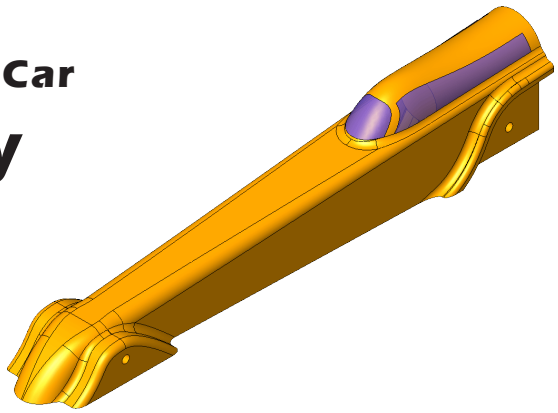
Chapter 2

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**.

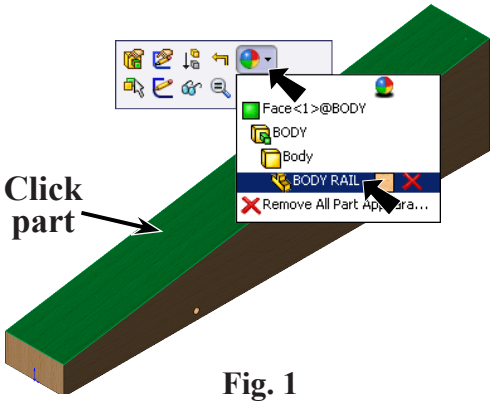


Fig. 1

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:**
R 231
G 150
B 0
Click OK in the Property Manager.

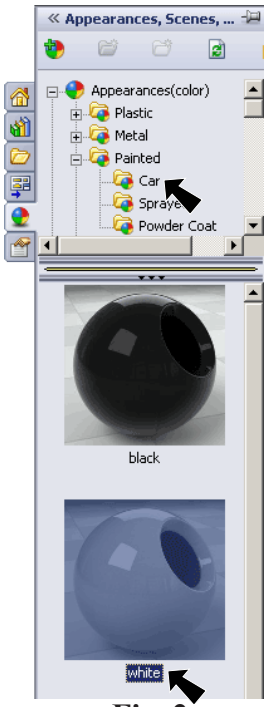


Fig. 2

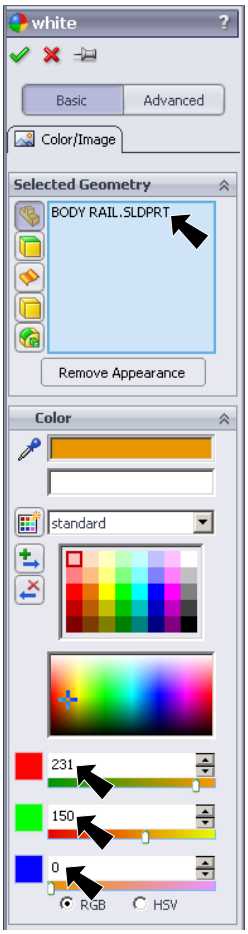


Fig. 3

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

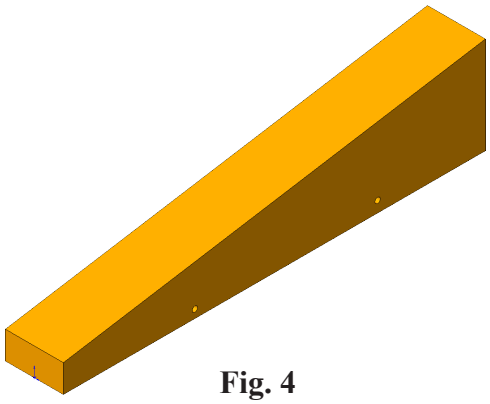


Fig. 4

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C. Side Cut.

Step 1. Click **Right Plane** in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 5**.

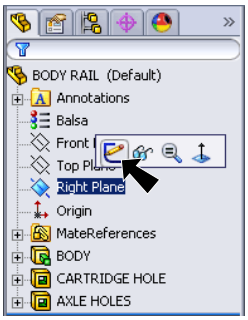


Fig. 5

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. 6**.

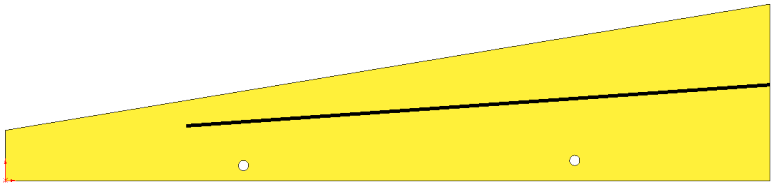


Fig. 6

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. 7**. **Right click drawing and click Select** from menu to end spline.

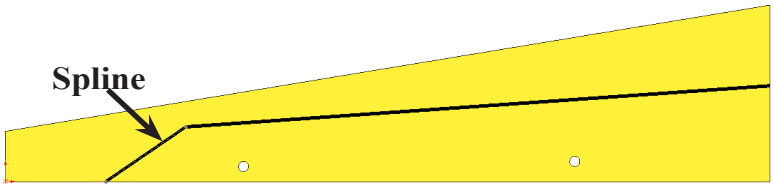


Fig. 7

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

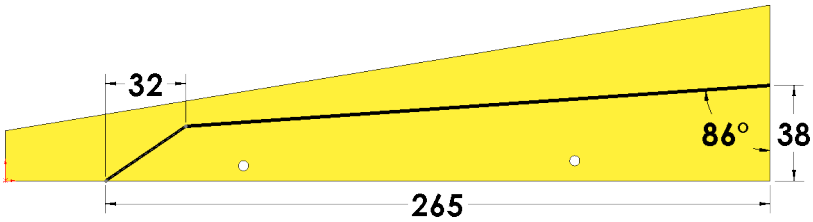


Fig. 8

Step 8. Add dimensions as shown in **Fig. 8**. 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. Release Ctrl key and click **Make Tangent** on the Content menu, **Fig. 9**.

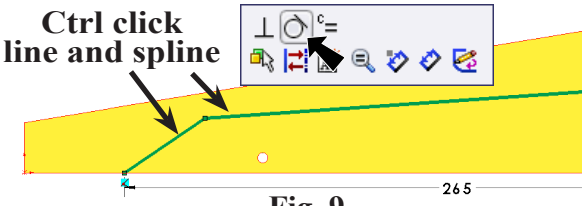
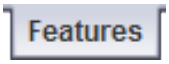
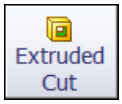


Fig. 9

Step 11. Click **Features** 

on the Command Manager toolbar.

Step 12. Click **Extruded Cut** 

on the Features toolbar.

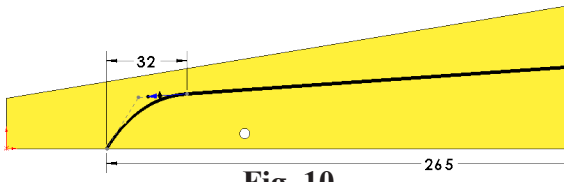


Fig. 10

Step 13. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 11**
End Condition **Through All**
The Direction arrow should point towards area to be cut away, Fig. 12. If arrow is pointing in wrong direction, click **Flip side to cut, Fig. 11**. Click OK .

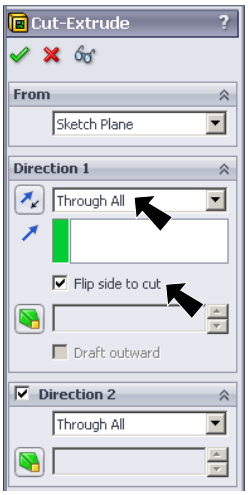


Fig. 11

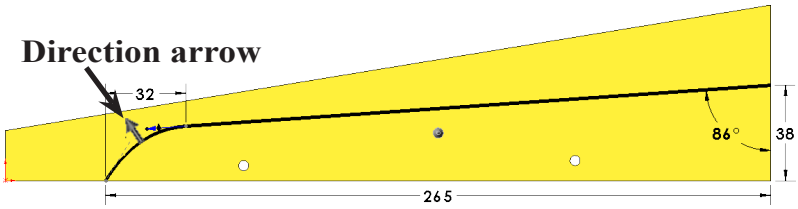


Fig. 12

Fig. 13

D. Rename Cut-Extrude1 SIDE CUT.

Step 1. **Rename Cut-Extrude1** to **SIDE CUT** in the Feature Manager, **Fig. 14**. To rename, click **Cut-Extrude1** name in Feature Manager and press **F2** on keyboard. Key-in **SIDE CUT**.

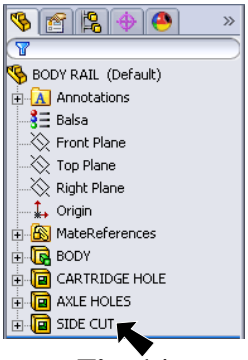


Fig. 14

E. 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.

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

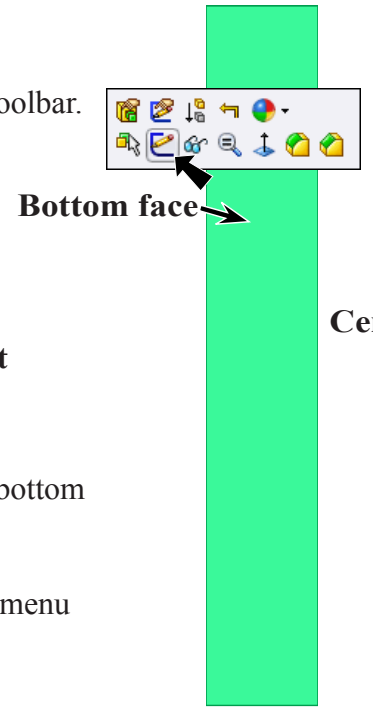


Fig. 15

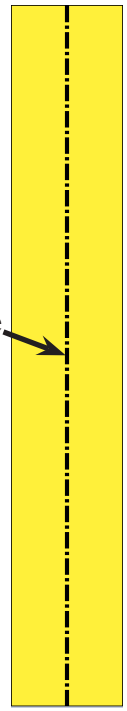


Fig. 16

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.

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.

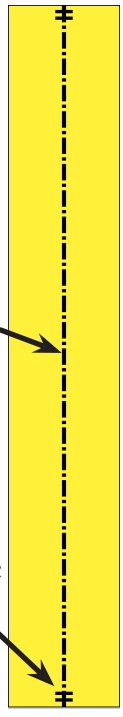


Fig. 17

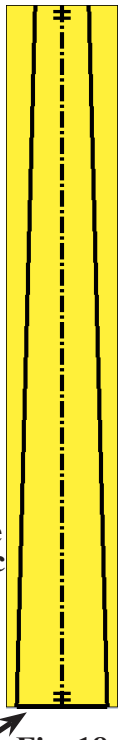
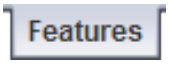


Fig. 18

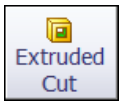
Step 10. Click **Smart Dimension**

(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.

Step 12. Click **Features** 

on the Command Manager toolbar.

Step 13. Click **Extruded Cut** 

on the Features toolbar.

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

under Direction 1

End Condition

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 .

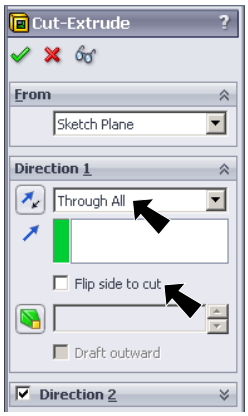


Fig. 20

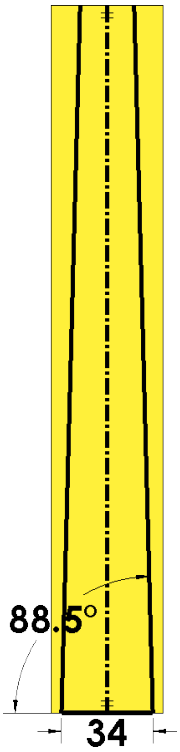


Fig. 19

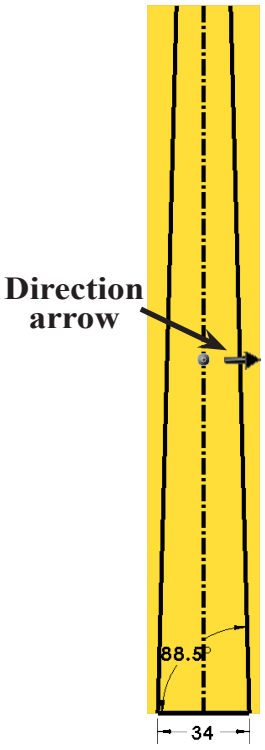


Fig. 21

F. Rename Cut-Extrude1 BOTTOM CUT.

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

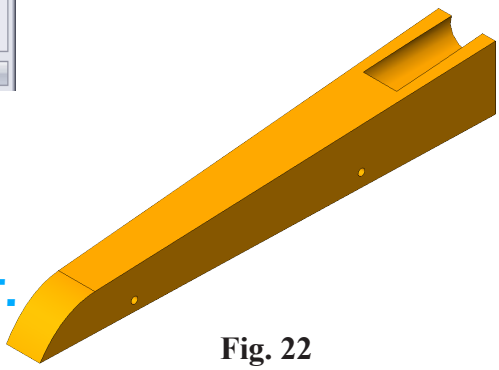


Fig. 22

Step 2. **Rename Cut-Extrude1** to **SIDE CUT** in the Feature Manager, **Fig. 23**. To rename, click **Cut-Extrude1** name in Feature Manager and press **F2** on keyboard. Key-in **BOTTOM CUT**.

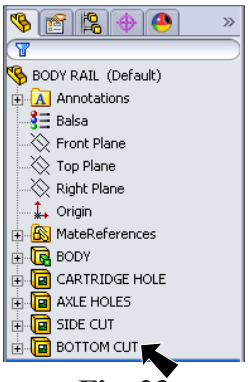


Fig. 23

G. Cockpit Loft Rear Sketch.

Step 1. Click **CARTRIDGE HOLE** feature in the Feature Manager and click **Suppress** in the menu, **Fig. 24**.

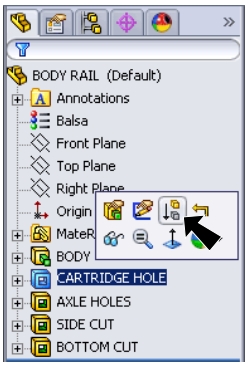


Fig. 24

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

Step 3. Click the **rear face** and click **Sketch** on the Content menu, **Fig. 25**.

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

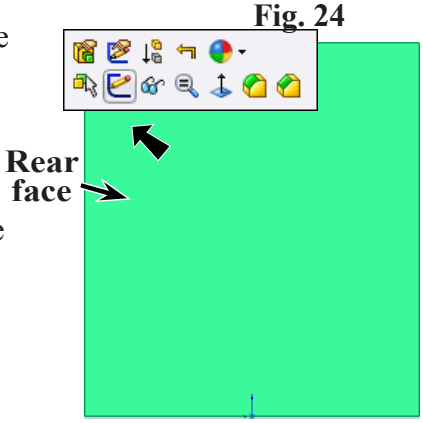


Fig. 25

Step 5. Starting from the Origin at the bottom of the body, draw a vertical line up through the body and extend the line out beyond top of body, **Fig. 26**.

Step 6. Click **Centerpoint Arc** (S) in the **Arc flyout** on the Sketch toolbar.

Step 7. Click the centerline (not midpoint) to start the arc and move the cursor to the right. Click to place the first end point, then move cursor counterclockwise 180 degrees. Click to place the second end point, **Fig. 27**.

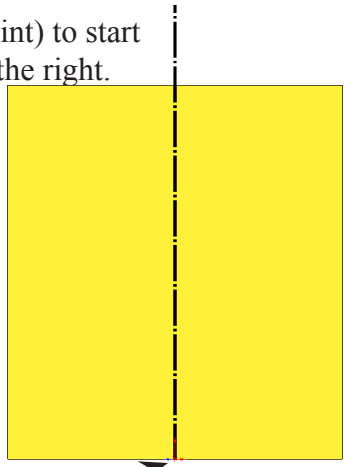


Fig. 26

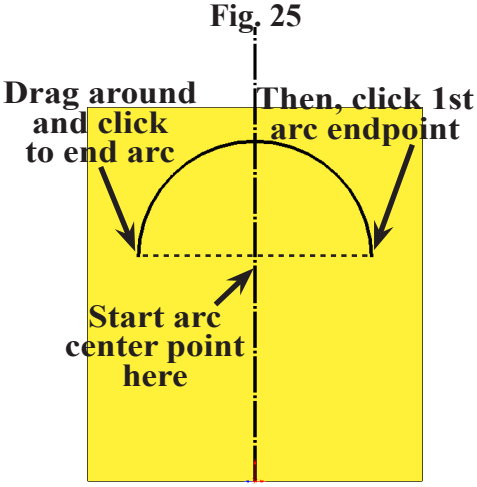


Fig. 27

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

Step 9. Draw a horizontal line across the endpoints of arc, **Fig. 28**.

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

Step 11. Dimension **arc radius 15**, then add the **34**, **Fig. 29**.

Step 12. Click **Exit Sketch** on the Sketch toolbar.

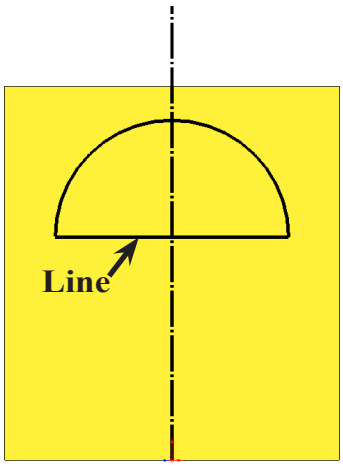


Fig. 28

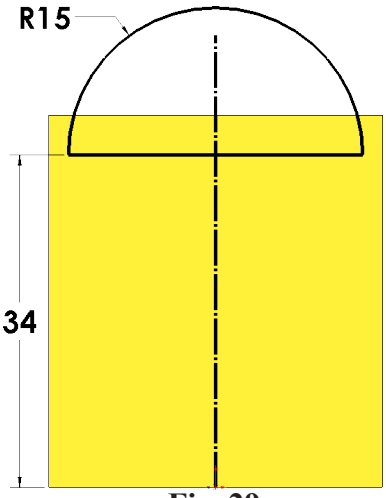


Fig. 29

H. 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. 30**.

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

Step 4. Zoom in around **rear edge of body**, **Fig. 31**. 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).

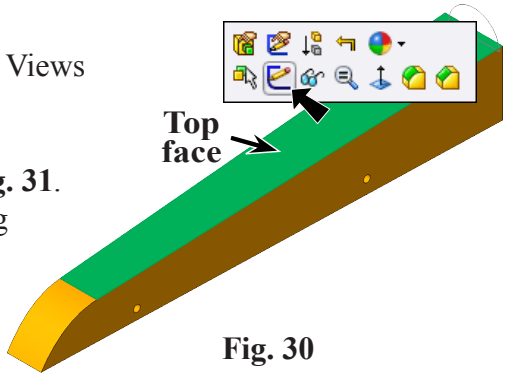


Fig. 30

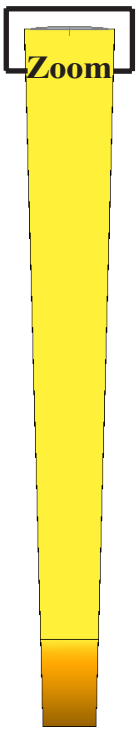


Fig. 31

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. 32**.

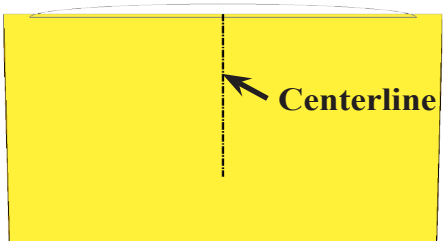


Fig. 32

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. 33**.

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

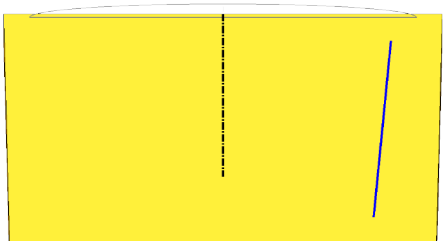


Fig. 33

Step 10. **Ctrl click top endpoint of line** and **arc in loft rear sketch** to select both. Release Ctrl key and click **Make Pierce** on the Content menu. Make Pierce adds a Pierce relation between line and rear sketch, **Fig. 34**.

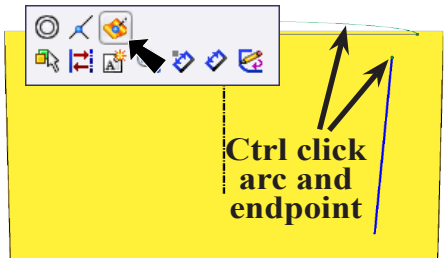


Fig. 34

Step 11. **Click line** and **Ctrl click right edge of body** to select both. Release Ctrl key and click **Make Parallel** on the Content menu, **Fig. 35**.

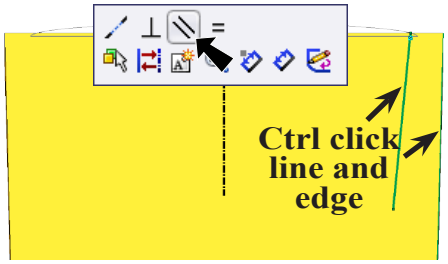


Fig. 35

Step 12. Click **Smart Dimension** on the Sketch toolbar.

Step 13. Dimension **line 62** and **vertical centerline 90**, **Fig. 36**.

Step 14. **Right click drawing and click Select** from menu to unselect Smart Dimension.

Step 15. Click the centerline and click **Zoom to Selection** (**Q**) on the View toolbar to zoom to sketch.

Step 16. Click **Spline** (**S**) on the Sketch toolbar.

Step 17. Draw **two point** spline between bottom endpoint of line and bottom endpoint of centerline line, **Fig. 37**. **Right click drawing and click Select** from menu to end spline and unselect Spline tool.

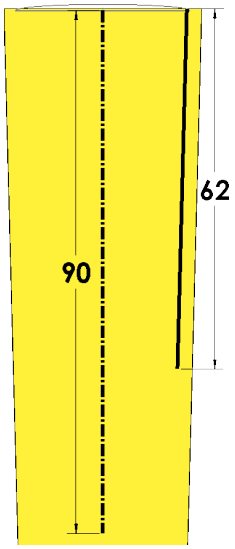


Fig. 36

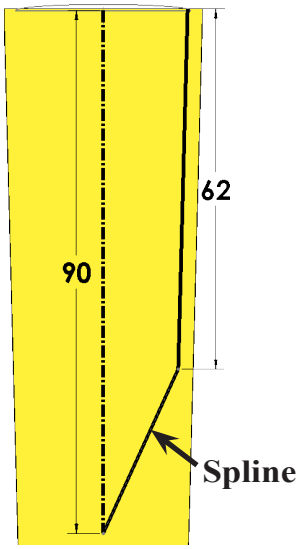


Fig. 37

Step 18. **Ctrl click line and spline** to select both spline and line to select both. Release Ctrl key and click **Make Tangent** on the Content menu, **Fig. 38**.

Step 19. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 20. Dimension Tangent Weighting2 **54**, **Fig. 39**. To dimension Tangent Weighting, click the **Circular Spline Handle** (small gray dot), then move the cursor out away from spline and click. Key-in 54 and press ENTER.

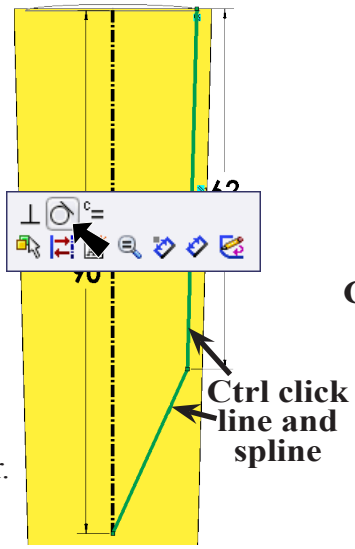


Fig. 38

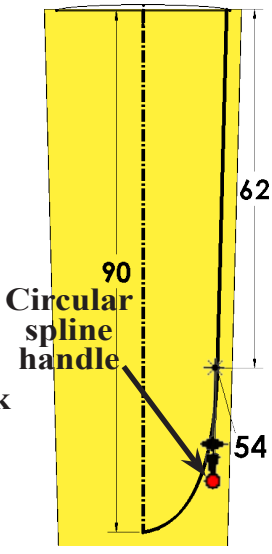


Fig. 39

Step 21. Click **Exit Sketch** on the Sketch toolbar.

Step 22. Save. Use **Ctrl-S**.

I. Cockpit Loft RIGHT Guide Curve.

Step 1. Click the **top face** and click **Sketch** on the Content menu, **Fig. 40**.

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. 41**.

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

Step 5. **Ctrl click top endpoint of line** and **arc in loft rear sketch** to select both. Release Ctrl key and click **Make Pierce** on the Content menu. Make Pierce adds a Pierce relation between line and rear sketch, **Fig. 42**.

Step 6. **Click line** and **Ctrl click right edge of body** to select both. Release Ctrl key and click **Make Parallel** on the Content menu, **Fig. 43**.

Step 7. Click **Smart Dimension** on the Sketch toolbar.

Step 8. Dimension **line 62**, **Fig. 44**.

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

Step 10. Draw **two point** spline between bottom endpoint of line and bottom endpoint of centerline line, **Fig. 45**. **Right click drawing and click Select** from menu to end spline and unselect Spline tool.

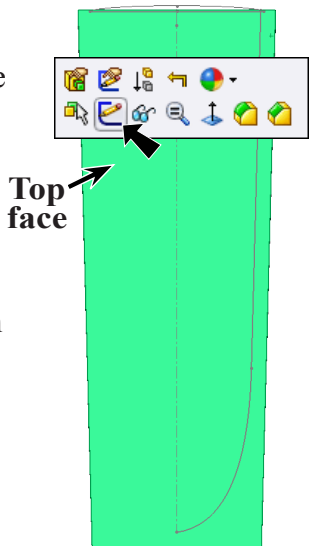


Fig. 40

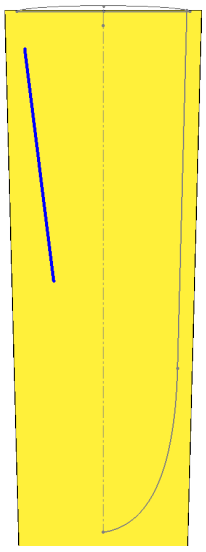


Fig. 41

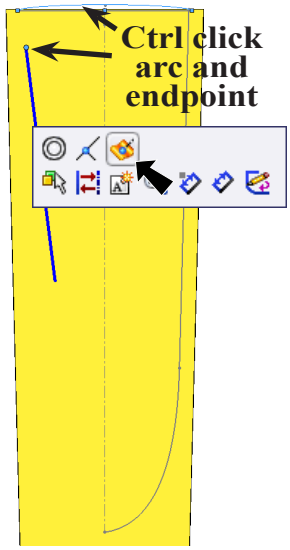


Fig. 42

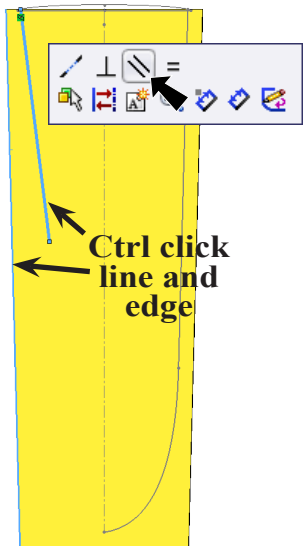


Fig. 43

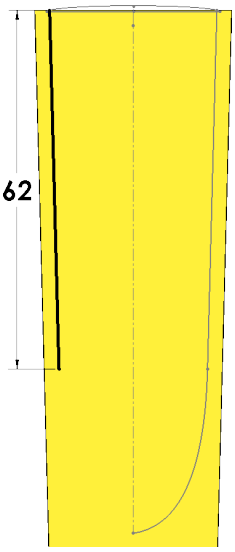


Fig. 44

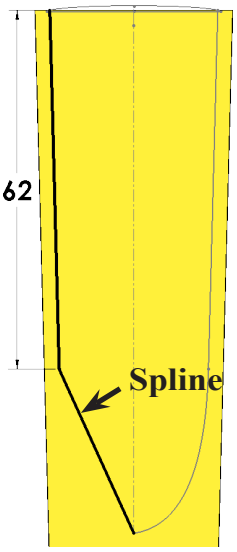


Fig. 45

Step 11. **Ctrl click line and spline** to select both spline and line. Release Ctrl key and click **Make Tangent** on the Content menu, **Fig. 46**.

Step 12. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 13. Dimension Tangent Weighting2 **54**, **Fig. 47**. To dimension Tangent Weighting, click the **Circular Spline Handle**, then move the cursor out away from spline and click. Key-in 54 and press ENTER.

Step 14. Click **Exit Sketch** on the Sketch toolbar.

Step 15. Save. Use **Ctrl-S**.

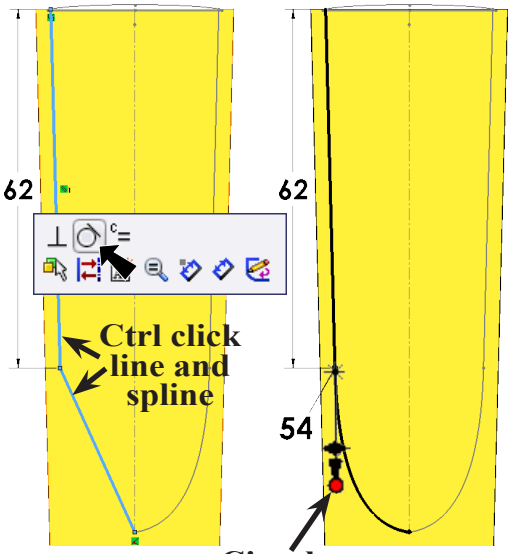


Fig. 46 Fig. 47

J. Create Plane.

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

Step 2. Click **Front Plane** in the Feature Manager, **Fig. 48**.

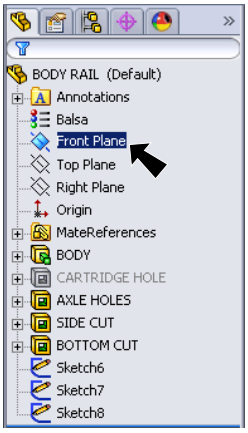


Fig. 48

Step 3. **Ctrl drag** Front plane in drawing towards rear of body and release, **Fig. 49**. To Ctrl drag, hold down Ctrl and drag plane to rear.

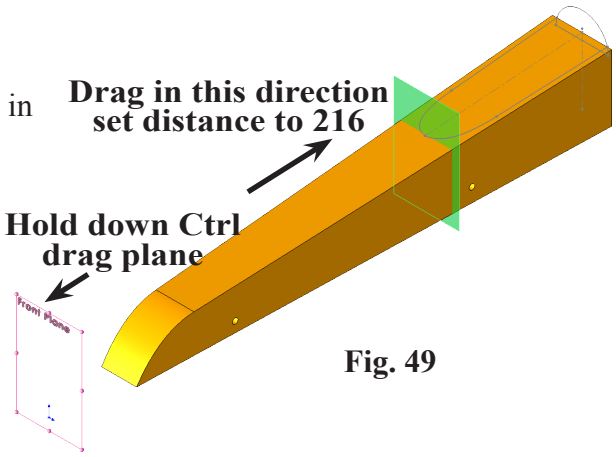


Fig. 49

Step 4. In the Plane Property Manager set:
under **First Reference**, **Fig. 50**
Distance **216**
press the ENTER key on keyboard.
If you can not see the Plane check **Flip, Fig. 50**
click OK .

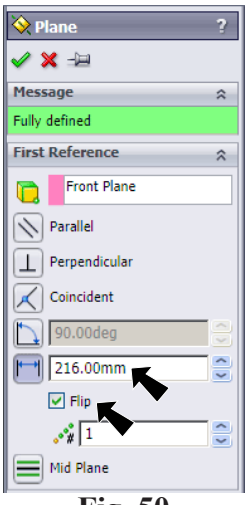


Fig. 50

K. Cockpit Loft Front Point Sketch.

Step 1. Click new **Plane 1** and click **Sketch** on the Content menu, **Fig. 51**.

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

Step 3. Draw one point above the Loft sketches, **Fig. 52**. Be very careful to draw only one point, it is easy to accidently click extra points.

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

Step 5. **Ctrl click Point** and **centerline in first guide curve sketch** to select both. Release Ctrl key and click **Make Pierce** on the Content menu, **Fig. 53** and **Fig. 54**. Make Pierce adds a Pierce relation between Point and centerline.

Step 6. Click **Exit Sketch** on the Sketch toolbar.

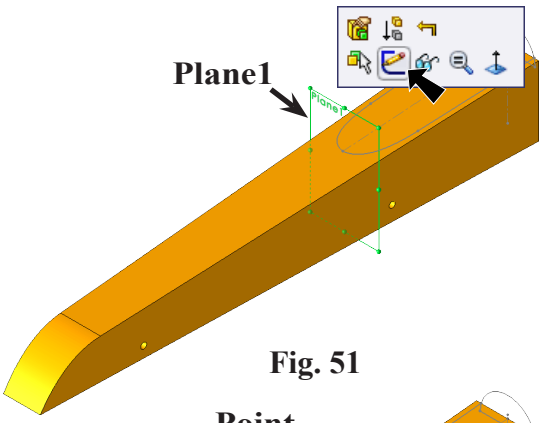


Fig. 51

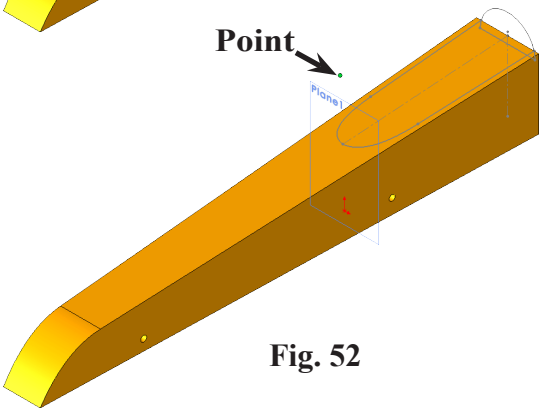


Fig. 52

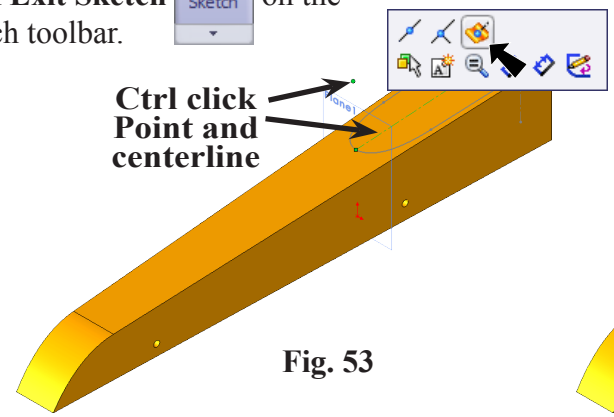


Fig. 53

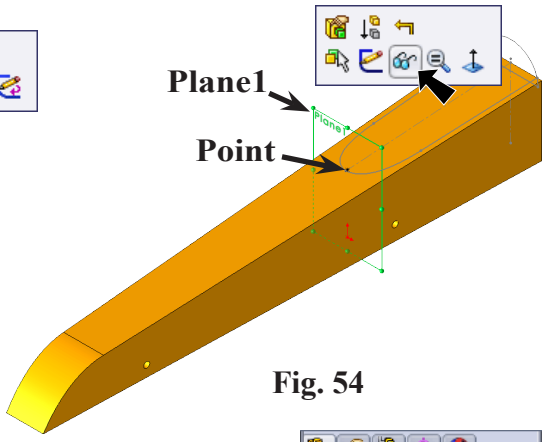


Fig. 54

L. Cockpit Loft SIDE Guide Curve.

Step 1. Hide Plane1. To hide, click **Plane1** in drawing and **Hide** from the menu, **Fig. 54**.

Step 2. Click **Right Plane** in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 55**.

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

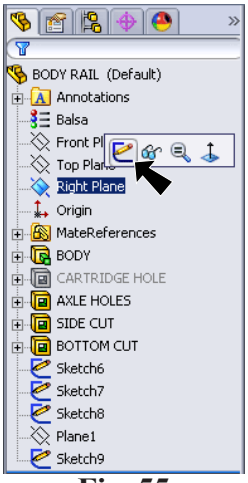


Fig. 55

Step 4. Zoom in around **loft sketches at rear**, **Fig. 56**. To **zoom**, click a guide curve sketch and click **Zoom to Selection** (**Q**) on the View toolbar to zoom to sketch.

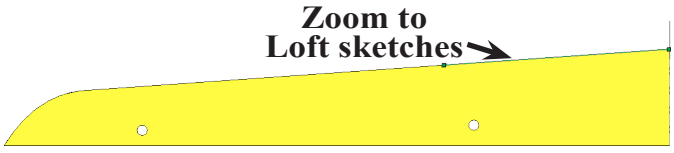


Fig. 56

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. 57**. **Right click drawing and click Select** from menu to end spline and unselect Spline tool.

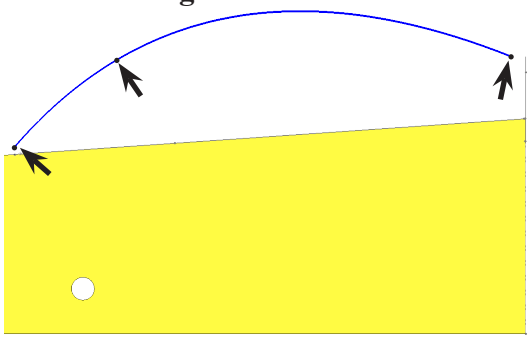


Fig. 57

Step 7. **Ctrl click right endpoint of spline** and **arc in rear sketch** to select both. Release Ctrl key and click **Make Pierce** on the Content menu, **Fig. 58** and **Fig. 59**. Make Pierce adds a Pierce relation between guide curve and rear sketch.

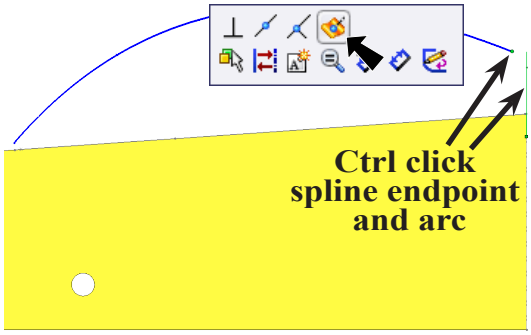


Fig. 58

Step 8. Click the spline to select it. Grab the Circular Spline handle (small gray dot) at endpoint, **Fig. 59** and pull up to adjust spline. Also, you can move the Spline point to adjust the spline.

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

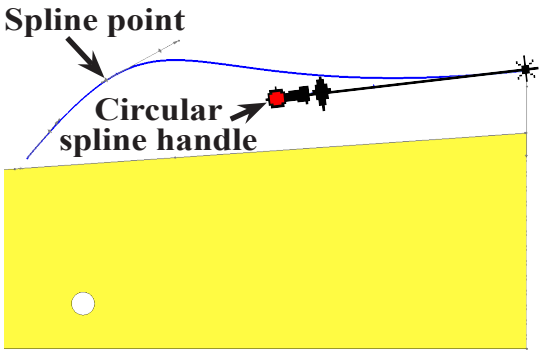


Fig. 59

M. Rename Sketches.

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. 60** and **Fig. 61**.
Change:

Sketch6	to	**REAR**
Sketch7		**LEFT**
Sketch8		**RIGHT**
Sketch9		**POINT**
Sketch10		**TOP**

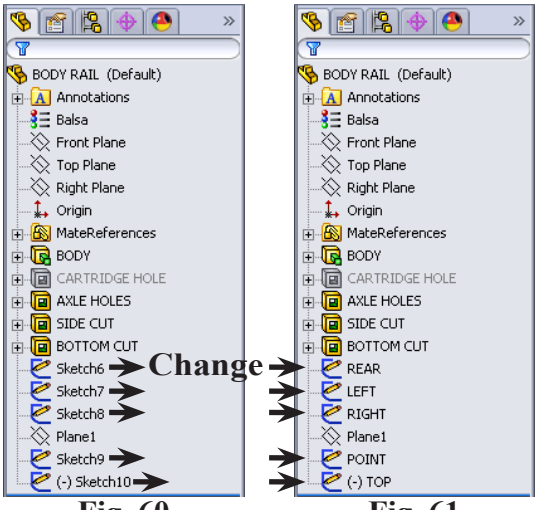
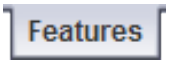
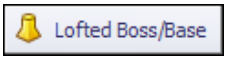


Fig. 60 Fig. 61

N. 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. 62**

click **Sketch REAR Fig. 63**

Sketch POINT

under Guide Curves, **Fig. 62**

click in the **Guide Curves box**

click **Sketch LEFT Fig. 64**

Sketch RIGHT

Sketch TOP

set **Guide curves influence to Global**

under Options

check **Merge results**, **Fig. 62**

click OK
.

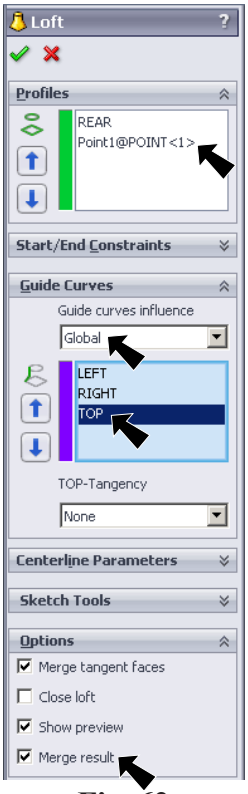


Fig. 62

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

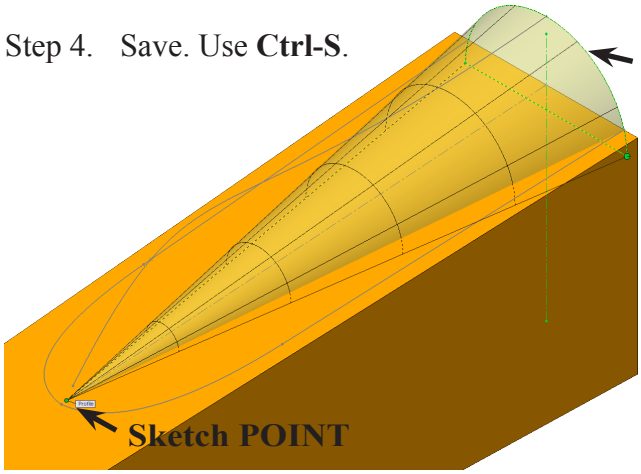


Fig. 63

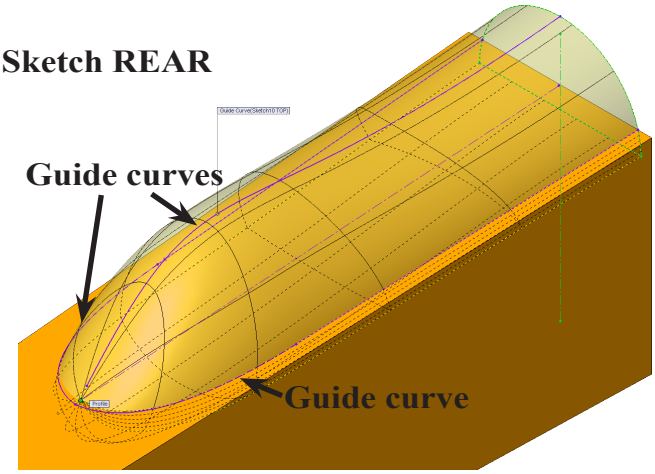


Fig. 64

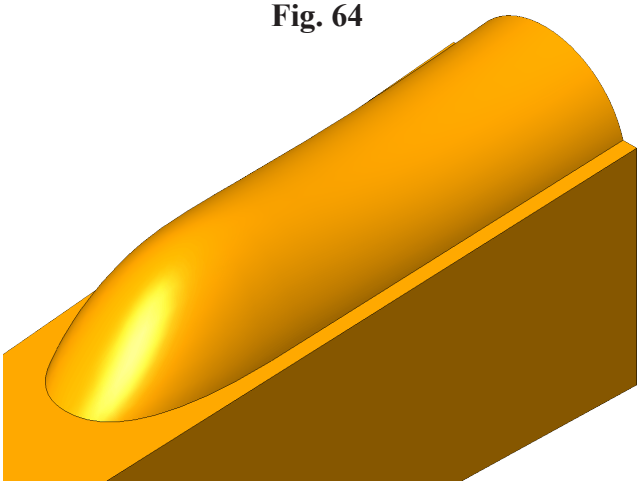


Fig. 65

O. Edit Axle Hole Sketch.

Step 1. In the Feature Manager move the suppressed **CARTRIDGE HOLE** below Loft1 feature, **Fig. 66**. To move the feature, drag **CARTRIDGE HOLE** down, when the yellow pointer is over Loft1 release.

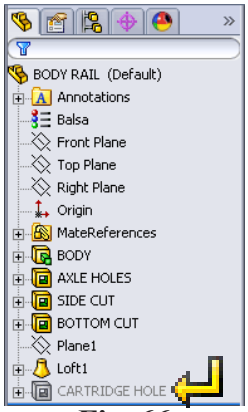


Fig. 66

Step 2. Click the suppressed **CARTRIDGE HOLE** and click **Unsuppress** in the menu, **Fig. 67**.

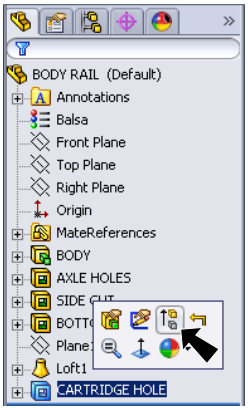


Fig. 67

Step 3. Move **AXLE HOLES** below **CARTRIDGE HOLE** feature, **Fig. 68**. To move the feature, drag **AXLE HOLES** down, when the yellow pointer is over **CARTRIDGE HOLE** and release. **Ignore the What's Wrong dialog box**.

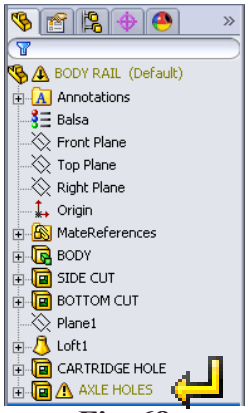


Fig. 68

Step 4. Click **AXLE HOLES** and click **Edit Sketch** on the Content menu, **Fig. 69**.

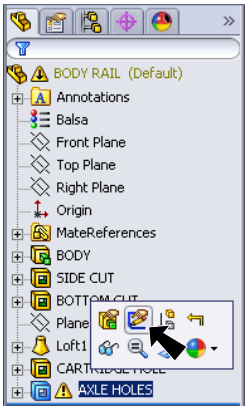


Fig. 69

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. 70**.

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

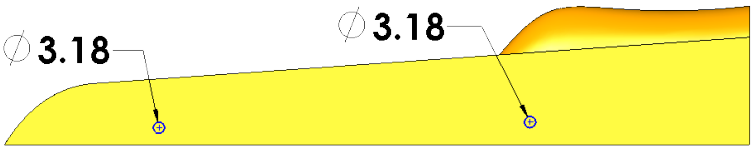


Fig. 70

Step 8. Add the dimensions as shown in **Fig. 71**.

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

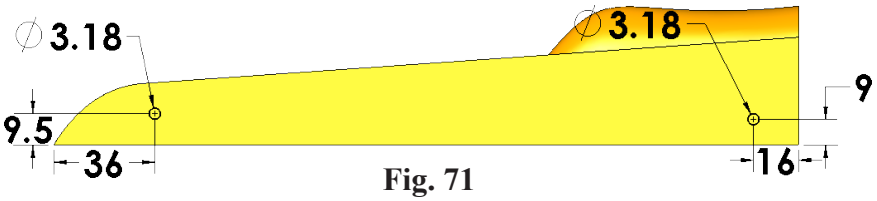


Fig. 71

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

P. Front Wheel Standoff.

Step 1. Click **Right Plane** in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 72**.

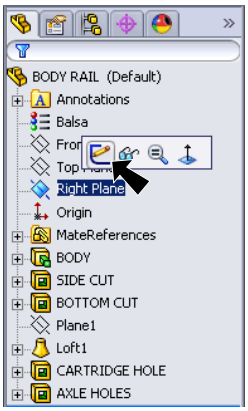


Fig. 72

Step 2. Zoom in around **front axle hole**, **Fig. 73**. 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).

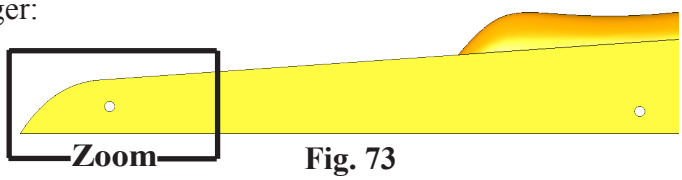


Fig. 73

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. 74**
click OK , **Fig. 75**.
This converts edge of hole to a circle.

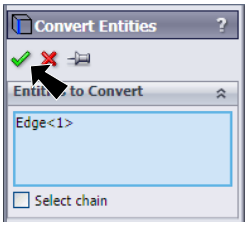


Fig. 75

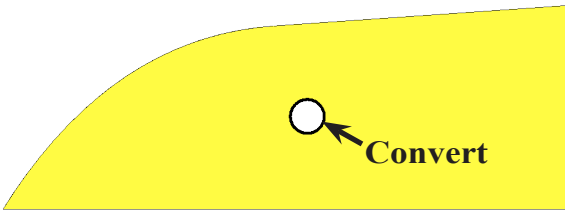


Fig. 74

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

Step 6. Draw a vertical centerline, **Fig. 76**.

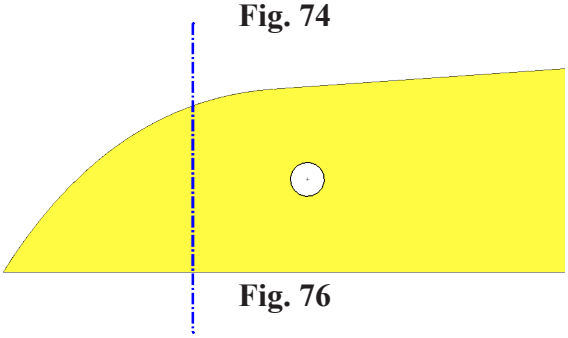


Fig. 76

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

Step 8. **Ctrl click the vertical centerline and center-point of axle converted circle** to select both. Release Ctrl key and click **Make Midpoint** on the Content menu, **Fig. 77**.

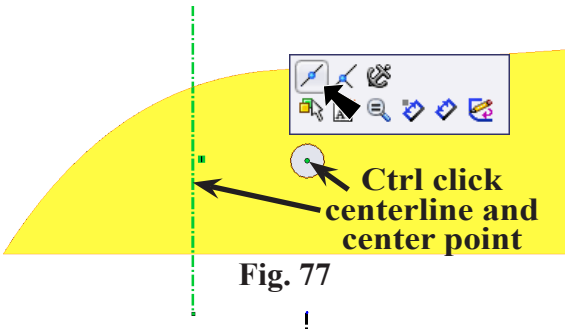


Fig. 77

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

Step 10. Draw **3 point** spline between bottom edge of body in front of axle hole and centerline above axle hole, **Fig. 78**. Before moving cursor away from 3rd spline point at the centerline, double click to **click End spline**.

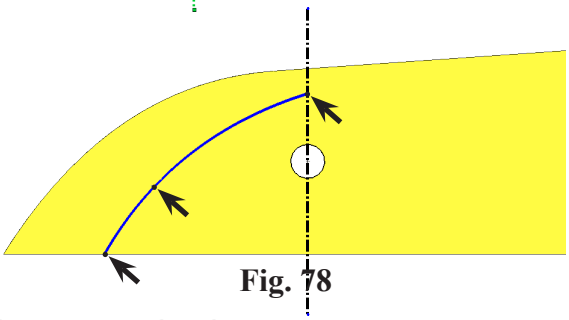


Fig. 78

Step 11. Draw **two point** spline between top end-point of spline (at centerline) and edge of body on rear side of axle hole, **Fig. 79**. **Right click drawing and click Select** from menu to end spline and unselect Spline tool.

Step 12. Click the second spline and grab the Circular Spline handle ● (small gray dot) at right endpoint, **Fig. 80** and pull up to adjust spline.

Step 13. **Ctrl click** both splines to select both splines. Release Ctrl key and click **Make Tangent** on the Content menu, **Fig. 81**.

Step 14. Click the left spline to select it, **Fig. 82**.

Step 15. Grab the Circular Spline handle ● at right endpoint and pull up to adjust spline, **Fig. 82**.

Step 16. Click **Smart Dimension**

on the Sketch toolbar.

Step 17. Dimension as shown in **Fig. 83**.

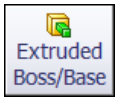
Step 18. Move the Circular Spline handle ● to adjust shape of spline.

Step 19. Click **Line** **(L)** on the Sketch toolbar.

Step 20. Draw a line across between bottom end-points of splines to close the sketch, **Fig. 84**.

Step 21. Click **Features**

on the Command Manager toolbar.

Step 22. Click **Extruded Boss/Base** 

on the Features toolbar.

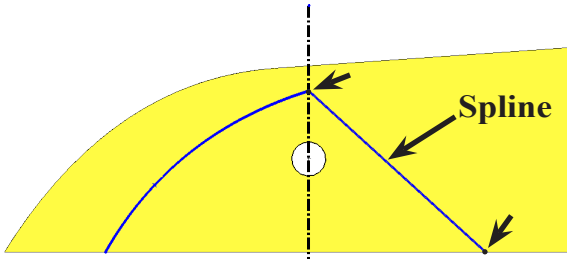


Fig. 79

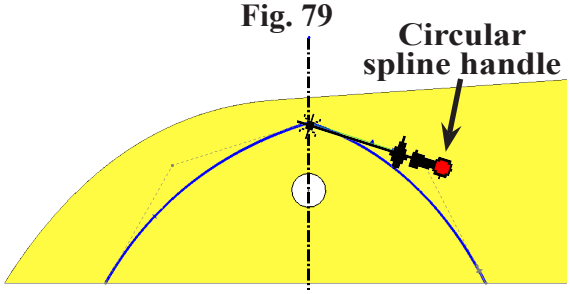


Fig. 80

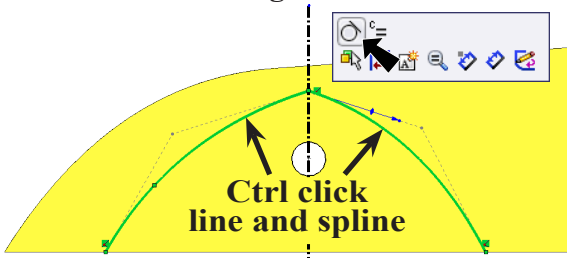


Fig. 81

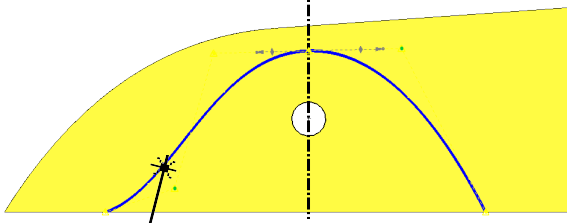


Fig. 82

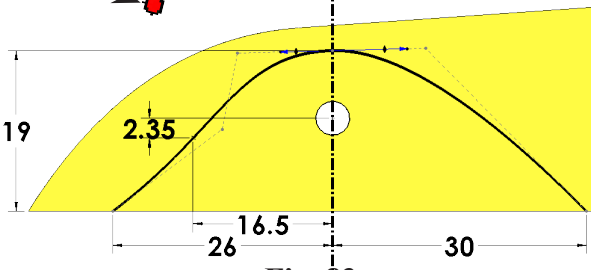


Fig. 83

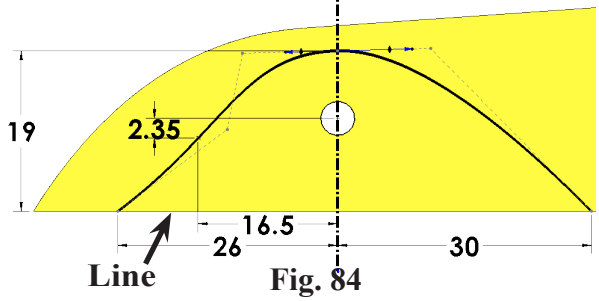


Fig. 84

Step 23. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 24. In the Property Manager set, **Fig. 85**
End Condition **Mid Plane**
Depth 40
click OK, **Fig. 86**.

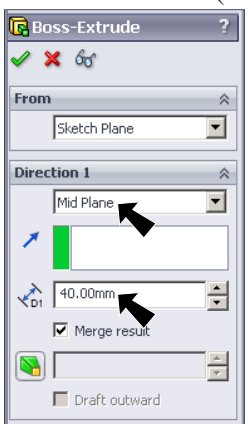


Fig. 85

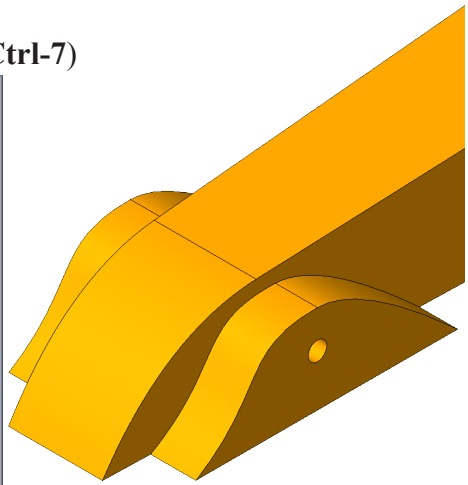


Fig. 86

Q. Rename Boss-Extrude1 FRONT WHEEL STANDOFF.

Step 1. **Rename Boss-Extrude1** to **FRONT WHEEL STANDOFF** in the Feature Manager, **Fig. 87**. To rename, click **Boss-Extrude1** name in Feature Manager and press **F2** on keyboard. Key-in **FRONT WHEEL STANDOFF**.

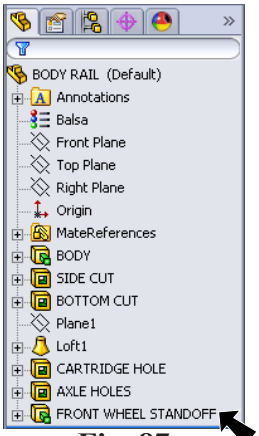


Fig. 87

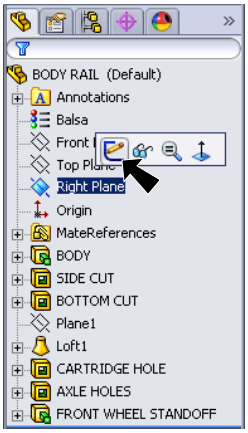


Fig. 88

R. Rear Fender.

Step 1. Click **Right Plane** in the Feature Manager and click **Sketch** from the Content toolbar, **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).

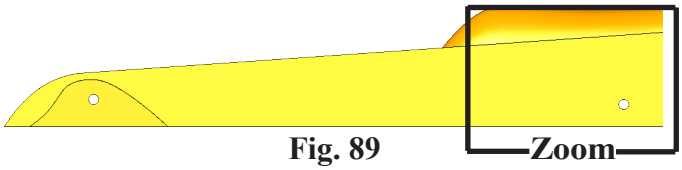


Fig. 89

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 endpoint of arc, then move cursor counterclockwise. Click to place the second endpoint, **Fig. 90**.

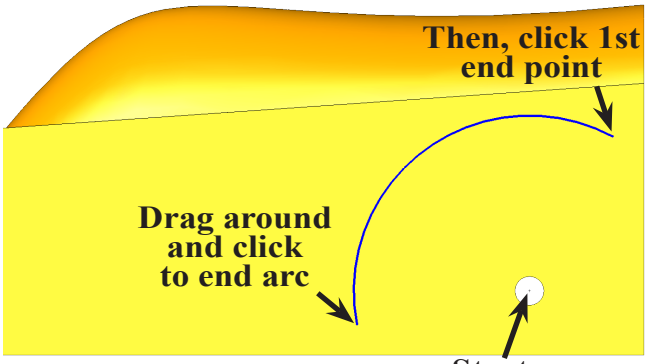


Fig. 90

Step 6. Click **Smart Dimension** (**S**) on the Sketch toolbar.

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

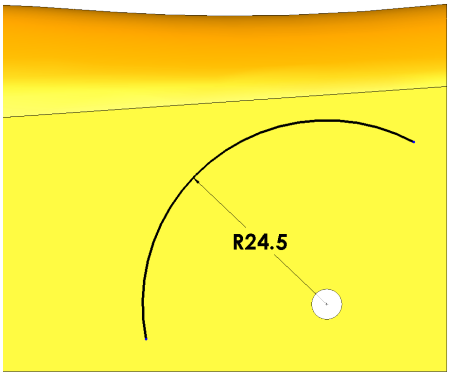


Fig. 91

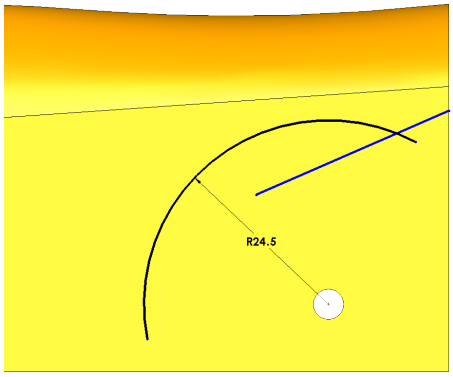


Fig. 92

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** to select both. Release Ctrl key and click **Make Parallel** on the Content menu, **Fig. 93**.

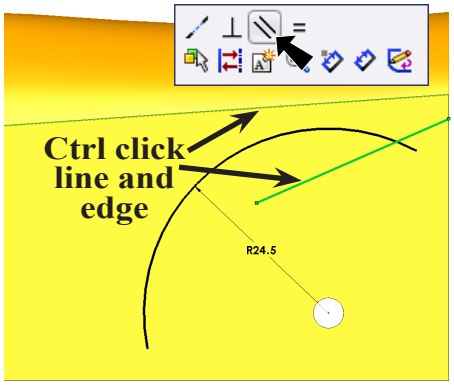


Fig. 93

Step 12. **Click line and Ctrl click arc** to select both. Release Ctrl key and click **Make Tangent** on the Content menu, **Fig. 94**.

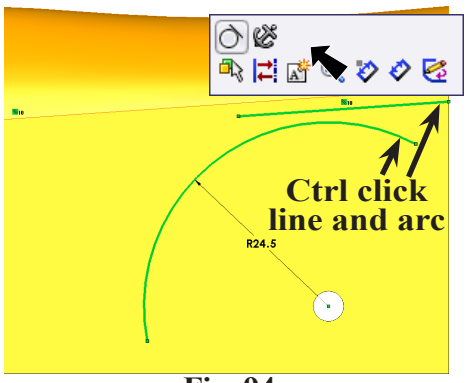


Fig. 94

Step 13. Click **Spline** (**S**) on the Sketch toolbar.

Step 14. Draw **two point** spline between arc and bottom edge of body, **Fig. 95**.

Step 15. Click **Smart Dimension** on the Sketch toolbar.

Step 16. Dimensions the distance across the bottom **57.5** as shown in **Fig. 96**.

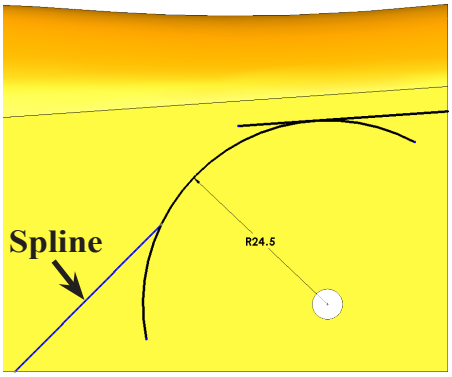


Fig. 95

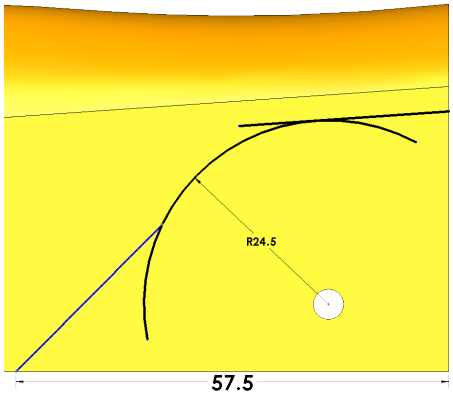


Fig. 96

Step 17. **Right click drawing and click Select from menu** to unselect Smart dimension tool.

Step 18. **Ctrl click spline and arc** to select both. Release Ctrl key and click **Make Tangent** on the Content menu, **Fig. 97**.

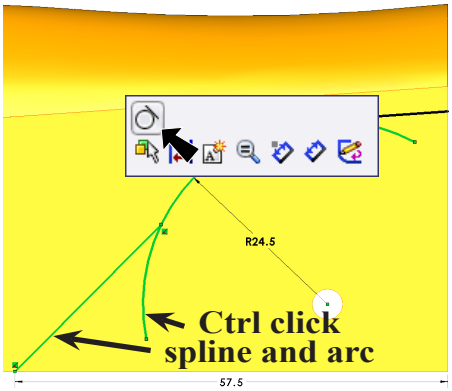


Fig. 97

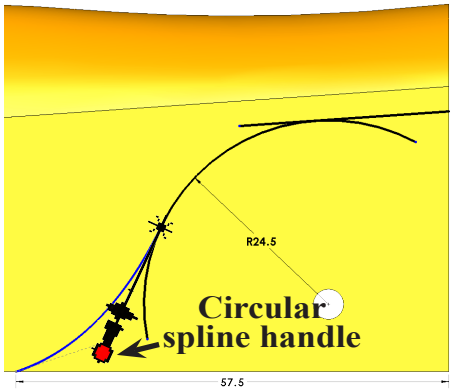


Fig. 98

Step 19. Grab the circular spline handle (small gray dot) at right endpoint, **Fig. 98** and pull up to adjust spline.

Step 20. Click **Trim Entities**

on the Sketch toolbar.

Step 21. In the Property Manger select:

Trim to closest , **Fig. 99**.
Trim the line and arcs as shown in **Fig. 100**.
Click segments to remove (trim).
Results shown in **Fig. 101**.
Click **Yes** to message.

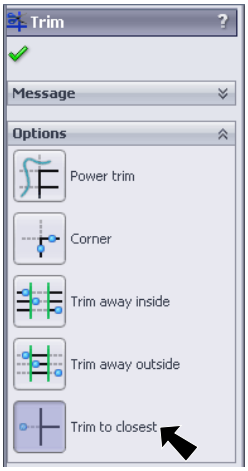


Fig. 99

Step 22. Click **Offset Entities**

on the Sketch toolbar.

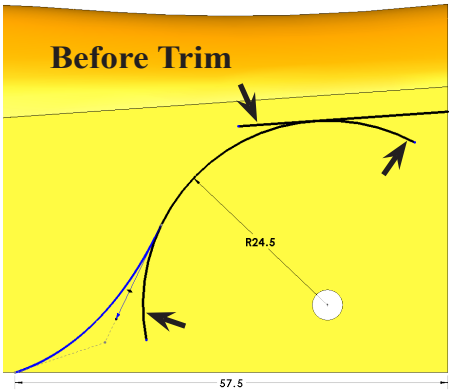


Fig. 100

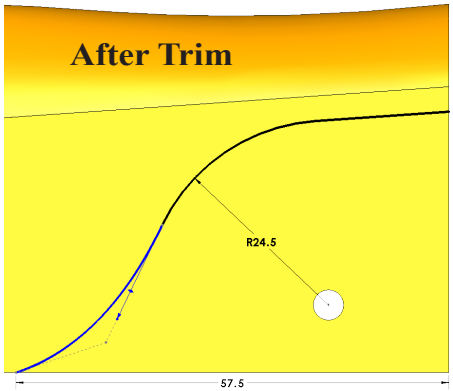


Fig. 101

Step 23. In the Offset Entities Property Manager set:

Distance **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 .

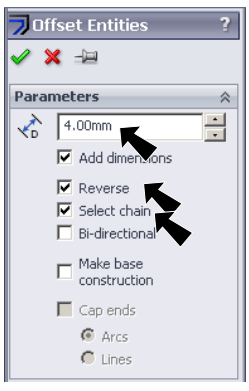


Fig. 102

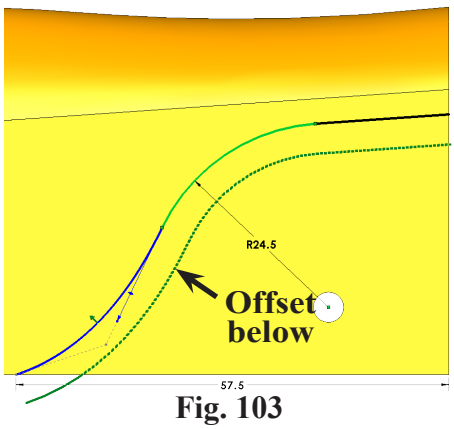


Fig. 103

Step 24. Click **Convert Entities**

on the Sketch toolbar.

Step 25. In the Convert Entities Property Manager:
click rear and bottom edges of body, Fig. 105
click OK . This converts the edges to lines.

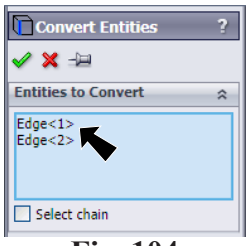


Fig. 104

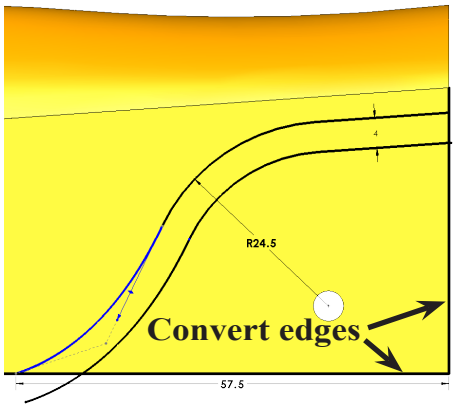


Fig. 105

Step 26. Click **Trim Entities**

on the Sketch toolbar.

Step 27. In the Property Manger select: **Trim to closest** .
Trim the converted lines to cap fender as shown in, **Fig. 106**.
Click segments to trim.
Results shown in **Fig. 107**.

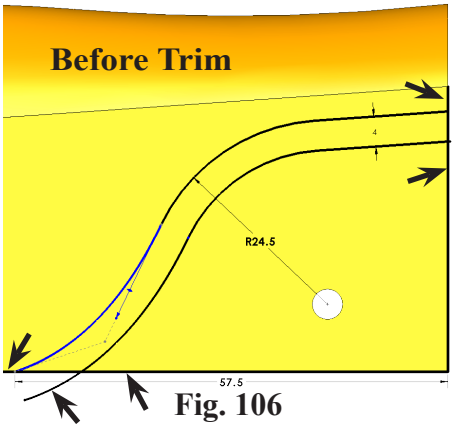


Fig. 106

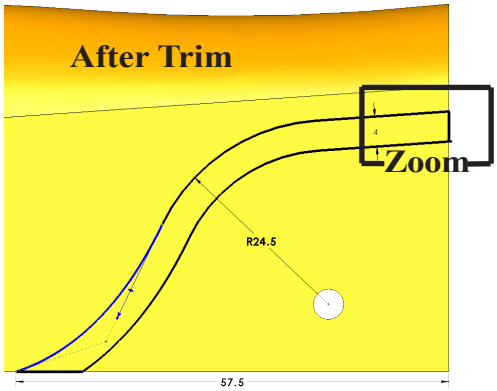


Fig. 107

Step 28. 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 29. Trim the small piece of line that extends out from body, **Fig. 108**.
Results shown in **Fig. 109**.

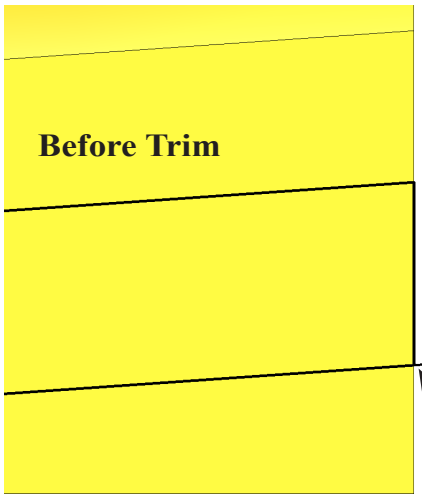


Fig. 108

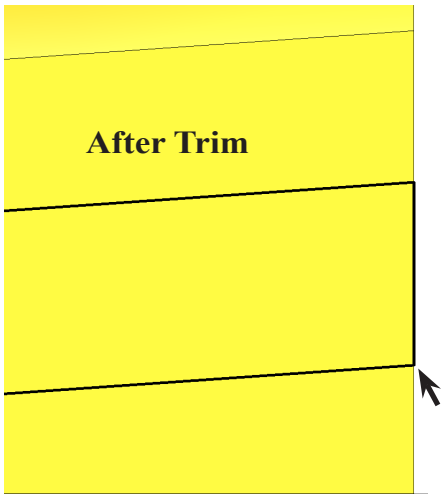


Fig. 109

Step 30. Click OK in the Property Manager.

Step 31. Save. Use **Ctrl-S**.

S. Extrude Fender.

Step 1. Rotate view slightly to view **back and side of body**, hold down middle mouse button (wheel) and drag to rotate view, **Fig. 110**.

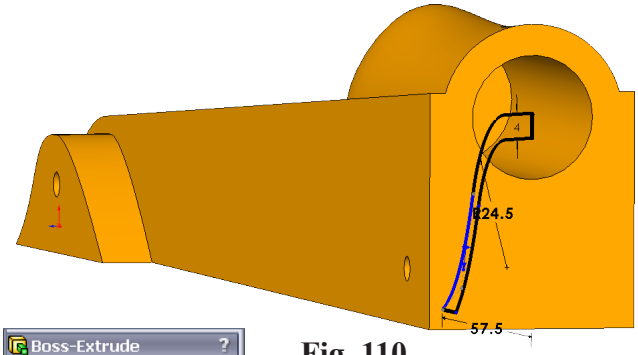
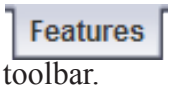
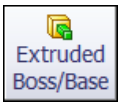


Fig. 110

Step 2. Click **Features** 

on the Command Manager toolbar.

Step 3. Click **Extruded Boss/Base** 

on the Features toolbar.

Step 4. In the Property Manager set:

End Condition **Mid Plane**

Depth

42, **Fig. 111**

click OK , **Fig. 112**.

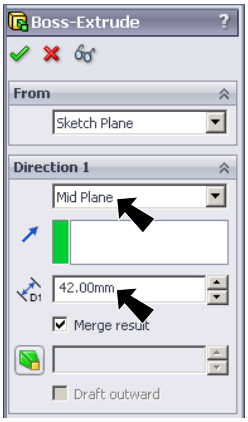


Fig. 111

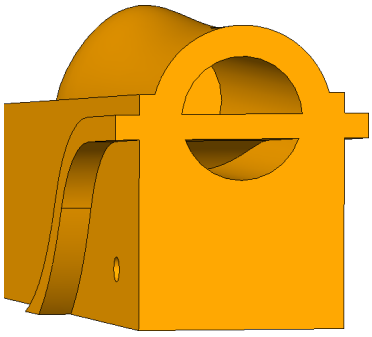


Fig. 112

Step 5. Save. Use **Ctrl-S**.

T. Rename Boss-Extrude1 REAR FENDER.

Step 1. **Rename Boss-Extrude1** to **REAR FENDER** in the Feature Manager, **Fig. 113**. To rename, use **F2** on keyboard.

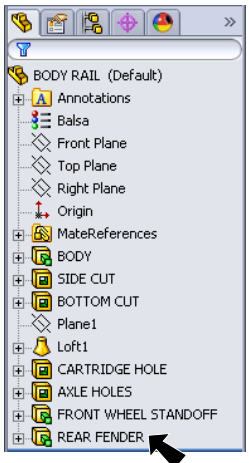


Fig. 113

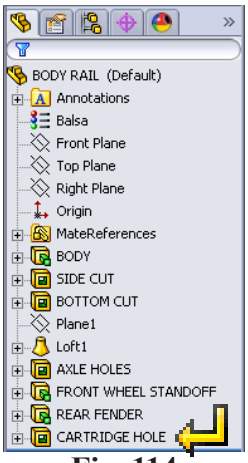


Fig. 114

U. Extrude Cut Wheel Wells.

Step 1. In the Feature Manager drag the **CARTRIDGE HOLE** below REAR FENDER feature, **Fig. 114** and **Fig. 115**.

Step 2. Click **Right Plane** in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 116**.

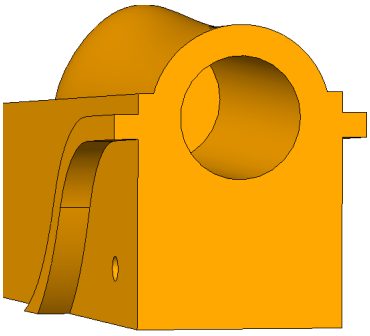


Fig. 115

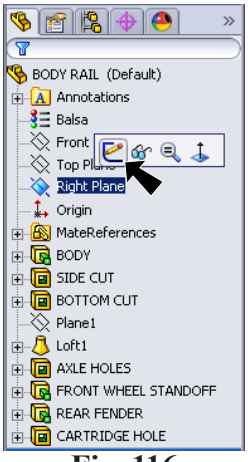


Fig. 116

Step 3. Click the **side face under the fender**, **Fig. 117**.

Step 4. Click **Convert Entities**

on the Sketch toolbar. This converts the face to entities, **Fig. 118**.

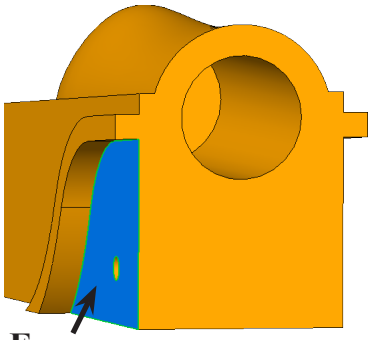


Fig. 117

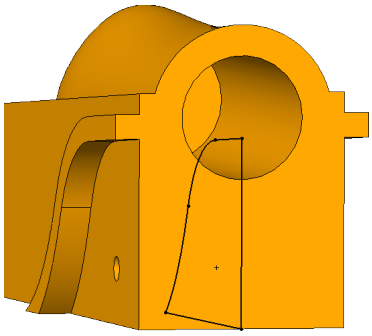
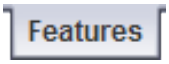
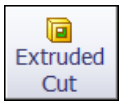


Fig. 118

Step 5. Click **Features** 

on the Command Manager toolbar.

Step 6. Click **Extruded Cut** 

on the Features toolbar.

Step 7. In the Property Manager set:
under **From**, **Fig. 119**
Start Condition **Offset**
Offset Value 17
under Direction 1
Depth

4
click OK , **Fig. 120**.

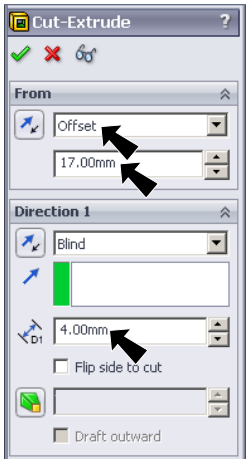


Fig. 119

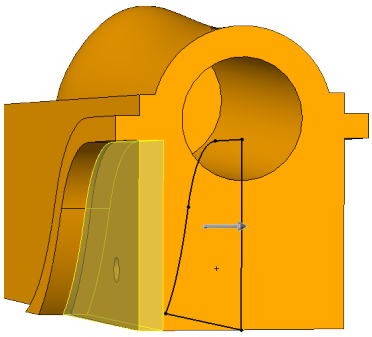


Fig. 120

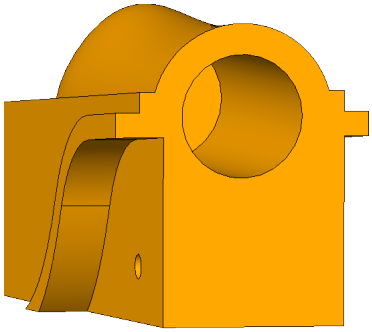


Fig. 121

V. Rename Cut-Extrude1 REAR WHEEL CUT.

Step 1. **Rename Cut-Extrude1** to **REAR WHEEL CUT** in the Feature Manager, **Fig. 122**. To rename, use **F2** on keyboard.

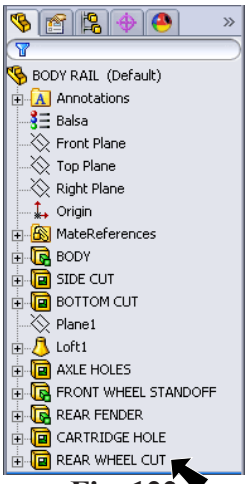


Fig. 122

W. Mirror Extrude Cut Wheel Wells.

Step 1. **Ctrl click Right Plane** and **REAR WHEEL CUT** feature to select both, **Fig. 123**.

Step 2. Click **Mirror** Mirror on the Features toolbar.

Step 3. In the Mirror Property Manager click OK , **Fig. 124** and **Fig. 126**.

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

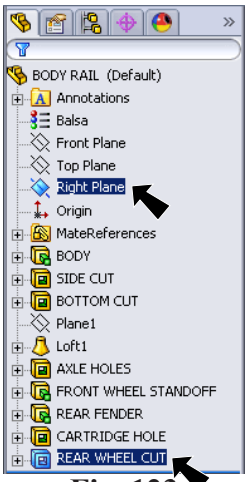


Fig. 123

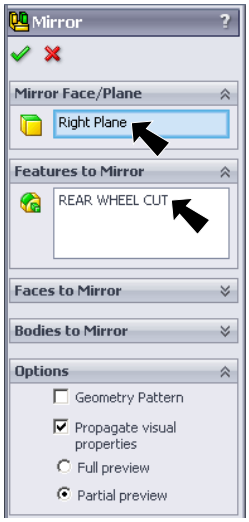


Fig. 124

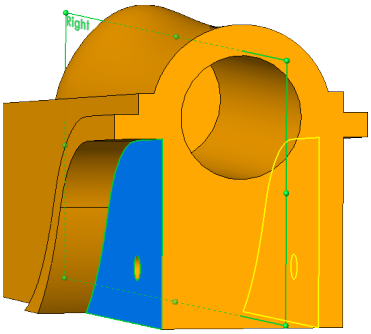


Fig. 125

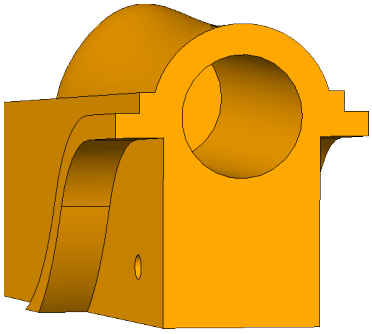


Fig. 126

X. 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. 127**. If necessary, use **F5** key to display the toolbar.

Fig. 127

Step 3. Click **Fillet** Fillet on the Features toolbar.

Step 4. In the Fillet Property Manager:
select **Manual**, **Fig. 128**
under **Fillet type**
Select **Variable radius**
select **Full preview**.
Click the two top edges on both side of the body, **Fig. 129**.
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. 130**.

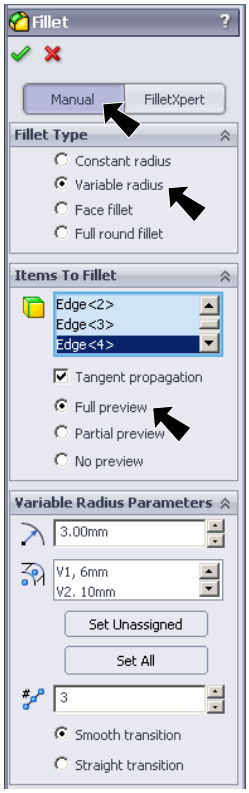


Fig. 128

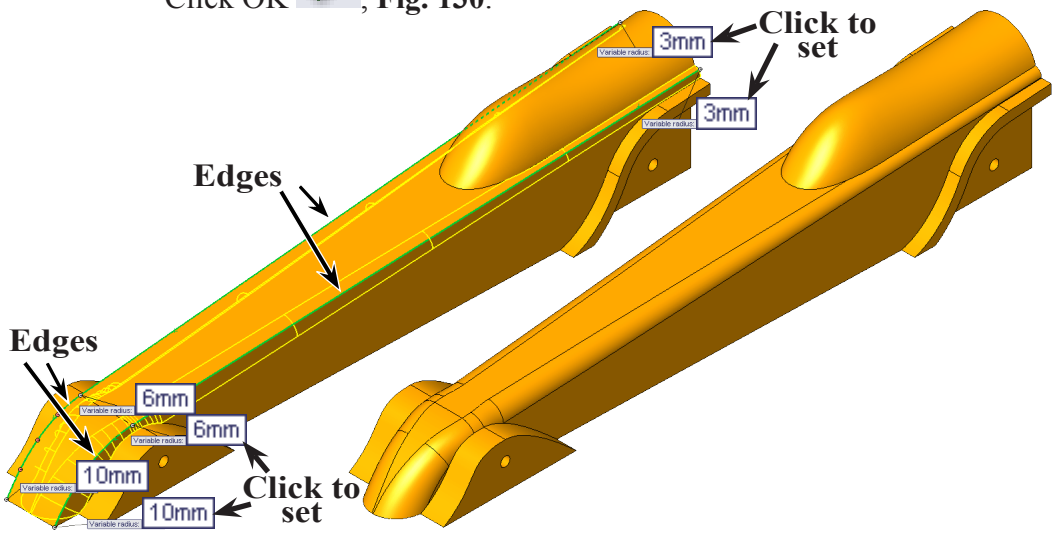


Fig. 129

Fig. 130

Y. Fillet Edges.

Step 1. Click **Fillet** on the Features toolbar.

Step 2. In the Fillet Property Manager set:

select **FilletXpert**, **Fig. 131**.

Radius **3**

select **Full preview**

click the **two top edges** of front wheel standoff, **Fig. 132**

rotate view to view **right side of standoff**, hold down middle mouse button (wheel) and drag to rotate view, **Fig. 133**

click the **two top edges** of right side of wheel standoff, **Fig. 133**

click Apply

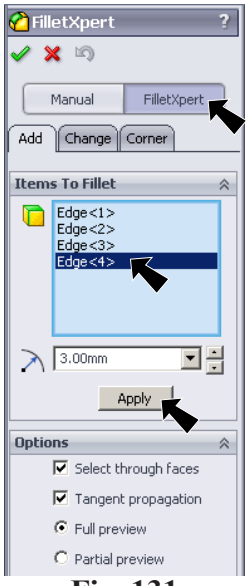


Fig. 131

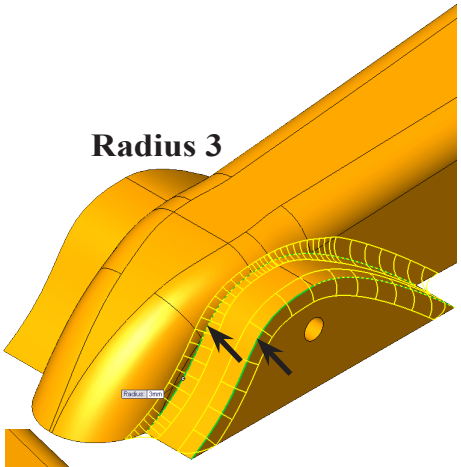


Fig. 132

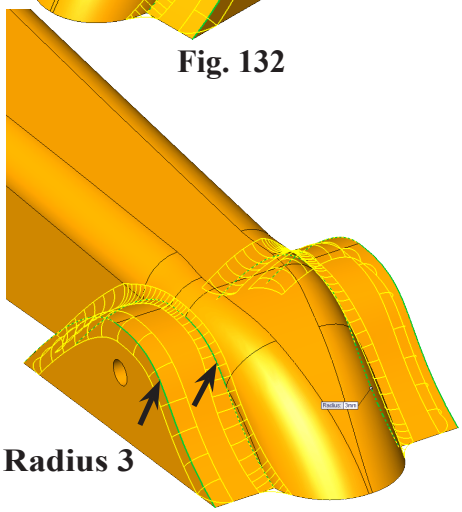


Fig. 133

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

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

Rotate view to view **right fender** as shown in **Fig. 135**. To rotate view, hold down middle mouse button (wheel) and drag.

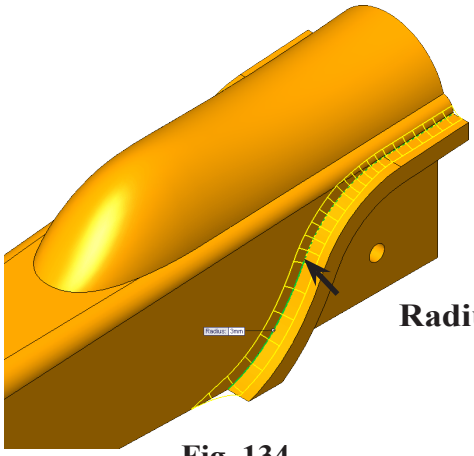


Fig. 134

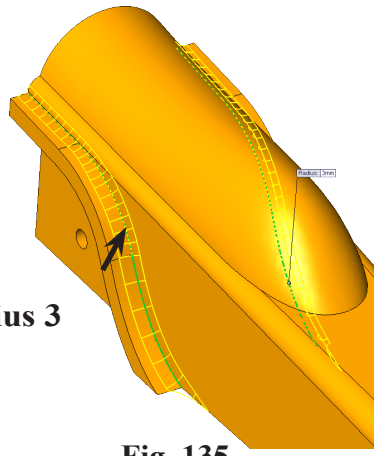


Fig. 135

click the **top inside edge of right fender**, **Fig. 135**

click Apply

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

click the **top outside edge of fender**, **Fig. 136**

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

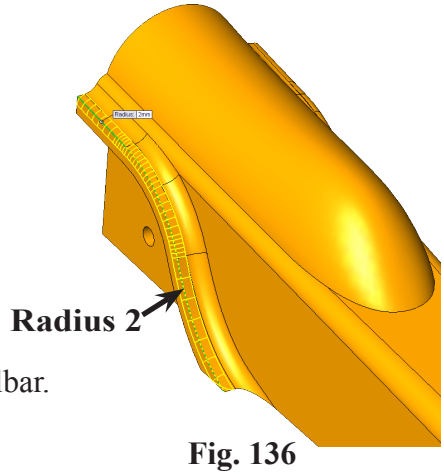


Fig. 136

click the **top outside edge of left fender**, **Fig. 137**

click Apply

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

click **edge of cockpit at body**, **Fig. 138**

click OK in Fillet Property Manager when done, **Fig. 139**.

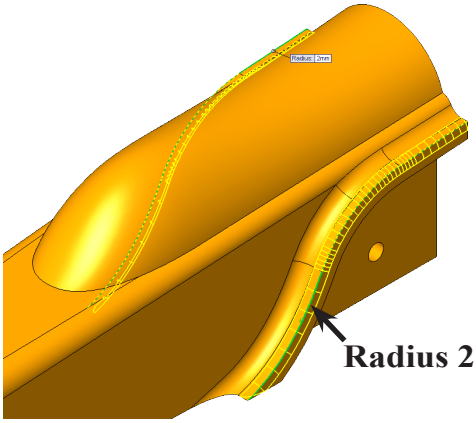


Fig. 137

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

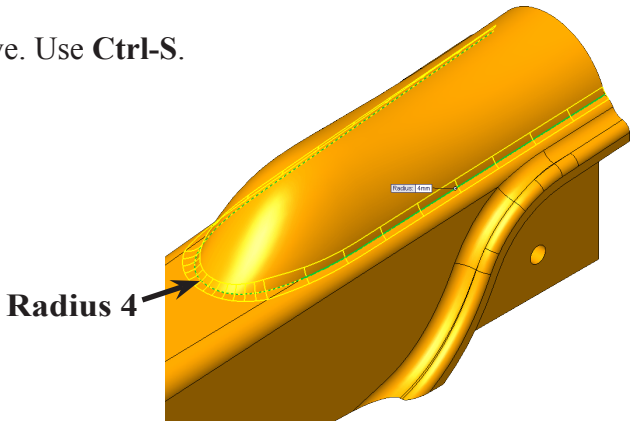


Fig. 138

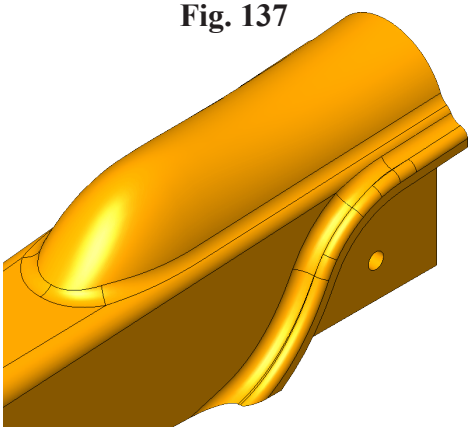


Fig. 139

2. Front Split Line.

Fig. 140

Step 1. Click **Filter Off** (**F6**) on the **Selection Filter toolbar** at the bottom of the display, **Fig. 140**. 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. 141**.

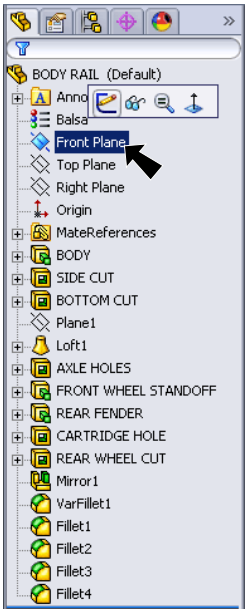


Fig. 141

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.

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. 142**.

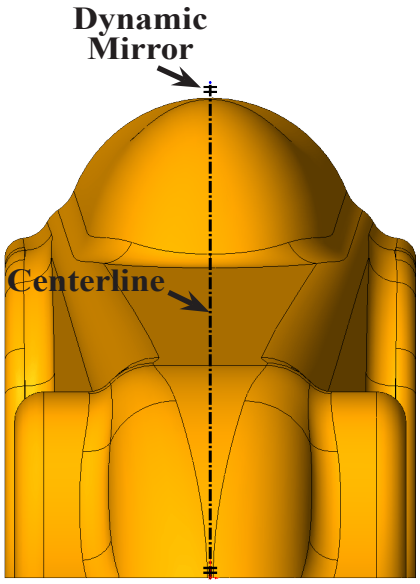


Fig. 142

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

Step 7. Click the centerline to select it, **Fig. 142**.

Step 8. Click **Dynamic Mirror** on the Sketch toolbar or Tools Menu > Sketch Tools > Dynamic Mirror, **Fig. 142**. Symmetry symbols appear at both ends of the centerline.

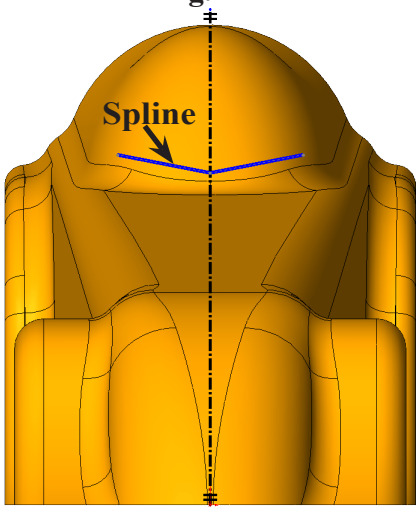


Fig. 143

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. 143**. Before moving cursor away from 2nd spline point, **double click** to **click End spline**.

Step 11. Draw **two point** spline between end of first spline and centerline above first spline, **Fig. 144**. **Right click drawing and click Select** from menu to end spline.

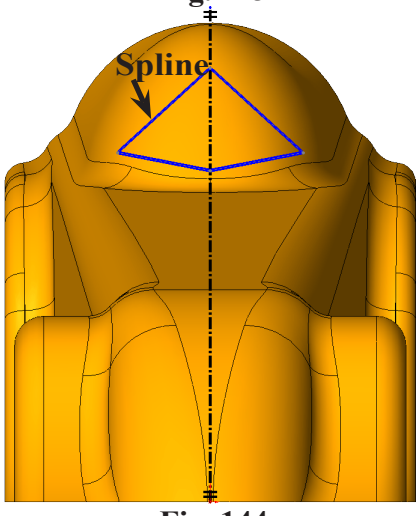


Fig. 144

Step 12. **Ctrl click** both **bottom** splines to select both splines. Release Ctrl key and click **Make Tangent** on the Content menu, **Fig. 145**.

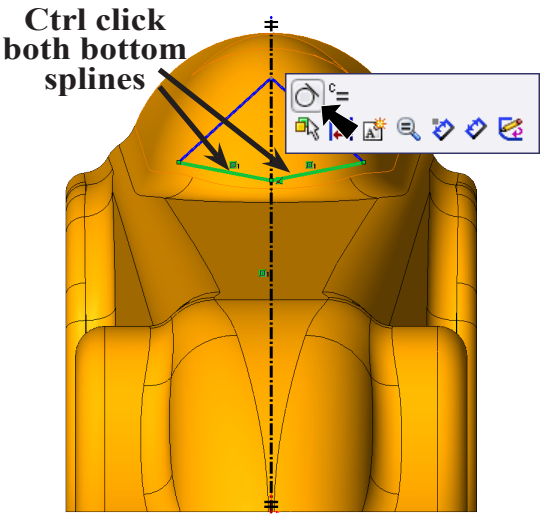


Fig. 145

Step 13. **Ctrl click** both **top** splines to select both splines. Release Ctrl key and click **Make Tangent** on the Content menu, **Fig. 146**.

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

Step 15. Add the dimensions as shown in **Fig. 147**.

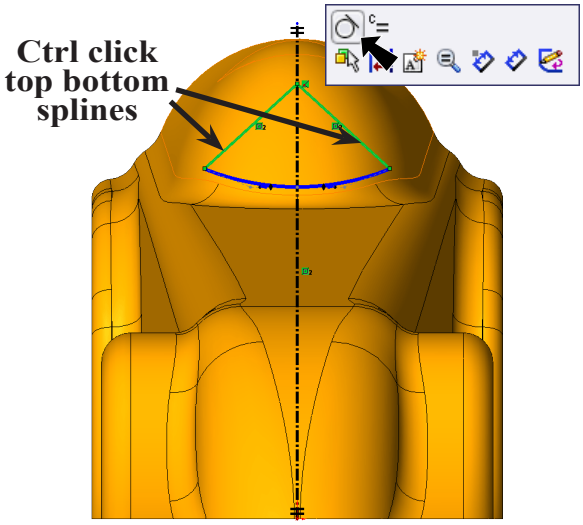


Fig. 146

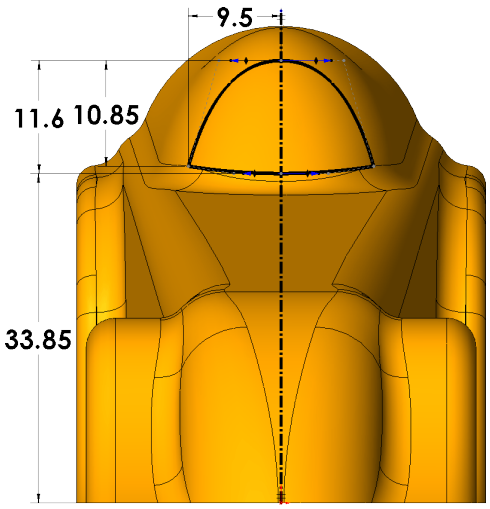


Fig. 147

Step 16. Dimension Tangent Weighting1 **17.6** for the endpoint of top spline at centerline, **Fig. 148**. To dimension Tangent Weighting, click the **Circular Spline Handle** (small gray dot)**,** then move the cursor out away from spline and click. Key-in 17.6 and press ENTER.

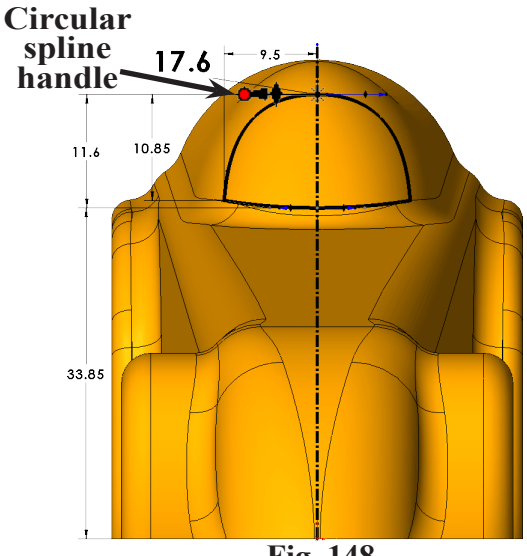


Fig. 148

Step 17. Click Insert Menu > Curve > Split Line.

Step 18. In the Split Line Property Manager:
under **Type of Split**, **Fig. 149**
select **Projection**
under **Selections**
Current Sketch should be selected
for the **Faces to Split** box **click cockpit loft in the drawing**, **Fig. 150**
click OK .

Step 19. Click the split face to confirm Split Line, **Fig. 151**.

Step 20. Save. Use **Ctrl-S**.

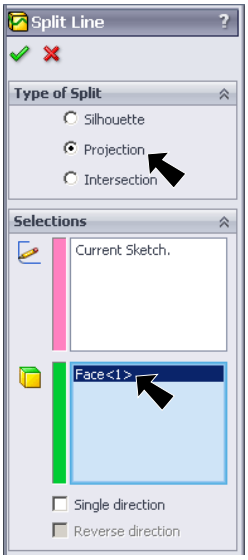


Fig. 149

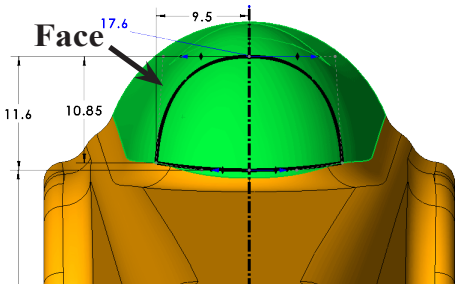


Fig. 150

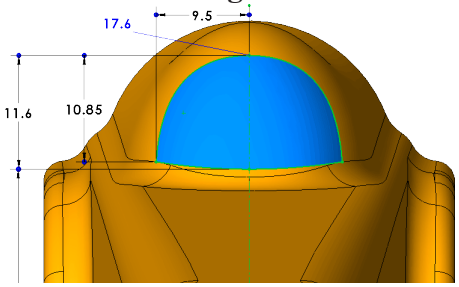


Fig. 151

AA. Side Split Line.

Step 1. Click **Right Plane** in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 152**.

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

Step 3. Zoom in around **cockpit**, **Fig. 153**. 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 **Offset Entities**

on the Sketch toolbar.

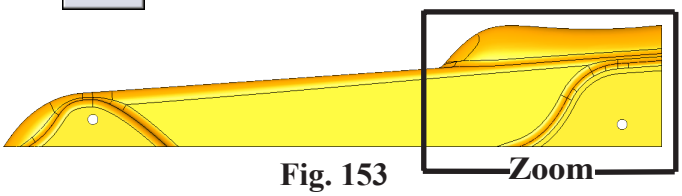


Fig. 153

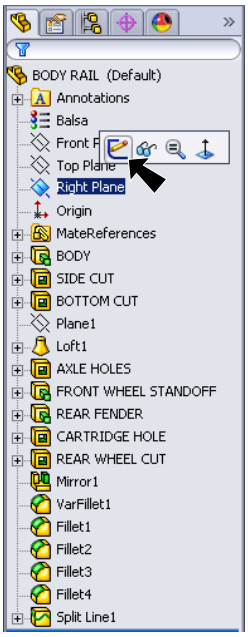


Fig. 152

Step 5. In the Offset Entities Property Manager set:

click **Keep Visible** , **Fig. 154**

Distance 3

Add dimensions

uncheck **Select chain**, **Fig. 154**

click rear edge of front Split Line face and top edge of cockpit loft, **Fig. 155**.

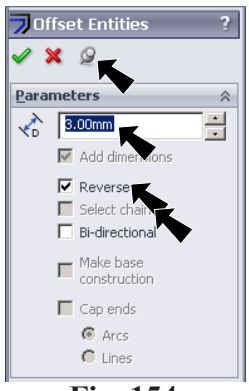


Fig. 154

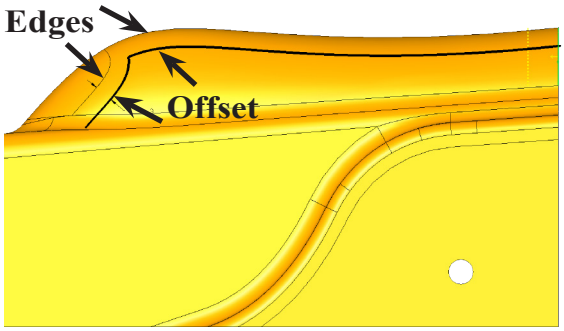


Fig. 155

The yellow offset should be inside the cockpit, **Fig. 155**. If it is not, click Reverse.

Click OK .

Distance 5

Fig. 156

click **rear of cockpit loft**, **Fig. 157**.

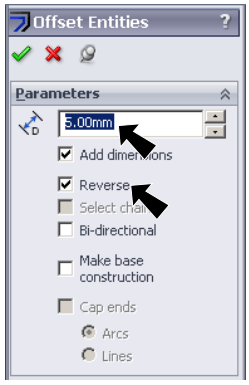


Fig. 156

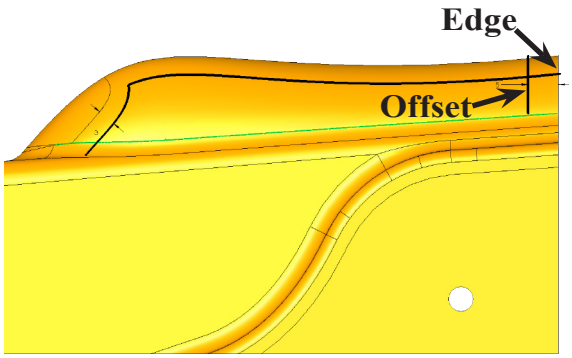


Fig. 157

The yellow offset should be inside the cockpit, **Fig. 157**. If it is not, click Reverse.

Click OK .

Distance .1

Fig. 158

click edge of fillet at the bottom of cockpit loft, **Fig. 159** and **Fig. 160**.

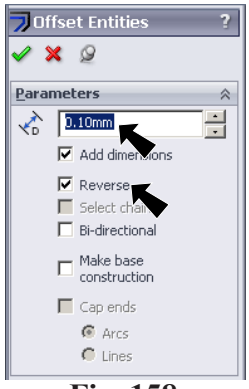


Fig. 158

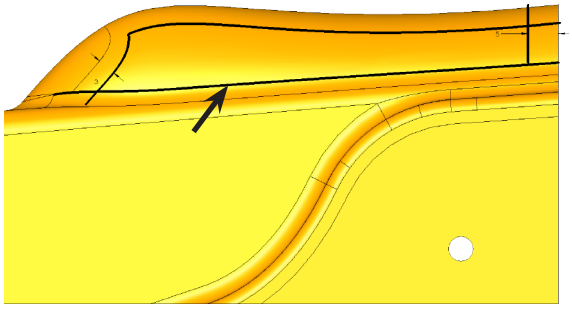


Fig. 159

The yellow offset should be inside the cockpit, **Fig. 160**. If it is not, click Reverse.

Click OK **twice** .

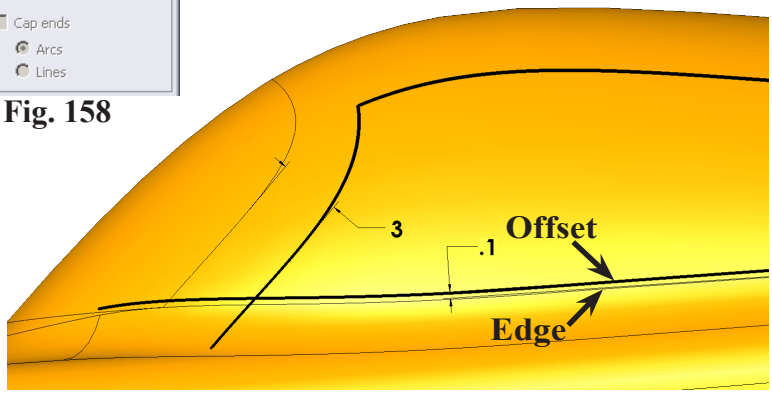


Fig. 160

Step 6. Click **Trim Entities**

on the Sketch toolbar.

Step 7. In the Property Manger select:

Corner ,
Fig. 161
click the inside corner lines to trim, **Fig. 162**. Results shown in **Fig. 163**.

Click OK in the Property Manager.

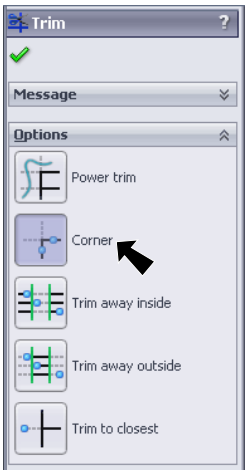


Fig. 161

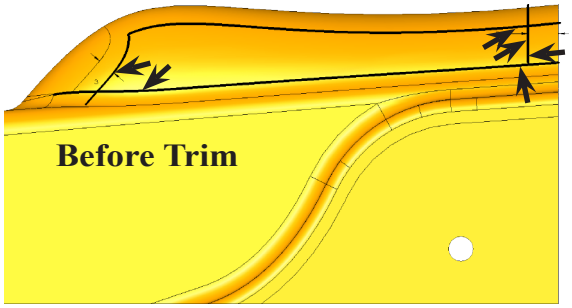


Fig. 162

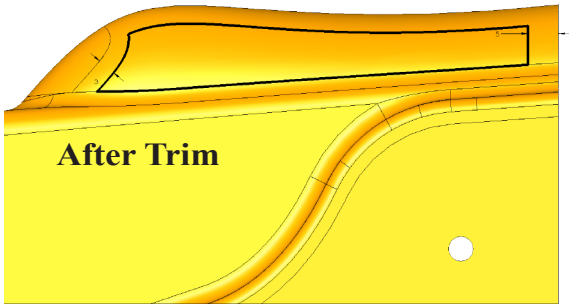


Fig. 163

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

for the Faces to Split box click the **cockpit loft** in the drawing, **Fig. 165**
click OK .

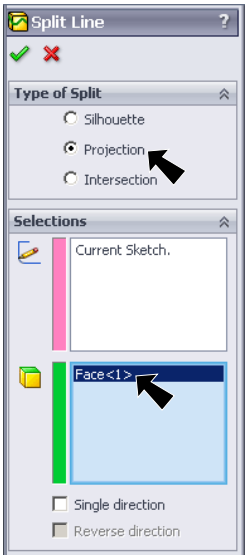


Fig. 164

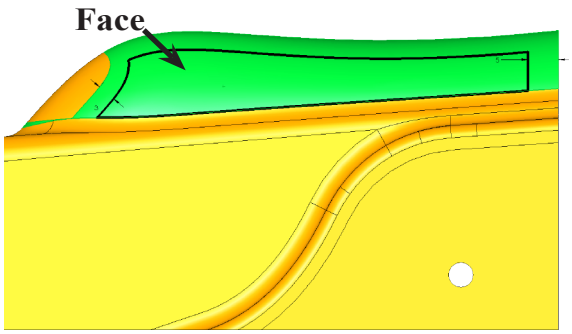


Fig. 165

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

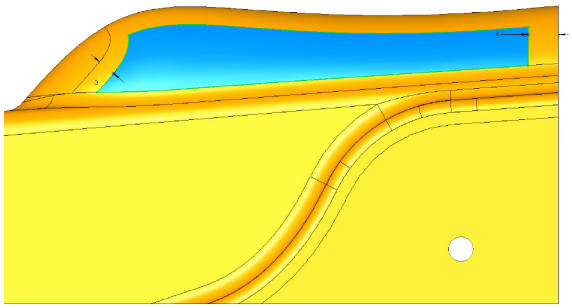


Fig. 166

BB. 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. 167**.

Step 2. Click a Split Line face, click **Appearance Callout** on the Content toolbar and click **Face 1 Split...**, **Fig. 167**.

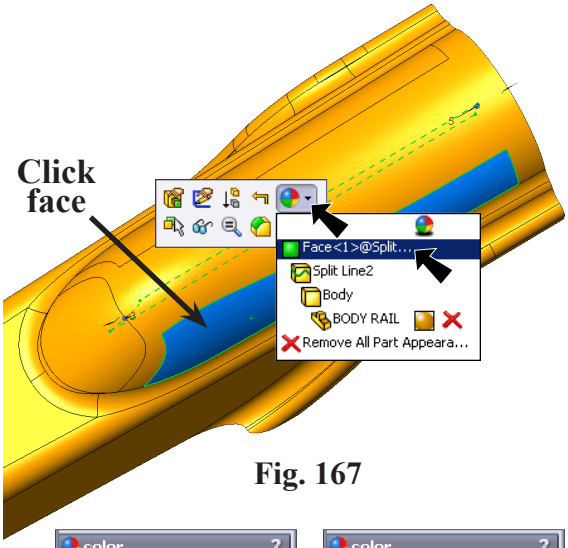


Fig. 167

Step 3. In the Appearances Property Manager,
click **Advanced button**, **Fig. 168**
under Selected Geometry
click the **other two Split Line faces** in the cockpit, **Fig. 169**

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

click **Illumination tab** Illumination, **Fig. 168**

set **Transparency amount .20**, **Fig. 170**

click OK in the Property Manager to accept the color.

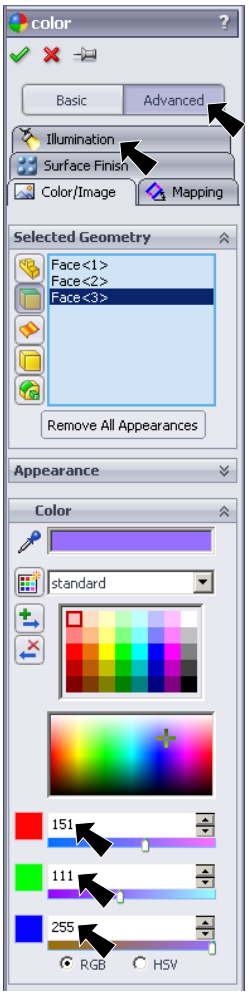


Fig. 168

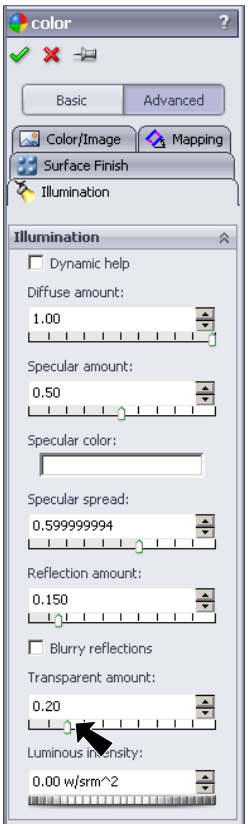


Fig. 170

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

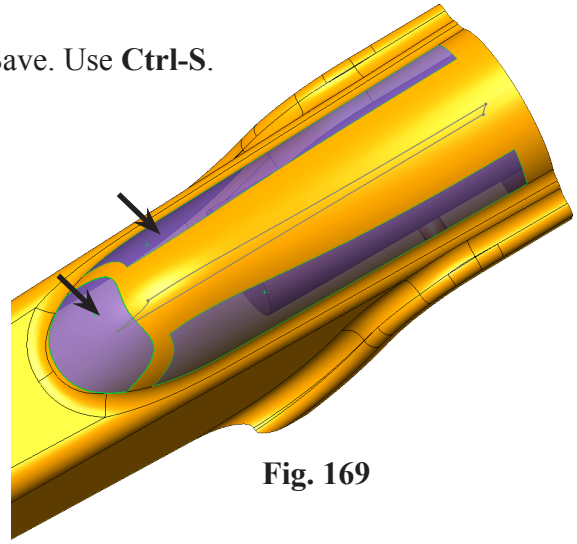
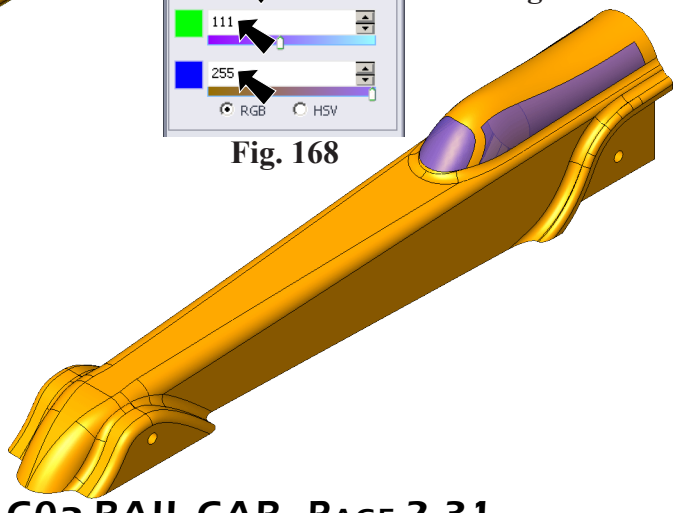



Fig. 169