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-The ATP Staff

## **ATP007C – “Modifying 3D Objects”**

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### **(3.1) Intro/Review –**

Now that we are moving around our UCS and viewing our objects from different angles, we are ready to start modifying them. We will want to remember a few things that make editing objects easier. Always remember to use that 3Dorbit command. Older versions will have to use the DVVIEW, I didn't cover this older command but it works like the 3Dorbit. It helps tremendously to set your shademode of a solid to flat or gouraud shading to see your edits better (you'll never go back to wireframe again). After a while you will notice that it is a good idea to set your UCS to an object or aligned to it as close as possible before working on them. You also might want to get in the habit of saving your work before doing major edits just in case something goes wrong. The other thing you will want to start doing is using your viewports. Lay them out however you like but set them up so you can see, and orientate, your objects from a few different angles.

### **(3.2) Modifying 3D Polylines, 3D Meshes and Surfaces –**

Lets start by modifying the 3D wireframe we created earlier in section B. Open the 3DPOLY.dwg, if you don't have this just create a simple 3D POLYLINE (be sure to give a Z value to at least one point). Set you viewports up so we have top, front and right side views (and an iso). For this exercise we are going to cover the fastest and simplest way to modify these.....GRIPS. Click on your object in the top viewport to highlight it and see your grip points. Now click on a grip to make it "HOT", you can hold down your shift key while selecting grips to manipulate more than one. So now that you have it/them hot you can drag or type in a relative value to move them (like @0,0,2)(from the current location move 0 on X and 0 on Y and 2 in the Z direction). Depending on your system variables, when you click into your front viewport your UCS might align with that view and you can then drag your grip in that viewport after making it "HOT" in the top viewport. Remember you can also use the PEDIT and PROPERTIES commands to Open/Close, Edit Vertex, Spline Curve and Decurve your 3D Polylines.

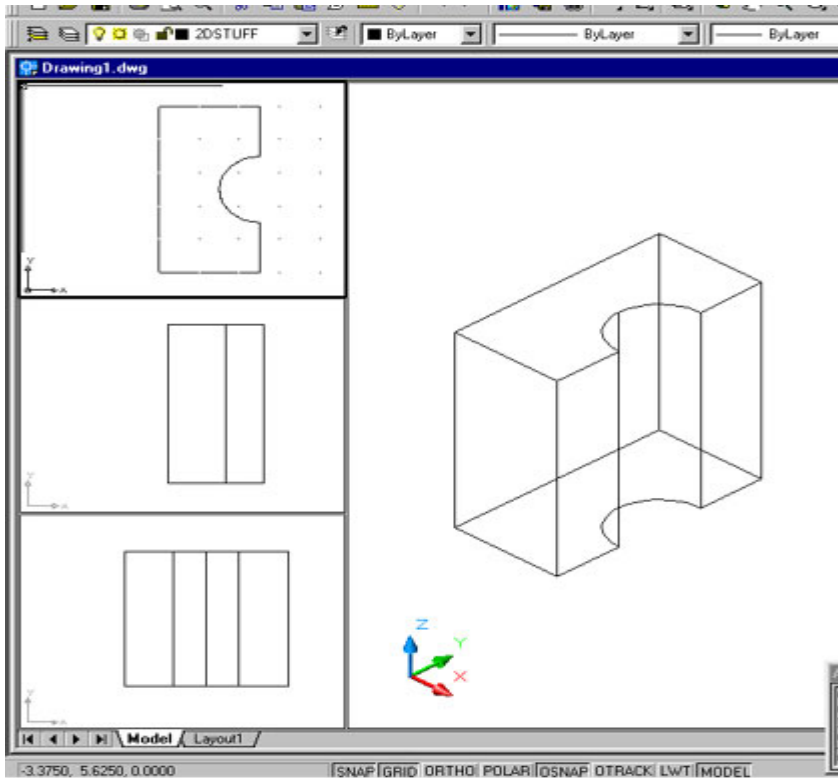
3D Meshes and Surfaces work the same as 3D Polylines in that the grips are by far the easiest way to modify them (change location of points). Sometimes you may have very large 3D Meshes with hundreds of vertices so in this case you would use the PEDIT command to Edit Vertex. Once you are at a vertex form there you can move to the next vertex by going Left, Right, Up or Down (instead of going through the order you entered them). Most of the time when you want to change a Surface you will need to modify the objects used to create the surface and then re-create it. So remember you can also modify these using the PEDIT and PROPERTIES commands, to give your objects a Smooth look with the Fit/Smooth option, or you could do an Mclose or Nclose to close the mesh in that direction.

### **(3.3) Modifying 3D Solids –**

As you can tell I'm not covering the simple commands like move, copy, fillet and chamfer, but just the ones special to 3D objects. We also went over the Union, Subtract and Intersect commands so you can go back to that section for review. Another thing to remember is a lot of the time you will be creating solids just to add (union) or subtract them from the solid you are working with.

Lets start a new drawing and take a look at the SLICE command. Use that acad3d.dwt template you created in the B segment or setup your viewports and create some layers. Set your UCS to the top viewport and make it current. Create a 3D box; type "BOX", use "0,0,0" for the first point and "5,5,5" for the second point. Lets also put a hole through the center of this box. Type "CYLINDER" and for the center point use "2.5,2.5,0", "1" for the radius, and "5" for the height. Now subtract the cylinder from the box (select the box as the "object to subtract from". Save you drawing as "SLICE1.dwg".

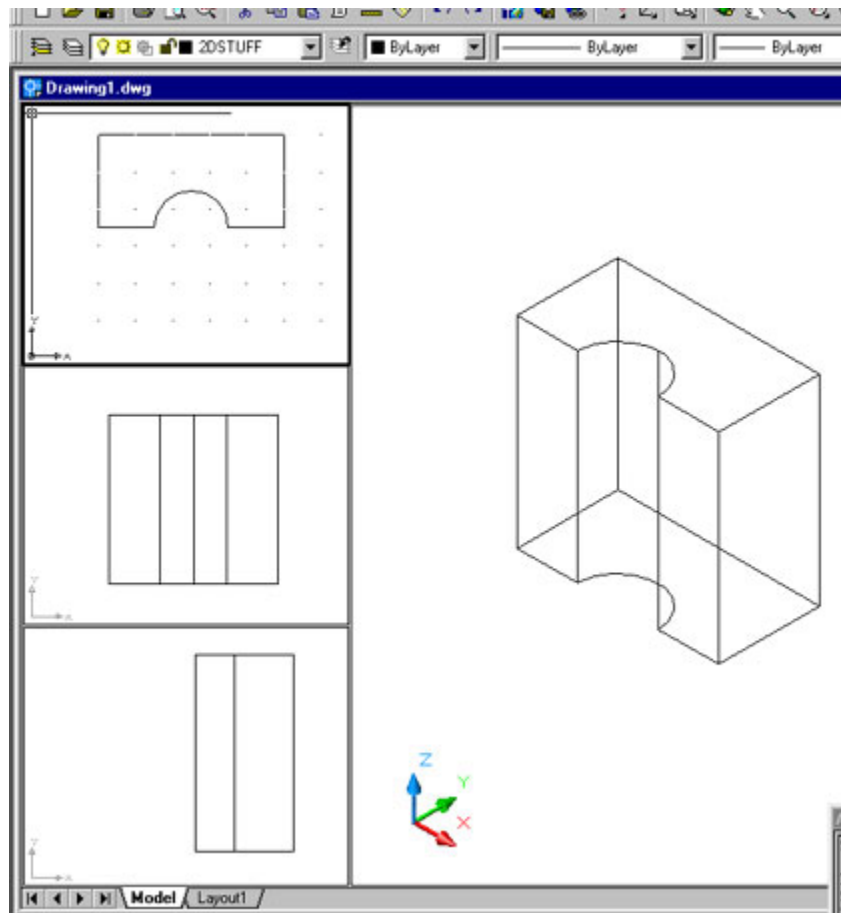
Now we are ready to SLICE our object. We will slice using a Slicing (Cutting) plane. Start the command (type "SLICE") and select the object, now the system is asking you for the first point and the slicing plane. We will need to select 3 points on the slicing plane to define it's location or we can use some other options. Lets use the "YZ" option (type "YZ"). Now you must imagine you are holding a slicing plane vertically and the system is asking "Specify a point on the YZ-plane" (where to do you what to chop it. Just pick the center of the hole. Now the system is asking "Specify point on desired side of plane, or keep Both". Pick anywhere to the left of the center hole to tell the system we want to keep the left half (fig15).



y\_slice.jpg(fig15)

### (3.3) Modifying 3D Objects – (continued)

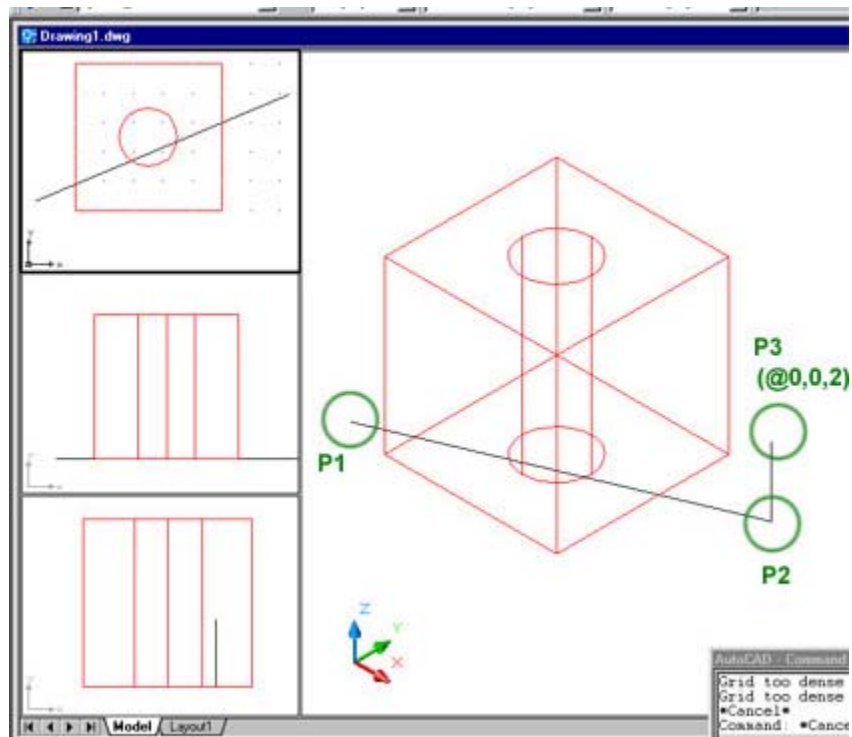
Undo that slice to get back to the box with a hole through it and start the “SLICE” command again. This time lets use the “ZX” option. Again use the center of the hole for the point on the plane and pick a point on the top half (above the center) to indicate that as the side to keep (fig16).



x\_slice.jpg  
(fig16)

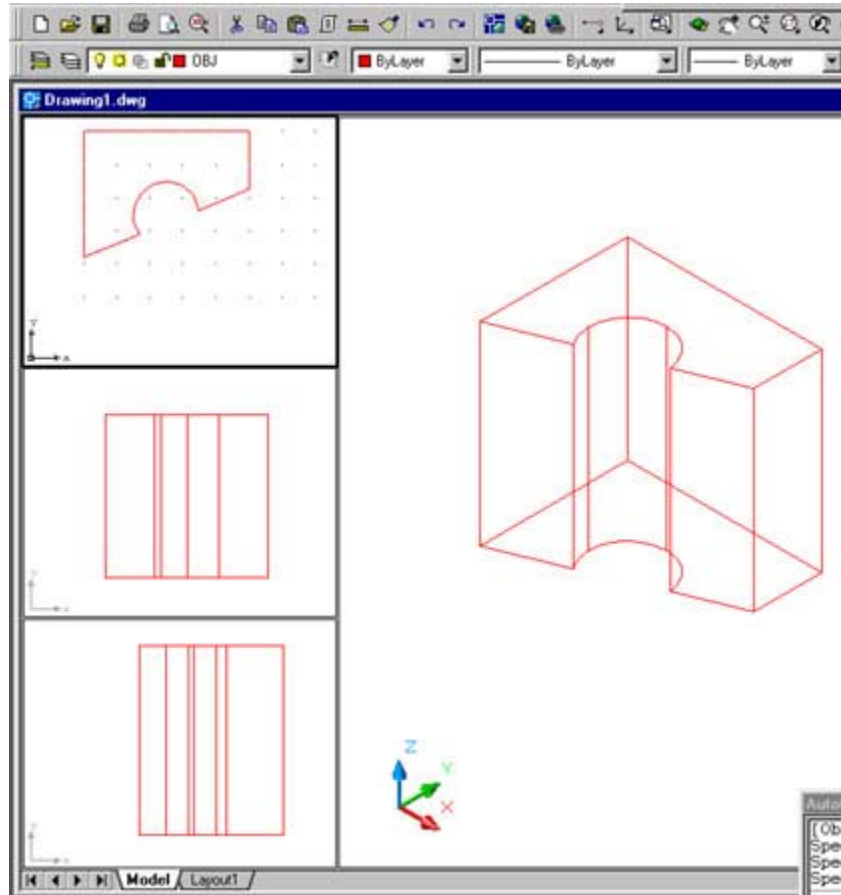
### (3.3) Modifying 3D Objects – (continued)

Lets do it one more time (so undo again back to the box and hole). Start the command and this time use the “3 Points” (or “3” or “Enter”) to accept the default. Now we have to pick three points on our slicing plane. Pick the points around the same locations I have below in. Notice the third point just gives a Z value to the second point so that would be the location of the 3<sup>rd</sup> point on that plane.(fig17) Again pick the top/back half to keep and you should get something like (fig18) below.



3\_slice1.jpg  
(fig17)

### (3.3) Modifying 3D objects – (continued)

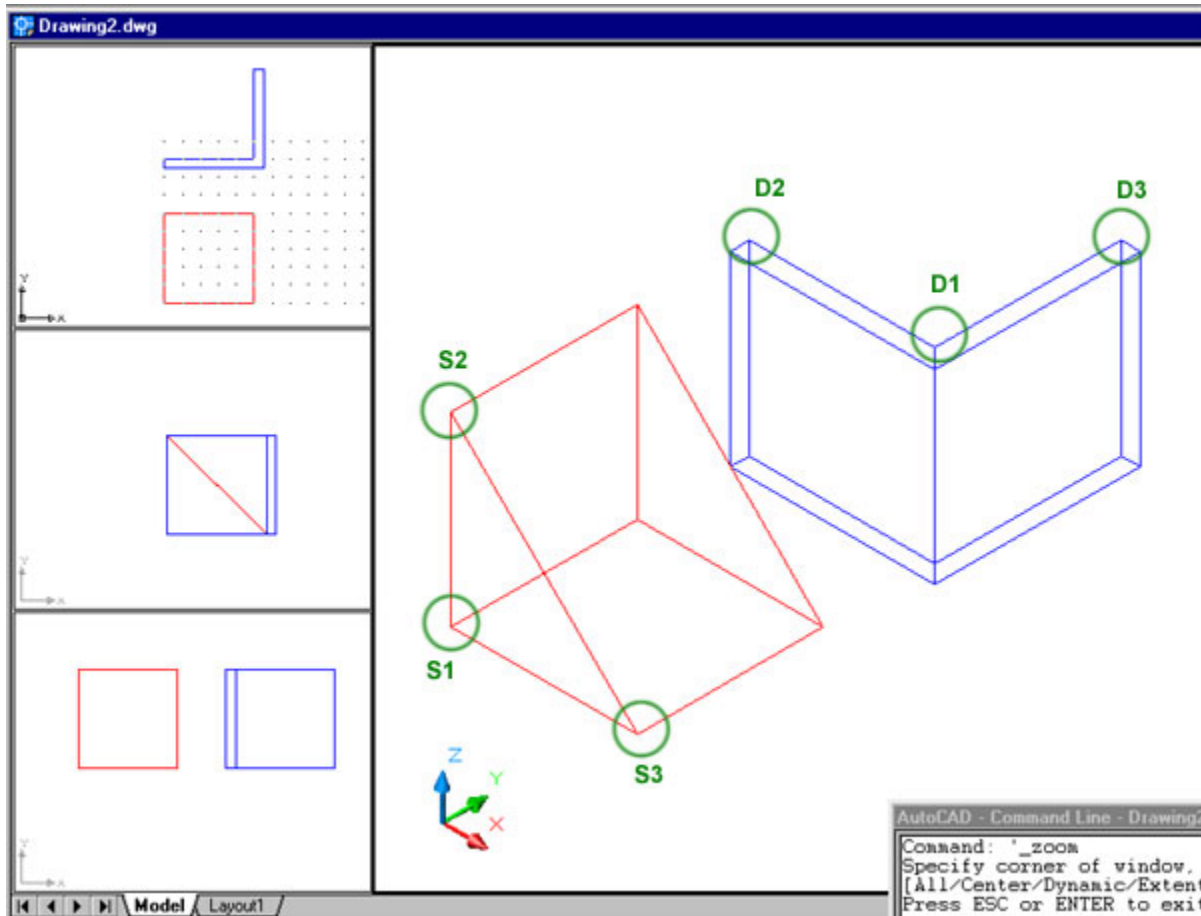


3\_slice2.jpg  
(fig18)

Lets move on to the ALIGN command. We will need some objects so lets create a wedge and an L bracket. Type "WEDGE", use "0,0,0" for the first corner and "5,5,5" for the second corner. Remember the first corner is the tall side and because we used "5" for our Z value we are done. Now lets create the L bracket. Type "PLINE", use these points "0,8", "5,8", "5,13", "5.5,13", "5.5,7.5", "0,7.5" and "CL" to close. Now type "EXTRUDE" and select the polyline, give it a height of "5". We are now ready to ALIGN the wedge and the L bracket.

### (3.3) Modifying 3D objects – (continued)

In the ISO viewport (make it current) type “ALIGN” and select the wedge. Pick (use OSNAPS) your lower left corner for the first source point (S1) (see (fig19) below).

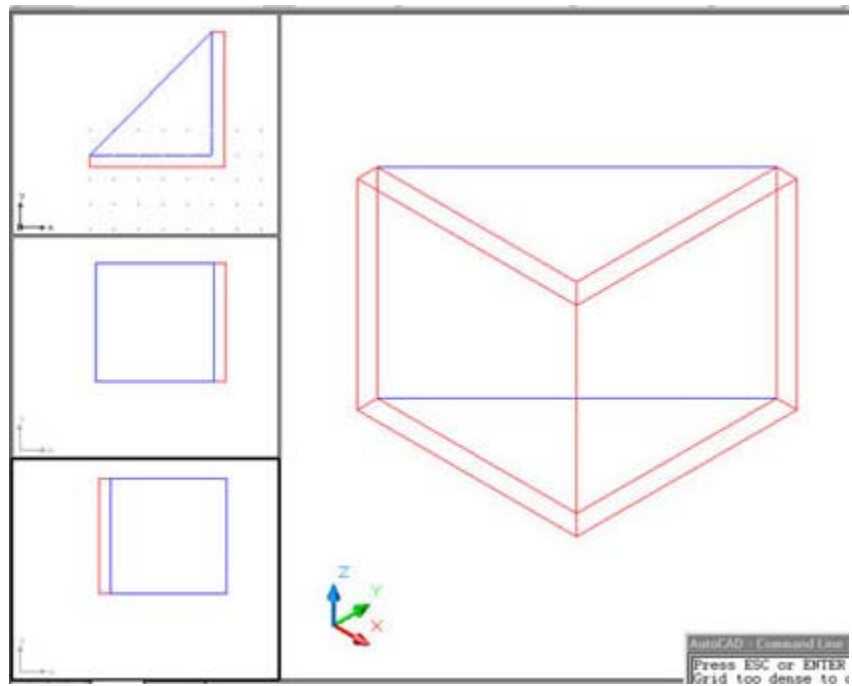


align1.jpg  
(fig19)

Next pick the middle top corner (D1) of the L bracket for your first destination point. The second source point will be the top left corner of the wedge (S2) and the second destination point will be the top right corner of the bracket (D2). The third source point will be the lower corner of the wedge (S3) and the third destination point will be the top right corner of the L bracket. Your WEDGE should ALIGN with your L bracket and look like (fig20) below.



### (3.3) Modifying 3D Objects – (continued)



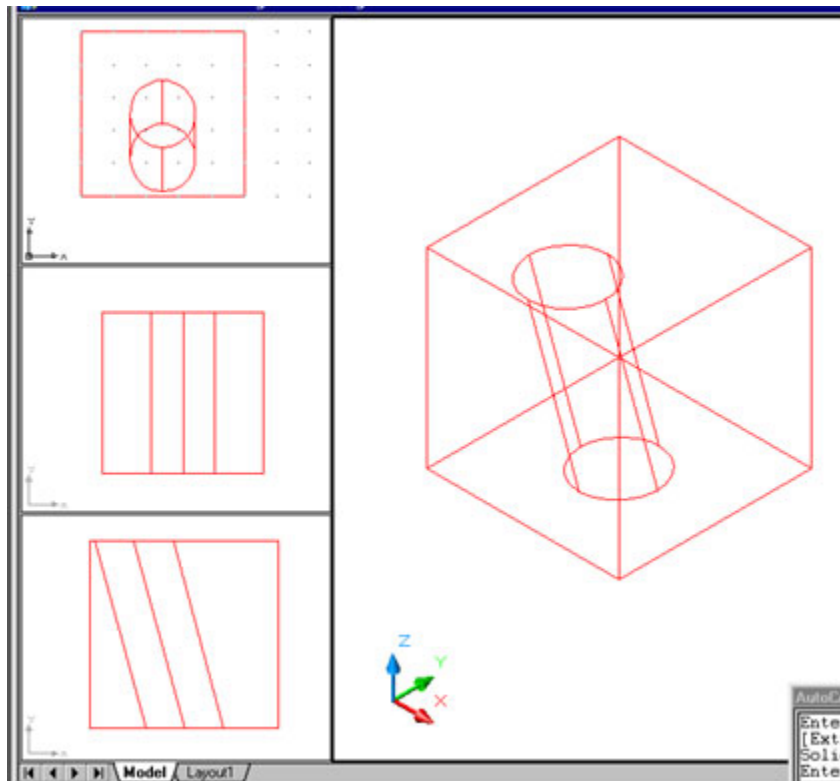
align2.jpg  
(fig20)

I can't go over all the fun commands here so be sure to play with the MIRROR3D, ROTATE3D, 3DARRAY, LIST, AREA, and MASSPROPERTIES. These last three are not modifying commands but you should become familiar with them. ;o)

### (3.4) Advanced 3D Object Modification

Again we are only going to go over a few of the basic SOLID EDITING commands and I'll let you play around with the rest on your own.

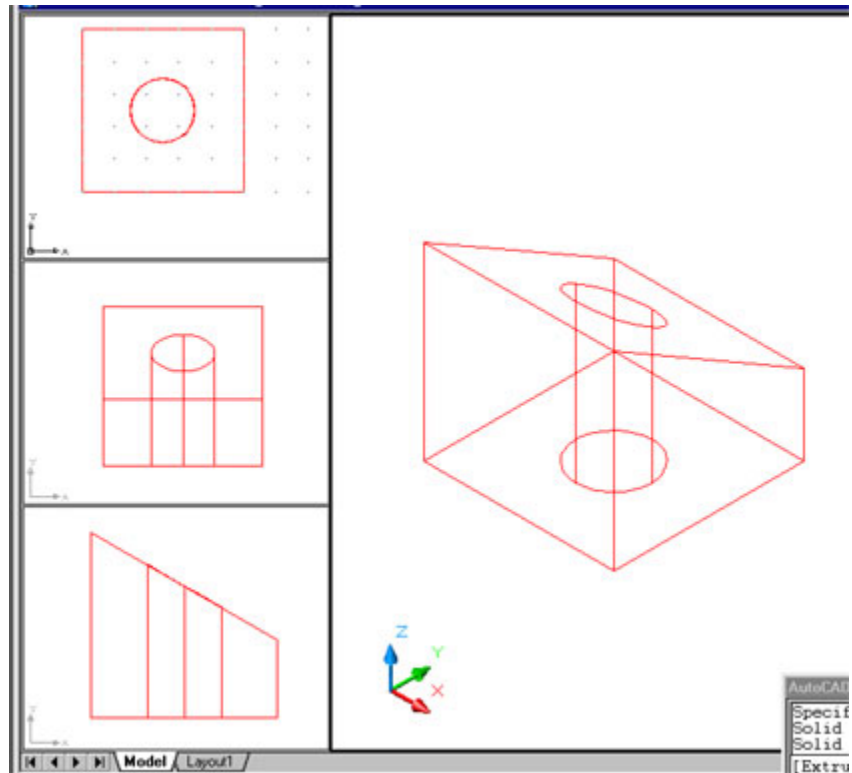
The first one I will explain is the "EXTRUDE FACE". Open the "SLICE1.dwg" drawing back up (or make that window current) and extrude the top face up "2" units. Type "SOLIDEDIT", "F" than "E" then pick the top face (**NOTE:** This is where you get to pick on a face and not the edge of solids) and then type in "2" (no taper) to EXTRUDE (the) FACE up 2 units. You could use a "-2" and the face would go down into the object subtracting material. Undo that and "R"otate (ROTATE FACE) (if still in the SOLIDEDIT command, if not get back in and go to "F"ace and then "R"otate). Select the inside of the hole to select that surface and type "X" (axis). Pick the bottom center of the hole as the "origin of rotation". Lets use "15" (degrees) as our angle and watch our hole rotate :o)) (fig21)



r\_face.jpg  
(fig21)

### (3.4) Advanced 3D Object Modification – (continued)

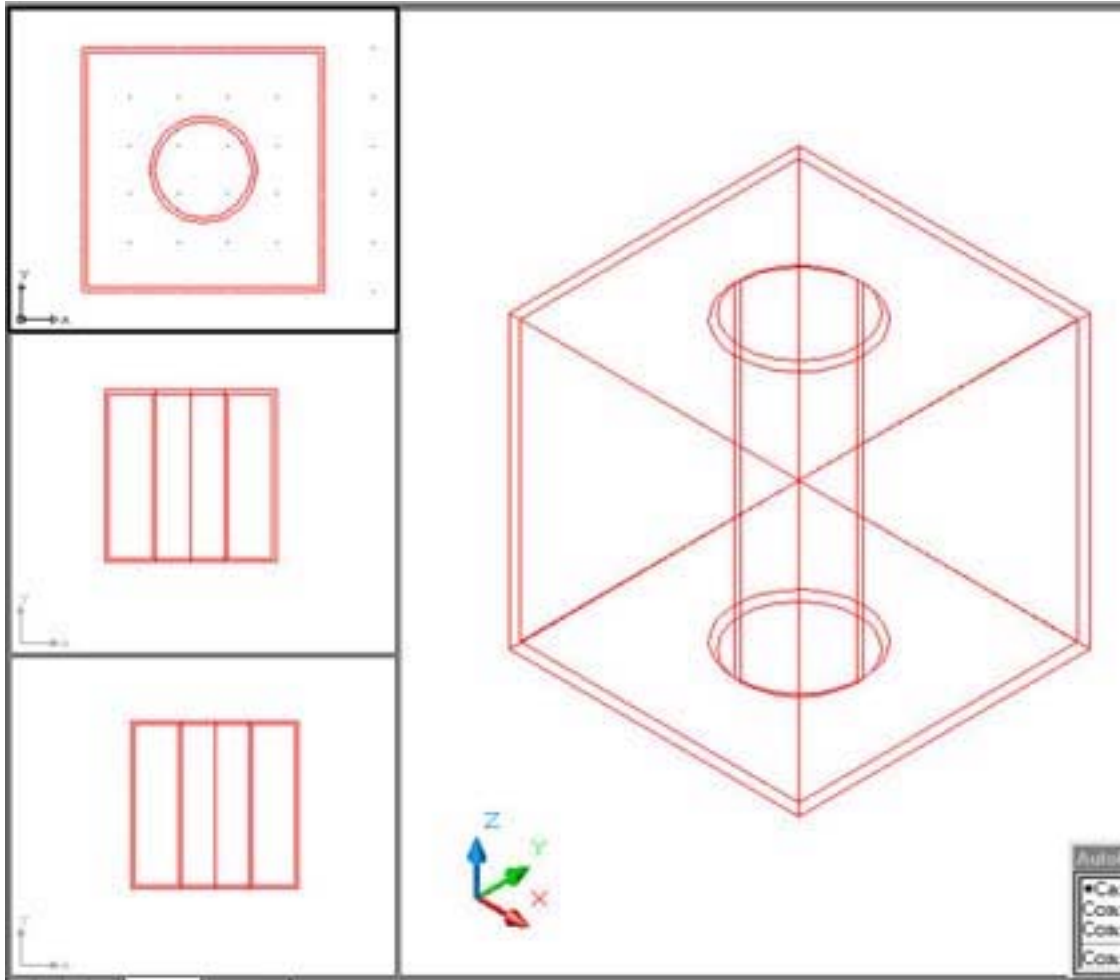
Undo that also and type “T” for TAPER FACE (again this is a sub-command of SOLIDEDIT). Pick your top face as the one to taper, and for the base point pick the top left corner, than “another point along the axis of tapering” will be the very top corner of the object. Use “30” (degrees) for the angle and you should get something like (fig22) below.



t\_face.jpg  
(fig22)

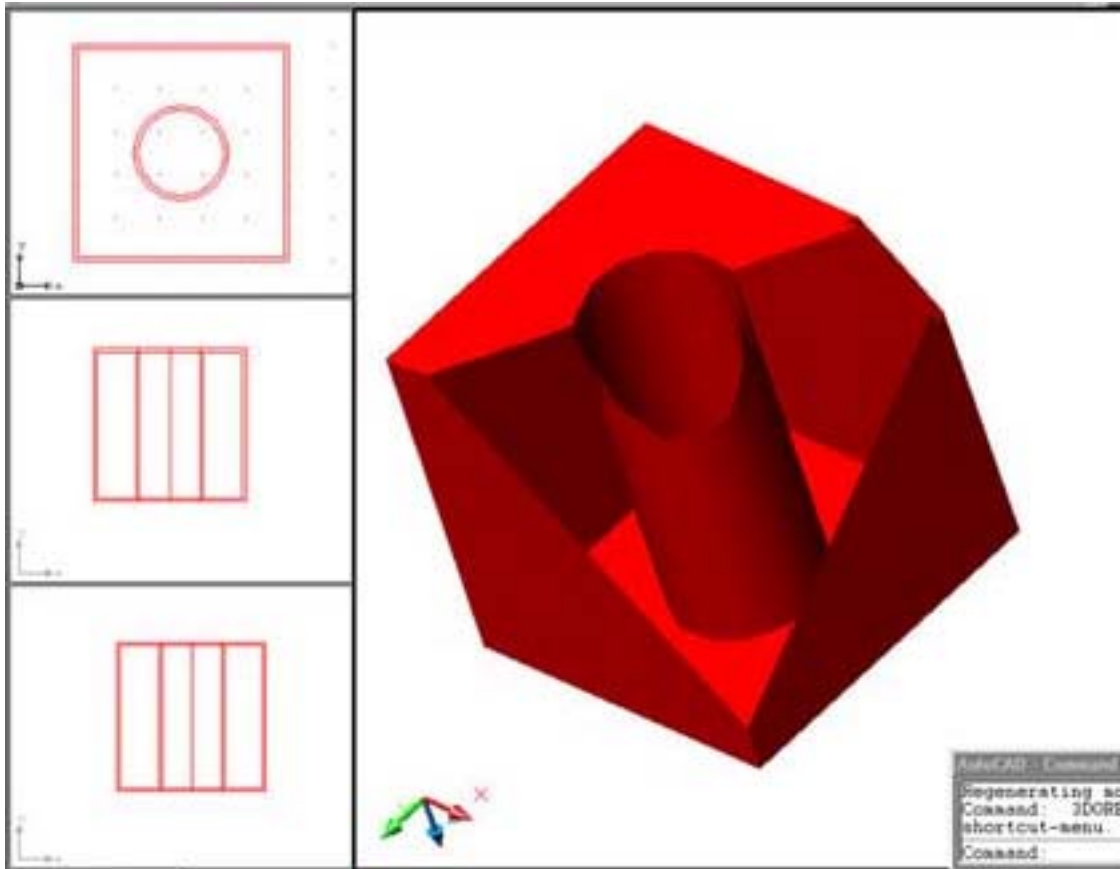
### (3.4) Advanced 3D Object Modification – (continued)

Again lets undo that and “X”(exit) back out to the “SOLIDEDIT” (ing option) and then type “B” (Body) and then “S” (SHELL). Select the 3D object and at the “Remove faces...” Prompt hit “Enter”, then type in “.1” for an “offset distance”. You should get something like (fig23) or (fig24) if you use the 3DORBIT with the SHADEMODE and CLIPPING PLANE on.  
(Small note: The offset distance is going into your object but you could use a negative unit (-.1) and it would offset to the outside)



s\_body1.jpg  
(fig23)

### (3.4) Advanced 3D Object Modification – (continued)



s\_body2.jpg  
(fig24)

### Conclusion –

I know I skipped a lot and left some exploring for you, so please feel free to ask questions and use your HELP if you ever get stuck. Try creating some objects of your own using all the different things we have learned so far (moving our UCS to draw on different planes etc. etc.)

Have fun :o))

Diev