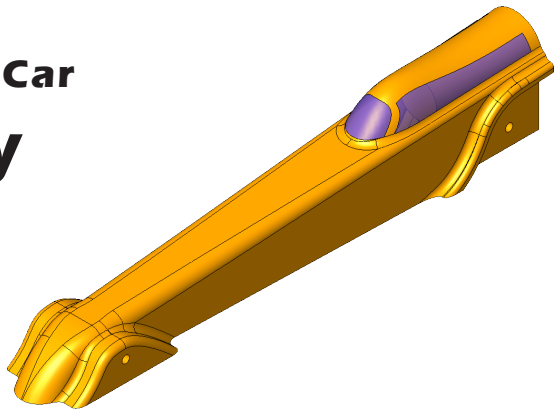
Chapter 2

CO2 Rail Car
Body



A. Save as "BODY RAIL".

Step 1. If necessary, open your **BLANK** file.

Step 2. Click File Menu > Save As.

Step 3. Key-in **BODY RAIL** for the filename and press ENTER.

B. Appearance.

Step 1. Click the Body to select the part, click **Appearances Callout** on the Content menu and click **BODY RAIL**, **Fig. 1**.

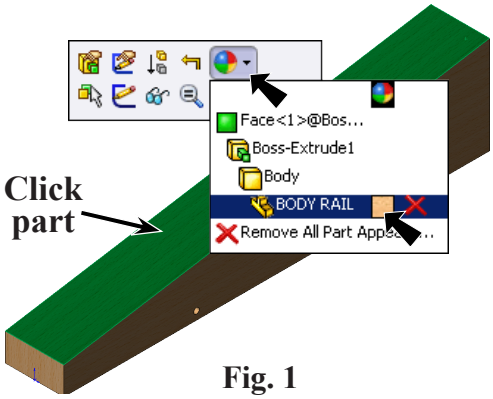


Fig. 1

Step 2. In the Appearances Task pane, expand **Painted**, click **Car** and in the lower pane select **white**, **Fig. 2**.

Step 3. In the Appearances Property Manager, **Fig. 3**
under Color:
set **RGB values** to**:**
R 231
G 150
B 0
Click OK in the Property Manager.

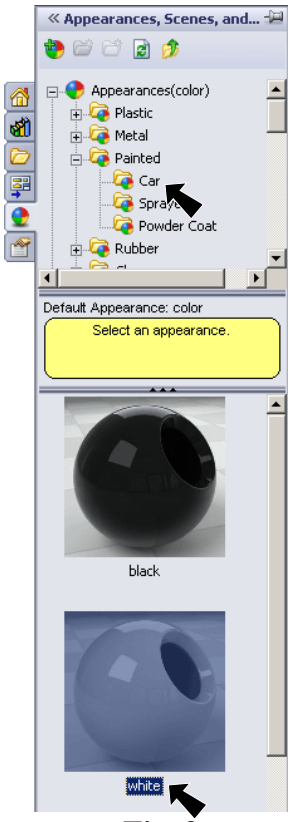


Fig. 2

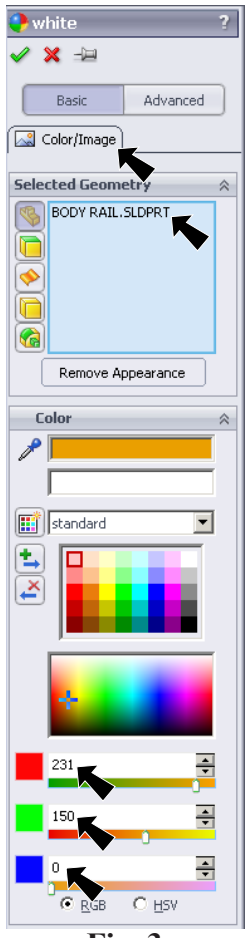


Fig. 3

Step 4. Save. Use **Ctrl-S**.

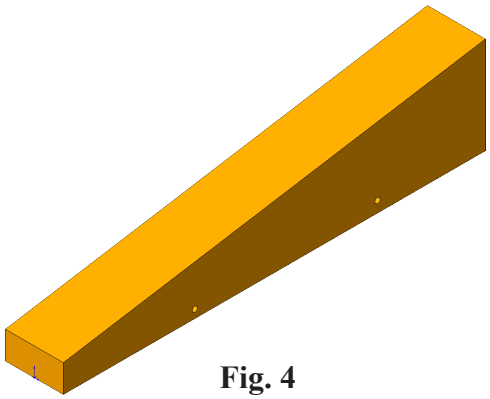


Fig. 4

C. Side Cut.

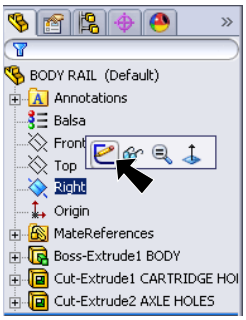


Fig. 6

Step 1. Click **Right** (plane) in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 6**.

Step 2. Click **Normal To** on the Standard Views toolbar. (**Ctrl-8**)

Step 3. Click **Line** (**L**) on the Sketch toolbar.

Step 4. Draw a line from back edge at a slight downward angle toward the front, **Fig. 7**.

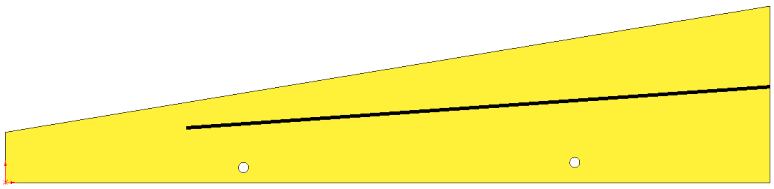


Fig. 7

Step 5. Click **Spline** (**S**) on the Sketch toolbar.

Step 6. Draw **two point** spline between front endpoint of line and bottom horizontal edge, **Fig. 8**. **Right click drawing and click Select** from menu to end spline.

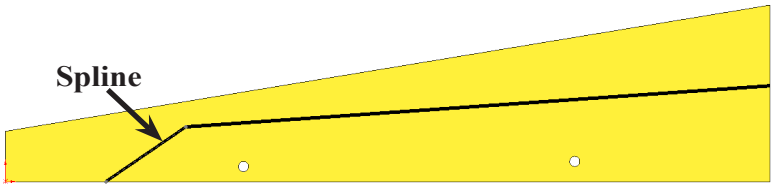


Fig. 8

Step 7. Click **Smart Dimension** (**S**) on the Sketch toolbar.

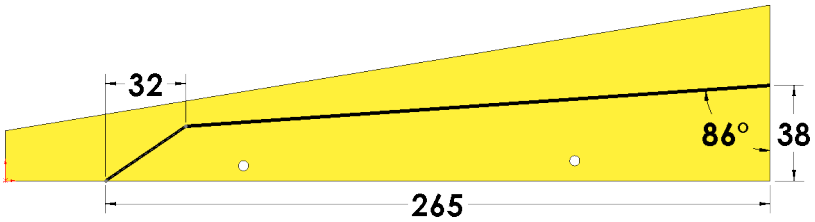


Fig. 9

Step 8. Add dimensions as shown in **Fig. 9**. First, dimension the end of the rear line to the bottom edge of body **38**. Dimension the angle **86° degrees** between the line and rear edge of the body. To Smart dimension the angle, click line and edge, then move the cursor down inside the angle and click. Key-in **86** for the dimension and press ENTER. Add the other dimensions.

Step 9. **Right click drawing and click Select** from menu to unselect Smart Dimension.

Step 10. **Ctrl click line and spline** to select both, **Fig. 10**. To Ctrl click, click line, then hold down the Ctrl key and click the spline. **Release Ctrl key** and click **Make Tangent**  on the Content menu, **Fig. 10**.

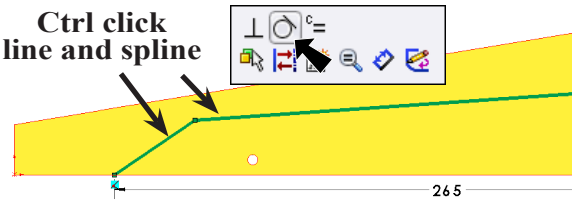
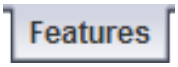


Fig. 10

Step 11. Click **Features**  on the Command Manager toolbar.

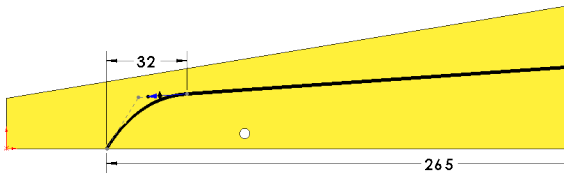
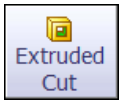


Fig. 11

Step 12. Click **Extruded Cut**  on the Features toolbar.

Step 13. In the Cut-Extrude Property Manager set:

under **Direction 1**

End Condition to Through All

The Direction arrow should point towards area to be cut away, Fig. 13. If arrow is pointing in wrong direction, click **Flip side to cut, Fig. 12**. Click OK  .

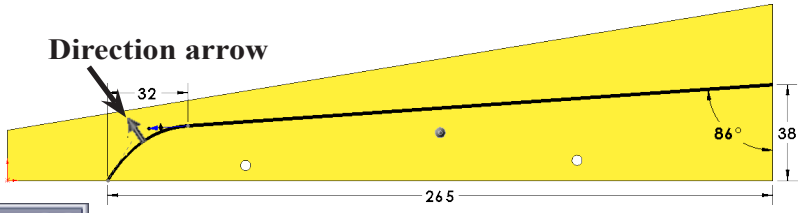


Fig. 13

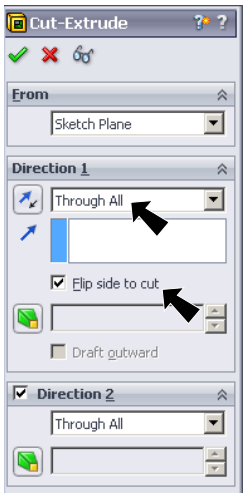


Fig. 12


Fig. 14

D. Bottom Cut.

Step 1. Click **Bottom**  on the Standard Views toolbar. (**Ctrl-6**)

Step 2. Click the **bottom face** of the body and click **Sketch**  on the Content menu, **Fig. 15**.

Step 3. Click **Centerline**  **(S)** in the **Line flyout**  on the Sketch toolbar.

Step 4. Draw a centerline from the midpoint on the bottom edge up through the sketch, **Fig. 16**.

Step 5. **Right click drawing and click Select** from menu to unselect Centerline Tool.

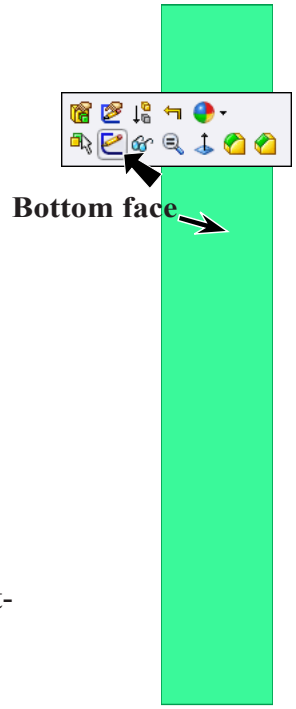


Fig. 15

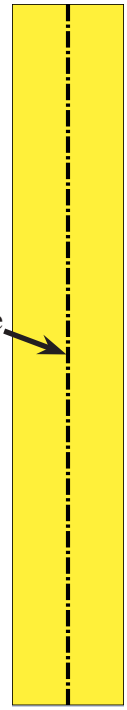


Fig. 16

Step 6. Click the centerline to select it, **Fig. 17**.

Step 7. Click **Dynamic Mirror** 

on the Sketch toolbar or Tools Menu > Sketch Tools > Dynamic Mirror, **Fig. 17**. Symmetry symbols appear at both ends of the centerline. Geometry drawn on one side of mirror centerline will mirror onto the other side.

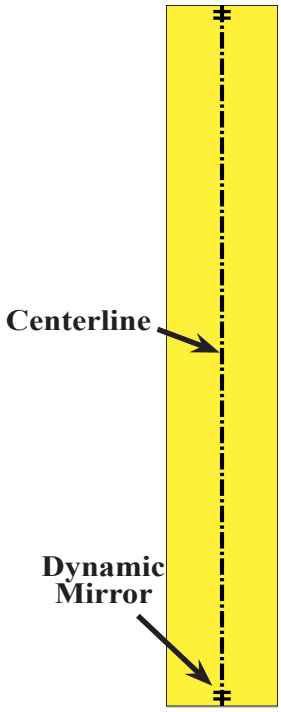


Fig. 17

Step 8. Click **Line**  **(L)** on the Sketch toolbar.

Step 9. Starting at the bottom endpoint of the centerline, draw a horizontal line across bottom edge almost to the corner, **Fig. 18**. **Do not** connect the line to the corner. Draw a non-vertical line from this new line up to the top edge. Keep the endpoint away from centerline and corner.

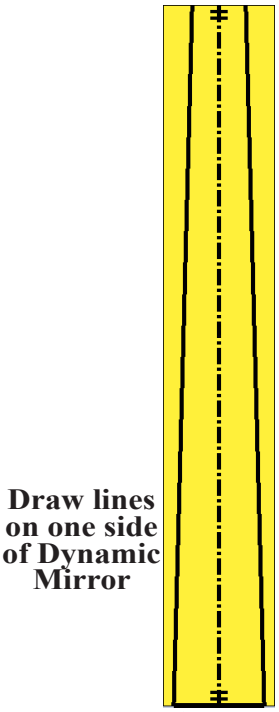


Fig. 18

Step 10. Click **Smart Dimension** 

(S) on the Sketch toolbar.

Step 11. Add dimensions as shown **Fig. 19**. Dimension across the bottom **34** and angle **88.5° degrees** between the line and bottom edge of the body as shown in **Fig. 19**. To Smart dimension the angle, click both line and bottom edge, then move the cursor inside and click. Key-in **88.5** for the angle and press ENTER.

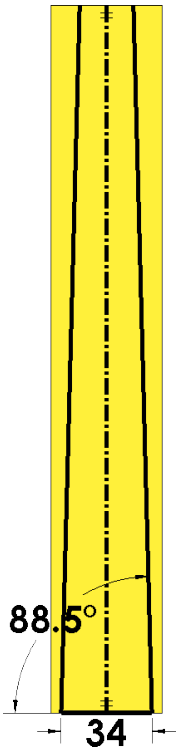
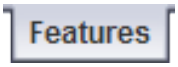
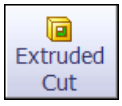


Fig. 19

Step 12. Click **Features** 

on the Command Manager toolbar.

Step 13. Click **Extruded Cut** 

on the Features toolbar.

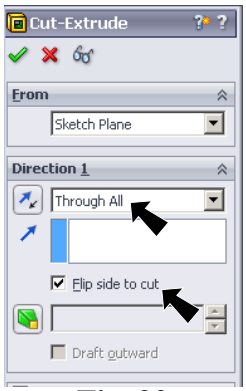


Fig. 20

Step 14. In the Cut-Extrude Property Manager set:

under **Direction 1**

End Condition to Through All

The Direction arrow should point towards area to be cut away, Fig. 21. If arrow is pointing in wrong direction, click **Flip side to cut, Fig. 20**. Click OK  .

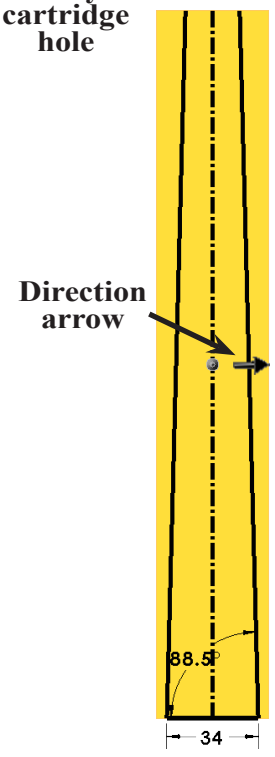


Fig. 21

E. Cockpit Loft Rear Sketch.

Step 1. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 2. Click **Cut-Extrude CAR-TRIDGE HOLE** in the Feature Manager and click **Suppress** in the menu, **Fig. 23**.

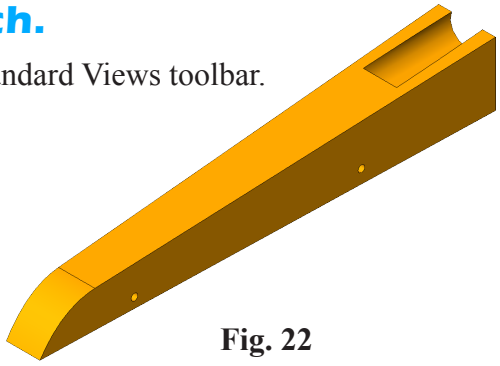


Fig. 22

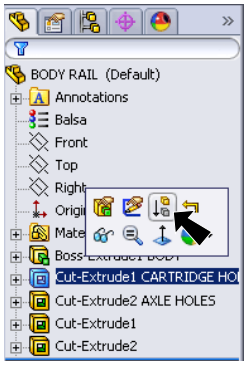


Fig. 23

Step 3. Click **Back** on the Standard Views toolbar. (**Ctrl-2**)

Step 4. Click the **rear face** and click **Sketch** on the Content menu, **Fig. 24**.

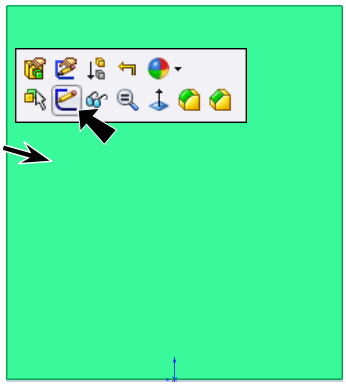


Fig. 24

Step 5. Click **Centerline** (**S**) in the **Line flyout** on the Sketch toolbar.

Step 6. Starting from the Origin at the bottom of the body, draw a vertical line up through the body and extend the line out past top of body, **Fig. 25**.

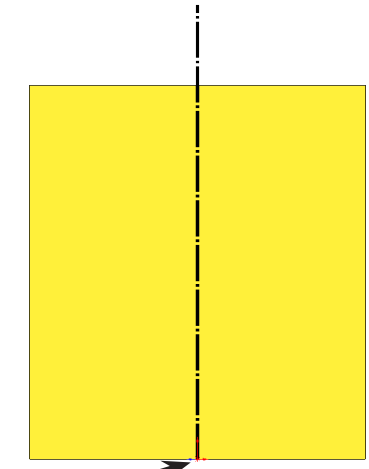


Fig. 25

Step 7. Click **Line** (**L**) on the Sketch toolbar.

Step 8. Draw a horizontal line across the body. Do not draw the line at the midpoint of the centerline, **Fig. 26**.

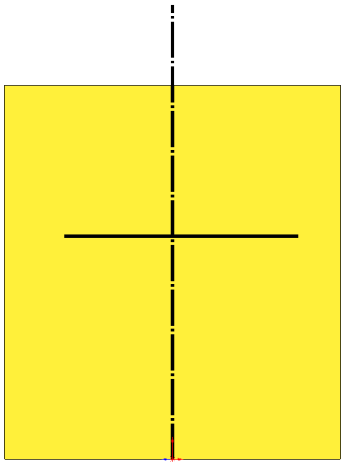


Fig. 26

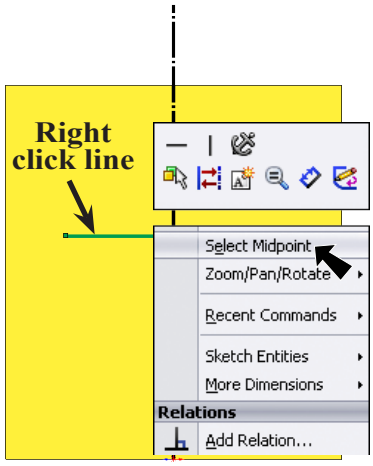


Fig. 27

Step 9. **Right click drawing and click Select** from menu to unselect Line Tool.

Step 10. **Right click horizontal line** and click **Select Midpoint** from Content menu, **Fig. 27**.

Step 11. **Ctrl click vertical centerline** and **release Ctrl key**, then click **Make Coincident** on the Content menu. To Ctrl click, right click line and click Select Midpoint from menu, then hold down the Ctrl key and click vertical centerline.

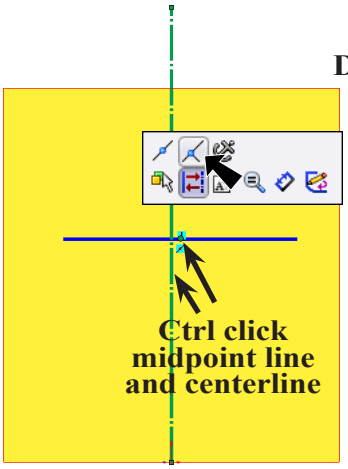


Fig. 28

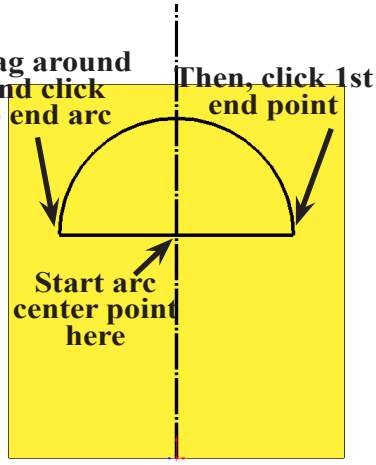


Fig. 29

Step 12. Click **Centerpoint Arc** (S) in the **Arc flyout** on the Sketch toolbar.

Step 13. Click the midpoint of the horizontal line (at centerline) to start the arc and move the cursor to the right endpoint of the line. Click to place the first end point, then move cursor counterclockwise. Click to place the second end point, **Fig. 29**.

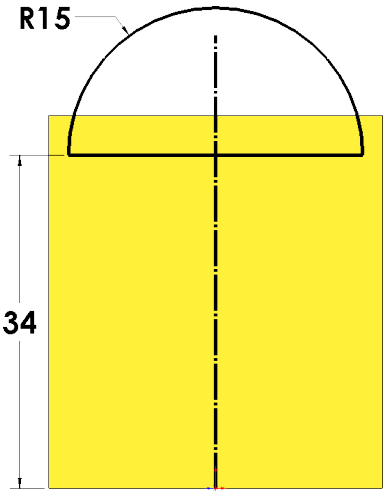


Fig. 30

Step 14. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 15. Dimension **arc radius 15**, then add the **34**, **Fig. 30**.

Step 16. Click **Exit Sketch** on the Sketch toolbar.

F. Cockpit Loft LEFT Guide Curve.

Step 1. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 2. Click the **top face** of body and click **Sketch** on the Content menu, **Fig. 31**.

Step 3. Click **Normal To** on the Standard Views toolbar. (**Ctrl-8**)

Step 4. Zoom in around **rear edge of body**, **Fig. 32**. To **zoom**, hold down **Shift key** and drag with middle mouse button (wheel). To **pan**, hold down **Ctrl key** and drag with middle mouse button (wheel).

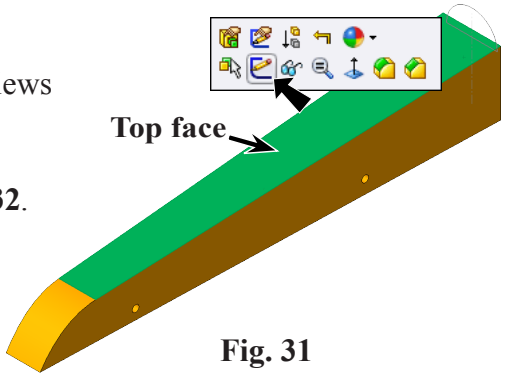


Fig. 31

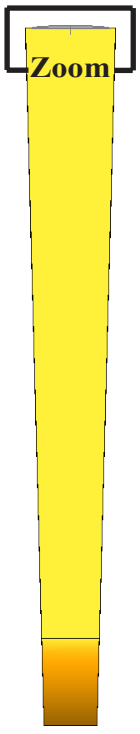


Fig. 32

Step 5. Click **Centerline**  (**S**) in the **Line flyout**  on the Sketch toolbar.

Step 6. Starting from midpoint of the rear edge, draw a vertical centerline down into the body, **Fig. 33**.

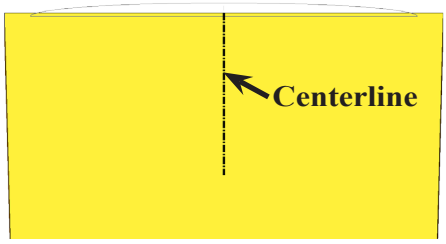


Fig. 33

Step 7. Click **Line**  (**L**) on the Sketch toolbar.

Step 8. Draw a line at angle some what parallel to the right body edge away from any geometry (sketch or edge), **Fig. 34**.

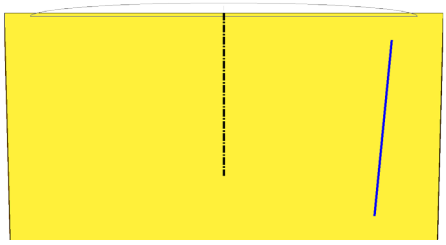


Fig. 34

Step 9. **Right click drawing and click Select** from menu to unselect Line Tool.

Step 10. **Ctrl click top endpoint of line** and **arc in loft rear sketch**, **Fig. 35**. To Ctrl click, click endpoint, then hold down Ctrl key and arc.

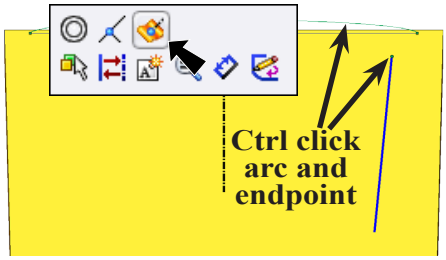


Fig. 35

Step 11. Click **Make Pierce**  on the Content menu, **Fig. 35**. Make Pierce adds a Pierce relation between line and rear sketch.

Step 12. **Click line** and **Ctrl click right edge of body**, **Fig. 36**. To Ctrl click, click line, then hold down Ctrl key and right edge of body.

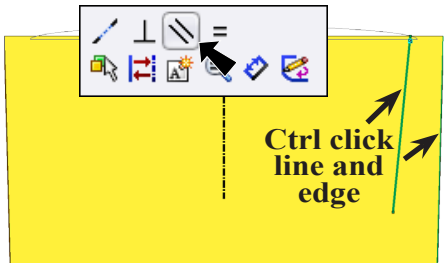


Fig. 36

Step 13. Click **Make Parallel**  on the Content menu, **Fig. 36**.

Step 14. Click **Smart Dimension** 

on the Sketch toolbar.

Step 15. Dimension **line 62** and **vertical centerline 90**, **Fig. 37**

Step 16. **Right click drawing and click Select** from menu to unselect Smart Dimension.

Step 17. Click the centerline and click **Zoom to Selection**  (**Q**) on the View toolbar to zoom to sketch.

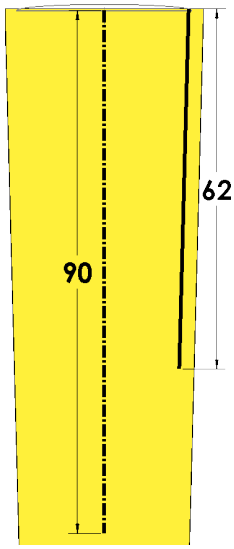


Fig. 37

Step 18. Click **Spline** (**S**) on the Sketch toolbar.

Step 19. Draw **two point** spline between bottom endpoint of line and bottom endpoint of centerline line, **Fig. 38**. **Right click drawing and click End spline** from menu.

Step 20. **Ctrl click line and spline** to select both spline and line, **Fig. 39**. To Ctrl click, click spline, then hold down the Ctrl key and click the line.

Step 21. Click **Make Tangent** on the Content menu, **Fig. 39** and **Fig. 40**.

Step 22. Click the **Control Polygon Handle**, **Fig. 40** and in the Spline Polygon Property set:

Y = **218** **Fig. 41**

click OK in the Property Manager.

Step 23. Click **Exit Sketch** on the Sketch toolbar.

Step 24. Save. Use **Ctrl-S**.

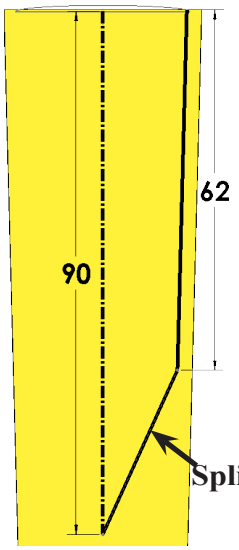


Fig. 38

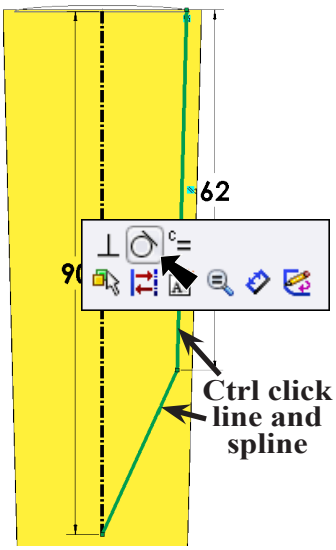


Fig. 39

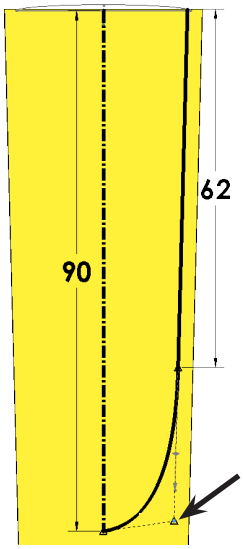


Fig. 40

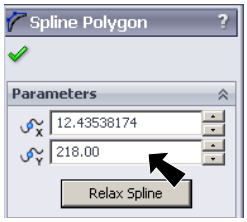


Fig. 41

G. Cockpit Loft RIGHT Guide Curve.

Step 1. Click the **top face** and click **Sketch** on the Content menu, **Fig. 42**.

Step 2. Click **Line** (**L**) on the Sketch toolbar.

Step 3. Draw a line at angle some what parallel to the left body edge away from any geometry (sketch or edge), **Fig. 43**.

Step 4. **Right click drawing and click Select** from menu to unselect Line Tool.

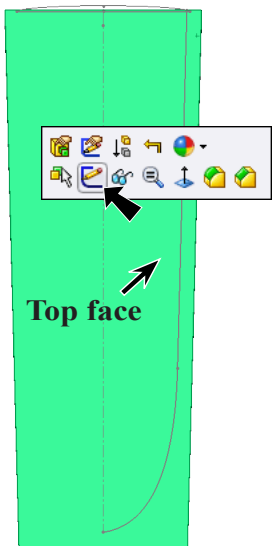


Fig. 42

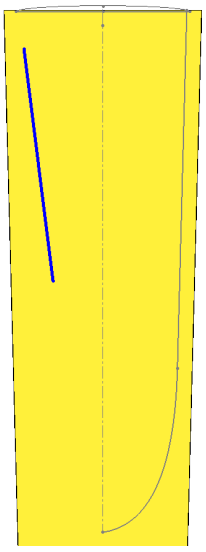


Fig. 43

Step 5. **Ctrl click top endpoint of line** and **arc in loft rear sketch**, **Fig. 44**. To Ctrl click, click endpoint, then hold down Ctrl key and arc.

Step 6. Click **Make Pierce** on the Content menu, **Fig. 44**. Make Pierce adds a Pierce relation between line and rear sketch.

Step 7. **Click line** and **Ctrl click edge of body**, **Fig. 45**. To Ctrl click, click line, then hold down Ctrl key and edge of body.

Step 8. Click **Make Parallel** on the Content menu, **Fig. 45**.

Step 9. Click **Smart Dimension** on the Sketch toolbar.

Step 10. Dimension **line 62**, **Fig. 46**.

Step 11. Click **Spline** **(S)** on the Sketch toolbar.

Step 12. Draw **two point** spline between bottom endpoint of line and bottom endpoint of centerline line, **Fig. 47**. **Right click drawing and click End spline** from menu.

Step 13. **Ctrl click line and spline** to select both spline and line, **release Ctrl key** and click **Make Tangent** on the Content menu, **Fig. 48**.

Step 14. Click the **Control Polygon Handle**, **Fig. 49** and in the Spline Polygon Property set:

Y = **218** **Fig. 50**

click OK in the Property Manager.

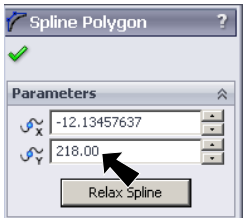


Fig. 50

Step 15. Click **Exit Sketch** on the Sketch toolbar.

Step 16. Save. Use **Ctrl-S**.

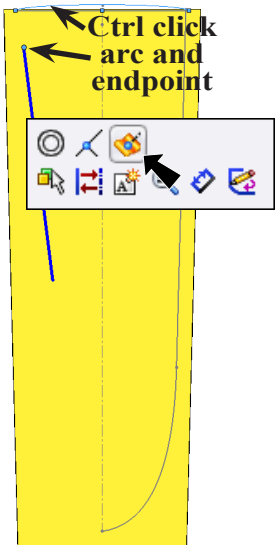


Fig. 44

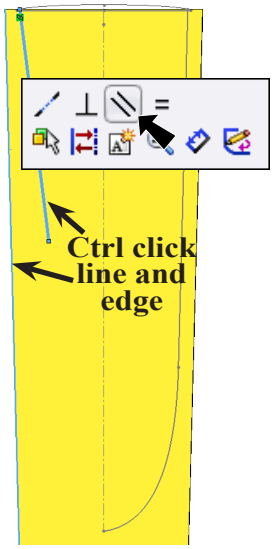


Fig. 45

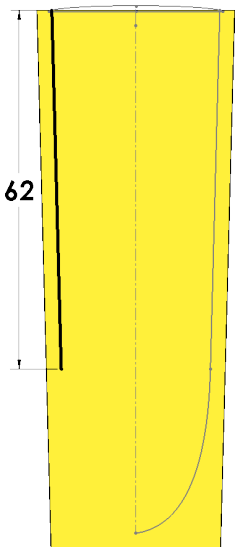


Fig. 46

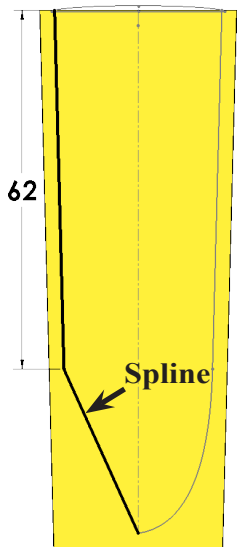


Fig. 47

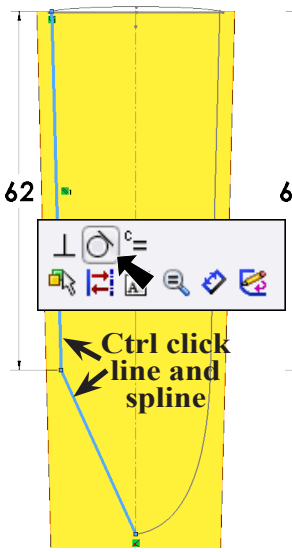


Fig. 48

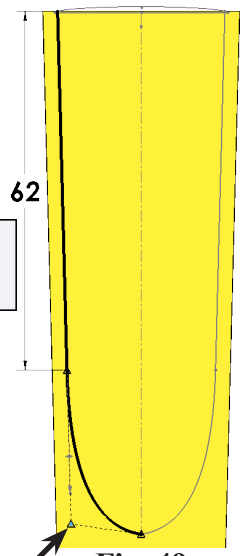


Fig. 49

H. Create Plane.

Step 1. Click **Isometric** on the Standard Views toolbar. **(Ctrl-7)**

Step 2. Click **Front** (plane) in the Feature Manager, **Fig. 51**.

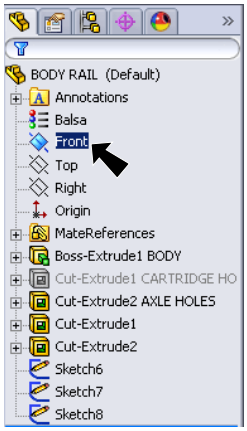


Fig. 51

Step 3. **Ctrl drag** Front plane in drawing towards rear of body and release, **Fig. 52**. To Ctrl drag, hold down Ctrl and drag plane to rear.

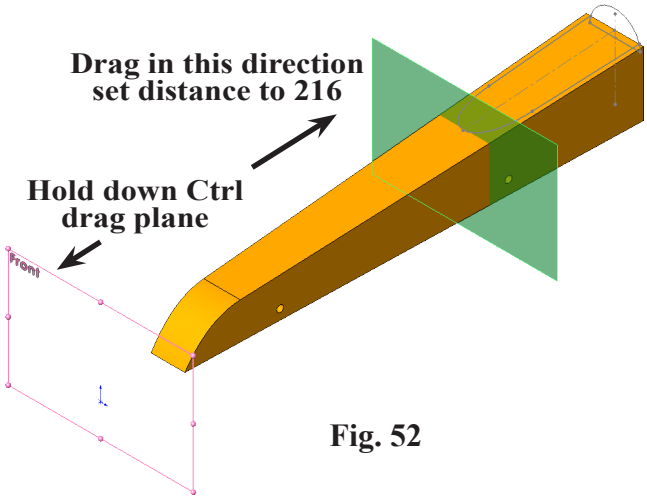


Fig. 52

Step 4. Key-in **216 for Distance** in the Property Manager, **Fig. 53**

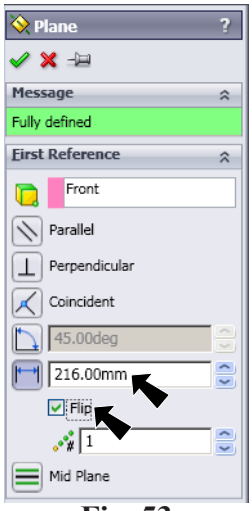


Fig. 53

Press the Tab key on keyboard. **If you can not see the Plane** check **Flip, Fig. 53**.

click OK .

I. Cockpit Loft Front Point Sketch.

Step 1. Click new **Plane 1** and click **Sketch** on the Content menu, **Fig. 54**.

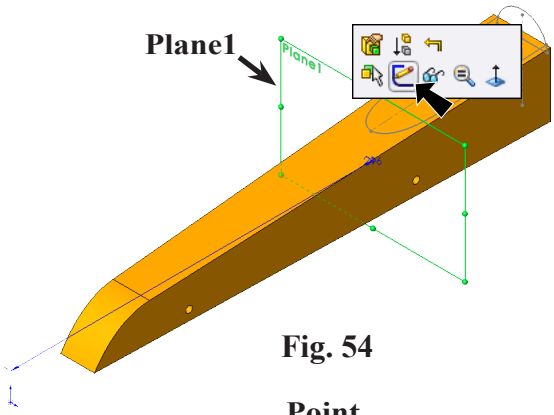


Fig. 54

Step 2. Click **Point** on the Sketch toolbar.

Step 3. Draw one point above the Loft sketches, **Fig. 55**. Be very careful to draw only one point, it is very easy to accidently click extra points.

Step 4. **Right click drawing and click Select** from menu to unselect Point tool.

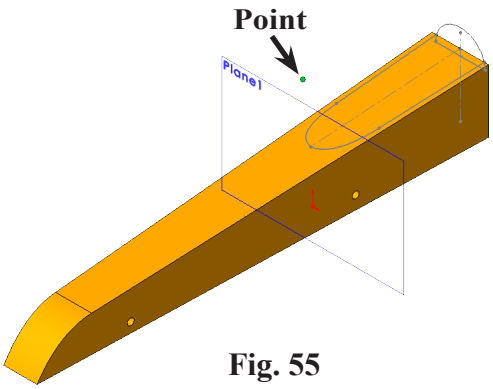


Fig. 55

Step 5. **Ctrl click Point** and **centerline in first guide curve sketch**, **Fig. 56**. To Ctrl click, click Point, then hold down Ctrl key and centerline.

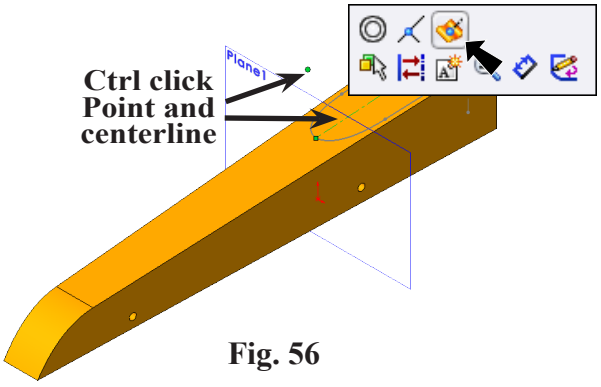


Fig. 56

Step 6. Click **Make Pierce** on the Content menu, **Fig. 56** and **Fig. 57**. Make Pierce adds a Pierce relation between Point and centerline.

Step 7. Click **Exit Sketch** on the Sketch toolbar.

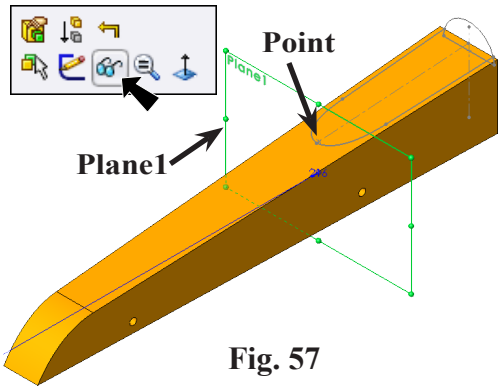


Fig. 57

J. Cockpit Loft SIDE Guide Curve.

Step 1. Hide Plane1. To hide, click **Plane1** in drawing and **Hide** from the menu, **Fig. 57**.

Step 2. Click **Right** (plane) in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 58**.

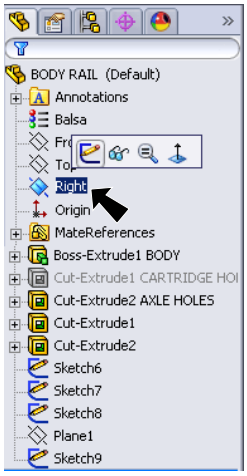


Fig. 58

Step 3. Click **Normal To** on the Standard Views toolbar. **(Ctrl-8)**

Step 4. Zoom in around **loft sketches at rear**, **Fig. 59**. To **zoom**, click a guide curve sketch and click **Zoom to Selection** **(Q)** on the View toolbar to zoom to sketch.

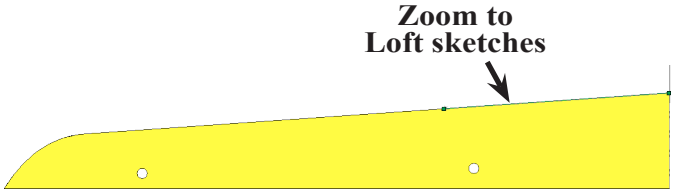


Fig. 59

Step 5. Click **Spline** **(S)** on the Sketch toolbar.

Step 6. Draw **three point** spline between front end guide curves sketch and rear arc, **Fig. 60**. **Right click drawing and click End spline** from menu.

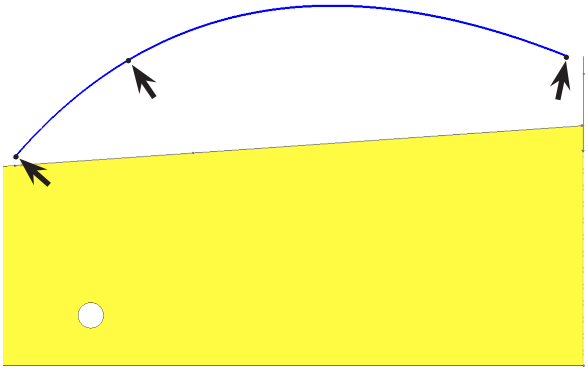


Fig. 60

Step 7. **Ctrl click right endpoint of spline** and **arc in rear sketch**, **Fig. 61**. To Ctrl click, click endpoint, then hold down Ctrl key and arc.

Step 8. Click **Make Pierce**  on the Content menu, **Fig. 61** and **Fig. 62**. Make Pierce adds a Pierce relation between guide curve and rear sketch.

Step 9. Click the spline to select it. Grab the Circular Spline handle (small gray dot) at endpoint, **Fig. 62** and pull up to adjust spline. Also, you can move the Spline point to adjust the spline.

Step 10. Click **Exit Sketch** 

on the Sketch toolbar.

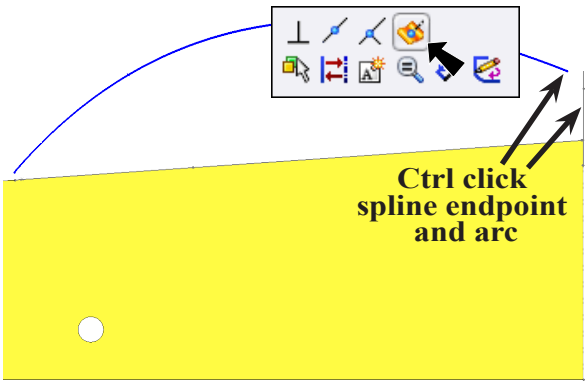


Fig. 61

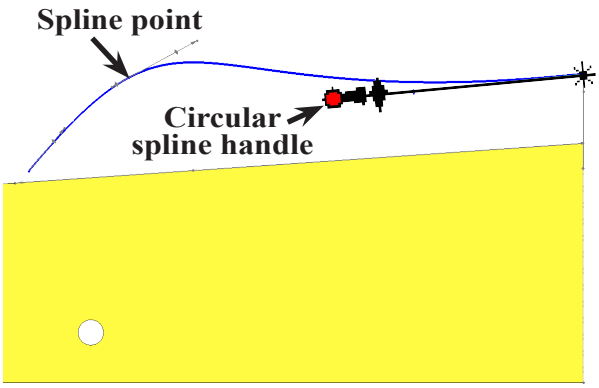


Fig. 62

K. Rename Sketch.

Step 1. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

Step 2. **Rename Sketches** in the Feature Manager. To rename, slowly click twice over the Sketch name and change name, **Fig. 63**.
Change to:

Sketch6 REAR
Sketch7 LEFT
Sketch8 RIGHT
Sketch9 POINT
Sketch10 TOP

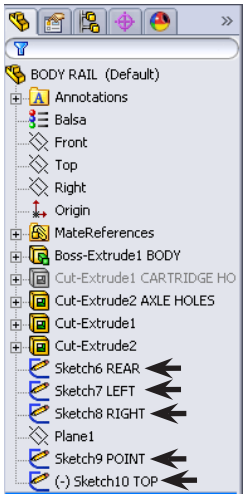
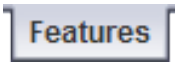
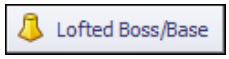


Fig. 63

L. Loft Boss/Base.

Step 1. Click **Features** 

on the Command Manager toolbar.

Step 2. Click **Lofted Boss/Base** 

on the Features toolbar.

Step 3. In the Loft Property Manager:

under **Profiles**, **Fig. 64**

click **Sketch6 REAR Fig. 65**

Sketch9 POINT

under **Guide Curves**, **Fig. 64**

click in the **Guide Curves box**

click **Sketch7 LEFT Fig. 66**

Sketch8 RIGHT

Sketch10 TOP

set **Guide curves influence to Global**

under **Options**

check Merge results, **Fig. 64**

click OK 

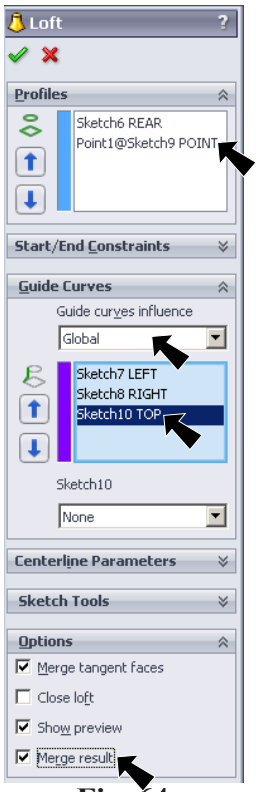


Fig. 64

Step 4. Save. Use **Ctrl-S**.

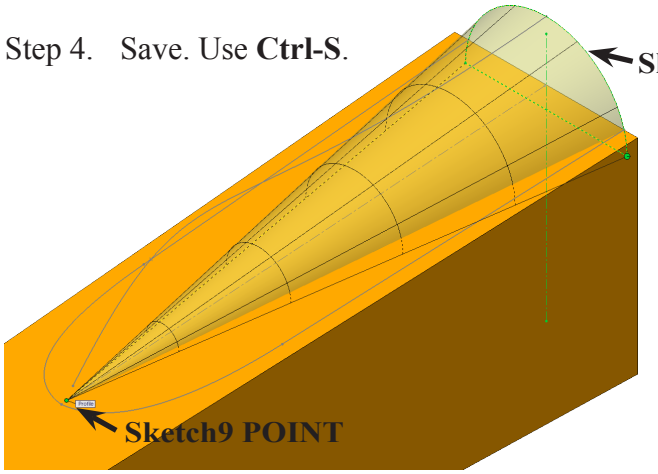


Fig. 65

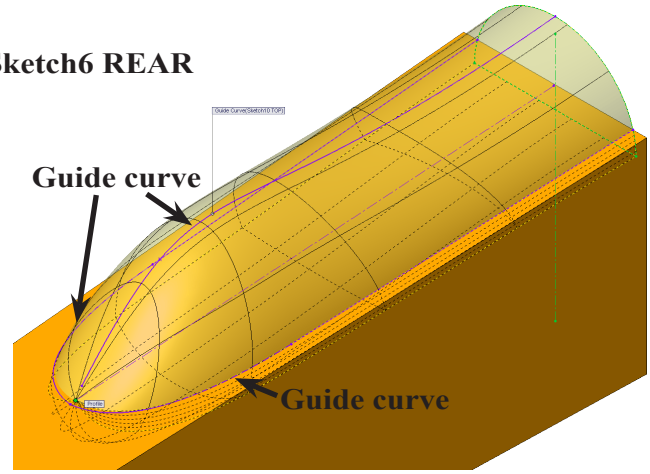


Fig. 66

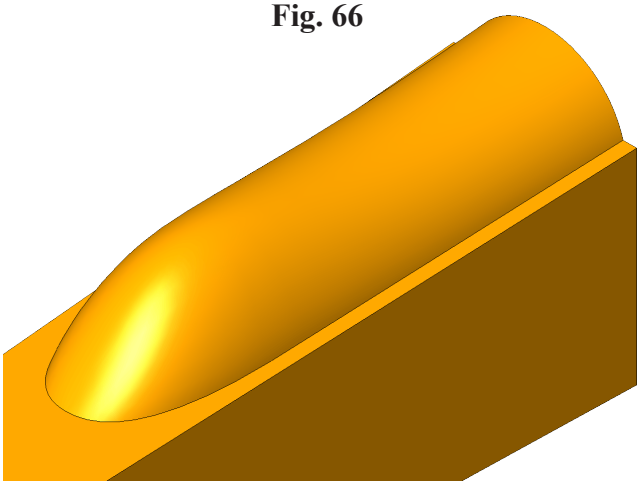


Fig. 67

M. Edit Axle Hole Sketch.

Step 1. In the Feature Manager move the suppressed **Cut-Extrude1 CARTRIDGE HOLE** below Loft1 feature, **Fig. 68**. To move the feature, drag **Cut-Extrude1 CARTRIDGE HOLE** down, when the yellow pointer is over Loft1 release.

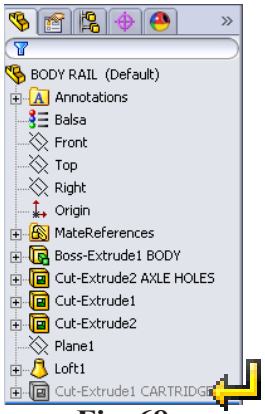


Fig. 68

Step 2. Click the suppressed **Cut-Extrude1 CARTRIDGE HOLE** and click **Unsuppress** in the menu, **Fig. 69**.

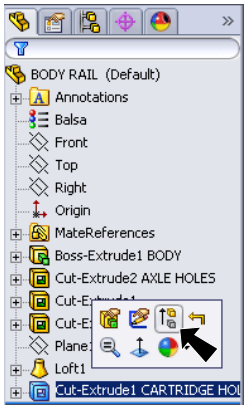


Fig. 69

Step 3. Move **Cut-Extrude2 AXLE HOLES** below **CARTRIDGE HOLE** feature, **Fig. 70**. To move the feature, drag **Cut-Extrude1 AXLE HOLES** down, when the yellow pointer is over **CARTRIDGE HOLE** and release. **Ignore the What's Wrong dialog box**.

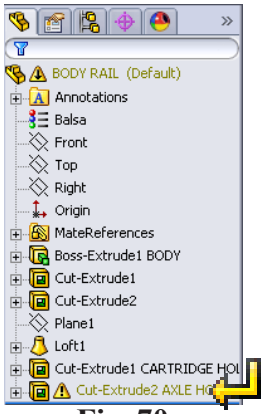


Fig. 70

Step 4. Click **Cut-Extrude2 AXLE HOLES** and click **Edit Sketch** on the Content menu, **Fig. 71**.

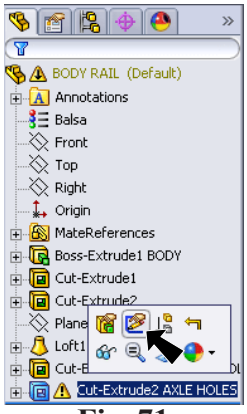


Fig. 71

Step 5. Click **Normal To** on the Standard Views toolbar. (**Ctrl-8**)

Step 6. **Delete all dimensions except 3.18 mm** axle hole diameters, **Fig. 72**.

Step 7. Click **Smart Dimension** (**S**) on the Sketch toolbar.

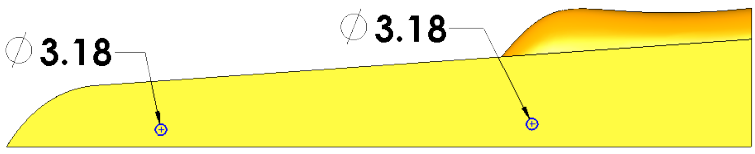


Fig. 72

Step 8. Add the dimensions as shown in **Fig. 73**.

Step 9. Click **Exit Sketch** on the Sketch toolbar.

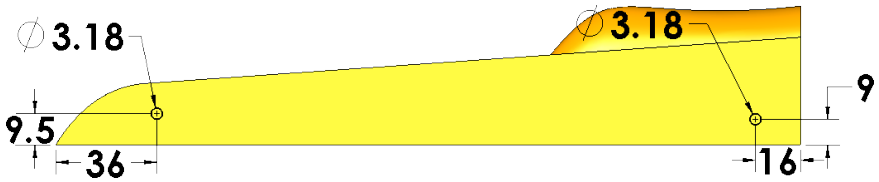


Fig. 73

Step 10. Save. Use **Ctrl-S**.

N. Front Wheel Standoff.

Step 1. Click **Right** (plane) in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 74**.

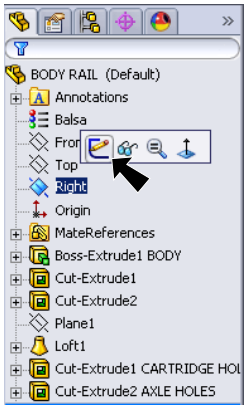


Fig. 74

Step 2. Zoom in around **front axle hole**, **Fig. 75**. To **zoom**, hold down **Shift key** and drag with middle mouse button (wheel). To **pan**, hold down **Ctrl key** and drag with middle mouse button (wheel).

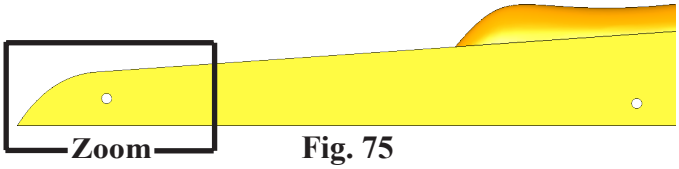


Fig. 75

Step 3. Click **Convert Entities** on the Sketch toolbar.

Step 4. In the Convert Entities Property Manager:

click edge of front axle hole in drawing, **Fig. 76**

click OK **twice** .

This converts edge of hole to a circle.

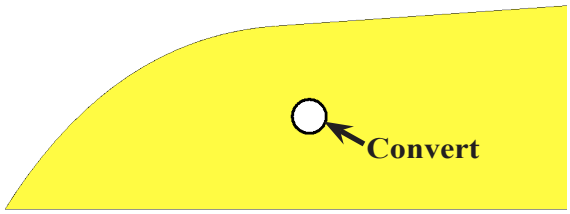


Fig. 76

Step 5. Click **Centerline** **(S)** in the **Line flyout** on the Sketch toolbar.

Step 6. Draw a vertical centerline, **Fig. 77**.

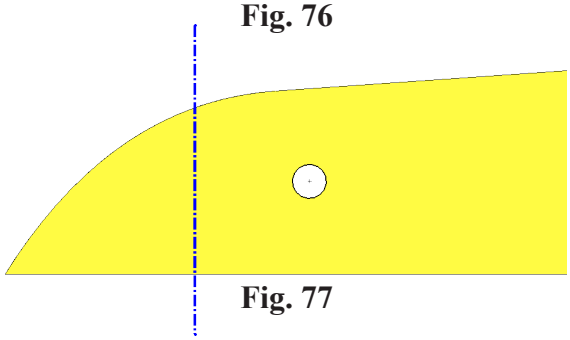


Fig. 77

Step 7. **Right click drawing and click Select** from menu to unselect Centerline Tool.

Step 8. **Ctrl click the vertical centerline and centerpoint of axle converted circle** to select both, **Fig. 78**. To Ctrl click, click centerline, then hold down the Ctrl key and click the centerpoint of converted circle.

Step 9. Click **Make Midpoint** on the Content menu, **Fig. 78**.

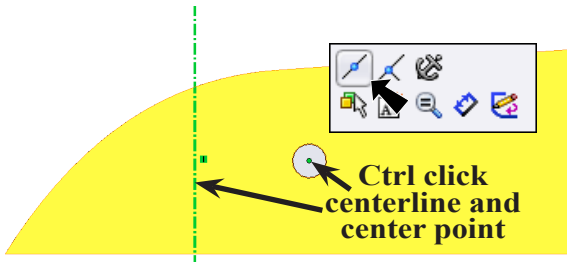


Fig. 78

Step 10. Click **Spline** **(S)** on the Sketch toolbar.

Step 11. Draw **3 point** spline between bottom edge of body in front of axle hole and centerline above axle hole, **Fig. 79**. **Right click drawing and click End spline** from menu.

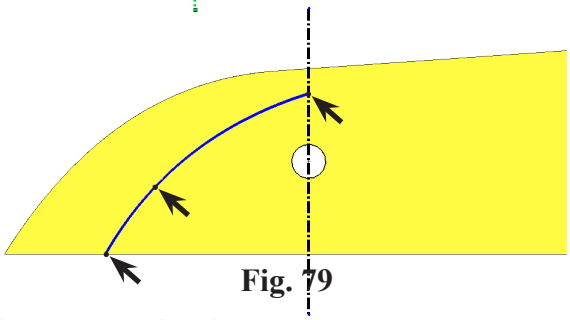


Fig. 79

Step 12. Draw **two point** spline between top end-point of spline (at centerline) and edge of body on rear side of axle hole, **Fig. 80**. **Right click drawing and click Select** from menu to end spline.

Step 13. Click the second spline and grab the circular spline handle (small gray dot) at right end-point, **Fig. 81** and pull up to adjust spline.

Step 14. **Ctrl click** both splines to select both splines, **Fig. 82**.

Step 15. Click **Make Tangent**  on the Content menu, **Fig. 82**.

Step 16. Click the left spline to select it, **Fig. 83**.

Step 17. Grab the circular spline handle (small gray dot) at right endpoint, **Fig. 83** and pull up to adjust spline.

Step 18. Click **Smart Dimension** 

on the Sketch toolbar.

Step 19. Dimension as shown in **Fig. 84**.

Step 20. Move the control polygon handles  to adjust shape of spline.

Step 21. Click **Line**  (**L**) on the Sketch toolbar.

Step 22. Draw a line across between bottom end-points of splines to close the sketch, **Fig. 85**.

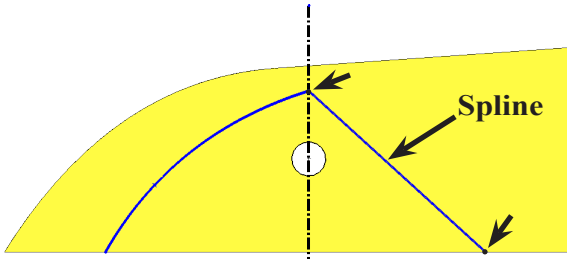


Fig. 80

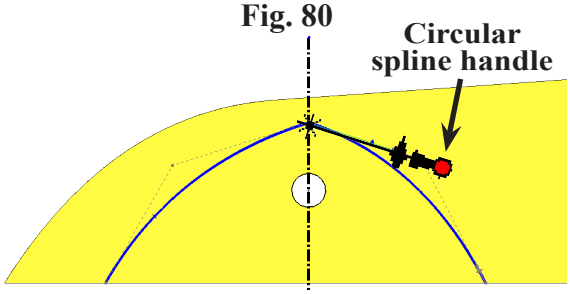


Fig. 81

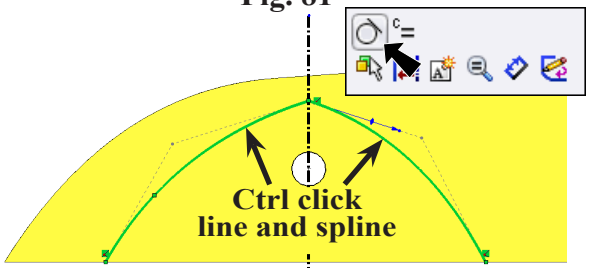


Fig. 82

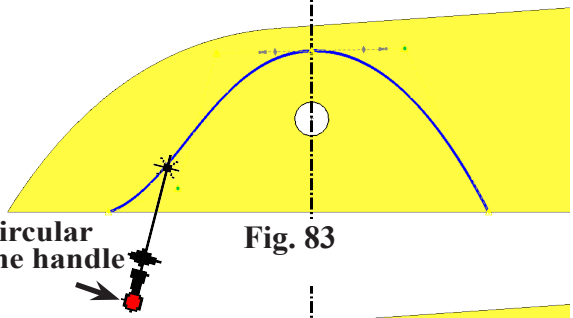


Fig. 83

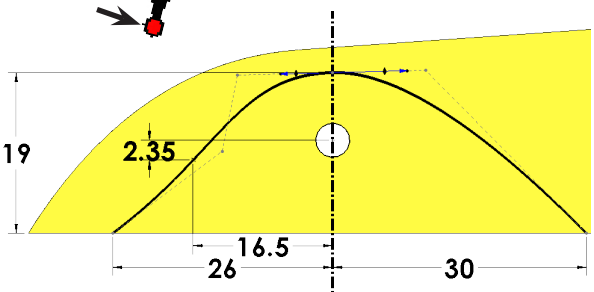


Fig. 84

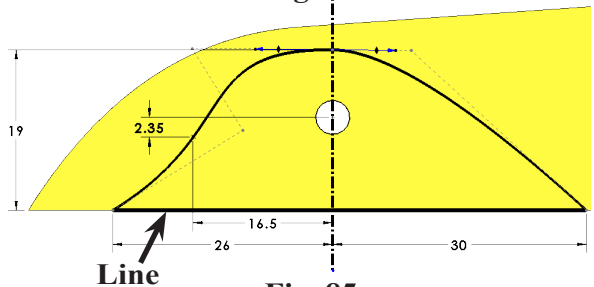
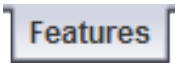
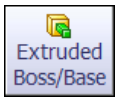


Fig. 85

Step 23. Click **Features** 

on the Command Manager toolbar.

Step 24. Click **Extruded Boss/Base** 

on the Features toolbar.

Step 25. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

Step 26. In the Property Manager, under **Direction 1** set:
End Condition to **Mid Plane**
Depth  to **40**
click OK  , **Fig. 86** and **Fig. 87**.

Step 27. Save. Use **Ctrl-S**.

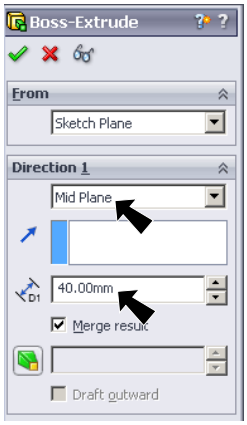


Fig. 86

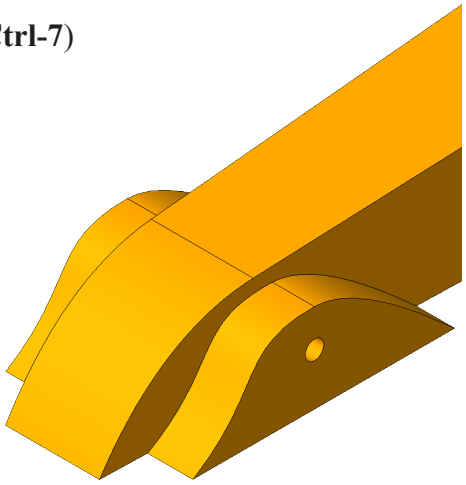


Fig. 87

O. Rear Fender.

Step 1. Click **Right** (plane) in the Feature Manager and click **Sketch**  from the Content toolbar, **Fig. 88**.

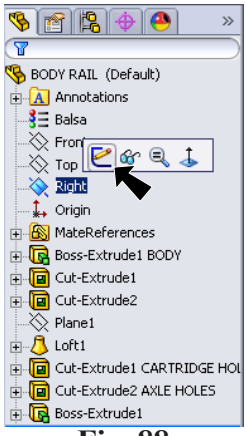


Fig. 88

Step 2. Click **Normal To**  on the Standard Views toolbar. (**Ctrl-8**)

Step 3. Zoom in around **rear axle hole**, **Fig. 89**. To **zoom**, hold down **Shift key** and drag with middle mouse button (wheel). To **pan**, hold down **Ctrl key** and drag with middle mouse button (wheel).

Step 4. Click **Centerpoint Arc**  (**S**) in the **Arc flyout**  on the Sketch toolbar.

Step 5. Click the centerpoint of rear axle hole to start the arc and move the cursor to the upper right. Click to place the first end point of arc, then move cursor counterclockwise. Click to place the second end point, **Fig. 90**.

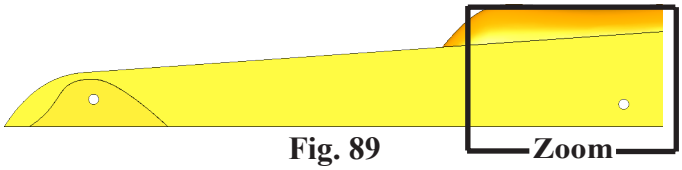


Fig. 89

Step 6. Click **Smart Dimension** 

(**S**) on the Sketch toolbar.

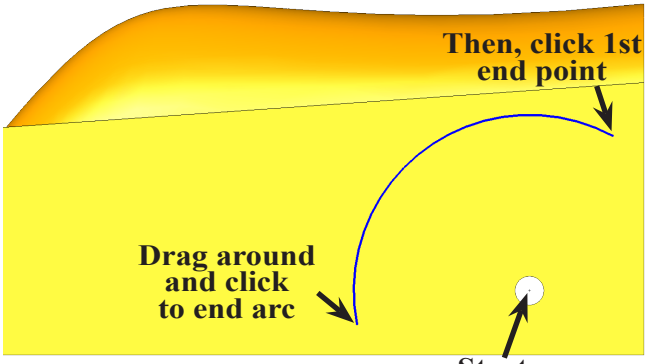


Fig. 90

Step 7. Dimensions the radius **24.5** as shown in **Fig. 91**.

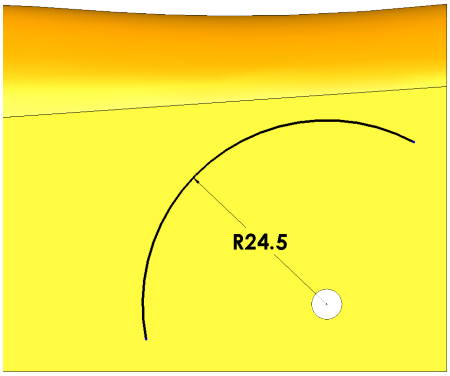


Fig. 91

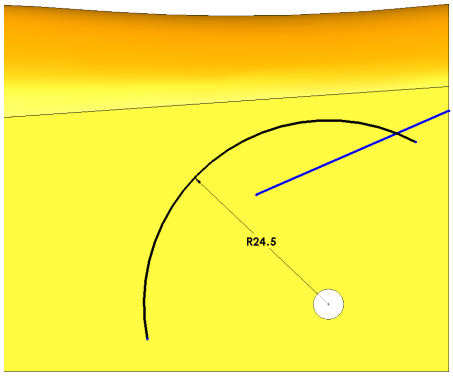


Fig. 92

Step 8. Click **Line** (**L**) on the Sketch toolbar.

Step 9. Start line on back edge and draw line toward front at a slight downward angle, **Fig. 92**.

Step 10. **Right click drawing and click Select from menu** to unselect Line tool.

Step 11. **Ctrl click line** and **top edge of body**, **Fig. 93**.

Step 12. Click **Make Parallel** on the Content menu, **Fig. 93**.

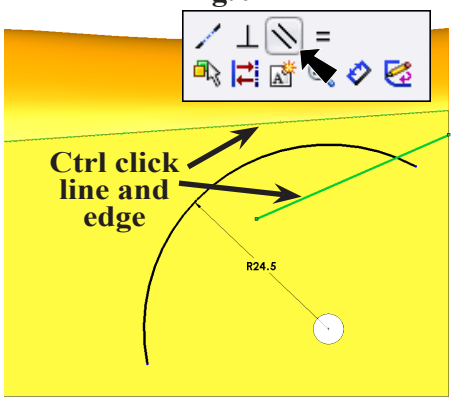


Fig. 93

Step 13. **Ctrl click line and arc** to select both, **Fig. 94**.

Step 14. Click **Make Tangent** on the Content menu, **Fig. 94**.

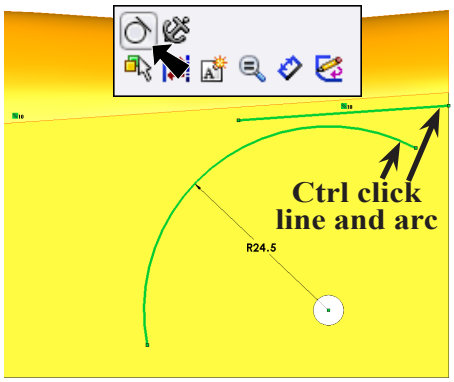


Fig. 94

Step 15. Click **Spline** (**S**) on the Sketch toolbar.

Step 16. Draw **two point** spline between arc and bottom edge of body, **Fig. 95**.

Step 17. Click **Smart Dimension** 

on the Sketch toolbar.

Step 18. Dimensions the distance across the bottom **57.5** as shown in **Fig. 96**.

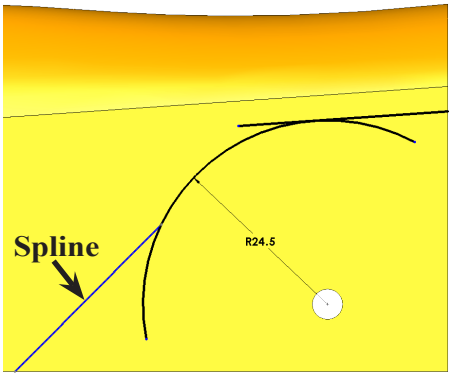


Fig. 95

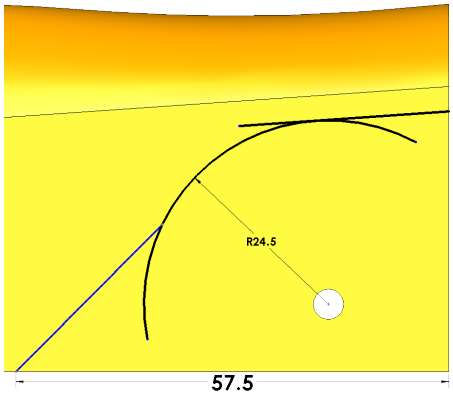


Fig. 96

Step 19. **Right click drawing and click Select from menu** to unselect Smart dimension tool.

Step 20. **Ctrl click spline and arc** to select both, **Fig. 97**.

Step 21. Click **Make Tangent**  on the Content menu, **Fig. 97**.

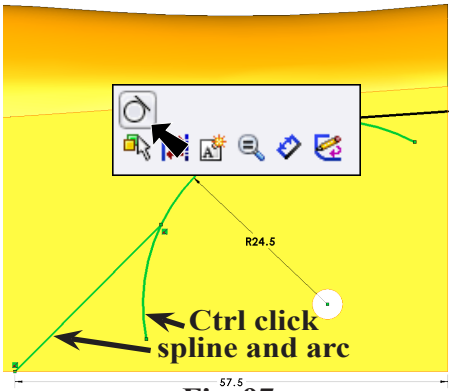


Fig. 97

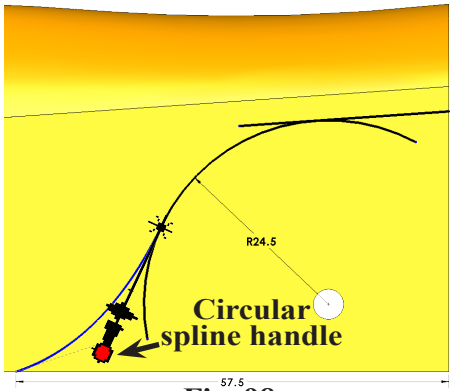


Fig. 98

Step 22. Grab the circular spline handle (small gray dot) at right endpoint, **Fig. 98** and pull up to adjust spline.

Step 23. Click **Trim Entities**  on the Sketch toolbar.

Step 24. In the Property Manger select **Trim to closest**  , **Fig. 99**.

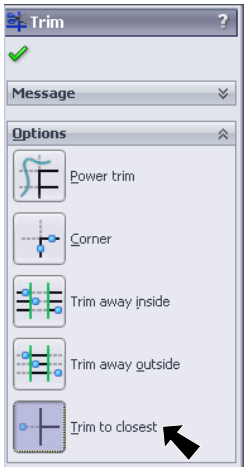


Fig. 99

Step 25. Trim the line and arcs as shown in **Fig. 100**. Click segments to remove (trim). Results shown in **Fig. 101**. Click **Yes** to message.

Step 26. Click **Offset Entities**  on the Sketch toolbar.

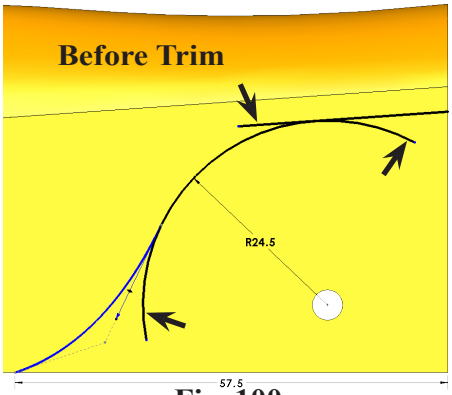


Fig. 100

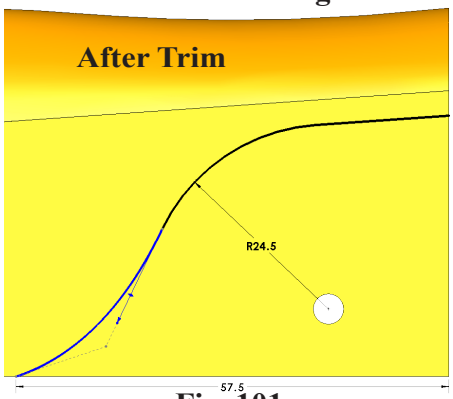


Fig. 101

Step 27. In the Offset Entities Property Manager set:

Distance  **to 4**

Check Select chain, **Fig. 102**.

Click any part of the sketch (line, spline or arc)

The yellow offset should be below the original green geometry, **Fig. 103**. If it is not, click Reverse. Click OK  .

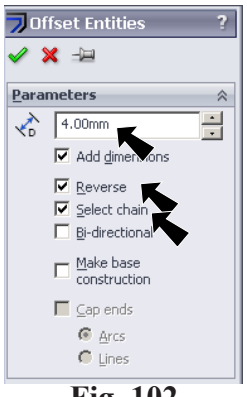


Fig. 102

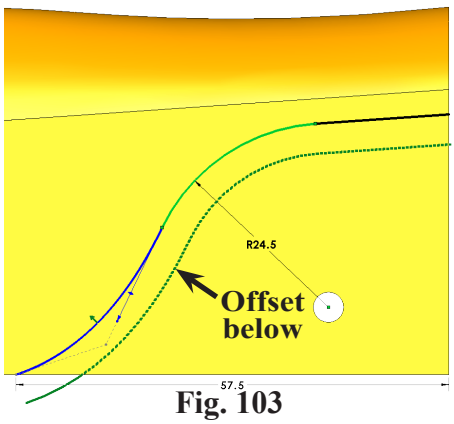


Fig. 103

Step 28. Click **Convert Entities** 

on the Sketch toolbar.

Step 29. In the Convert Entities Property Manager:
click rear and bottom edges of body, **Fig. 105**
click OK **twice**  .
This converts the edges to lines.

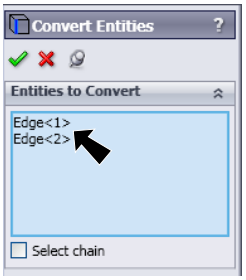


Fig. 104

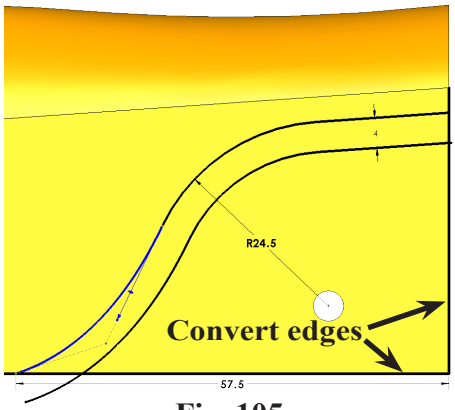


Fig. 105

Step 30. Click **Trim Entities** 

on the Sketch toolbar.

Step 31. In the Property Manger select **Trim to closest**  .

Step 32. Trim the converted lines to cap fender as shown in, **Fig. 106**. Click segments to trim. Results shown in **Fig. 107**.

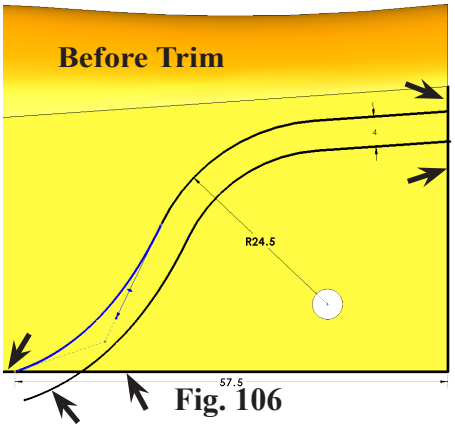


Fig. 106

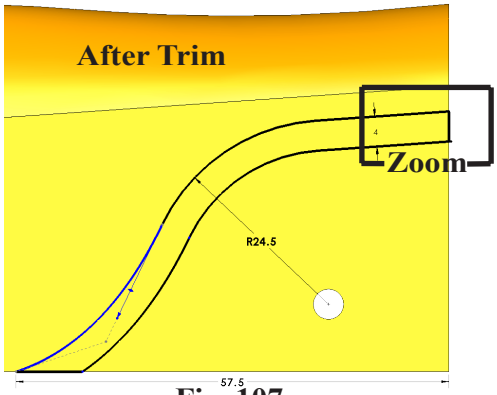


Fig. 107

Step 33. Zoom in around **rear edge of fender**, **Fig. 107**. To **zoom**, hold down **Shift key** and drag with middle mouse button (wheel). To **pan**, hold down **Ctrl key** and drag with middle mouse button (wheel).

Step 34. Trim the small piece of line that extends out from body, **Fig. 108**. Results shown in **Fig. 109**.

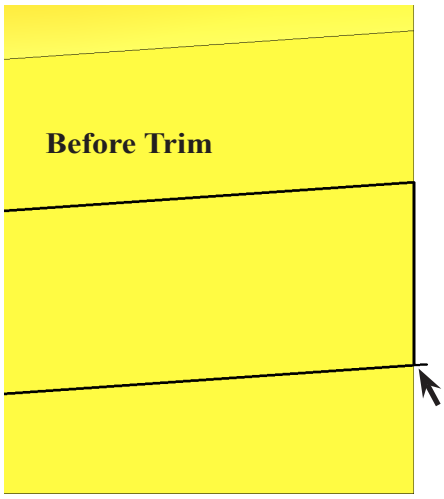


Fig. 108

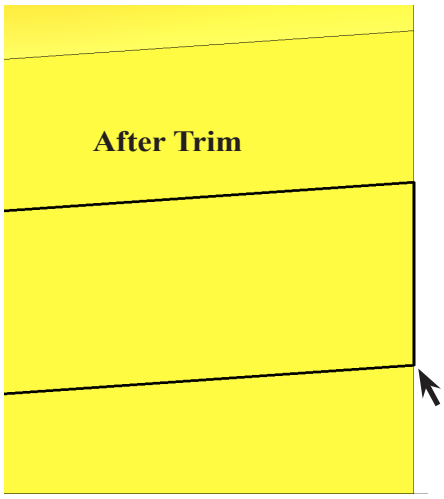


Fig. 109

Step 35. Click OK  in the Property Manager.

Step 36. Save. Use **Ctrl-S**.

P. Extrude Fender.

Step 1. Click **Back** on the Standard Views toolbar. (**Ctrl-2**)

Step 2. Rotate view slightly to view **back and side of body**, hold down middle mouse button (wheel) and drag to rotate view, **Fig. 110**.

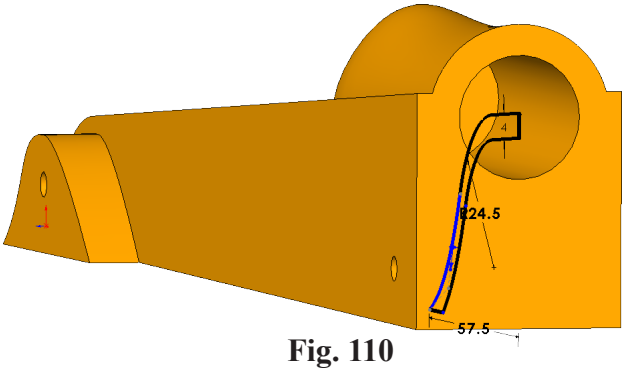


Fig. 110

Step 3. Click **Features** Features on the Command Manager toolbar.

Step 4. Click **Extruded Boss/Base** Extruded Boss/Base on the Features toolbar.

Step 5. In the Property Manager, under **Direction 1** set:

End Condition to **Mid Plane**

Depth D1 to **42**

click OK, **Fig. 111** and **Fig. 112**.

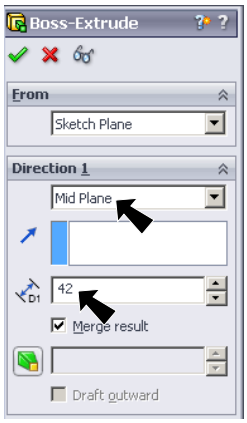


Fig. 111

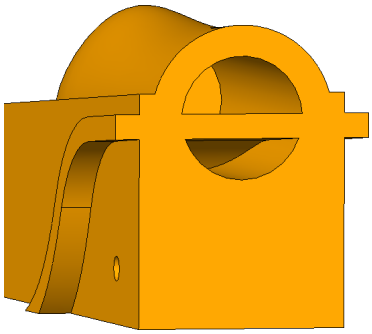


Fig. 112

Step 6. Save. Use **Ctrl-S**.

Q. Extrude Cut Wheel Wells.

Step 1. In the Feature Manager drag the **Cut-Extrude1 CARTRIDGE HOLE** below Boss-Extrude2 (Extruded Fenders) feature, **Fig. 113** and **Fig. 114**.

Step 2. Click **Right** (plane) in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 115**.

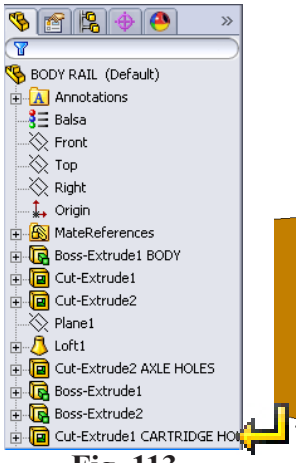


Fig. 113

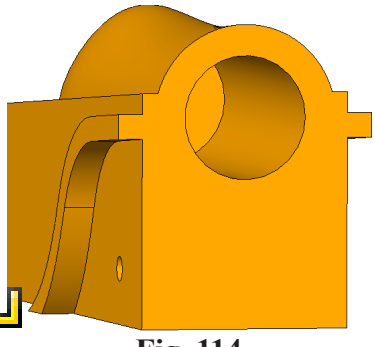


Fig. 114

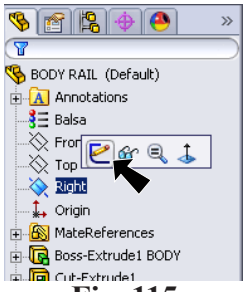


Fig. 115

Step 3. Click the **side face under the fender**, **Fig. 116**.

Step 4. Click **Convert Entities** 

on the Sketch toolbar.

Step 5. In the Convert Entities Property Manager:

click OK  .
This converts the face to edges, **Fig. 117**.

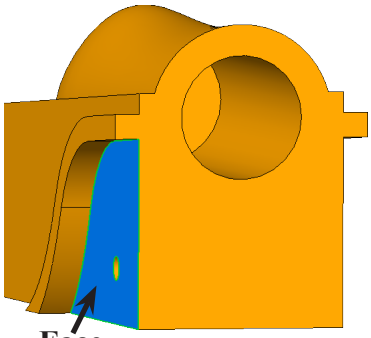


Fig. 116

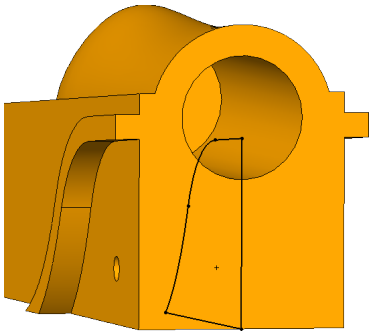
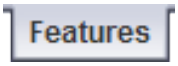
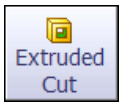


Fig. 117

Step 6. Click **Features** 

on the Command Manager toolbar.

Step 7. Click **Extruded Cut** 

on the Features toolbar.

Step 8. In the Property Manager set:

under **From**

Start Condition  to **Offset**
Offset Value to **17**

under **Direction 1**

Depth 

to **4**

click OK  , **Fig. 118** and **Fig. 120**.

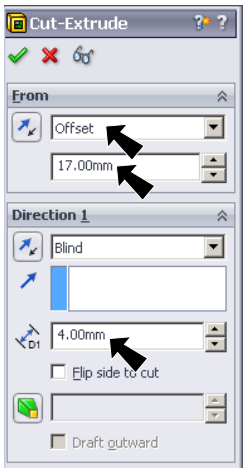


Fig. 118

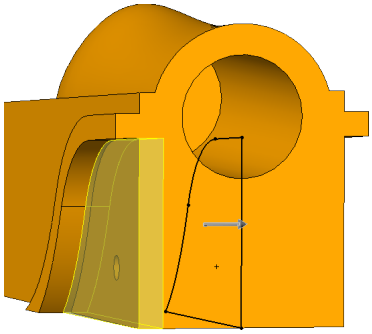


Fig. 119

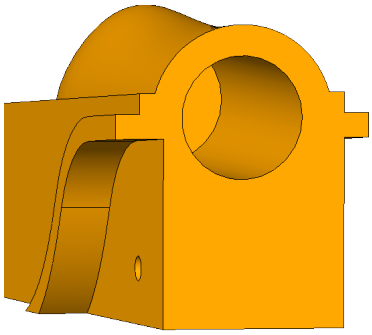


Fig. 120

R. Mirror Extrude Cut Wheel Wells.

Step 1. **Ctrl click Right** (plane) and **Cut-Extrude3** at the bottom of Features to select both, **Fig. 121**.

Step 2. Click **Mirror** 

on the Features toolbar.

Step 3. In the Mirror Property Manager click OK  , **Fig. 122** and **Fig. 124**.

Step 4. Save. Use **Ctrl-S**.

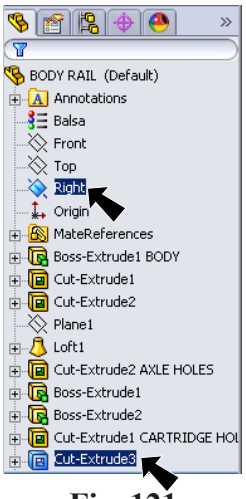


Fig. 121

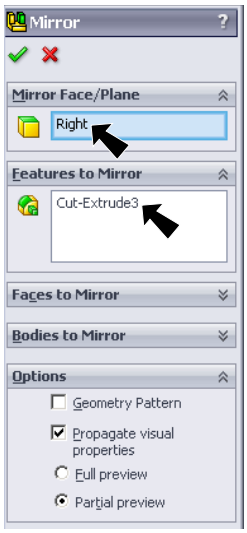


Fig. 122

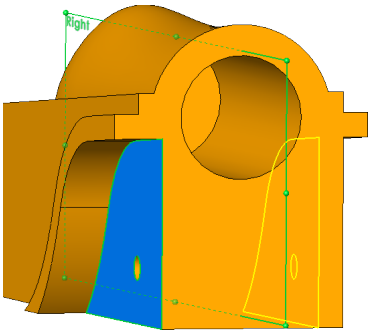


Fig. 123

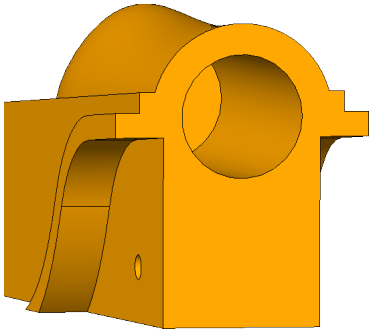


Fig. 124

S. Variable Fillet Top Edges.

Step 1. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

Step 2. Click **Filter Edges**  (**E**) on the **Selection Filter toolbar** at the bottom of the display, **Fig. 125**. If necessary, use **F5** key to display the toolbar.

Fig. 125

Step 3. Click **Fillet** 

on the Features toolbar.

Step 4. In the Fillet Property Manager:

select **Manual**, **Fig. 127**.

under **Fillet type**

Select **Variable radius**

select **Full preview**

Click the two top edges on both side of the body, **Fig. 126**.

Set the Unsigned Variable radius to 3 in the rear, middle to 6 and 10 in the front. To set radius, click Unassigned and key in radius

Click OK  , **Fig. 126** and **Fig. 128**.

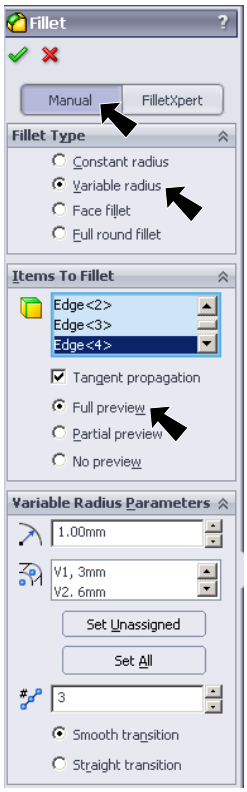


Fig. 127

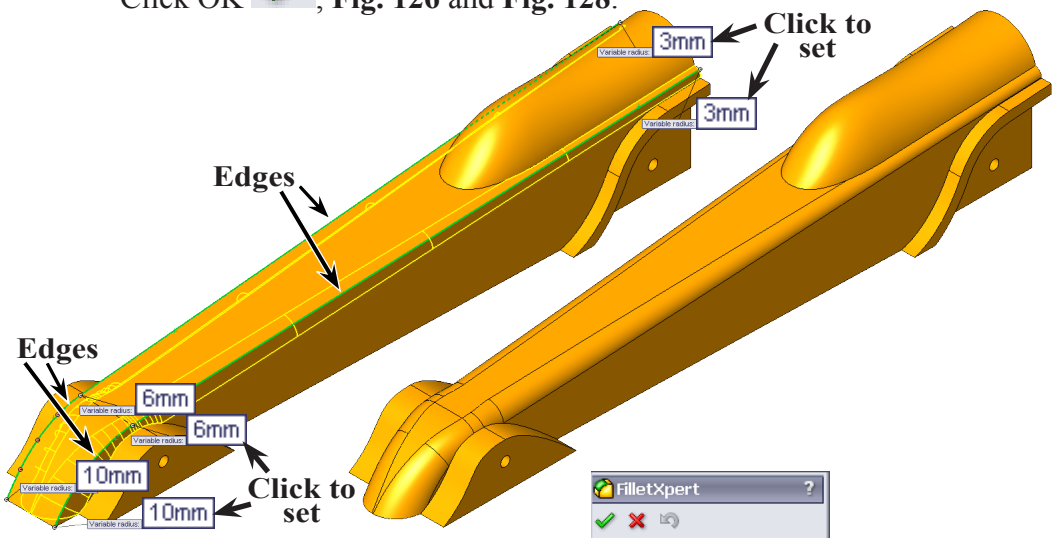


Fig. 126 **Fig. 128**

T. Fillet Edges.

Step 1. Click **Fillet** 

on the Features toolbar.

Step 2. In the Fillet Property Manager:

select **FilletXpert**, **Fig. 129**.

set **Radius**  to **3**

select **Full preview**

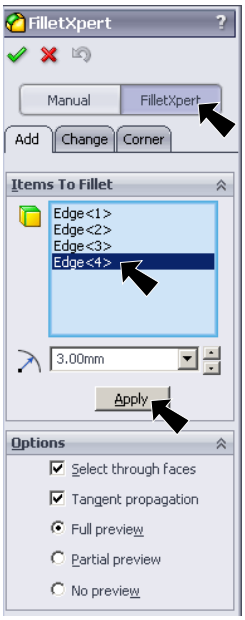


Fig. 129

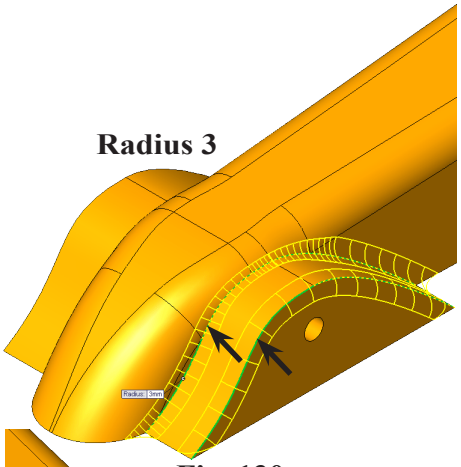


Fig. 130

click the **two top edges** of front wheel standoff, **Fig. 130**.

rotate view to view **right side of standoff**, hold down middle mouse button (wheel) and drag to rotate view, **Fig. 131**.

click the **two top edges** of right side of wheel standoff, **Fig. 131**.

click Apply

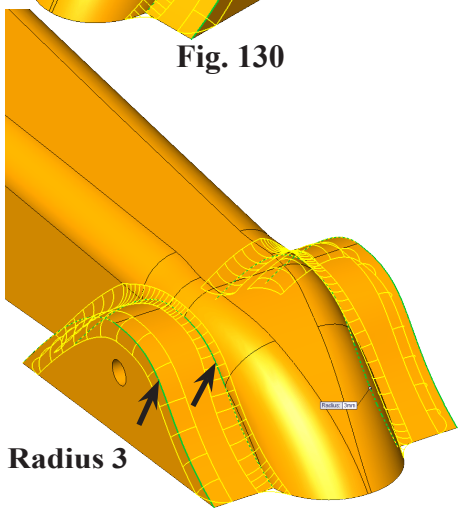


Fig. 131

Step 3. Set **Radius** to **3**

click the **top inside edge of fender**, **Fig. 132**

Rotate view to view **right fender** as shown in **Fig. 133**. To rotate view, hold down middle mouse button (wheel) and drag.

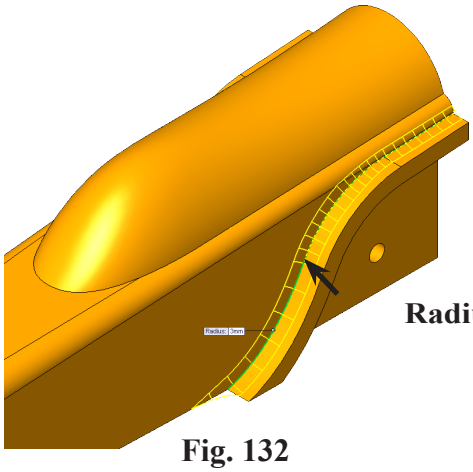


Fig. 132

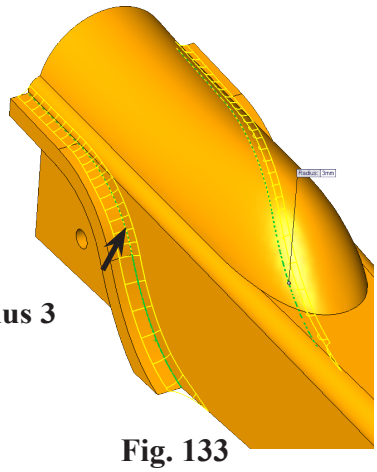


Fig. 133

click the **top inside edge of right fender**, **Fig. 133**

click Apply

Step 4. Set **Radius** to **2**

click the **top outside edge of fender**, **Fig. 134**

Click **Previous View** on the Standard Views toolbar. (**Ctrl-Shift-Z**)

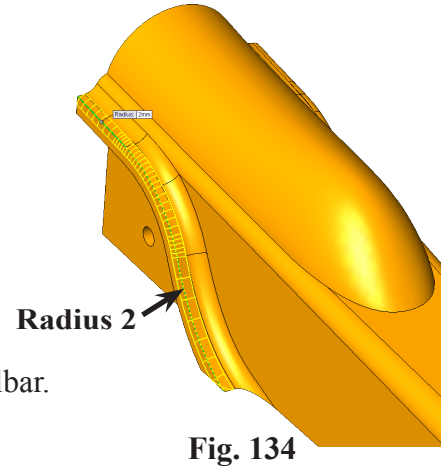


Fig. 134

click the **top outside edge of left fender**, **Fig. 135**

click Apply

Step 5. Set **Radius** to **4**

click **edge of cockpit at body**, **Fig. 136**

click OK in Fillet Property Manager when done, **Fig. 137**.

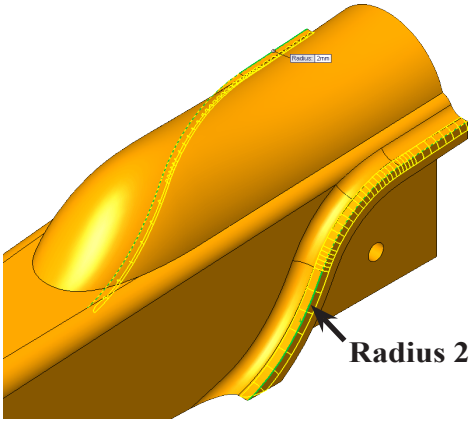


Fig. 135

Step 6. Save. Use **Ctrl-S**.

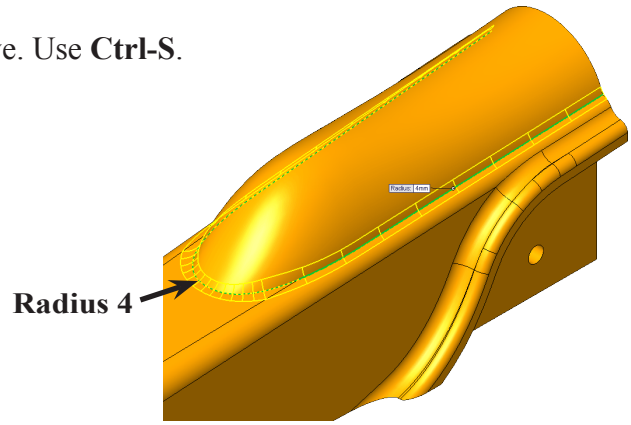


Fig. 136

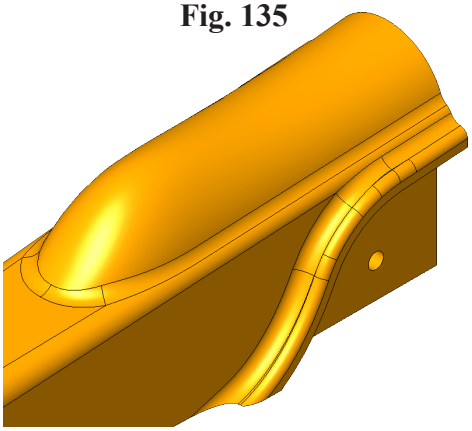


Fig. 137

U. Front Split Line.

Fig. 138

Step 1. Click **Filter Off** (**F6**) on the **Selection Filter toolbar** at the bottom of the display, **Fig. 138**. If necessary use **F5** key to display the toolbar.

Step 2. Click **Front** (plane) in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 139**.

Step 3. Click **Normal To** on the Standard Views toolbar. (**Ctrl-8**)

Step 4. Click **Centerline** in the **Line flyout** (**S**) on the Sketch toolbar.

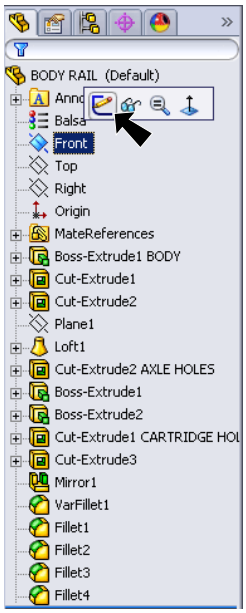


Fig. 139

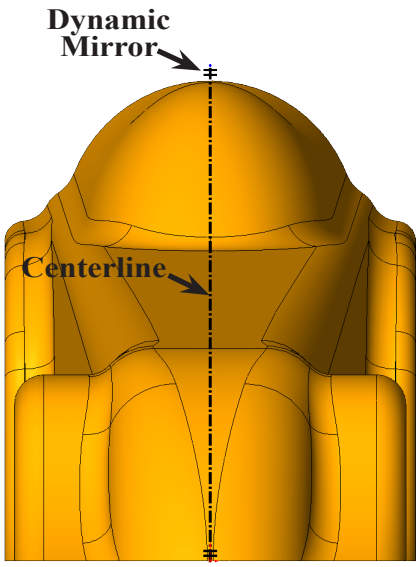


Fig. 140

Step 5. Starting from the Origin at the bottom of the body, draw a vertical line up through the body and extend the centerline out past body, **Fig. 140**.

Step 6. **Right click drawing and click Select** from menu to unselect Centerline tool.

Step 7. Click the centerline to select it, **Fig. 140**.

Step 8. Click **Dynamic Mirror** on the Sketch toolbar or Tools Menu > Sketch Tools > Dynamic Mirror, **Fig. 140**. Symmetry symbols appear at both ends of the centerline.

Step 9. Click **Spline** (**S**) on the Sketch toolbar.

Step 10. Draw **2 point** spline from centerline out into the cockpit at an angle, **Fig. 141**. **Right click drawing and click End Spline** from menu.

Step 11. Draw **two point** spline between end of first spline and centerline above first spline, **Fig. 142**. **Right click drawing and click Select** from menu to end spline.

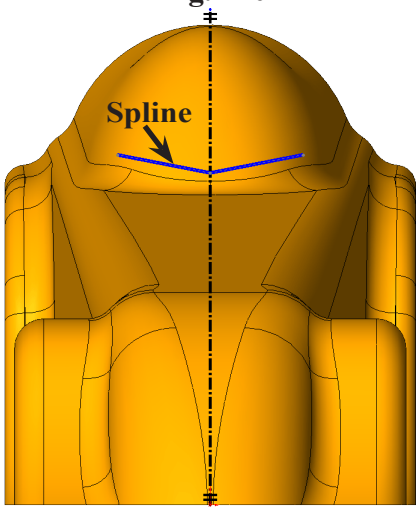


Fig. 141

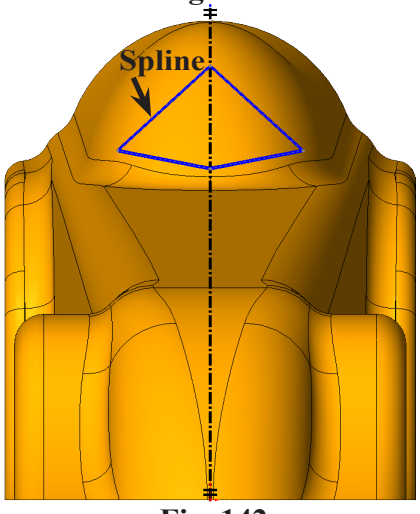


Fig. 142

Step 12. **Ctrl click** both **bottom** splines to select both splines, release Ctrl key and click **Make Tangent** on the Content menu, **Fig. 143**.

Step 13. **Ctrl click** both **top** splines to select both splines, release Ctrl key and click **Make Tangent** on the Content menu, **Fig. 144**.

Step 14. Click **Smart Dimension** on the Sketch toolbar.

Step 15. Add the dimensions as shown in **Fig. 145**.

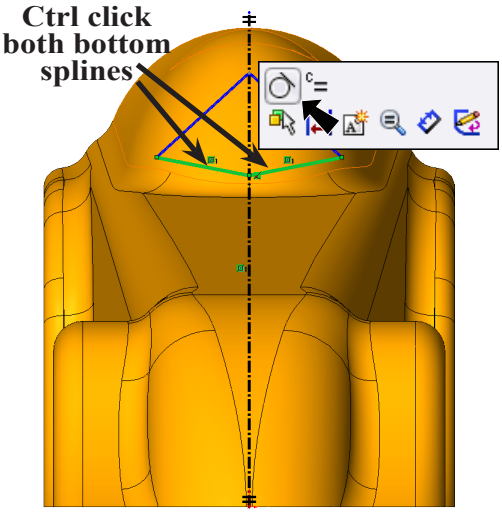


Fig. 143

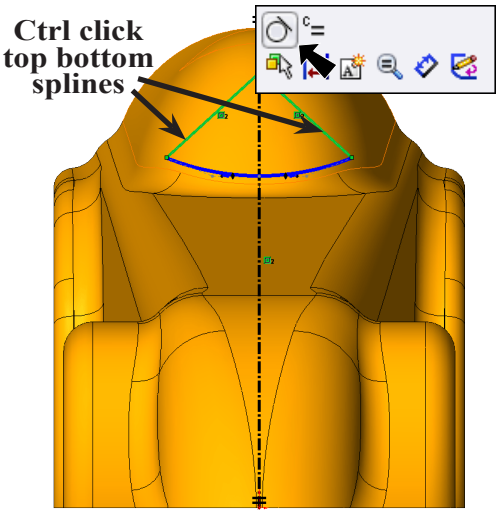


Fig. 144

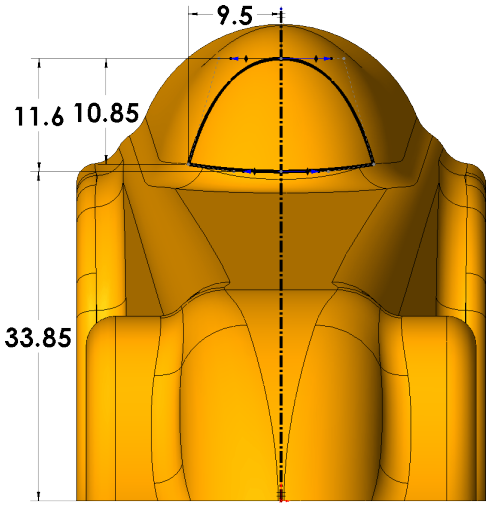


Fig. 145

Step 16. **Right click drawing and click Select** from menu to unselect Smart Dimension.

Step 17. Click the **Control Polygon Handle**, **Fig. 146** and in the Spline Polygon Property set:

X = **-8.8** **Fig. 147**

click OK in the Property Manager.

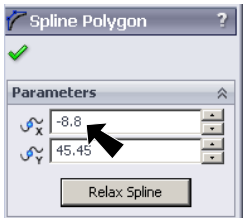


Fig. 147

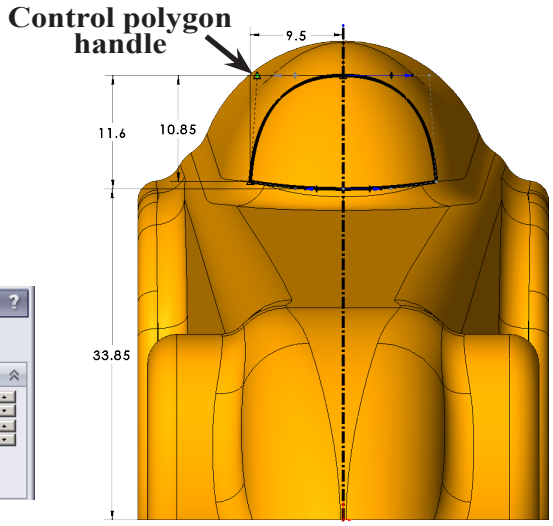


Fig. 146

Step 18. Click Insert Menu > Curve > Split Line.

Step 19. In the Split Line Property Manager:
under **Type of Split**
Select **Projection**
under **Selections**
Current Sketch should be selected
in the **Faces to Split** box **click cockpit loft in the drawing**
Click OK  , **Fig. 148** and **Fig. 149**.

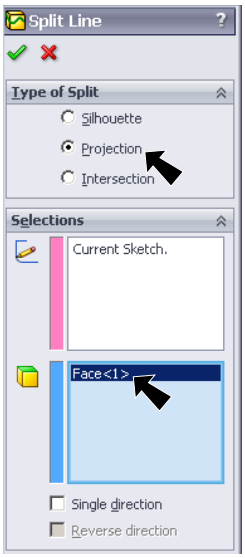


Fig. 148

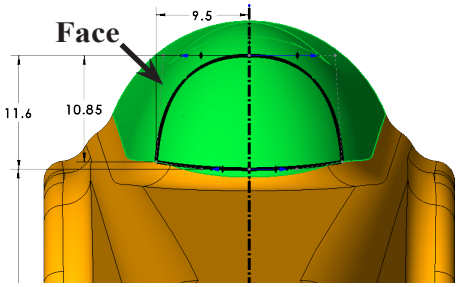


Fig. 149

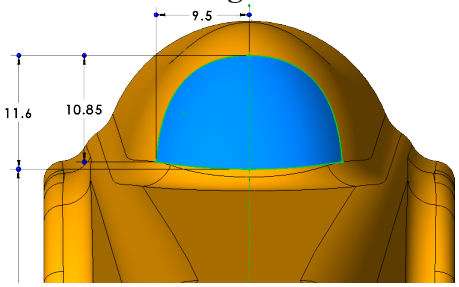


Fig. 150

Step 20. Click the split face to check Split Line, **Fig. 150**.

Step 21. Save. Use **Ctrl-S**.

V. Side Split Line.

Step 1. Click **Right**  (plane) in the Feature Manager and click **Sketch**  from the Content toolbar, **Fig. 151**.

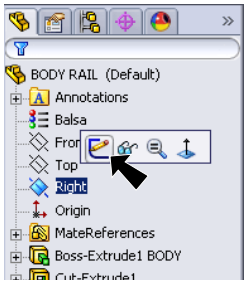


Fig. 151

Step 2. Click **Normal To**  on the Standard Views toolbar. (**Ctrl-8**)

Step 3. Zoom in around **cockpit**, **Fig. 152**. To **zoom**, hold down **Shift key** and drag with middle mouse button (wheel). To **pan**, hold down **Ctrl key** and drag with middle mouse button (wheel).

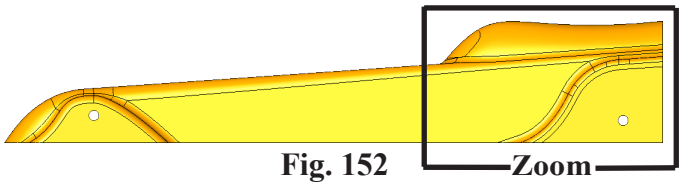


Fig. 152

Step 4. Click **Offset Entities** 

on the Sketch toolbar.

Step 5. In the Offset Entities Property Manager set:

Click **Keep Visible**, **Fig. 153**.

Distance to 3
Add dimensions
Uncheck Select chain, **Fig. 153**.

Click rear edge of front Split Line face and top edge of cockpit loft

The yellow offset should be inside the cockpit, **Fig. 154**. If it is not, click Reverse.

Click OK.

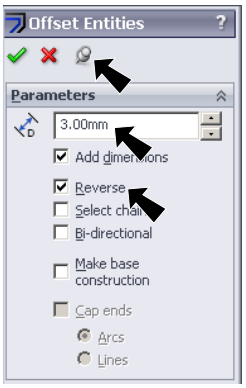


Fig. 153

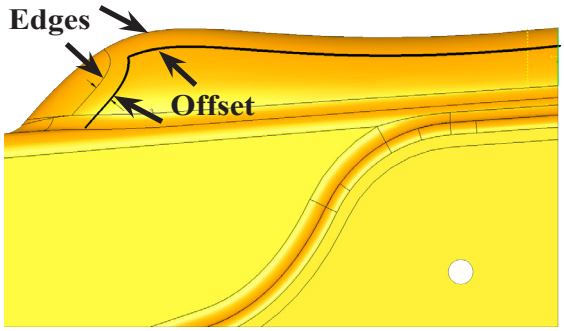


Fig. 154

Distance to 5
Click rear of cockpit loft
Uncheck Select chain, **Fig. 155**.

The yellow offset should be inside the cockpit, **Fig. 156**. If it is not, click Reverse.

Click OK.

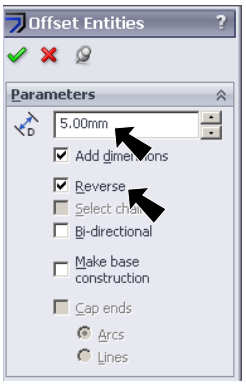


Fig. 155

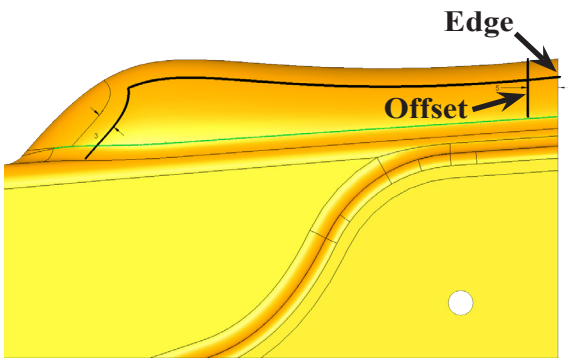


Fig. 156

Distance to .1
Click edge of fillet at the bottom of cockpit loft

The yellow offset should be inside the cockpit, **Fig. 158**. If it is not, click Reverse.

Click OK **twice**.

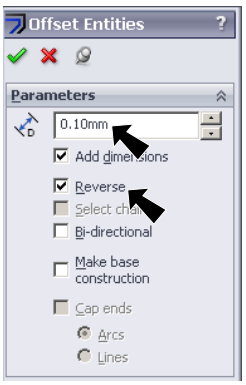


Fig. 157

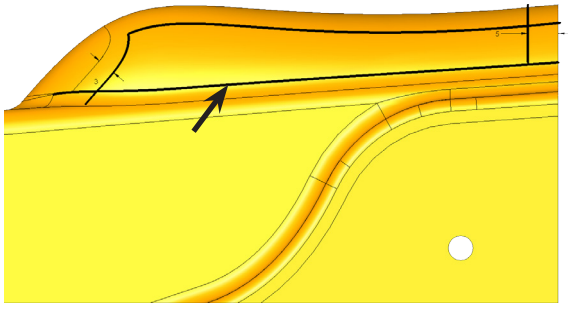
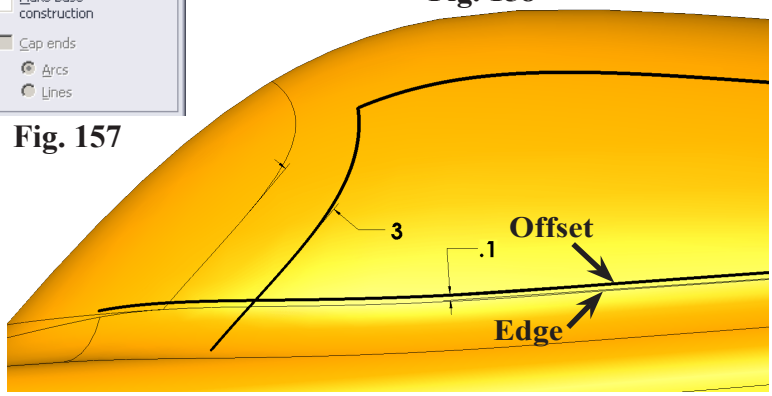


Fig. 158



Step 6. Click **Trim Entities** 

on the Sketch toolbar.

Step 7. In the Property Manger select:

Corner  ,
Fig. 159.

Click the inside corner lines to trim, **Fig. 160**. Results shown in **Fig. 162**.

Click OK  in the Property Manager.

Step 8. Click Insert Menu > Curve > Split Line.

Step 9. In the Split Line Property Manager:
under **Type of Split**
Select **Projection**
under **Selections**
Current Sketch should be selected

in the Faces to Split box click the cockpit loft in the drawing

Click OK  , **Fig. 163** and **Fig. 164**.

Step 10. Save. Use **Ctrl-S**.

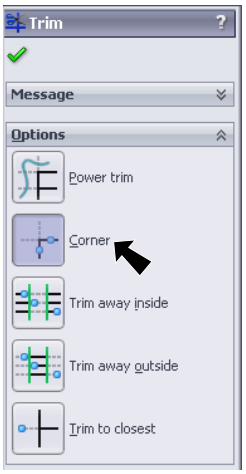


Fig. 159

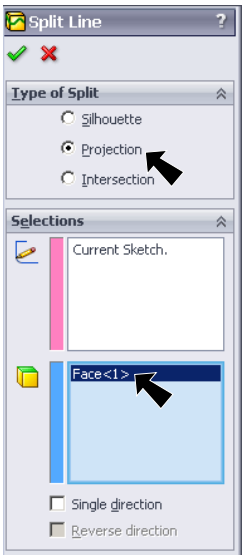


Fig. 162

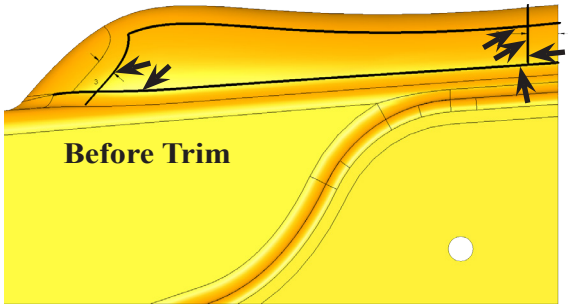


Fig. 160

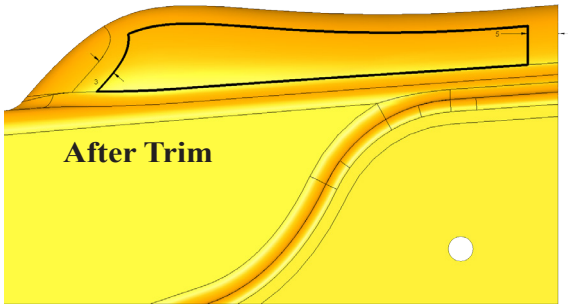


Fig. 161

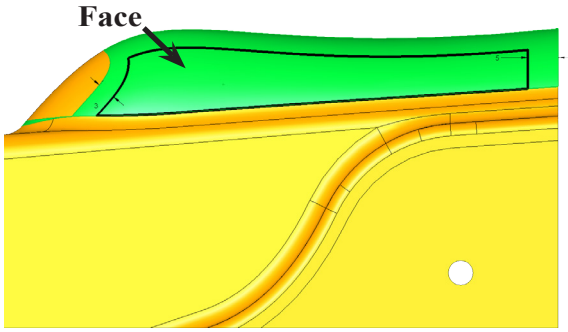


Fig. 163

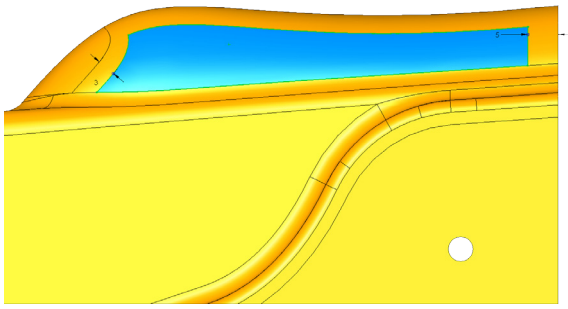


Fig. 164

W. Appearance Color.

Step 1. Rotate view slightly to view **all three Split Line faces**, hold down middle mouse button (wheel) and drag to rotate view, **Fig. 165**.

Step 2. Click a Split Line face, click **Appearance Call-out** on the Content toolbar and click **Face 1 Split...**, **Fig. 165**.

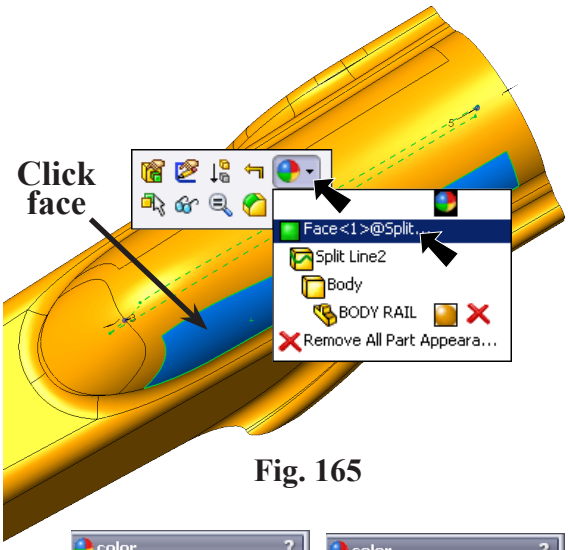


Fig. 165

Step 3. In the Appearances Property Manager,
click **Advanced button**, **Fig. 166**
under Selected Geometry
click the other two Split Line faces in the cockpit, **Fig. 167**

under Color:
set **RGB values** to**:**
R 151
G 111
B 255

click **Illumination tab** Illumination, **Fig. 166**

set **Transparency amount .20**, **Fig. 168**.

Click OK in the Property Manager to accept the color.

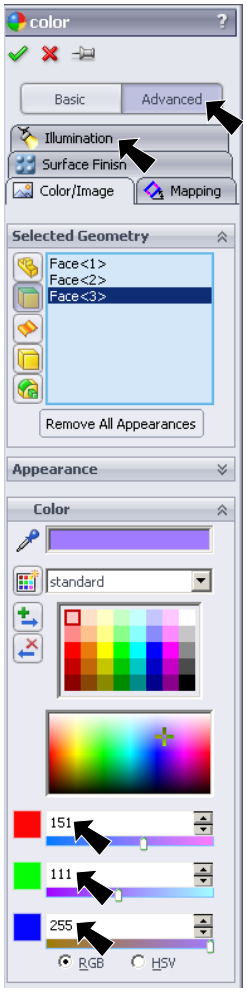


Fig. 166

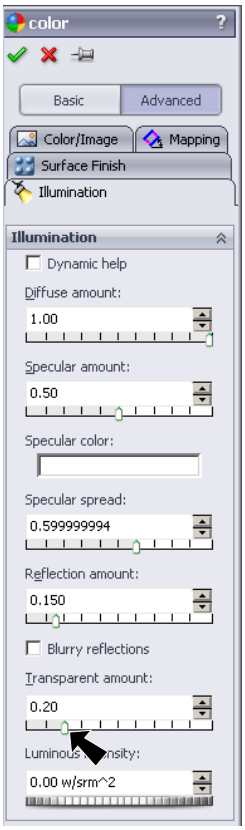


Fig. 168

Step 4. Save. Use **Ctrl-S**.

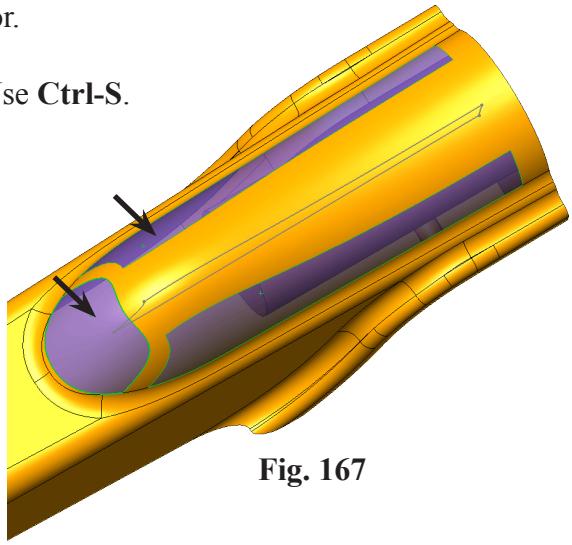


Fig. 167