

Automotive Demonstration

I-DEAS Master Series 6.0

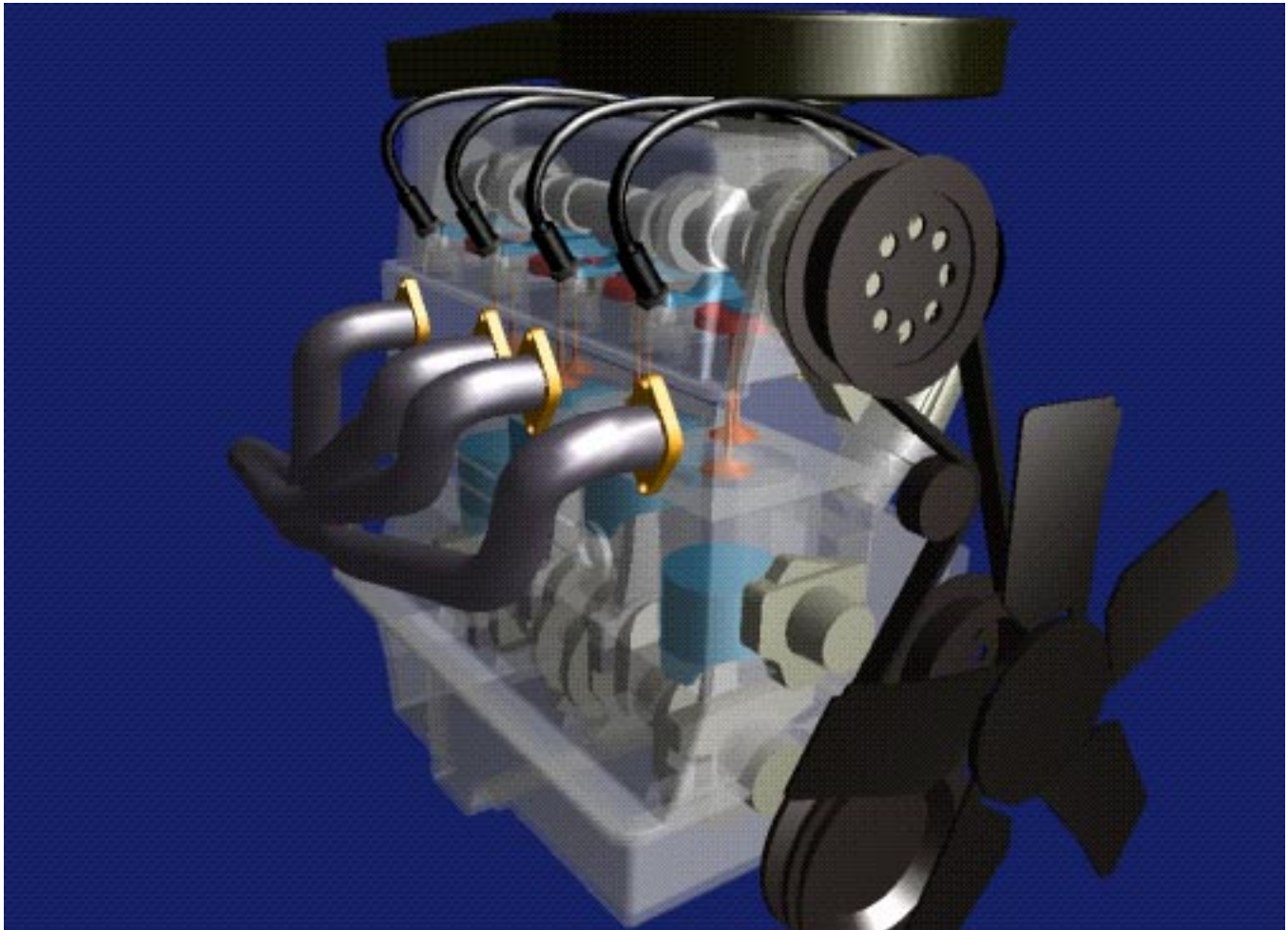


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(Do this once after unloading files from CD)

Demonstration Installation

- Copy or unload the demo files to a local directory
...engine/
- cd .../engine/demo_backup
- uncompress archive file (*.arc)
- While in .../engine/demo_backup/ directory...
ideas
Project = **engine_scratch** (*Create scratch project*)
Model File = (no model file)
Application = Design
Task = Master Modeler
- File, Import, Ideas Archive File, 'engine6.arc'
- While in I-deas run '**engine_setup.prg**'

Program file will save data as engine6.mf*
and exit automatically
- Run dmadmin and delete the project, **keep all files.**

(Do this each time you run the demonstration)

Demonstration Setup - Workstation 1 (WS1)

- `cd ../engine`
- `run ./install`
 - > deletes existing engine project & execution files
 - > copies model file from demo_backup
 - > starts ideas
- Project = engine (*Create the project*)
- Model File = engine6 (should already exist)
- Application = Design
- Task = Master Model

Once in I-DEAS...

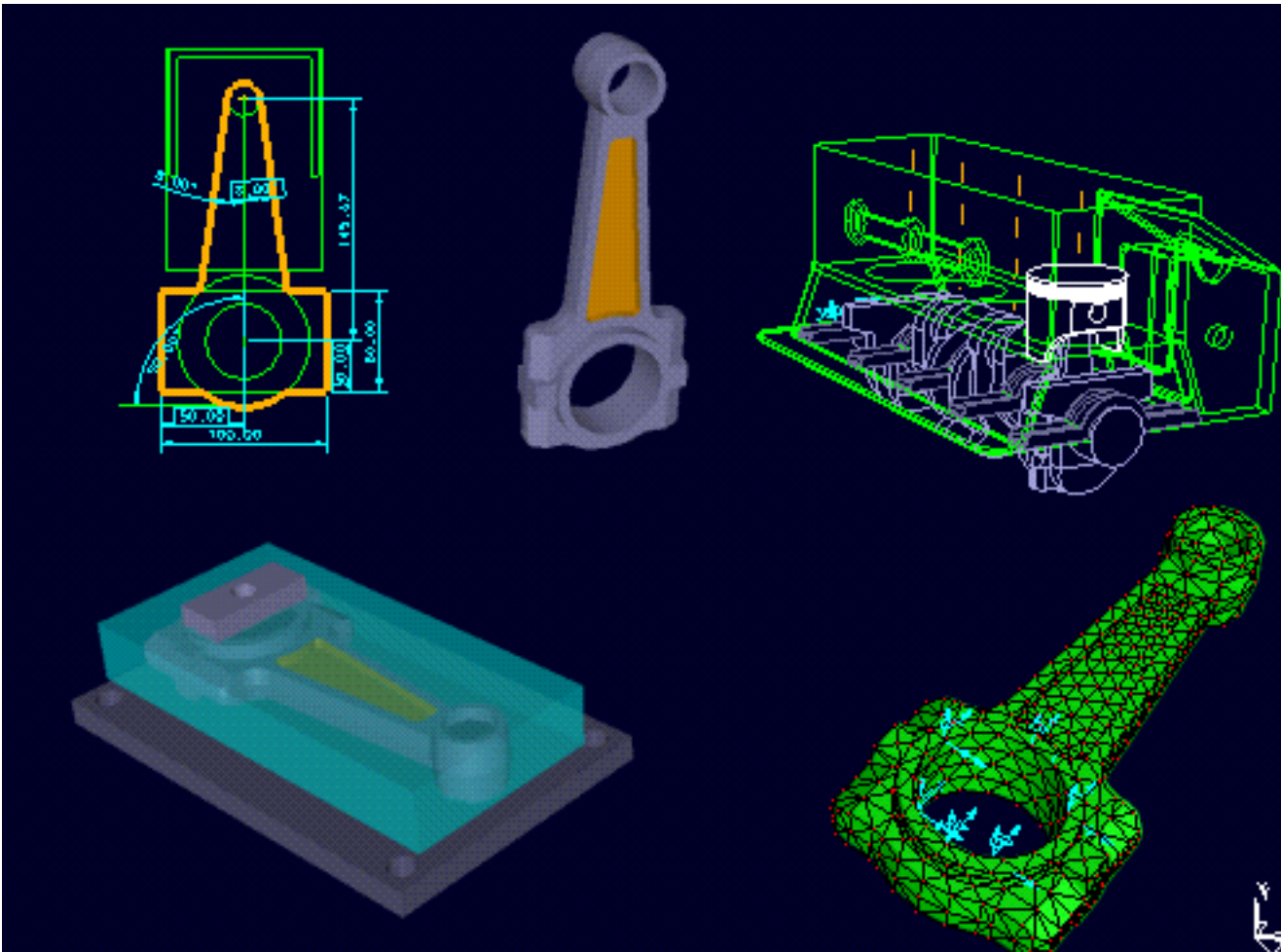
- `run startup.prg`

Global Symbols

<i>add</i>	– autoscales dimensions and sets as a default after they are preselected.
<i>arr</i>	– sets arrows out of preselected dimensions
<i>cfl</i>	– toggles visibility of centerlines and centerpoints
<i>cvv</i>	– toggles visibility of constraints on wireframe
<i>loo</i>	– turns off local origins
<i>sff</i>	– runs sff.prg to set global element lengths
<i>cee</i>	– changes the font to a centerline font
<i>css</i>	– changes the font to solid
<i>trr</i>	– turns the part translucent after preselection
<i>opp</i>	– turns the part opaque after preselection
<i>cpp</i>	– turns centerpoints off
<i>opt</i>	– optimization set-up
<i>vvv</i>	– volume program file for fuel tank
<i>ree</i>	– feature reorder
<i>pp1</i>	– Shows results of FEA on bracket
<i>pll</i>	– runs pl.prg to do section cut of all parts on the workbench

Picture file to be used at the beginning of the demonstration.

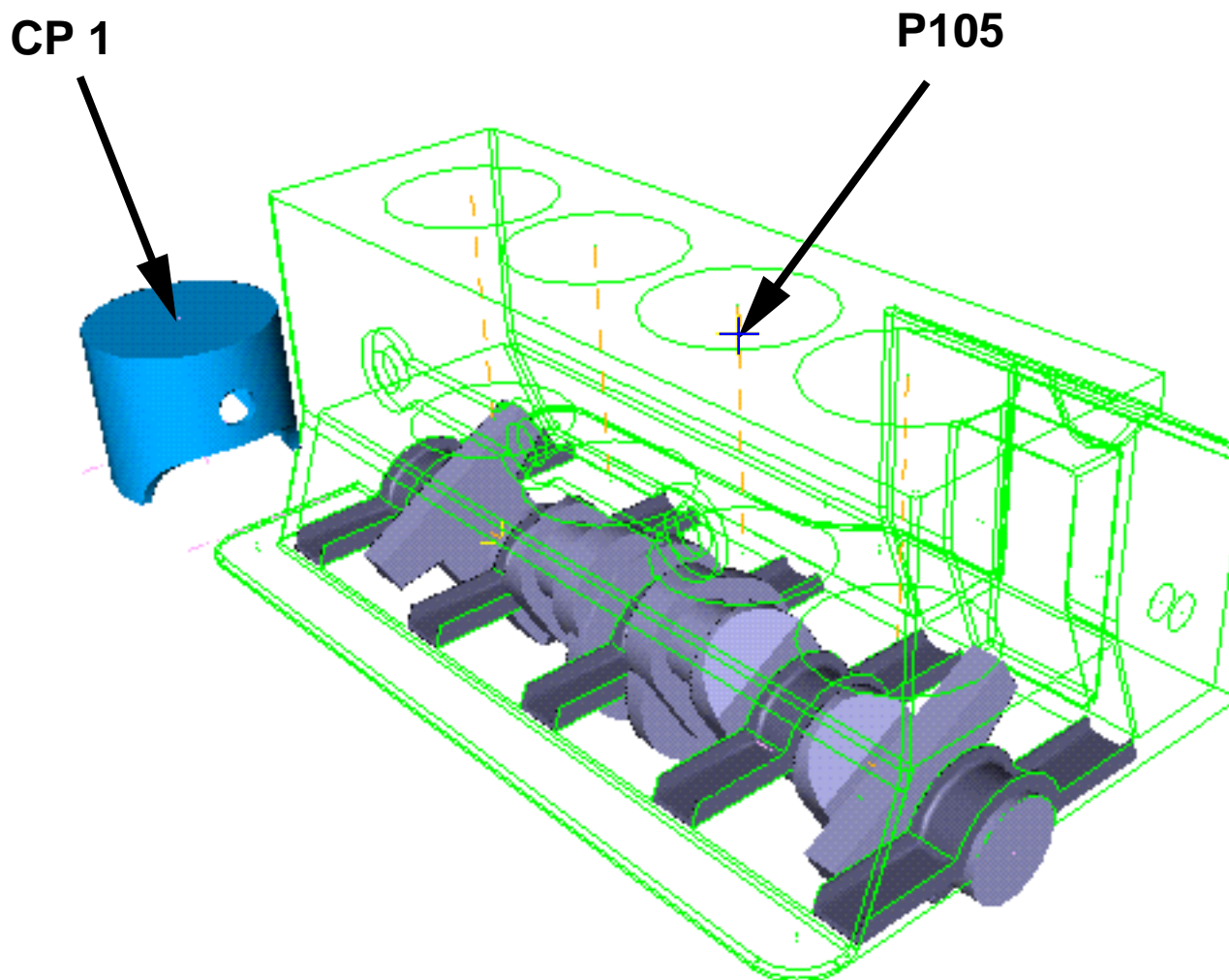
If you save and exit prior to actually performing the demo, turn the erase switch off, **er off**, prior to displaying the picture file start.pff. Remember, however, to turn it back on again.



△ **Shade**

△ **Move**

Pick piston, **MB2**, **Move To**, pick the center point of piston CP1, and the blue point on the block P105, **MB2**



Tech – tips

Use "t" from the keyboard instead of selecting "move to" from the menu to reduce your mouse motion during the piston move command.

Support Notes

The positioning of this demonstration, as with all demonstrations is important to communicate with the customer. You should make sure that you mention the following points, in addition to the standard ease of use, integrated engineering etc. points that we make during demonstration introductions.

- * We will take a single part through an engineering process and highlight the strengths of SDRC as an engineering company with a strong integrated applications suite.

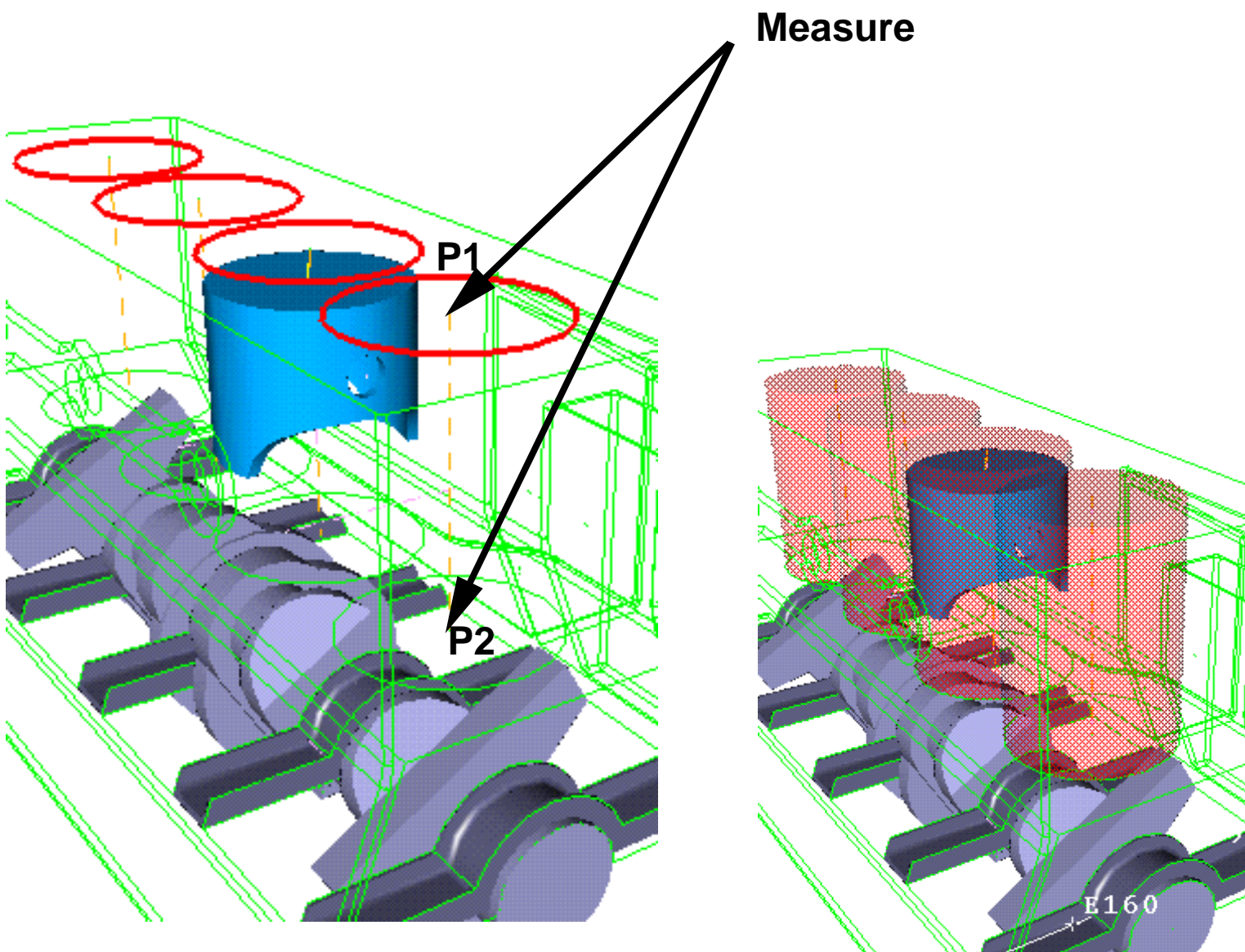
- * The parts on the screen are an assembly that represents:
 - A wireframe representation of an engine block that provides us with a volume in which we may do design .
 - A solid model of a crankshaft
 - A solid model of a "rough" piston for initial conceptual design

- * Our task today is to work with wireframe, surface models, as well as solid models to design a connecting rod that connects the piston and crankshaft. The key to the statement is that we will design, not merely model, a part in the context of an assembly having no need for dimension knowledge prior to beginning our task. The fit and function of the part will come from the parts that surround, or functional requirements, such as stroke, that are required for the part to perform.

△ Extrude

Pick the 4 wireframe circles on the top of the wireframe block **MB2**, pull down measure, pick points 1 and 2, **MB2** (should be 133.35)

toggle **protrude**, **OK** and pick wireframe block



Tech – tips

Support Notes

Emphasize the fact that dimensions are not needed at this point, and that you are working directly on 3-D wireframe. This wireframe may have come from any number of 3-D wireframe/surface modelers, or from within I-DEAS itself.

pll – Pick center point of piston, **MB2**

runs pll.prg to generate cross section through all parts using xy plane

Δ **Put Away**

Select block to put away

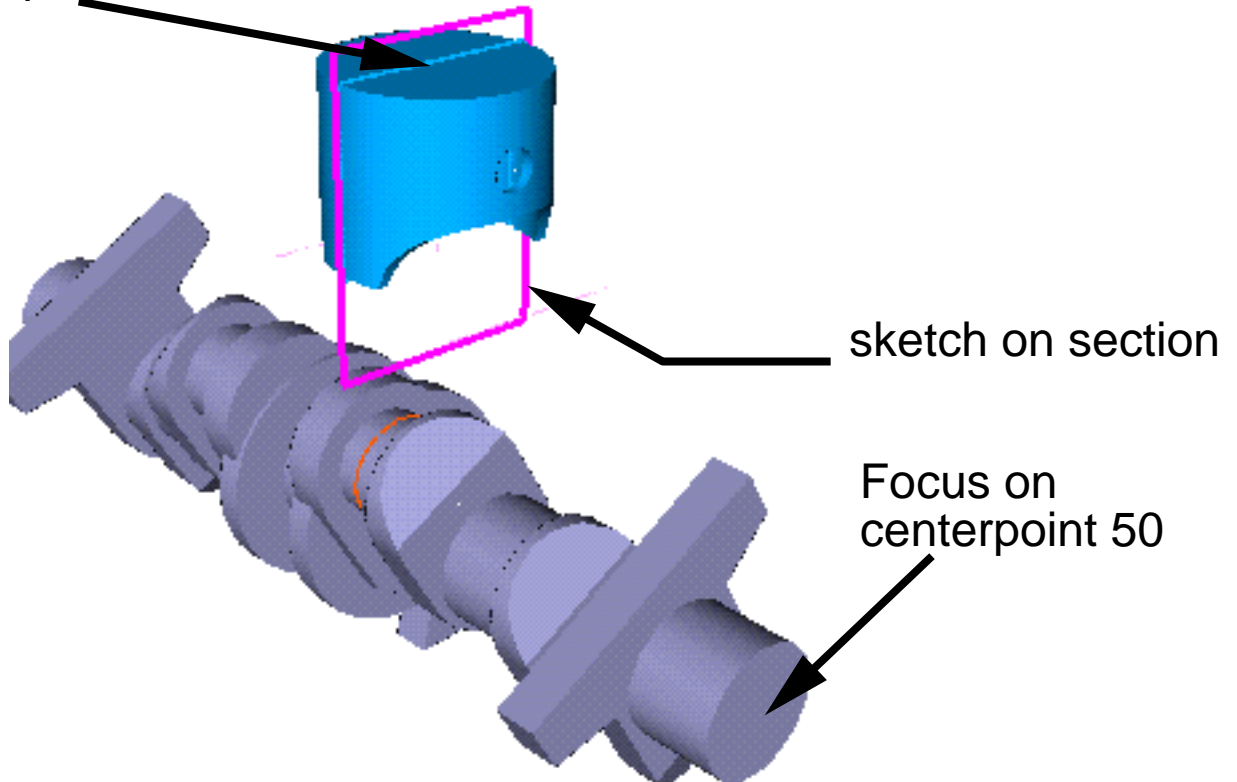
Δ **Sketch in Place**

Pick cylinder section

Δ **Points**

MB3, focus, pick center point at end of crankshaft

pick center point for section cut



Support Notes

Position the following design problem:

I have an assembly on the screen that consists of a number of parts. Note that the parts themselves are positioned in a rather random fashion. The crankshaft is not at top dead center (TDC) or bottom dead center (BDC). The piston is in some arbitrary location after we positioned it. The task at hand is to design a connecting rod that will drive the piston from TDC to BDC within the assembly on the screen. We have no real dimensional knowledge at this point, but we do have geometric information, and can use it to design, rather than model a connecting rod.

Many times in the design world your concepts start on a piece of paper, or a drawing board. How can I take a 3D assembly and reduce this problem to 2D? Let's see how we can accomplish this in I-DEAS

△ **Put Away**

Put away crankshaft

△ **Front View – Do Not use view workplane icon**

△ **Zoom all**

△ **Circle, Ctr/Edge**

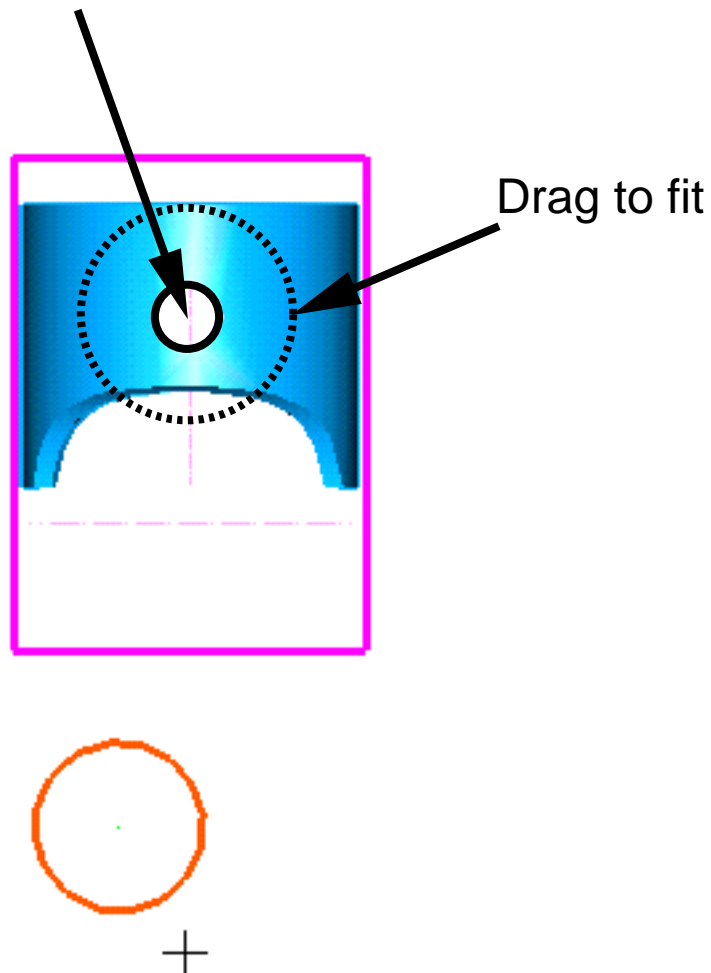
MB3, focus on centerpoint, pick focus point at center of hole, drag circle diameter to roughly fit size of piston hole, **MB2**

△ **Put away**

Put away the piston

Note: Hold down the control key during the drag to disable the navigator.

Focus on centerpoint



Tech – tips

Support Notes

Show the ability to navigate to a part and capture the wrist pin location.

△ Lines

Navigate from **P1** to **P2**

△ Modify

MB3, section options, stop at intersections off

Pick piston section, pick upper circle, line, and lower circle, **MB2, MB2, Dismiss** to self intersecting warning.

△ Constrain and dimension

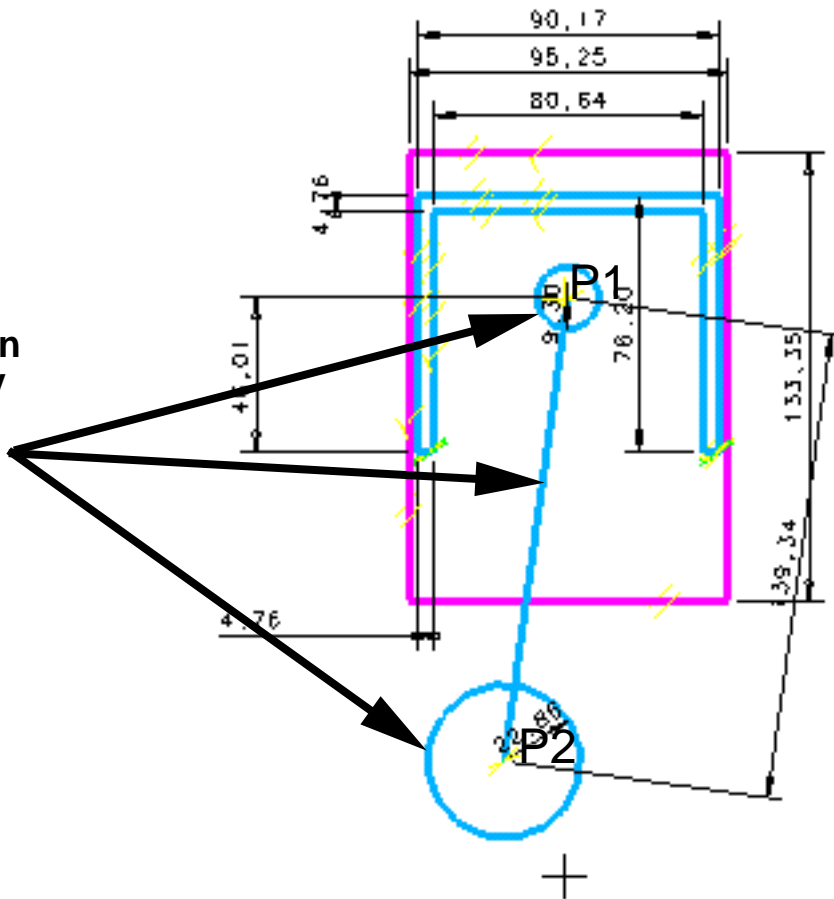
△ **Autoconstrain, MB3, Constrain options**

toggle on linear dimensions; **OK**

pick cylinder section

pick piston section, **MB2**

Modify Section
Add geometry



Tech – tips

If you need to scale the dimensions, zoom in a little, preselect all of the dimensions, and type *add*. The dimension should autoscale, and the new default size is set.

(*add* stands for *autoscale dimension*. I repeat the last letter to make it unique from menu commands. You will find this convention throughout.)

Support Notes

Highlight the ability to automatically add dimensions, although they are not necessary as you showed earlier.

△ Polyline

Pick center of lower circle, **P1**, and lower point **P2**, continue by dragging line **C2** out to the left catching constraint and dimension to the top horizontal line.

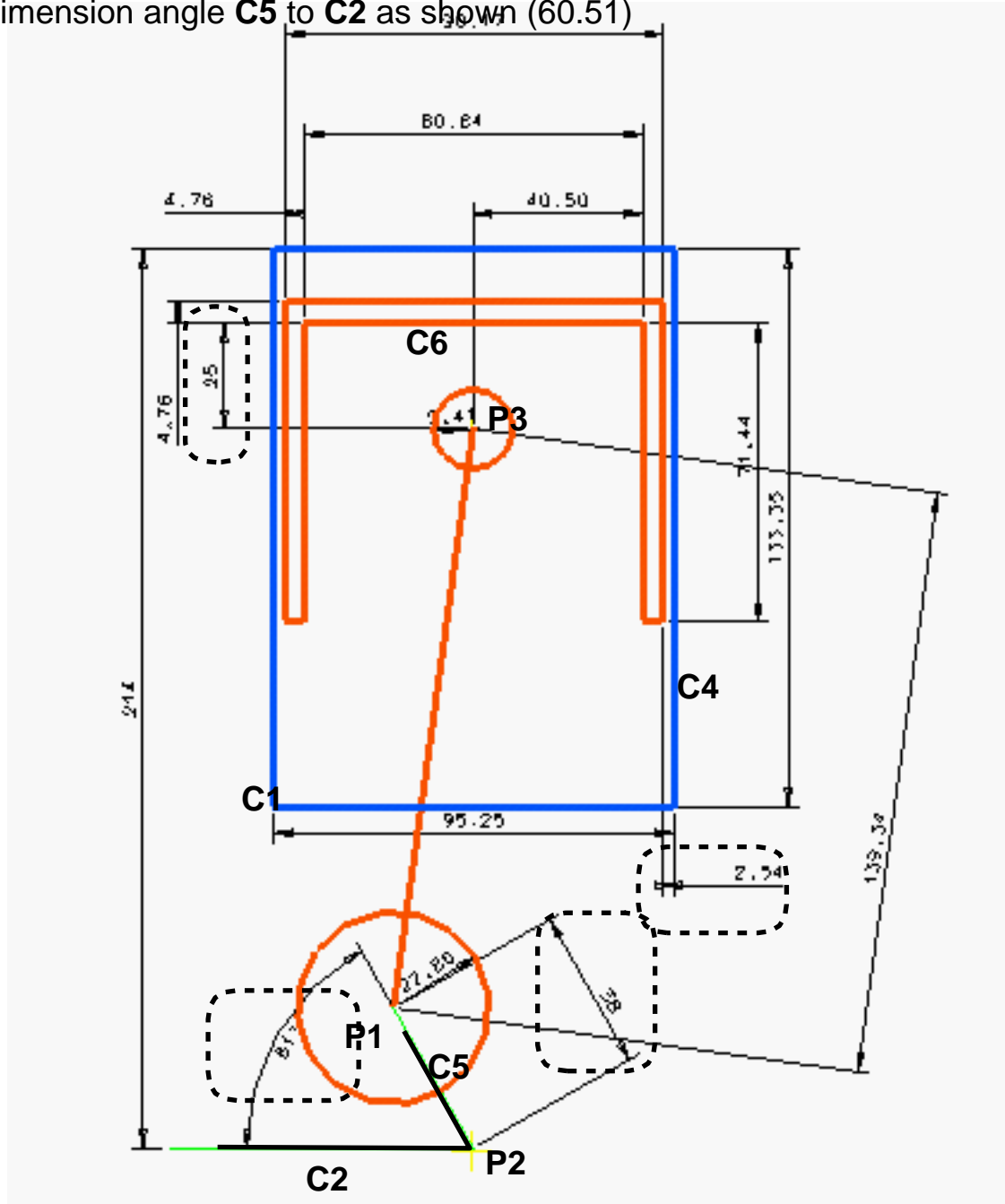
△ Dimension

Pick line **C4** from cylinder wall , and lower right point of piston (2.54)

Dimension **P1,MB2** to **P2,MB2** as shown (38.42)

Dimension Circle center **P3** to line **C6**

Dimension angle **C5** to **C2** as shown (60.51)



△ Hide

Pick a dimension, MB3 All, deselect the conrod length dimension and angular dimension.

△ Constrain and dimension

△ Parallel

Pick line C2 and C3

△ Ground

Ground lines C4, C5

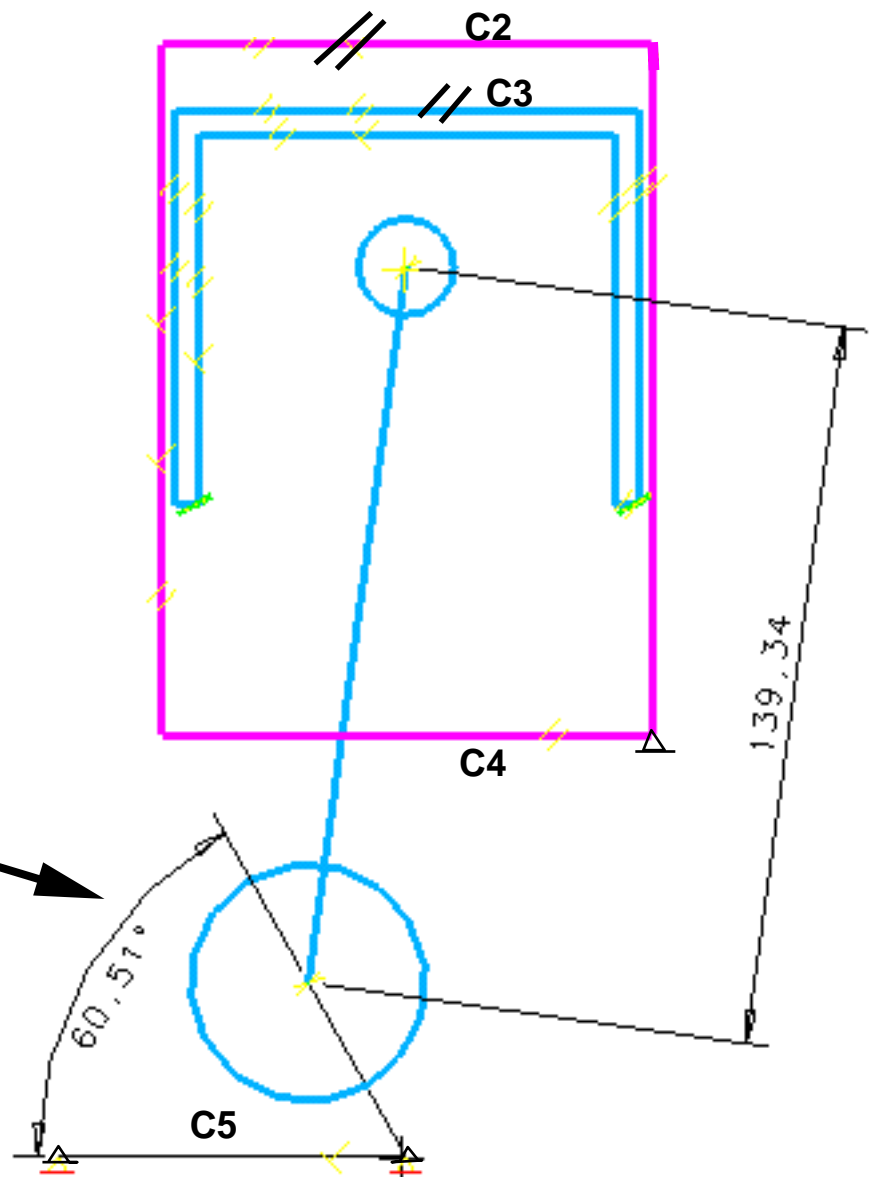
△ Drag

Drag angular dimension, piston should move vertically

△ Constrain and Dimension

Animate – under show free
Pick the angular dimension;
cycles=6
range=0 to 360
speed~80

Drag and animate



Tech – tips

It is very important that you drag prior to animating the dimension. This will validate your VG network prior to committing to the animation.

Support Notes

△ Modify

Change the angular dimension to 90 degrees, **OK**

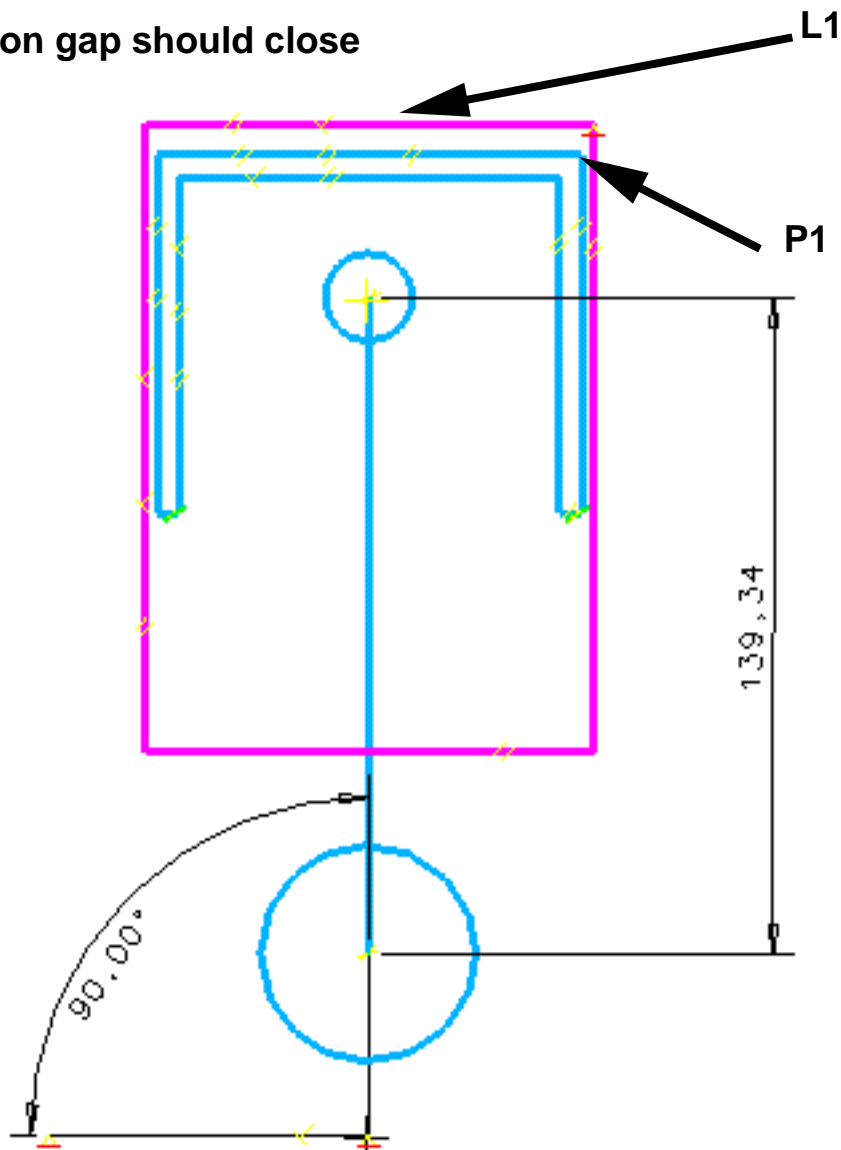
△ Drag

Drag length to show ability to change dimension, then cancel after drag to leave dimension unchanged.

△ Modify

Select the linear dimension (139.xx)
Pull down measure, MB3 line, select **L1**, and **P1**, **MB2**,
Select **reset**, type a "+" sign after the 139.xx dimension
Overstrike the **D1** dimension in the list region (6.5xxxx) mm)
Click on the dimension field in the form, **MB2** to paste
it into the form after the "+" sign, **OK**

The piston gap should close



Tech – tips

Support Notes

Position this as a "PC" capability. Easy to "cut and paste" numbers between windows. We have now "designed" the connecting rod length.

△ Rectangle by center

Pick the center at **P1**, **MB3 focus**, pick **C1** and catch perpendicular restraint, drag to right **MB1**, and up, **MB1** to create rectangle

△ Line

Create 2 lines tangent to top circle and on the rectangle edge as shown.

NOTE: **MB3 align off**, if you are having difficulty getting tangency condition

△ Dimension

Add angular dimensions as shown

Use **MB3, quadrant lock**, to lock dimension quadrant and then move outside as shown

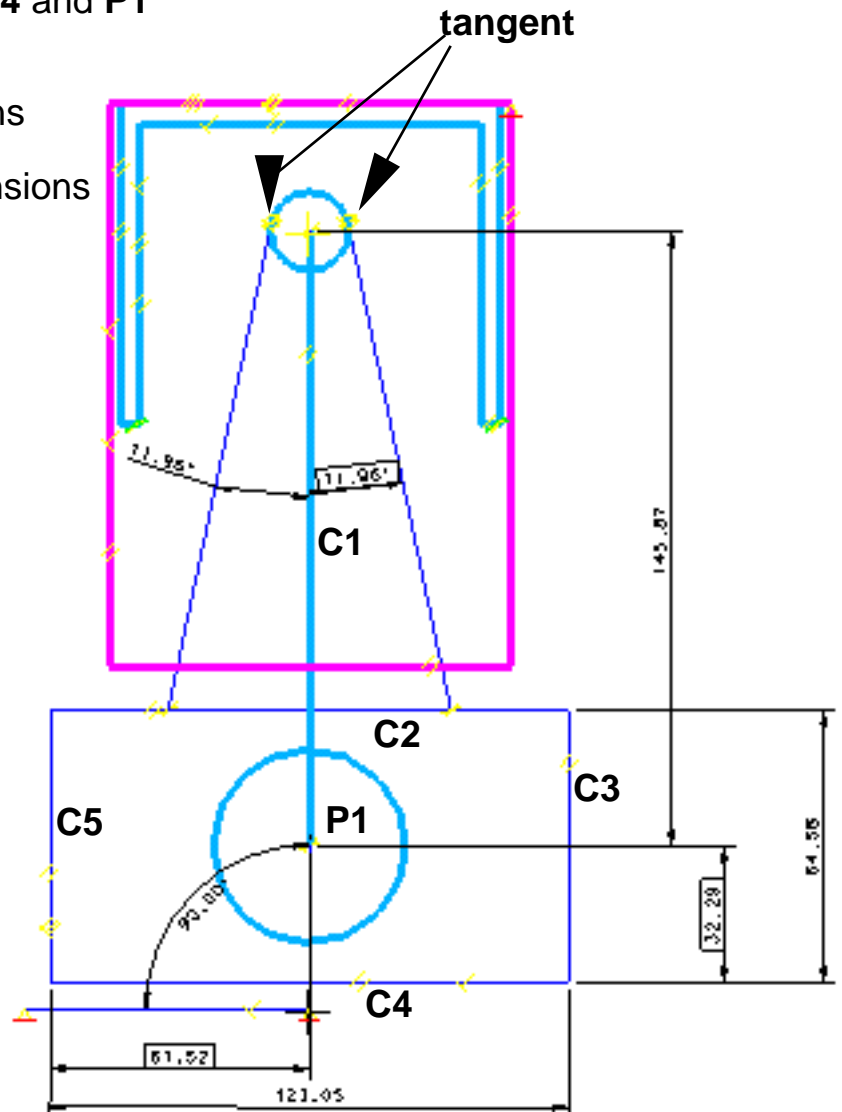
Add linear dimensions between;

C3 and C1
C4 and P1

△ Modify

Match angular dimensions

Relate "half width" dimensions of rectangles to the full length values/2.



△ Drag

Drag rectangle width and height
Change **height~65**
width~100-130

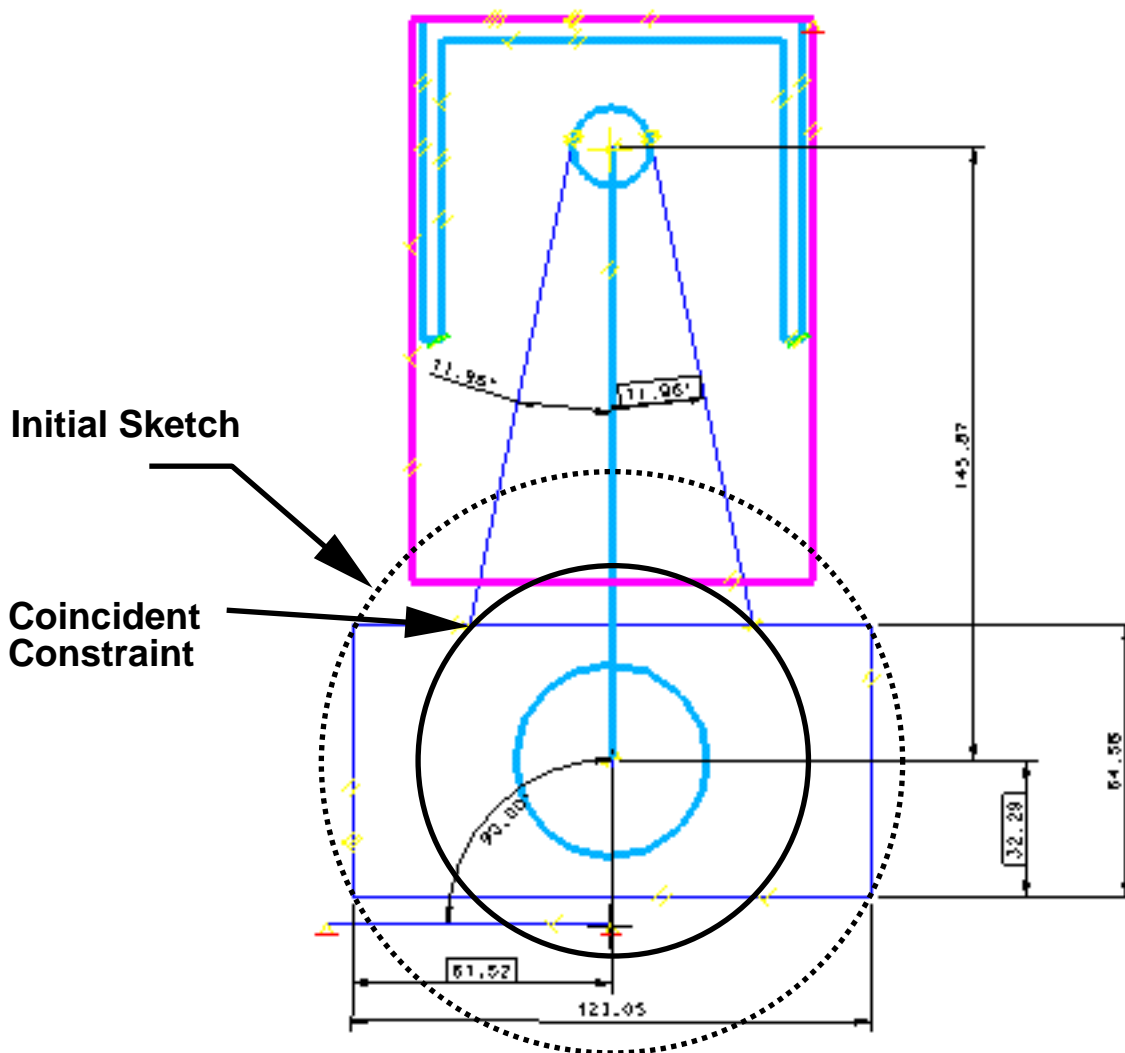
△ Circle – Ctr/Edge

Pick circle center, drag circle out as shown
MB3 navigator, radial dimensions off, OK

△ Constrain and dimensions

△ Coincident and collinear

Pick circle and point at intersection of angled line
and rectangle



△ Build Section

MB3, toggle on **Stop at intersections on,OK**
Build section as shown

△ Drag

Drag angular dimension to show rotation and visual clearance
Abor drag and leave at original 90 degree position

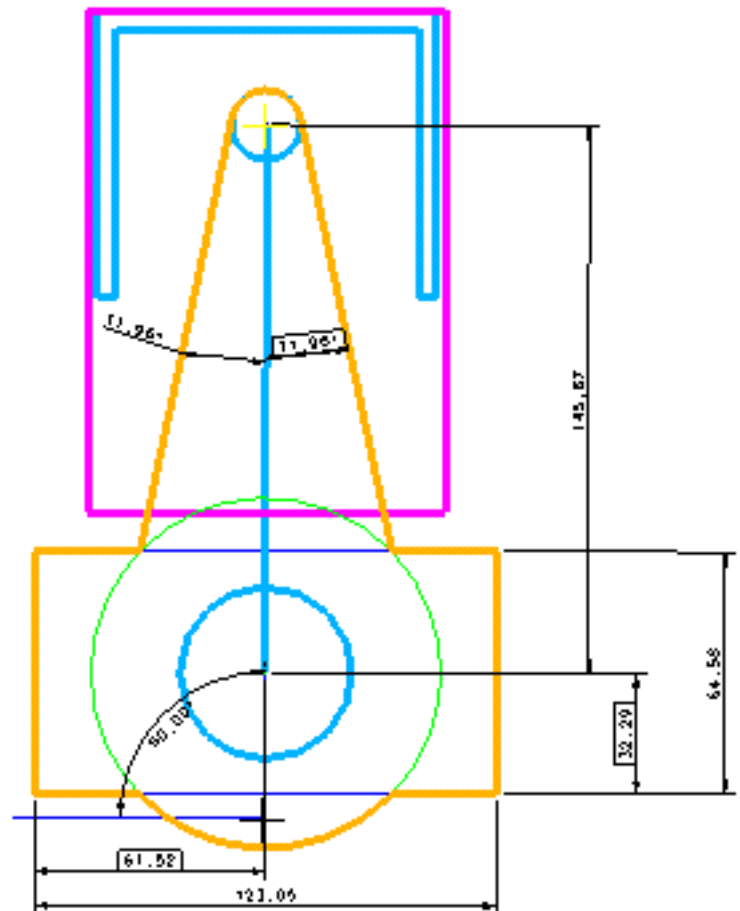
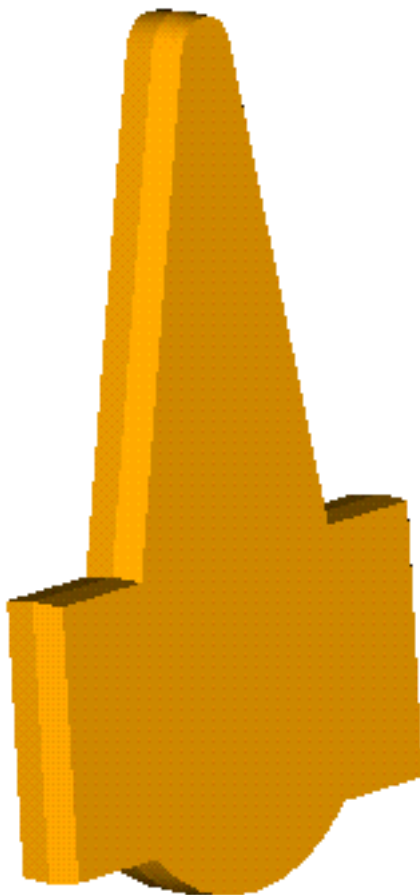
△ Extrude

Select section, **MB2**
Dynamically rotate screen to show distance preview

Distance = 16 mm
Draft = -5 degrees
toggle distance to thicken
New Part

Preselect the part, *opp*, to turn opaque

Note: Delete any wireframe left on workbench afte the extrude



Tech – tips

If the section is constrained properly, none of the wireframe should remain. If this happens, delete the unused portion of the section and wireframe. This will not affect the rest of the demo.

Support Notes

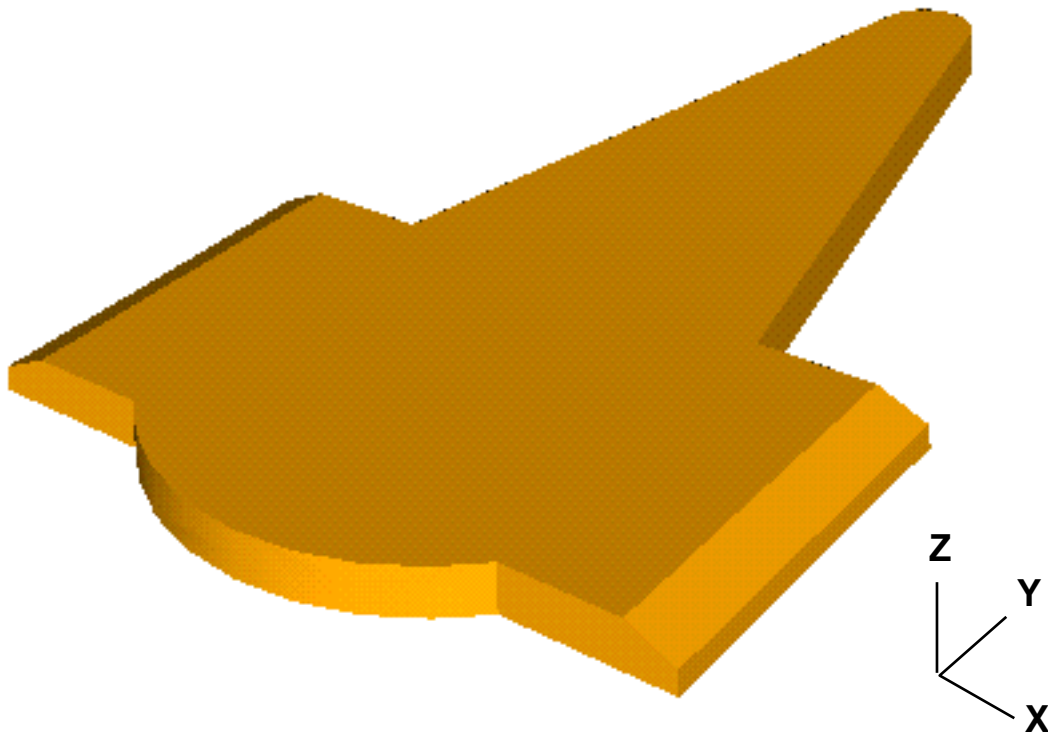
△ **Modify**

Pick the part, **MB2, Feature Parameters**, change
Distance = 8 mm
Toggle thicken to Distance
Vector should point in +z direction
OK

△ **Update**

△ **Chamfer**

Pick 2 upper outside edges, **MB2, Unequal offset, 8, MB2, 4, MB2**
MB2, MB2, MB2



△ Fillet

MB3 filter, edge , pick only

Pick **C1** and **C2**, **MB2**,
r=10 mm

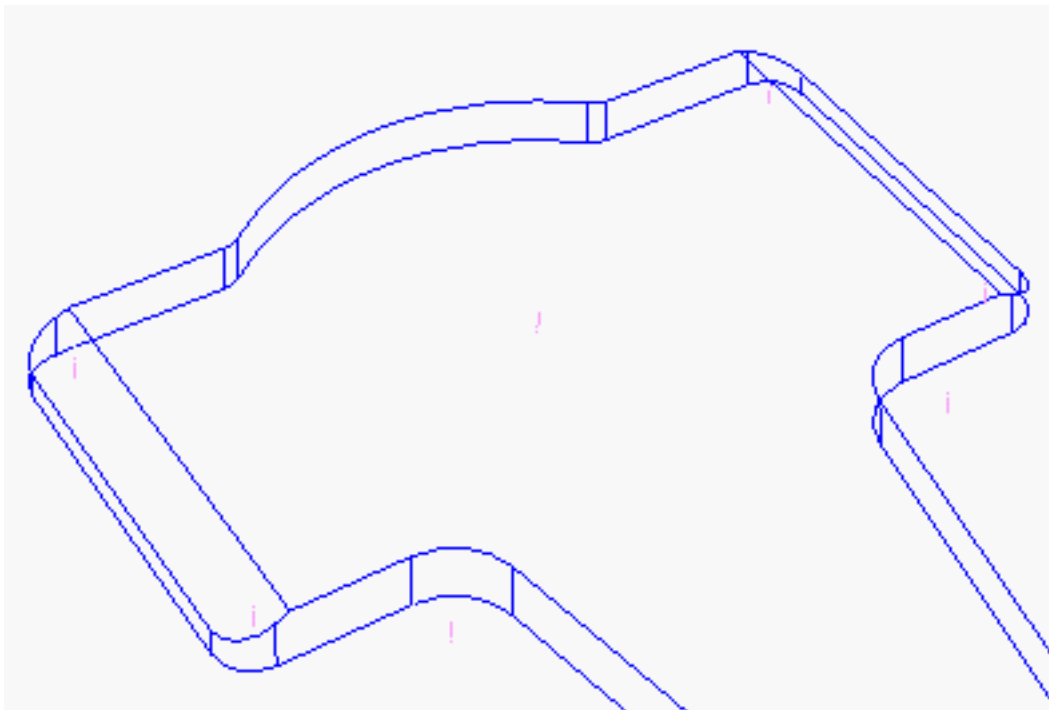
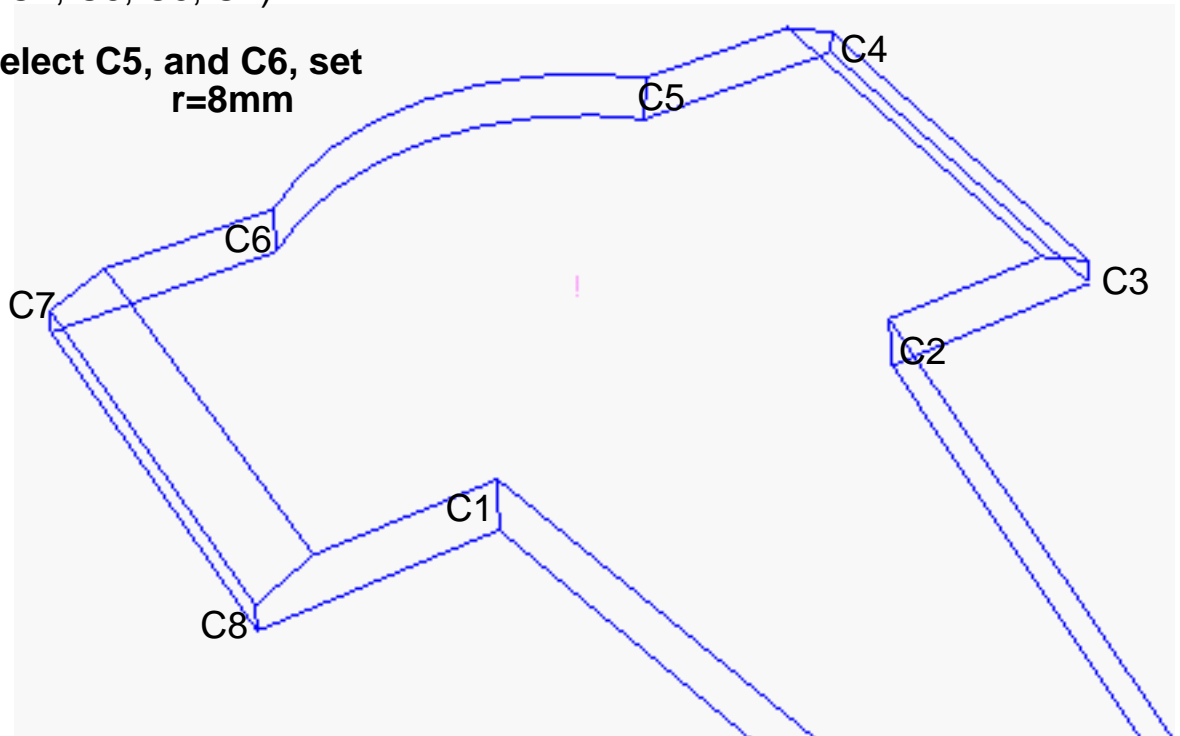
MB3, Filter, highlight edge in form, **Attributes**, **Max length = 6**, **OK**

Pick only, MB3, all, MB2,

r = 4 mm,

(Should select C7, C8, C3, C4)

select C5, and C6, set
r=8mm



△ Sketch in Place

Pick bottom surface (Opposite Chamfered Surface)

△ Circle – Ctr/Edge

MB3, options, radius=30 mm , OK

Navigate to center point and snap in place

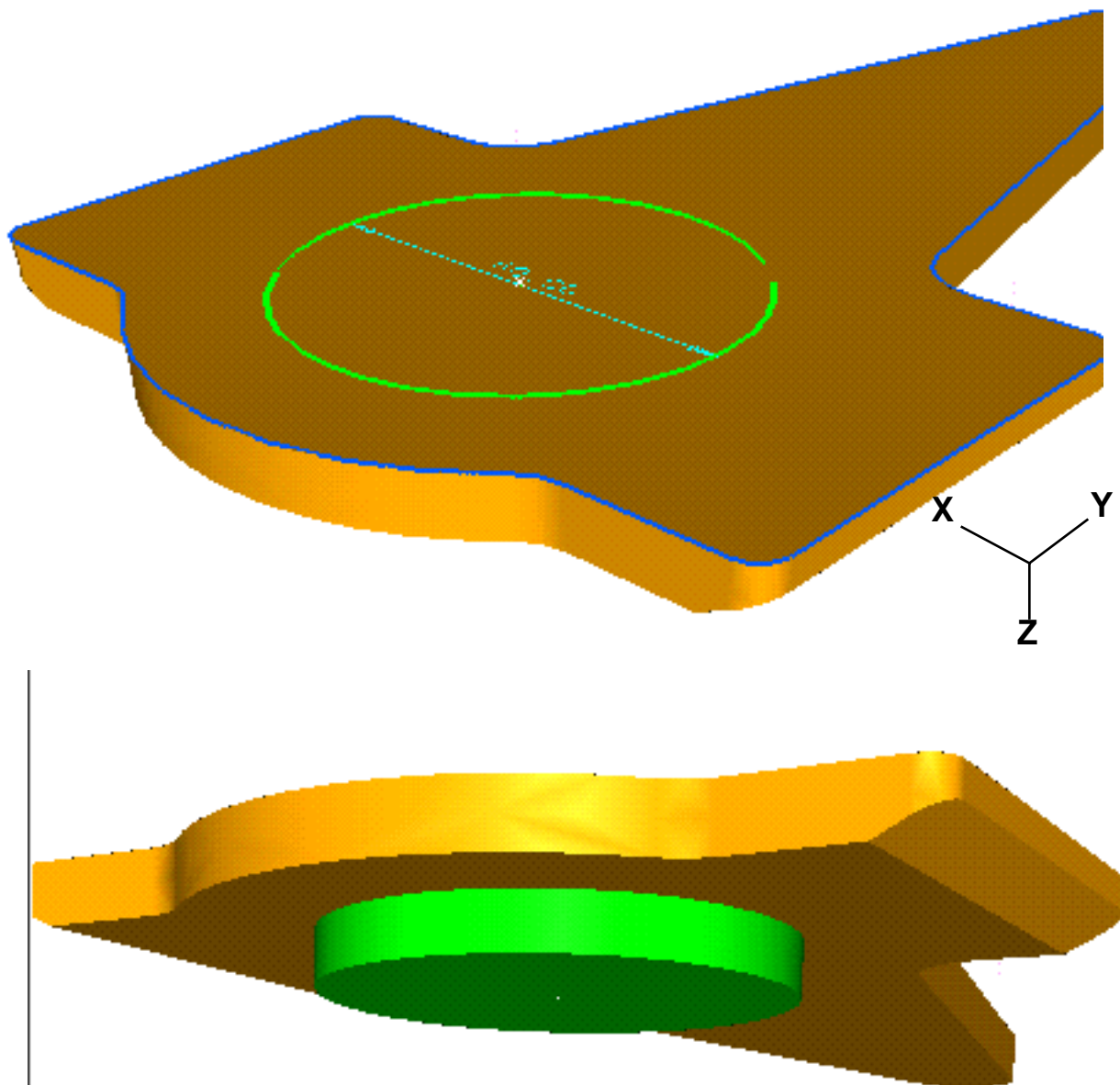
△ Extrude

Pick circle, **MB2**

Distance = 15 mm

Draft = -3 degrees

Flip direction



△ **Sketch in Place**

Pick bottom surface

△ **Polyline**

Pick line at **P1**, **MB3** navigator, toggle **off linear dimensions**, **OK**
navigate line **C1** parallel to edge **E1** and snap to edge of part at **P2**

Continue diagonally down to **P3**, and again vertically to **P4** capturing parallel constraint to **C1**, **MB2**

△ **Dimension and constrain**

Coincident

Pick the diagonal line and center of the surface

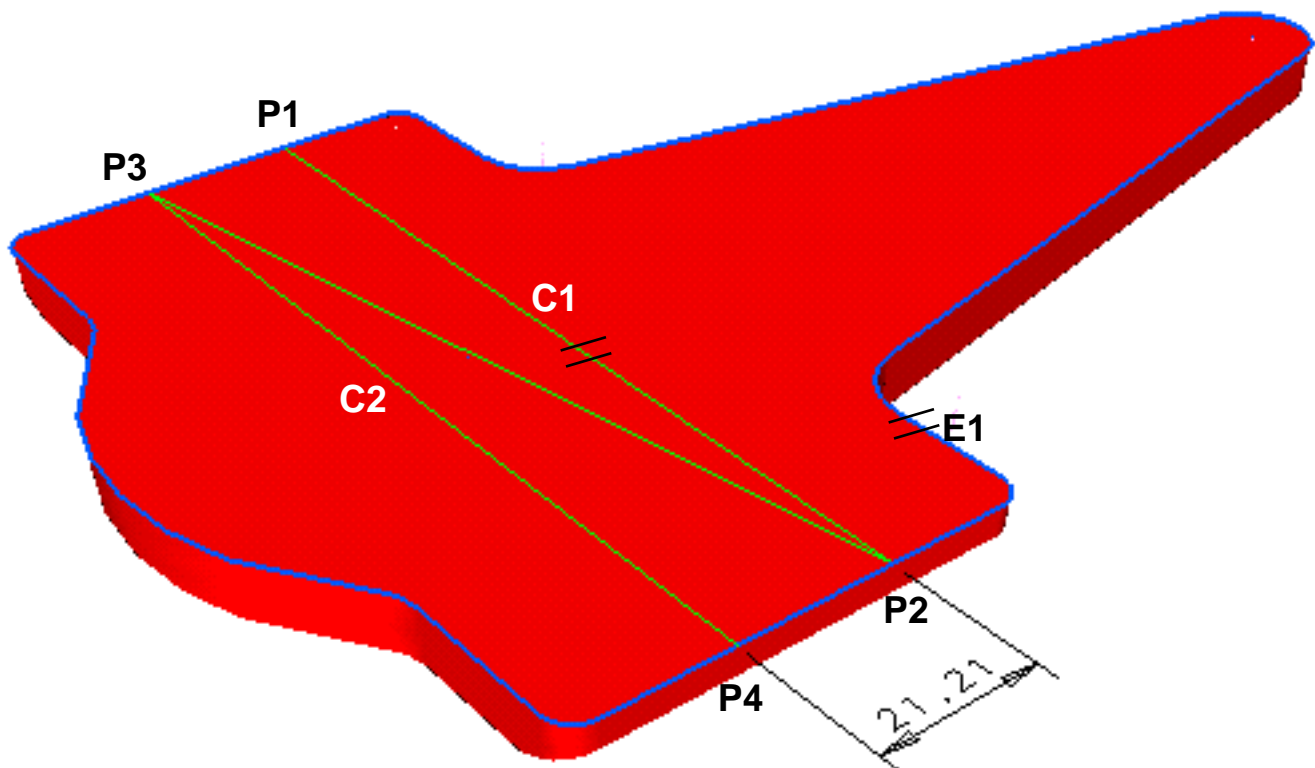
Option – Pick at P2 and drag to establish constraint to center

△ **Dimension**

Add linear dimension from **C1** to **C2**

△ **Drag**

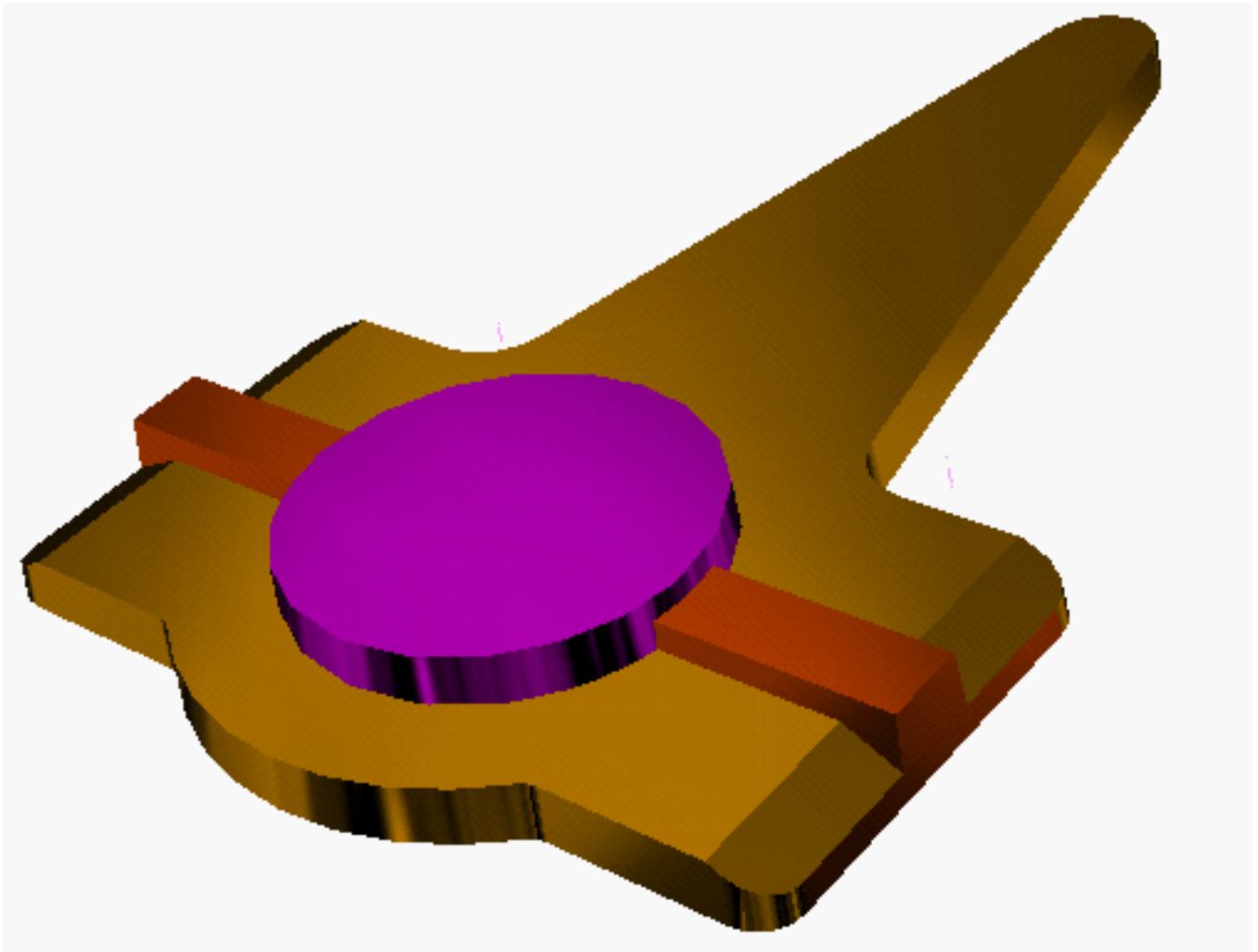
Drag dimension to ~12–14 mm
(Should drag symmetrically about center)



△ Extrude

Pick the lines and part edges to close the rectangular section

Distance = 12 mm
Draft = -5 degrees
Flip Direction



Δ **Appearance**

Select the part and change the color to "steel" or "steel1" from the bottom of the list

Δ **Reference Plane**

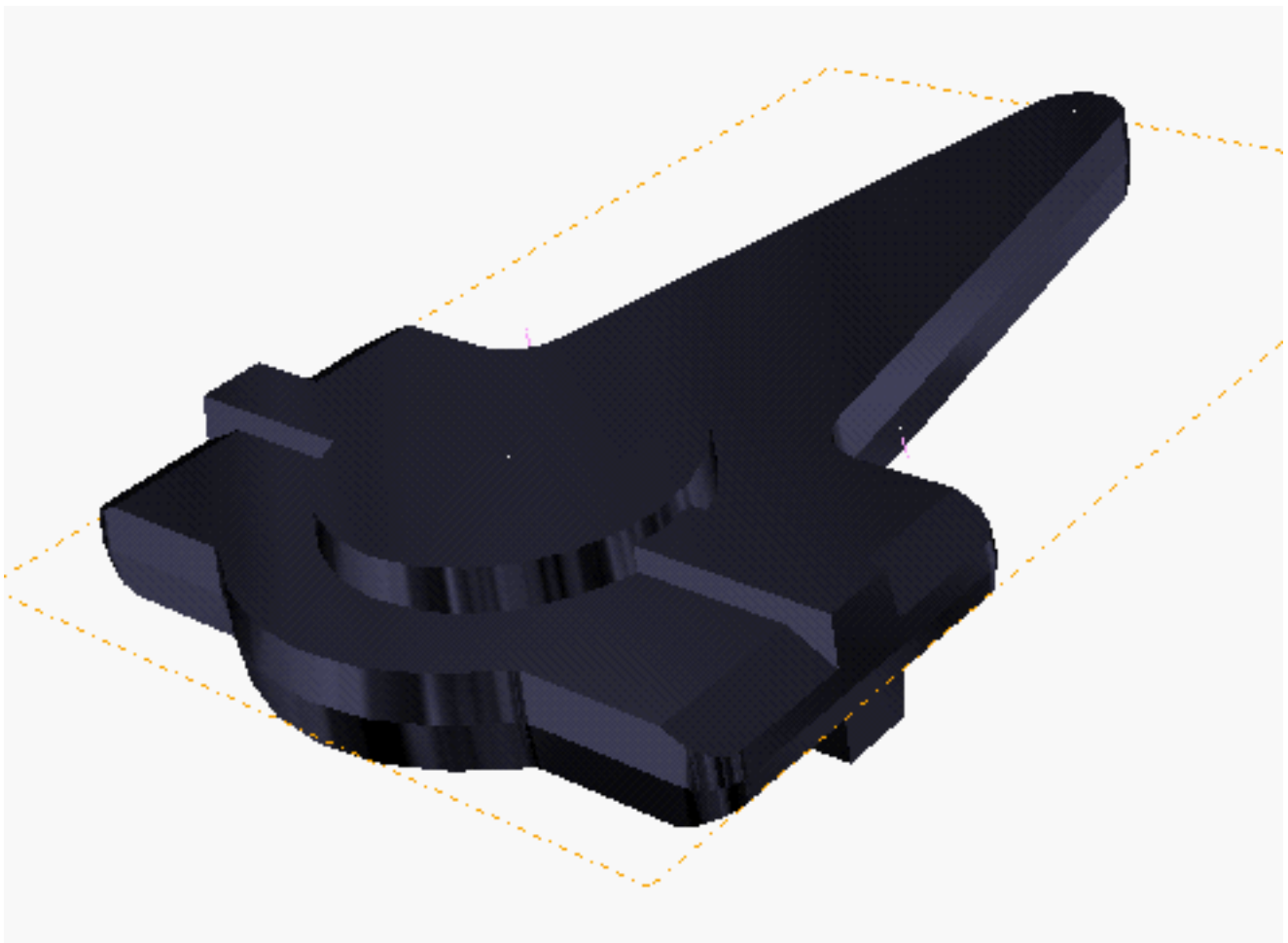
Pick the bottom surface of the part

Δ **Reflect**

Pick the part, **MB2**, pick the reference plane, **MB2**

Δ **Name Parts**

Name the part (i.e. conrod), **OK**



△ *Master Model ... Drafting Setup*

△ Create layout

Front/Rt toggle on

Size = A2

Sheet Format = Picture file a2format.pff

OK, yes to prompt

△ View Names off, View Borders off

△ Move views

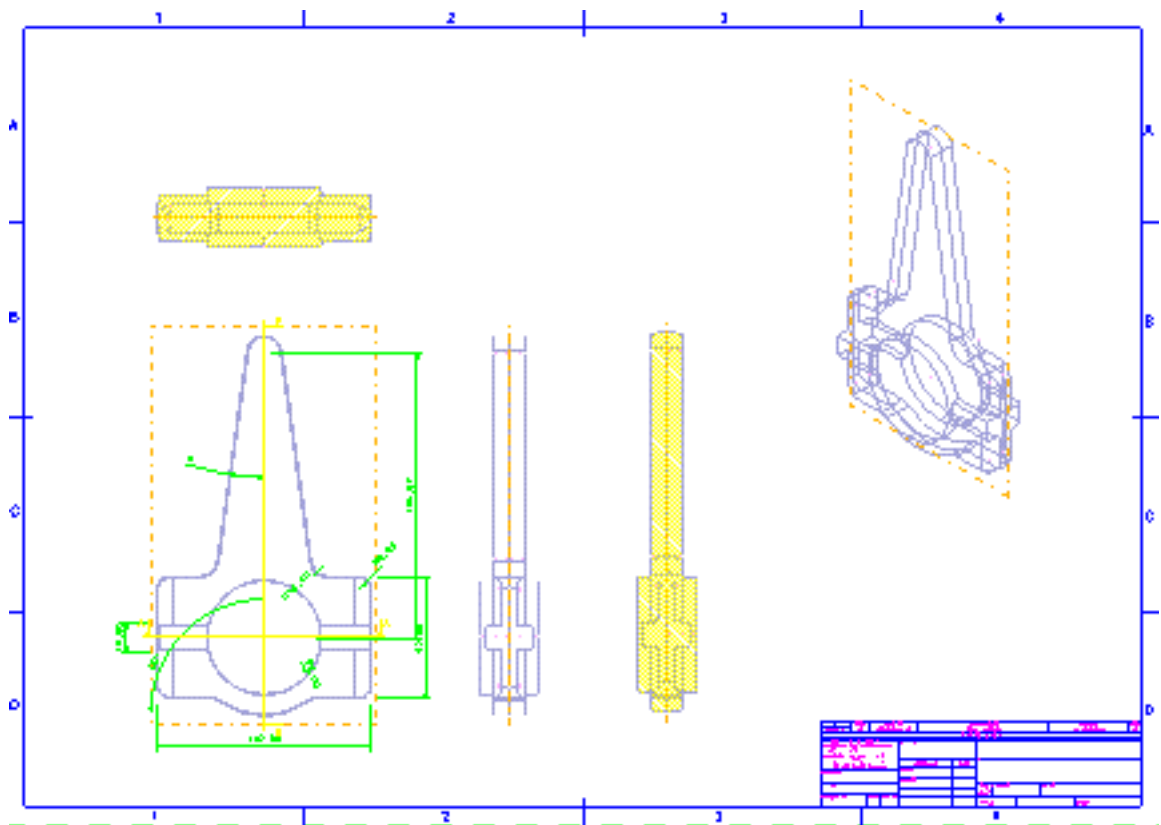
MB3, All, move the two views to the lower left as shown

△ Section

Pick the front view, plane only, **OK** off of the form, navigate a vertical line through the center of the part, **MB2, Yes**, place to the right as shown, **Yes**

Create the next section while in the command, pick the front view, **OK**, navigate a horizontal line through the part as shown, **MB2, No**, place above front view, **MB2, MB2**

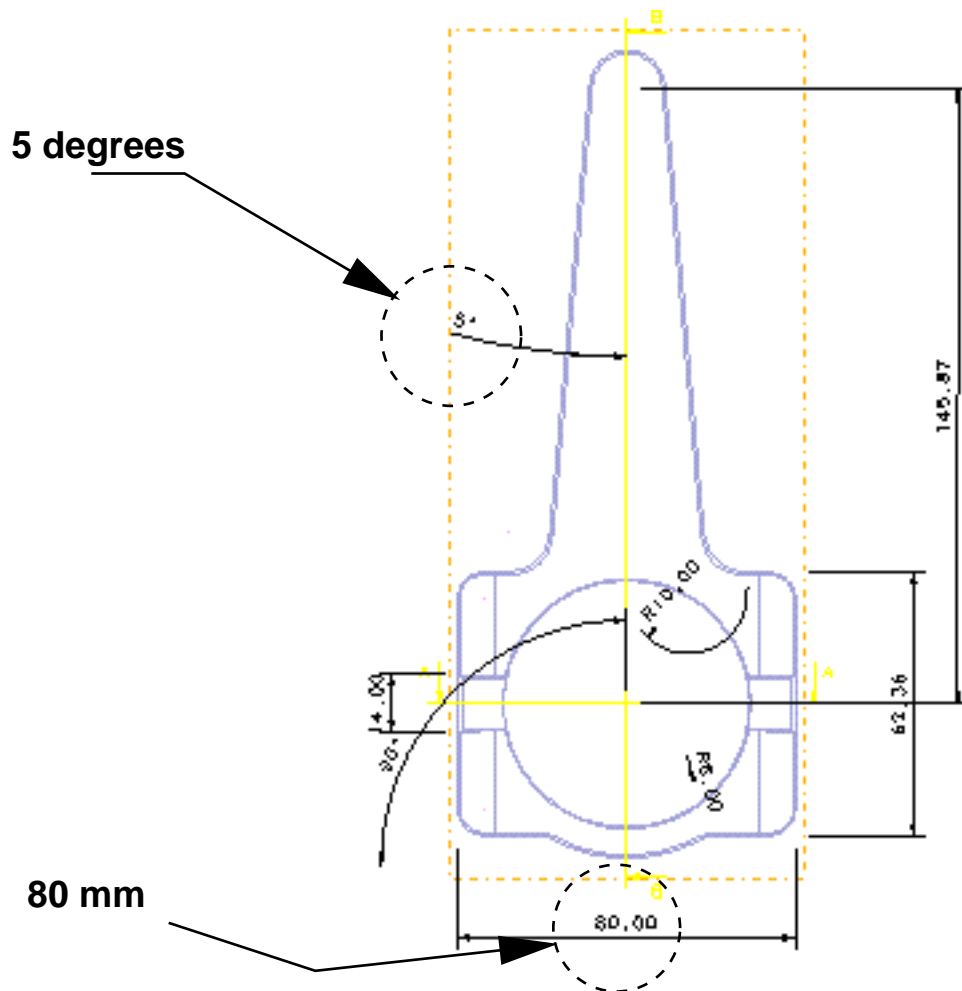
△ Iso



△ **Modify**

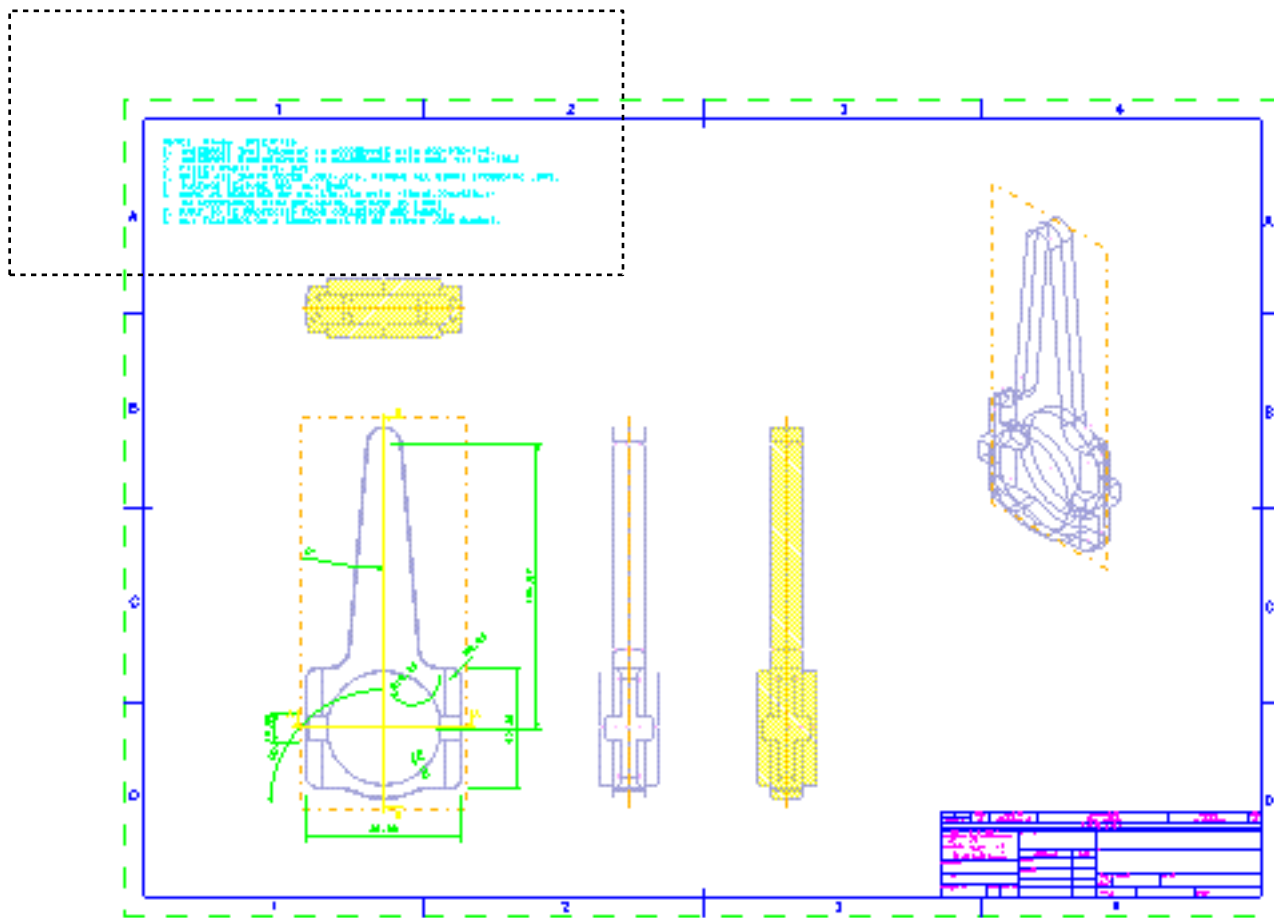
Select the angular dimension, change to **5 degrees**, OK
Select the width dimension, set to **80 mm**. OK

△ **Update**



△ **Note**

Highlight "**file**" on the form, click folder icon, select **gen.txt** from the list.
Toggle **leader line off**, place in upper left hand corner

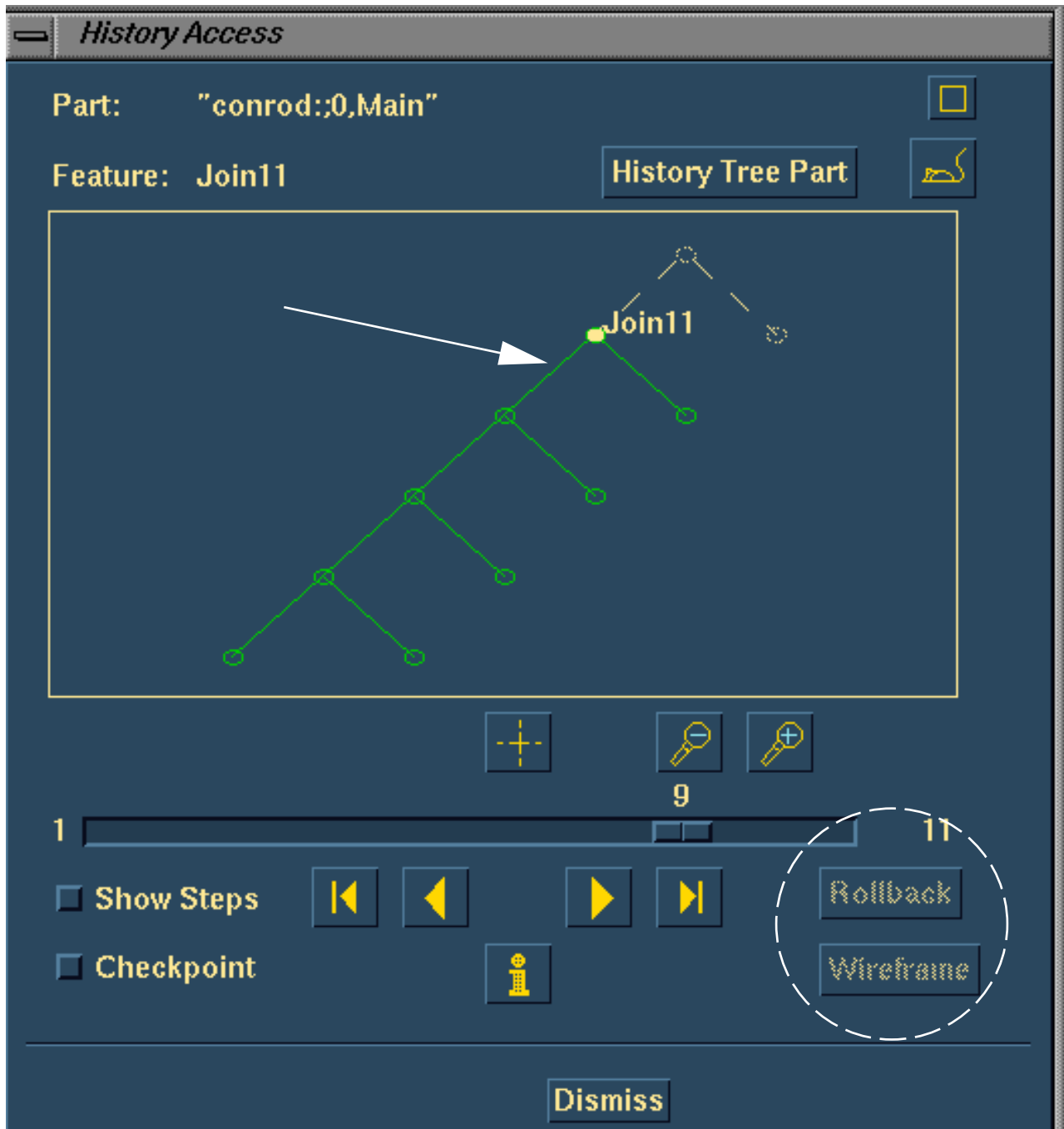


△ Drafting Setup ... Master Modeler

△ History Access

Pick the part, **MB2**

Highlight "Join11" and click on **rollback**, **Dismiss**



Tech – tips

Support Notes

Spend some time on this form explaining the various options. This is another example of the ease of use capabilities in I-DEAS. We have a real advantage over other systems with this capability.

By using "rollback" we are in a feature insert mode.

△ Sketch in Place

Pick the reference plane

△ Circle – Ctr/Edge

MB3, Options, r=17, OK, MB3, focus, pick the center point and drop the circle at the focus point created, **MB2**

△ Extrude

Pick the circle, **MB2**,

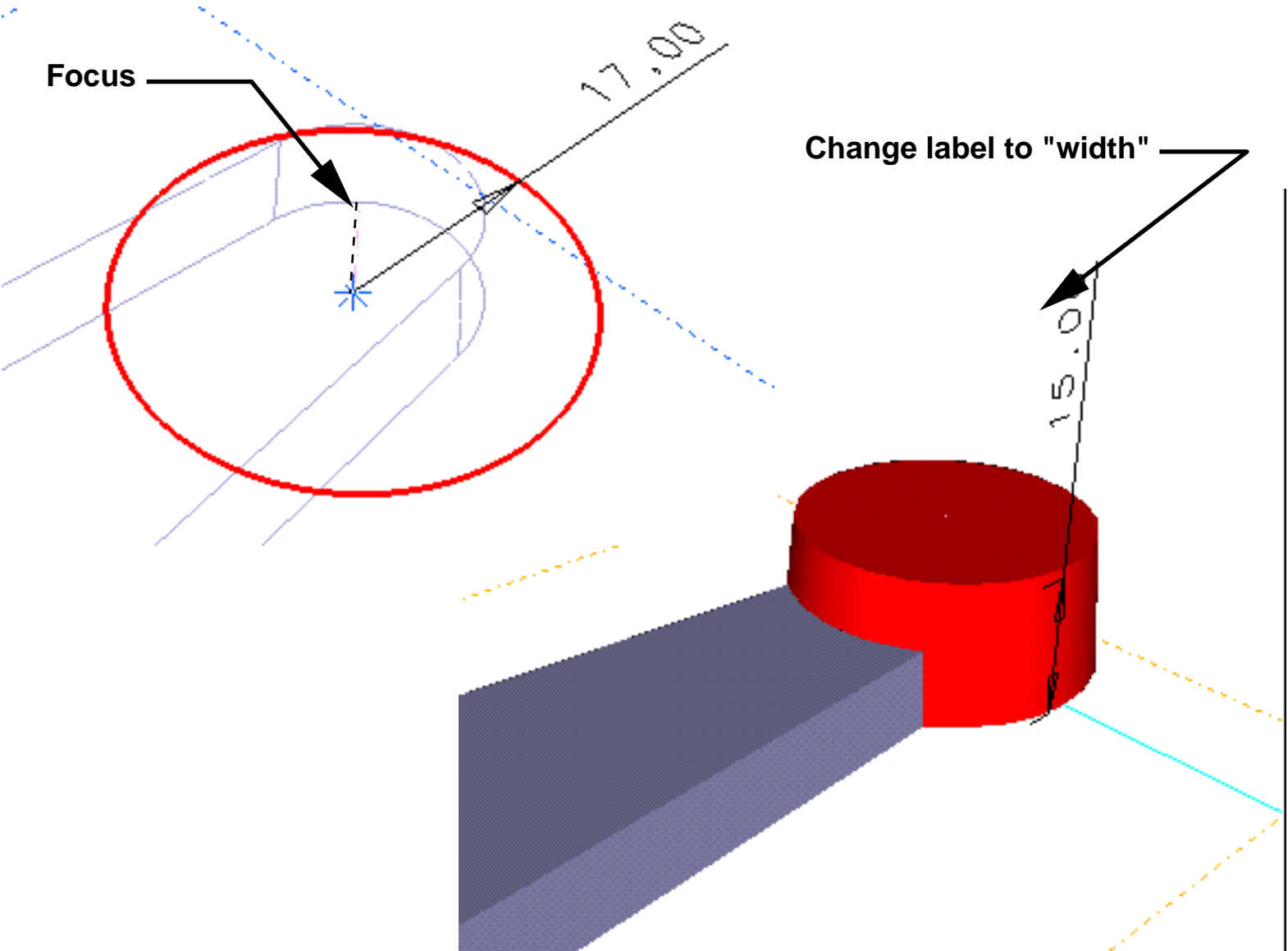
Distance = 15 mm

Draft = -5 degrees

Flip Direction, OK

△ Modify

Pick the part, **MB2, MB2**, select the **15 mm** extrude distance on the feature just created and change the label to **"width"**.



Support Notes

You insert the feature that provides the interface to the wrist pin connecting the piston to the connecting rod.

Highlight the ease of feature customization. The name you give the feature is arbitrary.

△ Update

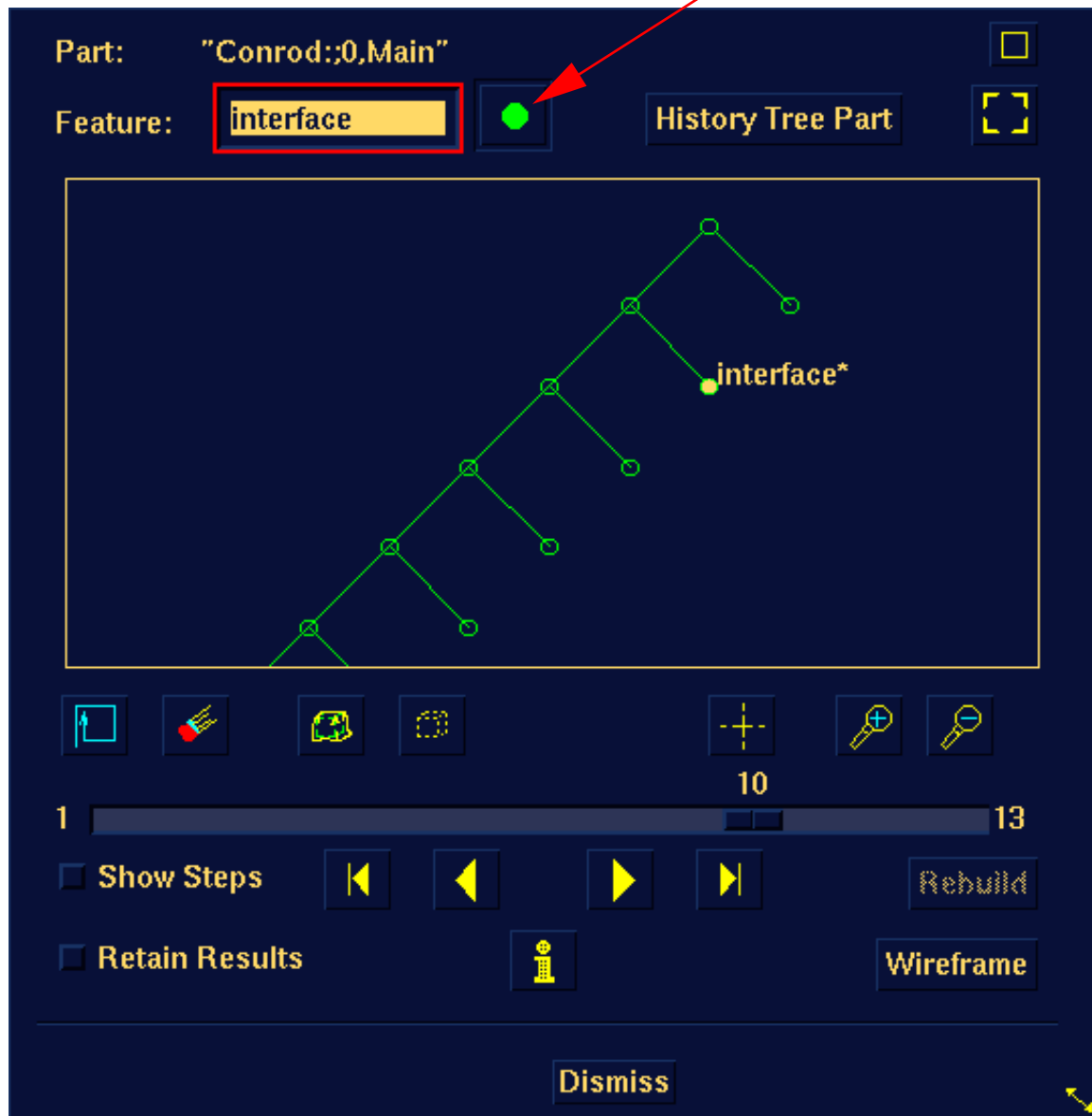
Update the part, OK to rebuild the part

△ Update

△ History access

Select the part, show the inserted feature, change the name in the highlighted field, pick the green icon

F9 to deselect the feature after dismissing the form



△ **Sketch in Place**

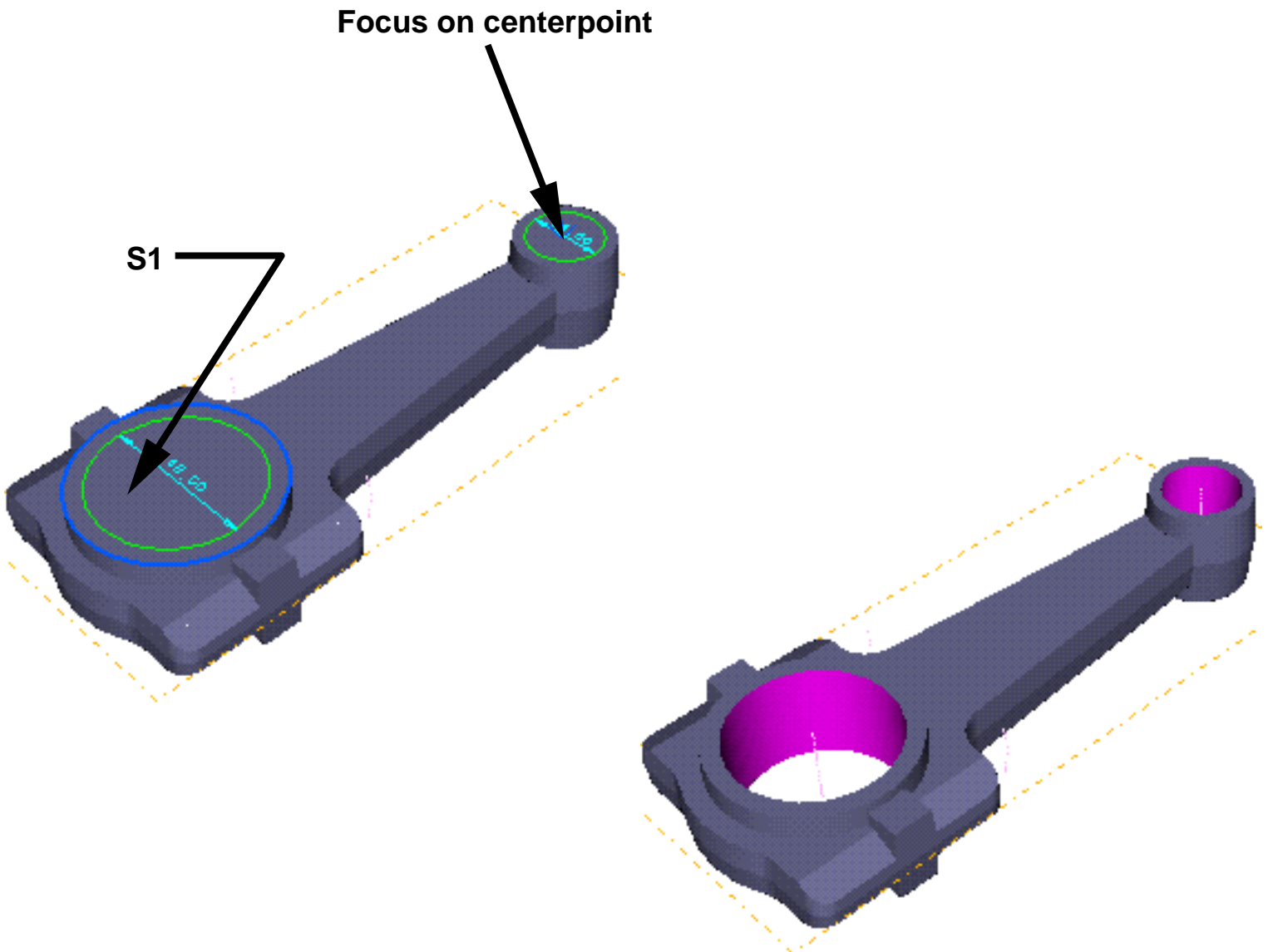
Pick surface **S1** as shown

△ **Circle, Ctr/Edge**

MB3, options, **Radius = 24 mm**, **OK**, navigate to the center point and click;
MB3 options, **Radius = 12 mm**, **OK**, **MB3**, **focus**, select the center point of the smaller surface, navigate to focus point, **MB2**

△ **Extrude**

Select the two circles created, **MB2**, **toggle cutout**, **OK**



Tech – tips

Support Notes

Make sure that you attach the workplane to the surface shown. A change to a dimension later may not give the results expected if you attach to the other end of the connecting rod.

Show updated drawing with additional features



Tech – tips

Support Notes

You have now shown bidirectional associativity between the part and the drawing.

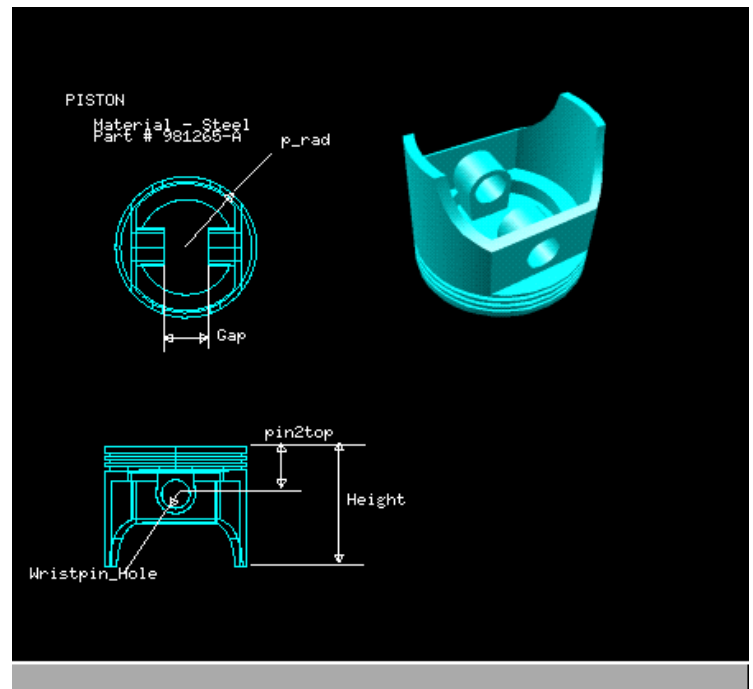
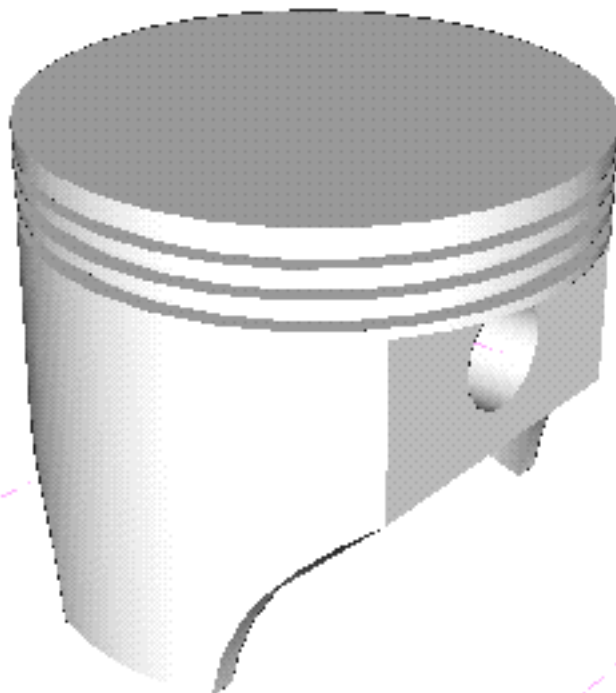
Drafting Setup ... Master Modeler

△ Parts

Highlight **piston_detail**, Preview, OK

△ Autoscale

△ Redisplay

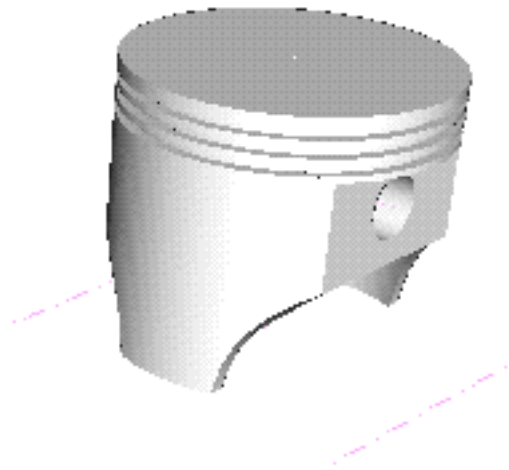
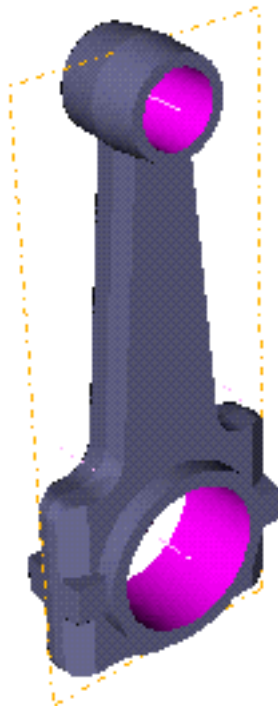


△ **Master Model... Master Assembly**

△ **Add to Assembly**

Name = *conrod assembly*, **OK**

Pick the conrod and piston from the screen



△ Display Filters

Parts..Coordinate systems on

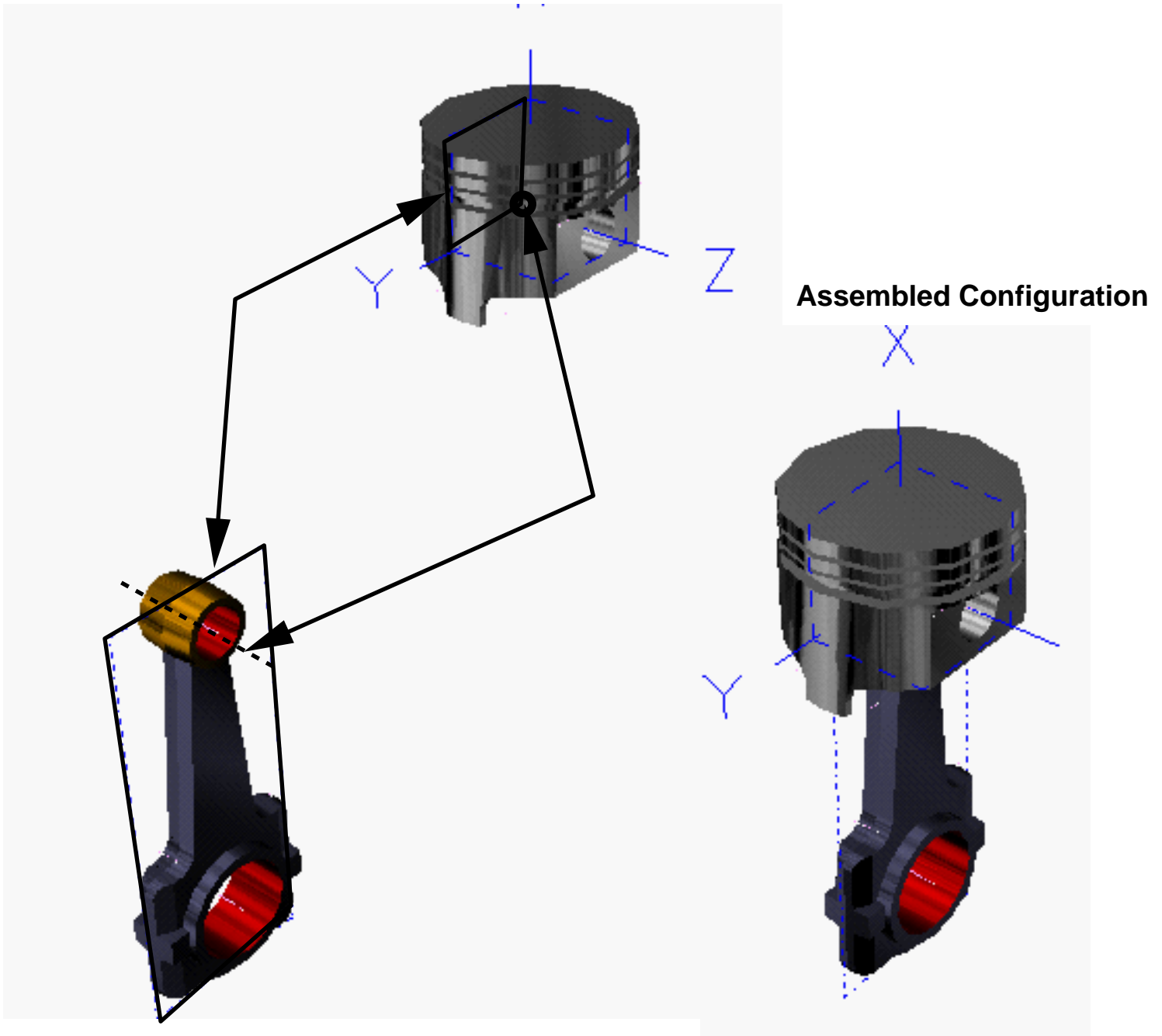
△ Constrain and Dimension

Coplanar

Select the reference plane from the conrod and the xy plane from the piston

Colinear

Select the hole center line from the conrod and the reference point from the piston.



△ Interference – (under measure icon)

Pick the Piston, **MB2**, Pick the conrod, **MB2**
Calculate clearance and interference.
Create Geometry, Dismiss

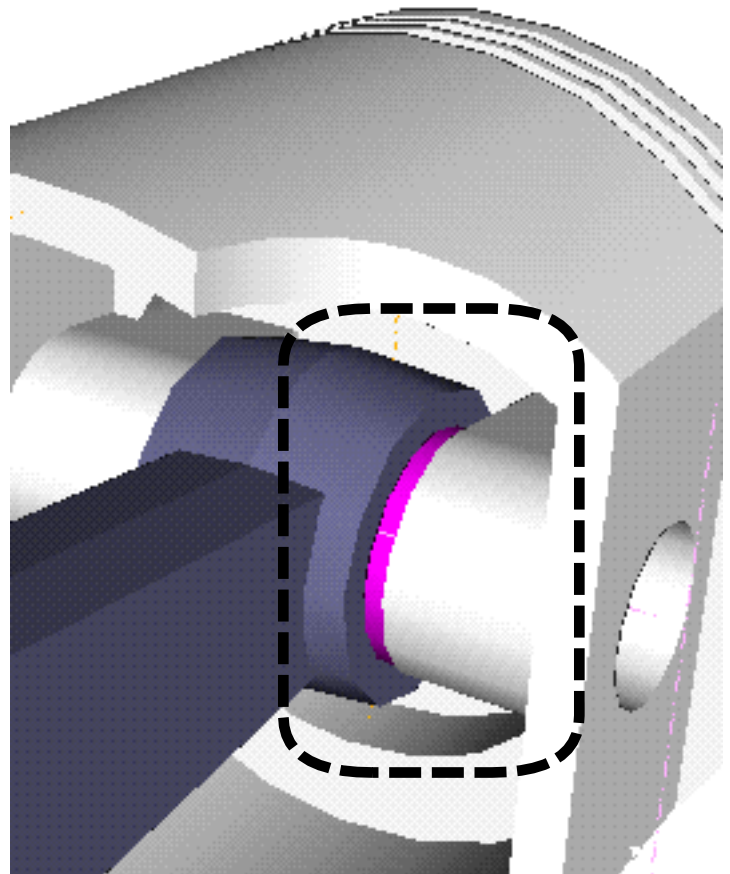
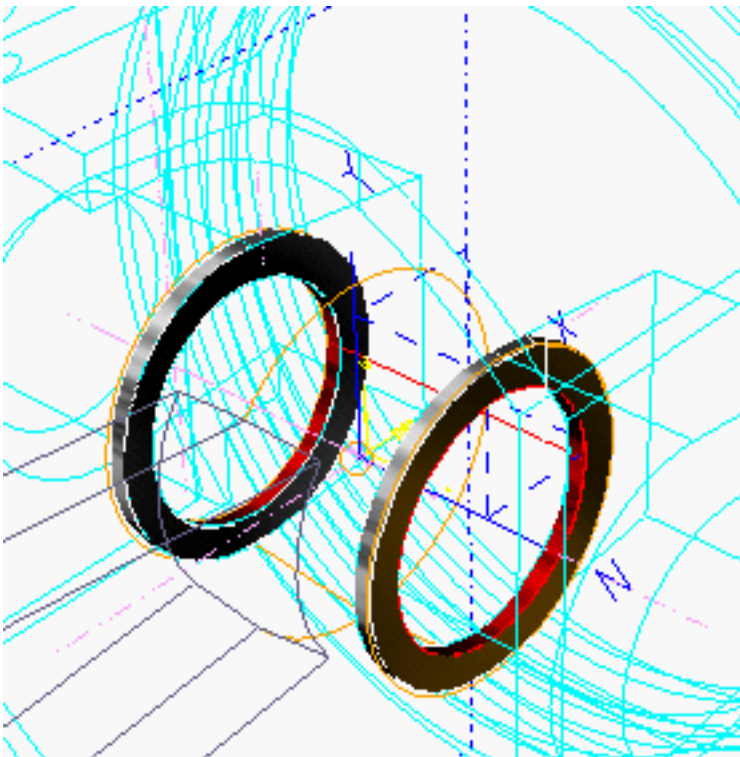


Master Assembly.. Master Model
Display Filters, Assembly off
Shade
er off,, line display
Display filters assy on
Delete all – to delete part interference
er on
Master Model ... Master Assembly
Shade
(Wow that was fun!!!!)

△ Assembly Equations

Create, MB3 Label, Dimension, Conrod 1, width, return
gap/2–2|mm|, return, done

△ Update



△ Shaded Options

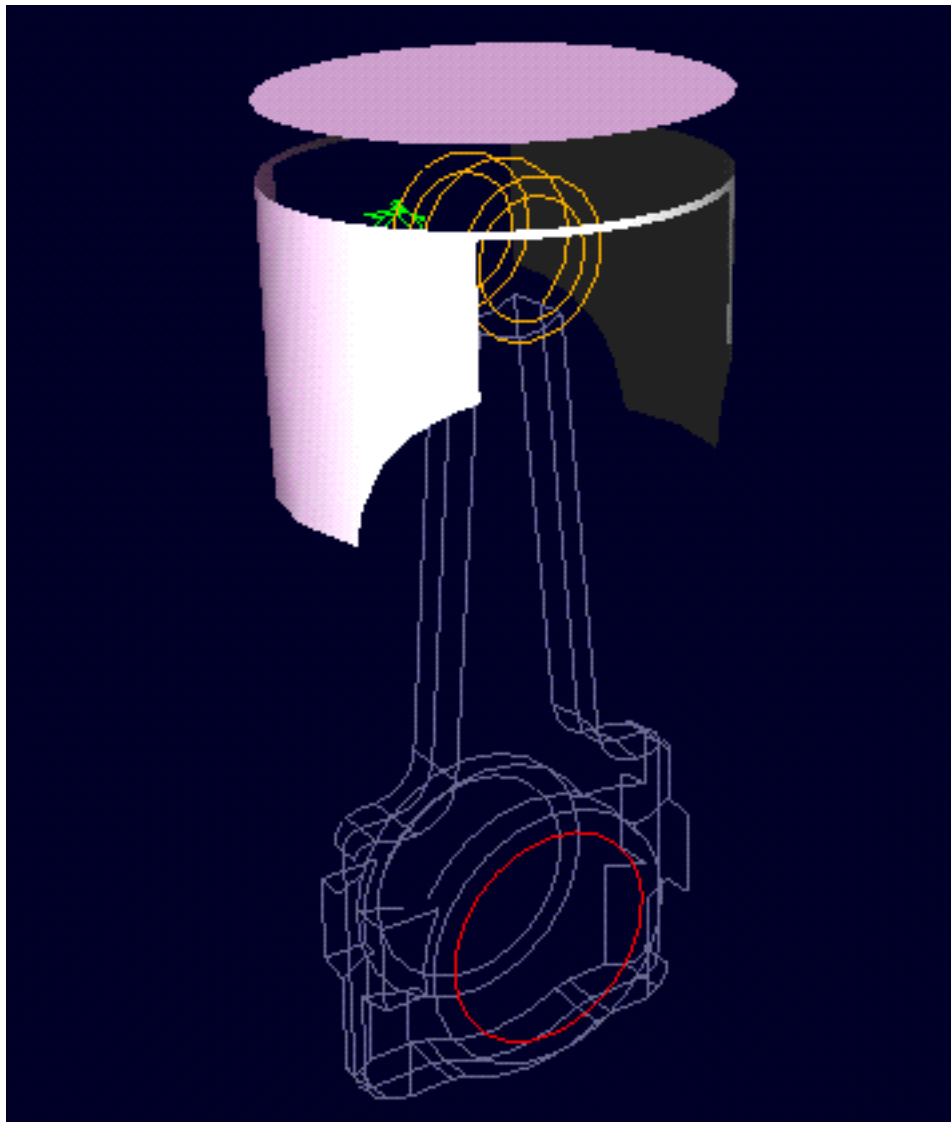
Turn on outline

△ Abstract

Select the conrod assembly, select an edge from the conrod, MB3 all.
select the top surface of the piston and the outer cylindrical surface, MB2

△ Hierarchy

Highlight Conrod Assembly, Show



Tech – tips

Support Notes

The ability to control large assemblies is important. This is an example of how easy it is to control visual information in Master Series.

△ Shaded Options

Turn outline off

△ Get

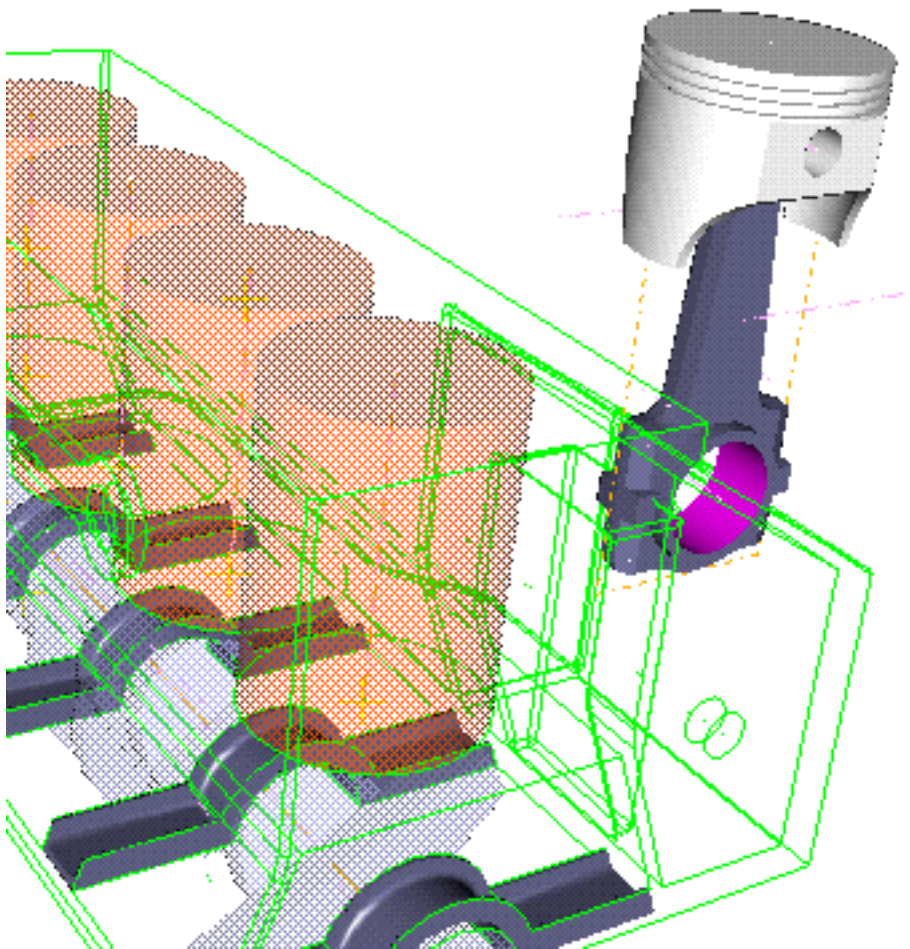
Get the **engine** from the assemblies bin

△ Update

△ Add to Assembly

Select the wireframe block to pick the assembly

MB3, get, **MB2**, select **Conrod Assy** from the form ,**OK**



Tech – tips

Zoom out prior to getting the engine assembly. "Zoom all" after retrieving the assembly.

Support Notes

trr– Preselect the crankshaft and type "trr" to turn it translucent

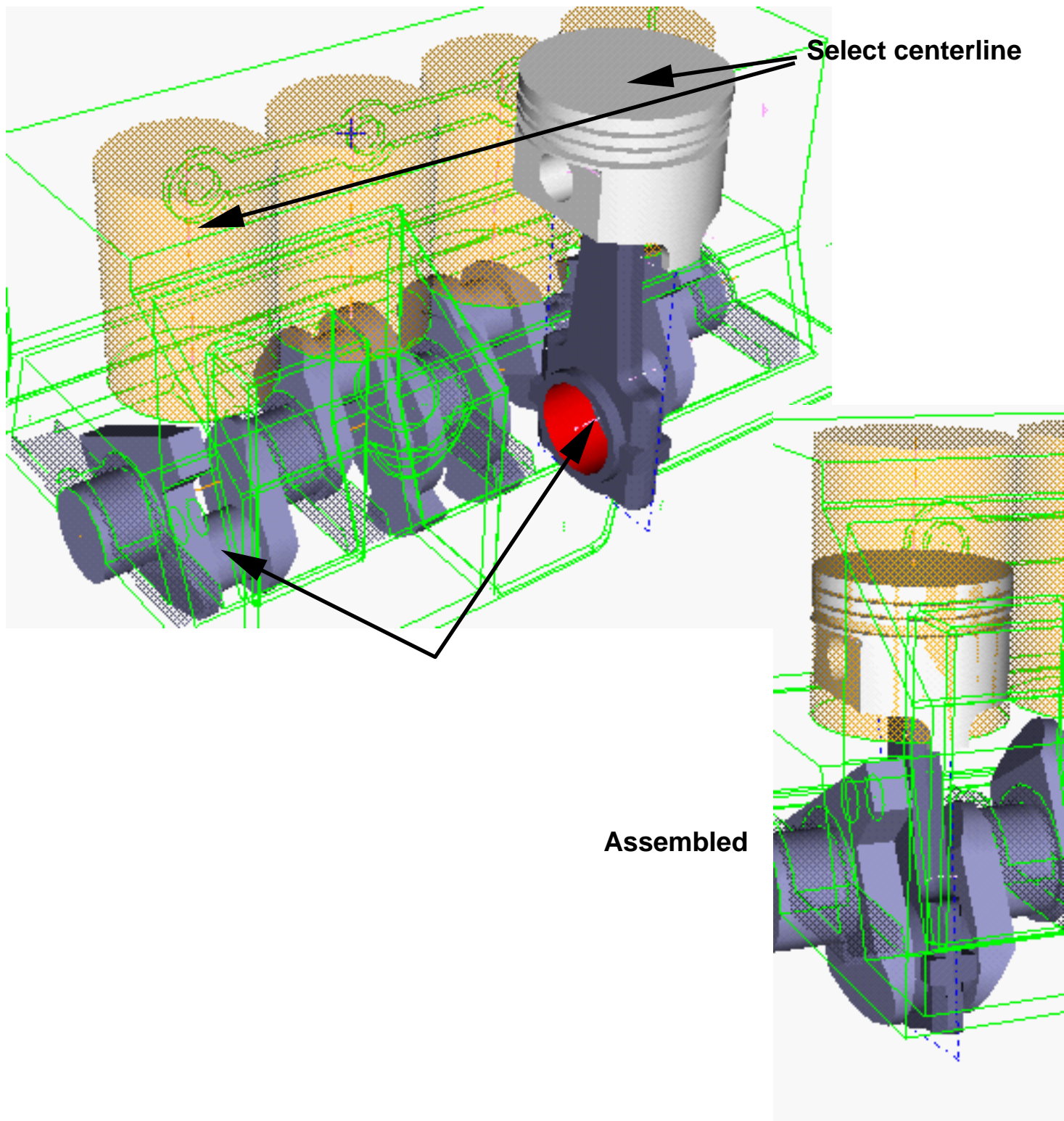
Manage Configurations

Highlight Conrod Assembly, select arrow to move to right, Dismiss

Δ Constrain and Dimension

Centerline piston to Centerline of cylinder

Centerline of conrod to centerline of crankshaft



△ Modify

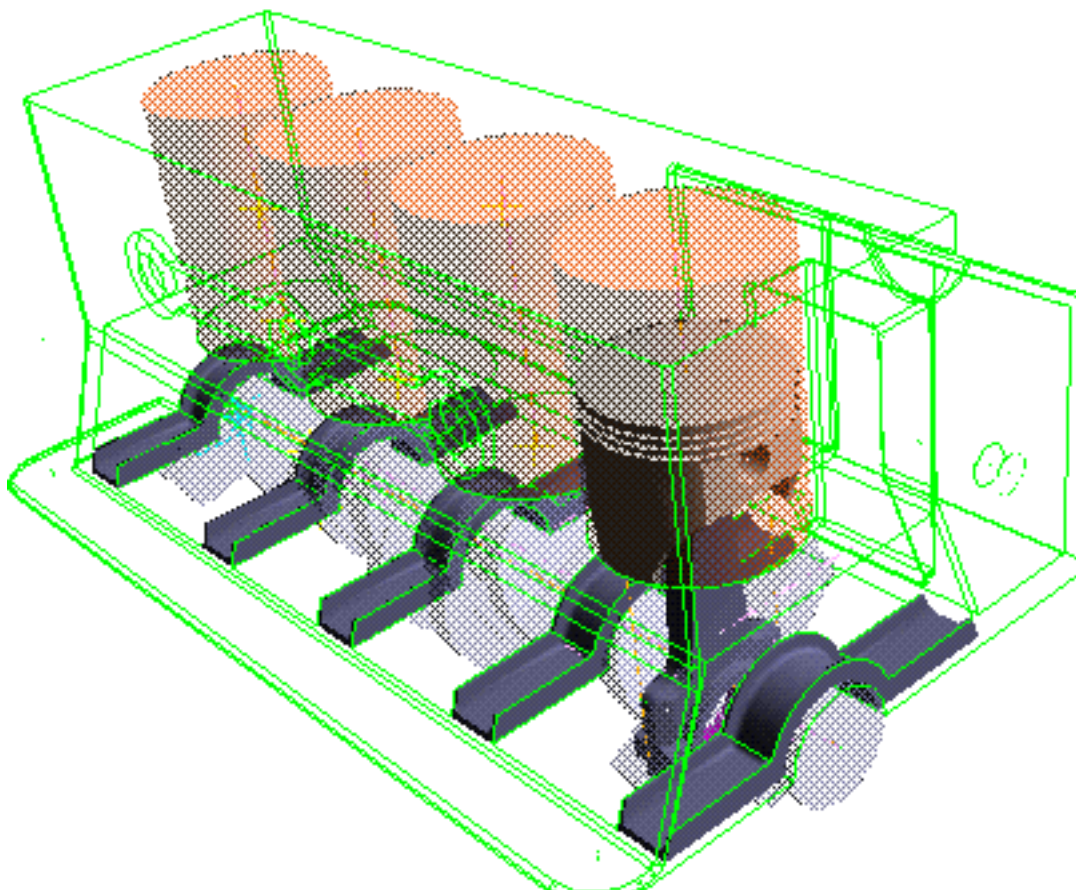
Pick 30 degree dimension, pull down animate
set range from 0 to 360, highlight sequence button, drag to 0, play

△ Hardware Animate

Set speed to 20

OK

△ Put Away



△ ***Design ... Manufacturing***

△ **Manage Bins**

Get the conrod part

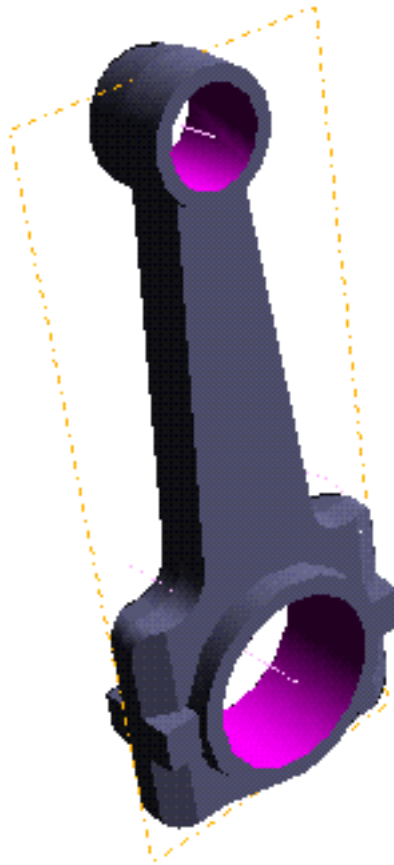
Get from library

Double click **NC Parts...**

Check out the Clamp Plate, Conrod fixture, Conrod stock

OK,OK, Dismiss

△ **Zoom All**



Tech – tips

Support Notes

Spend some time describing libraries, as this is the only opportunity that you have to discuss the advantages of a team environment in a single headed demo.

Master Modeler ... Generative Machining

Pick Part – select the conrod part from the screen, OK

Δ Modify Setup

Select 1,2,3

Move **Maintain Op Group and
Group by tool Id** order to the left

Move **Center Drill before drill** to right,OK

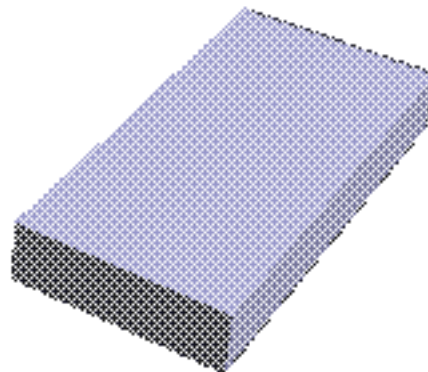
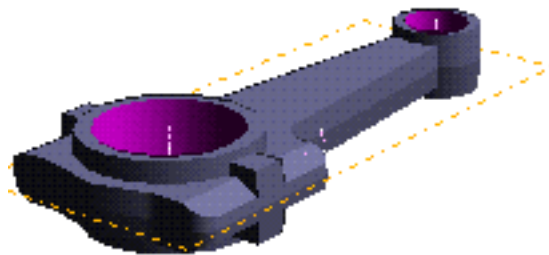
Modify Assembly



Δ Add Stock to Assembly

MB3 get, MB2, Conrod Stock, OK

Δ Zoom All



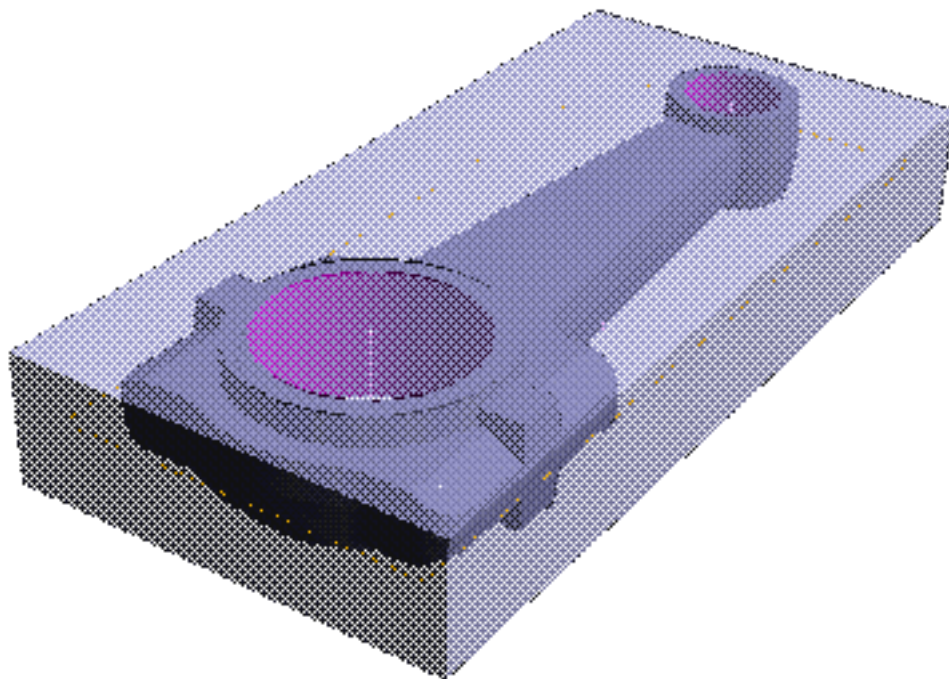
△ **Align**

Pick the reference plane from the conrod, **conrod**, pick the top surface, **F2**, from the stock, **done**

△ **Zoom All**

△ **Move**

Select the conrod, **MB2,, 0,0,-15**



Assembly Setup ...Generative Machining

Enable In-Process stock, Dismiss

△ Add Operation

Pull Down **Hole Making, Drill, Create**

Name = Small Hole

△ **Geometry Select**, MB3 deselect all, select small hole centerpoint, MB2, OK

△ **Cutting Tool Specification**

Identifier = Twist Drill

Cutter Diameter = 23 mm , OK

Machining Parameters

Hole Depth = 32 mm

Highlight Peck/Break Chip

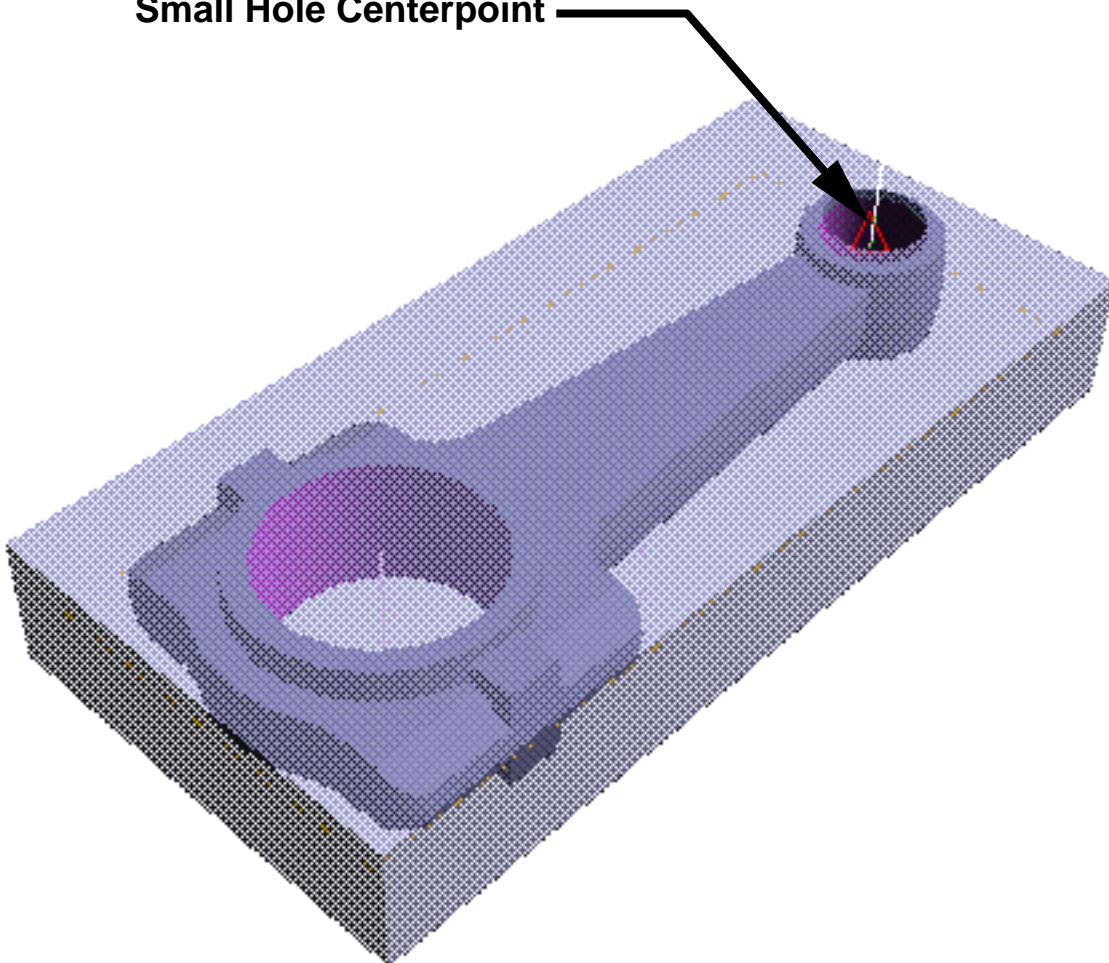
Toggle Off " Check for Collisions

OK

Process



Small Hole Centerpoint



△ Add Operation

△ Create

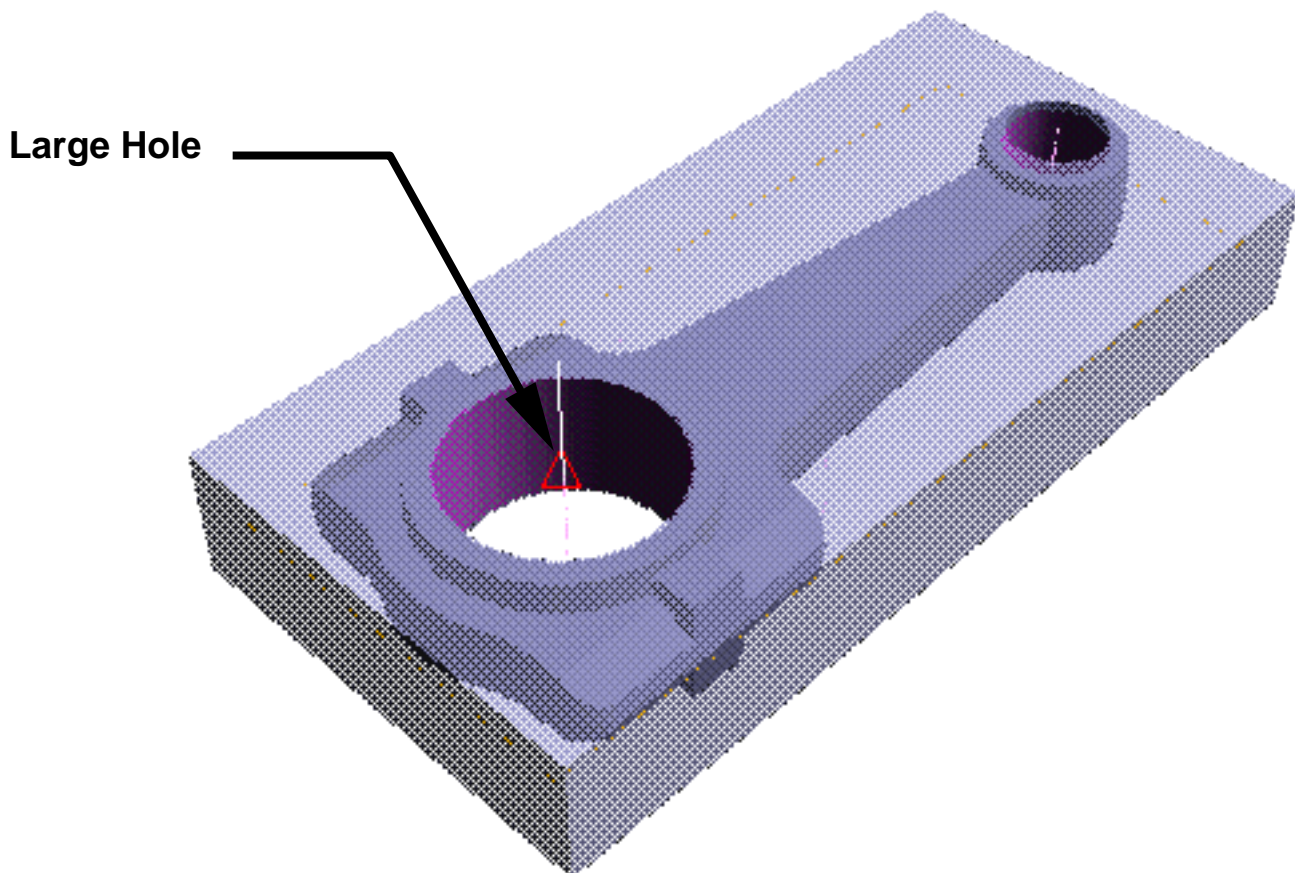
**△ Geometry Select, pick geometry select icon, MB3, deselect all
Pick center point for large hole, MB2, OK**

**△ Cutting Tool Spec.
Identifier – 47 mm twist drill
Cutter Diameter – 47 mm**

**OK
Process**

△ Animate

△ Show Next



△ Add Op Group

△ Add Operation (Lower Left Icon)

Pull down **Category, Hole Making**

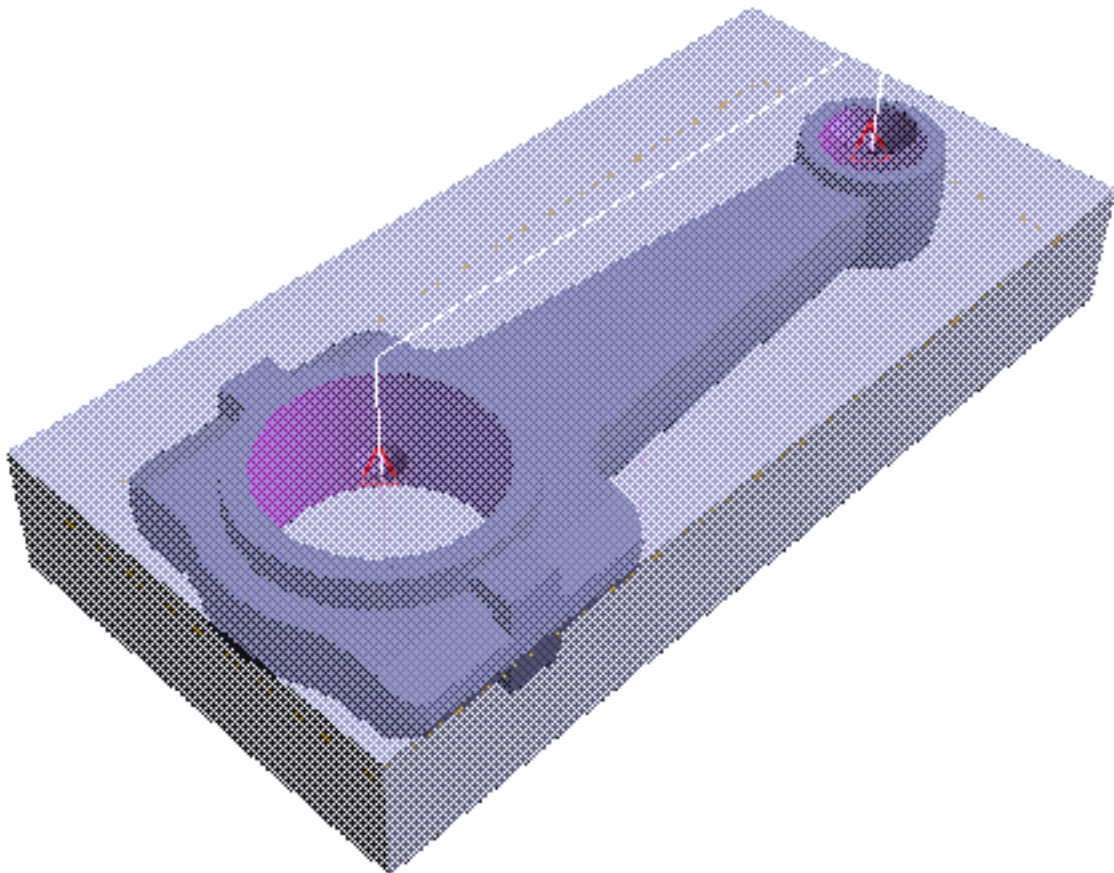
Pull down **Type, Center Drill**

Create

Name = Center Drill

△ Select Geometry

Pick the two center points from the holes, **MB2, OK**
Process



△ Job Planning

Highlight **Setup 1**

△ Sequence Rules

Show rules (Center Drill before drill etc.)

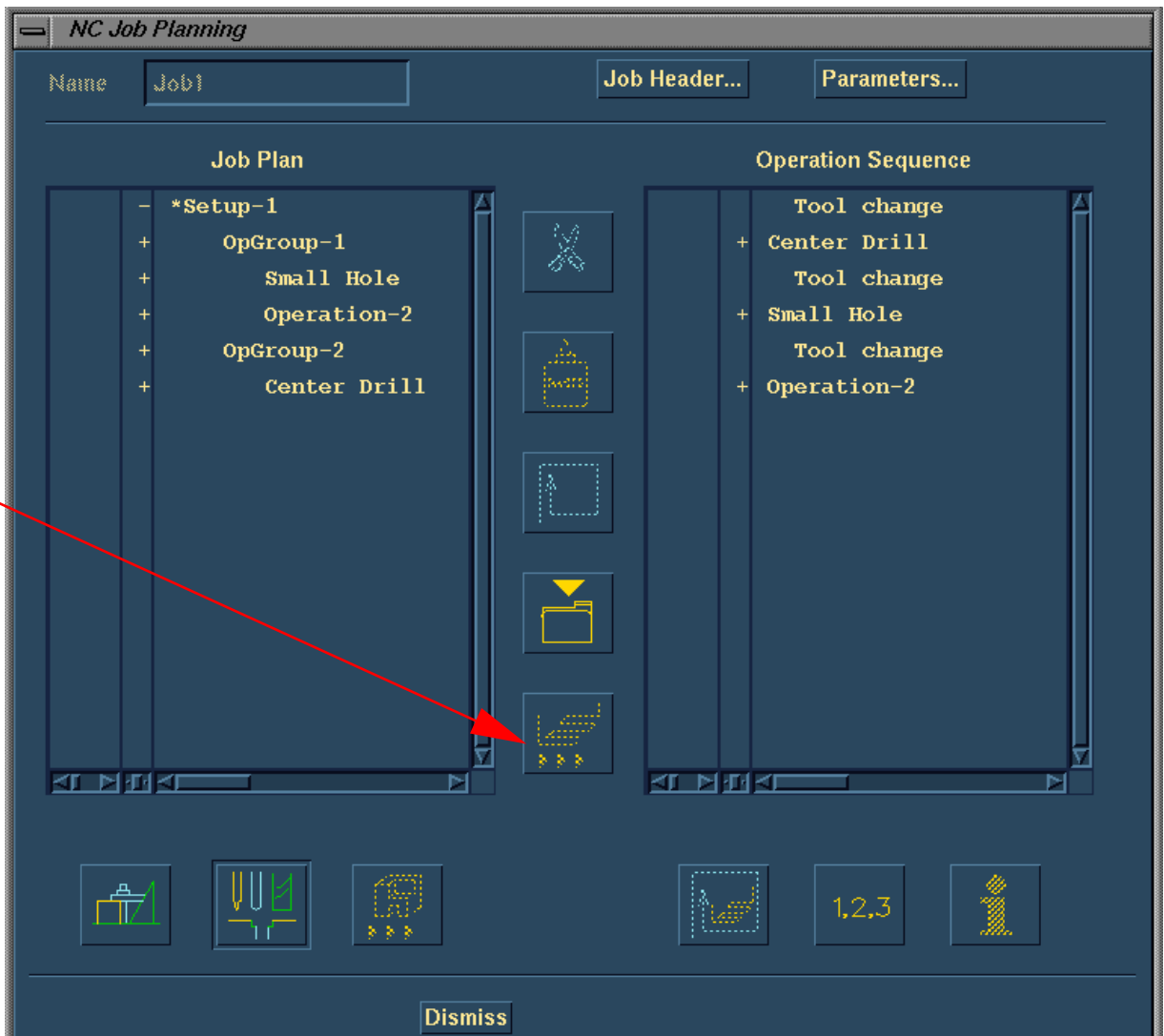
△ Update, OK

Note the "-" signs in the drill operation prior to the update and their change to "+" signs indicating that the sequence rules have now been followed

△ Dismiss

△ Display Filters

Toggle **toolpaths off**, **Assemblies off**



Support Notes

Not that even though we entered the operations in an improper manufacturing order, the sequence rules were followed, and reordered the operations. The customer can set up his/her own sequence rules so that proper manufacturing conventions can be maintained at their site.

Manufacturing ... Simulation Master Modeler

△ Display Filters

Assembly Off

△ Get

Get the **conrod** part

△ Zoom All

loo – turns off local origin

ree – */mo spe reorder* global symbol

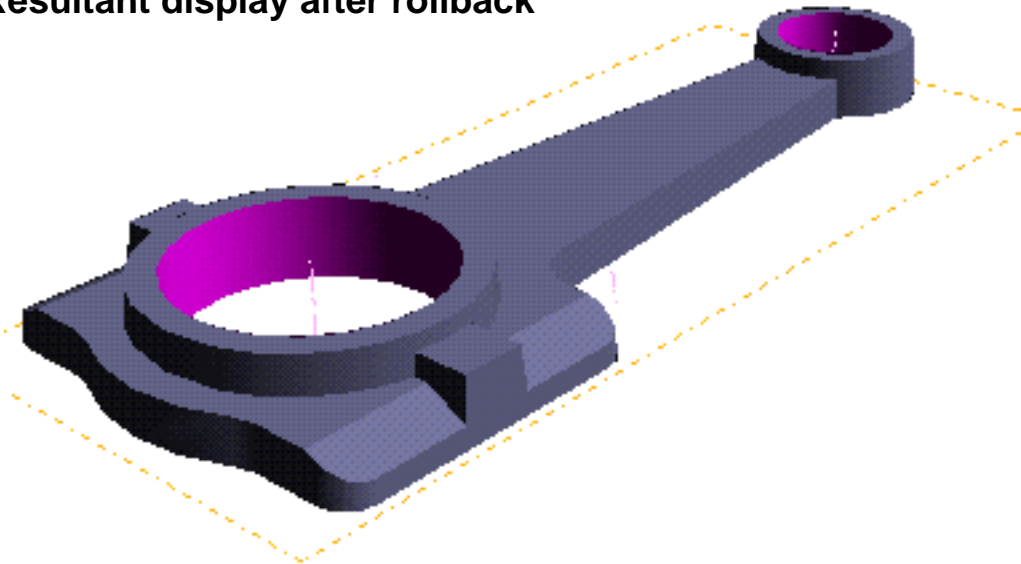
select the reflect plane (i.e. FEA Plane 13), **MB2**, pick the part, **MB2**

△ Update

△ History Access

Pick the conrod part, **MB2**, Highlight 2nd node from top, **Rollback**
Dismiss

Resultant display after rollback



Master Modeler ... Boundary Conditions

△ Create FE Model

Select **conrod**, **Geometry based**, **OK**

△ Displacement Restraint

Select the hole surface **S1**, **MB2**

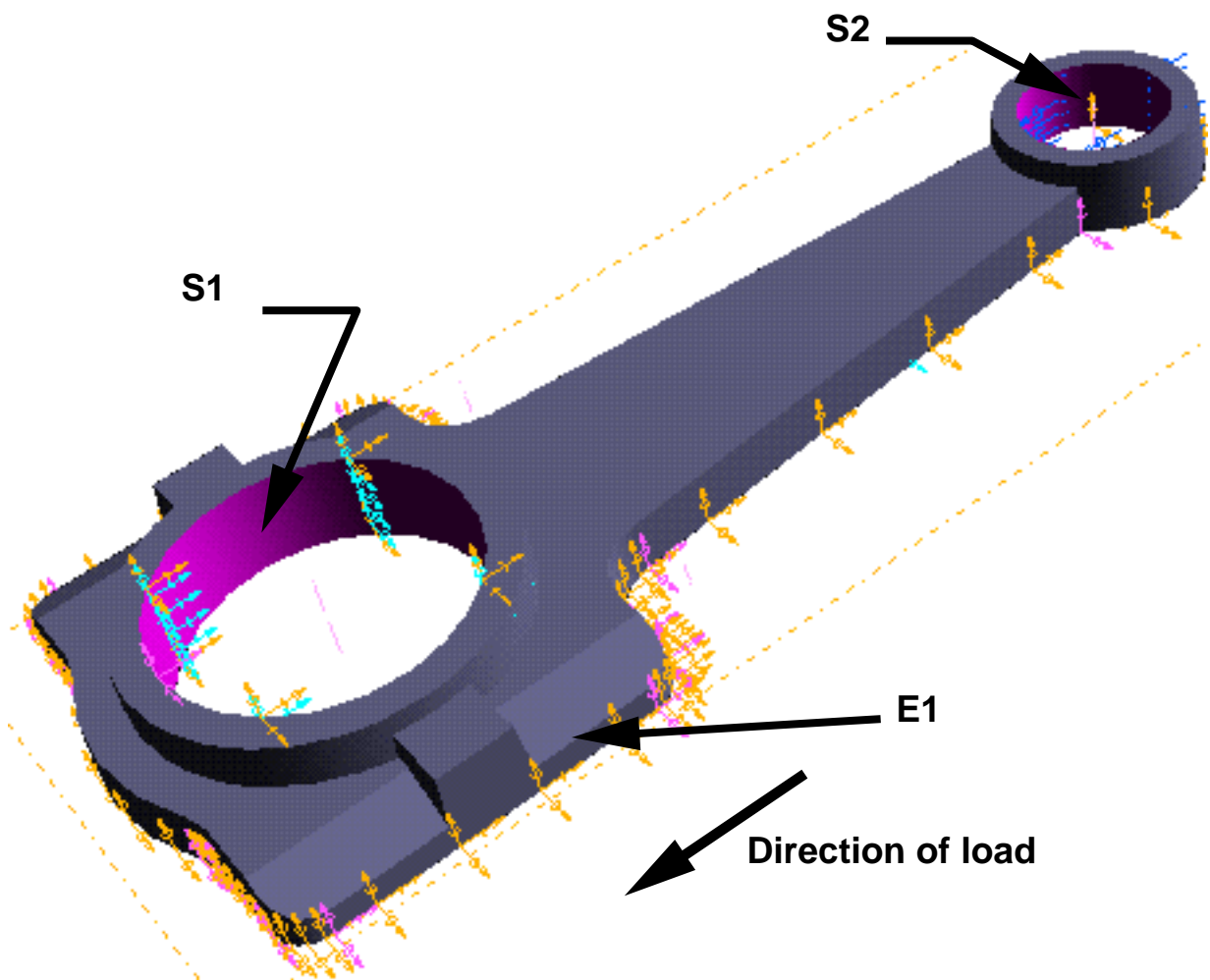
Set the **rotations free**, **OK**

△ Displacement Restraint

Select the plane of symmetry, set **X and Y–Translation**, and **Z–Rotation free**

△ Force

Pick the small hole inner surface **S2**, **MB2**, select the vector icon from the form, pick the edge **E1**, **MB2**, **traction=2.6E6**, **OK**



Boundary Conditions ... Meshing

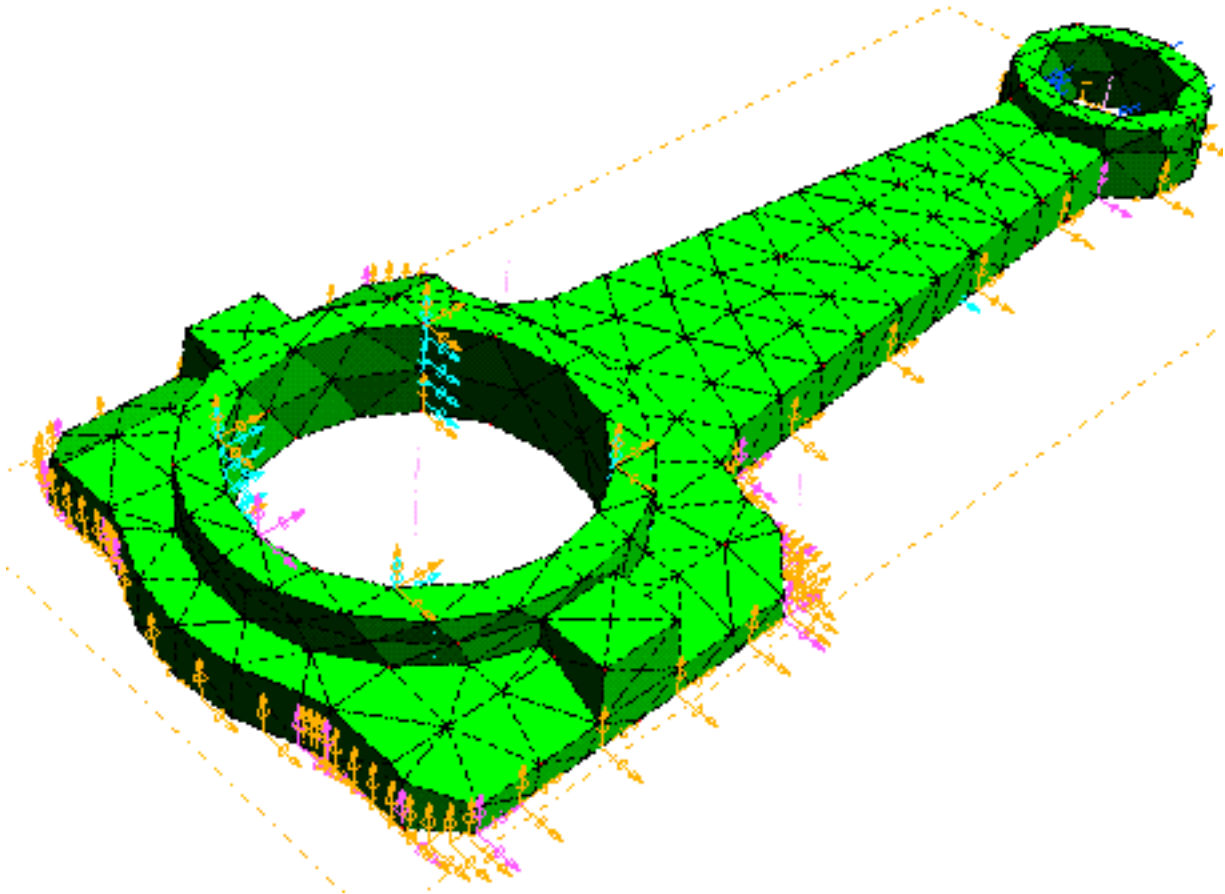
sff – runs *sff.prg* to set global lengths and linear tets (Does task switch)

△ Display Filter

FE Models..

All On/Off, toggle elements only **on**, OK,OK

△ Mesh on Part



Meshing ...Master Modeler

△ Appearance

MB3, defaults, Curve Appearance, set color to other than the element color

△ Sketch in Place

Select the top surface

△ Circle – Ctr/Edge

Navigate to hole centers and drag two circles as shown

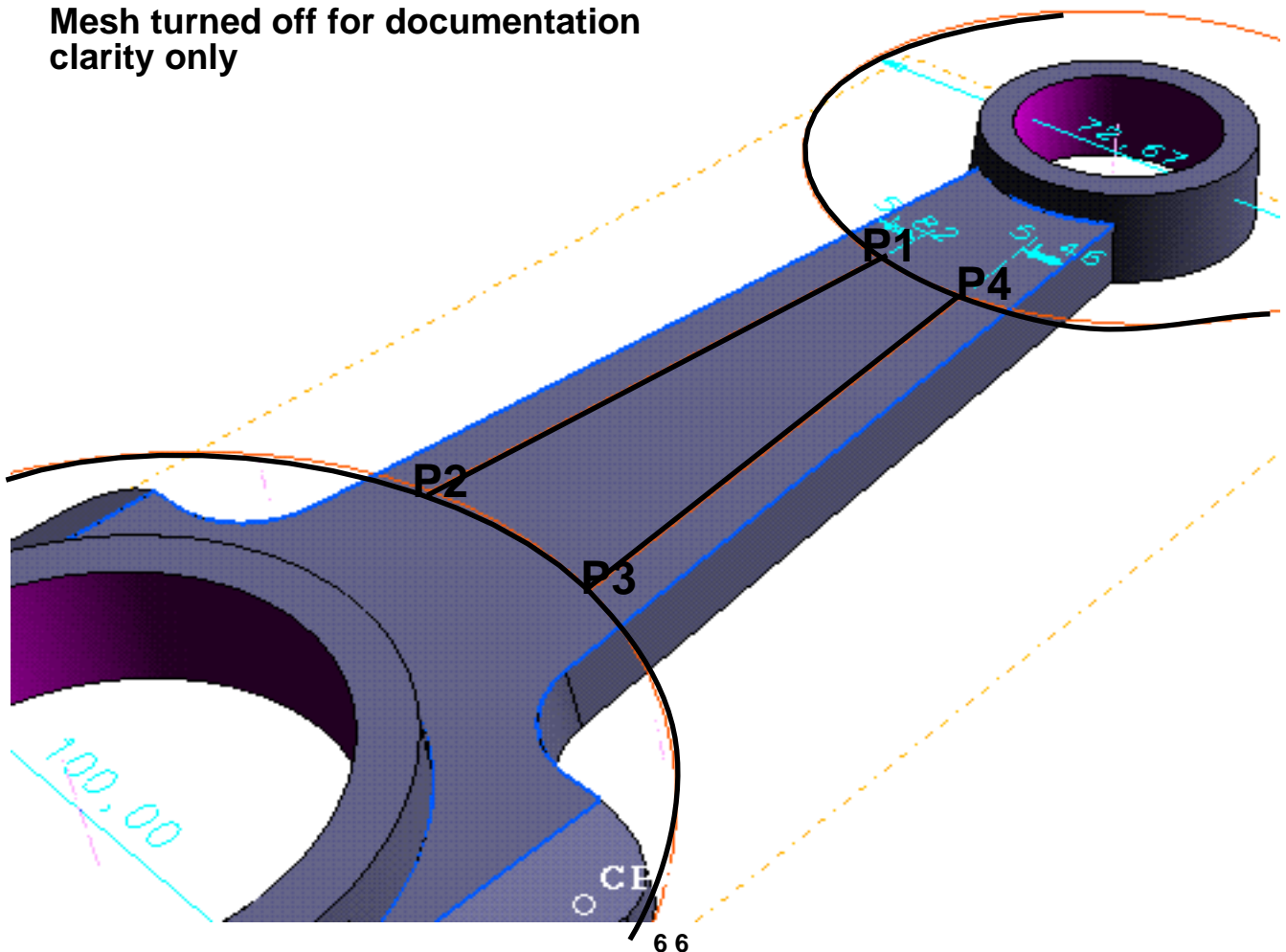
△ Polyline

MB3, align off for ease of creation

Pick on circle at **P1** and create to **P2**, **MB2**

select **P3**, **P4** for other line. Capture parallel constraint to part edge as well as dimension upon creation.

Mesh turned off for documentation clarity only



Δ Modify

Pick the linear dimensions and match

Δ Modify

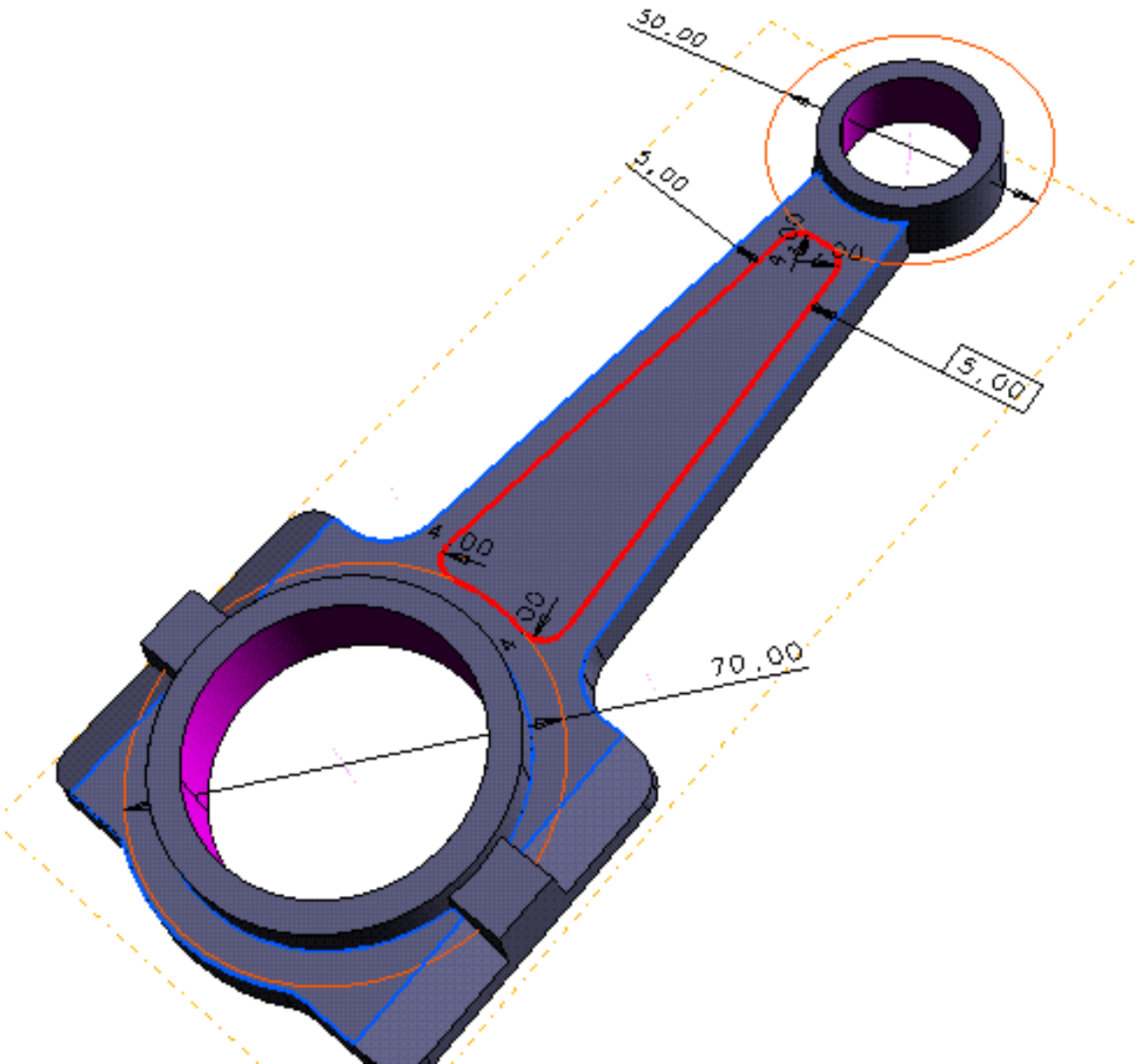
Modify the diametral values to **70mm** and **50 mm** as shown, and the linear dimension to **5 mm**.

Δ Build Section

MB3, Section Options, Toggle on stop at intersections, OK
and create pocket section

Δ Fillet

Select section, **MB2, R = 4 mm , OK**



△ **Extrude**

Pick the section, **MB2**

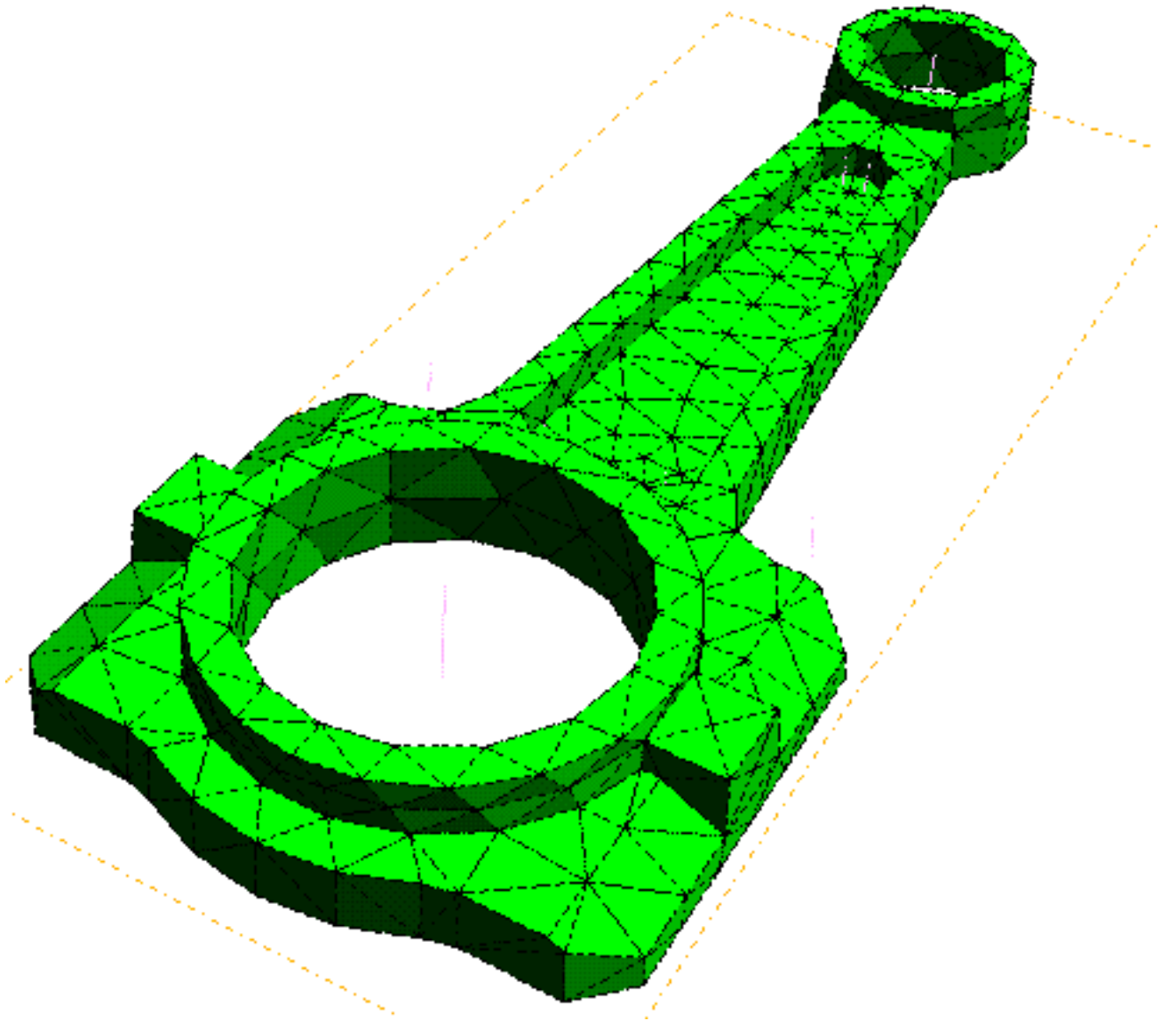
Distance = 5 mm

Cutout

Draft = -3 degrees

OK

Use pp1, pp2, pp3 global symbols to show post results as well as optimization



Support Notes

Discuss the capabilities of post processing. You can do a live solve if you want to. Be aware that additional restraints should really be applied at the point of load to more realistically represent the load path of the piston force on the connecting rod. You will get an oblong defromation that isn't necessarily correct. It will solve in approxiamately 1 minute however.

△ Manage Bins

Put away FEA model associated with conrod

△ Fillet

Select the 4 top chamfer edges as shown

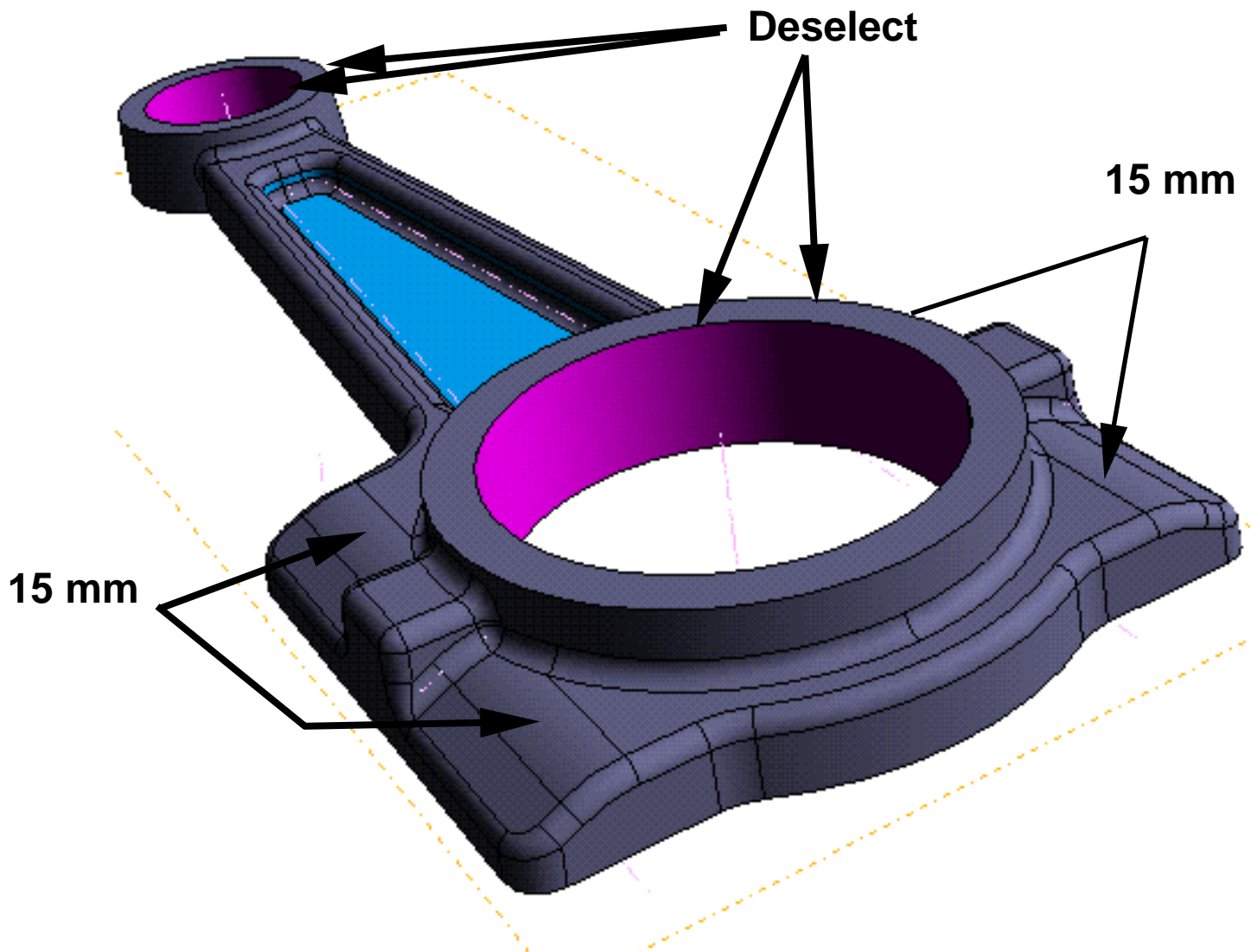
R = 15 mm

△ Side View

△ Fillet

MB3, filter edges, pick only, MB3 Area Options toggle, Part In OK,
Capture all of the edges in the side view except for those on the
plane of symmetry, **MB3, highlight selection** (Should be 112 entities)
Deselct machined edges shown.

R=2 mm

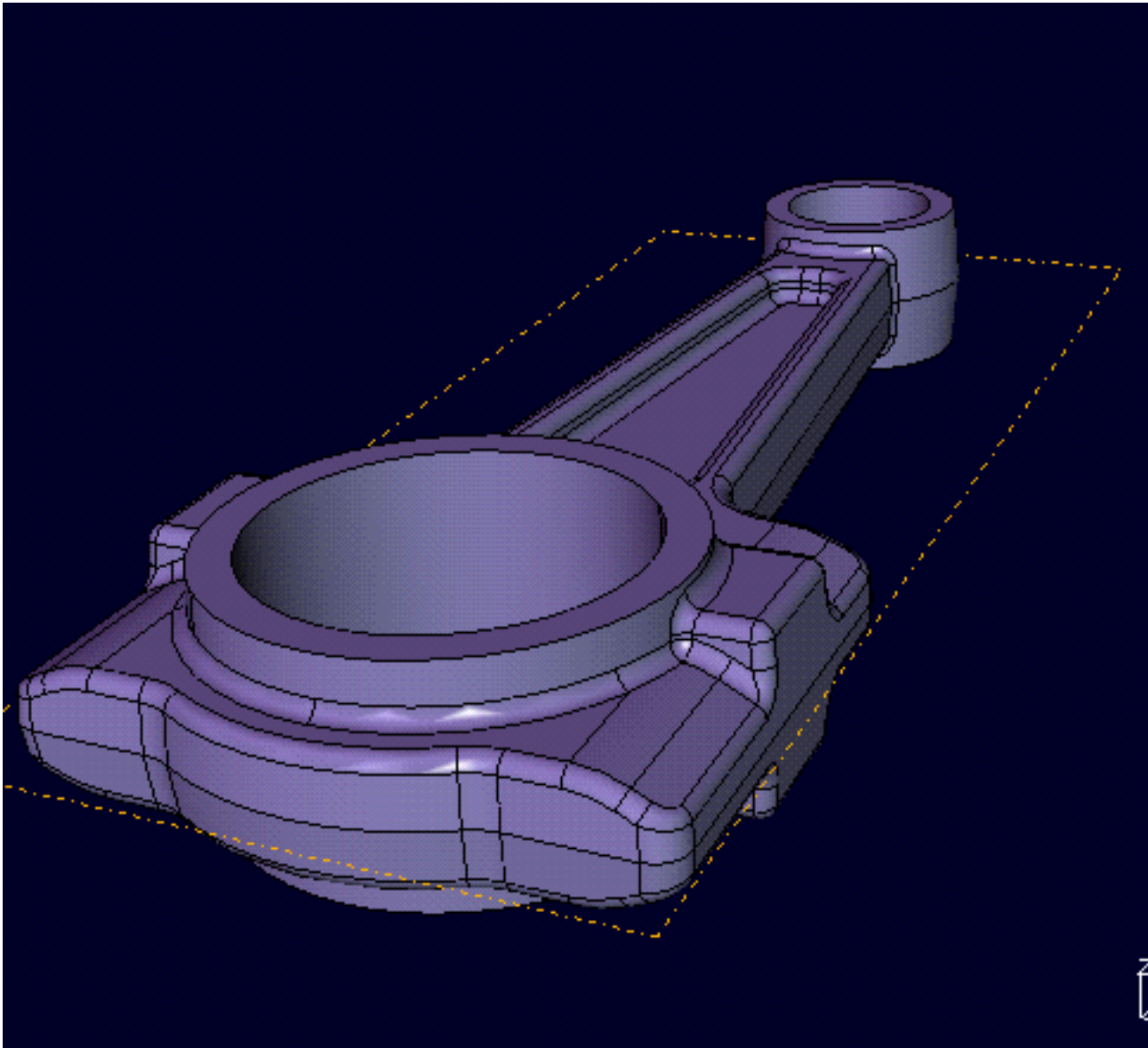


Tech – tips

Don't forget to pt away the FEA model. It will remesh the entire model if you do!

Support Notes

Note that the first 4 fillets that you place on the part take advantage of the new architecture.



Simulation ... Manufacturing Master Modeler

△ Put away

Put away the conrod part

△ Display Filters

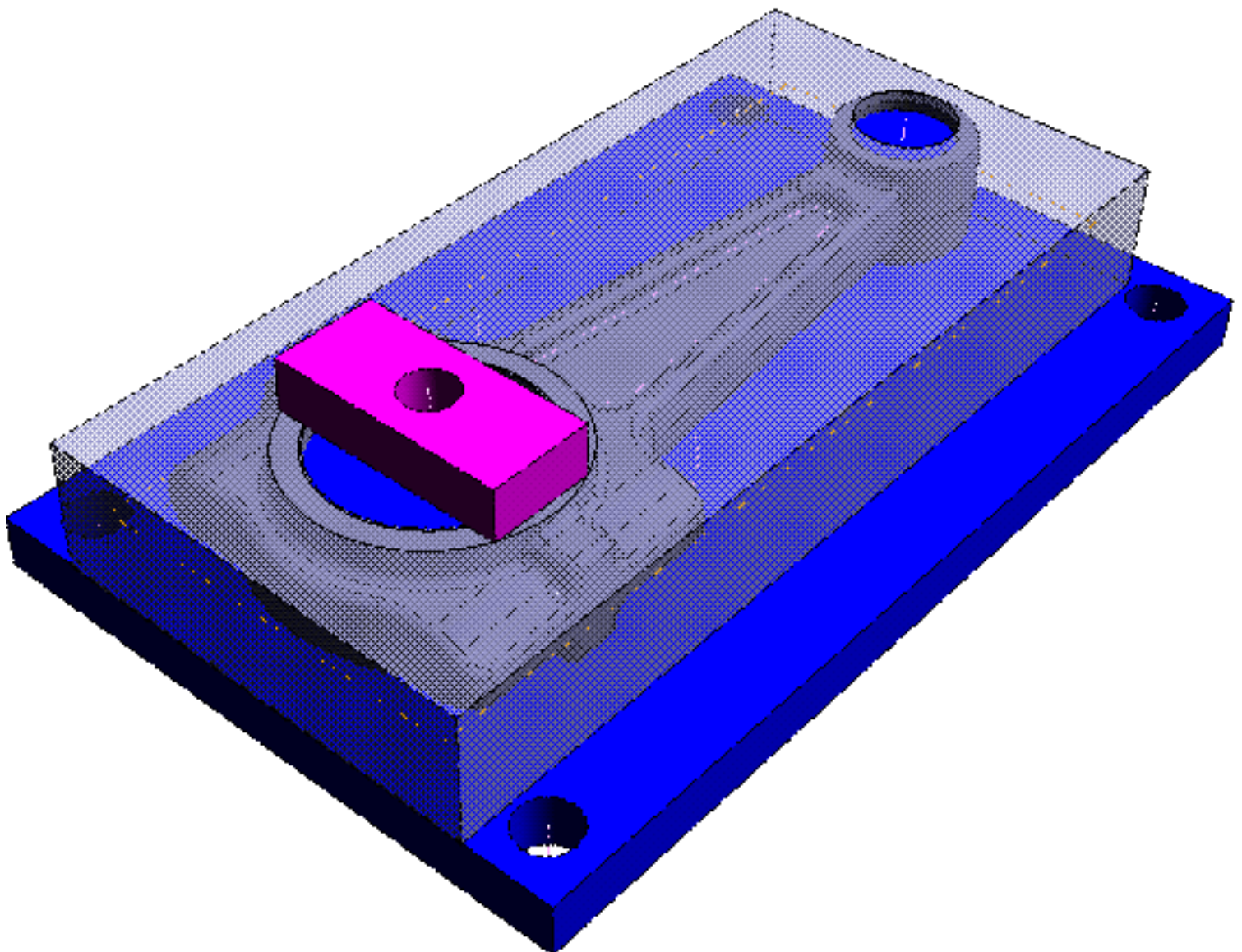
Assembly on ; Toolpaths on

Master Modeler ... Generative Machining

△ Add Setup

△ Modify Assembly

△ Add Fixture To Assembly, MB3, get, MB2
highlight **Clamp Plate** and **Conrod Fixture**, OK



Assembly Setup... Generative Machinng

Dismiss

△ Add Operation

△ Milling Volume, Clear, Create

△ Surface Select

MB3 all, MB2, OK

△ Cutting Tool Spec

Find..

Identifier = 10 mm end mill

Diameter = 10

Pull Down Ball mill to End Mill, OK

△ Machining Parameters

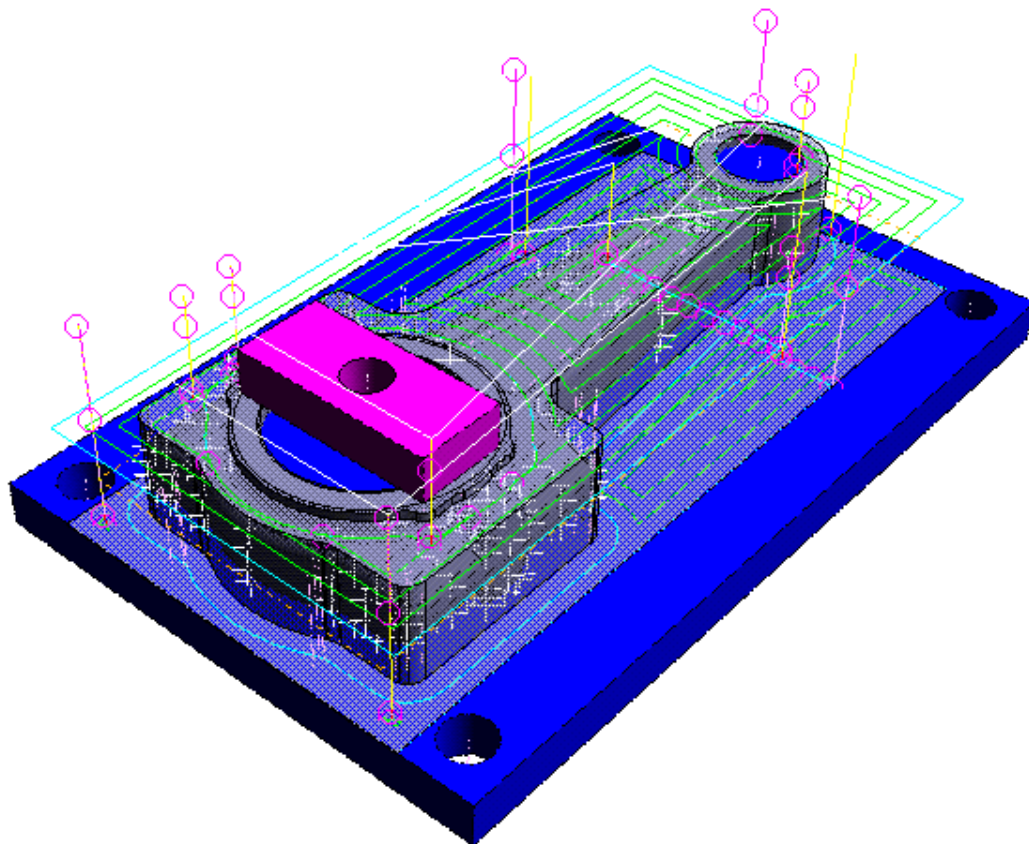
Cut Pattern – Spiral IN

Axial Depths

Generate Depths, toggle automatic depth creation off, highlight second depth from the top, click the eraser icon and delete all but the first value. Type **12** in the highlightd box, select the green icon, OK, OK

△ Process , OK

△ Animate



Generative Machining ... Design Master Assembly

△ Get

Get the engine assembly

△ Zoom All

△ Hierarchy

Highlight **Head Assembly (Hidden)...**
Select **Show, Dismiss**

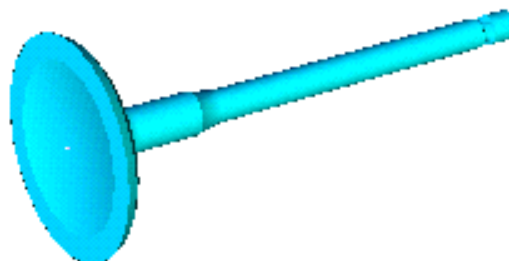
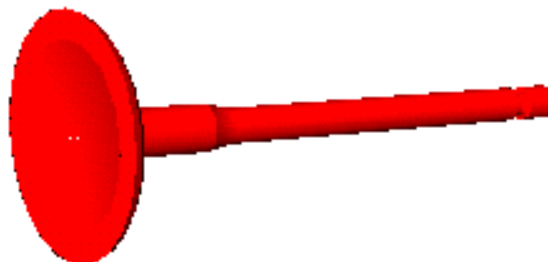
Master Assembly.... Master Modeler

△ Display Filter

Assembly toggle off

△ Get

Get the valve-cored and valve solid



val – global to display valve development form.
The valve development form appears. Click on the form to make it disappear. Discuss customization of forms and interface.

sss – to access open architecture spreadsheet

Discuss the ability to access Master Model information, drive critical parameters to a spreadsheet, change the values in the spreadsheet, and then drive the Master Model geometry from that spreadsheet.

Valve Development System

Type of Valve: ☒ Intake ☐ Exhaust ☐ Both
☐ Solid ☐ Sodium

Design Alternative Name:

Geometry

Overall Length:

Head:

Diameter:
Seat Angle:
Seat Width:
Secondary Angle:
Secondary Width:
Back Angle:
Blend Radius:
Stem Base Dia.:
Head Height:
Cup Radius:
Cup Depth:

Keeper:

Position:
Radius:

Stem:

Diameter:
Blend Radius:

Sodium:

Diameter:
Length:

Material Selector

Type	Max Temp Allowable	Endurance Strength @ Max Temp.
4340	550	7000
4340 with sleeve	700	7000
1020	400	5000

OK APPLY RESET CANCEL

Design Results Comparison

Design Type	Weight	Cost	Material	FEA stress/ allowable	Head Bleed Radius	Cup Depth	Cup Radius	
Design A Solid	7.51E-09	2.91	steel	20000	4.0	1.5	40	
Design B Sodium	6.89E-09	3.82	steel	20000	4.0	1.5	40	

Modify Cancel

Master Model ... Master Assembly

△ Display Filters

Toggle Assembly Display on

△ Replace Instance

Select a valve instance in the assembly

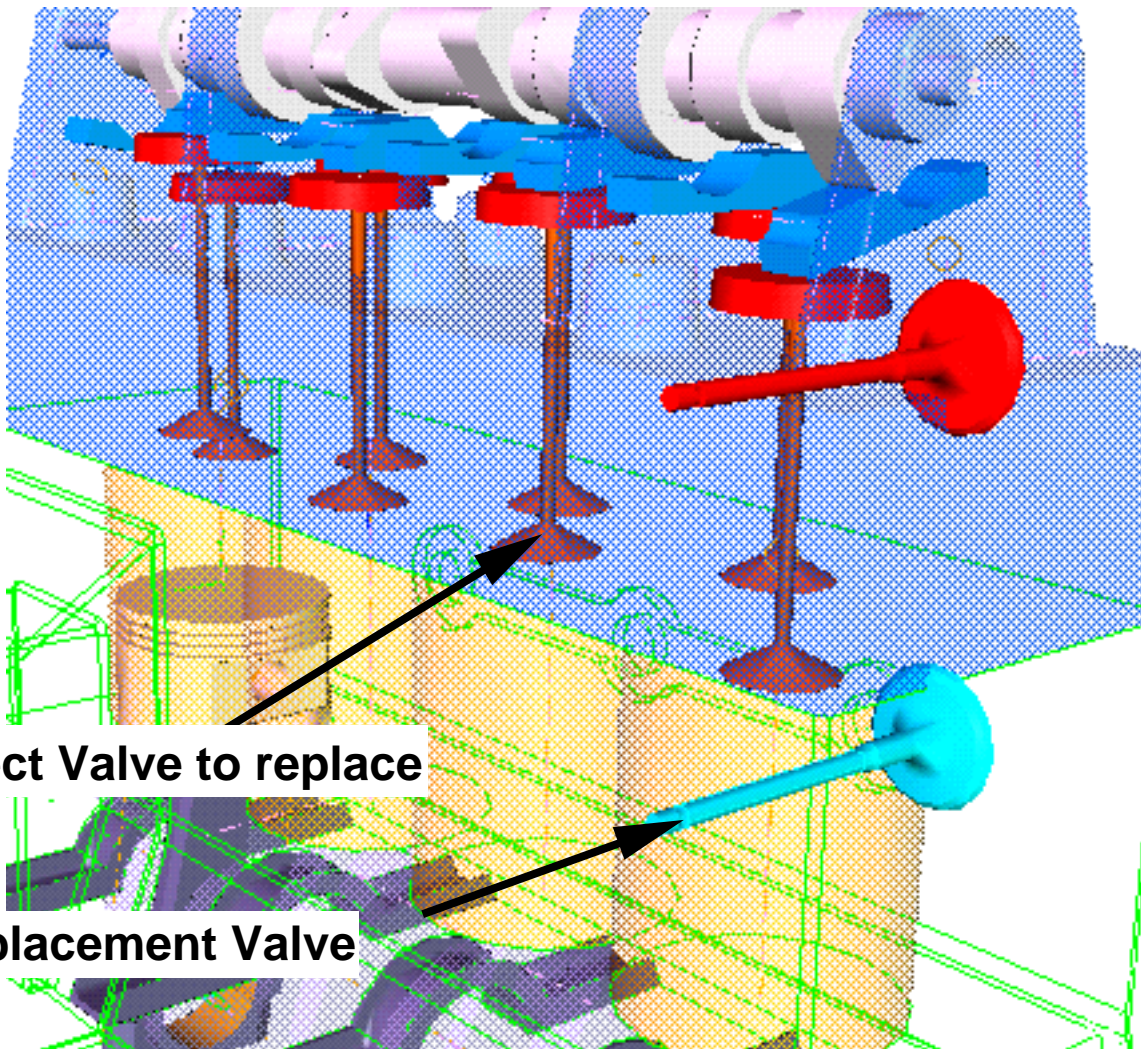
Select the lower valve instance (cyan) to replace it with.

△ Delete

Select the red valve left over to delete

cg – Clear Graphics

Turn erase off and display start.pff to wrap up demo



Open Part Modeling Vignette

△ **Get**

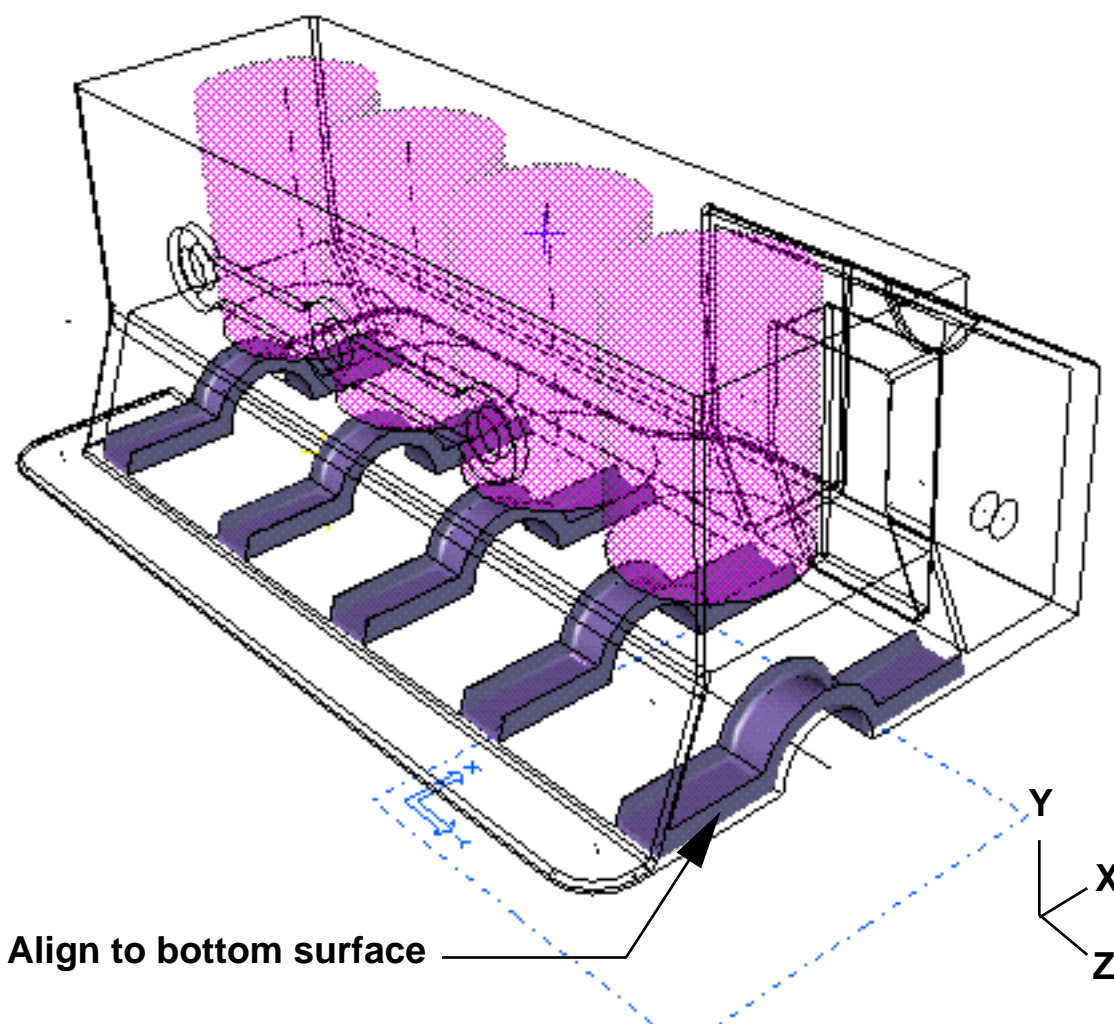
Get the block_wf from the parts bin

△ **Display Filters**

Turn the workplane display on, **OK**

△ **Align**

Pick the workplane, align to the lower surface of the front bearing cap as shown, **Done**



△ **View Workplane**

△ **Perspective Off**

△ **Polyline**

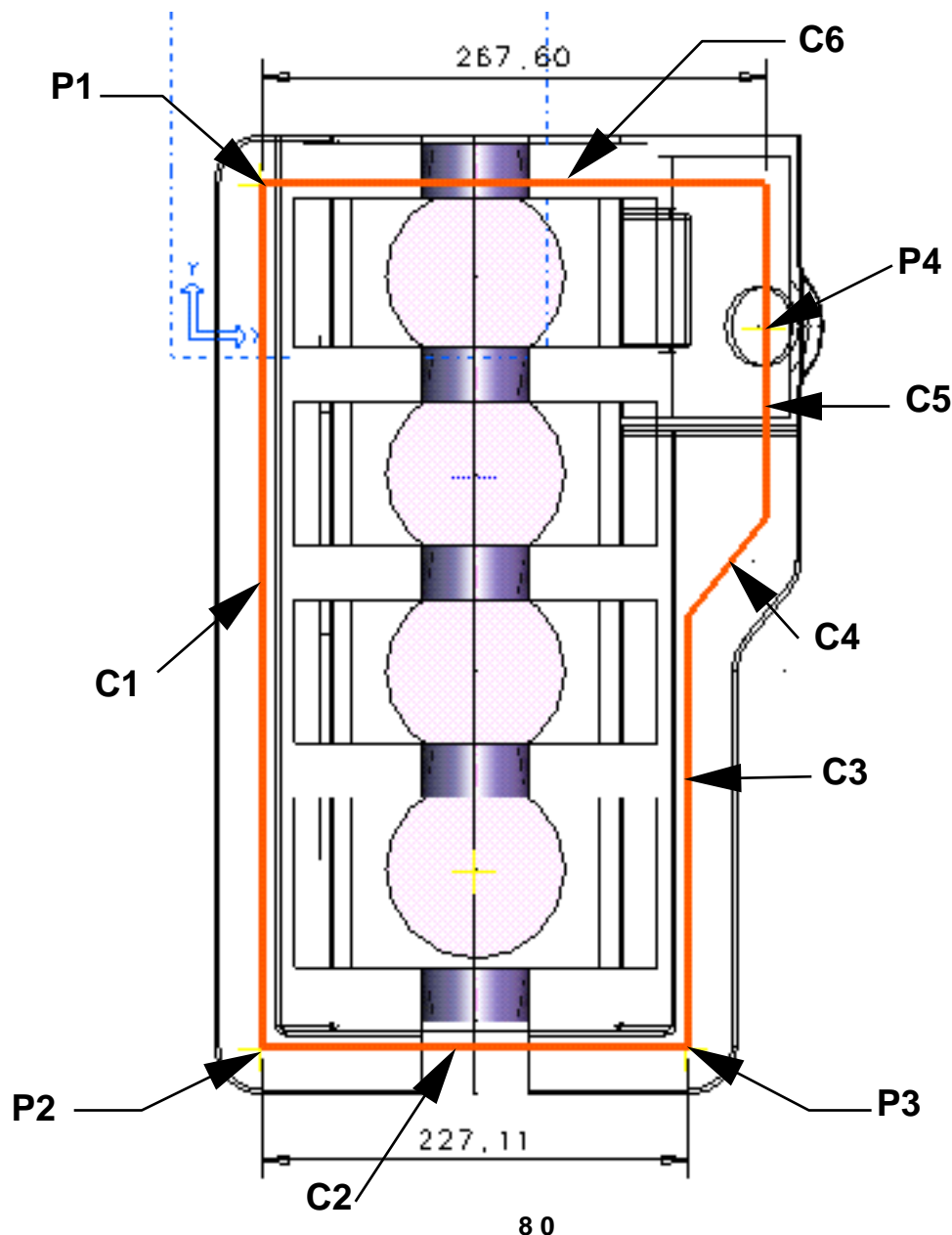
MB3, Focus, pick point **P1**. Continue selecting and focusing on **P2** and **P3** to create lines **C1** and **C2**.

Catch the center drop line of **C1** to create line **C3**

Sketch line **C4** roughly as shown focusing on and aligning to **P4**

Create line **C5** by aligning to and catching a parallel constraint to **C1**.

Finish the sketch with line **C6**

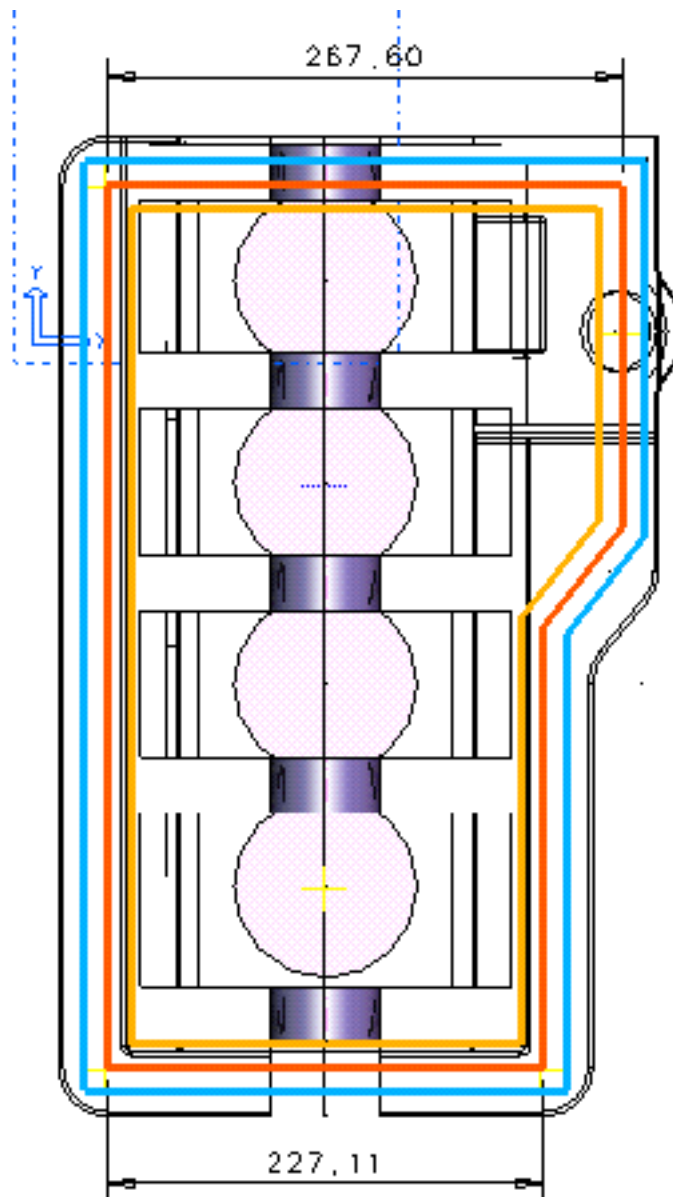


△ Build Section

Select the wireframe

△ Offset

Pick the section, **MB2**,
Distance = 12
Pull Down Both Sides
Associativity off
Highlight Section
OK



Shade Options

Hardware Support

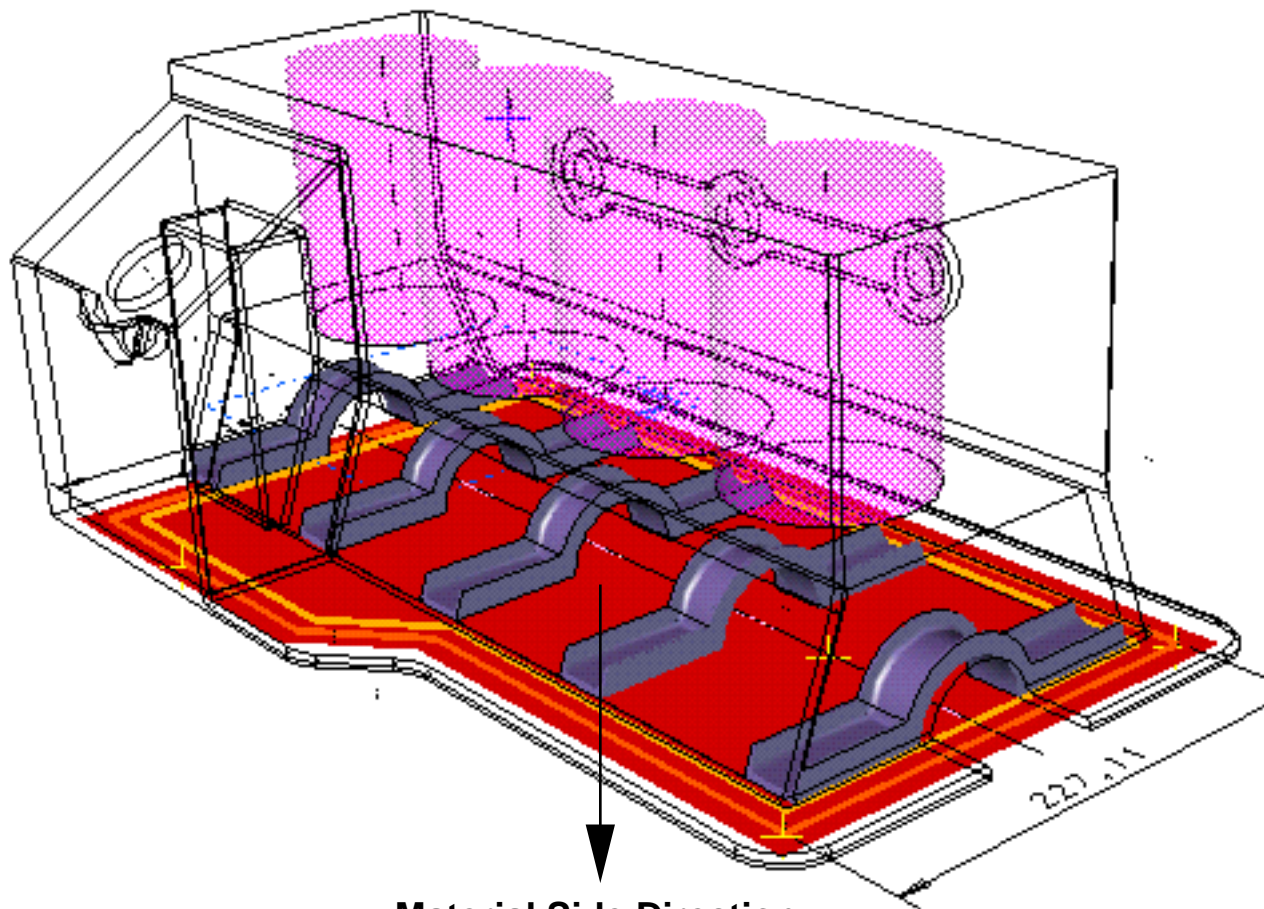
Toggle **on** Hardware Backlighting, **OK, OK**

Surface by Boundary

Pick the outer section, MB2, Yes

Material Side

Select the new surface, MB2, set so arrow points away from block

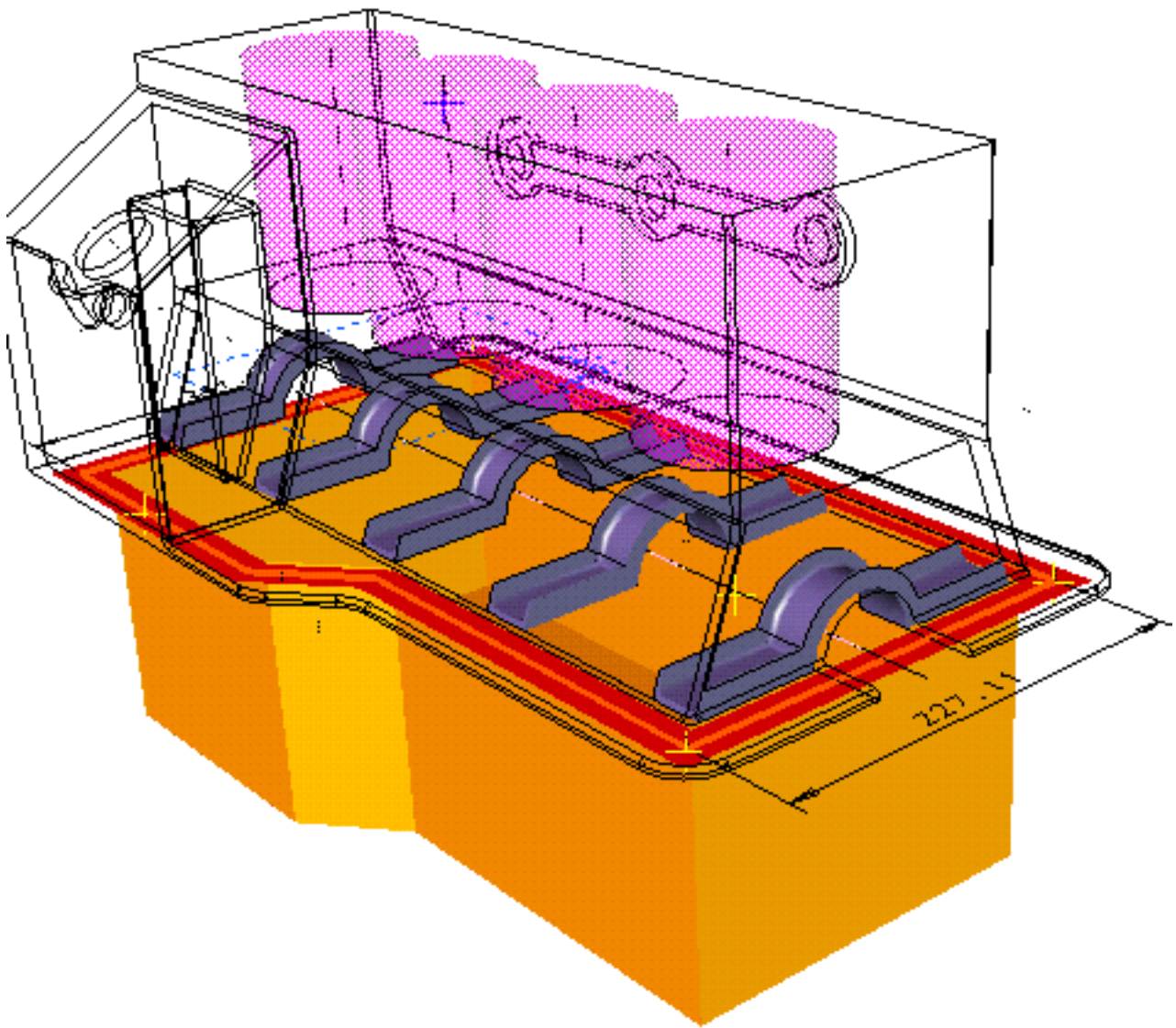


Material Side Direction

△ Extrude

Select the inner section, **MB2**,

Distance = 150
Toggle Cutout, OK
Pick the surface



△ Put Away

Select the Block

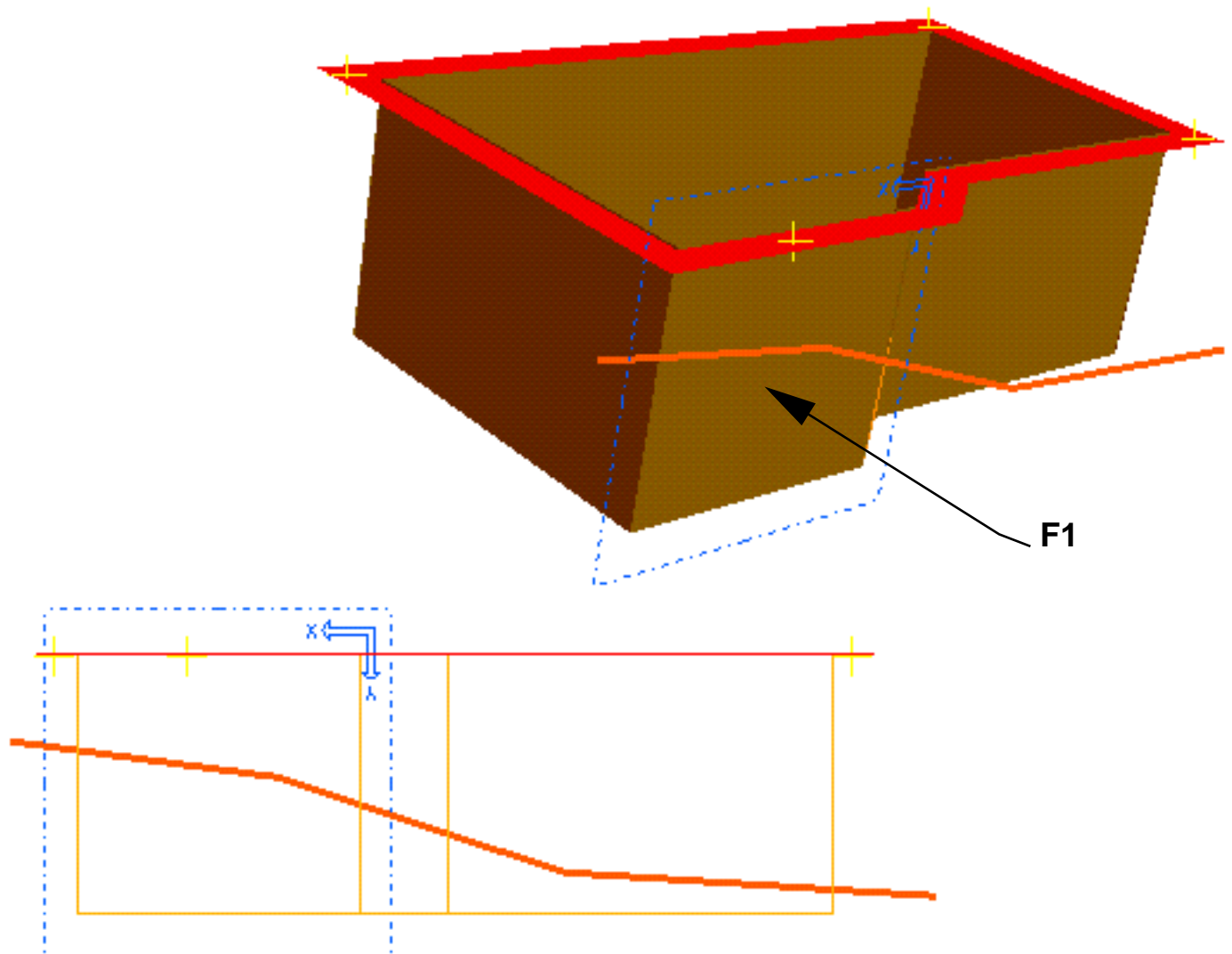
△ Align

Select the workplane and align to F1, Done

△ Side View

△ Polyline

Sketch the side view of the oil pan



△ **Extrude**

Select the wireframe, New part, extrude into the existing part, OK

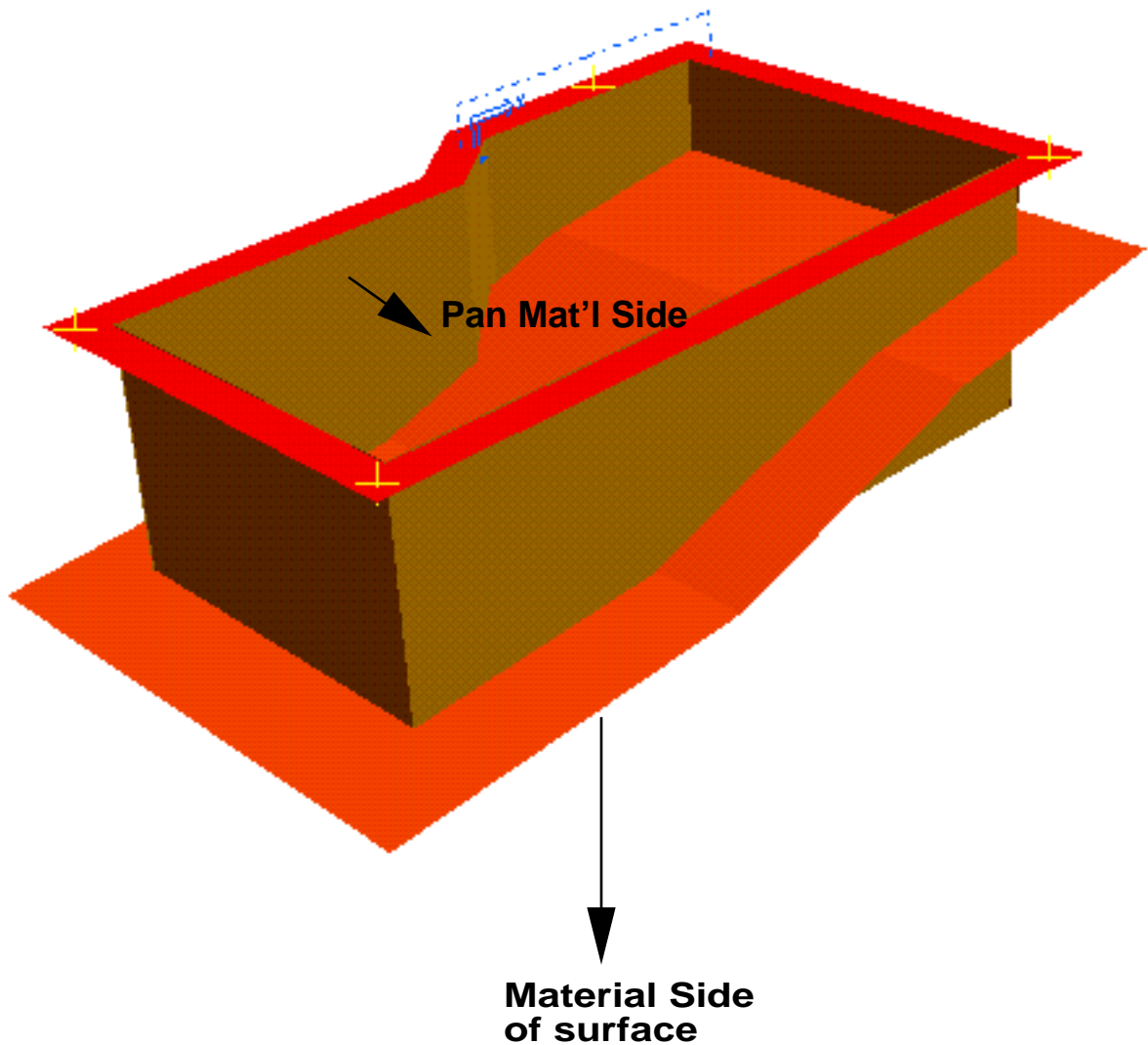
△ **Material Side**

Select the newly created surface, **MB2, One, Yes, No MB2**

Material side should be facing down

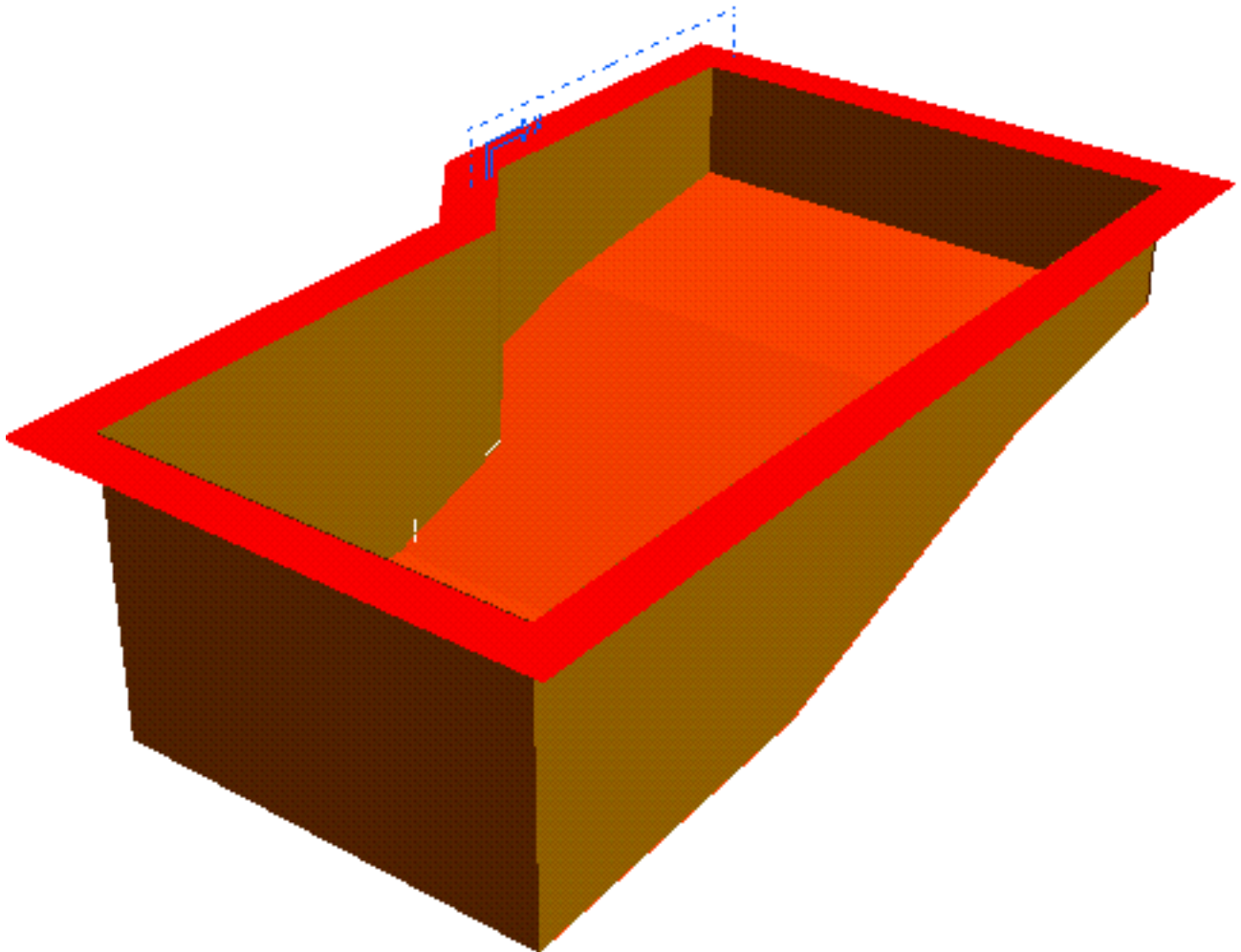
△ **Material Side**

Select a surface from the pan, **MB2, Yes** to flip side pointing in, **NO, MB2**



Cut

MB3, Relations Off
Pick the surface, pick the pan part



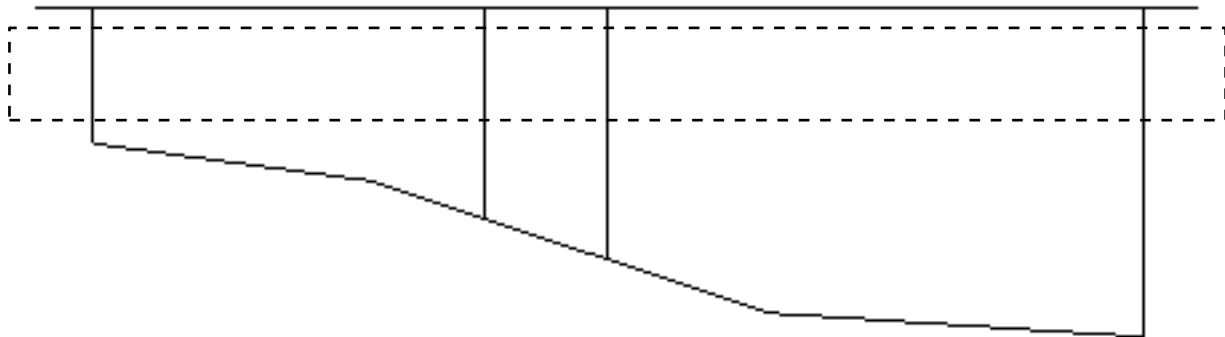
△ Fillet

MB3, Filter, edges, pick only

MB3, Area Options...Part In

Capture all of the edges on the window as shown

R=20 mm



△ **Fillet**

Select edge **E1** and **E2**
R=30

△ **Fillet**

MB3, Edge Chaining ON, select lower edge **E3**, **MB2**,
R=15

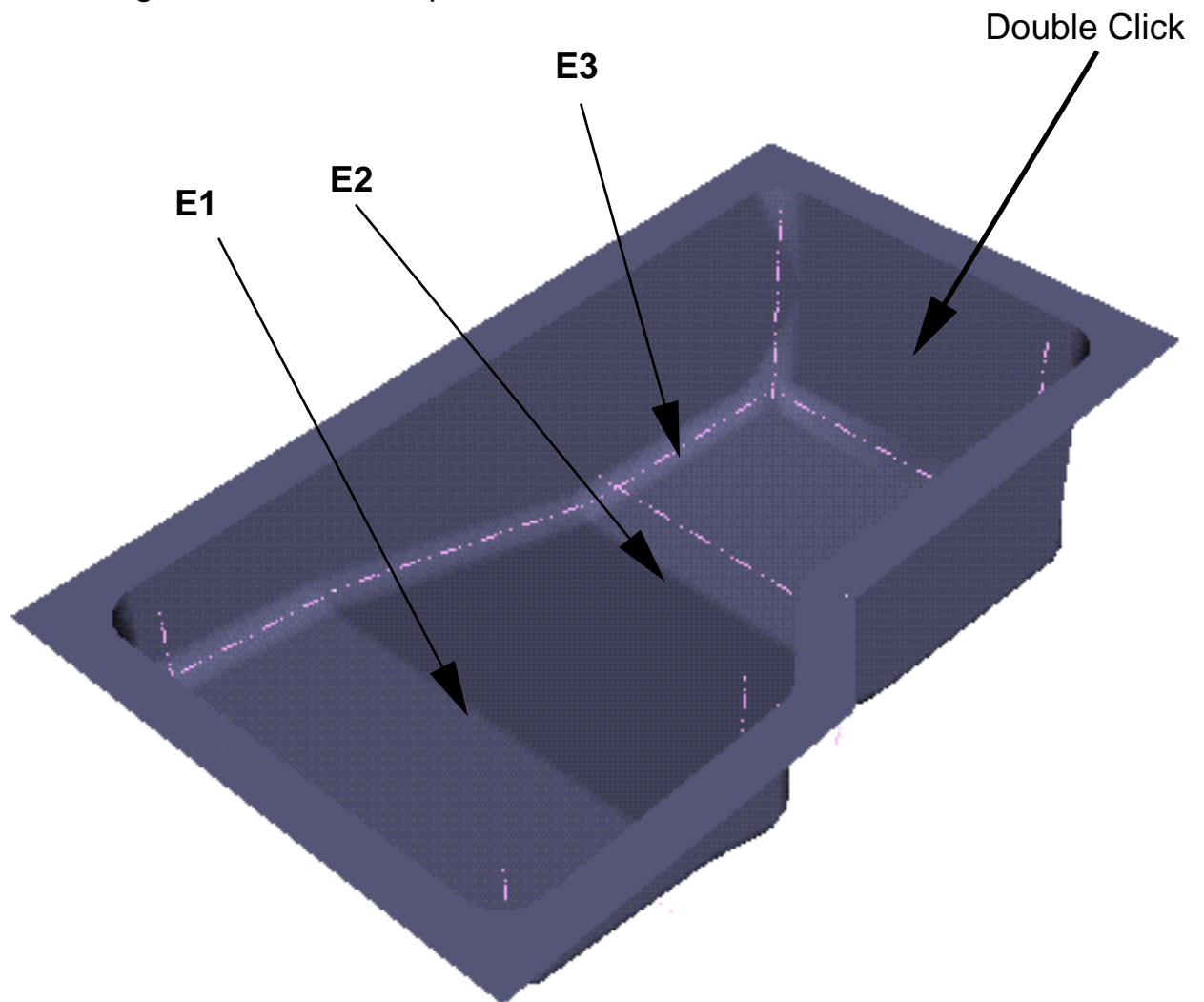
△ **Modify**

Double click the extrude feature, **MB2, Feature Parameters**
toggle **Draft = -5 degrees**

△ **Update**

△ **Appearance**

Change the color of the pan to **steel**



△ **Sketch in Place**

Select the top surface of the pan

Build Section

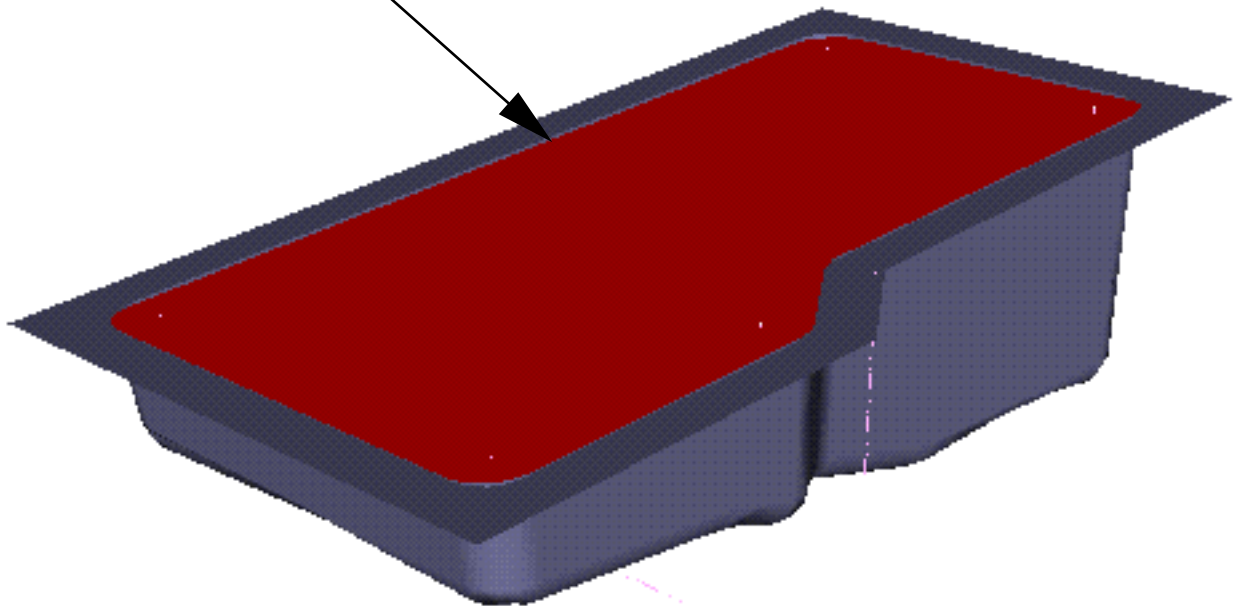
△ **Surface by Boundary**

Select the inside top edge of thje pan

△ **Stitch Surface**

MB3, pick surfaces, MB3, All Done

Select the inside edge to
create the surface



vw – runs volume.prg

Estimate the lower bound of the part

Select an approximate location at **P1**

Estimate the upper bound of the Part

Select an approximate location at **P2**

Set Oil

Quarts

Enter Volume of Oil

5

Enter the allowable error (+/-)

2

Estimate

Select an approxiamte location at **P3**

Calculate

Delete the top surface of the oil pan to further expose the level of "oil" in the pan after the macro completes

