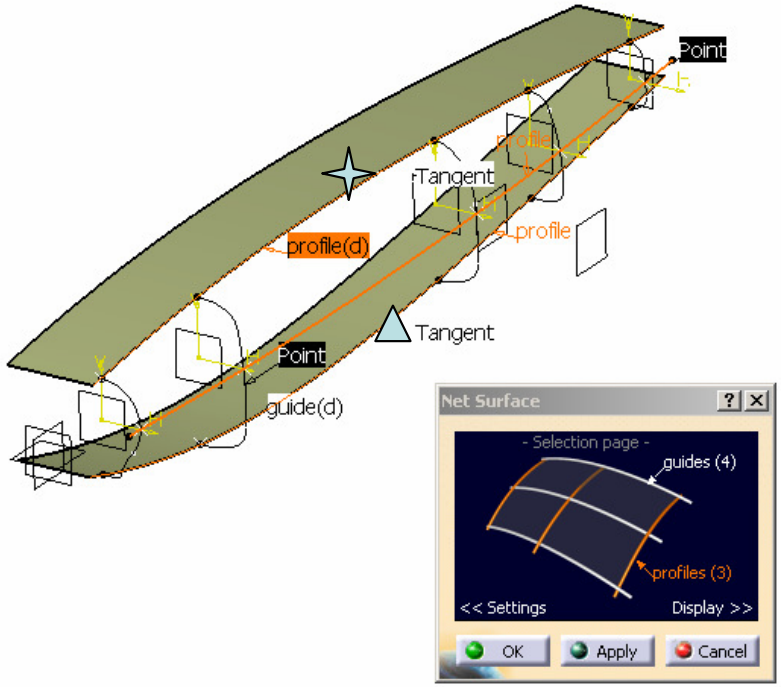
To Create a Net Surface:-

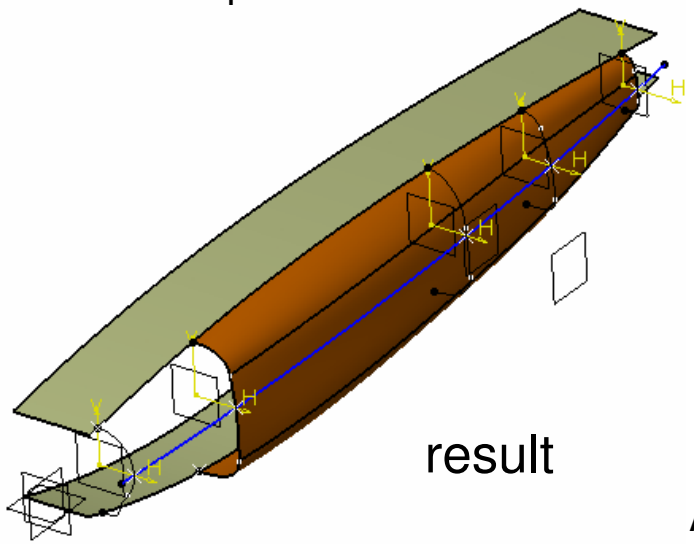
- Click “Net Surface” icon
- Pressing “CTRL” key on the keyboard, multi-select “Sketch5” , “Sketch6”, “Sketch7” and “Sketch8” as Guides
- Click on the text “Profiles(0)” ☆ in the command window
- Pressing “CTRL” key on the keyboard, multi-select the surface edge ✦, “3D Curve3” and another surface edge △ as Profiles
- Change the continuity on both surface edges as “TANGENT”
- Click ok to complete











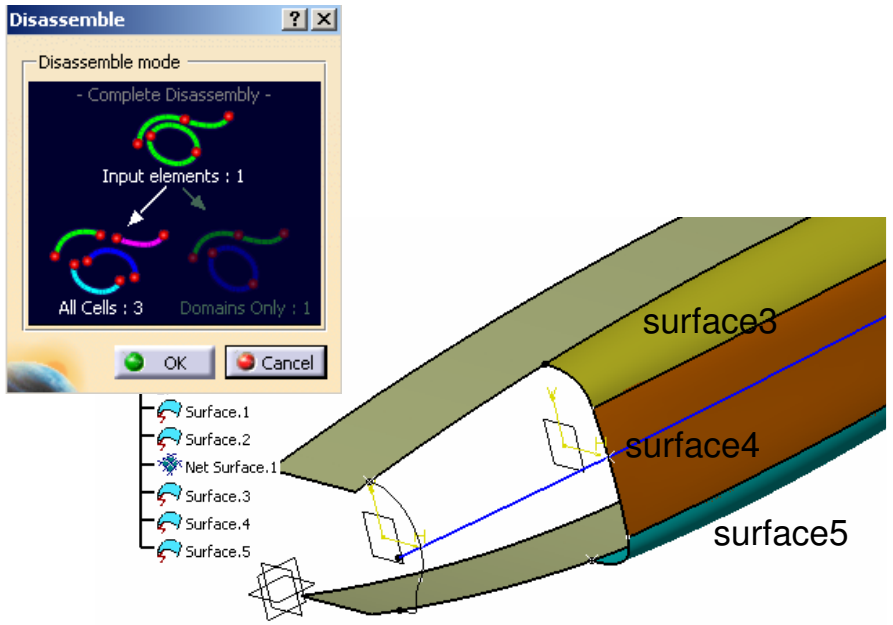
result

Tutorial 4B

To Disassemble a multi-faces Surface:-

- Click “Disassemble” icon
- Select “Net Surface.1”
- Select “All Cells:3” as Disassemble mode
- Click ok to complete

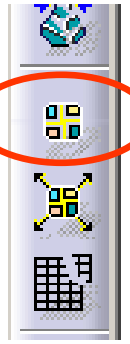
- (Three surfaces are created, representing each face of NetSurface.1)
- Delete Netsurface.1 (or hide it)

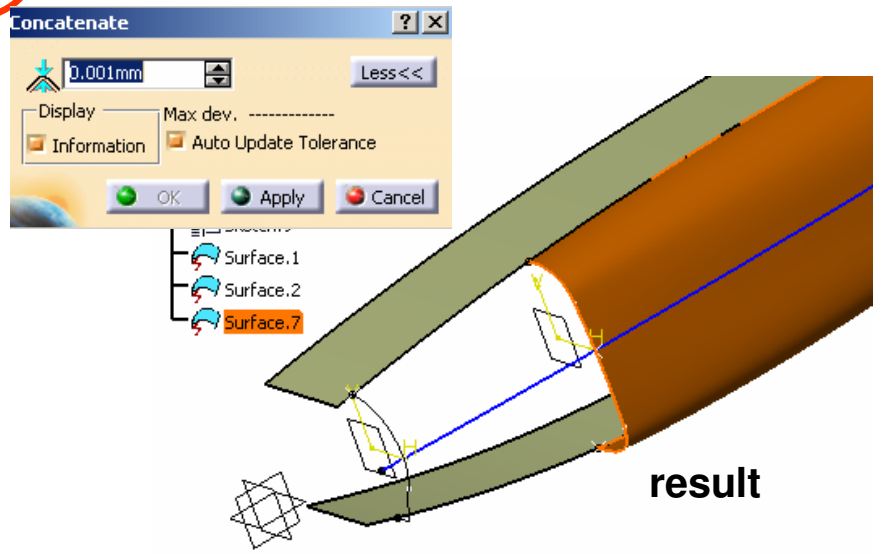


To convert 3 surfaces into ONE Surface:-

- Click “Concatenate” icon
- Select “Auto Update Tolerance”
- Multi-select two surfaces (Surface3 & Surface4)
- Click Apply, then click ok to complete

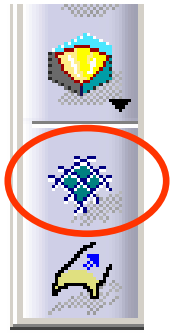
- Click “Concatenate” icon again
- Select “Auto Update Tolerance”
- Multi-select two surfaces (Surface5 & Surface6)
- Click Apply, then click ok to complete

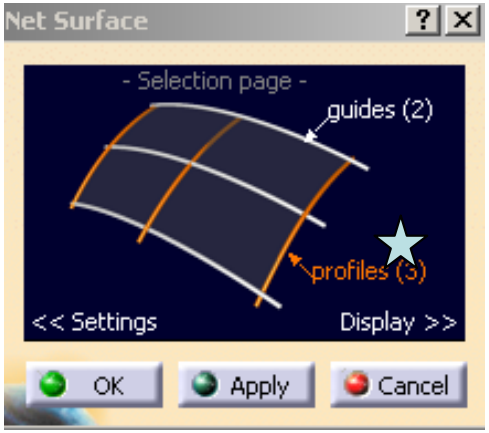




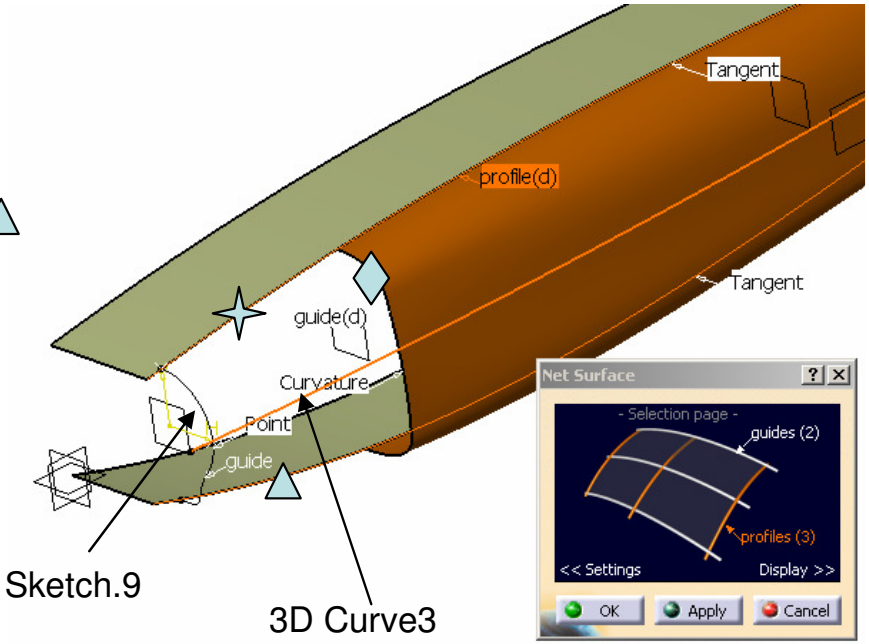
Tutorial 4B

To Create a Net Surface (2nd):-





- Hide “Sketch5” , “Sketch6”, “Sketch7” and “Sketch8”
- Click “Net Surface” icon
- Pressing “CTRL” key on the keyboard, multi-select the surface edge and then “Sketch9” as Guides
- **(REMARK: The surface edge must be selected FIRST because its shape is more important than “Sketch9”)**
- Change the continuity on the surface edge as “CURVATURE”

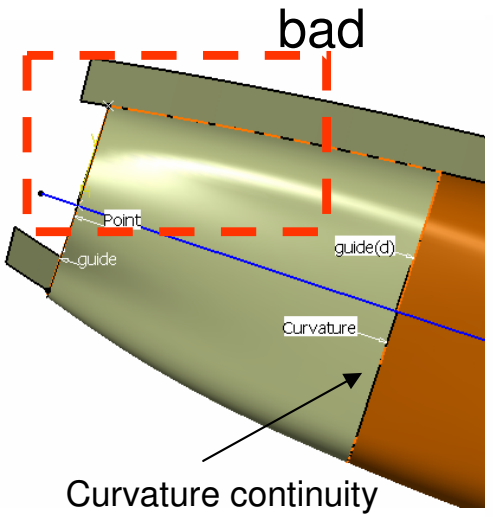


- Click on the text “Profiles(0)” in the command window
- Pressing “CTRL” key on the keyboard, multi-select the surface edge, “3D Curve3” and another surface edge as Profiles
- Change the continuity on both surface edges as “TANGENT”
- **Click “Apply” to preview FIRST**

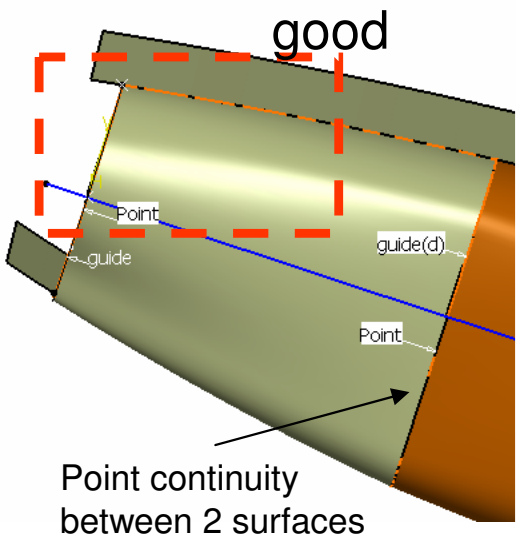
Tutorial 4B

(Cont'):-

- From the preview, the portion near Sketch9 is not smooth, therefore …
- Change "Curvature Continuity" to "Point Continuity"
- Click ok to complete
- (It leads to a sharp edge between this NetSurface and its connecting surface, but we will correct it later)
- (Remark: "NetSurface2" should be a single-face surface because it is built from an edge of another single-face surface)

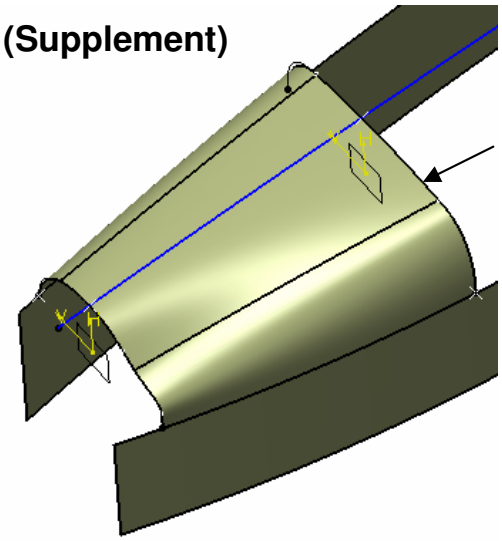


Curvature continuity between 2 surfaces



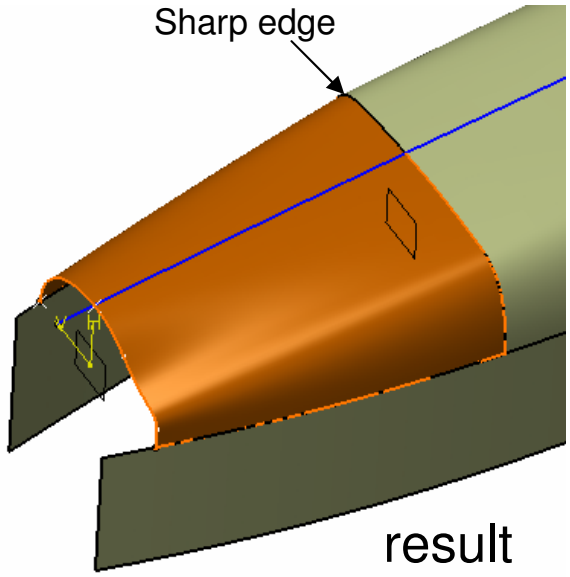
Point continuity between 2 surfaces

(Supplement)



Sketch5 (with 3 curves)

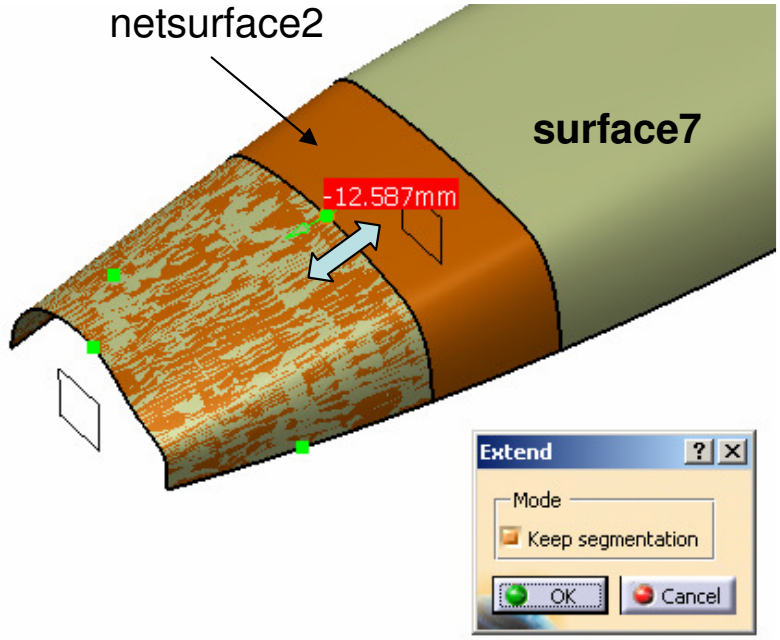
If Sketch5 is used as the guide, the resultant surface will be a multi-faces surface. To convert it into a single-face surface, refer to the previous page.



Tutorial 4B

Hide "Surface1" & "Surface2" (two extrude surfaces)

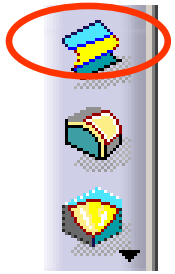
Hide "3D curve3" & "Sketch9"



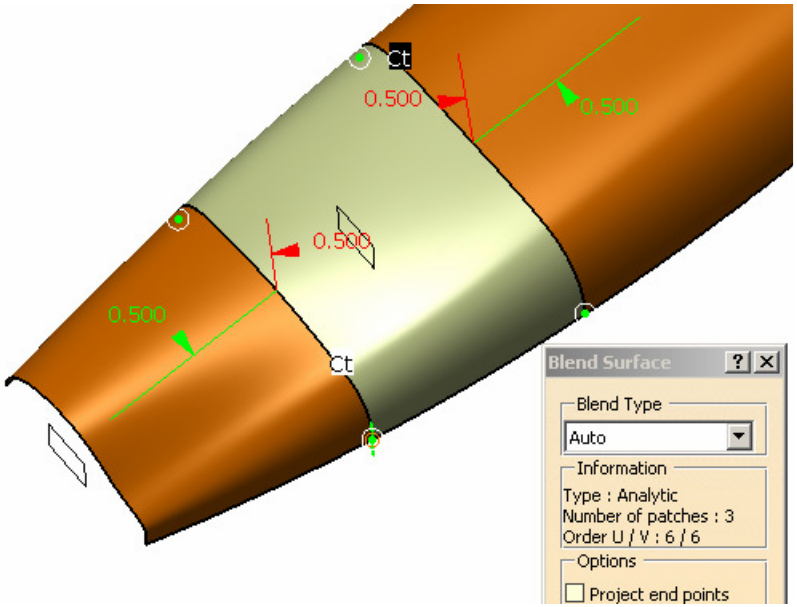
To Shorten surfaces:-

- Click "Extend" icon
- Click on "NetSurface2"
- (A new surface will be created, click ok to accept)
- Drag on the green dot to shorten the surface by around 13mm
- Click ok to complete
- Delete "NetSurface2" (or hide it)
- Similarly, Shorten "Surface7" by ~13mm

To create a Blend Surface:-



- Click "Freestyle Blend Surface" icon
- Select the two surface edges
- Change both continuities to "CURVATURE"
- Click ok to complete



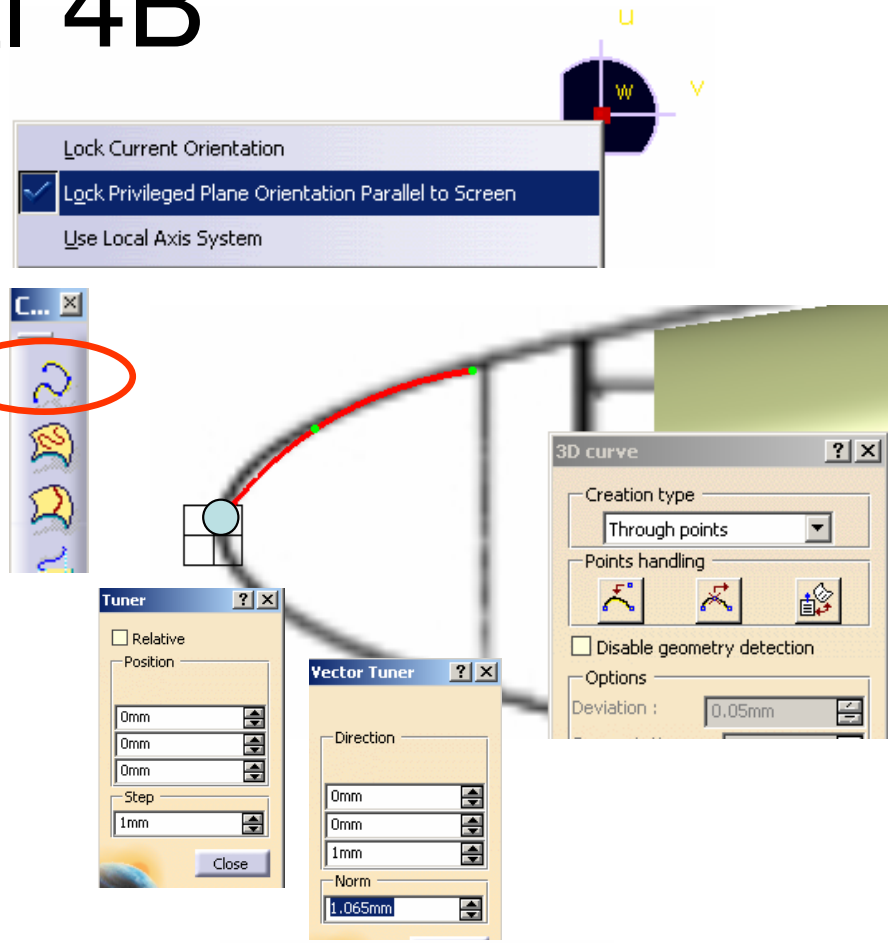
Tutorial 4B

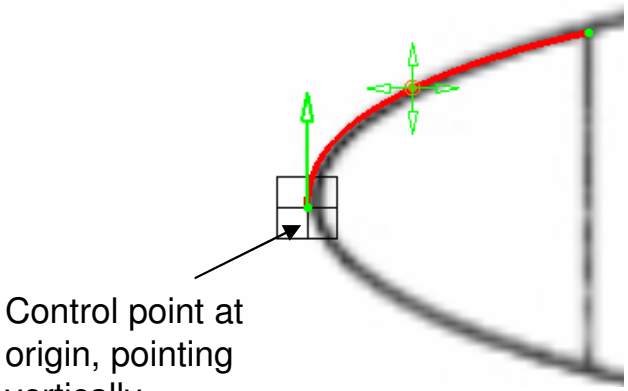
To Create a 3D Spline Curve:-

- Right-click on the compass, check if the option "Lock Privileged Plane Orientation Parallel to Screen" is on
- Click "Right VIew" icon
- Click "3D Curve" icon
- Draw a curve with 3 control points as shown
- Right Click on the control point near the origin, then select "EDIT"
- Change "x","y",and "z" to 0mm, select "Close"

- Right-click on the control point again, then select "Impose tangency"
- Right-click on the green arc, then select "Edit"
- Change "x", "y" to 0mm, change "z" to 1mm
- Select Close

- Adjust the other control points to match the image
- Click ok to complete





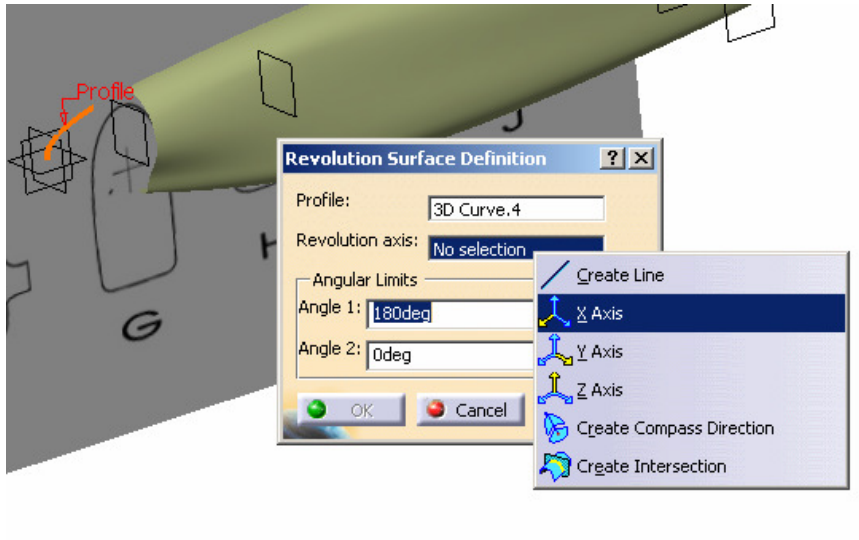
Control point at origin, pointing vertically

Result

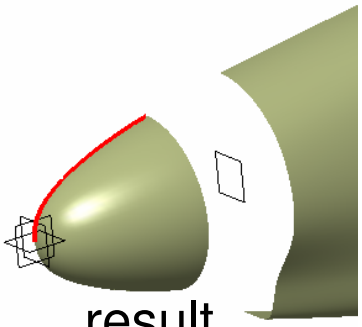
Tutorial 4B

To create a Revolve surface:-

- Click “Revolve” icon
- Select “3D Curve.4” as profile
- Right-Click on the entry box “Revolution axis”
- Select “X axis”
- Enter 0 as Angle1
- Enter 180 as Angle2
- Click ok to complete



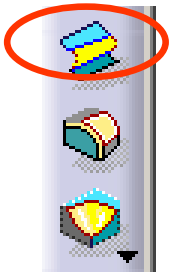
- Hide “3D Curve.4”

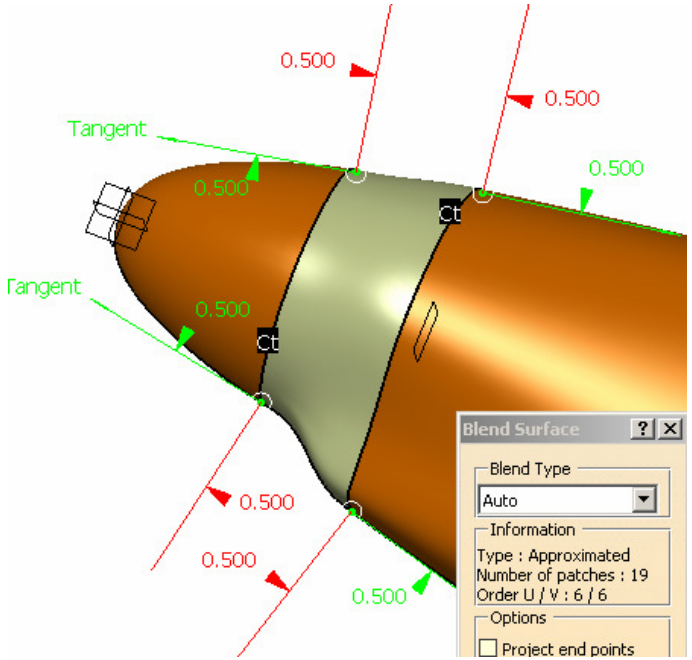


result

To create a Blend Surface:-

- Click “Freestyle Blend Surface” icon
- Select the two surface edges
- Change both continuities to “CURVATURE”
- Click ok to complete

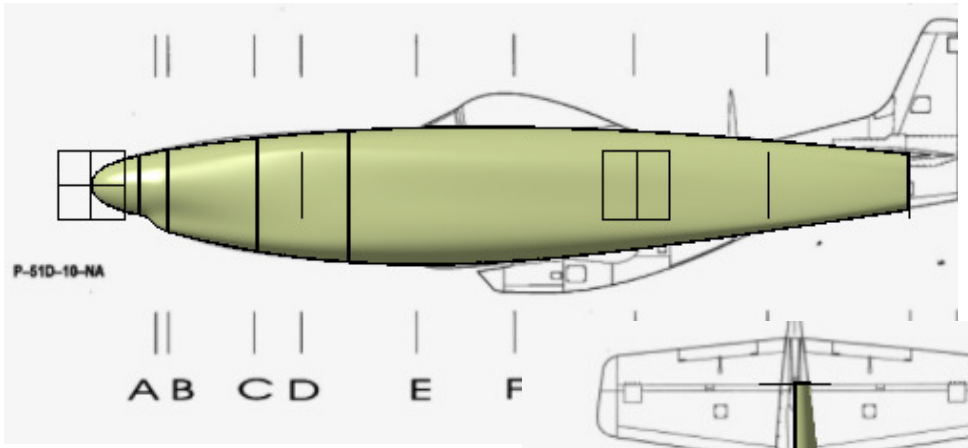




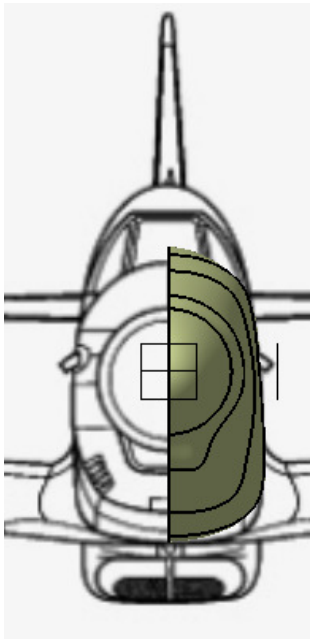
Tutorial 4B

Check Surfaces:

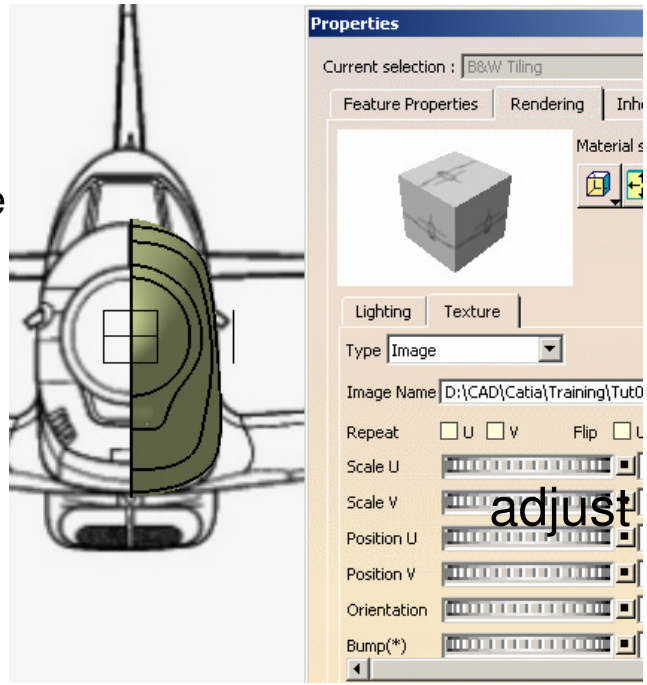
- Click “Right View” icon; The surfaces should match the right view
- Click “Top View” icon; they should also match the top view. (because most of the control curves were referred to these two views)

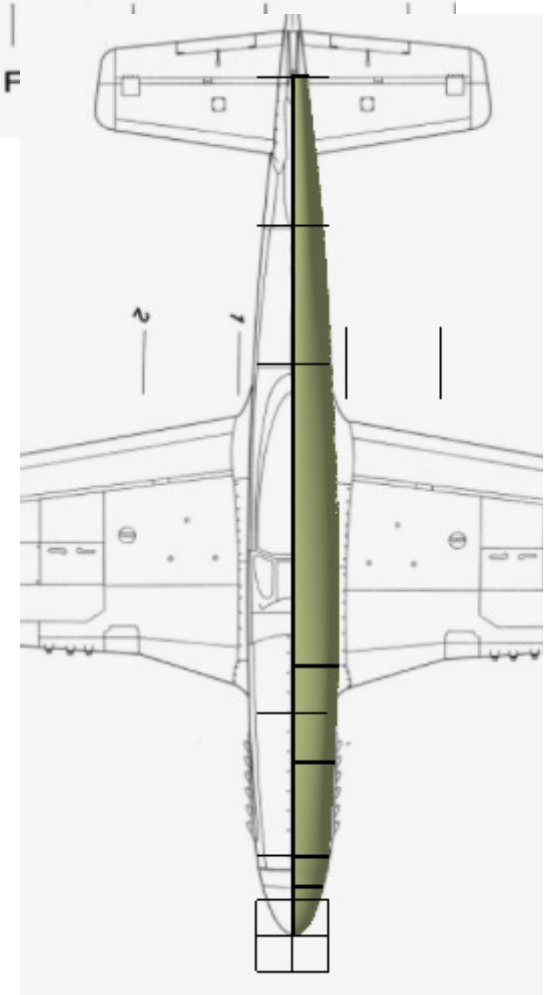


- Click “Front View” icon
- If any misalignment is found, adjust the image location of the front view

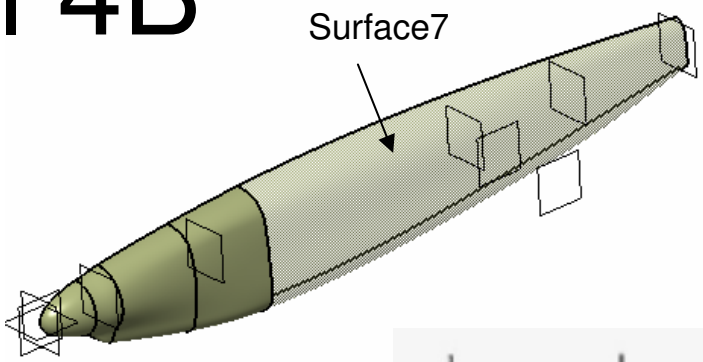


Fine-Tune front view image





Tutorial 4B

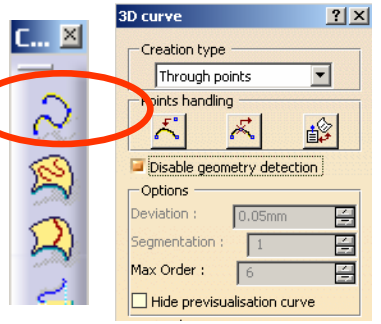


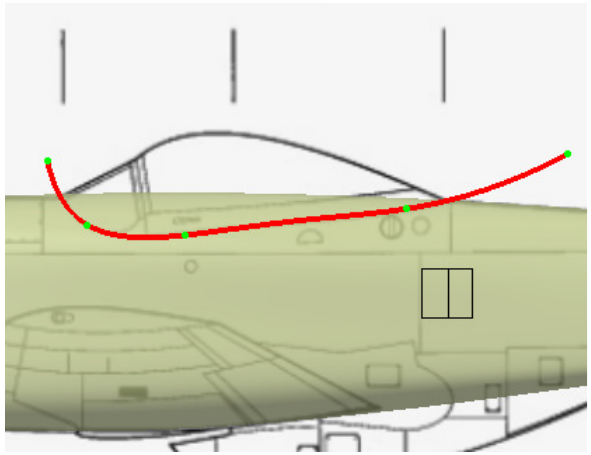
To make a surface SemiTransparent:-

- Right-Click “Surface7”
- Select “Properties”, change Transparency to 50
- Click ok to confirm

To Make a 3D curve:-

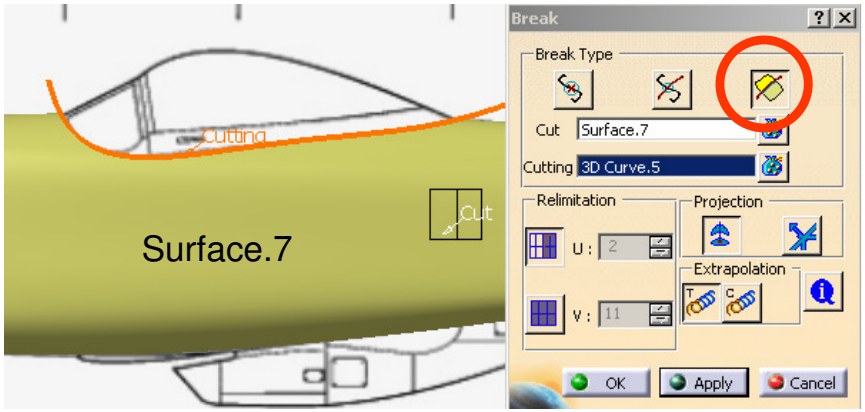
- Click “Right View” icon
- Click “3D Curve” icon
- “Disable geometry detection” (we will not click a point on the existing surface)
- Draw a curve with 5 control points as shown
- Click ok to complete





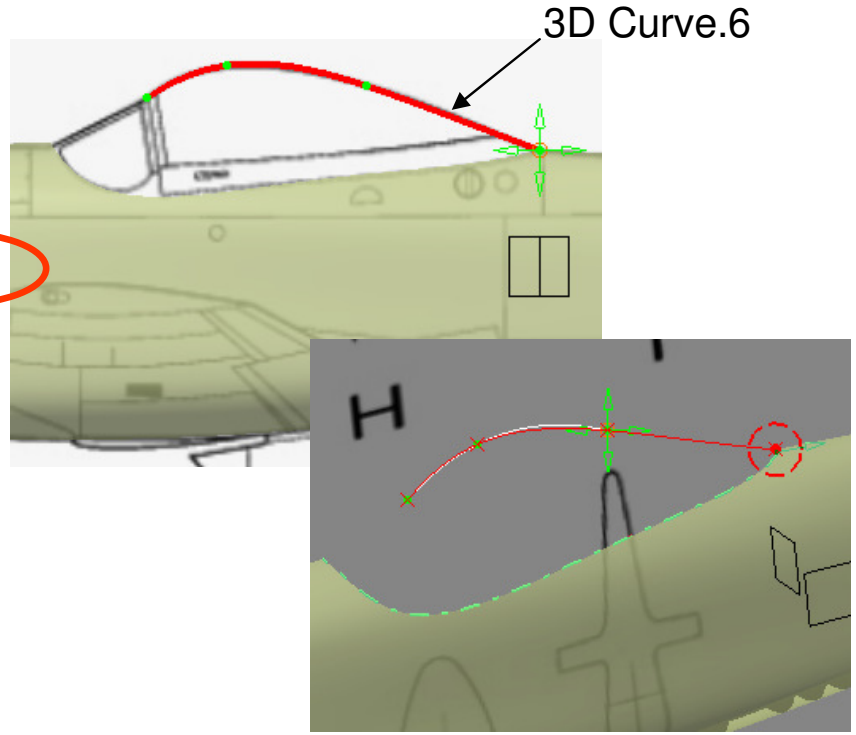
To Cut a surface by a curve (not on the surface):-

- Click “Break Surface or Curve” icon
- Select “Break Surfaces by Curves” as Type
- Select “Along Compass” as direction
- Select “Surface 7” as Cut
- Select “3D Curve5” as Cutting
- Click Apply
- Click on the portion to remove
- Click ok to complete



Tutorial 4B

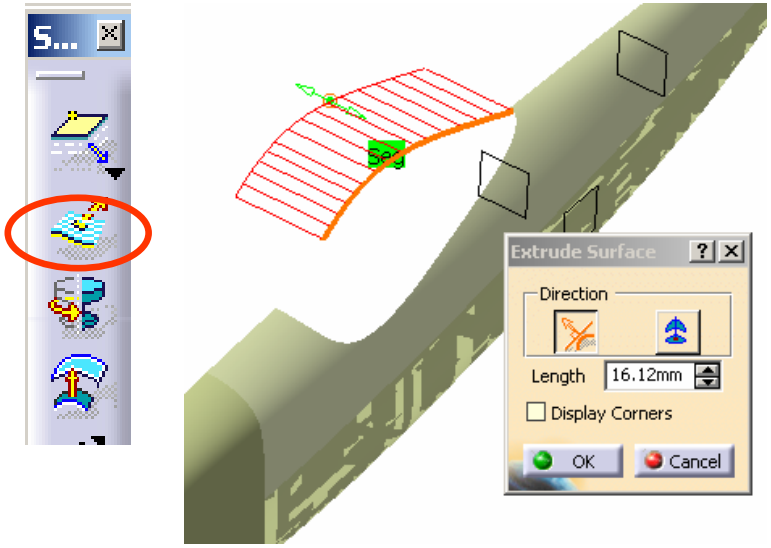
Hide "3D Curve.5"



To make a 3d curve:-

- Click "Right View" icon (if the current viewpoint is not Right View)
- Click "3D Curve" icon
- Draw a curve with 4 control points as shown
- (We need to rotate the model a little bit so that we can snap the last point onto the existing endpoint)
- Click ok to complete

To create an Extrude surface:-

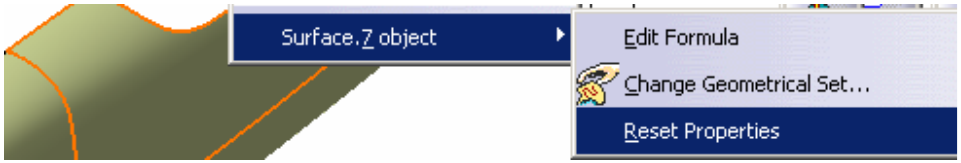


- Click "Extrude" icon
- Select "3D Curve.6"
- Select "Normal to the curve" as direction
- Drag the double arrow on the preview surface to the left, up to ~15mm
- Click ok to complete

Tutorial 4B

To Reset the graphic properties of a surface:-

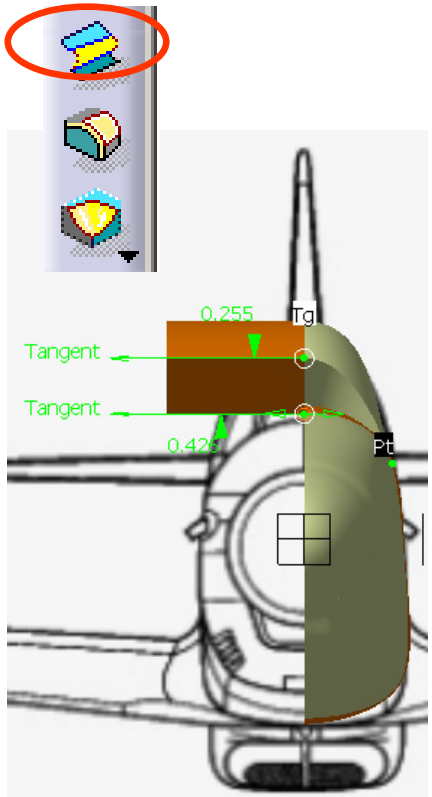
- Right Click “Surface.7” (transparent surface)
- Select “Surface.7 object/ Reset Properties”
- Select “Apply to Children”
- Click ok to confirm (the default graphic properties will be restored)

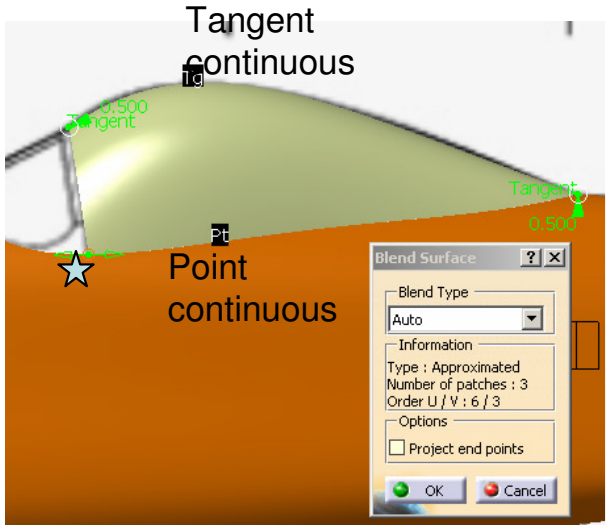


To Create a Blend Surface:-

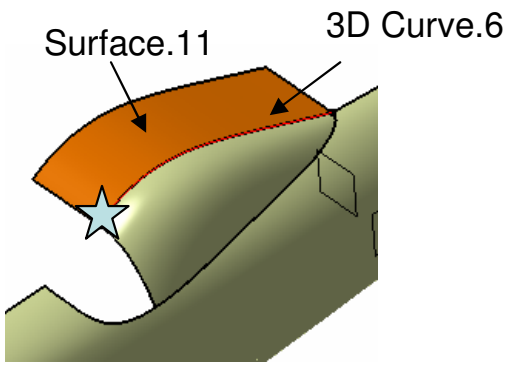
- Click “Freestyle Blend Surface” icon
- Select the two surface edges
- Disable “Project End points”
- Change the continuities as shown
- Drag the point ☆to match the image

- Click “Front View” icon
- Adjust the tension values to match the image
- Click ok to complete





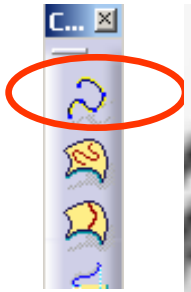
Tutorial 4B

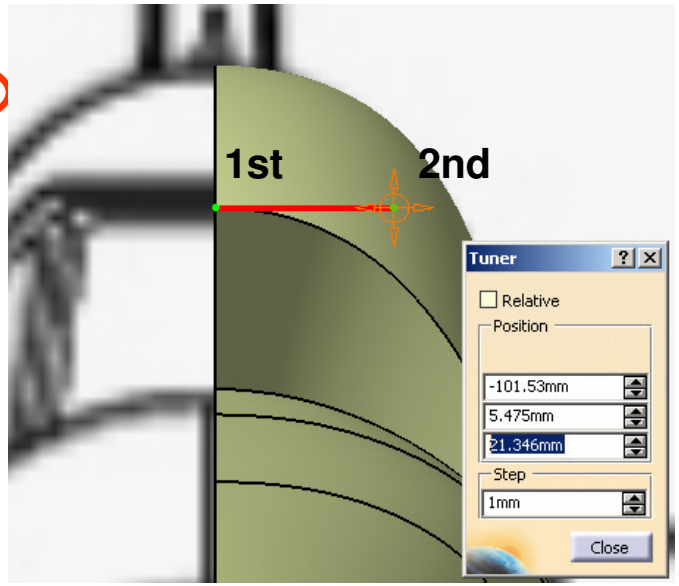


Hide “3D Curve.6” & “Surface.11”

To make a 3d curve:-

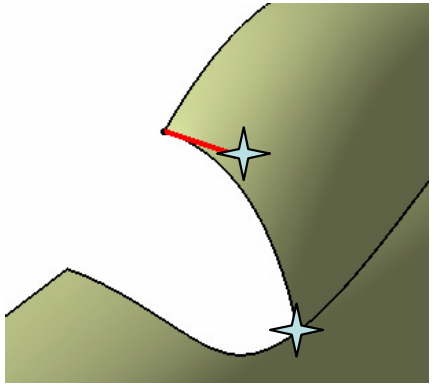
- Click “3D Curve” icon
- Pick the existing endpoint
- (When the endpoint is detected, a red dashed circle appears)
- Click “Front View” icon
- “Disable geometry detection”
- Pick another point on the right
- Right-click on the first point, then select “Edit”
- Copy the Z value
- Right-click on the second point, then select “Edit”, then past the previous Z value onto this Z value
- Click ok to complete





To make another 3d curve:-

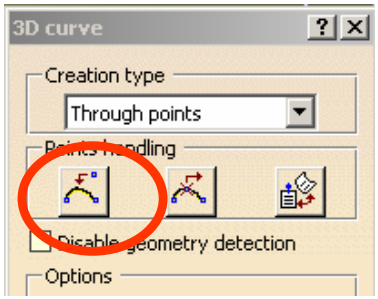
- Rotate the 3D model as shown
- Click “3D Curve” icon again
- Pick the two existing endpoints

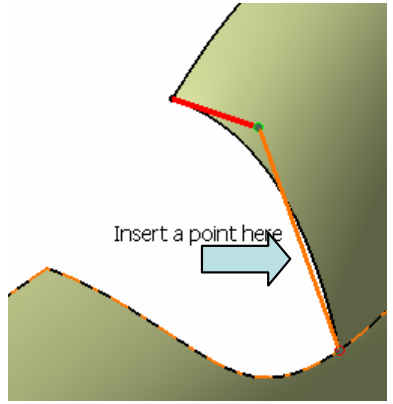


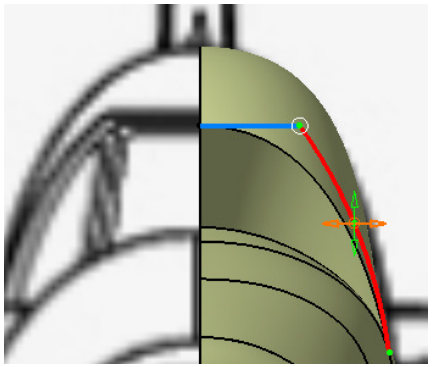
Tutorial 4B

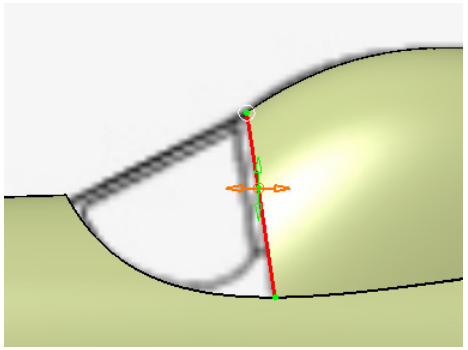
Cont':-

- Then click "Insert a Point" icon
- Click the middle of the line (the middle point will then be created)
- Click "Front View" icon
- "Disable geometry detection"
- Drag the middle point to match the image
- Click "Right View" icon
- Drag the middle point to match the image
- Click ok to complete



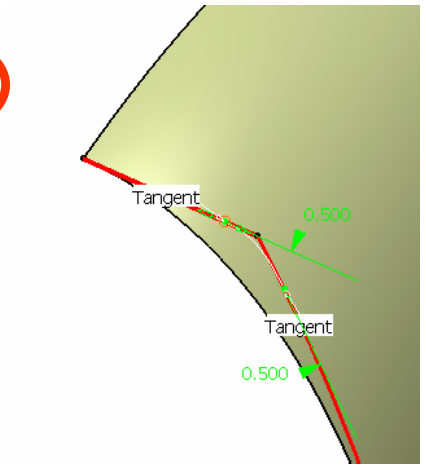


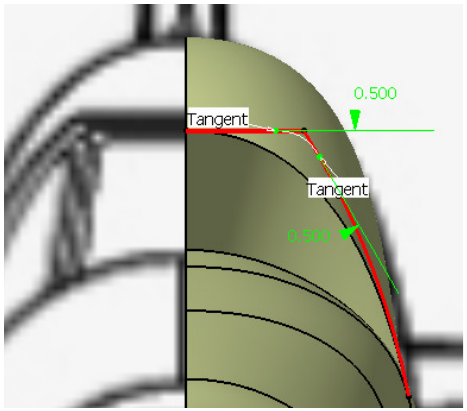




To make a Blend curve:-

- Click "Freestyle Blend Curve" icon
- Select the two 3D curves
- Change the continuities to "Tangent"
- Drag on the endpoints to change their positions until the blend curve can match the image
- Click ok to complete

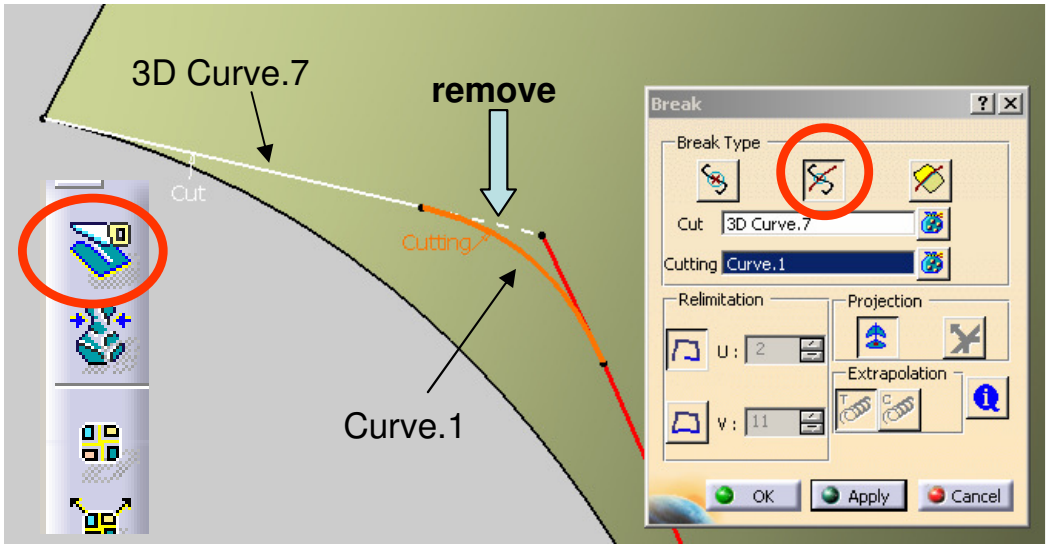




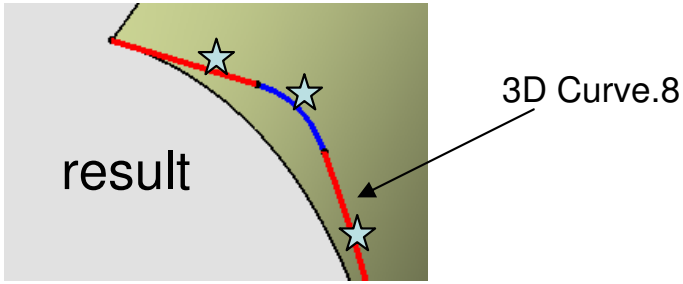
Tutorial 4B

To Cut a curve by another curve:-

- Click “Break Surface or Curve” icon
- Select “Curves by Curves” as Break Type
- Select “3D Curve.7” as Cut
- Select “Curve.1” (previous blend curve) as Cutting
- Click Apply
- Click on the portion to remove
- Click ok to complete

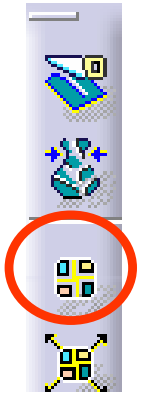


- Similarly, remove the portion on “3D Curve.8”



To Convert THREE curves into ONE curve:-

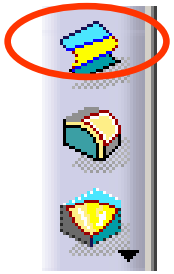
- Click “Concatenate” icon
- Multi-select the three curves ☆
- Click Apply , then click Ok to complete

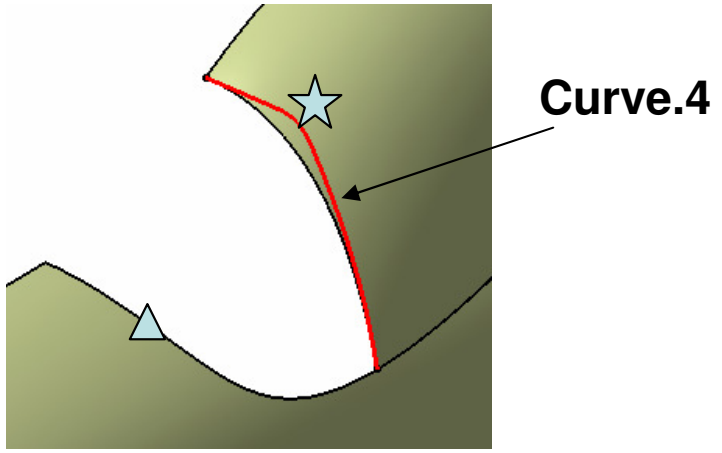


Tutorial 4B

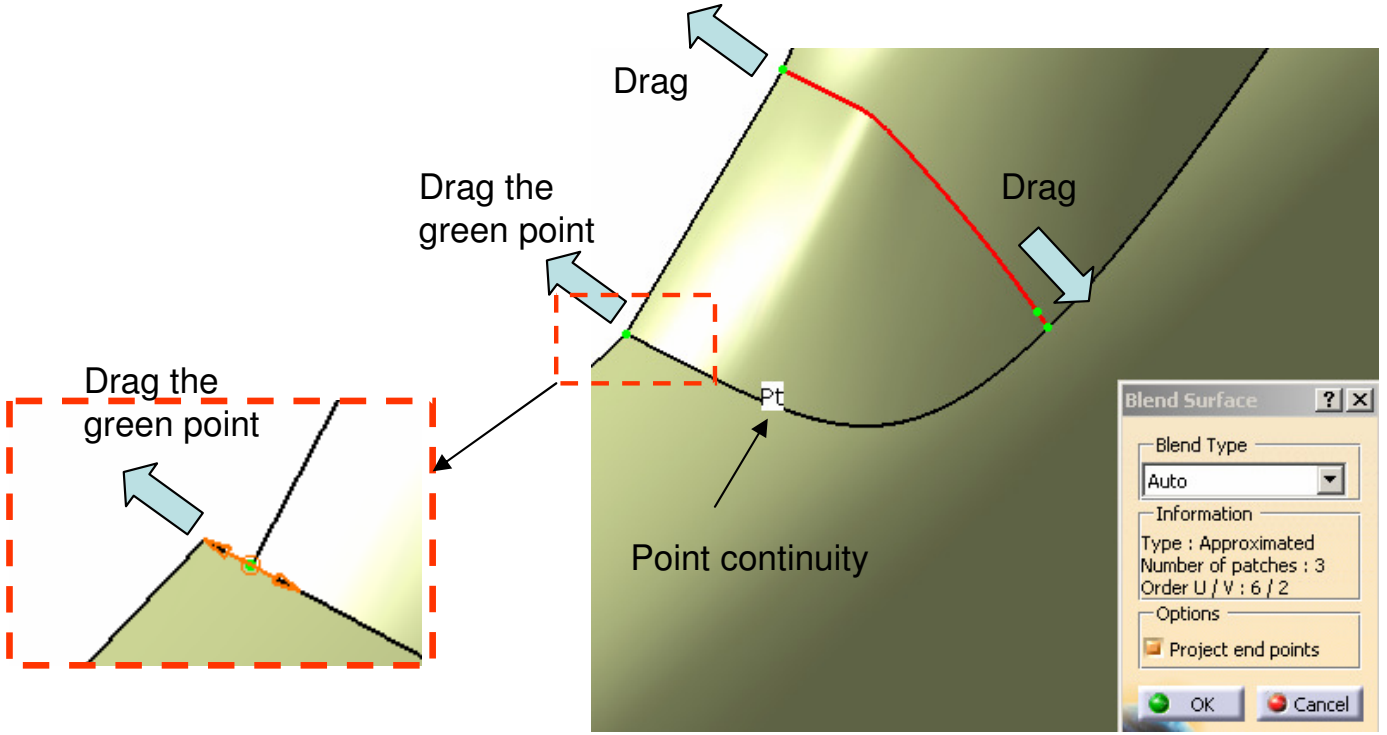
To create a Blend surface:-

- Click “Freestyle Blend Surface” icon
- Select the curve ☆
- Select the surface edge △
- Click ok on the pop-up window
- Select “Project Endpoints” option
- Select “Point” as the continuity
- Drag the three green points to limit (as shown)
- Click ok to complete





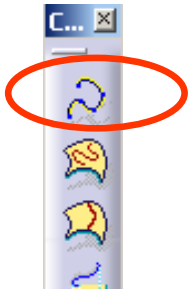
Hide “Curve.4”

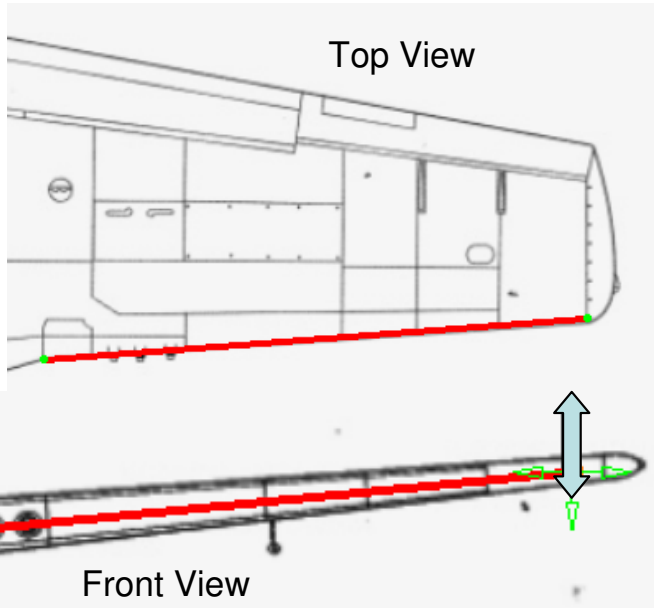


Tutorial 4B

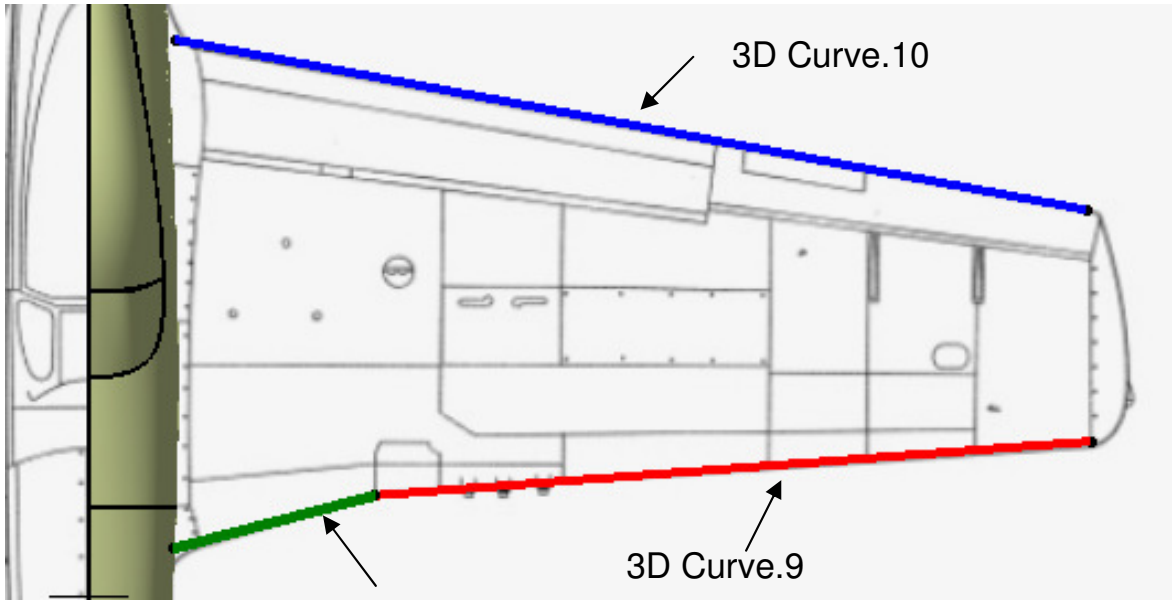
To make a 3d curve:-

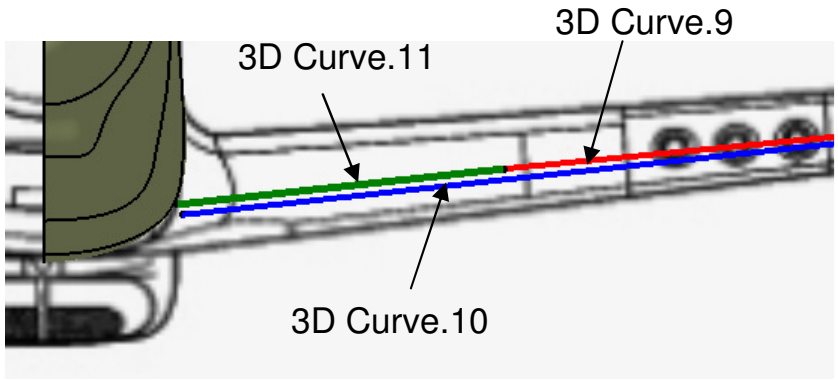
- Click “Top View” icon
- Click “3D Curve” icon
- Draw a curve with 2 control points as shown
- Click “Front View” icon
- Drag the two control points to match the image
- Click ok to complete





- Similarly, draw another two 3D Curves as shown below (“3DCurve.10” & “3DCurve.11”)

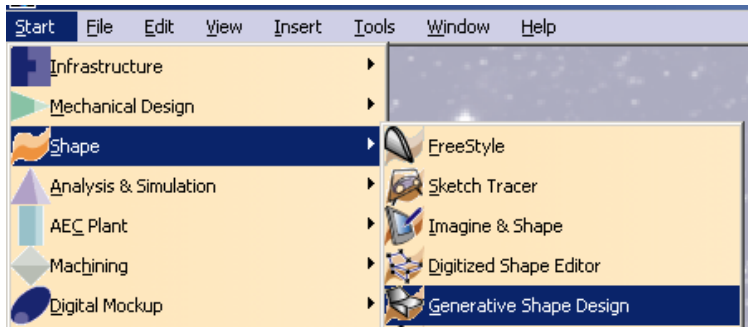




Tutorial 4B

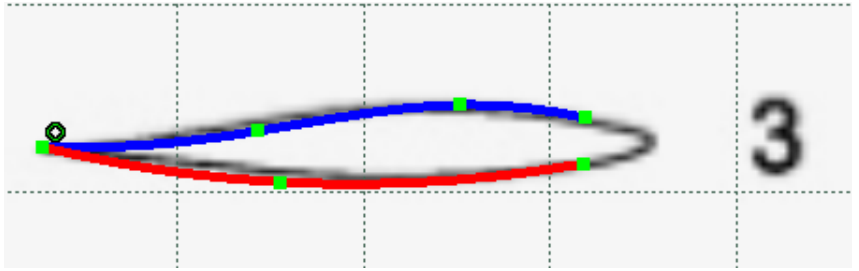
To create a Sketch on Section 3:-

- **Select "Start/Shape/Generative Shape Design"** on the menu bar

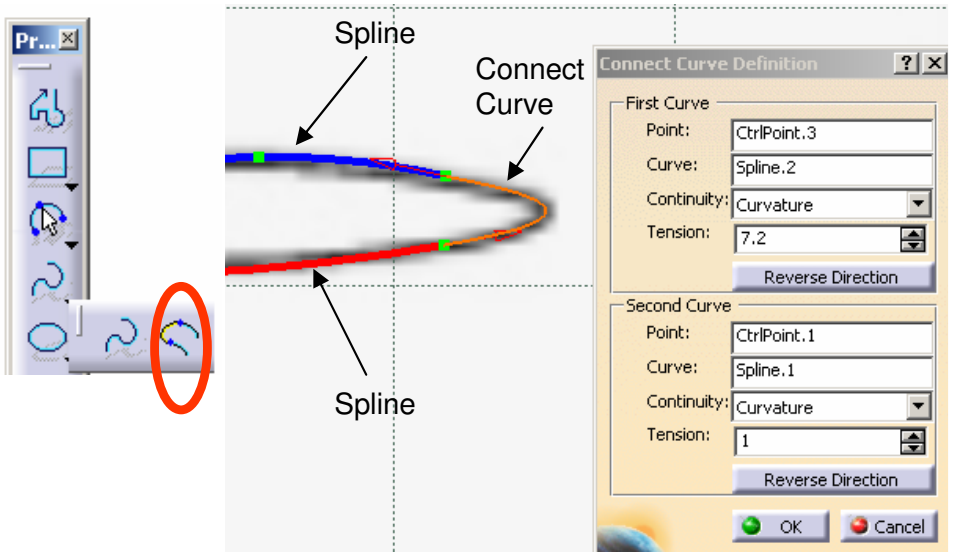


- Click "Sketch" icon, select xy plane

- Draw a spline curve with 4 control points on the image of Section3
- Draw another spline curve with 3 control points on the image of Section3



- Draw a Connect Curve (double click on it to change the tangential direction at the endpoints)
- Adjust the tensions to match the image

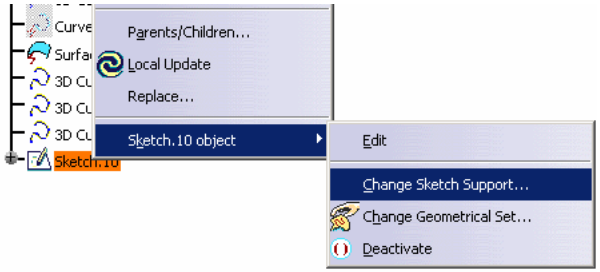


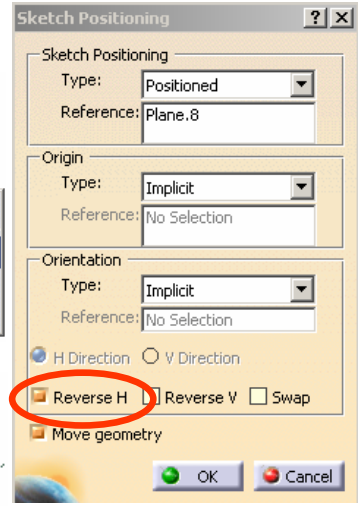
- Click Exit to complete

Tutorial 4B

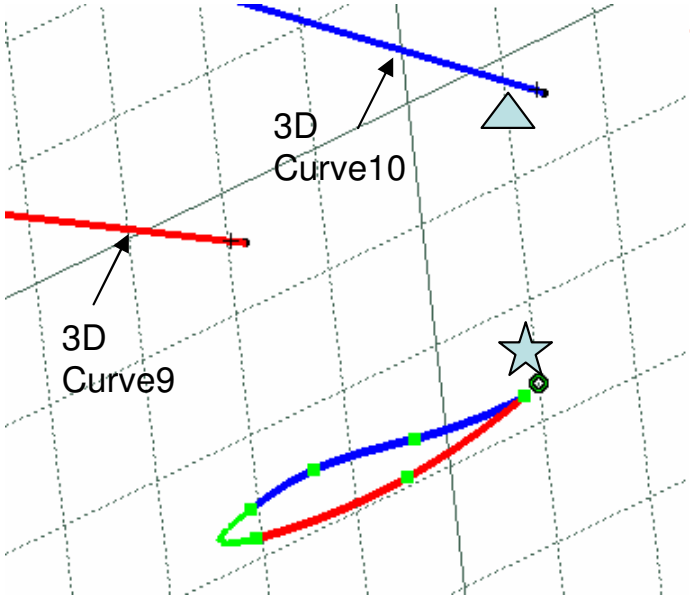
To Reposition the Sketch of Section 3:-

- Right-click “Sketch10”
- Select “Sketch.10 object/ Change Sketch Support“
- Select “Plane8” (for section 3)
- Select “Positioned” as Type
- **Select “Reverse H”**
- Click ok to confirm



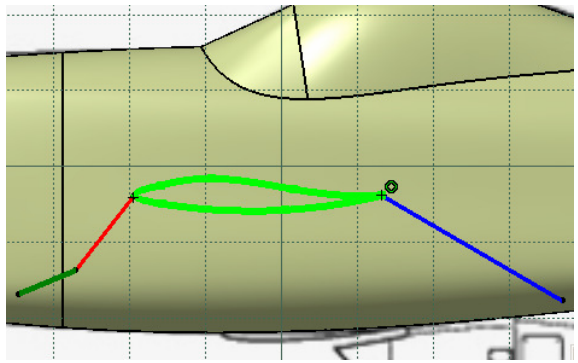


- Double-Click “Sketch10” to edit
- Multi-select “3D Curve9” & “3D Curve10”
- Click “Intersect 3D elements” icon to get two intersection points



- Select all curves
- Click “Translate” icon
- Deselect “Duplicate mode”
- Click the point ☆
- Then click the point △

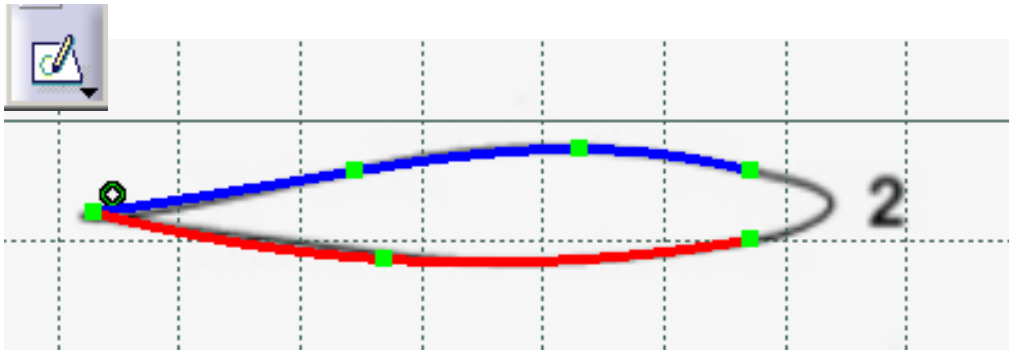
- Adjust the profile so that it can touch “3D Curve9”
- Click Exit complete



Tutorial 4B

To Create a Sketch on Section 2:-

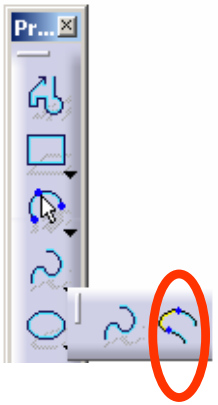
- Click “Sketch” icon, select xy plane

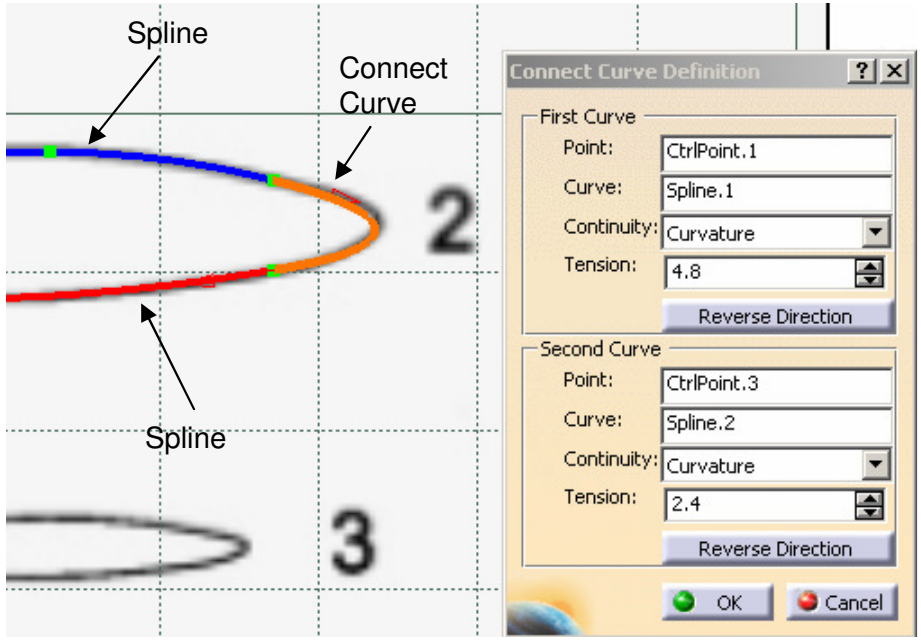


- Draw a spline curve with 4 control points on the image of Section2
- Draw another spline curve with 3 control points on the image of Section2

- Draw a Connect Curve (double click on it to change the tangential direction at the endpoints)
- Adjust the tensions to match the picture

- Click Exit to complete

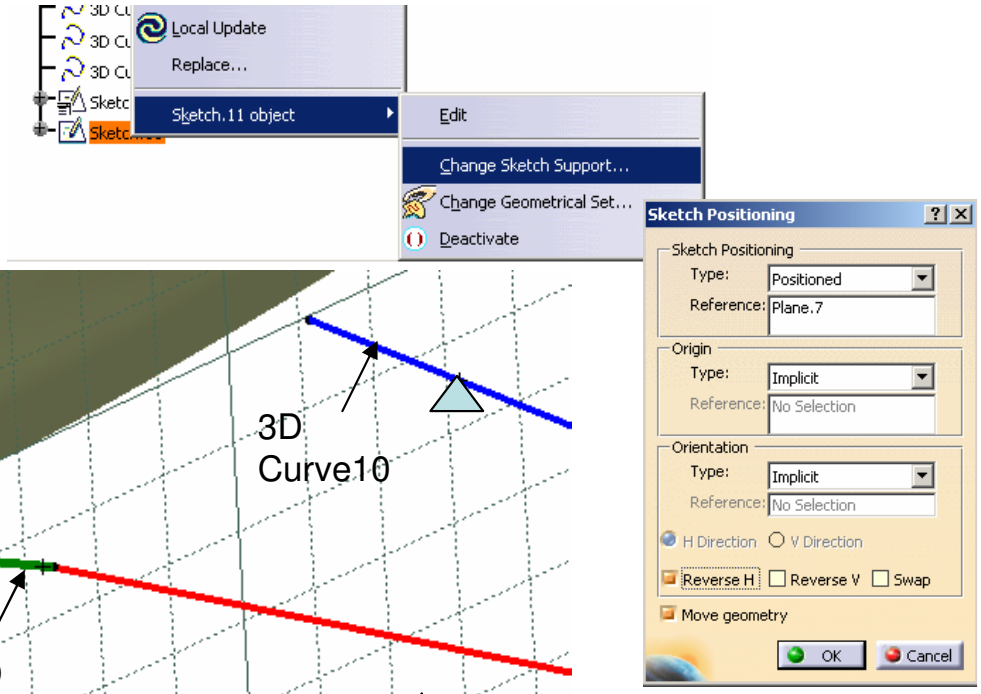




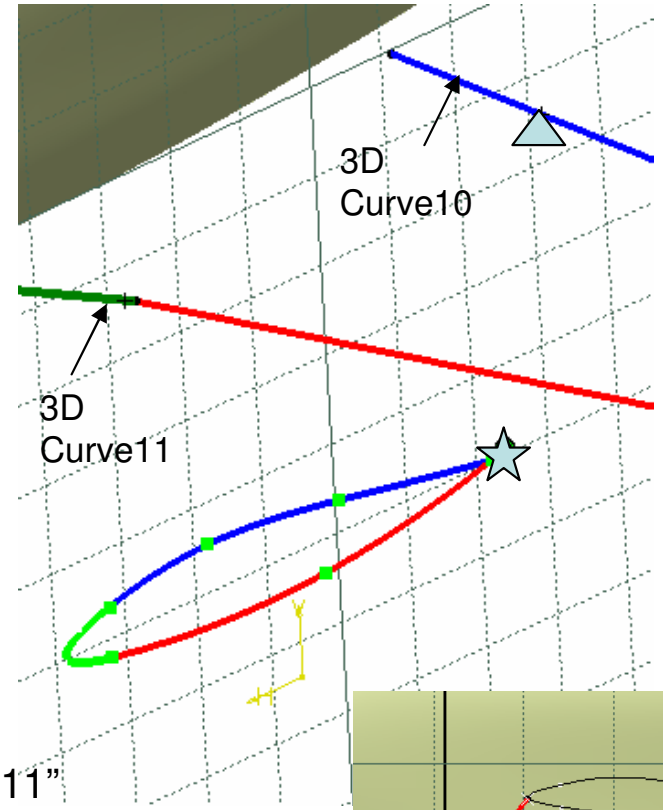
Tutorial 4B

To Reposition the sketch of Section 2:-

- Right-click “Sketch11”
- Select “Sketch.11 object/ Change Sketch Support“
- Select “Plane7” (for section 2)
- Select “Positioned” as Type
- **Select “Reverse H”**
- Click ok to confirm

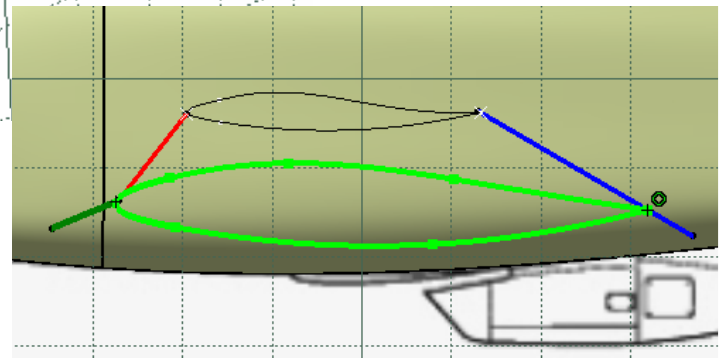


- Double-Click “Sketch11” to edit
- Multi-select “3D Curve10” & “3D Curve11”
- Click “Intersect 3D elements” icon to get two intersection points



- Select all curves
- Click “Translate” icon
- Deselect “Duplicate mode”
- Click the point ☆
- Then click the point △

- Adjust the profile so that it can touch “3D Curve11”
- Click Exit complete



Tutorial 4B

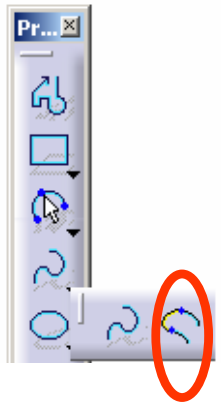
To Create a Sketch on Section 1:-

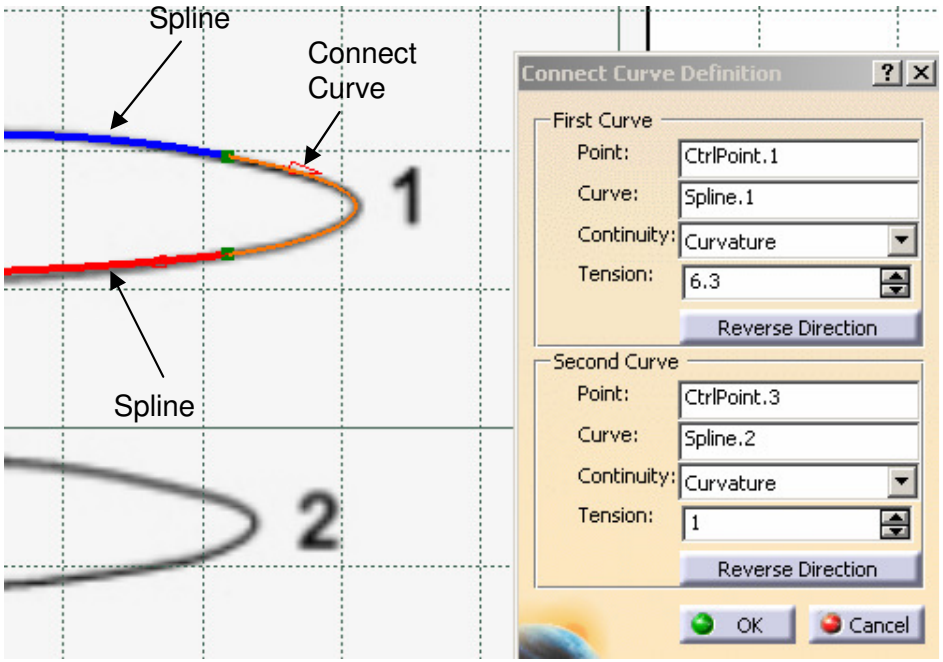
- Click “Sketch” icon, select xy plane

- Draw a spline curve with 4 control points on the image of Section1
- Draw another spline curve with 3 control points on the image of Section1

- Draw a Connect Curve (double click on it to change the tangential direction at the endpoints)
- Adjust the tensions to match the image

- Click Exit to complete

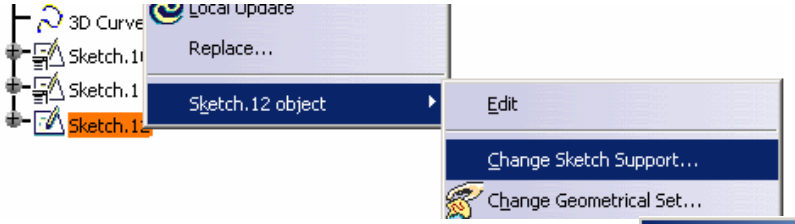


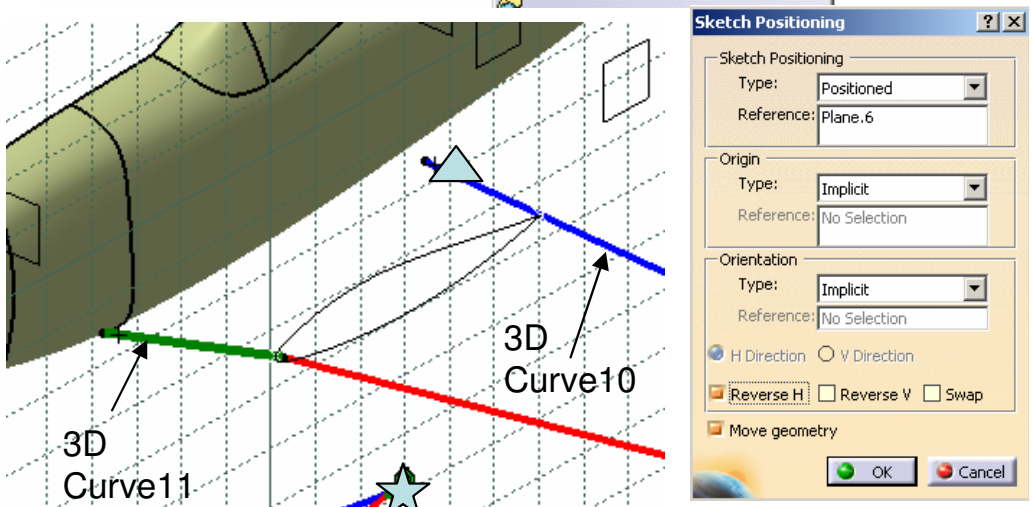


Tutorial 4B

To Reposition the Sketch of Section 1:-

- Right-click “Sketch12”
- Select “Sketch.12 object/ Change Sketch Support“
- Select “Plane6” (for section 1)
- Select “Positioned” as Type
- **Select “Reverse H”**
- Click ok to confirm

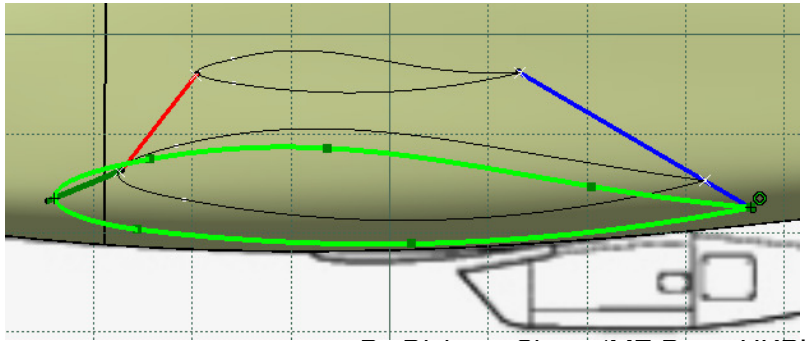




- Double-Click “Sketch12” to edit
- Multi-select “3D Curve10” & “3D Curve11”
- Click “Intersect 3D elements” icon to get two intersection points

- Select all curves
- Click “Translate” icon
- Deselect “Duplicate mode”
- Click the point ☆
- Then click the point △

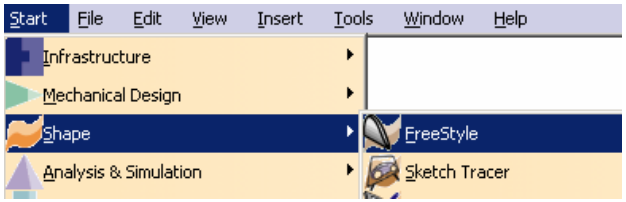
- Adjust the profile so that it can touch “3D Curve11”
- Click Exit complete



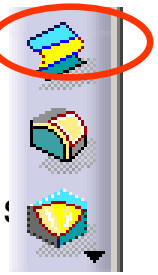
Tutorial 4B

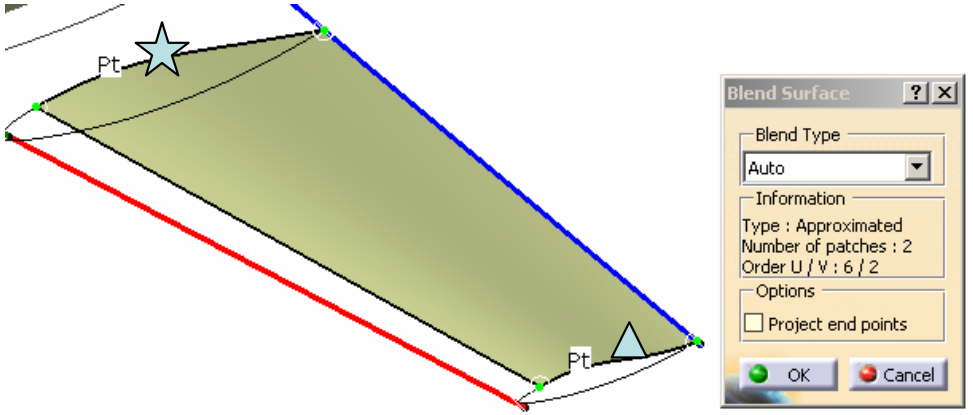
To create a Blend Surface:-

- **Select "Start/ Shape/ Freestyle" on the menu bar**

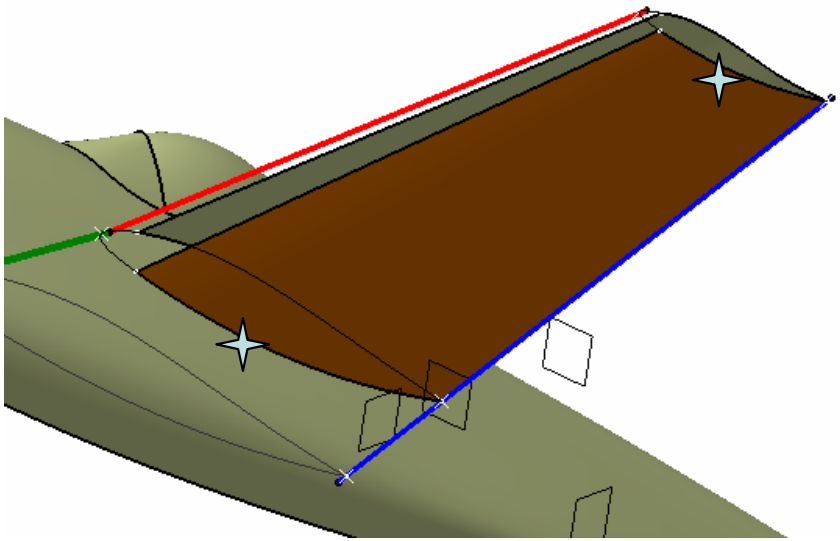


- Click "Freestyle Blend Surface" icon
- Select the curve ☆
- Select the curve △
- Select "Point" as the continuity on both s
- Click ok to complete





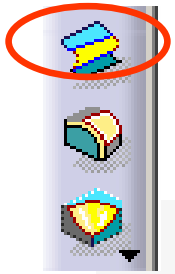
- Similarly, Click "Freestyle Blend Surface" icon again
- Select the curves ✦
- Select "Point" as the continuity on both sides
- Click ok to complete

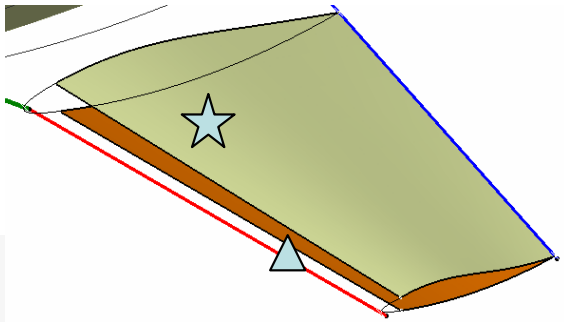


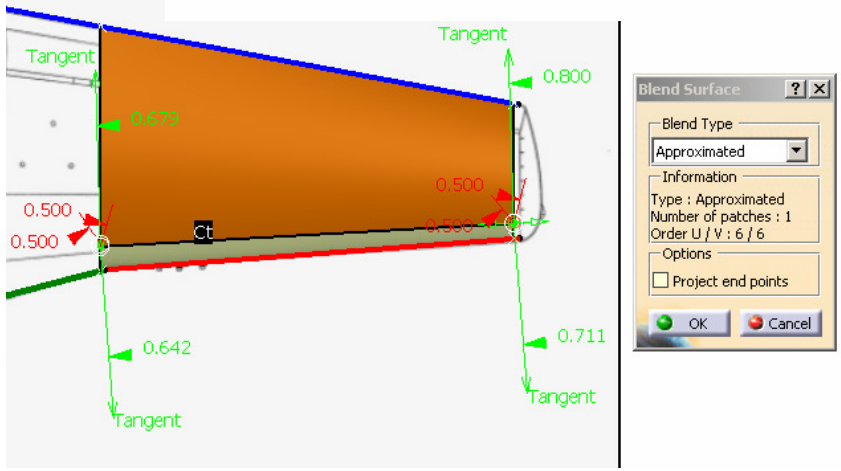
Tutorial 4B

To Create another Blend Surfaces:-

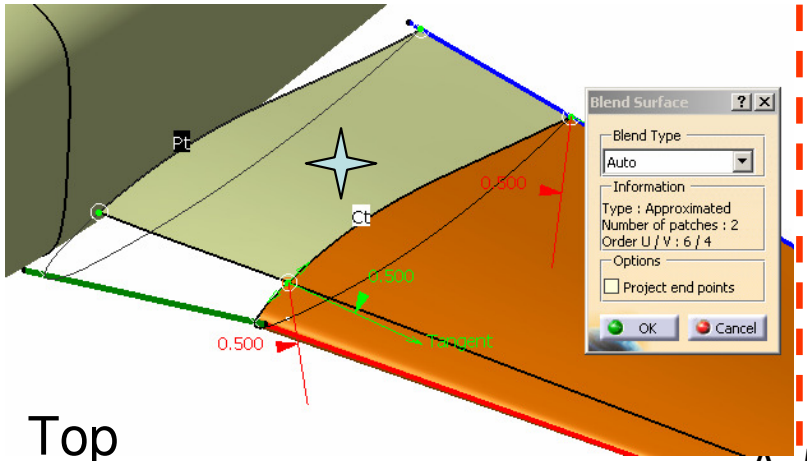
- Click “Freestyle Blend Surface” icon
- Select the surface edge ☆
- Select the surface edge △
- Select “Curvature” as the continuity on both sides
- Select “Approximated” as Blend Type
- Click “Top View” icon
- Adjust the tension values (green numbers) on both sides to match the image
- Click ok to complete



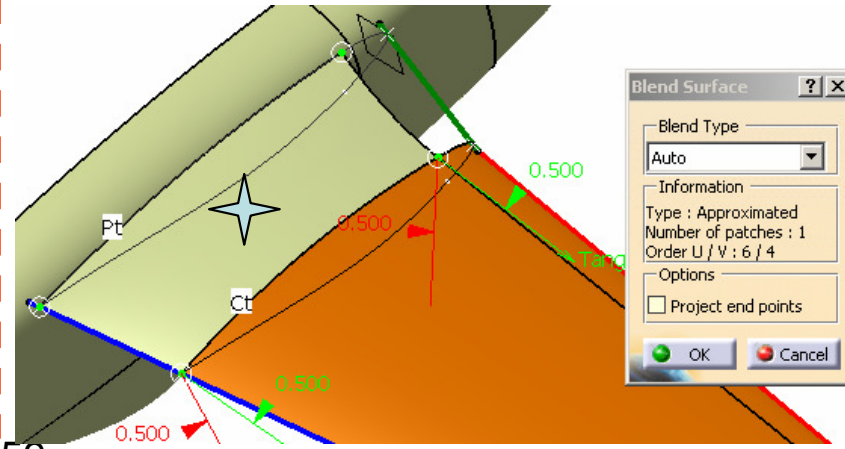




- Similarly, create two more Blend Surfaces ✦ as shown below (curvature continuous on one side)



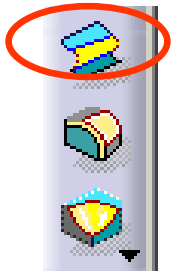
Top



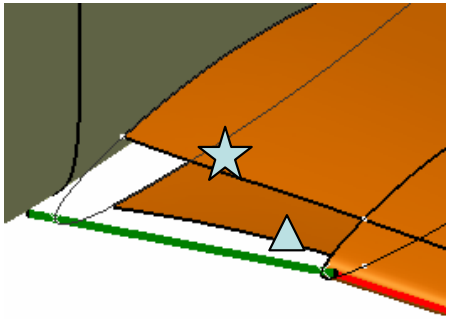
Bottom

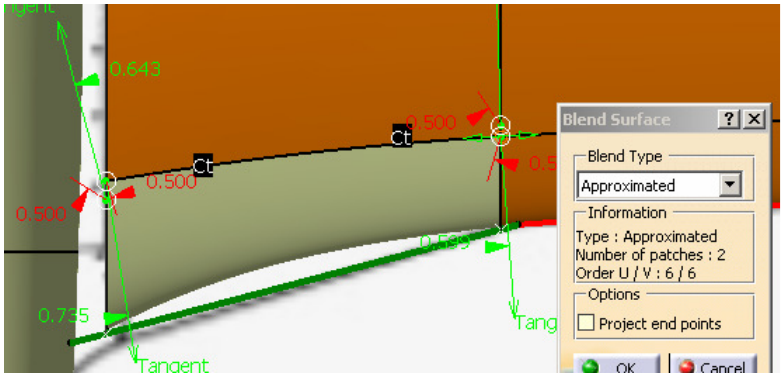
Tutorial 4B

To create a Blend Surface:-

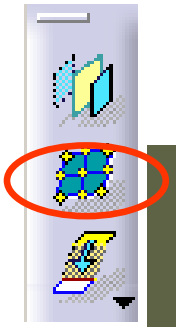


- Click “Freestyle Blend Surface” icon
- Select the surface edge ☆
- Select the surface edge △
- Select “Curvature” as the continuity on both sides
- Select “Approximated” as Blend Type
- Click “Top View” icon
- Adjust the tension values (green numbers) on both sides to match the image **(two ends only)**
- Click ok to complete

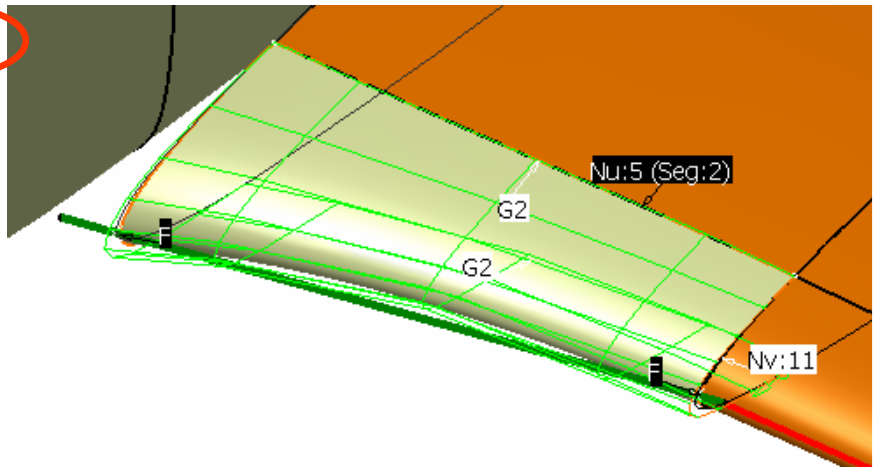




To Modify a Surface by its Control Points:-



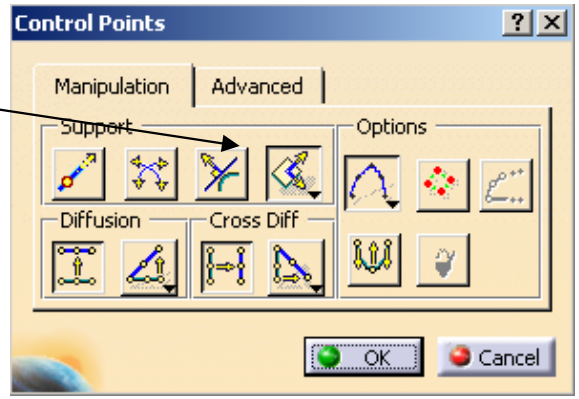
- Click “Control Points” icon
- Select the previous Blend Surface
- Select “G2” (keep curvature continuous) on surface edges; select “F” (free to move) on the other edges
- Change Nu to 5; Nv to 11 (right-click on the number, then select on the list)



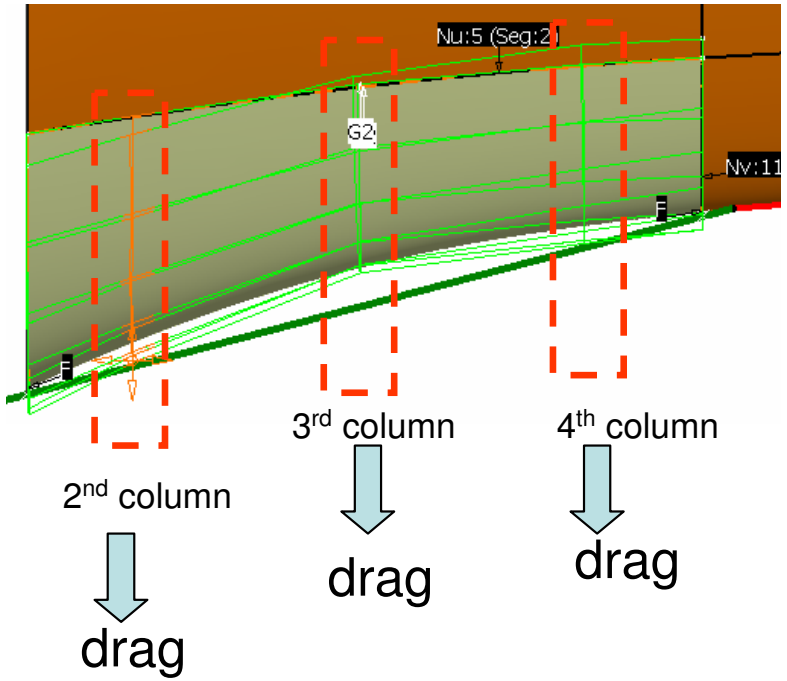
Tutorial 4B

Cont':-

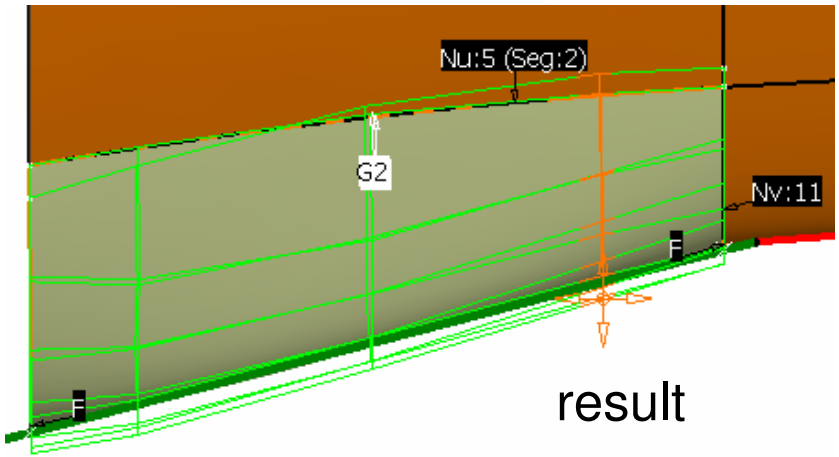
- Select "Compass Plane" as Support
- Select "Linear" as Diffusion
- Select "Linear" as Cross Diffusion
- Select "Mesh only" as Options



- Click "Top View' icon
- Click on the second column, then drag it downward to match the image



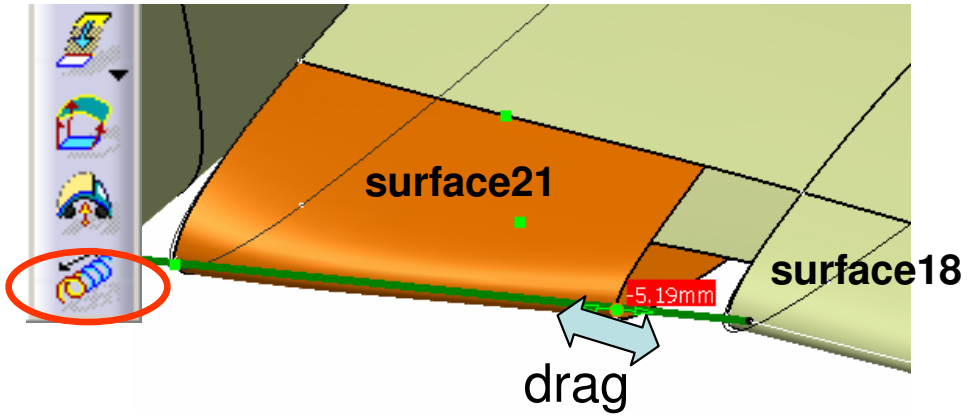
- Similarly, drag the third column, then the fourth column to match the image
- Click ok to complete



Tutorial 4B

To Shorten surfaces:-

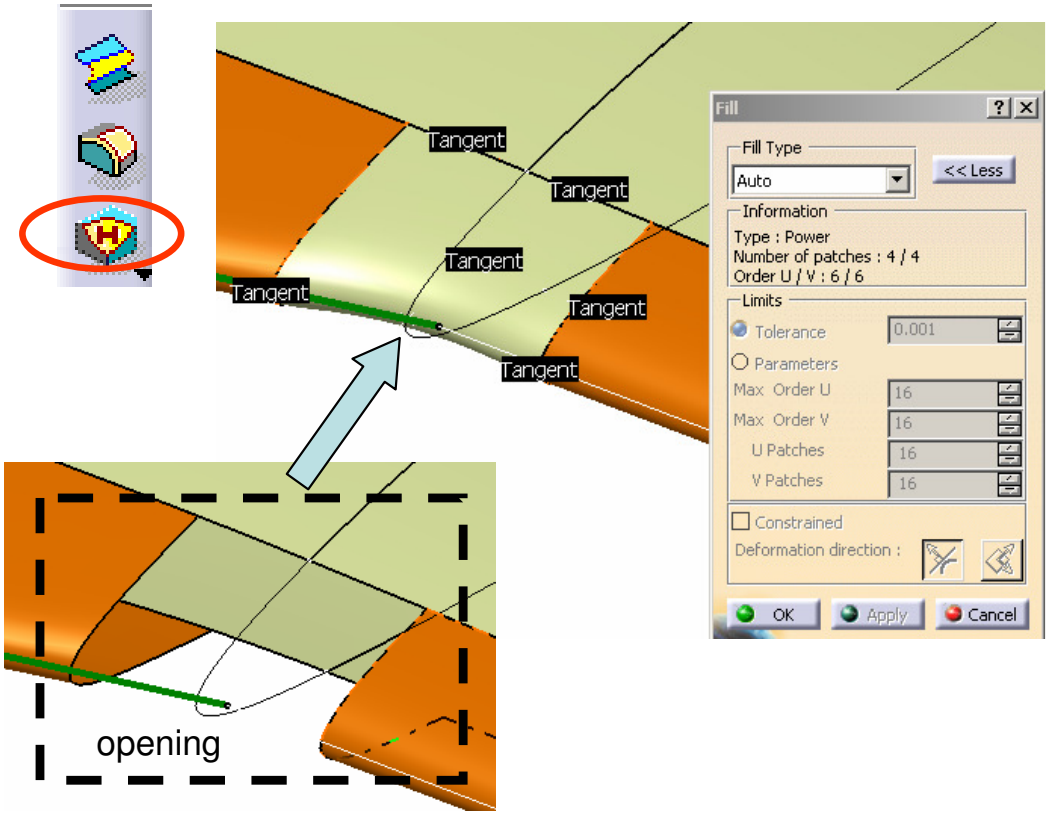
- Click “Extend” icon
- Click on “Surface21”
- Drag on the green dot to shorten the surface by around 5mm
- Click ok to complete
- Similarly, Shorten “Surface18” by ~5mm



To create a Fill Surface:-

- Click “Freestyle Fill” icon
- Select the surface edges of the opening
- Change all continuities to “Tangent”
- Click ok to complete
- (Different from “Fill”, the “Freestyle Fill” surface will be updated if its boundary is changed)

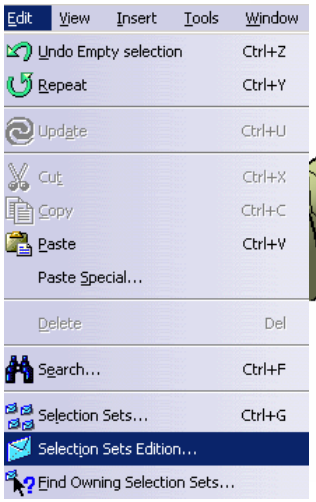
- (Optional: Extend Surface21 to modify this “Freestyle Fill” surface)

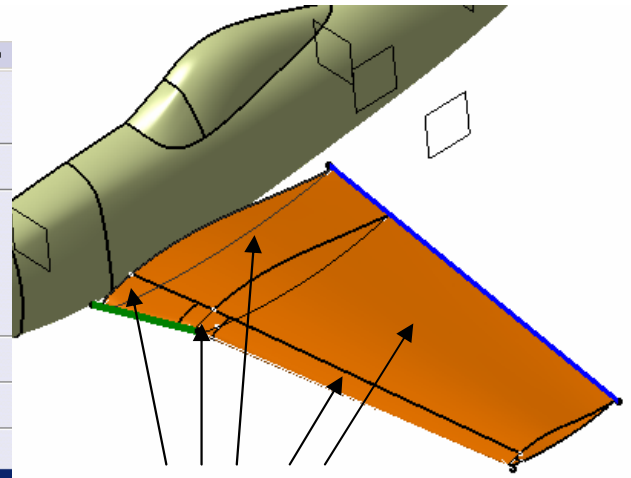


Tutorial 4B

To Define a Selection Set:-

- Select “Edit/ Selection Sets Edition” on the menu bar
- Click “Create Set” icon
- Rename it as “Wing”
- Select all the surfaces belonging to “Wing” (totally 7 surfaces)
- Click ok to complete

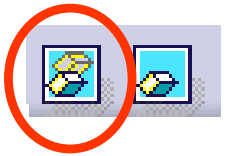


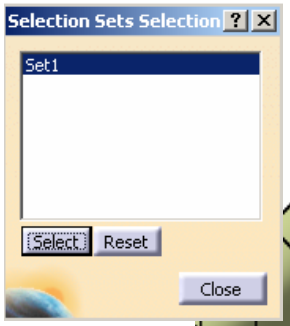


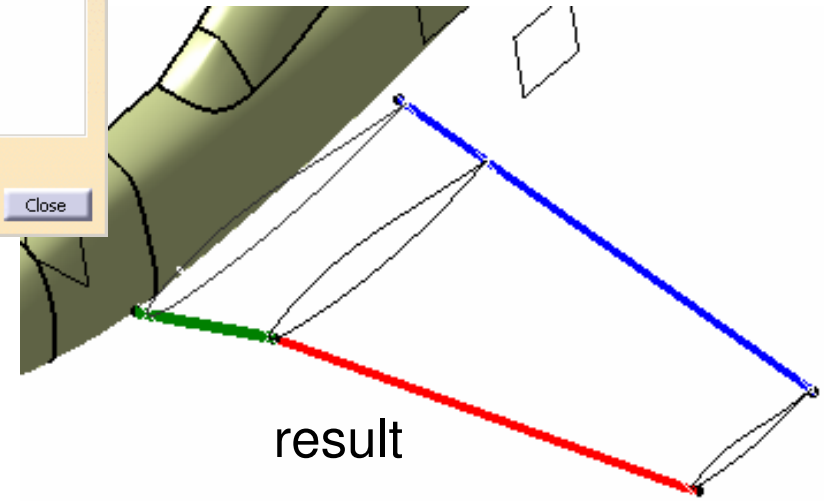
Define a selection set for these 7 surfaces

To Hide a Selection Set:-

- Select “Edit/ Selection Sets…” on the menu bar
- Select “Wing” on the list
- Click “Select” icon (all surfaces belonging to “Wing” will be selected)
- Click “Hide/Show” icon to hide
- Click “Close”







result

Save the file again

END of Tutorial 4B

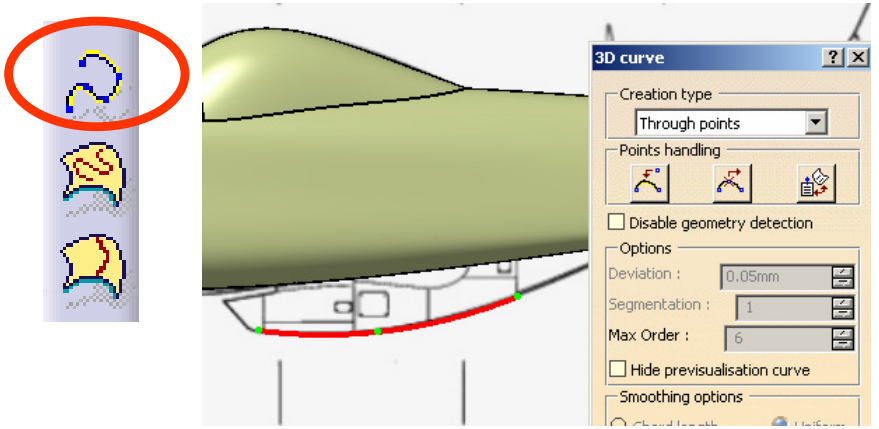
By Dickson Sham (ME Dept, HKPU)

Tutorial 4C

Hide all elements, except surfaces & x,y,z planes

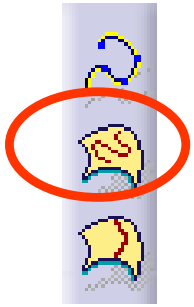
To create a 3D Spline Curve:-

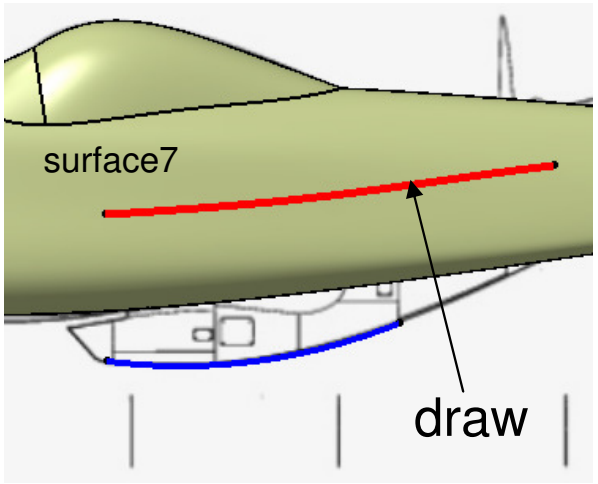
- Click “Right VIew” icon
- Click “3D Curve” icon
- Draw a curve with 3 control points as shown
- Click ok to complete



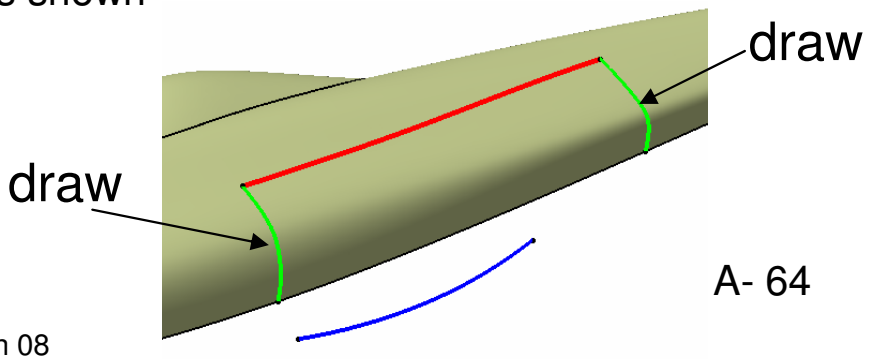
To create a Curve on a Surface:-

- Click “Curve on Surface” icon
- Click on “Surface 7”
- Draw a curve with 3 control points as shown
- Click ok to complete





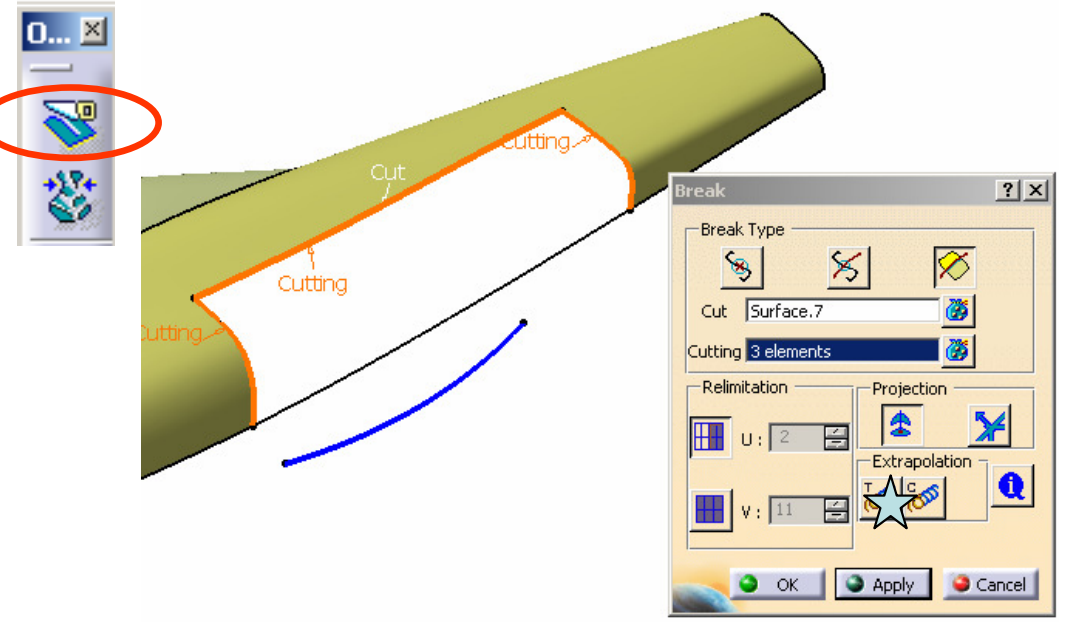
- Similarly, draw another 2 Curves on the same surface as shown



Tutorial 4C

To Cut a surface by curves:-

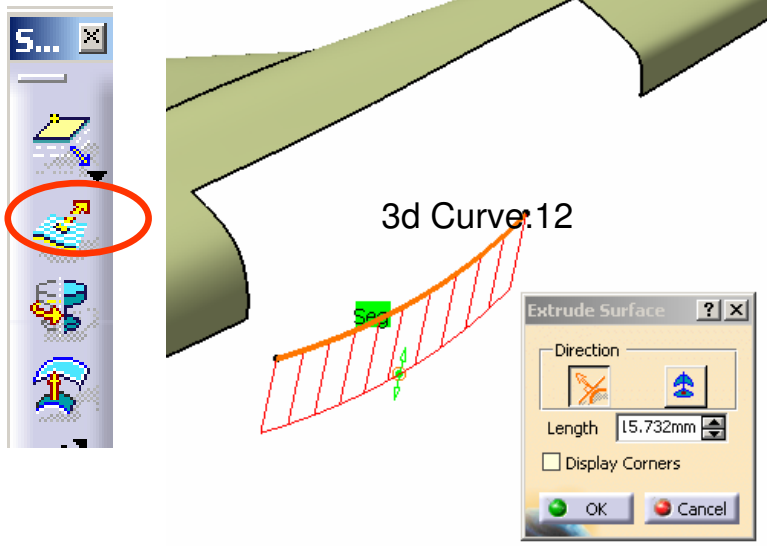
- Click “Break Surface or Curve” icon
- Select “Break Surfaces by Curves” as Type
- Select “Along Compass” as direction
- Select “Surface 7” as Cut
- Multi-Select the three curves (on surface) as Cutting
- **Deselect “Tangential Extrapolation”** ☆
- Click Apply
- Click on the portion to remove
- Click ok to complete



Delete the three curves on surface

To create an Extrude surface:-

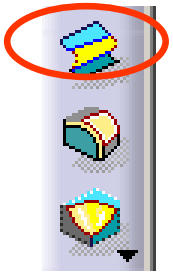
- Click “Extrude” icon
- Select “3D Curve.12”
- Select “Normal to the curve” as direction
- Drag the double arrow on the preview surface to the left, up to ~15mm
- Click ok to complete

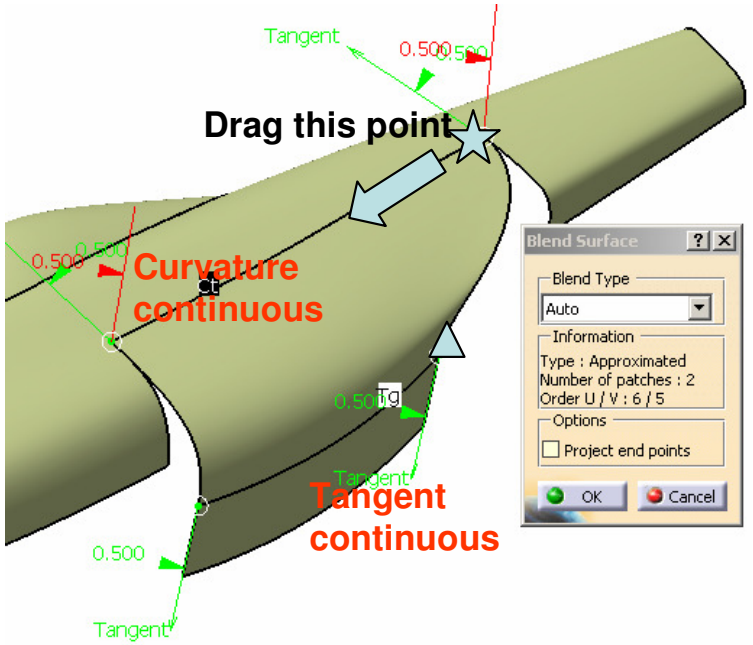


Tutorial 4C

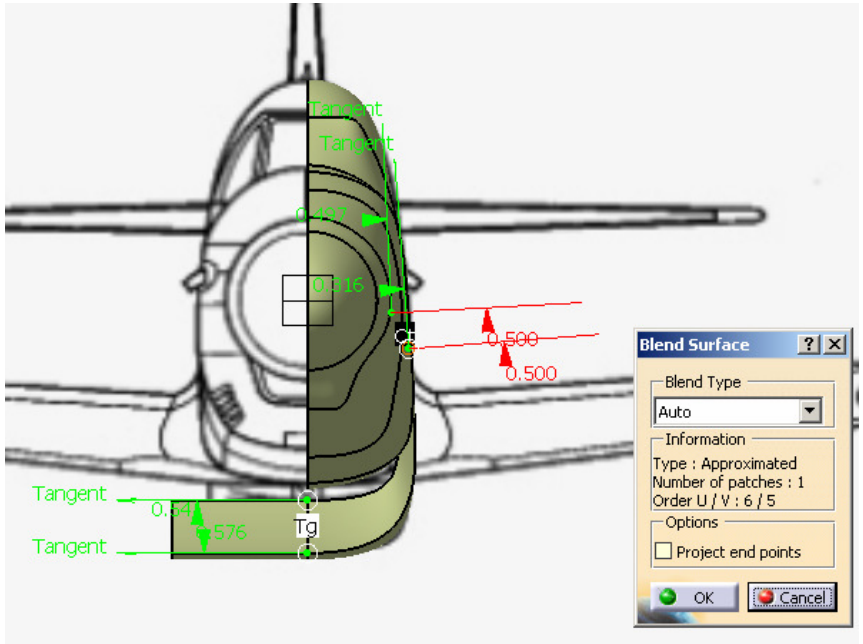
To create a Blend Surface:-

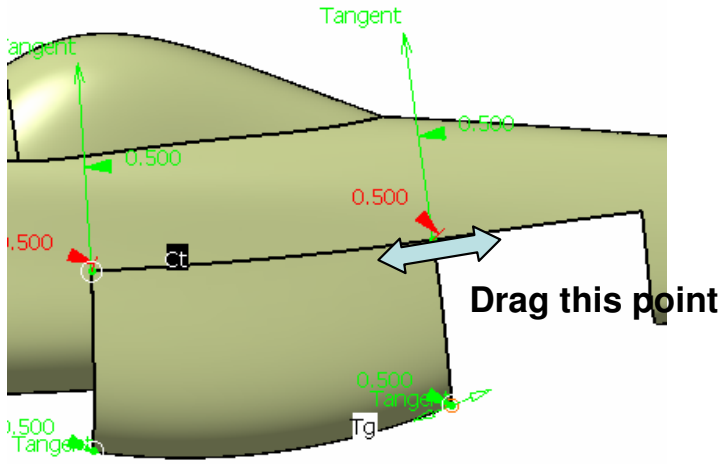
- Hide “3D Curve.12”
- Click “Freestyle Blend Surface” icon
- Select the two surface edges
- **Disable “Project End points”**
- Change the continuities as shown
- Drag the point ☆ closer to the point △





- Click “Front View” icon
- Adjust the tension values to match the image
- Click ok to complete



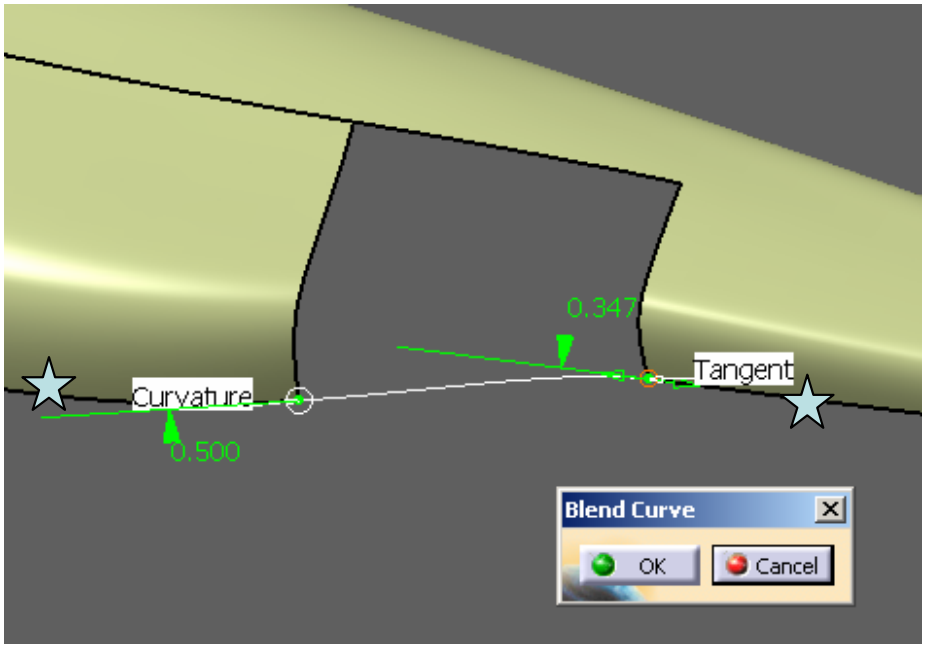


Tutorial 4C

Hide the Extrude surface

To make a Blend curve:-

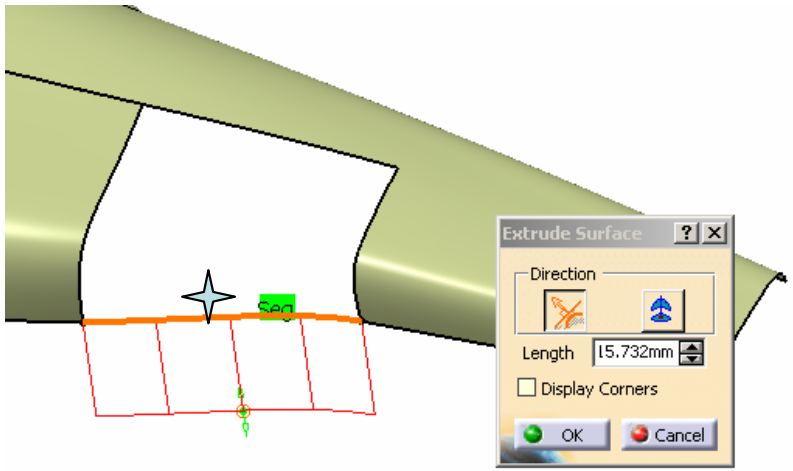
- Click “Freestyle Blend Curve” icon
- Select the two surface edges
- Change the continuities as shown
- Adjust the tensions to match the image (Right View)
- Click ok to complete



To Create an Extrude Surface:-

- Click “Extrude” icon
- Select the curve
- Select “Normal to the curve” as direction
- Drag the double arrow on the preview surface to the left, up to ~15mm
- Click ok to complete

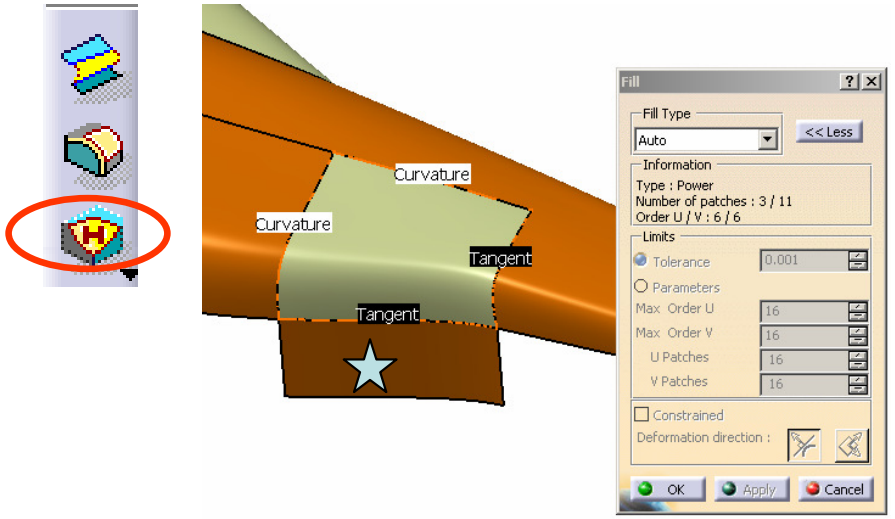
- Hide the curve



Tutorial 4C

To create a Fill Surface:-

- Click “Freestyle Fill” icon
- Select the surface edges of the opening
- Change the continuities as shown
- Click ok to complete

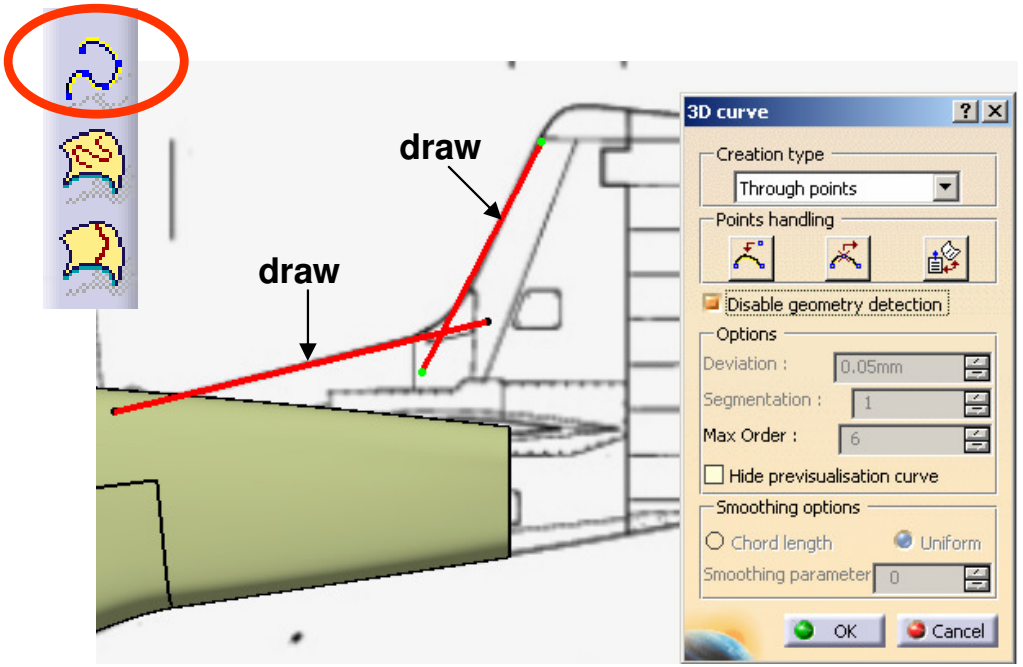


Hide the Extrude Surface ☆

To make a 3d curve:-

- Click “Right View” icon
- Click “3D Curve” icon
- **“Disable geometry detection”**
- Draw a curve with 2 control points as shown
- Click ok to complete

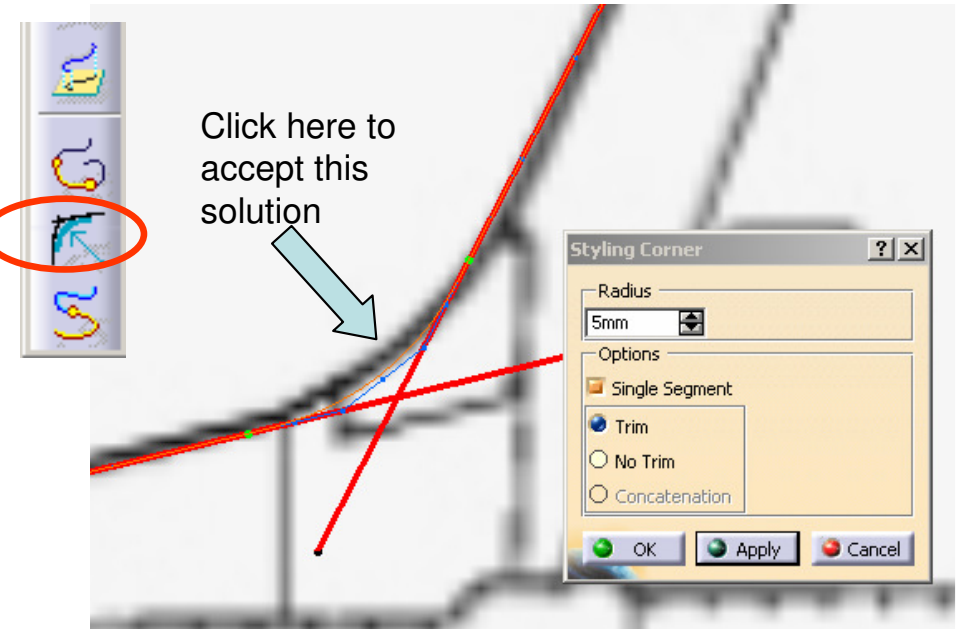
- Similarly, draw another 3D Curve as shown



Tutorial 4C

To Create a Fillet between two planar curves:-

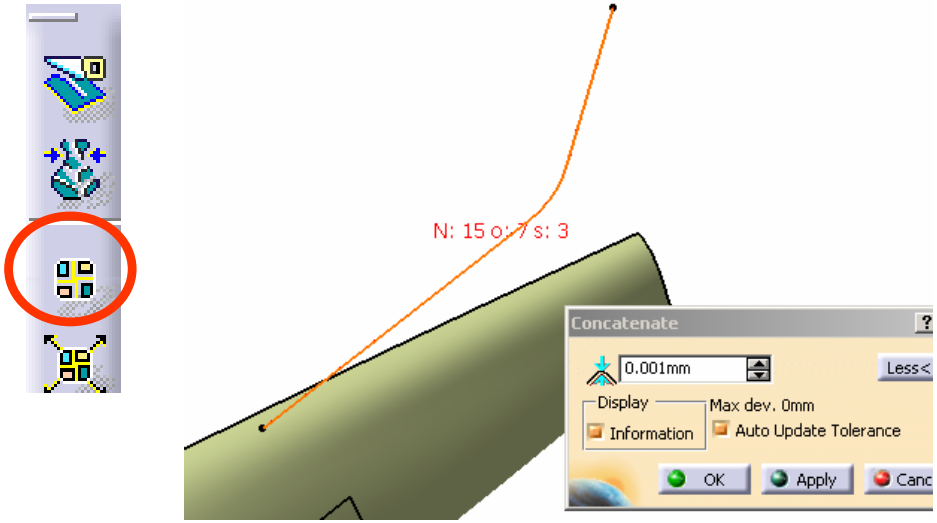
- Click “Styling Corner” icon
- Select the two 3D curves
- Enter 5mm as Fillet Radius
- Select “Trim” option
- Click Apply to preview
- Click on the portion to keep
- Click ok to complete



Hide the two 3D Curves

To Convert a multi-segments curve into a single-segment curve:-

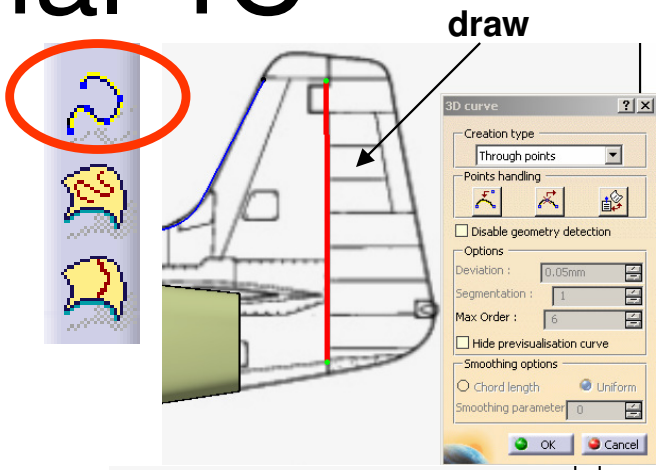
- Click “Concatenate” icon
- Select “Auto Update Tolerance”
- Multi-select all segments of the Fillet Curve
- Click Apply, then click ok to complete
- Delete the Fillet Curve (or hide it)

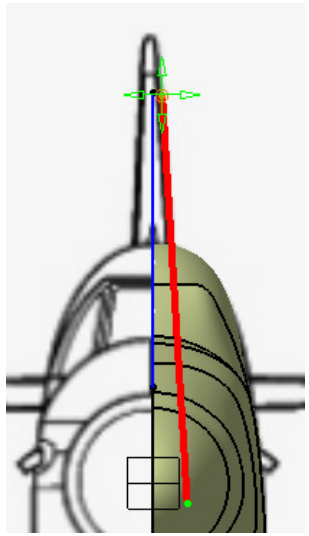


Tutorial 4C

To make another 3d curve:-

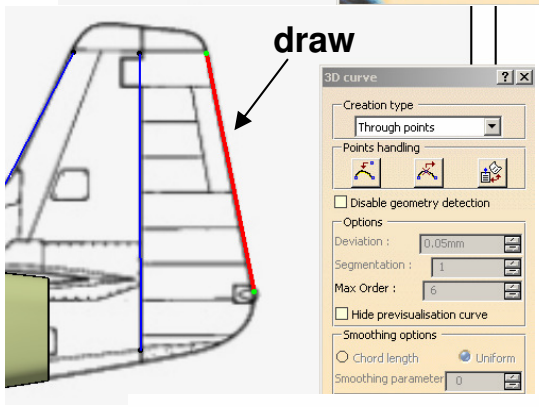
- Click “Right View” icon
- Click “3D Curve” icon
- Draw a curve with 2 control points as shown
- Click “Front View” icon
- Drag the control points to match the image
- Click ok to complete





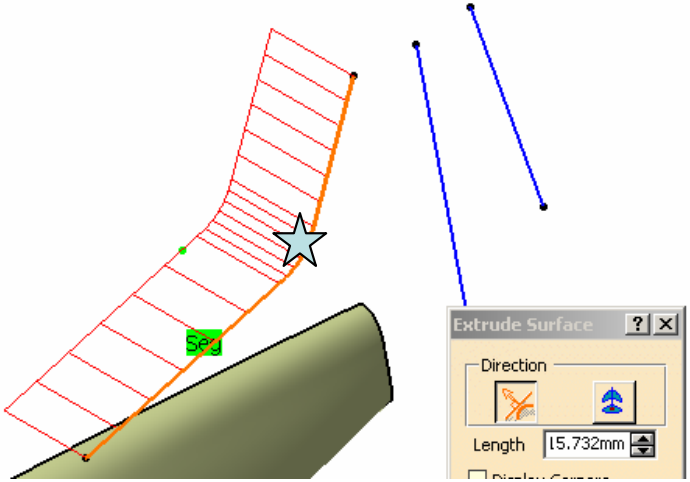
To make another 3d curve:-

- Click “Right View” icon
- Click “3D Curve” icon
- Draw a curve with 2 control points as shown
- Click ok to complete



To create an Extrude surface:-

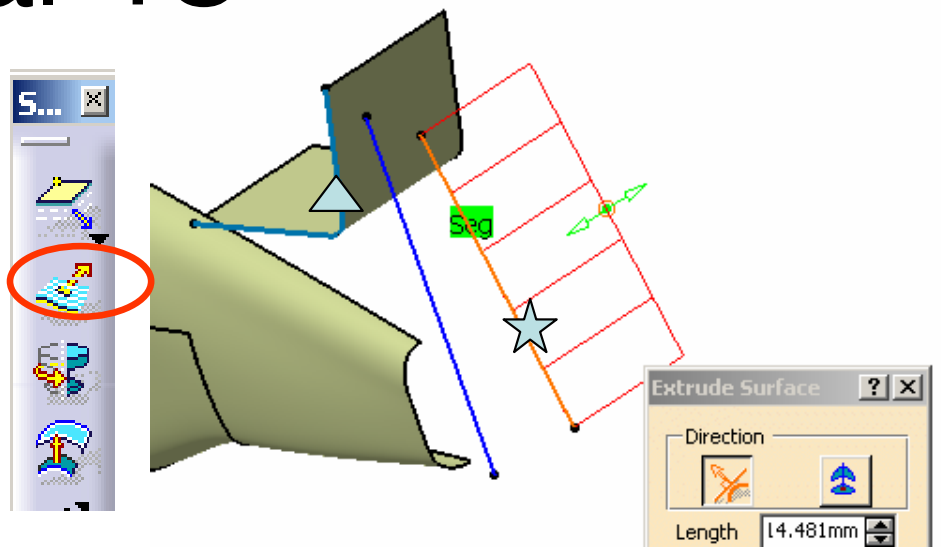
- Click “Extrude” icon
- Select the curve ☆
- Select “Normal to the curve” as direction
- Drag the double arrow on the preview surface to the left, up to ~15mm
- Click ok to complete



Tutorial 4C

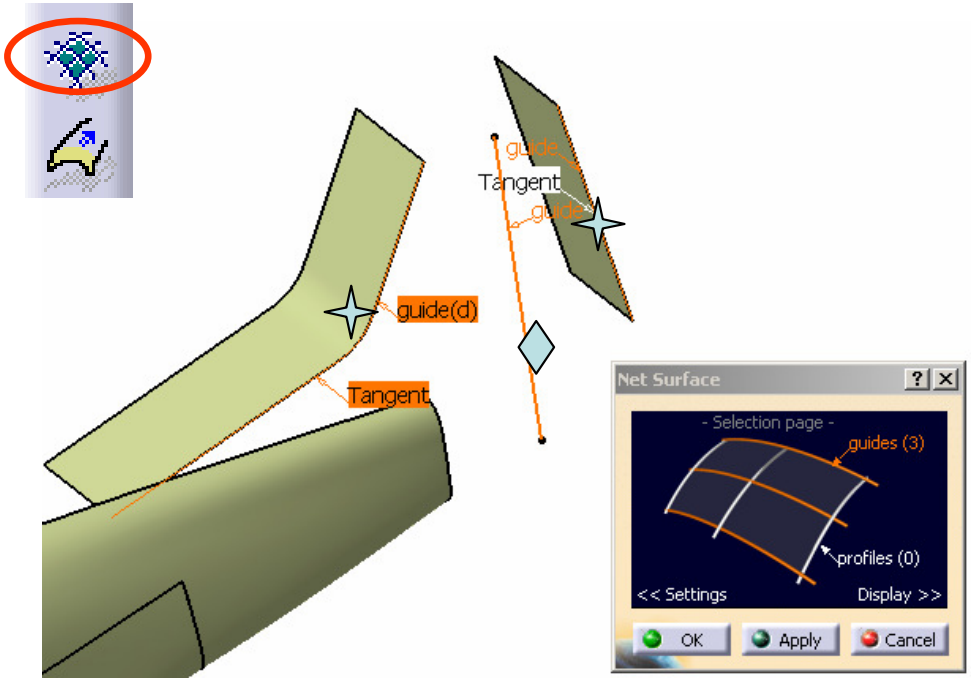
To Create an Extrude Surface:-

- Click “Extrude” icon again
- Select the curve ☆
- Select “Normal to the curve” as direction
- Drag the double arrow on the preview surface to the left, up to ~15mm
- Click ok to complete
- Hide the curves △☆



To Create a Net Surface:-

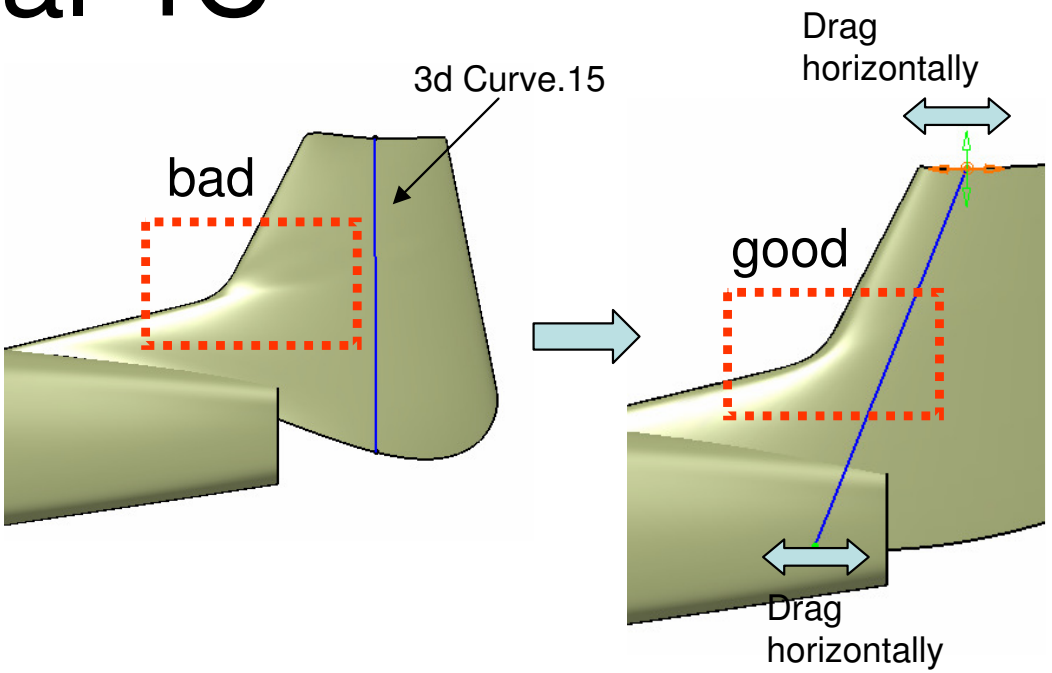
- Click “Net Surface” icon
- Multi-select the surface edges ✦ & the curve ◇
- Change the continuities to “Tangent”
- Click ok to complete



Tutorial 4C

To Modify a Net Surface:-

- (The highlighted portion of the resultant surface is not good enough to accept; some shrinkage is found)

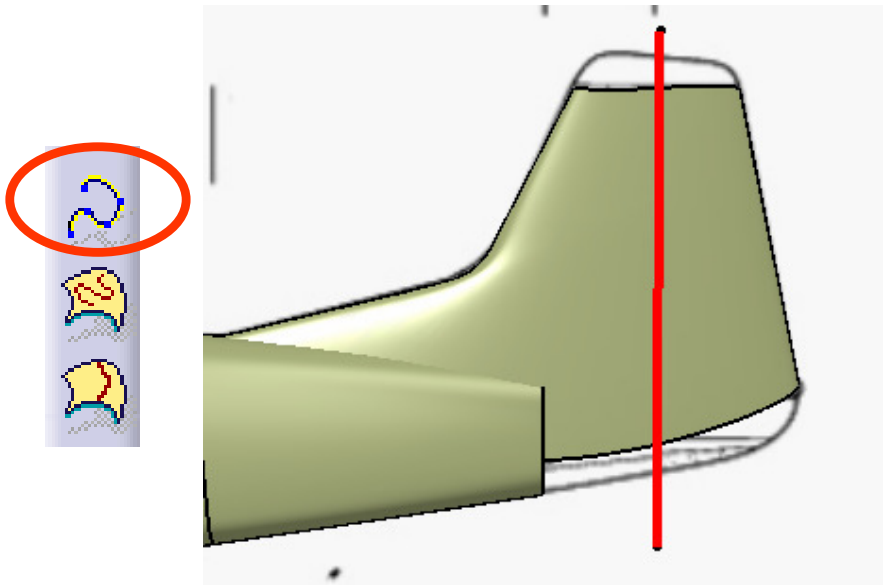


- Double-Click the “3D curve.15”
- Click “Right View” icon
- Drag the endpoints horizontally until the highlighted portion is improved.
- (The modified 3D curve should still match the front view image)

Hide the two Extrude Surfaces & the 3D curve

To Make a 3d curve:-

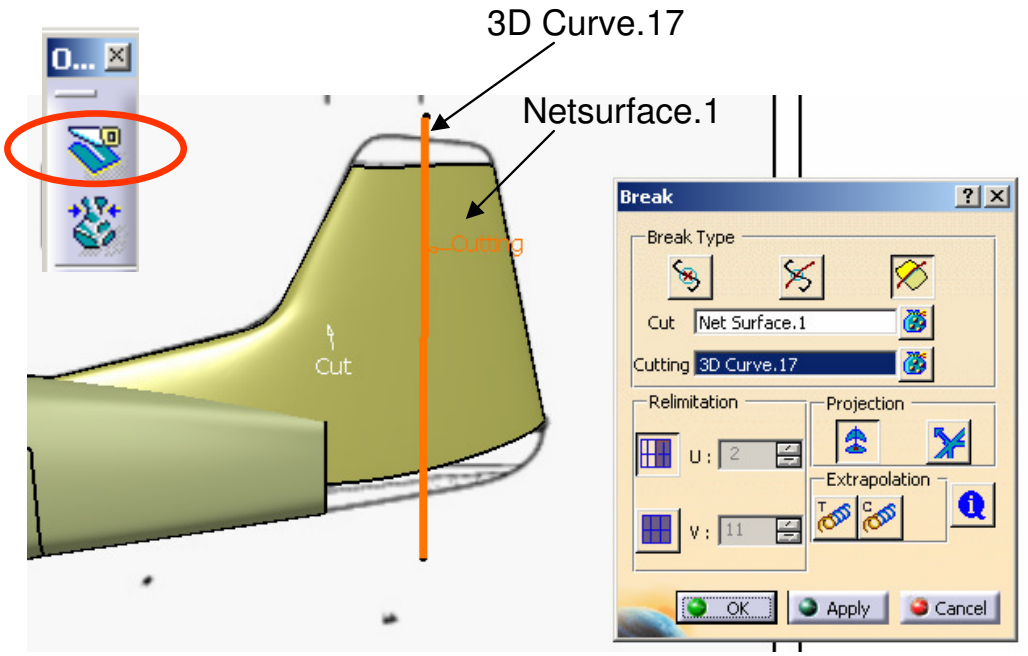
- Click “Right View” icon
- Click “3D Curve” icon
- Draw a curve with 2 control points as shown
- Click ok to complete



Tutorial 4C

To Cut a surface by a curve (not on the surface):-

- Click “Break Surface or Curve” icon
- Select “Break Surfaces by Curves” as Type
- (Click “Right View” icon)
- Select “Along Compass” as direction
- Select “NetSurface.1” as Cut
- Select the “3D curve.17” as Cutting
- Click Apply
- Click ok to complete (BOTH sides are kept)

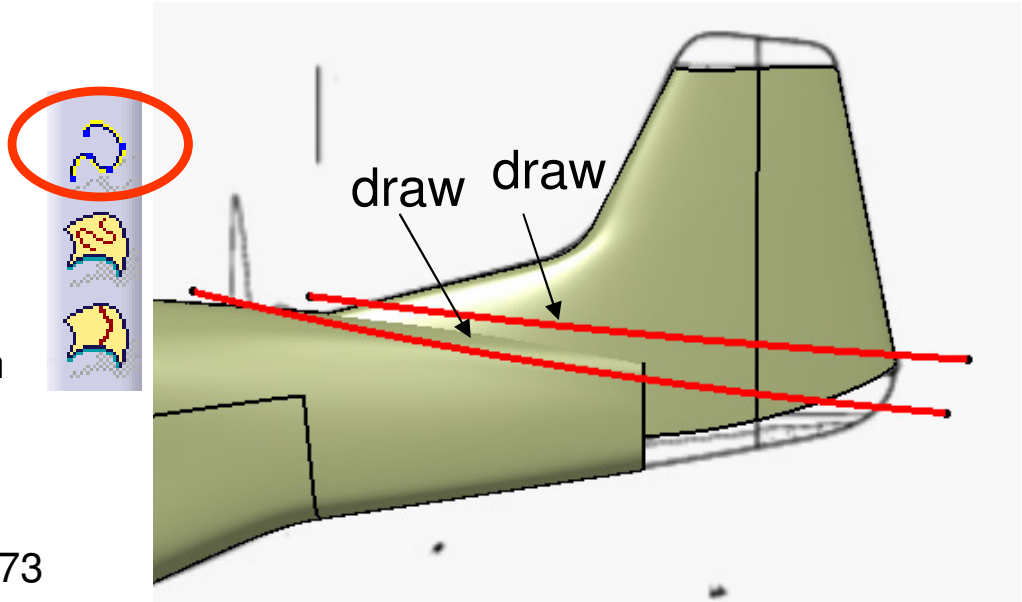


Hide “3D Curve.17”

To Create a 3D Spline Curve:-

- Click “Right VIew” icon
- Click “3D Curve” icon
- “Disable geometry detection”
- Draw a curve with 3 control points as shown
- Click ok to complete

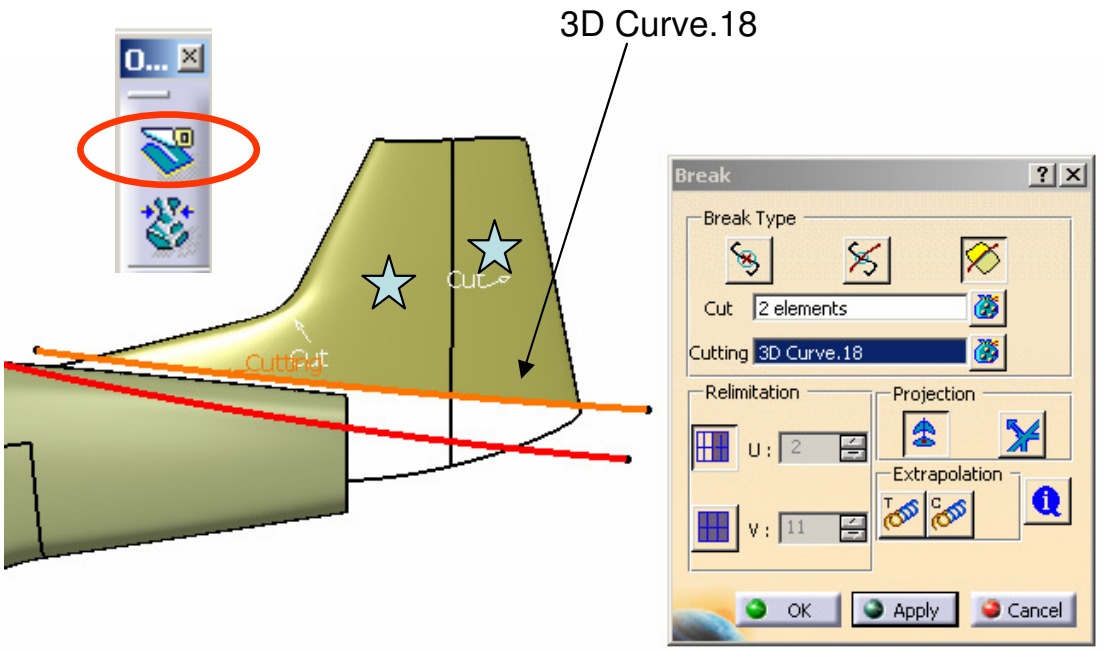
- Similarly, draw another 3D spline curve.



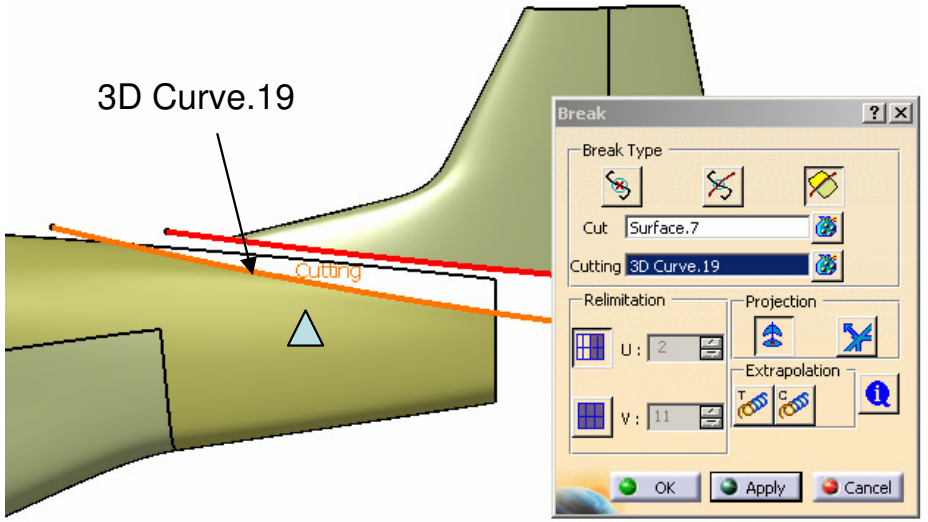
Tutorial 4C

To Cut a surface by a curve (not on the surface):-

- Click “Break Surface or Curve” icon
- Select “Break Surfaces by Curves” as Type
- (Click “Right View” icon)
- Select “Along Compass” as direction
- Select the two surfaces ☆ as Cut
- Select the “3D curve.18” as Cutting
- Click on the portion to remove
- Click Apply
- Click ok to complete



- Click “Break Surface or Curve” icon again
- Select the surface △ as Cut
- Select the “3D curve.19” as Cutting
- Click on the portion to remove
- Click Apply
- Click ok to complete



Hide “3D Curve.18” & “3D Curve.19”

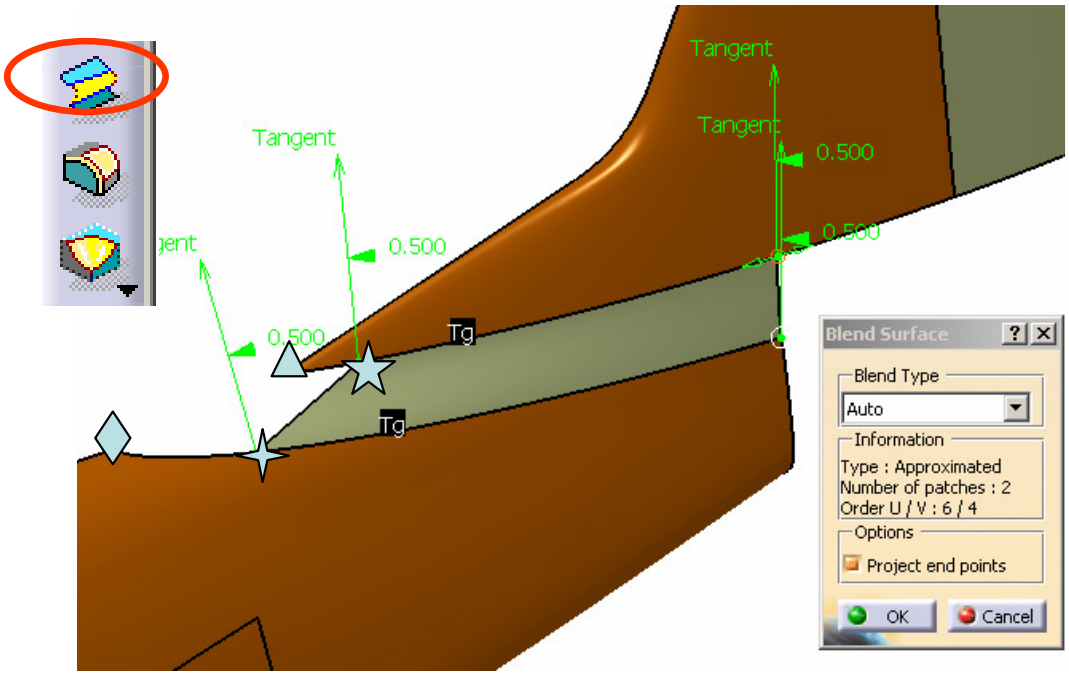
Tutorial 4C

To create a Blend surface:-

- Click “Freestyle Blend Surface” icon
- Select the two surface edges
- Disable “Project End points”
- Change the continuities to Tangent

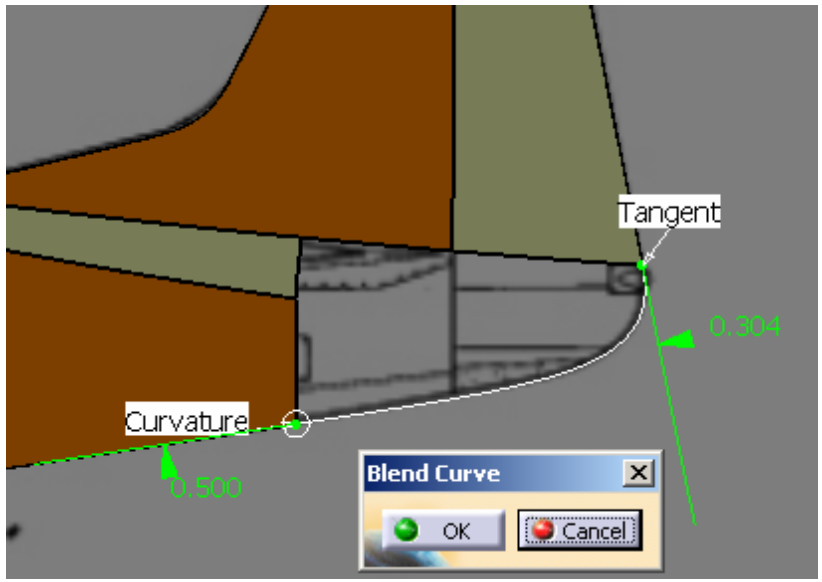
- Drag the point ☆ onto the point △
- Drag the point ✦ onto the point ◇

- Click ok to complete



To make a Blend curve:-

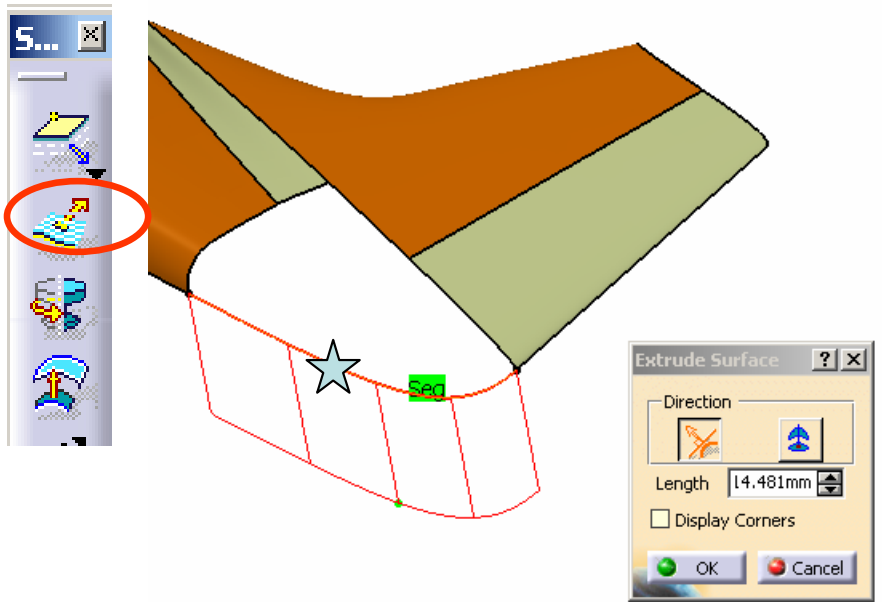
- Click “Freestyle Blend Curve” icon
- Select the two surface edges
- Change the continuities as shown
- Click “Right View” icon
- Adjust the tensions to match the image
- Click ok to complete



Tutorial 4C

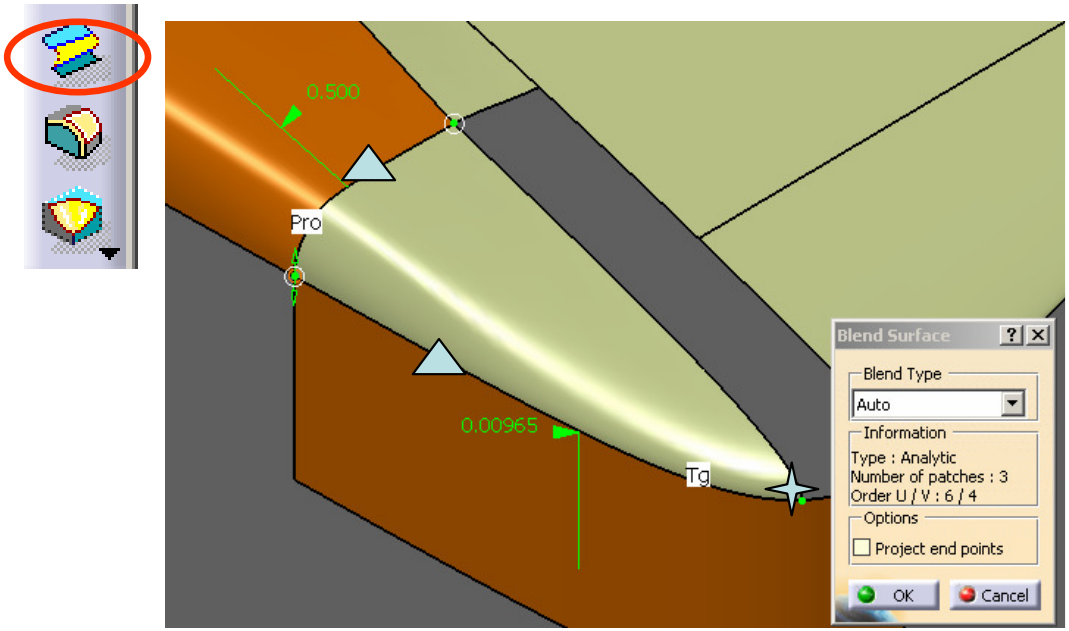
To create an Extrude surface:-

- Click “Extrude” icon
- Select the curve ☆
- Select “Normal to the curve” as direction
- Drag the double arrow on the preview surface to the left, up to ~15mm
- Click ok to complete
- Hide the curve ☆



To create a Blend surface:-

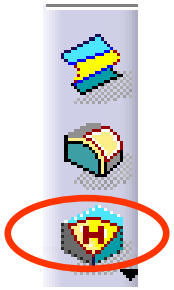
- Click “Freestyle Blend Surface” icon
- Select the two surface edges △
- Move the endpoint to the position ✦
- Change the continuities as shown
- Adjust the tensions
- Click ok to complete

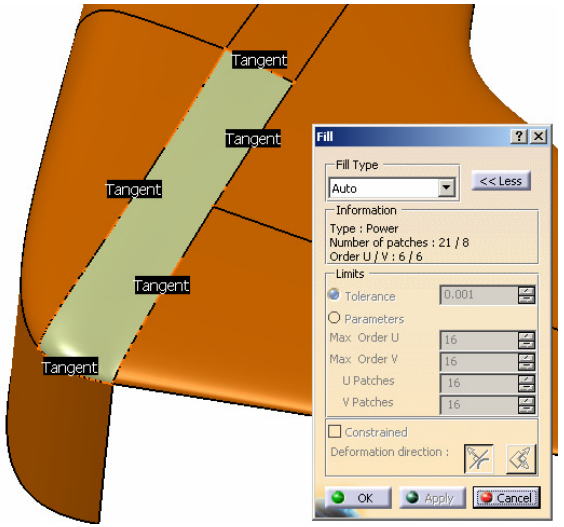


Tutorial 4C

To create a Fill surface:-

- Click “Freestyle Fill” icon
- Select the surface edges of the opening
- Change the continuities as shown
- Click ok to complete

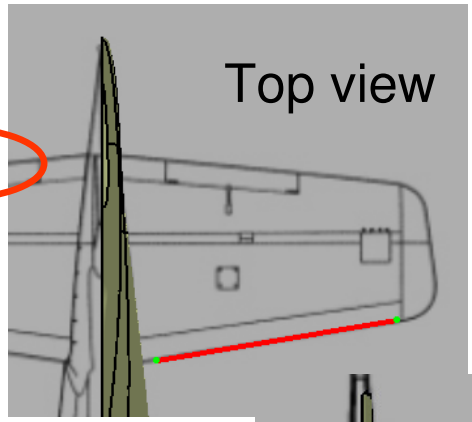


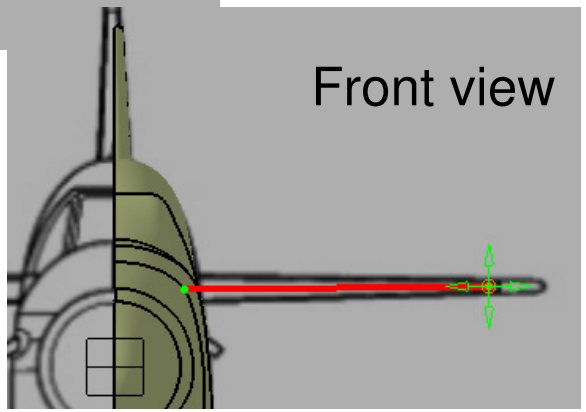


Hide the Extrude Surface

To make a 3d curve:-

- Click “Top View” icon
- Click “3D Curve” icon
- Draw a curve with 2 control points as shown
- Click “Front View” icon
- Drag the two control points to match the image
- Click ok to complete

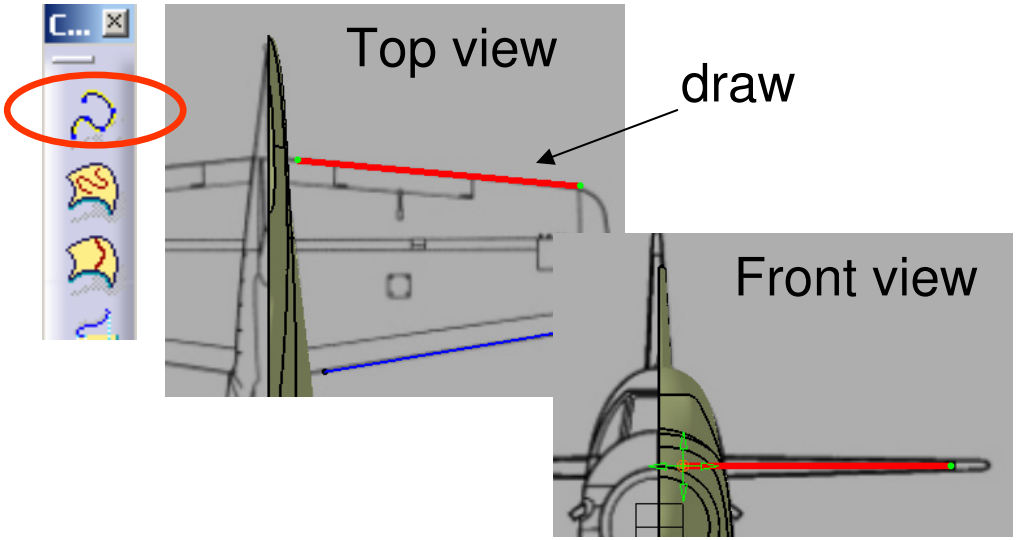




Tutorial 4C

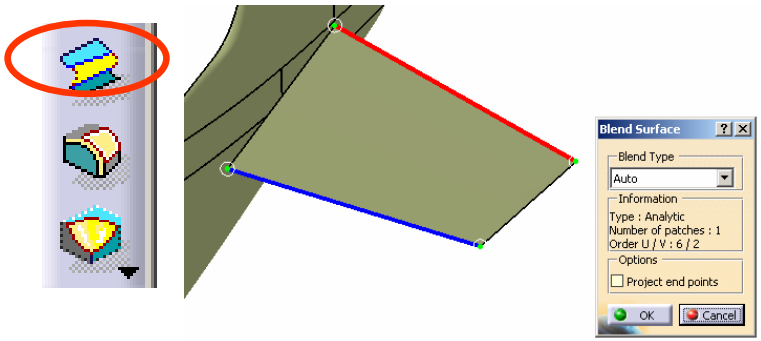
To make a 3d curve:-

- Click “Top View” icon
- Click “3D Curve” icon
- Draw a curve with 2 control points as shown
- Click “Front View” icon
- Drag the two control points to match the image
- Click ok to complete



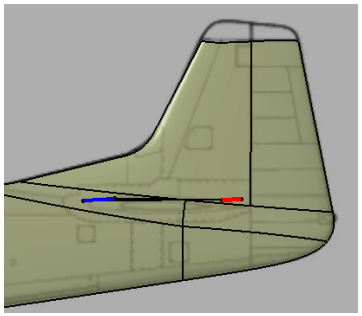
To create a Blend Surface:-

- Click “Freestyle Blend Surface” icon
- Select the two 3D Curves
- Click ok to complete



Make the nearby surfaces semi-transparent::-

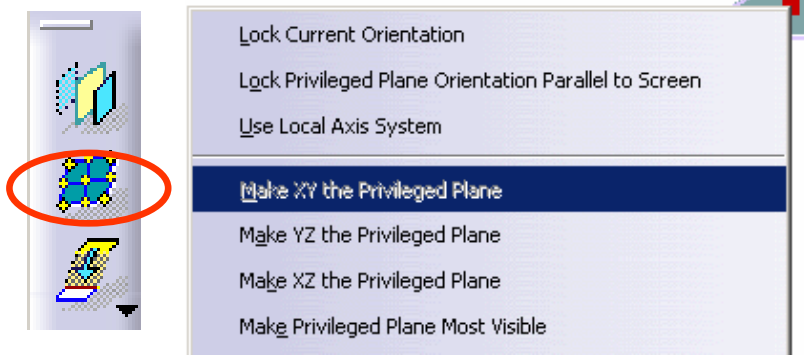
- Right-click on the surfaces
- Select “Properties”, set Transparency to 50
- Click ok to complete



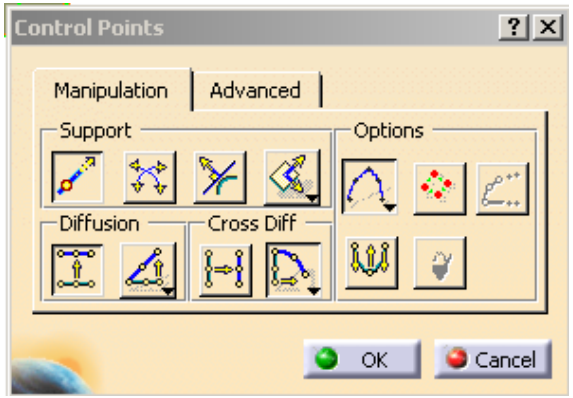
Tutorial 4C

To Modify a Surface by its Control Points:-

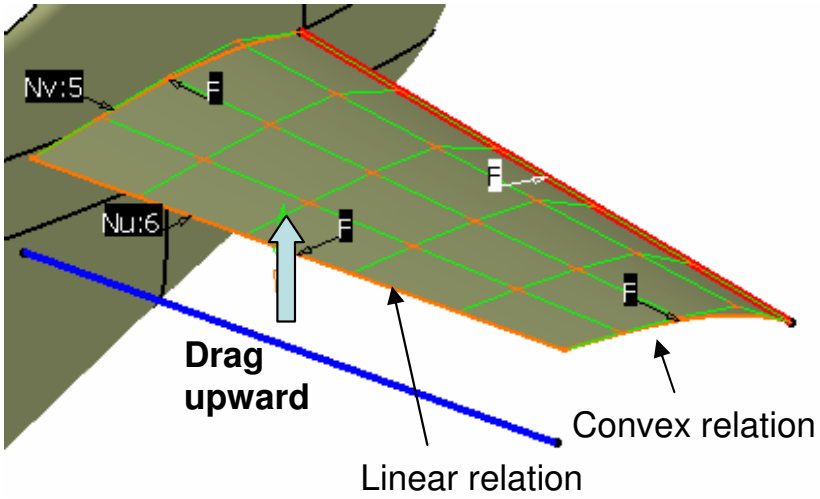
- Click “Control Points” icon
- Select the previous Blend Surface
- Change Nu to 6; Nv to 5 (right-click on the number, then select on the list)



- Right-Click the compass
- **Deselect “Lock Privileged Plane Orientation Parallel to Screen”**
- **Select “Make XY the Privileged Plane”**



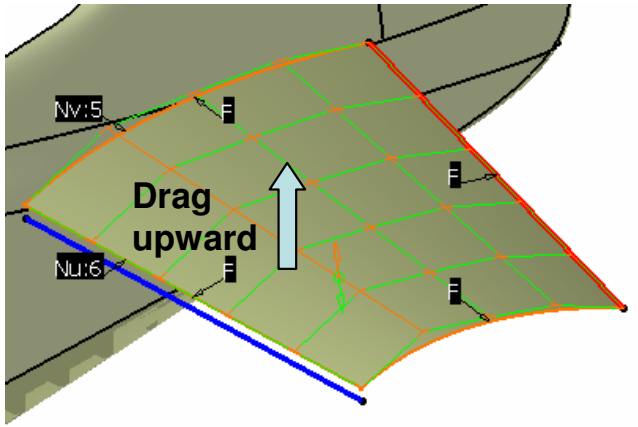
- Select “Normal to Compass” as Support (Pulling Direction)
- Select “Linear” as Diffusion
- Select “Convex Law” as Cross Diffusion
- Click “Select all Points” icon  to activate all mesh points
- Drag the first row upward



Tutorial 4C

Cont':-

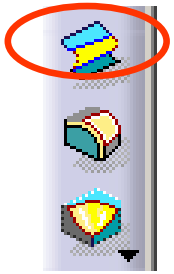
- Drag the first row upward to match the image (Right View)

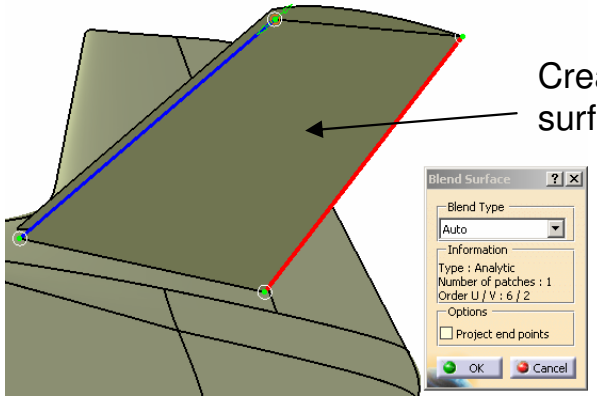


- Drag the second row upward to match the image
- Click ok to complete

To create a Blend surface:-

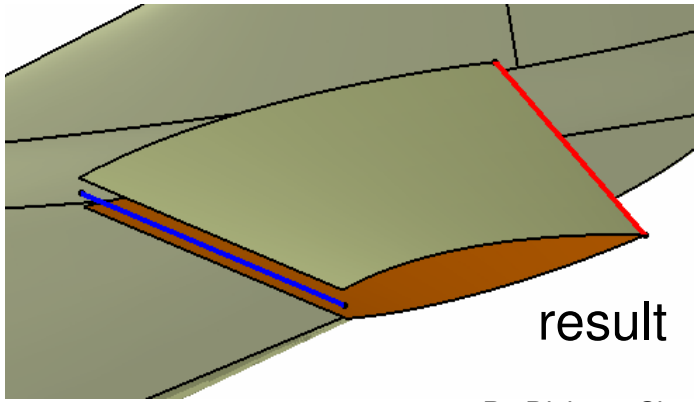
- Click "Freestyle Blend Surface" icon
- Select the two 3D Curves
- Click ok to complete





To Modify the Surface by its Control Points:-

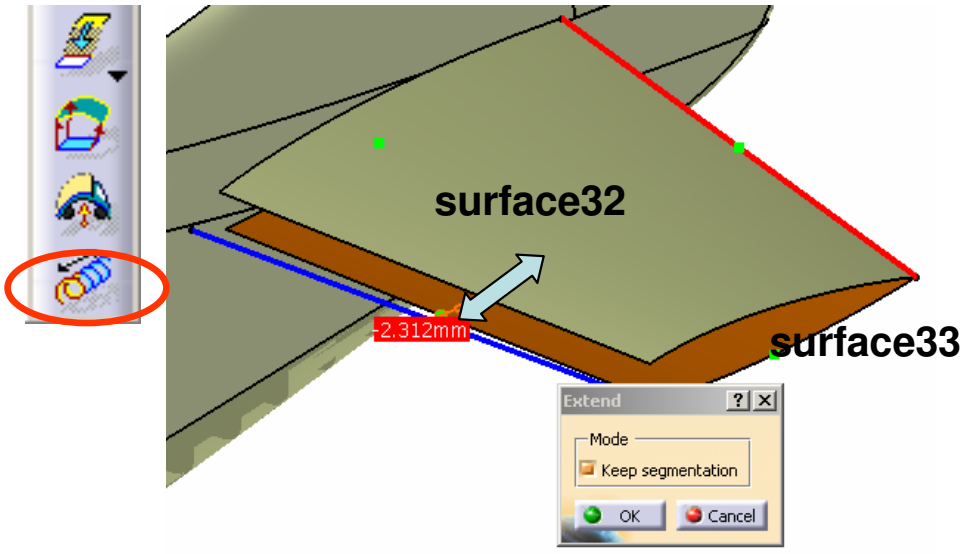
- Refer to previous pages



Tutorial 4C

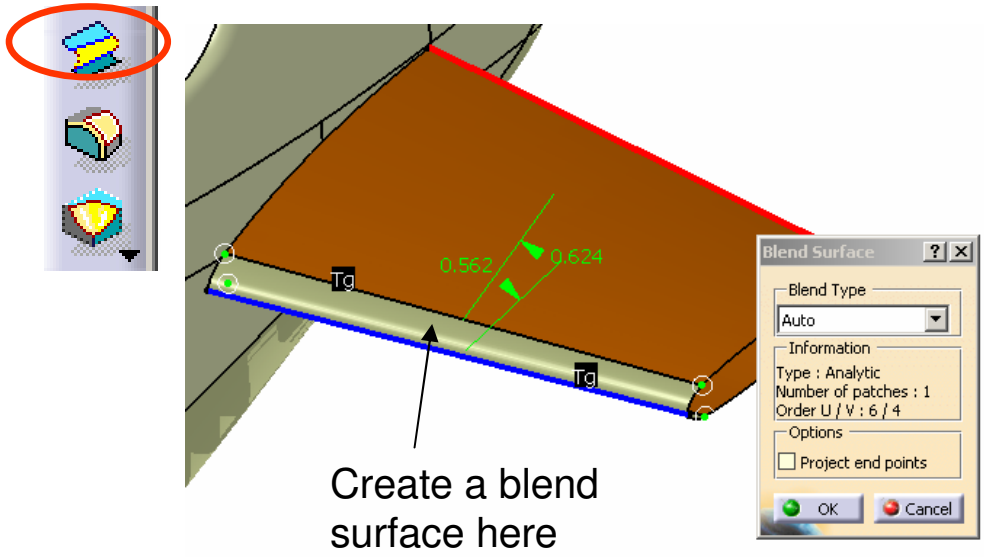
To Shorten surfaces:-

- Click “Extend” icon
- Click on “Surface32”
- Drag on the green dot to shorten the surface by around 2mm
- Click ok to complete
- Similarly, Shorten “Surface33” by ~2mm



To Create a Blend Surface:-

- Click “Freestyle Blend Surface” icon
- Select the two surface edges
- Change the continuities to Tangent
- Click “Top View” icon
- Adjust the tensions to match the image
- Click ok to complete

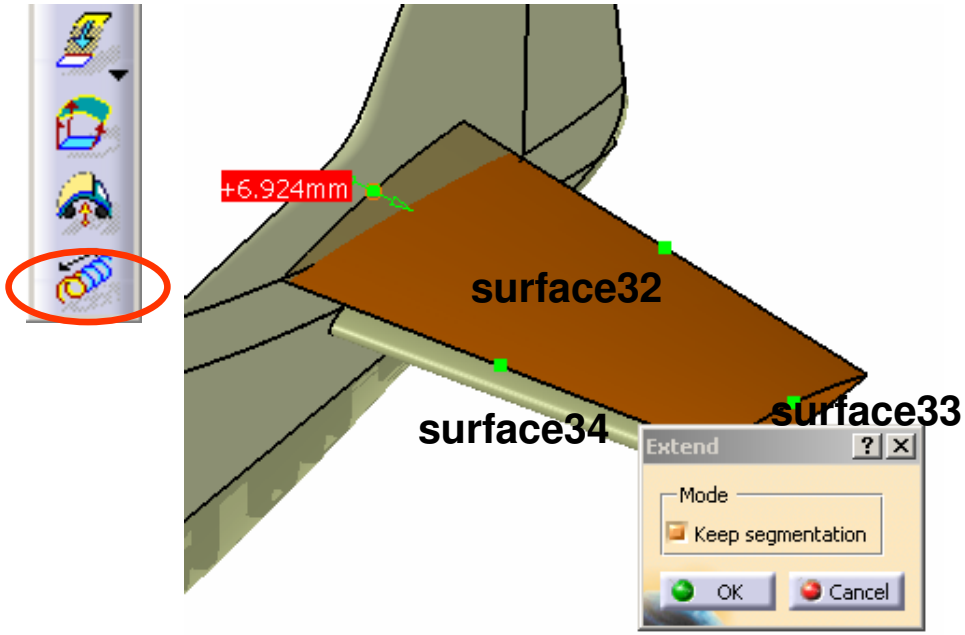


Hide the two 3D Curves

Tutorial 4C

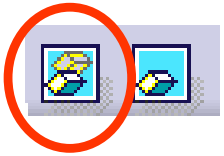
To Extend surfaces:-

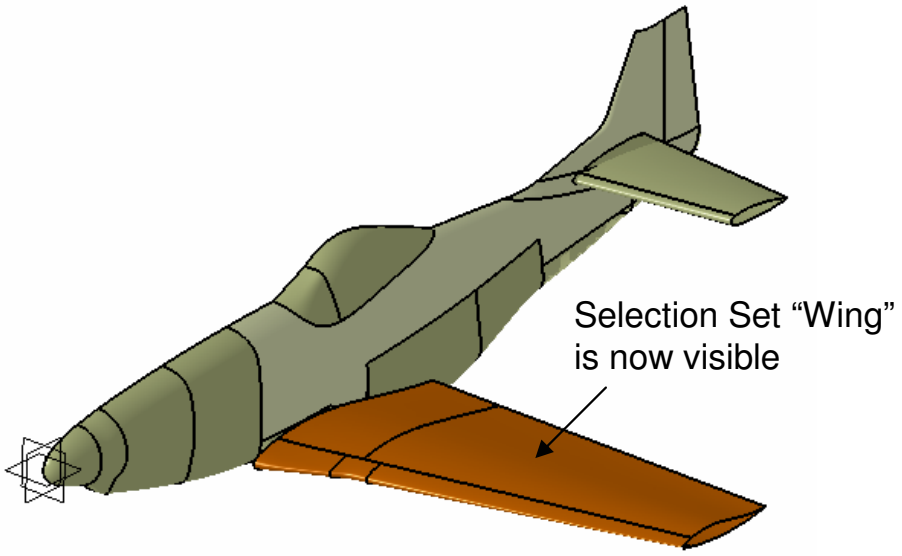
- Click “Extend” icon
- Click on “Surface32”
- Drag on the green dot to extend the surface by around 5mm
- Click ok to complete
- Similarly, Extend “Surface33” and “Surface34” by ~5mm



To Show a Selection Set:-

- Select “Edit/ Selection Sets…” on the menu bar
- Select “Wing” on the list
- Click “Select” icon (all surfaces belonging to “Wing” will be selected)
- Click “Hide/Show” icon to show
- Click “Close”

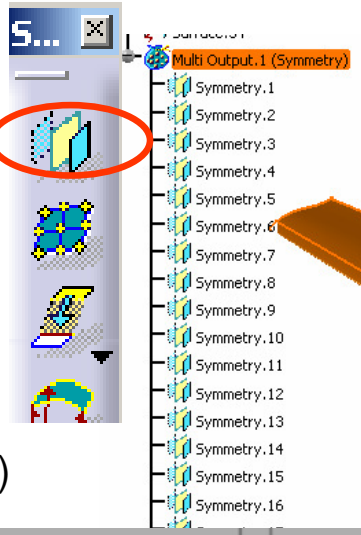


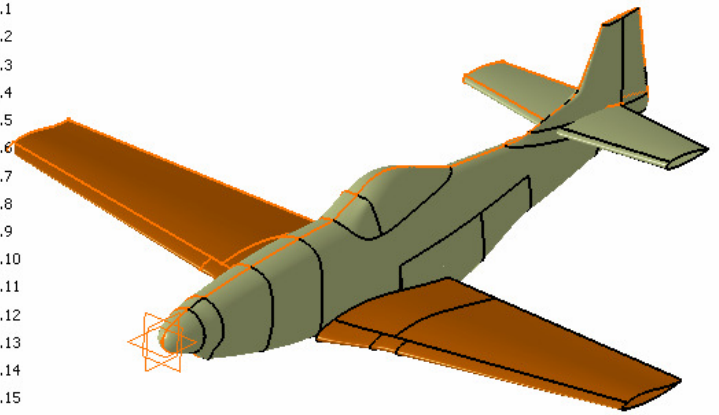


Tutorial 4C

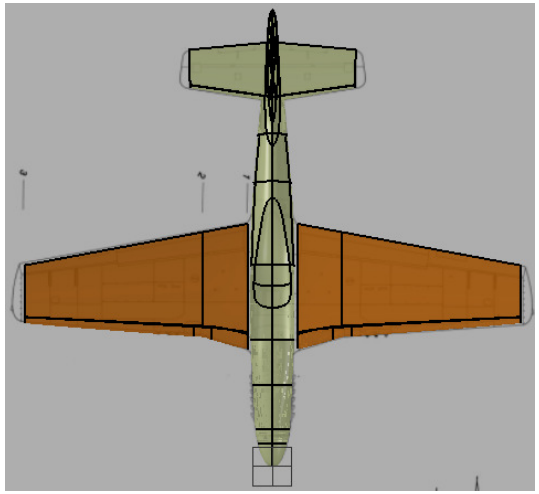
To Make a Mirror:-

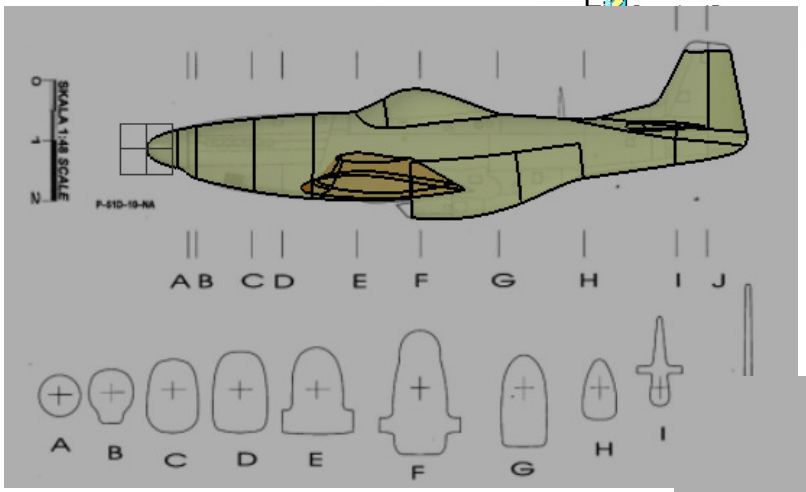
- Click “Symmetry” icon
- Select all Surfaces (visible)
- Then click on “ZX plane” as Reference
- Click ok to complete

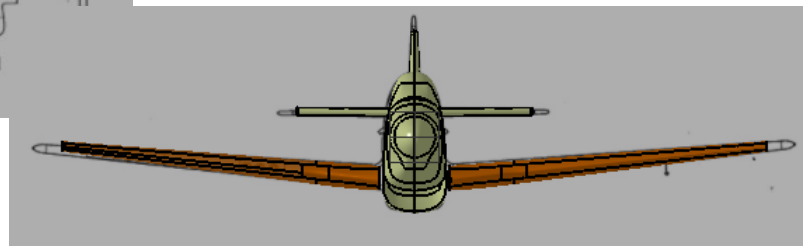




(The resultant model should match the reference image of Front View, Right-View and Top View)







Save your File again

END of Tutorial 4C

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