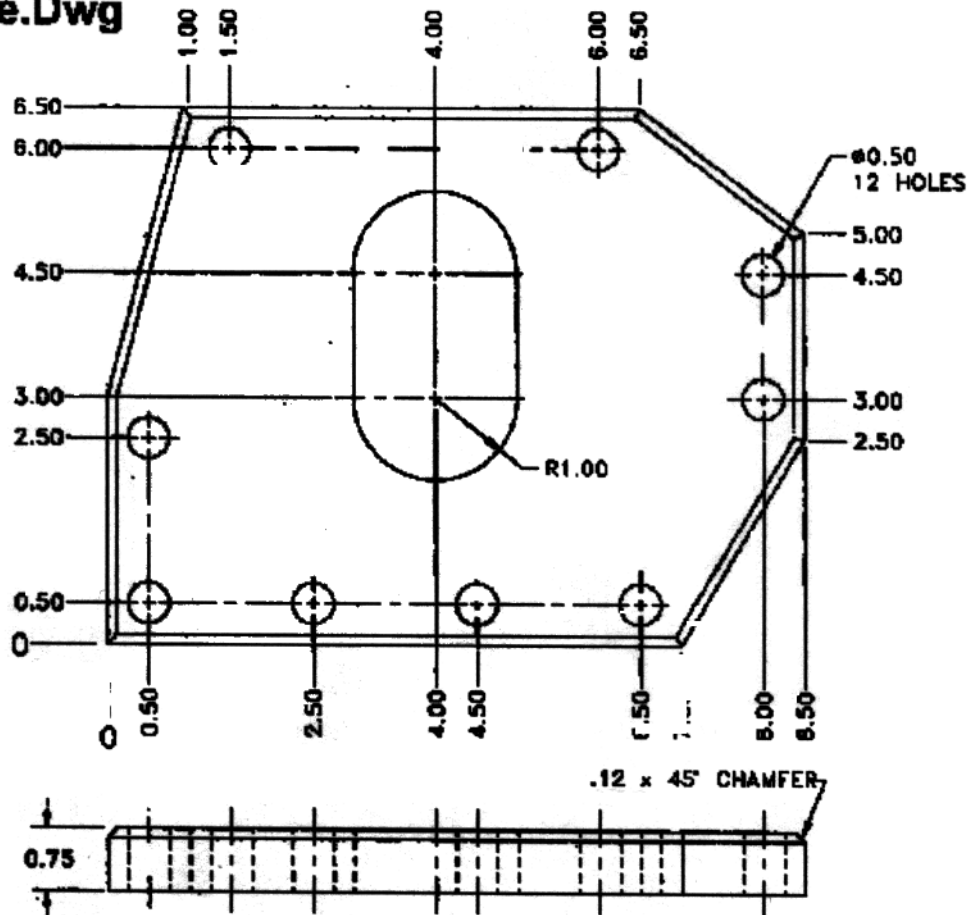*To use Extrude
line must be pline*

Bplate.Dwg

Purpose:

This tutorial is designed to produce a solid model of the Bplate using AutoCAD Advanced Modeling Extension commands.

System settings

Keep the current system settings to 0,0 for the lower left corner and to 12,9 for the upper right corner. Use the Units command to change the number of decimal places past 0 from 4 to 2. Turn the Grid on and change the grid spacing from 1 to 0.5 units. Keep all the remaining system settings.

Layers

Special layers do not have to be created for this tutorial.

Suggested commands:

Begin this tutorial by constructing the profile of the Bplate using polylines. Add all circles and enter the Advanced Modeling Extension. Use the Solext command to extrude all entities the thickness of the base at 0.75 units. Use the Solsub command to subtract all cylinders from t5he Bplate forming the holes of the plate. Use the Solmesh command to surface the model before performing a hidden line removal using the Hide command.

Dimensioning

Dimensions do not have to be added to this problem.

Plotting

This tutorial exercise may be plotted on "B" size paper (11"x17"). Plot the objet to a scale value of 1=1 to produce a scale plot.

Step # 1

Begin the Bplate by establishing the a new coordinate system using the UCS command. Define the origin at 2,1.5. Use the Ucsicon command to update the user coordinate system icon to the new coordinate system location on the display screen. Use the Pline ccmmand to draw the profile of the Bplate.

Command: **UCS**
Origin/Zaxis/3point/Entity/View/X/Y/Z/Prev/restore/Save/Del/?/<World> **Or**
Origin point<0,0,0> **2,1.5**

Command: **Ucsicon**
ON/OFF/All/Noorigin/ORigin/<ON> **Origin**

Command: **Pline** ——————/ can be extruded
Form point: **0,0**
Current line width is 0.00
<Endpoint of line>: **@7<0**
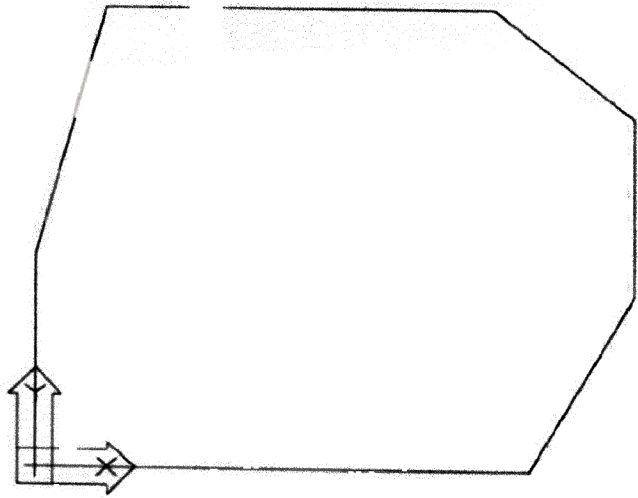<Endpoint of line>: **@1.5,2.5**
<Endpoint of line>: **@2.5<90**
<Endpoint of line>: **@-2,1.5**
<Endpoint of line>: **@5.5<180**
<Endpoint of line>: **@-1,-3.5**
<Endpoint of line>: **Close**

Step #2

Draw the 12 circles of 0.5 diameter by placing one circle at "A", and copying the remaining circles to their desired location. Use Copy-Multiple command to accomplish this.

Command: **Circle**
3P/2P/TTR/<Center point>: **0.5,0.5**
Diameter or <Radius>: **D**
Diameter: **0.5**

Command: **Copy**
Select objects: **L**
Select objects: *(Strike Enter to continue)*
<Base point or displacement>/Multiple: **M**
Base point: **@** *(references the center of the 0.5 circle)*
Second point of displacement: **2.5,0.5**
Second point of displacement: **4.5,0.5**
Second point of displacement: **6.5,0.5**
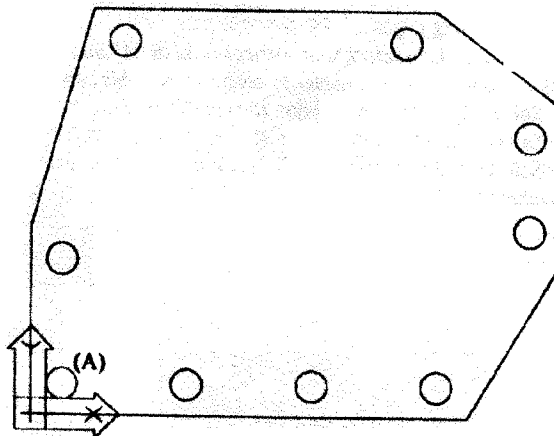Second point of displacement: **8,3**
Second point of displacement: **8,4.5**
Second point of displacement: **0.5,2.5**
Second point of displacement: **1.5,6**
Second point of displacement: **6,6**
Second point of displacement: *(Strike Enter to end this command)*

Step #3

Form the slot by placing the 2 circles using Circle command followed by two lines drawn from the quadrants of the circles using Osnap-Quadrant mode

Command: **Circle**
3P/2P/TTR/<Center point>: **4,3**
Diameter or <Radius>: **1**

Command: **Circle**
3P/2P/TTR/<Center point>: **4,4.5**
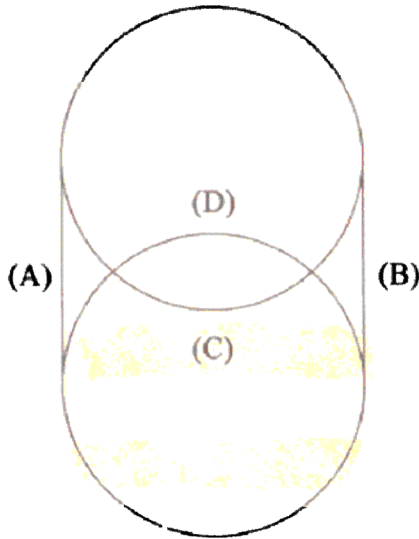Diameter or <Radius>: **1**

Command: **Line**
From point: **Qua**
Of (Select the quadrant of the circle at "A")
To point: **Qua**
Of (Select the quadrant of the circle at "B")
To point: (Strike Enter to end this command)

Step #4

Use the Trim command, to trim away any unnecessary arcs to form the slot.

Command: **Trim**
Select cutting edge(s)…
Select objects: *(select both the vertical lines at "A" and "B")*
Select objects: *(Strike Enter to continue)*
<Select object to trim>/Undo: *(select the circle at "C")*
<Select object to trim>/Undo: *(select the circle at "D")*
<Select object to trim>/Undo: *(Strike Enter to exit this command)*

Step #5

In a few moments, the Advanced Modeling Extension Solext command will be used to extrude all entities to the thick ness of the Bplate, which is 0.75 units. This command, however, only operates on polylines and circles. Currently, all entities must be extruded except for the two arcs and lines representing the slot. Then use the Pedit command to convert these entities into a single polyline.

Command: **Pedit**
Select polyline: *(select the dashed line near "A")*
Entity selected is not a polyline.
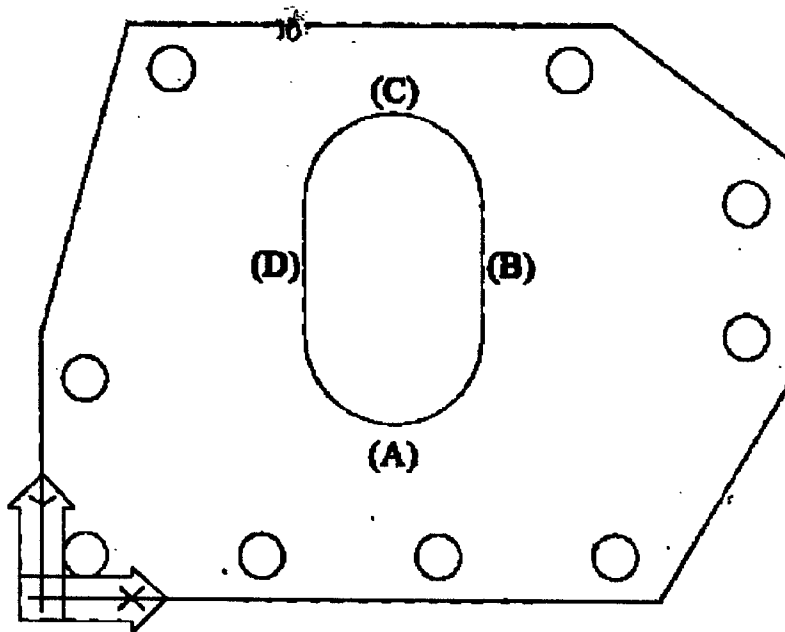Do you want to turn it into one?<Y> **Y**
Close/Join/Width/Edit vertex/Fit curve/Spline curve/Decurve/Undo/eXit<X> **J**
Select objects: *(select the entities labeled "B", "C" and "D")*
Three segments added to polyline.
Close/Join/Width/Edit vertex/Fit curve/Spline curve/Decurve/Undo/eXit<X> **X**

change to
pline

Step #6

From the pull down menu area, load the Advanced Modeling Extension by selecting the Extrude command, which really is the Solext command (Solid Extrude). Selecting the Extrude prompts the user to select the objects to extrude. Select all the polylines and circles that make the plate. Enter a value of 0.75 as the height of the extrusion. This process might tale a few minutes, depending on the speed and the amount of memory of your machine. Turn off the user coordinate system.

Draw → Solids → Extr

Command: **Solext** *(already selected from the pull down menu)*
Initializing Advanced Modeling Extension.
Select polylines and circles for extrusion...
Select objects: **W**
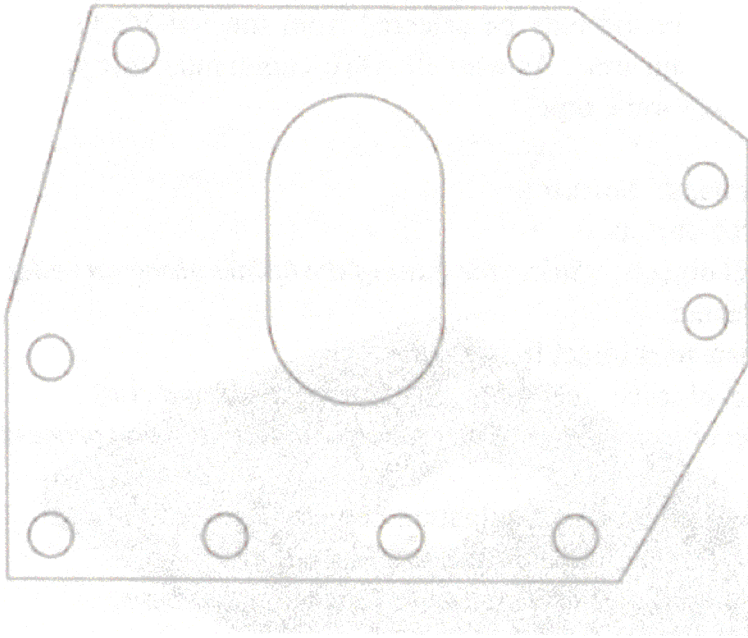First corner: **-1,-1**
Other corner: **9,7**
Select objects: *(Strike Enter to continue this command)*
Height of extrusion: **0.75**
Extrusion taper angle from Z<0>: *(Strike Enter to accept the default)*

Command: **Ucsicon**
ON/OFF/All/Noorigin/ORigin/<ON> **Off**

Step #7

Use the Vpoint command to view the plate in 3D. Use the Solcham command to place a chamfer along the top edge of the Bplate. When prompted to select the base surface, select the entire top surface of the plate. This surface may not select the first time. Use the "Next" prompt until the top surface is selected. Select all individual edges of the top of the plate as the edges to be chamfered. Enter 0.12 as the two chamfer distances to place a 45 degree chamfer. Wait a moment while AME updates the model to include the chamfer.

Command: **Vpoint**
Rotate/<View point><0,0,1>: **0.5,-0.75,0.5**

Command: ~~**Solcham**~~ *Chamfer* (or select from the sol-Modify menu)
Select base surface: *(Select the top surface at "A")*
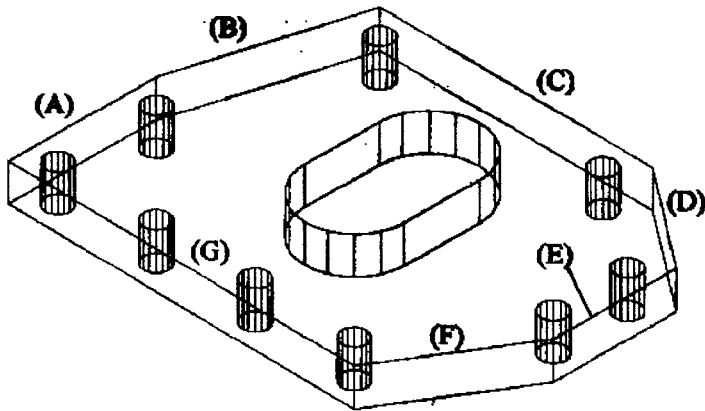<OK>/Next: **N** *(may be required if the top surface did not select)*
<OK>/Next: *(Strike enter if the top surface did select)*
Select edges to be chamfered (Press ENTER when done): *(select all the individual edges of the top of the bplate, edges "A" to "G" then strike Enter)*
Enter the distance along the first surface:<0.00>: **0.12**
Enter the distance along the second surface:<0.12>: *(strike Enter)*

Step #8

With all entities extruded the distance 0.75, the plate is now a solid object complete with 0.12x45 degree chamfer. The holes and slot however are also solid. The Solsub command is used to subtract the holes and the slot from the base of the plate. This resembles actual drilling holes and milling the slot to size. This command may be selected from the Sol-Modify pull down menu area. As with AME commands, this process may take some time.

Command: **Solsub** *Subtract*
Source objects…
Select objects: *(select the base of the bplate along any edges)*
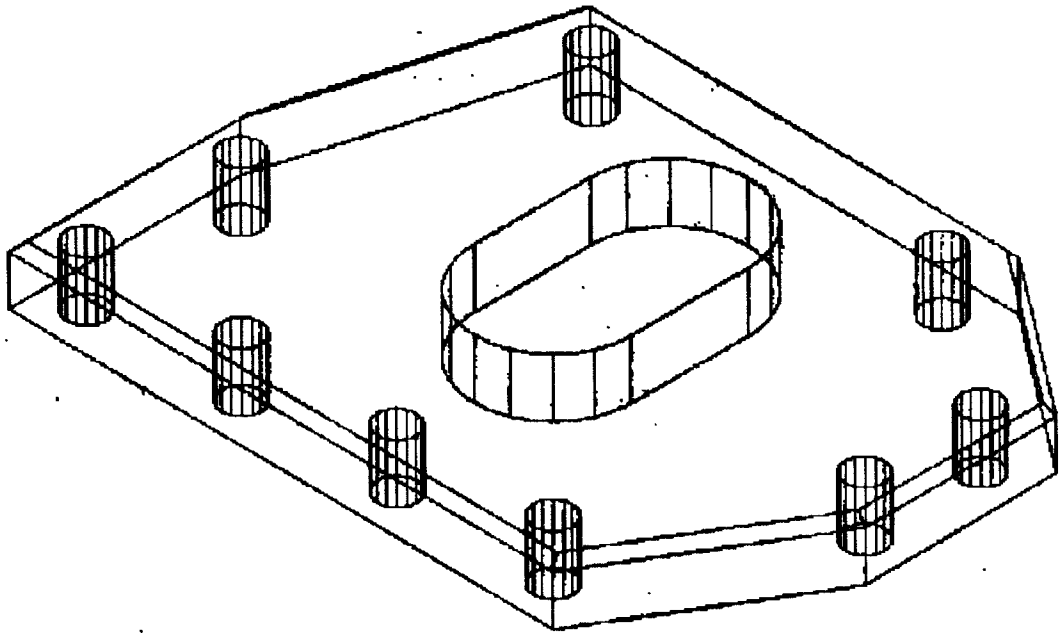1 selected
Objects to subtract from them…
Select objects: *(carefully select every hole and slot)*
Select objects: *(Strike enter to begin the subtraction process)*

Phase I – Boundary evaluation begins.
Phase II – Tesselation computation begins.
Updating AME database.

Step #9

The correct solid model of the plate is illustrated at the right. By default, the current display is that of a wire frame view. To surface the model, Solmesh command is used. This command may be selected from the Sol-Display pull down menu area. This command will take some time to process, depending on the computer.

Command: **Solmesh**
Select objects: *(select an entity on the bplate; all should be highlighted)*
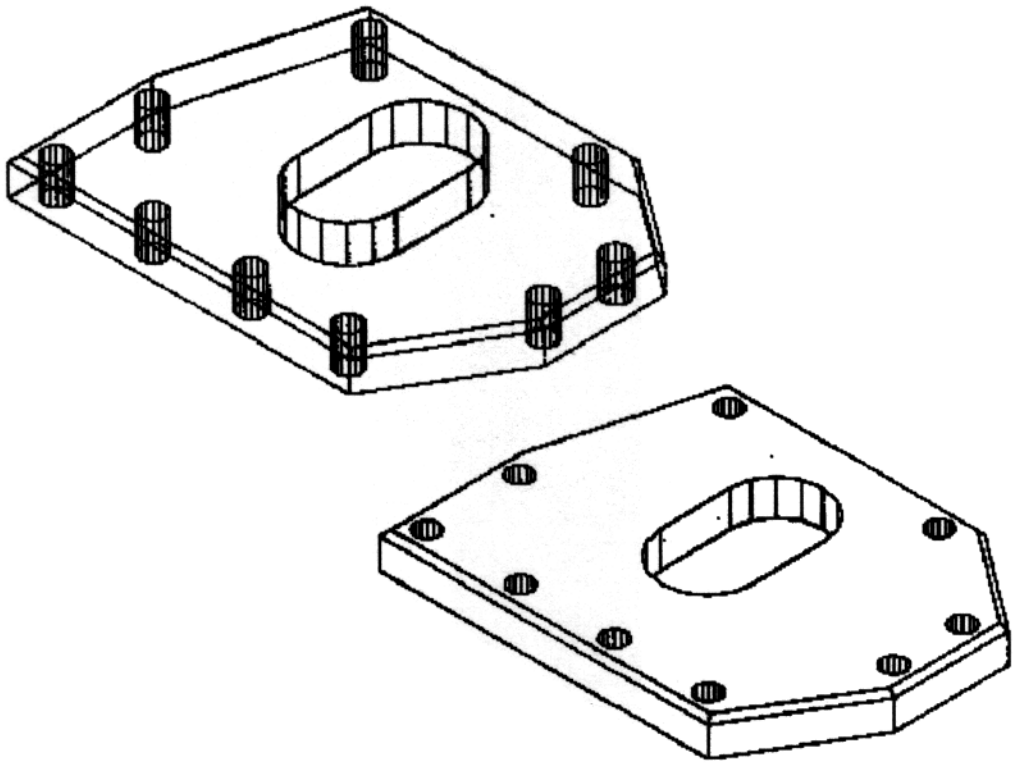Select objects: *(Strike enter to continue with this command)*

Phase I of surface meshing.
Phase II of surface meshing.
Surface meshing of current solid is complete.
Creating block for mesh representation.
Done.

Step #10

To appreciate the automatic surfacing performed by the Solmesh command, set the system variable Splframe to 1. This will turn on all of the 3D surfaces that went into the construction of the object. The faces will not appear until a screen regeneration is forced using the Regen command. This effect is illustrated at the right. To remove the display of the surfaces, , set the system variable Splframe to 0 and perform another screen regeneration.

Command: **Splframe**
Current value <0>: New value: **1**

Command: **Regen**
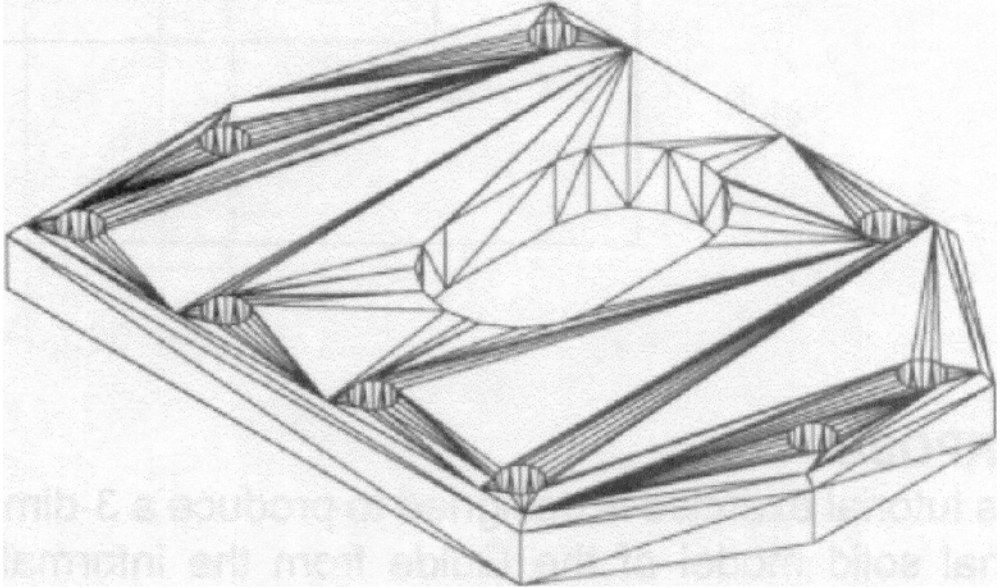
Step #11

Illustrated below is a display of the plate that has been shaded using Shade command. This will produce a shaded image consisting of hidden line removal in addition to the shading being performed in the original color of the model. There are no areas of shadows using Shade command. For best results, add lights and cameras, create a scene, and finally create a filmroll file of this or any surfaced object and import the results into AutoShade.

Command; **Shade**
Regenerating screen.
Shading xx% done.