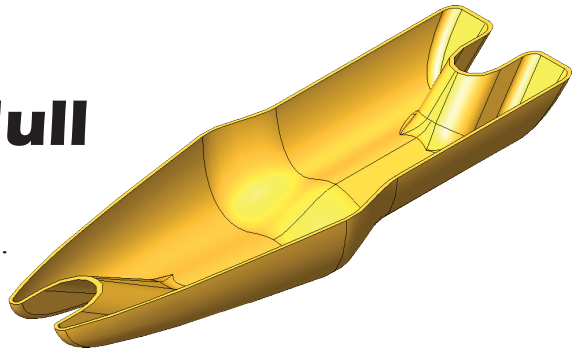
Chapter 21

Boat
Hydro Hull



A. Save as "HYDRO".

Step 1. Open your **HULL MID PLANE** file (Chapter 2).

Step 2. Click File Menu > Save As.

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

B. Delete Loft1, Sketch2 and Sketch3.

Step 1. Click **Loft1** in the Feature Manager, **Fig. 1**.

Step 2. Press **Delete key** on keyboard and Yes to confirm delete.

Step 3. Repeat and delete **Sketch2 and Sketch3**, Ctrl click Sketch2 and Sketch3 in the Feature Manager, press **Delete key** on keyboard and Yes to confirm delete, **Fig. 2**.

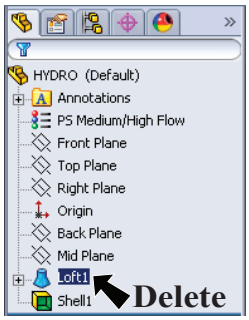


Fig. 1

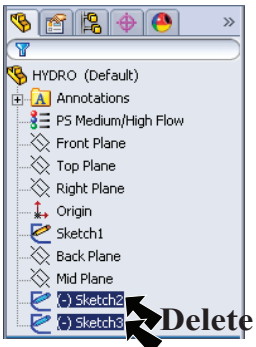


Fig. 2

C. Change Mid Plane.

Step 1. Click **Mid Plane** in the Feature Manager and click **Edit Feature** from the Content toolbar, **Fig. 3**.

Step 2. In the Plane Property Manager set,
under First Reference:

set **Offset Distance** to **4.7**

click OK in the Property Manager, **Fig. 4**.

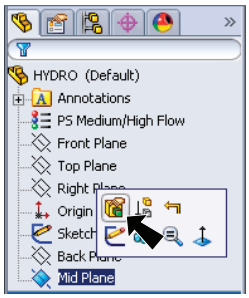


Fig. 3

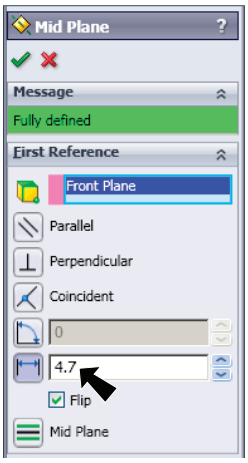


Fig. 4

Step 3. **Show Back and Mid Planes**. To show Planes, **Ctrl click** each Plane and click **Show** from the Content toolbar, **Fig. 5** and **Fig. 6**.

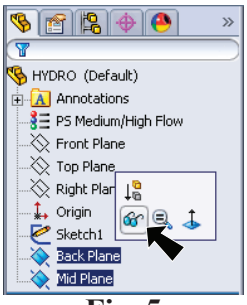


Fig. 5

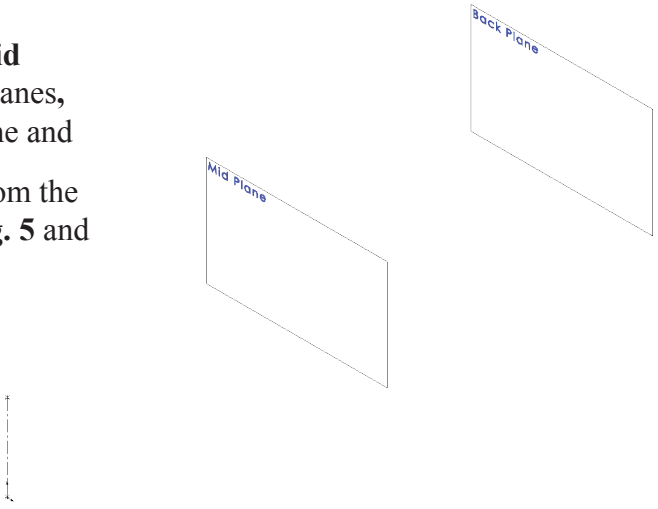


Fig. 6

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D. Create Sketch in Mid Plane.

Step 1. Click **Mid Plane** in the Feature Manager and click **Sketch** from the Content toolbar, **Fig. 7**.

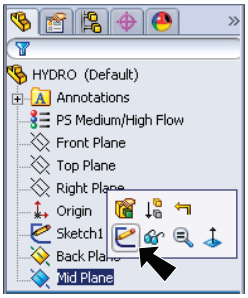


Fig. 7

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

Step 3. Click **Centerline** in the **Line flyout**.

Step 4. Starting from the Origin, draw a centerline up to the **Point** in Sketch1, **Fig. 8**.

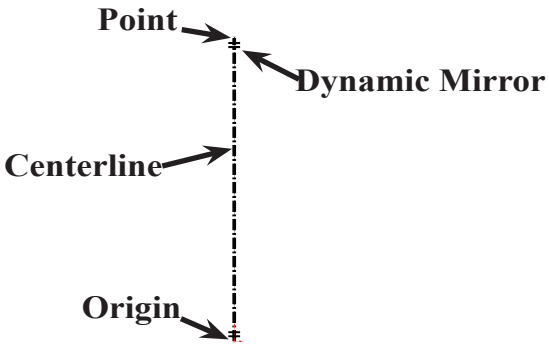


Fig. 8

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

Step 6. Click the centerline to select it, **Fig. 8**.

Step 7. Click **Dynamic Mirror** on the Sketch toolbar or Tools Menu > Sketch Tools > Dynamic Mirror, **Fig. 8**. Symmetry symbols appear at both ends of the centerline.

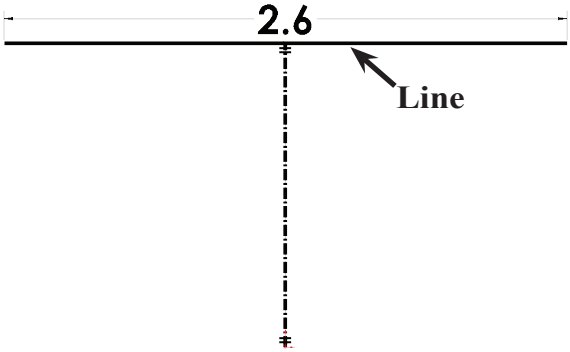


Fig. 9

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

Step 9. Draw a horizontal line from top endpoint of centerline out to left, **Fig. 9**.

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

Step 11. Dimension line **2.6**, **Fig. 9**.

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

Step 13. Draw **spline 4 point spline between left endpoint of line** and **centerline slightly above bottom endpoint of centerline, Fig. 10**. Press **Escape** to end spline.

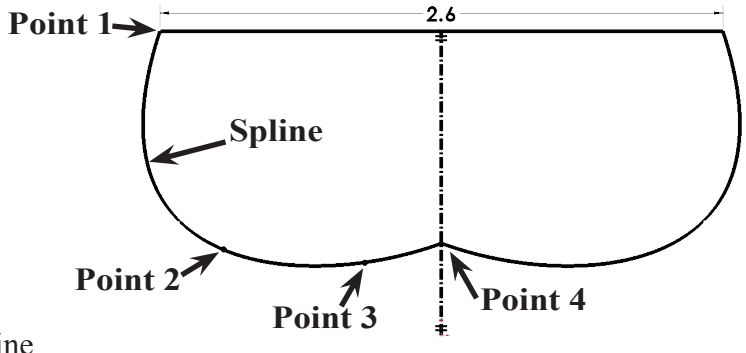


Fig. 10

Step 14. Click **Smart Dimension**

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

Step 15. Dimension between horizontal line and spline bottom endpoint, **Fig. 11**.

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

Step 17. **Ctrl click both splines** to select both. Release Ctrl key and **Make Tangent** on the Content menu, **Fig. 12**.

Step 18. Click Zoom to Fit (**F**) on the View toolbar.

Step 19. Click a gray Control Point to activate it and Control Point turns yellow Move yellow Control Point to adjust spline, **Fig. 13**. **Important** to keep side of boat (spine) inside endpoint of horizontal line, **Fig. 14**.

Step 20. Click **Exit Sketch**

on the Sketch toolbar.

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

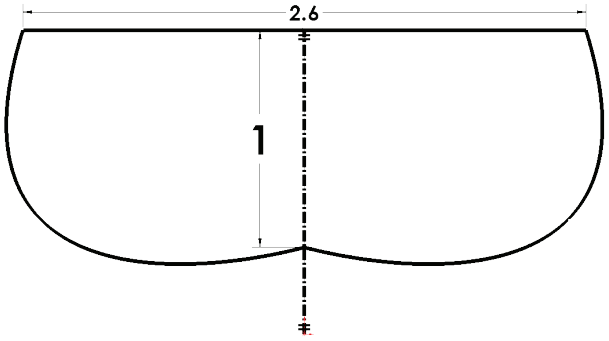


Fig. 11

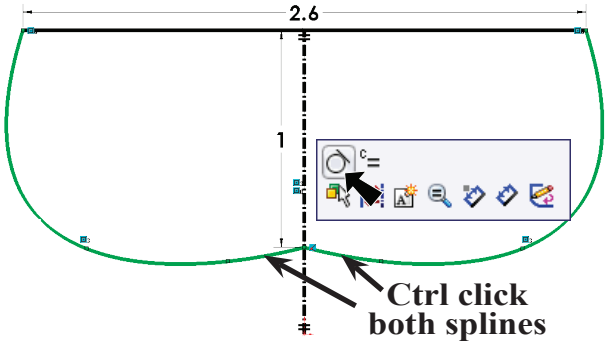


Fig. 12

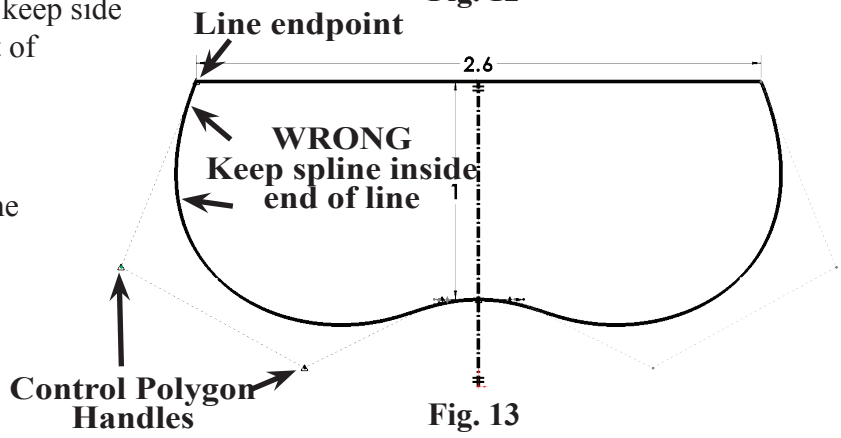


Fig. 13

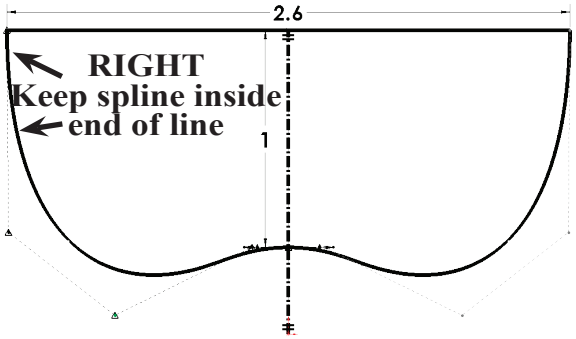


Fig. 14

E. Copy Sketch2 to Back Plane.

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

Step 2. Click **Sketch2** (**on Mid Plane**) in the Feature Manager, **Fig. 15**.

Step 3. Click Edit Menu > Copy (**Ctrl-C**).

Step 4. Click **Back Plane** in the Feature Manager, **Fig. 16**.

Step 5. Click Edit Menu > Paste (**Ctrl-V**), **Fig. 17**.

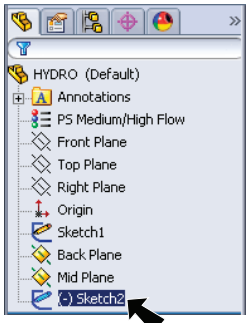


Fig. 15

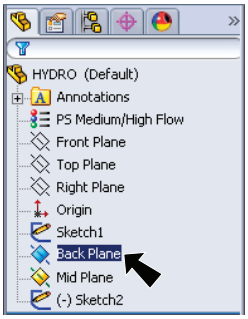


Fig. 16

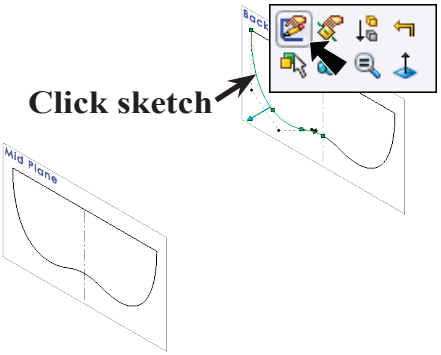


Fig. 17

F. Change Back Plane Sketch3.

Step 1. Click **Sketch3 (on Back Plane)** in the drawing and click **Edit Sketch** on the Content menu, **Fig. 17**.

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

Step 3. Click **top endpoint** of the centerline and click **Make Fixed** from Content menu, **Fig. 18**.

Step 4. Change dimensions to **2.2** and **.7** as shown in **Fig. 19**.

Step 5. Adjust the spines. Click a spline to display Control Polygon Handles (yellow) . Move Control Polygon Handles to adjust spline. **Important** to keep side of boat (spine) inside end of horizontal line, **Fig. 20**.

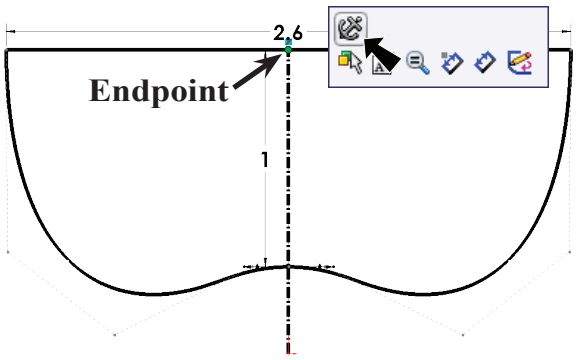


Fig. 18

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

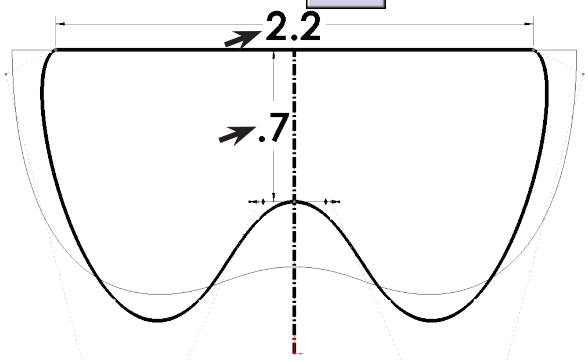


Fig. 19

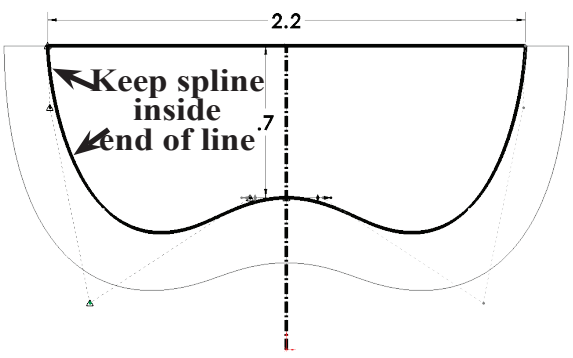


Fig. 20

G. Create Mid Plane 2.

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

Step 2. Click **Front Plane** in the Feature Manager, **Fig. 21**.

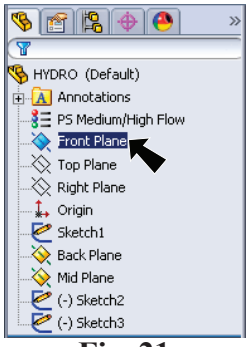


Fig. 21

Step 3. **Ctrl drag** Front plane in drawing area towards rear of hull and release, **Fig. 22**. To Ctrl drag, hold down Ctrl and drag plane to right.

Step 4. Key-in **5.8 for Distance** in the Property Manager, **Fig. 23** and click OK.

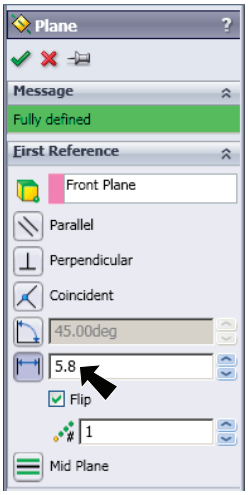


Fig. 23

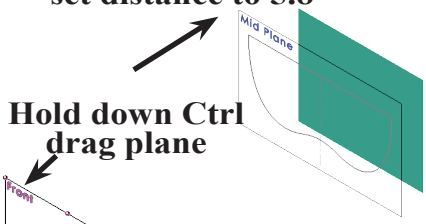
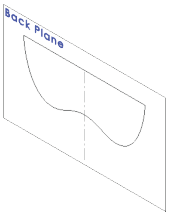


Fig. 22



H. Rename Plane1 Mid Plane2.

Step 1. Click **Plane1** in the Feature Manager.

Step 2. Press **F2** key on keyboard, change Plane1 to **Mid Plane2** and press ENTER, **Fig. 24**.

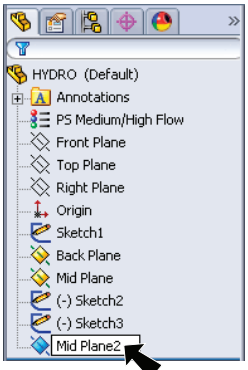


Fig. 24

Step 3. Save. Use **Ctrl-S**.

I. Copy Sketch3 on Back Plane to Mid Plane2.

Step 1. Click **Sketch3** (sketch on Back Plane) in the Feature Manager, **Fig. 25**.

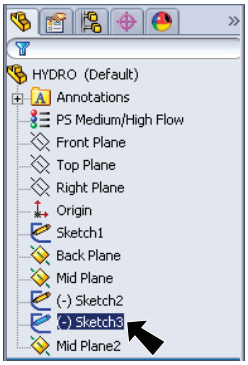


Fig. 25

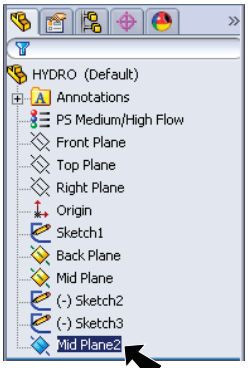


Fig. 26

Step 2. Click Edit Menu > Copy (**Ctrl-C**).

Step 3. Click **Mid Plane2** in the Feature Manager, **Fig. 26**.

Step 4. Click Edit Menu > Paste (**Ctrl-V**), **Fig. 27**.

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

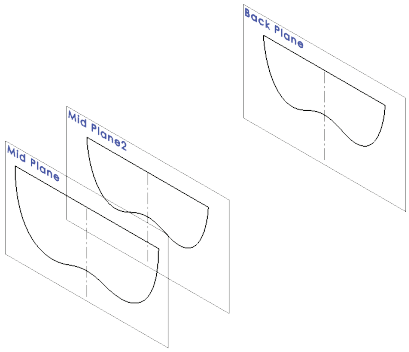
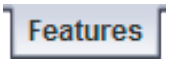


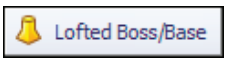
Fig. 27

J. Loft Boss/Base.

Step 1. Click View Menu > Planes, to hide Planes.

Step 2. Click **Features** 

on the Command Manager toolbar.

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

on the Features toolbar.

Step 4. In the Loft Property Manager:
under **Profiles**, **Fig. 28**
click **Point1 Sketch**,
click **Sketch2**, **Fig. 29**
expand Start/End Constraints

under Start/End Constraints:
Start constraint:
Normal to Profile
Start Tangent Length 1.5
click OK .

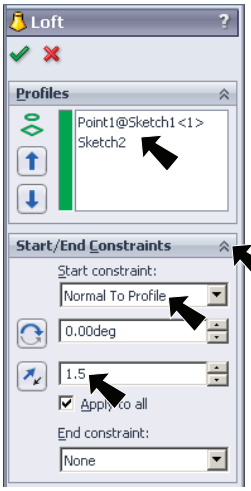


Fig. 28

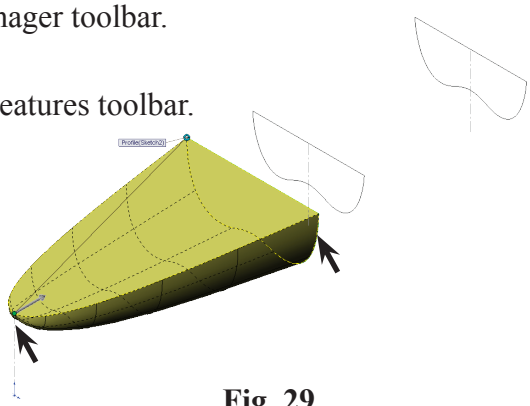
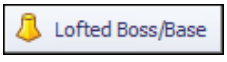


Fig. 29

Step 5. Click **Lofted Boss/Base** 

on the Features toolbar.

Step 6. Rotate view to view rear of loft as shown in **Fig. 30**. Hold down middle mouse button (wheel) and drag.

Step 7. In the Loft Property Manager:
under **Profiles**, **Fig. 31**
click **rear face of loft**, **Fig. 30**
click **Sketch4**, **Fig. 32**
if necessary, **reposition connector points** ● **of profiles to align loft**, **Fig. 32**
expand Start/End Constraints, **Fig. 31**
under Start/End Constraints:
Start constraint:
Tangency to Face
End constraint:
Normal to Profile
uncheck Merge tangent faces
click OK .

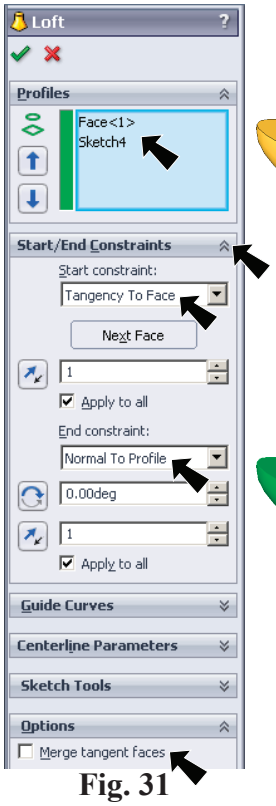


Fig. 31

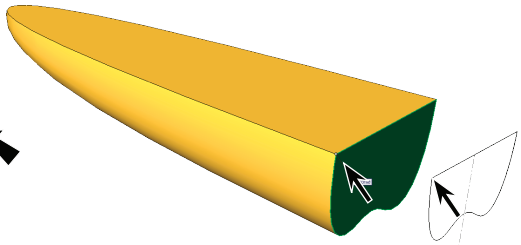


Fig. 30

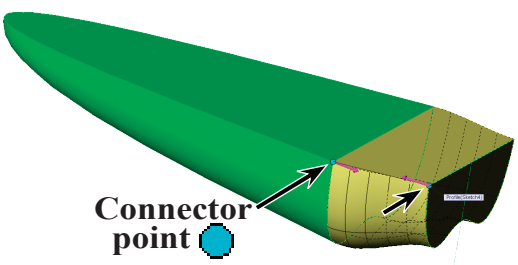
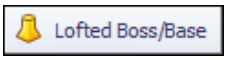


Fig. 32

Step 8. Click **Lofted Boss/Base** 

on the Features toolbar.

Step 9. In the Loft Property Manager:
under **Profiles**, **Fig. 33**
click **rear face of loft**
click **Sketch3**, **Fig. 34**

if necessary, **reposition connector points** **of profiles to align loft**, **Fig. 35**
click OK .

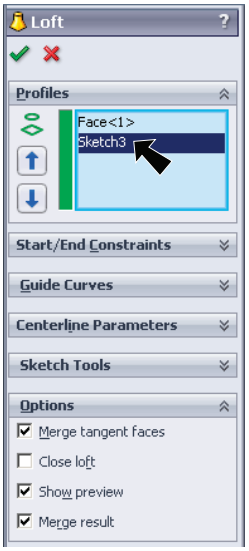


Fig. 33

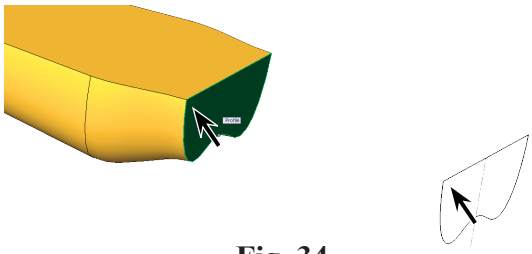


Fig. 34

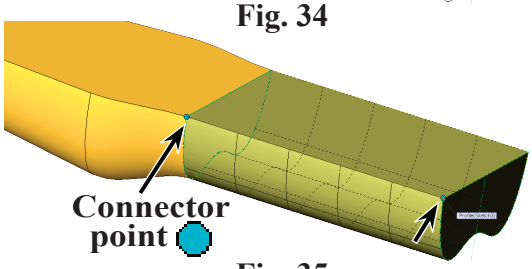


Fig. 35

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

K. Bow Cut.

Step 1. Click **top face of hull** and click **Sketch** on the Content toolbar, **Fig. 36**.

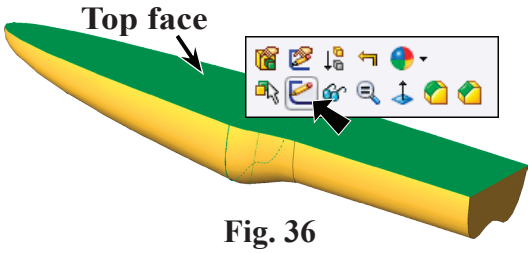


Fig. 36

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

Step 3. Click **Rectangle** (**S**) on the Sketch toolbar.

Step 4. Draw a rectangle at the front of the Hull and away from the Origin as shown in **Fig. 37**.

Step 5. **Right click drawing and click Select** from menu to unselect Rectangle tool.

Step 6. **Ctrl click front horizontal line and** Origin to select both. Release Ctrl key and **Make Midpoint** on the Content menu, **Fig. 38** and **Fig. 39**.

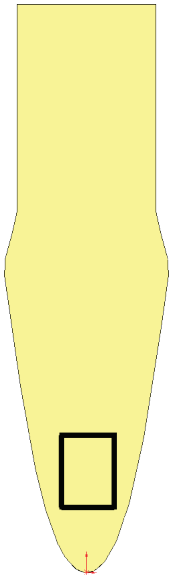


Fig. 37

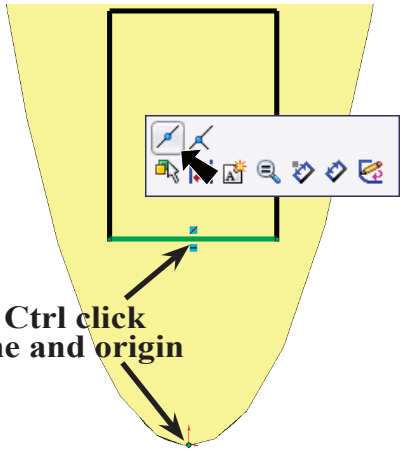


Fig. 38

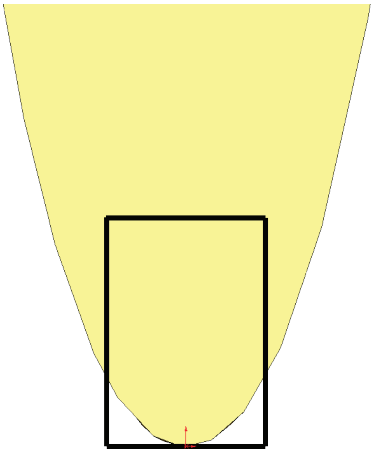


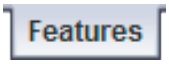
Fig. 39

Step 7. Click **Smart Dimension**

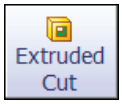
(**S**) on the Sketch toolbar.

Step 8. Dimension rectangle **1.5** and **.6**, **Fig. 40**.

Step 9. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**).

Step 10. Click **Features** 

on the Command Manager toolbar.

Step 11. Click **Extruded Cut** 

on the Features toolbar.

Step 12. In the Cut Extrude Property Manager:
under **Direction 1**
End Condition to Through All
click **Draft On** and **6 degrees**

check **Draft outward**.

The Direction arrow should point towards area to be cut away, **Fig. 42.** If arrow is pointing in wrong direction, click **Flip side to cut, Fig. 41**.

Click OK .

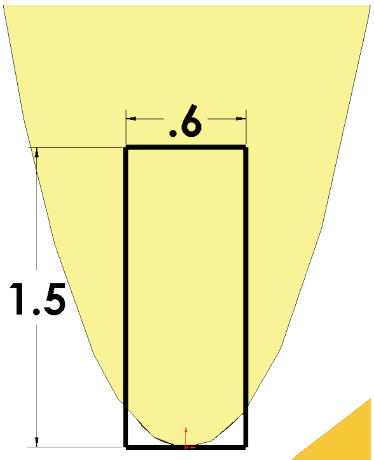


Fig. 40

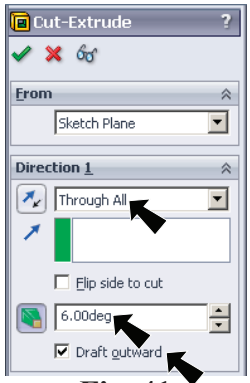


Fig. 41

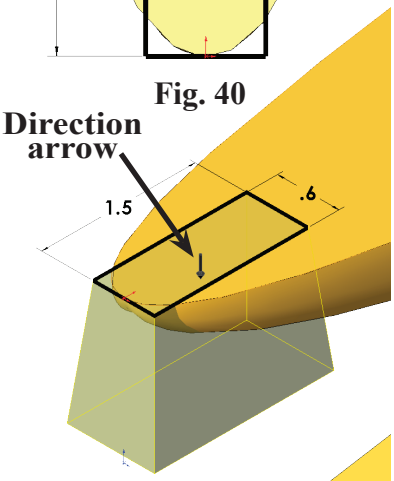


Fig. 42

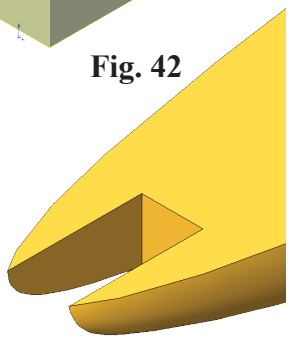
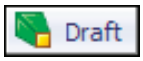


Fig. 43

L. Draft Bow Extrude Cut.

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

Step 2. In the Draft Property Manager set:
under Type of Draft**, Fig. 44**
select **Neutral Plane**
under **Draft Angle**
60 degrees
under **Neutral Plane**
click **top face of hull, Fig. 45**

under **Faces to Draft**
click **front face of extruded cut**
under **Neutral Plane**
click **Reverse Direction** and in drawing **direction arrow points down**, **Fig. 45**.

Rotate view to view draft from bottom as shown in **Fig. 46**. Hold down middle mouse button (wheel) and drag.

Click OK .

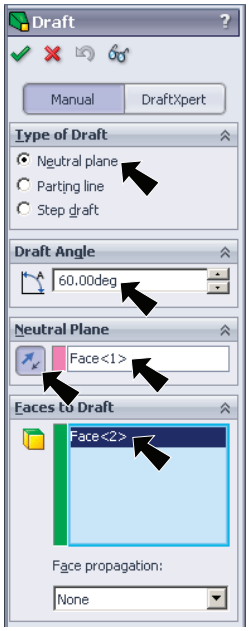


Fig. 44

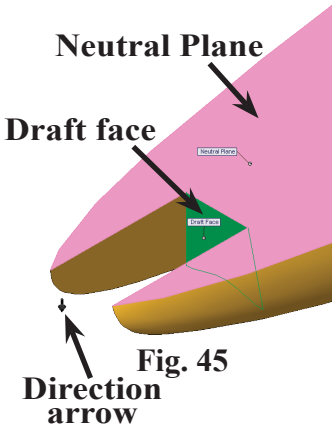


Fig. 45

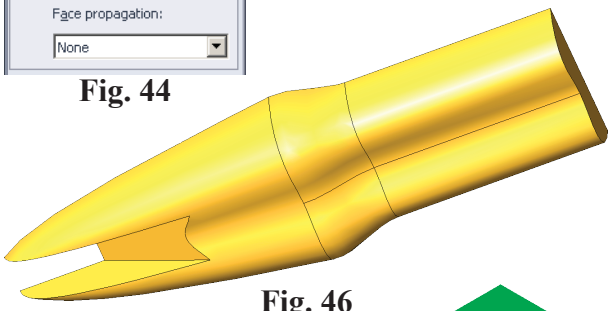


Fig. 46

Step 3. Save. Use **Ctrl-S**.

M. Stern Cut.

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

Step 2. Click **top face of hull** and click **Sketch** on the Content toolbar, **Fig. 47**.

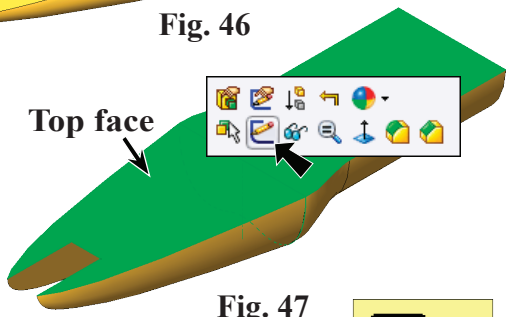


Fig. 47

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

Step 4. Click **Rectangle** (**S**) on the Sketch toolbar.

Step 5. Draw a rectangle over the rear Hull and away from rear edge as shown in **Fig. 48**.

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

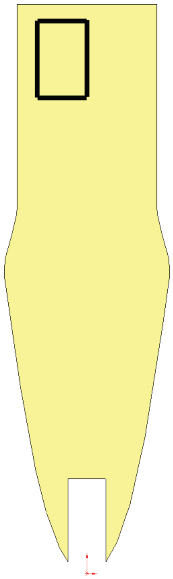


Fig. 48

Step 7. **Ctrl click midpoint of rear hull edge and rear horizontal line of rectangle** to select both. Release Ctrl key and click **Make Midpoint** on the Content menu, **Fig. 49** and **Fig. 50**.

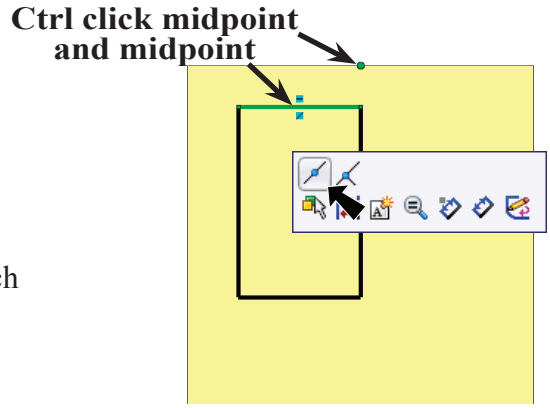


Fig. 49

Step 8. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 9. Dimension rectangle **1** and **.6**, **Fig. 51**.

Step 10. Click **Features** on the Command Manager toolbar.

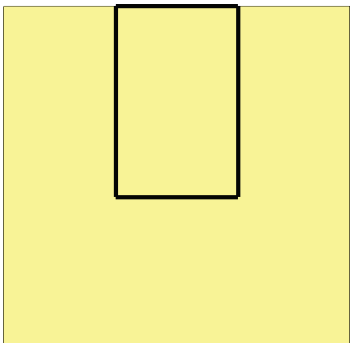


Fig. 50

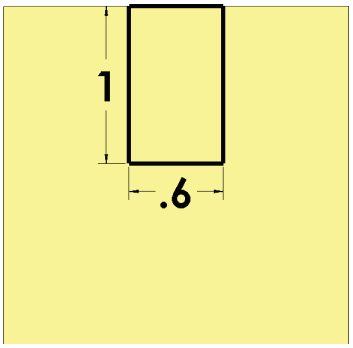


Fig. 51

Step 11. Click **Extruded Cut** on the Features toolbar.

Step 12. Rotate view to view as shown in **Fig. 53**. Hold down middle mouse button (wheel) and drag.

Step 13. In the Cut Extrude Property Manager:

under **Direction 1**

End Condition to Through All

click **Draft On** and **6 degrees**

check **Draft outward**.

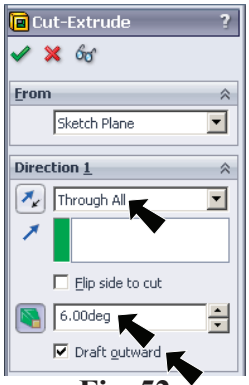


Fig. 52

The Direction arrow should point towards area to be cut away, **Fig. 53.** If arrow is pointing in wrong direction, click **Flip side to cut, Fig. 52**.

Click OK .

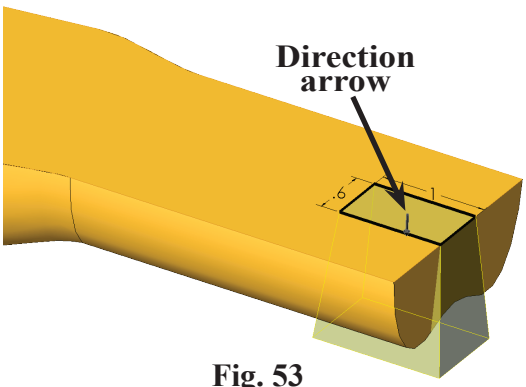


Fig. 53

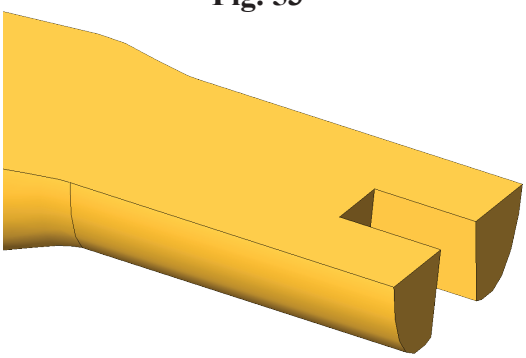
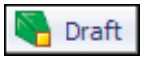


Fig. 54

N. Draft Stern Extrude Cut.

Step 1. Rotate view to view rear of hull as shown in **Fig. 55**. Hold down middle mouse button (wheel) and drag.

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

Step 3. In the Draft Property Manager set:

under Type of Draft
select **Neutral Plane**

under **Draft Angle**
40 degrees, **Fig. 56**
under **Neutral Plane**
click **top face**, **Fig. 56**

under **Faces to Draft**
click the **3 vertical rear faces of hull**
under **Neutral Plane**
click Reverse Direction and in **drawing direction arrow points down**
click OK .

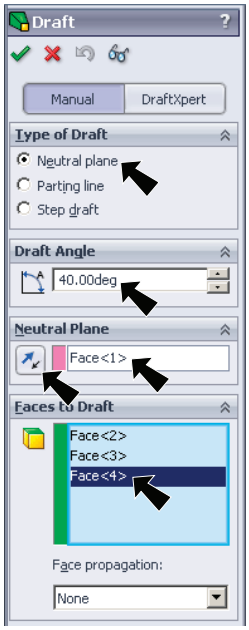


Fig. 55

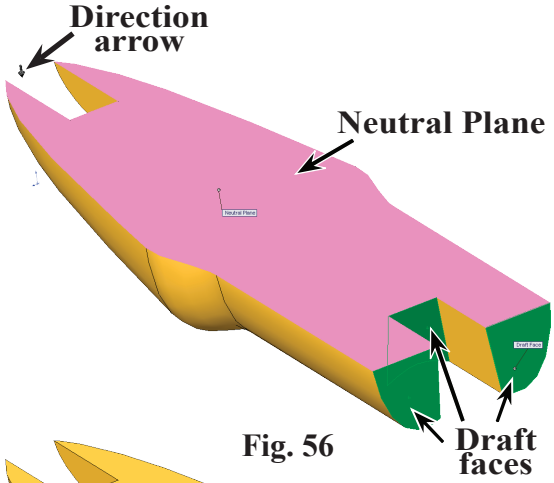


Fig. 56

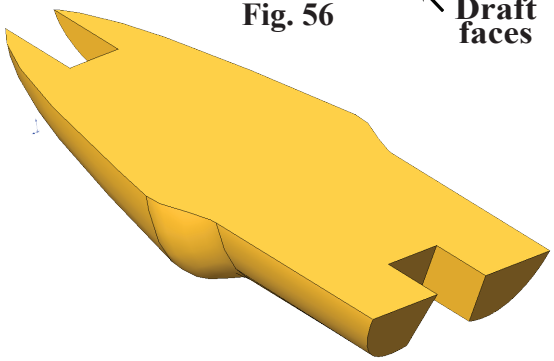


Fig. 57

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

O. Fillet Edges.

Step 1. Rotate view as shown in **Fig. 58**, hold down middle mouse button (wheel) and drag.

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

Step 3. In the Fillet Property Manager set:

FilletXpert, **Fig. 59**

Radius to **.5**

Full preview

click **bottom edge of hull**, **Fig. 58**.

click **Apply**

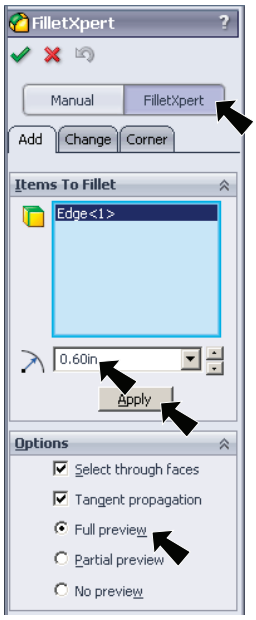


Fig. 59

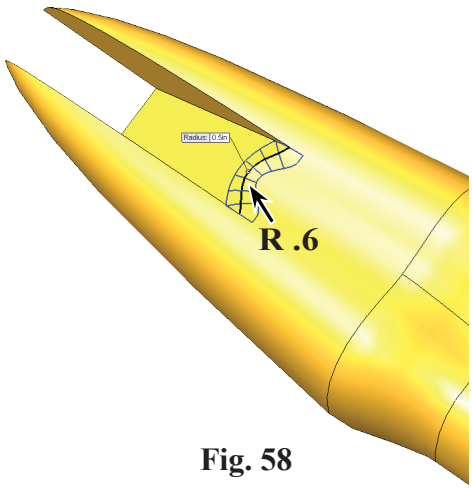


Fig. 58

Radius to **.3**

Click **inside top edges of front cut on both sides**, **Fig. 61**.

Click **Apply**

Continue and add Fillets:

Bottom edges of front cut both sides, Radius .1, **Fig. 62**.

Bottom edge of rear cut both sides, Radius .2, **Fig. 63**.

Inside edges of rear cut both sides, Radius .3, **Fig. 64**.

Outside edges of rear cut both sides, Radius .2, **Fig. 65**.

click OK

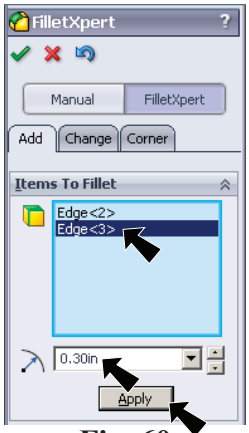


Fig. 60

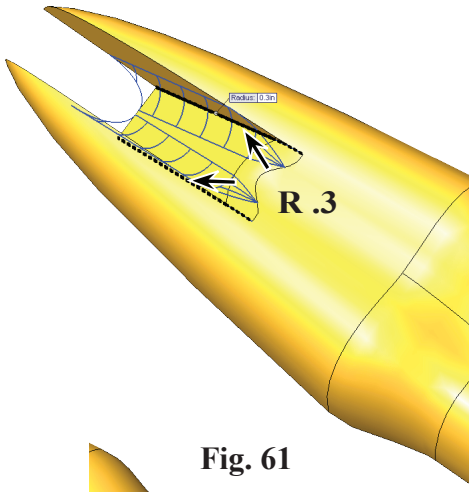


Fig. 61

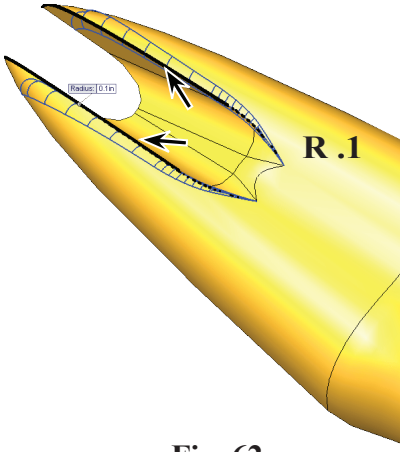


Fig. 62

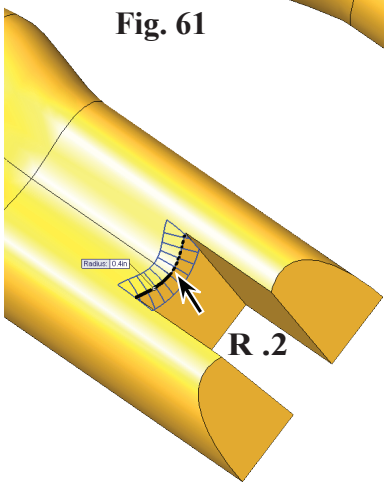


Fig. 63

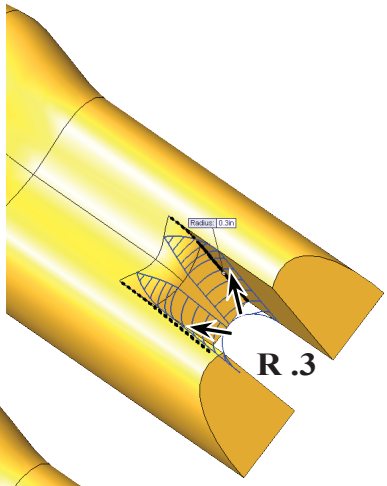


Fig. 64

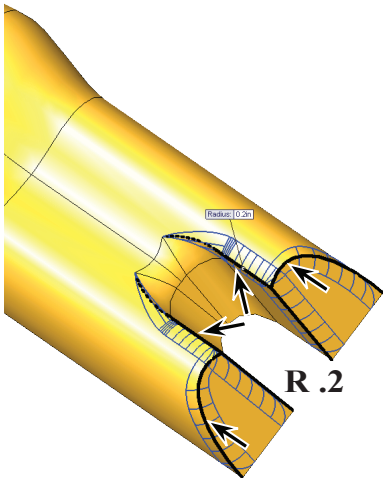


Fig. 65

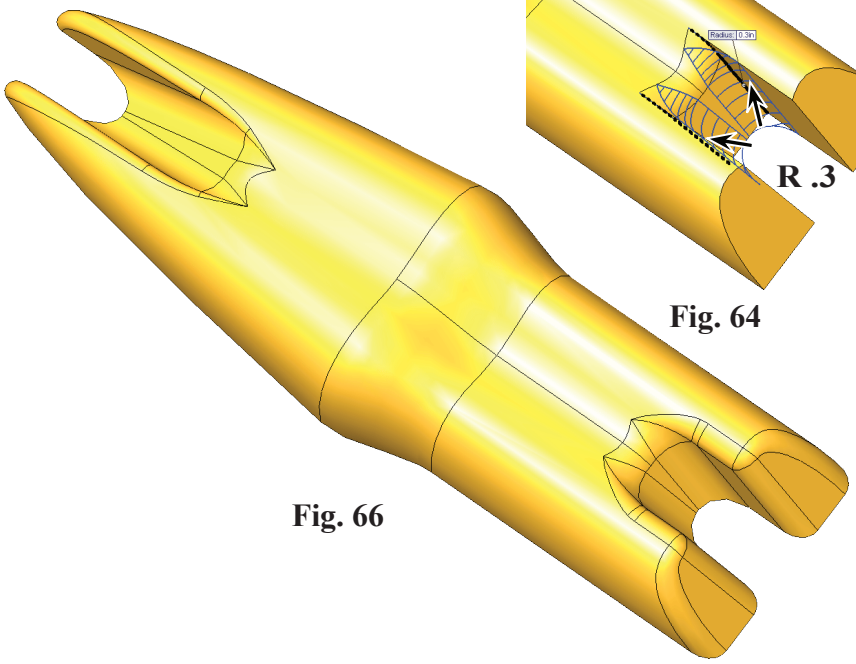


Fig. 66

P. Shell.

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

Step 2. Click the **top face** of hull, **Fig. 67**.

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

Step 4. In the Shell Property Manager set:

Distance D1 to **.05**
Fig. 68
check **Show preview**

click OK .

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

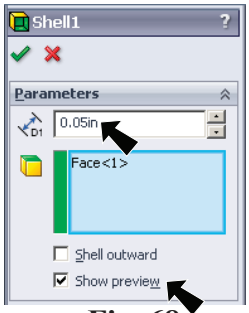


Fig. 68

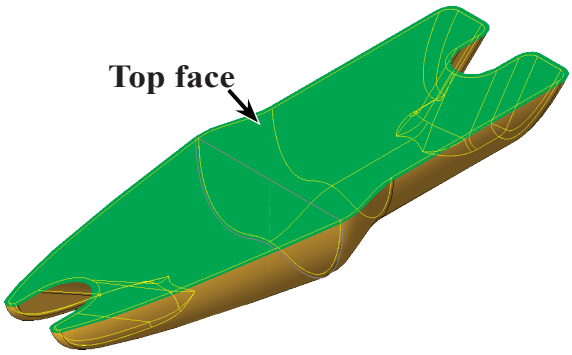


Fig. 67

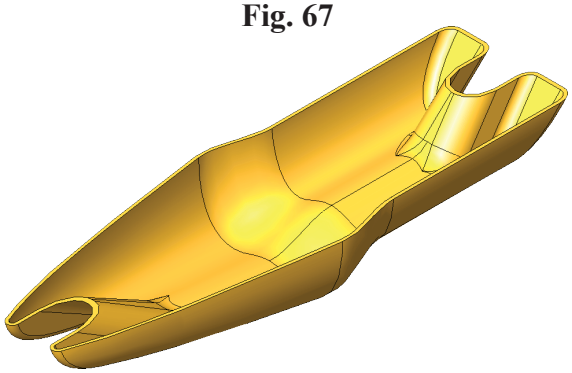


Fig. 69