

The background of the slide is a complex, abstract wireframe mesh in shades of gray. A solid blue horizontal band spans the middle of the image, serving as a backdrop for the title and speaker information.

# 3D Modeling in AutoCAD




David Cohn

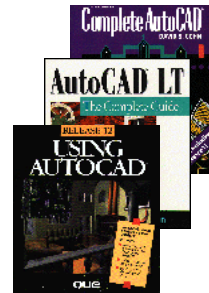
Senior Content Manager – 4D Technologies/CADLearning

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# David Cohn



- Senior Content Manager – 4D Technologies/CADLearning 
- Contributing Editor – Digital Engineering 
- Former editor – CADalyst, Engineering Automation Report 
- Writer – PC Magazine, Computer Graphics World
- Registered architect – 35+ years
- AutoCAD experience – 30+ years
- Revit experience – 15+ years
- Author – 12+ books



# It's a 3D World

If our world is 3-dimensional, why do so many of us work in 2D?

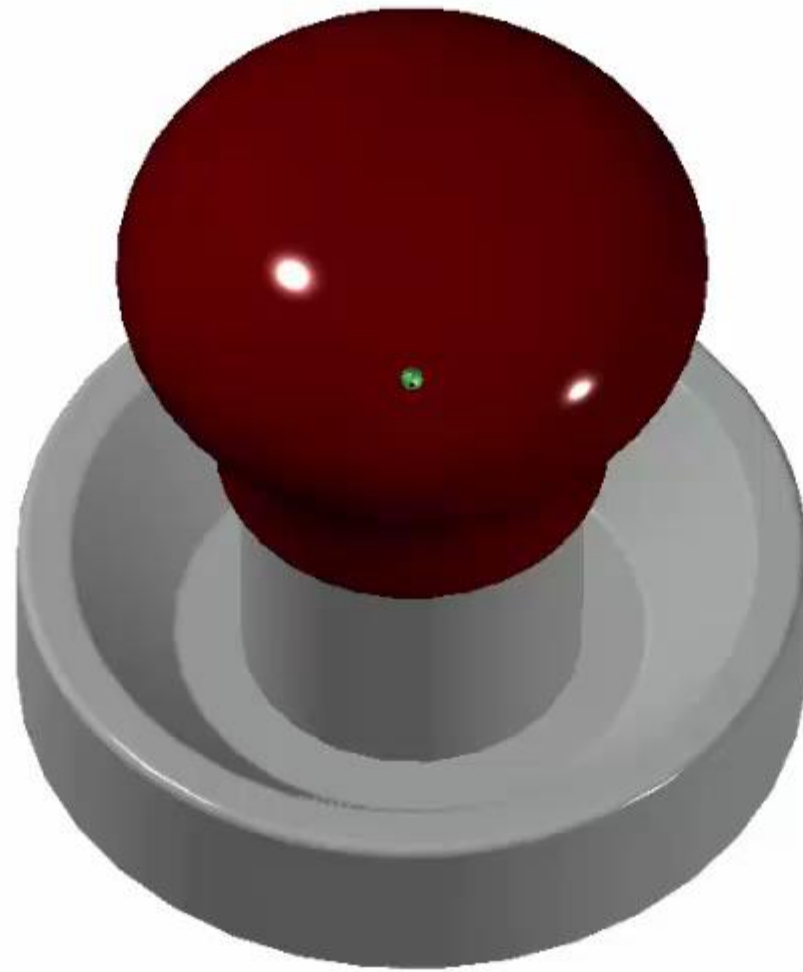


- We design in 3D, then draw in 2D, and then interpret what it means in 3D
- CAD was originally 2D but now you easily do 3D
- 3D is actually easier because you don't have to mentally flatten the design



# What we are going to create

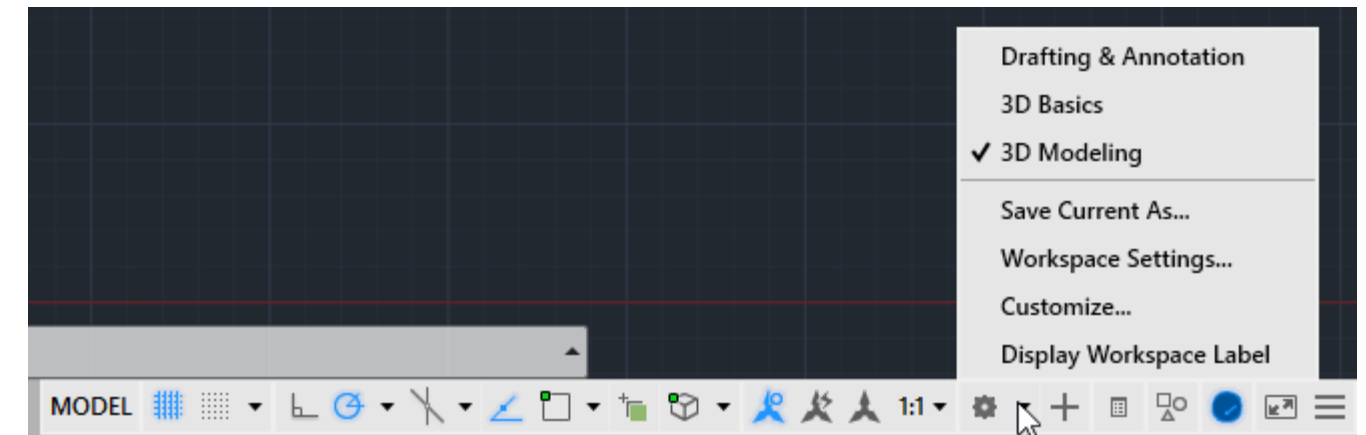
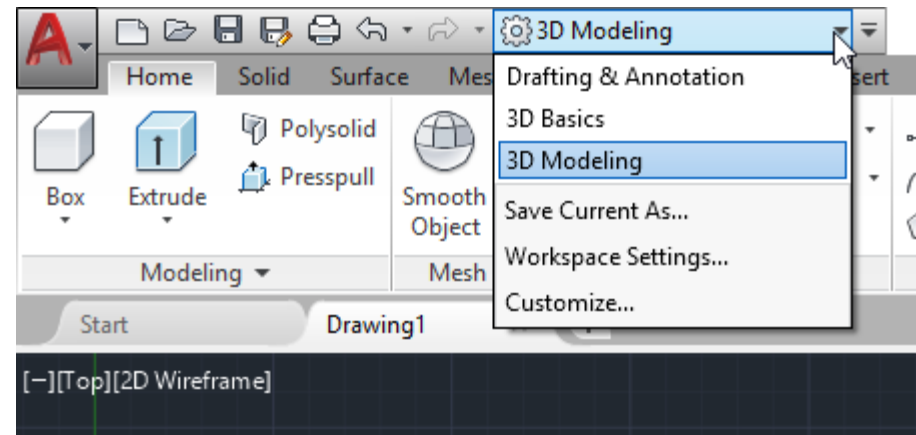
Air hockey paddle consisting of cylinders, boxes, a sphere, and a cone



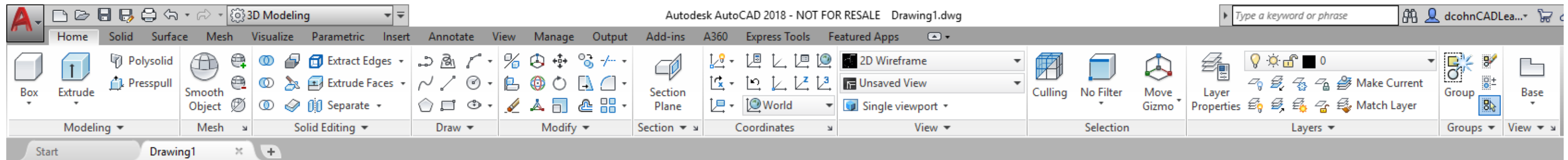
Reduce modeling to combinations of basic shapes whenever possible

# 3D Modeling Workspace

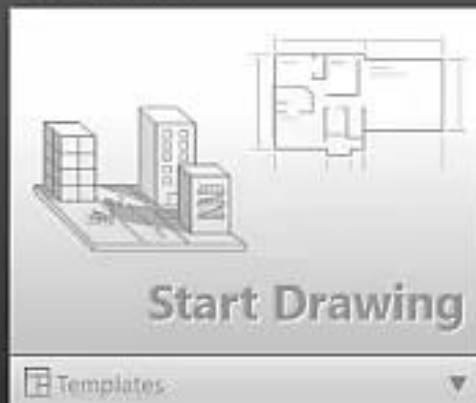
AutoCAD has three default workspaces, accessible from the Status bar or the Quick Access toolbar.



The 3D Modeling workspace provides 3D modeling and visualization tools via the ribbon.



## Get Started



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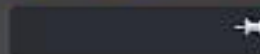
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DEMO

## Notifications

2

You have 1 product update.



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## Connect

Welcome Joel

(dcohn@cadlearning.com)



A360

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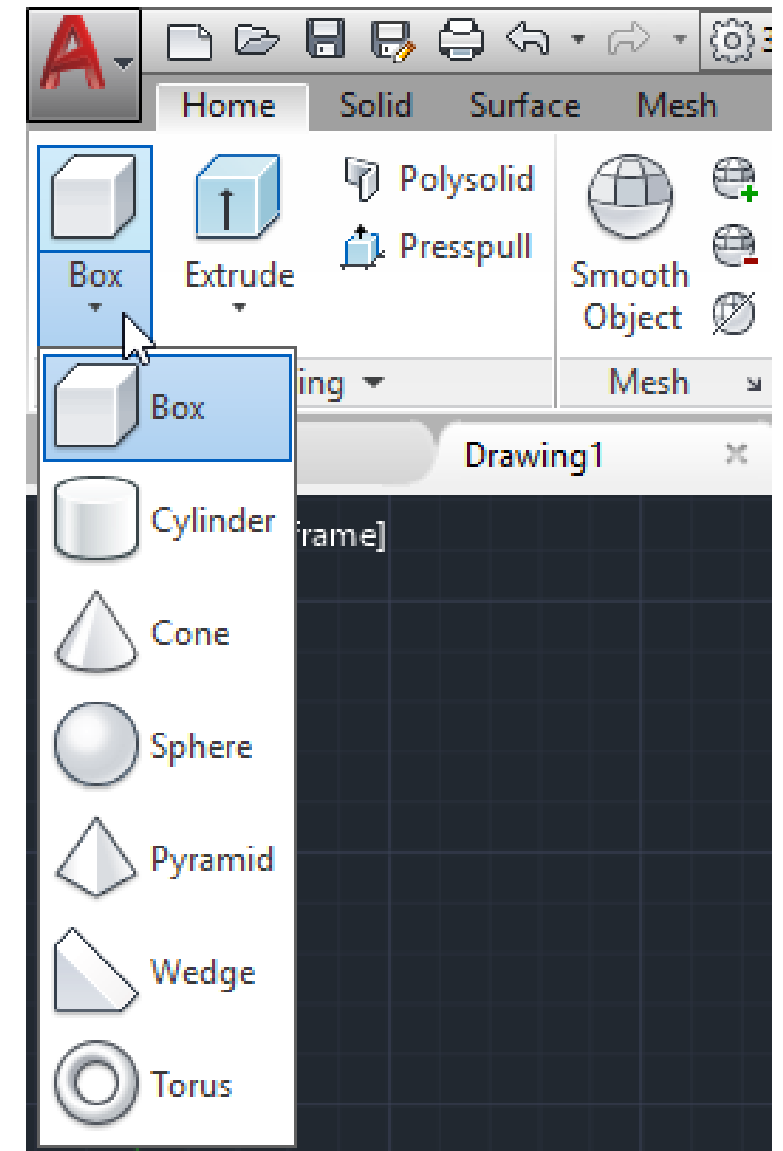
Help us improve our products

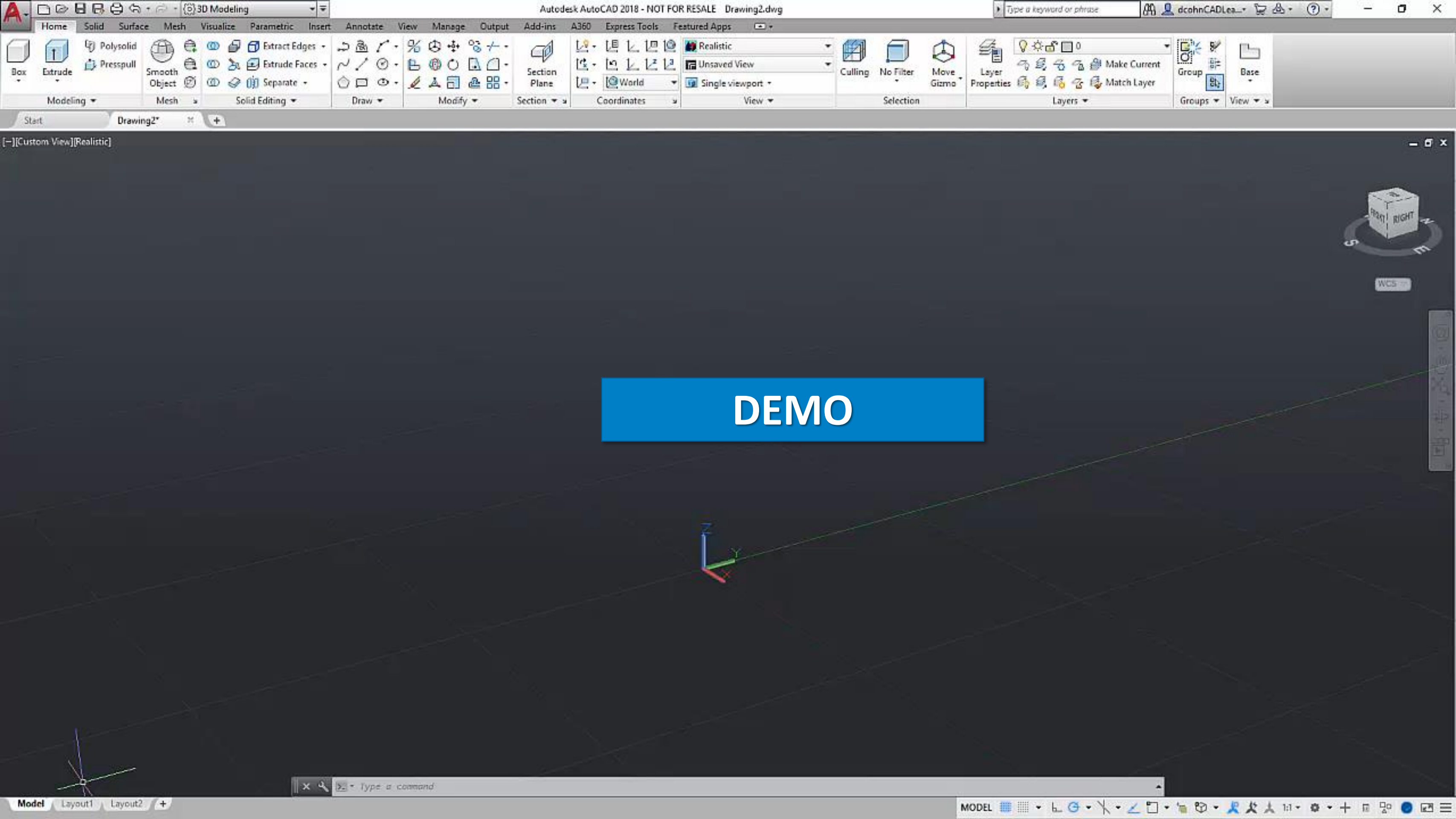
Send Feedback

# Creating and Editing Solid Cylinders

Tools for creating 3D solid primitives are found on the **Home** ribbon in the **Modeling** panel.

- They work similar to familiar 2D tools
- 3D solids can be modified using grips



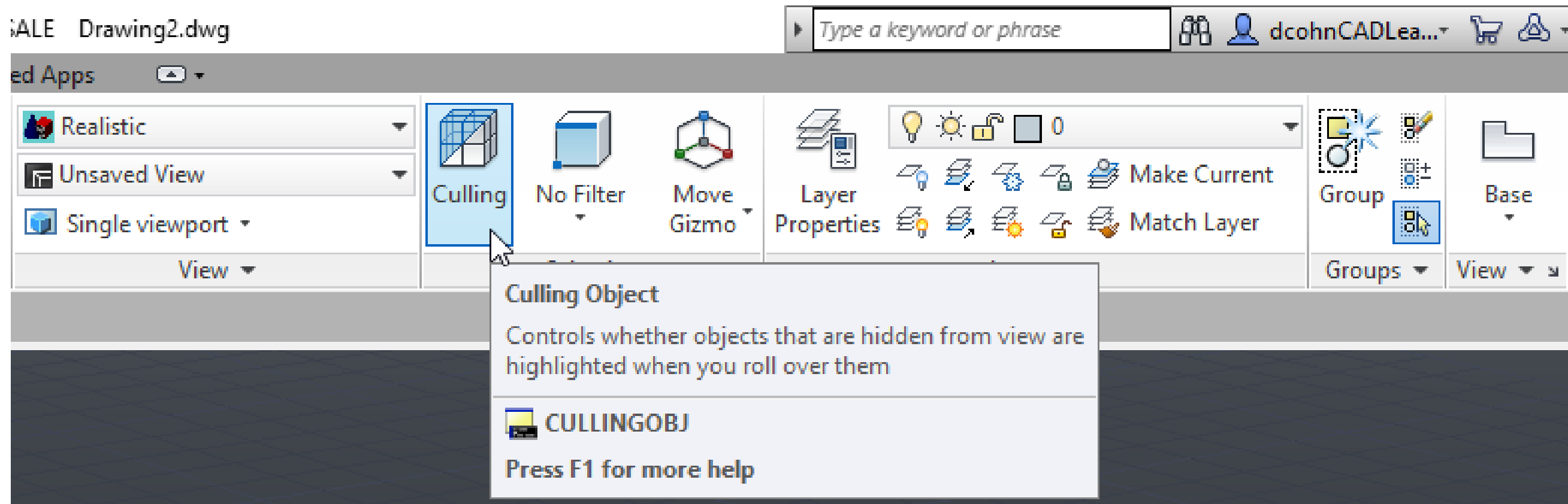


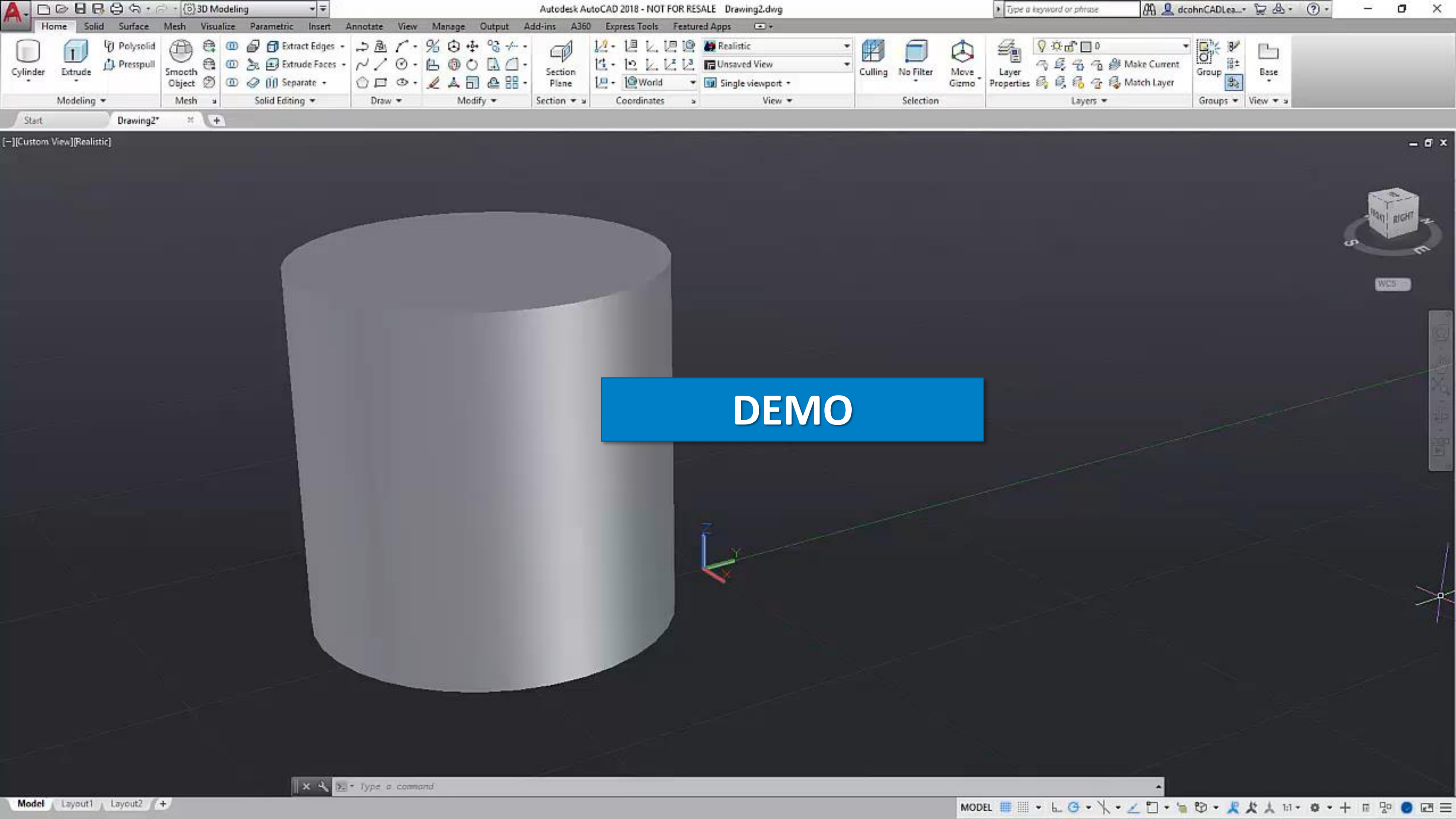


# Culling

Culling controls whether 3D objects that are hidden from view can be selected:

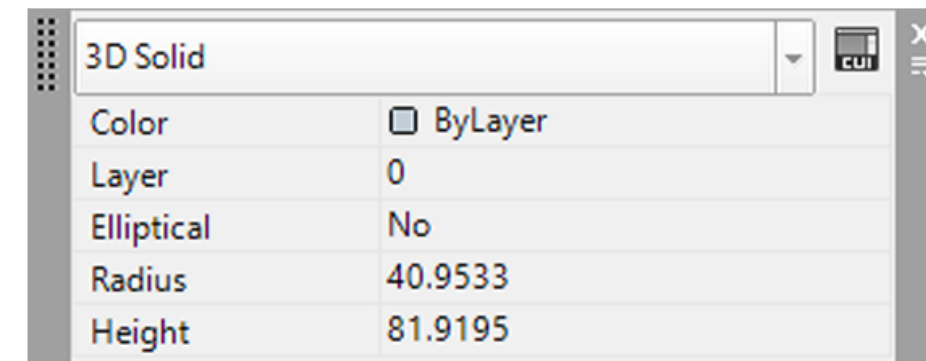
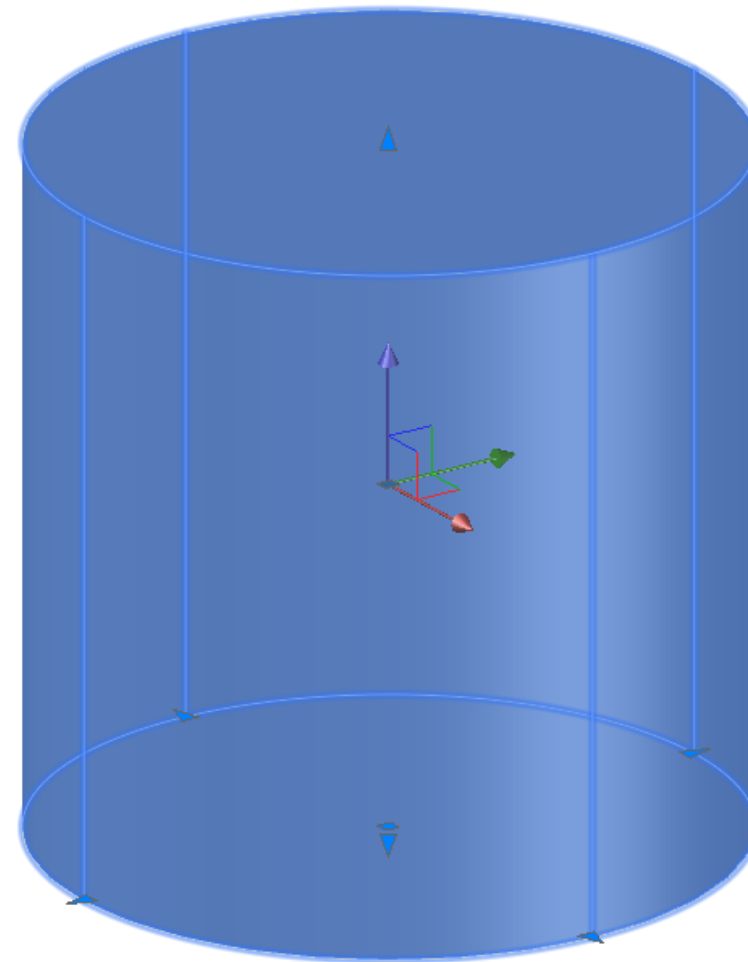
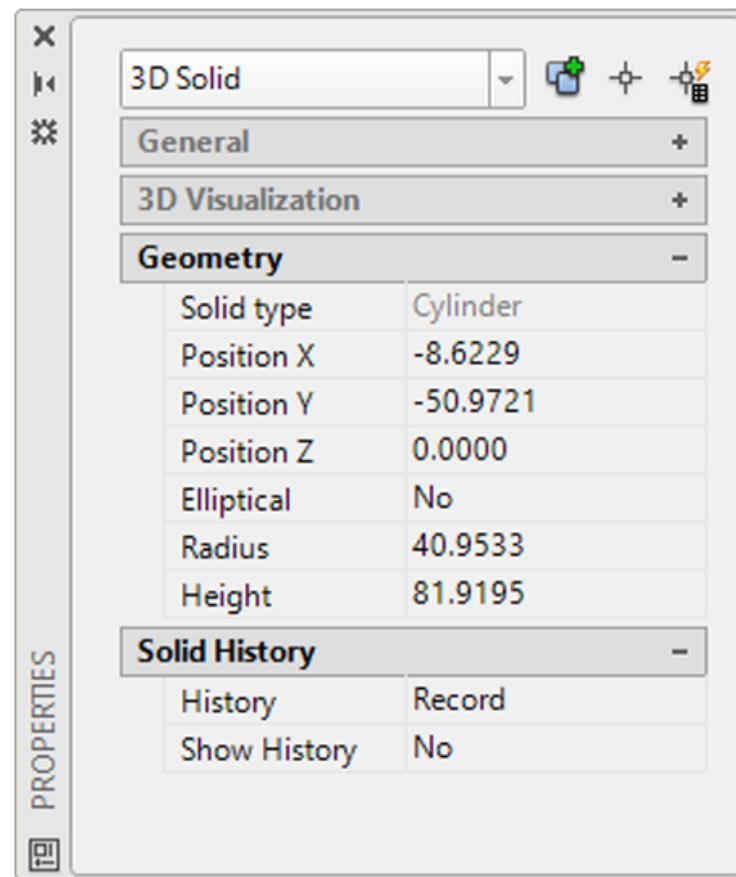
- When enabled – you only see grips on visible faces (default)
- When disabled – you see all grips





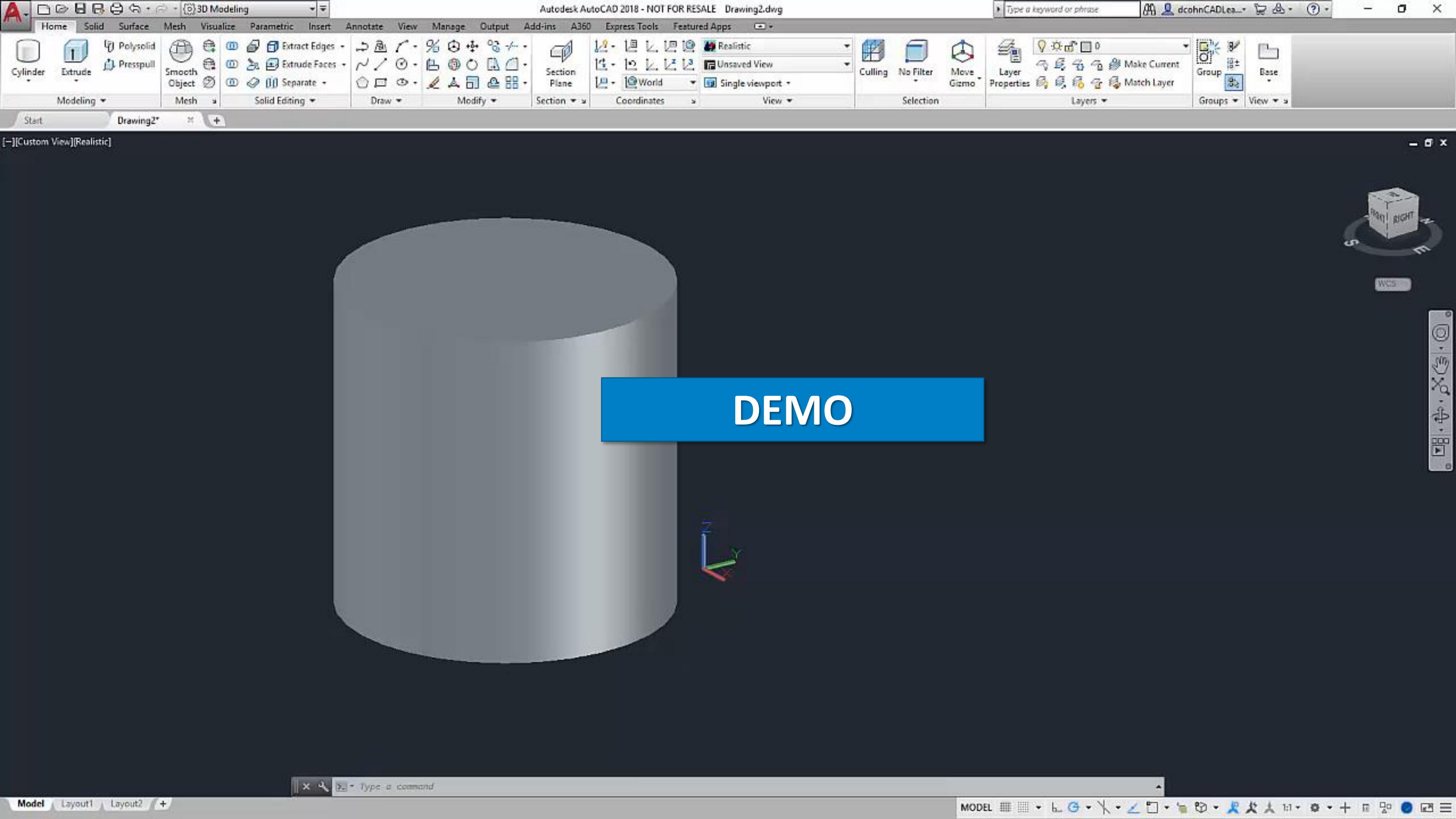
# Changing Properties

You can use the Properties palette or Quick Properties to change solid primitives



Modify Quick Properties to display the properties you need to access

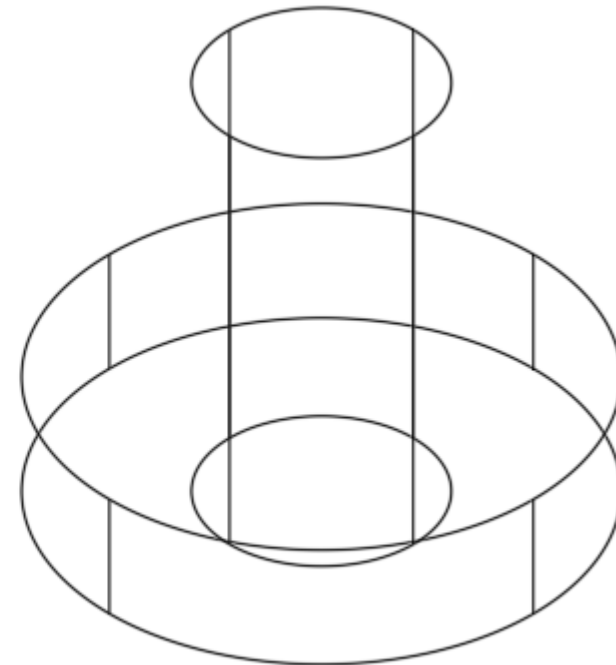
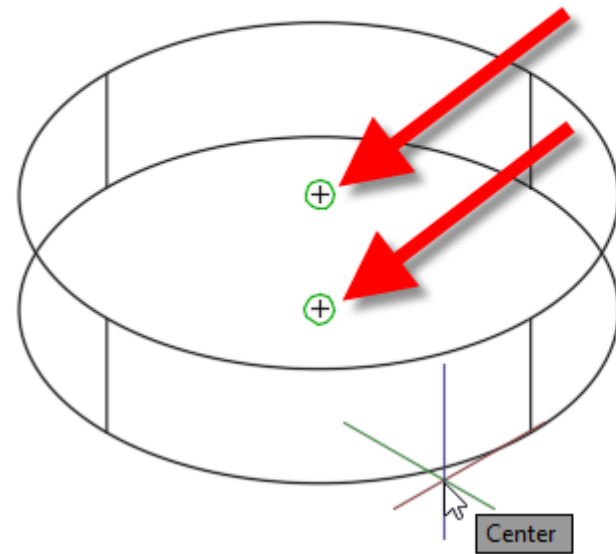
Radius = 30      Height = 14





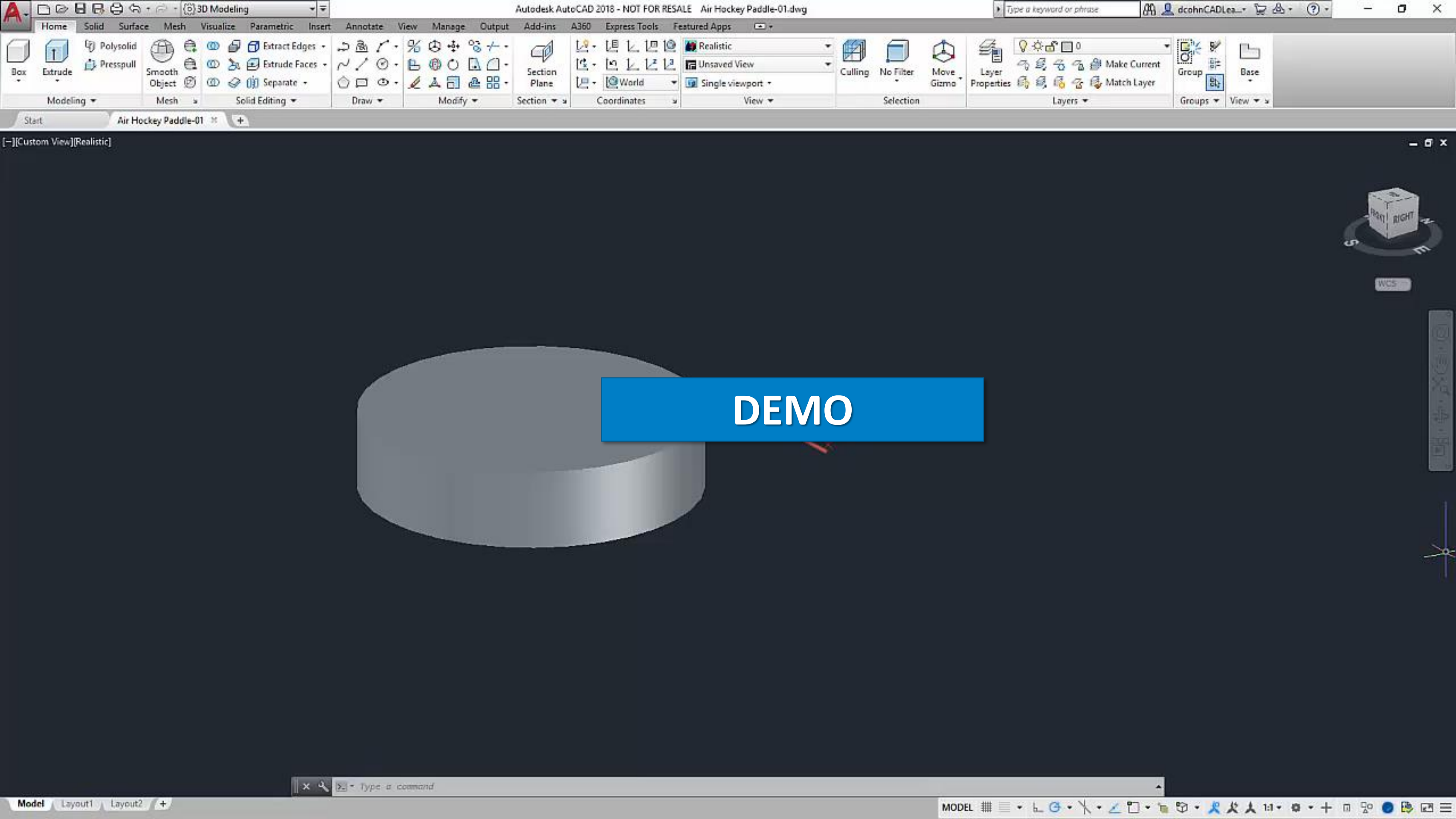
# Adding a Second Cylinder

- Use the CYLINDER command to add a second cylinder
- Use OSNAP to center the second cylinder at the center of the base of the first cylinder



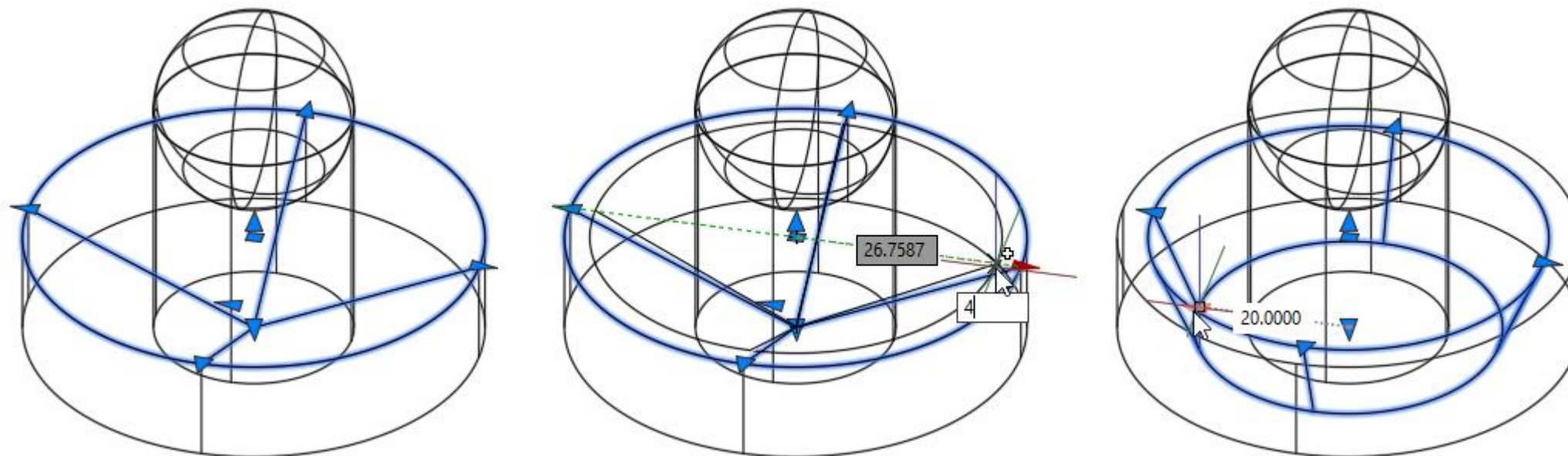
Radius = 14

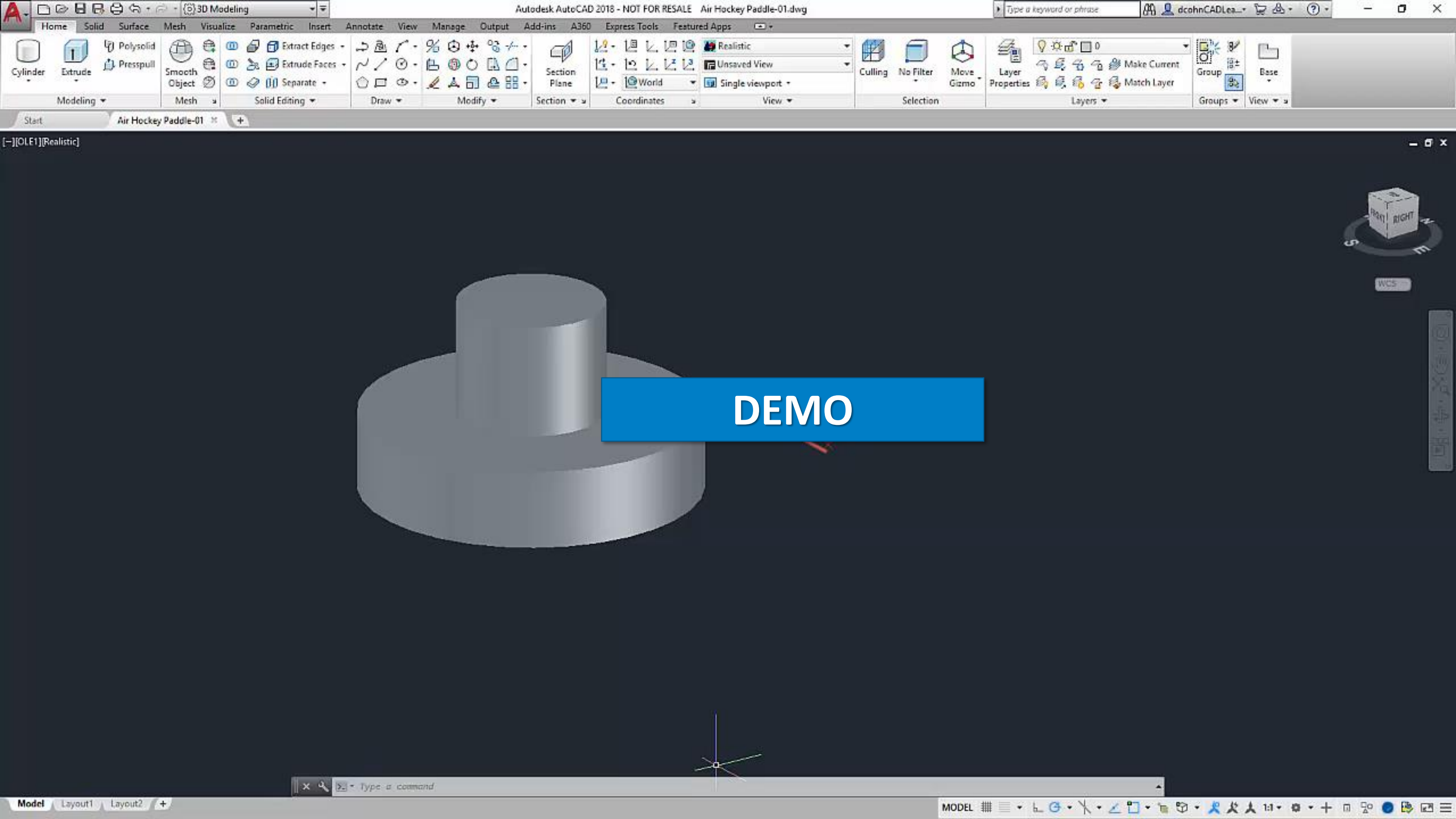
Height = 34



# Creating and Editing Solid Spheres and Cones

- Add a sphere centered on the top of the tall cylinder.
  - Set its radius by snapping to the quadrant of the cylinder
- Add a cone with its base centered on the top of the lower cylinder and its top centered on bottom of that cylinder
  - Adjust its size using grips

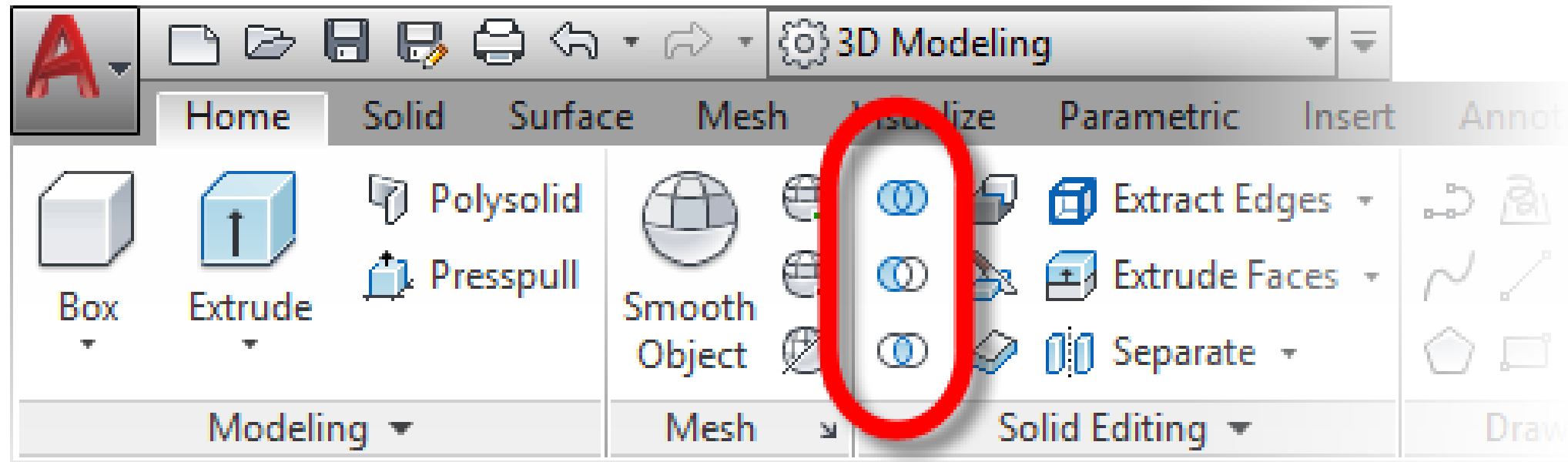






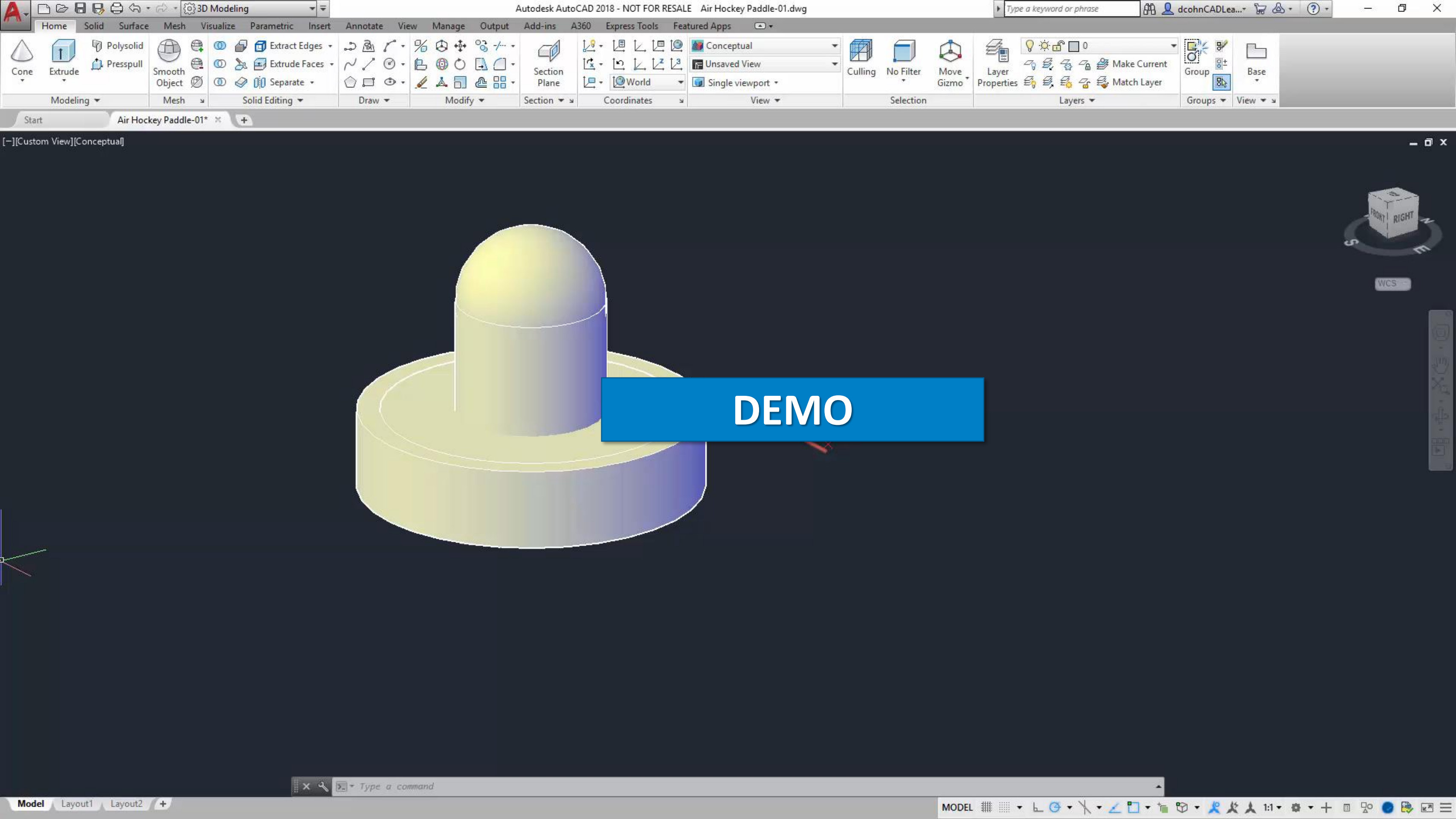
# Subtracting and Unioning Solids

You can use Boolean operations—UNION, SUBTRACT, INTERSECT—to combine individual solid primitive shapes into a single object.



The order in which you perform Boolean operations is important.

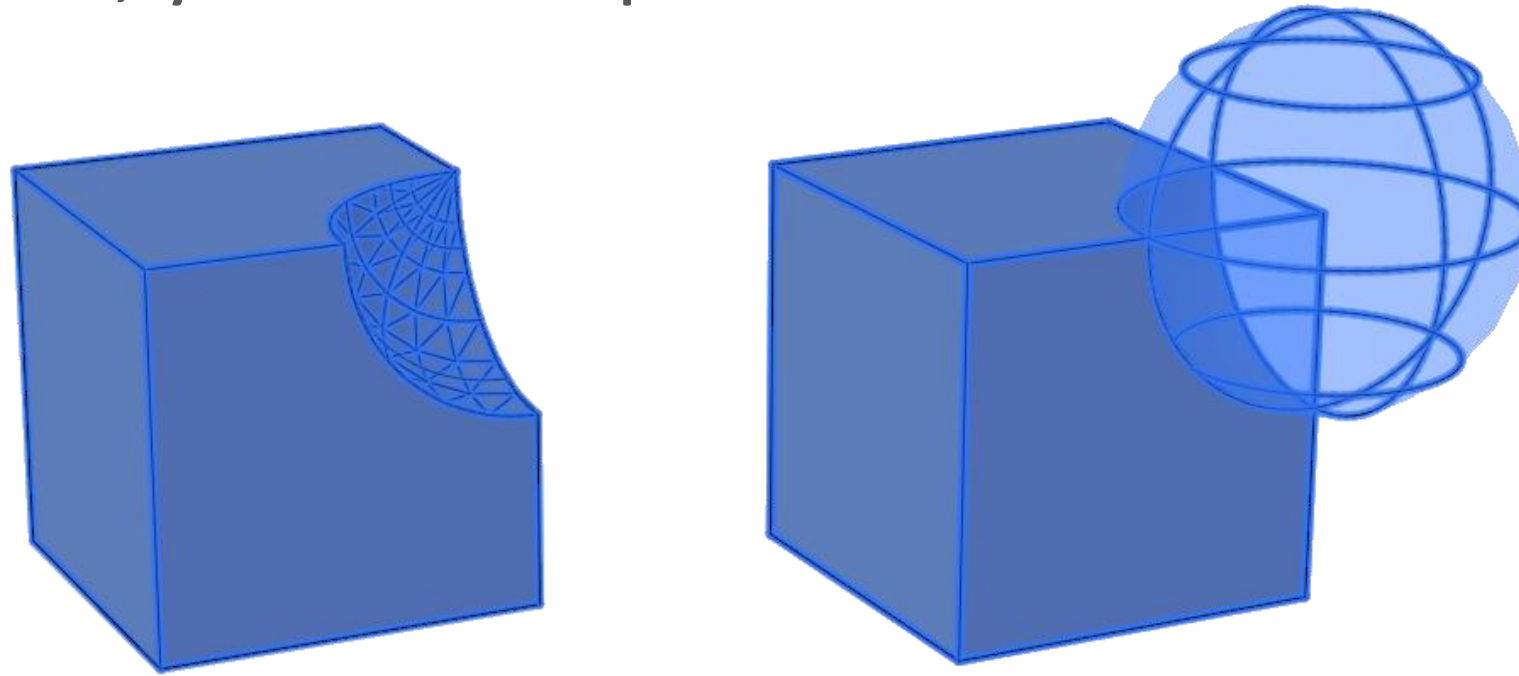
- SUBTRACT prompts for 2 selection sets



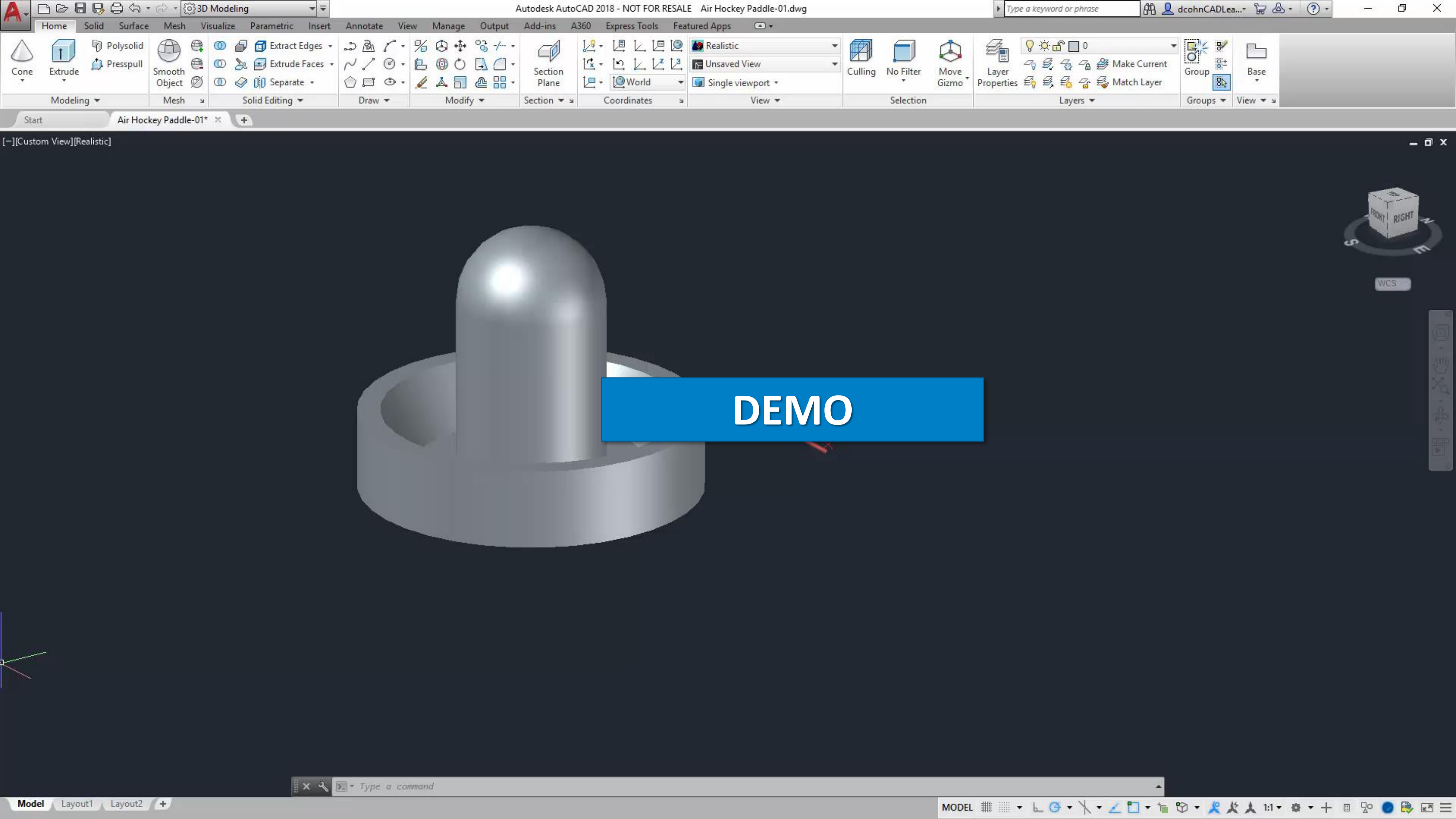
# Solid History

Solid History is off by default (SOLIDHIST=0)

- When SOLIDHIST=1, you can press **CTRL** to select subobjects
- When SOLIDHIST=0, you cannot press **CTRL** to select subobjects



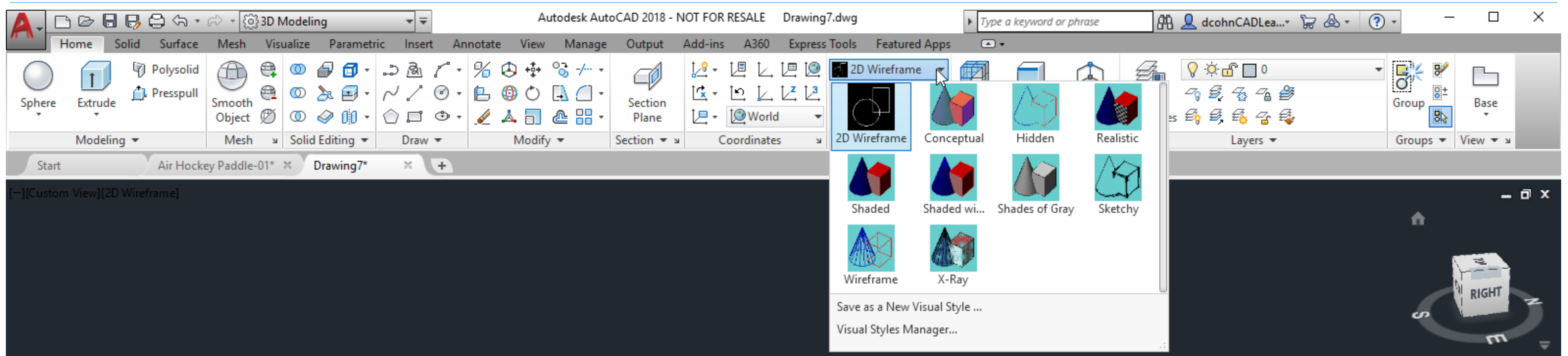
You must change the SOLIDHIST value before creating or combining solids in order to use subobject selection.

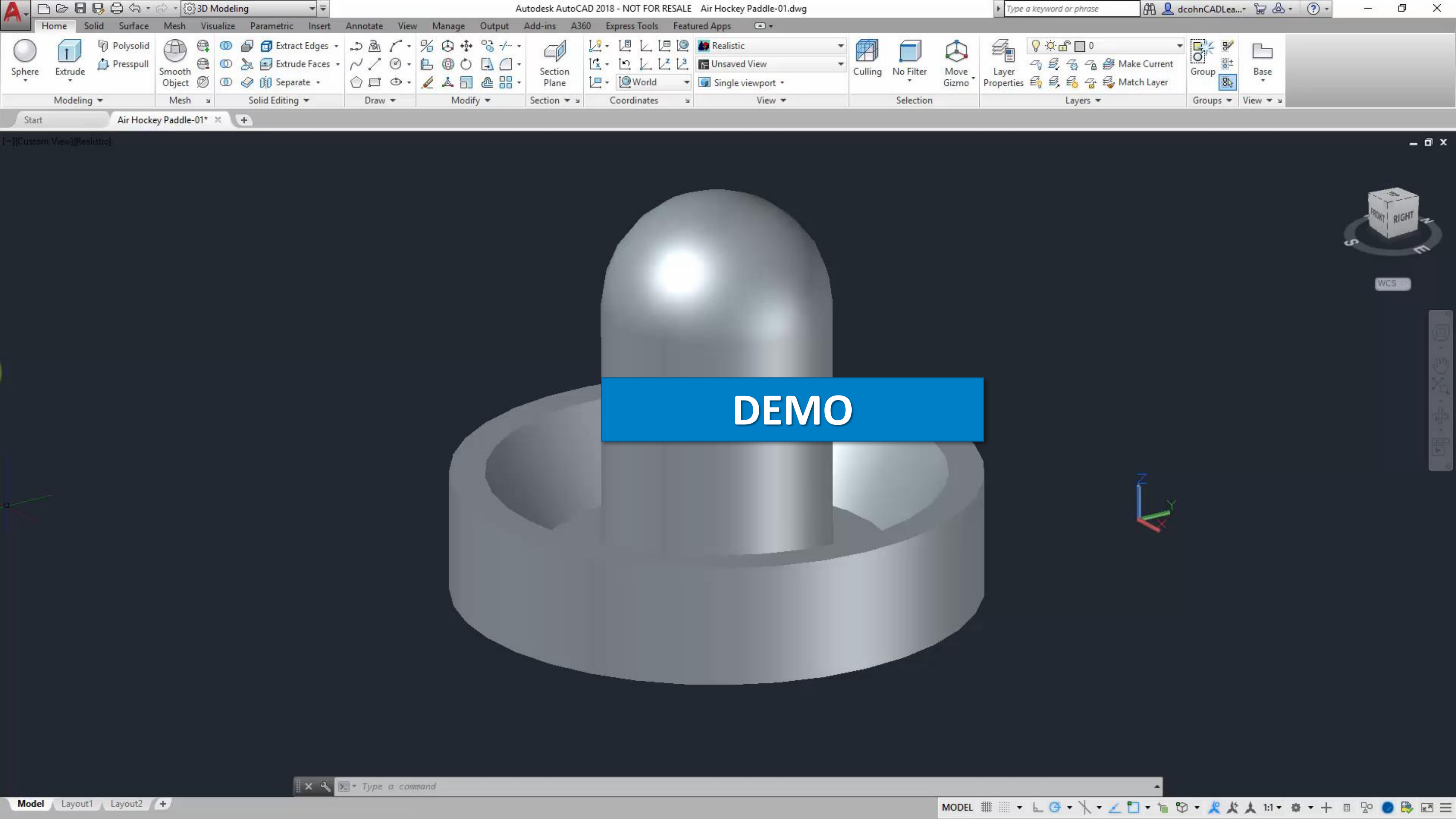




# Setting a Visual Style

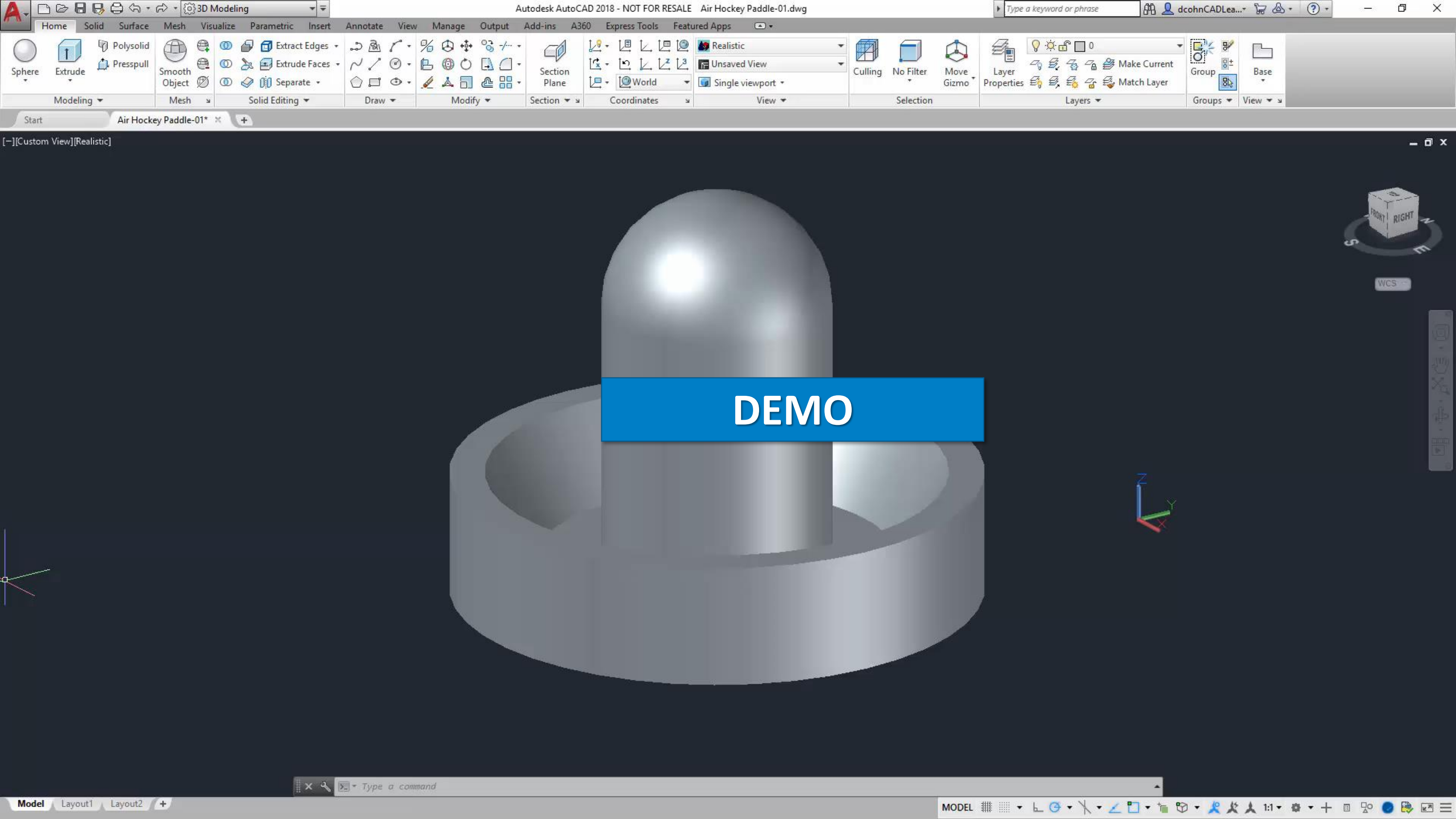
- You can easily change Visual Styles
- You can create and save your own custom Visual Styles





# Editing Composite Solids

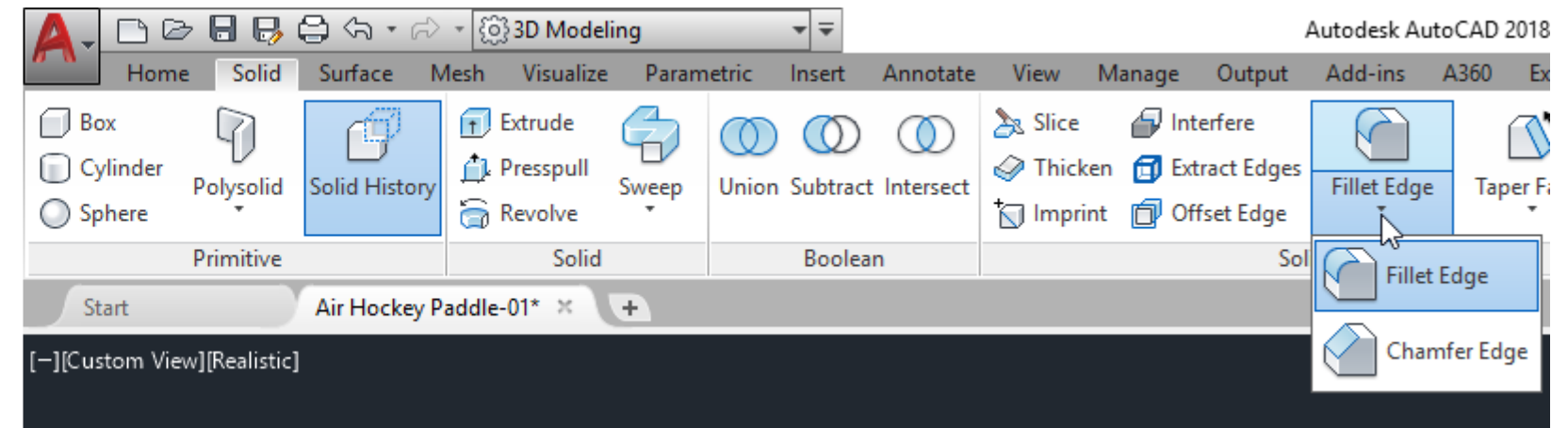
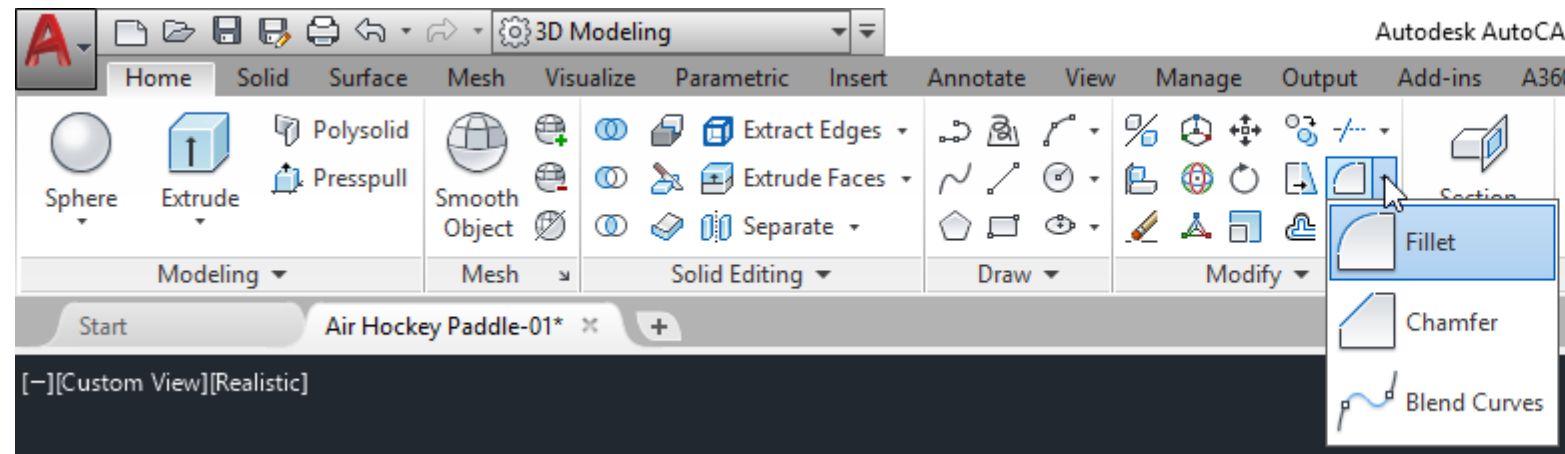
- When you combine solids, AutoCAD creates a composite solid
- When you select a composite solid, the entire solid is selected
- If you model without history, you can only modify component solids using direct manipulation
- If you model with history, you can press **CTRL** to select subobjects
- You can then use Properties or grips to modify the subobject

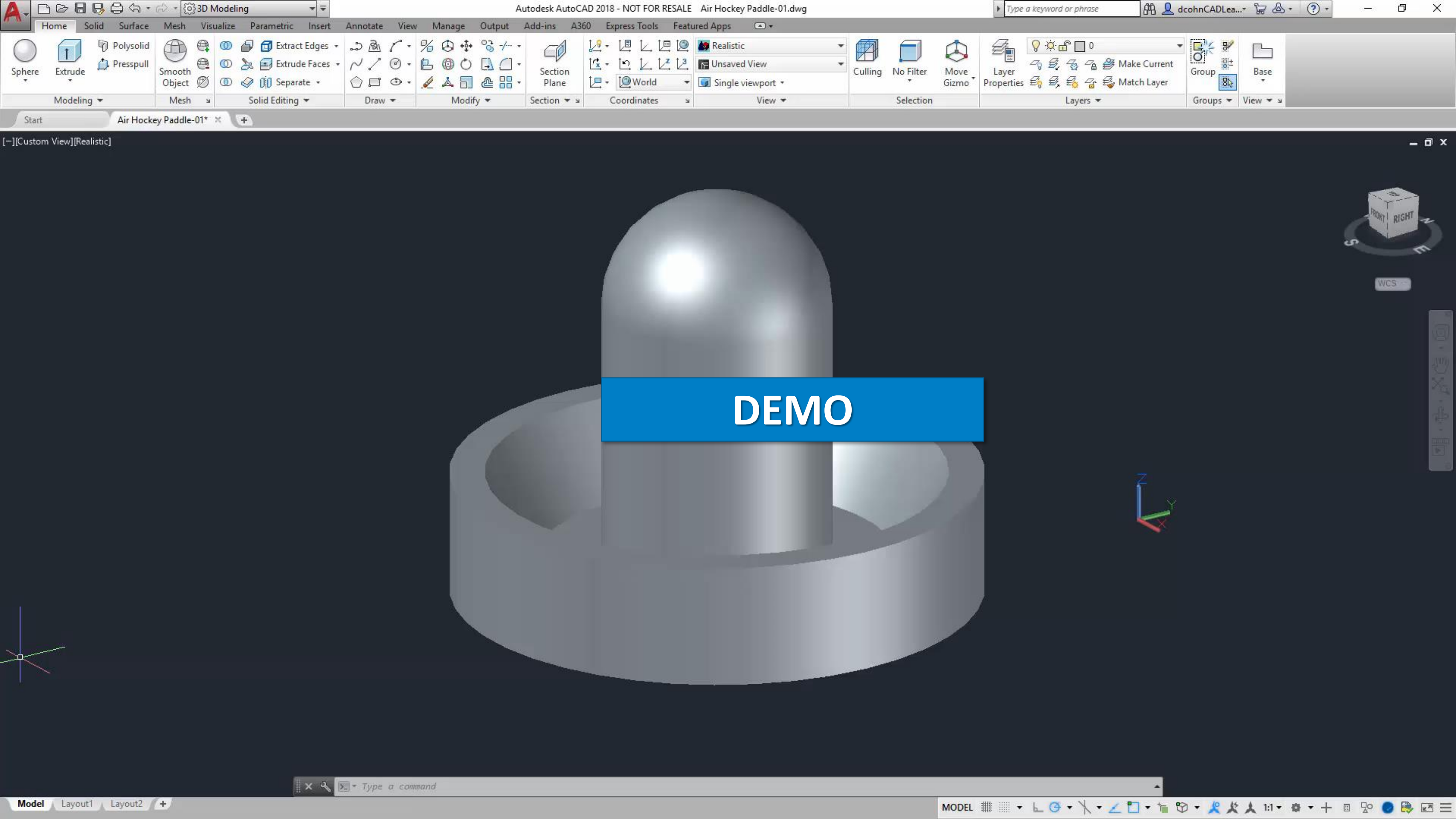




# Creating and Editing Chamfers and Fillets

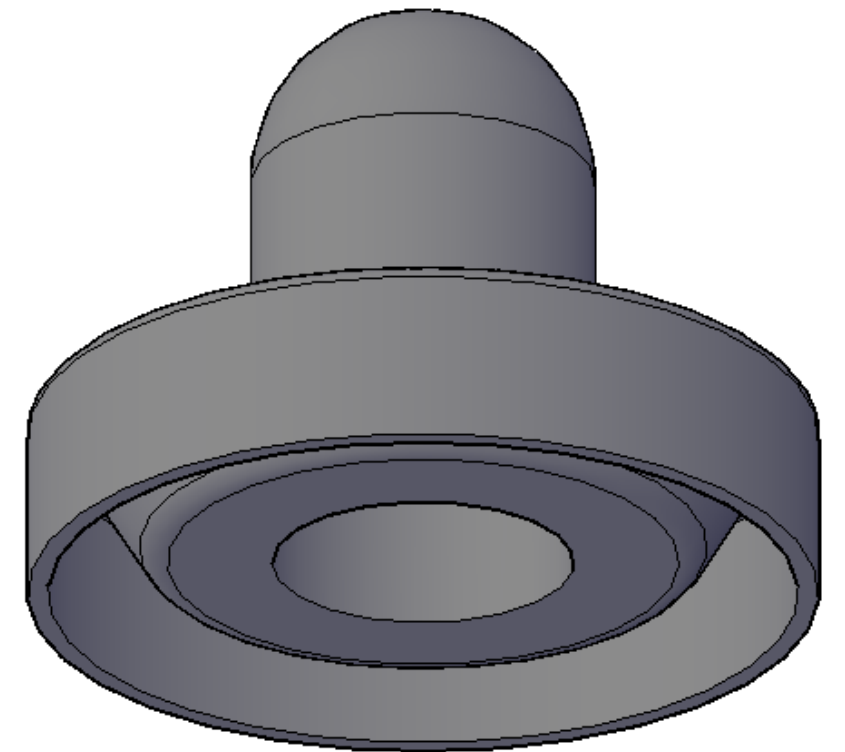
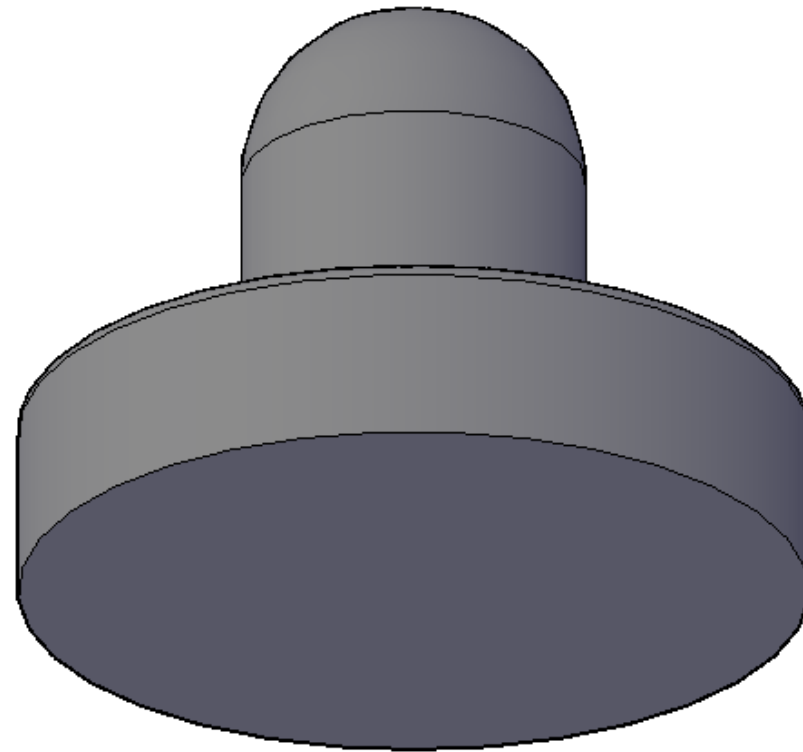
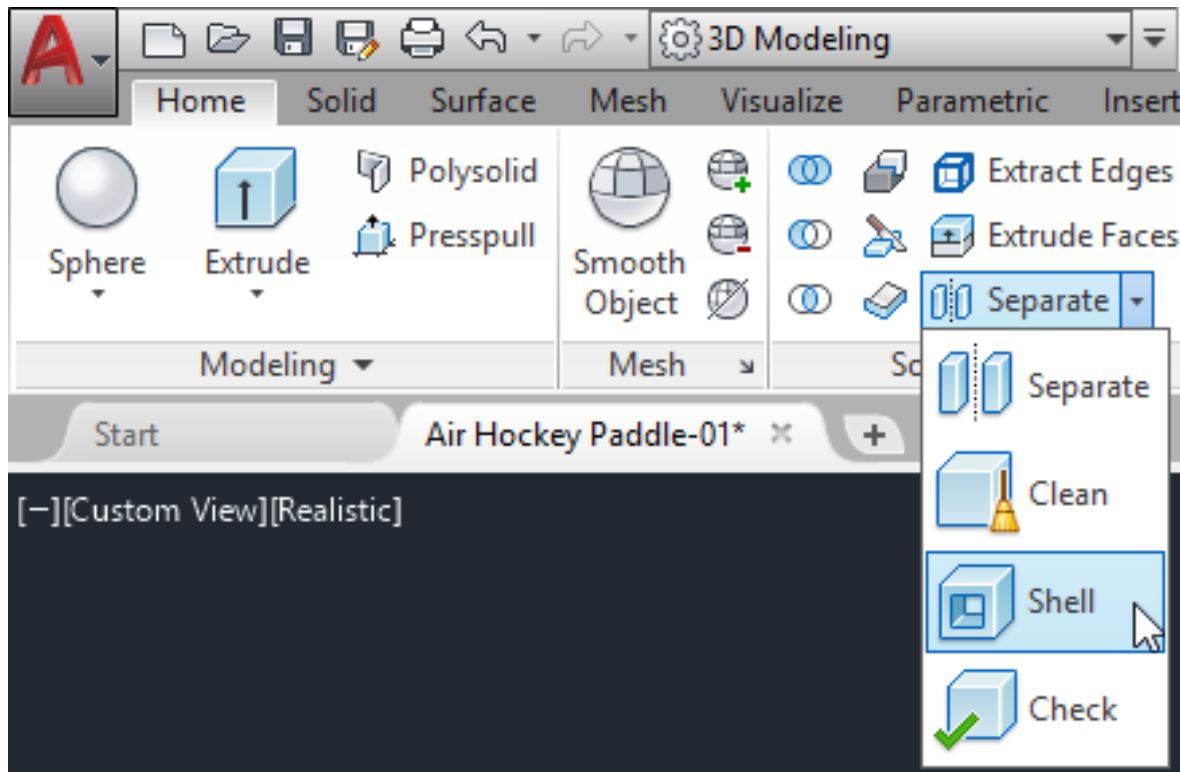
- Add Chamfers and Fillets to solids
- Similar to 2D versions of these commands
- If History is on, Chamfers and Fillets can be selected w/**CTRL** key



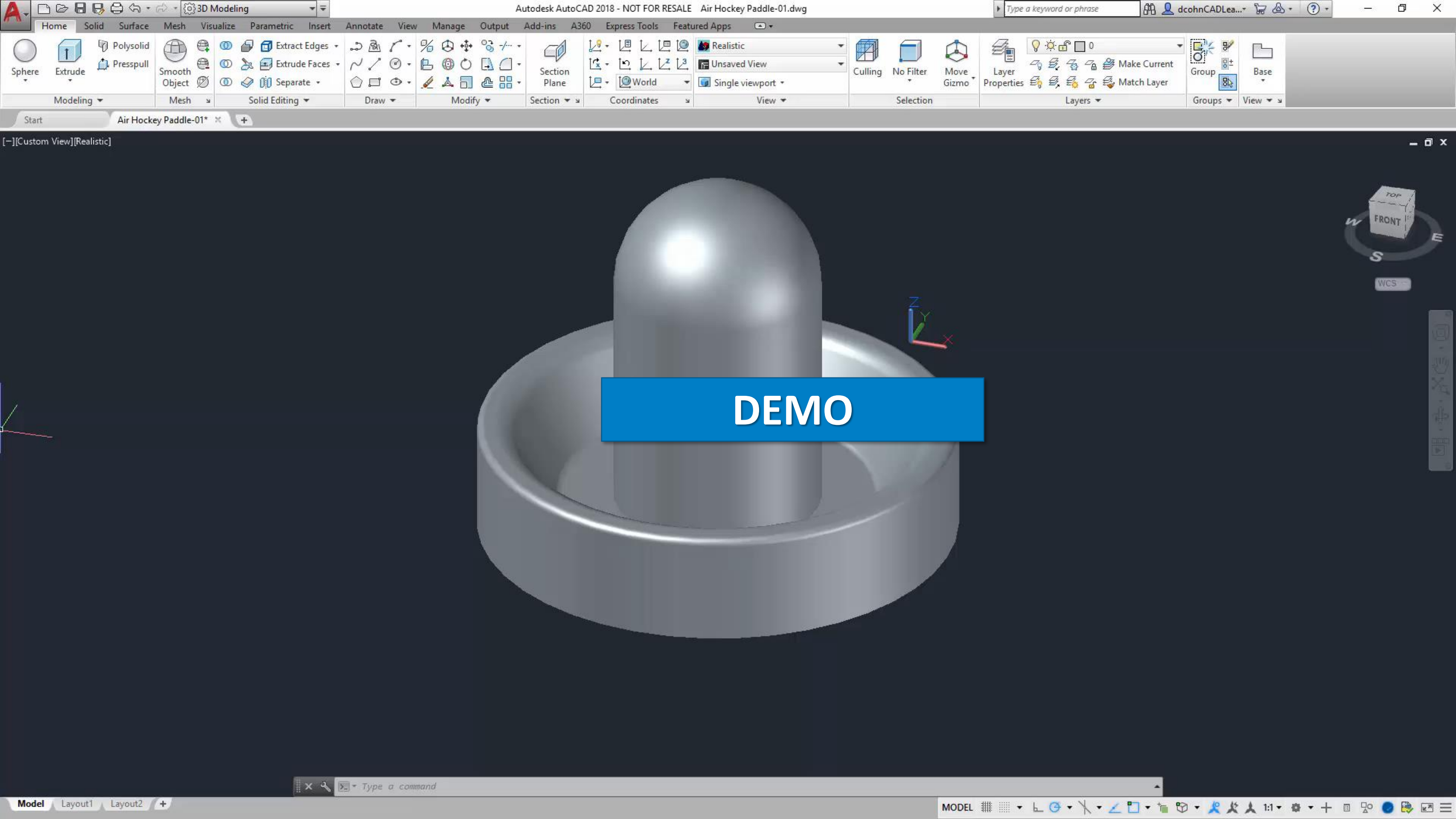


# Shelling a Solid

- Use the Shell option of the SOLID edit command to convert the solid into a thin-shelled object



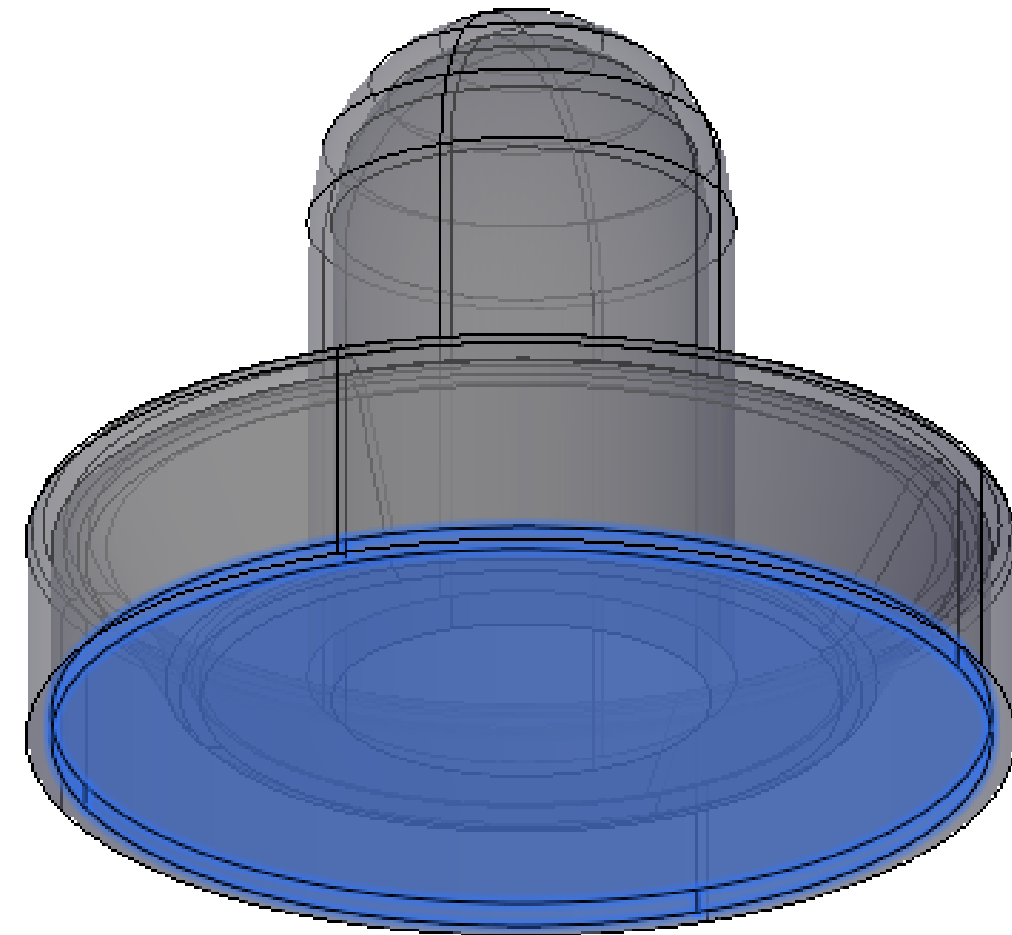
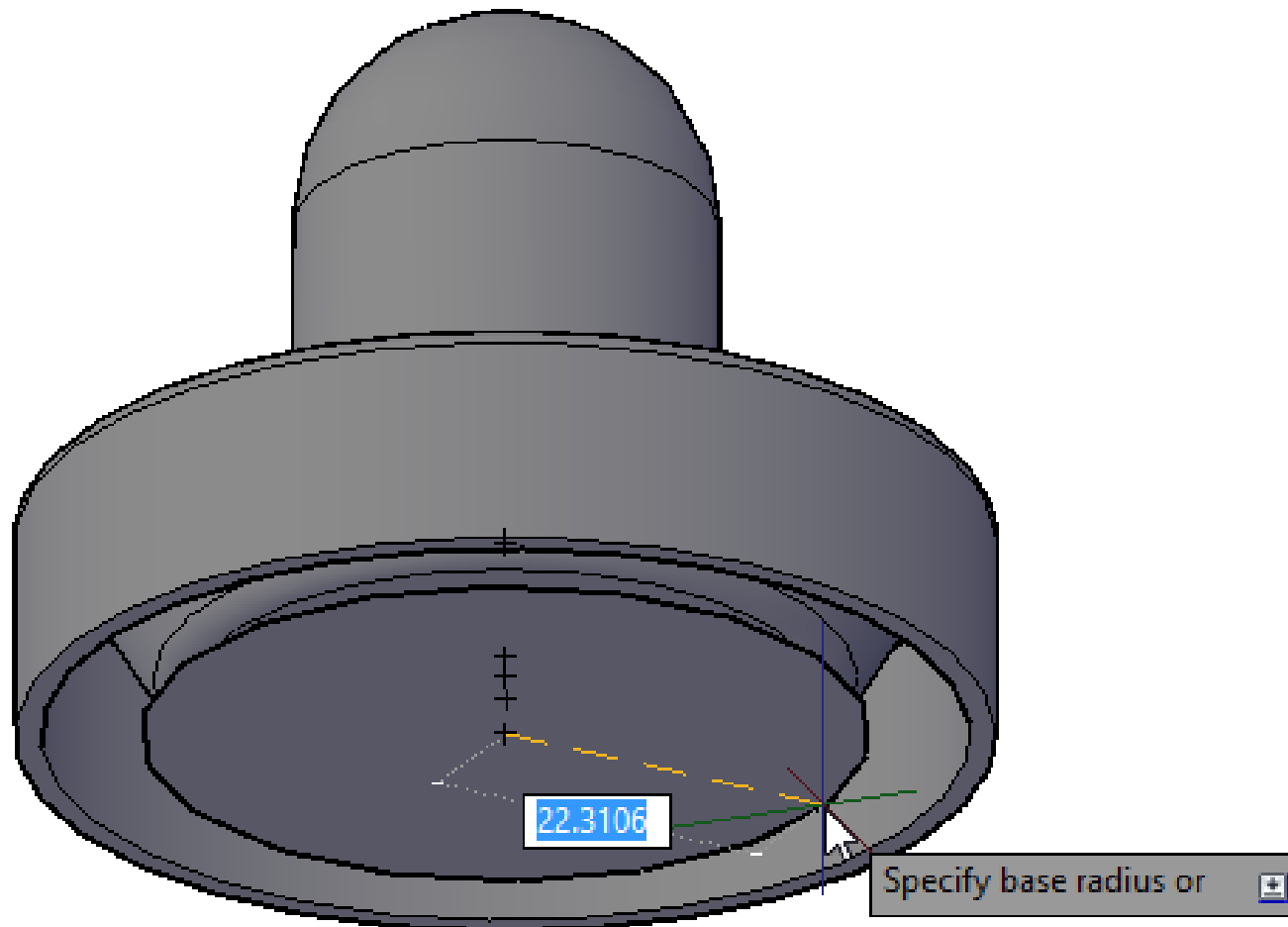
- This removes the ability to modify subobjects
- Don't do this until your model is well-defined

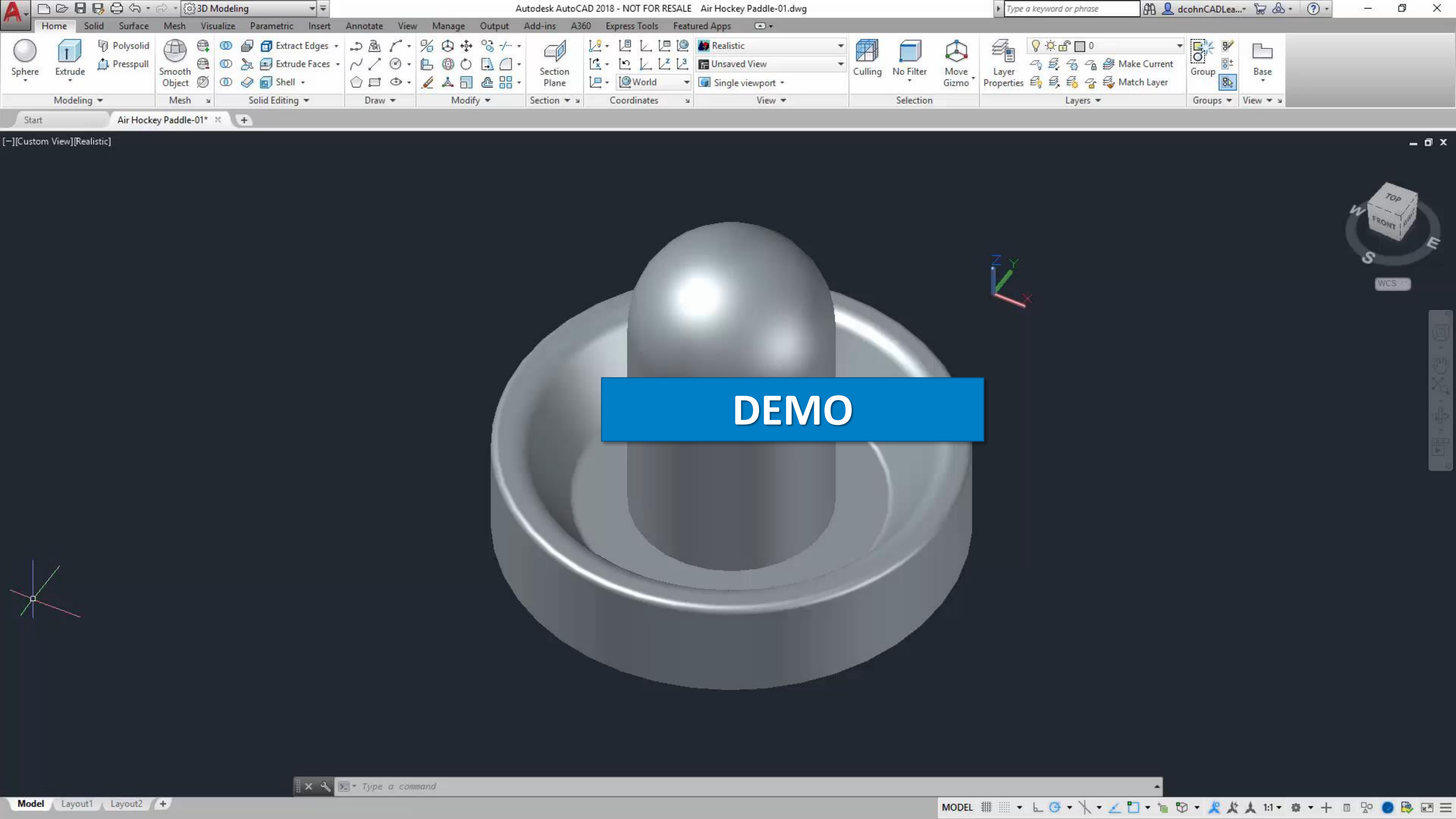




# Adding a Second Part

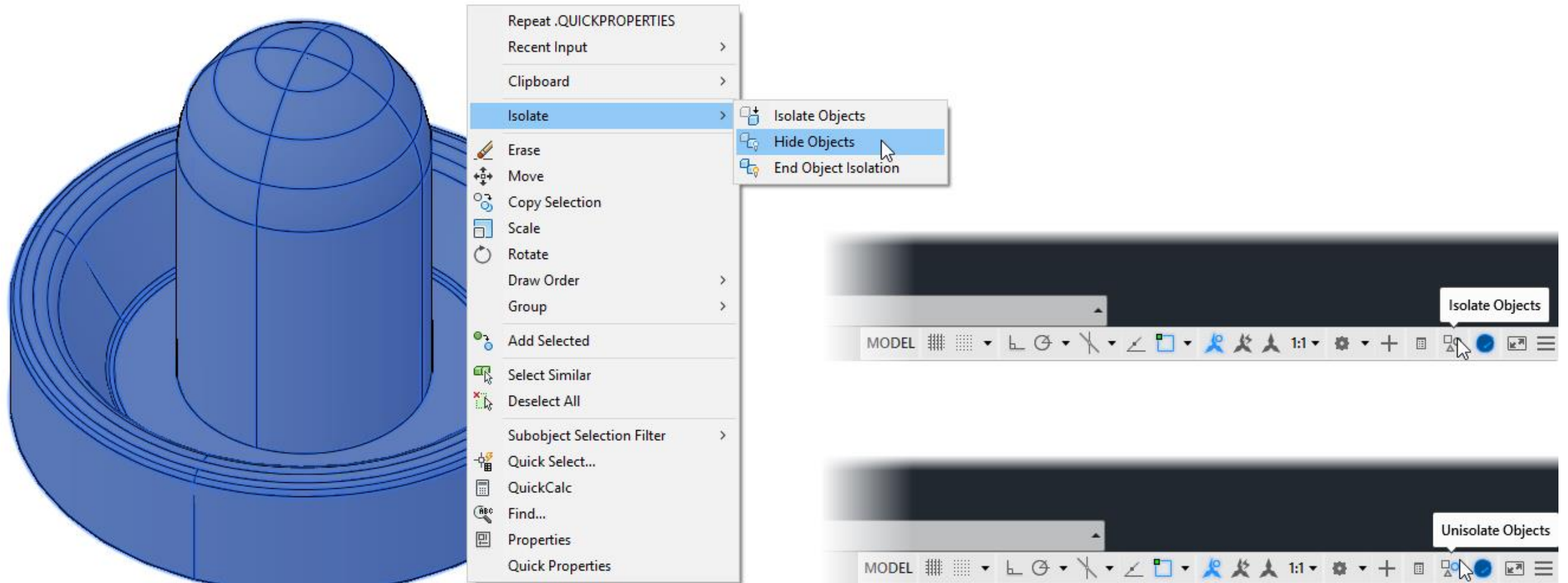
- Add a cylinder at the center of the base with its radius snapped to the inside of the base and make its height (thickness) 1.5 units

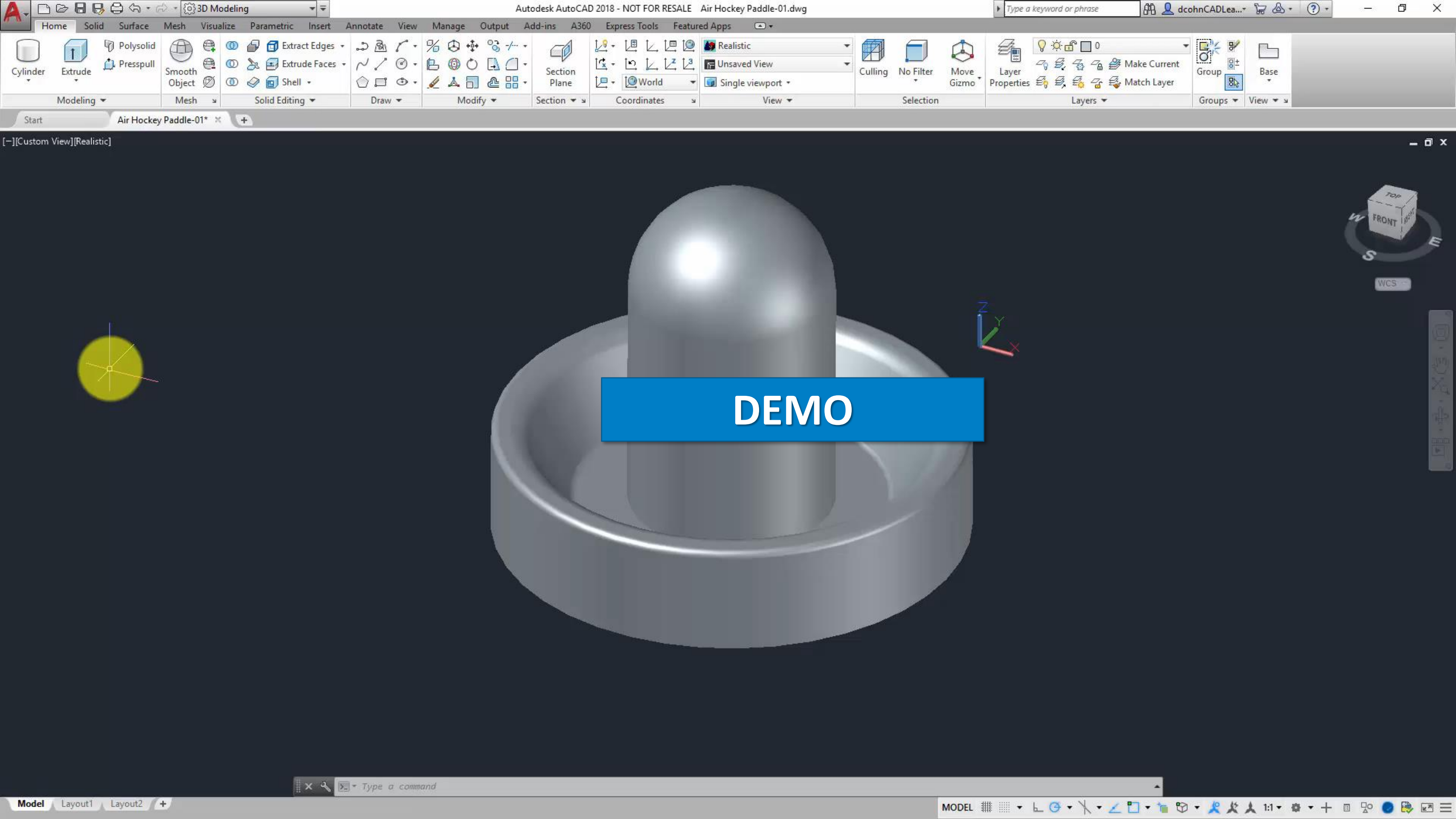




# Hiding and Isolating Objects

- You can modify geometry regardless of the current Visual Style
- Temporarily hide the first part so you can see the new part inside it



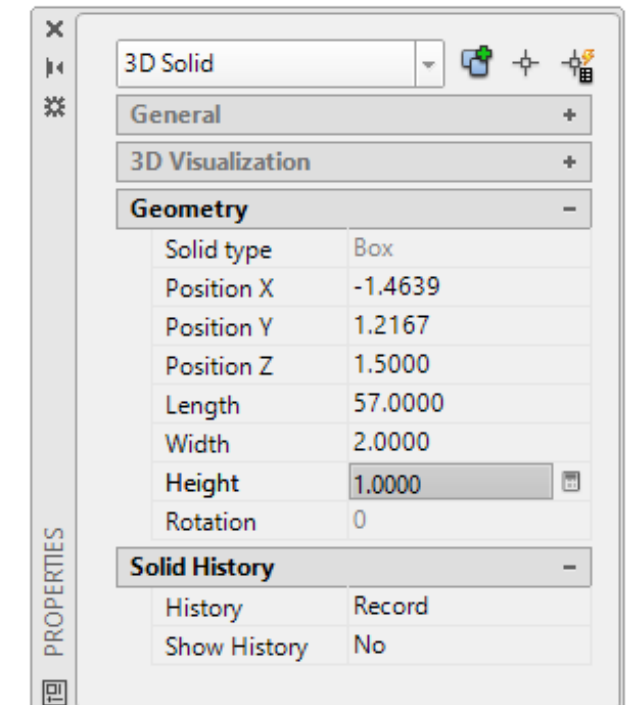
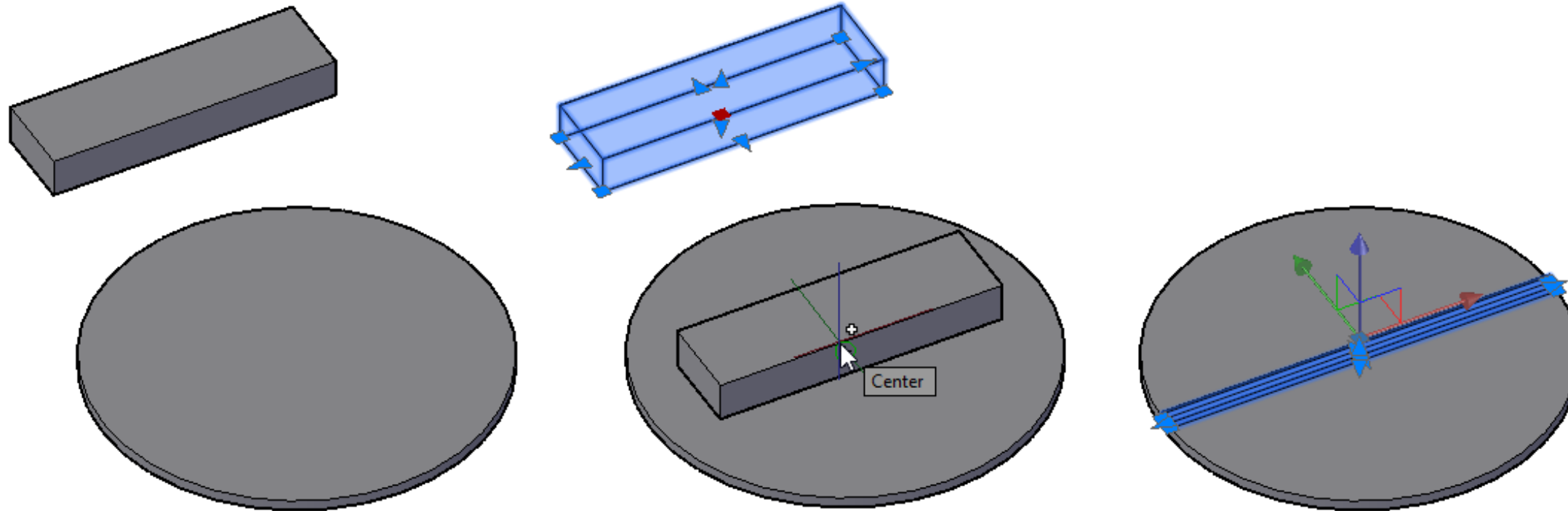


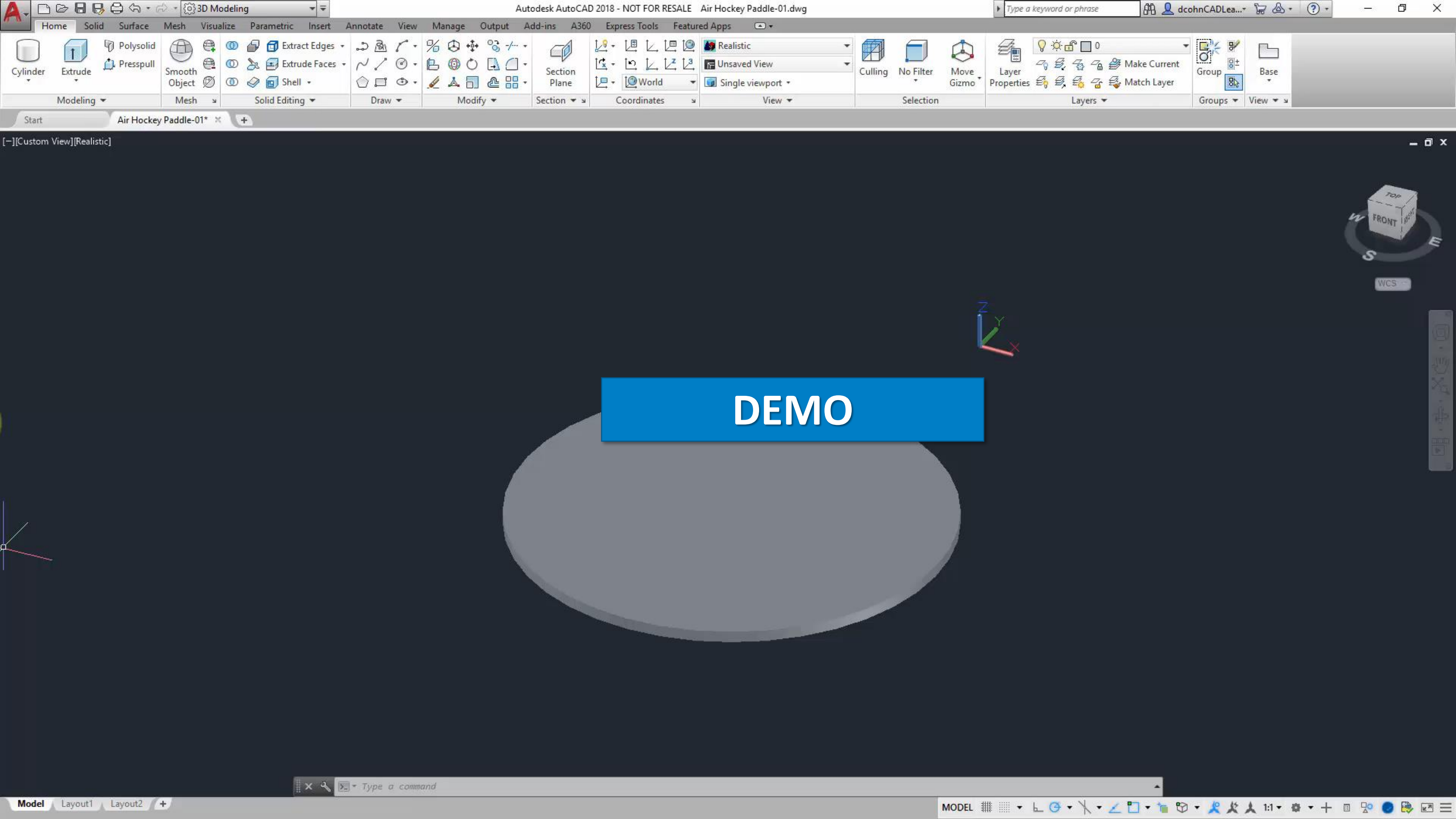


# Creating and Editing a Solid Box

Add a BOX to serve as a stiffening rib

1. Create a box
2. Move it into place
3. Resize it

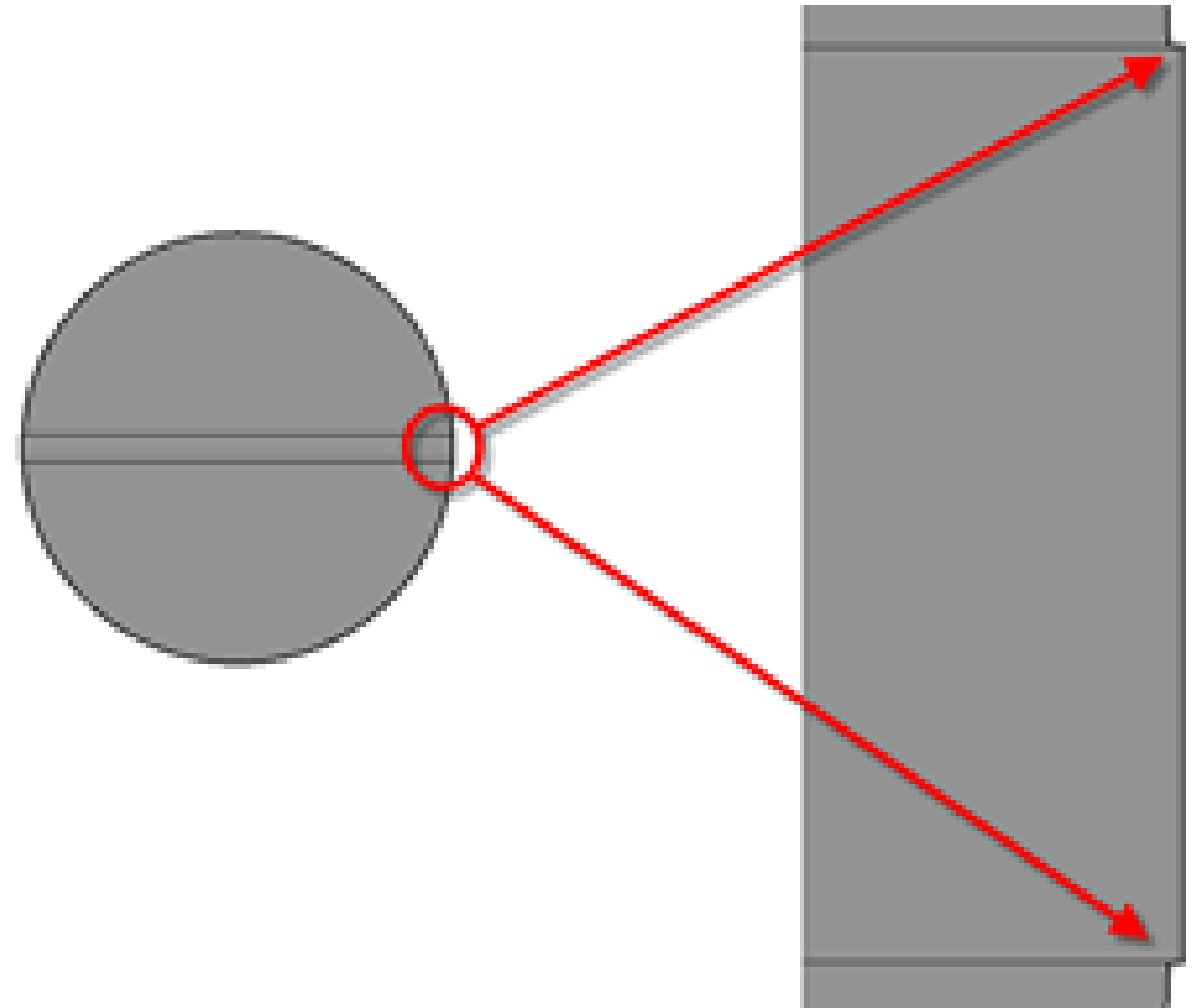
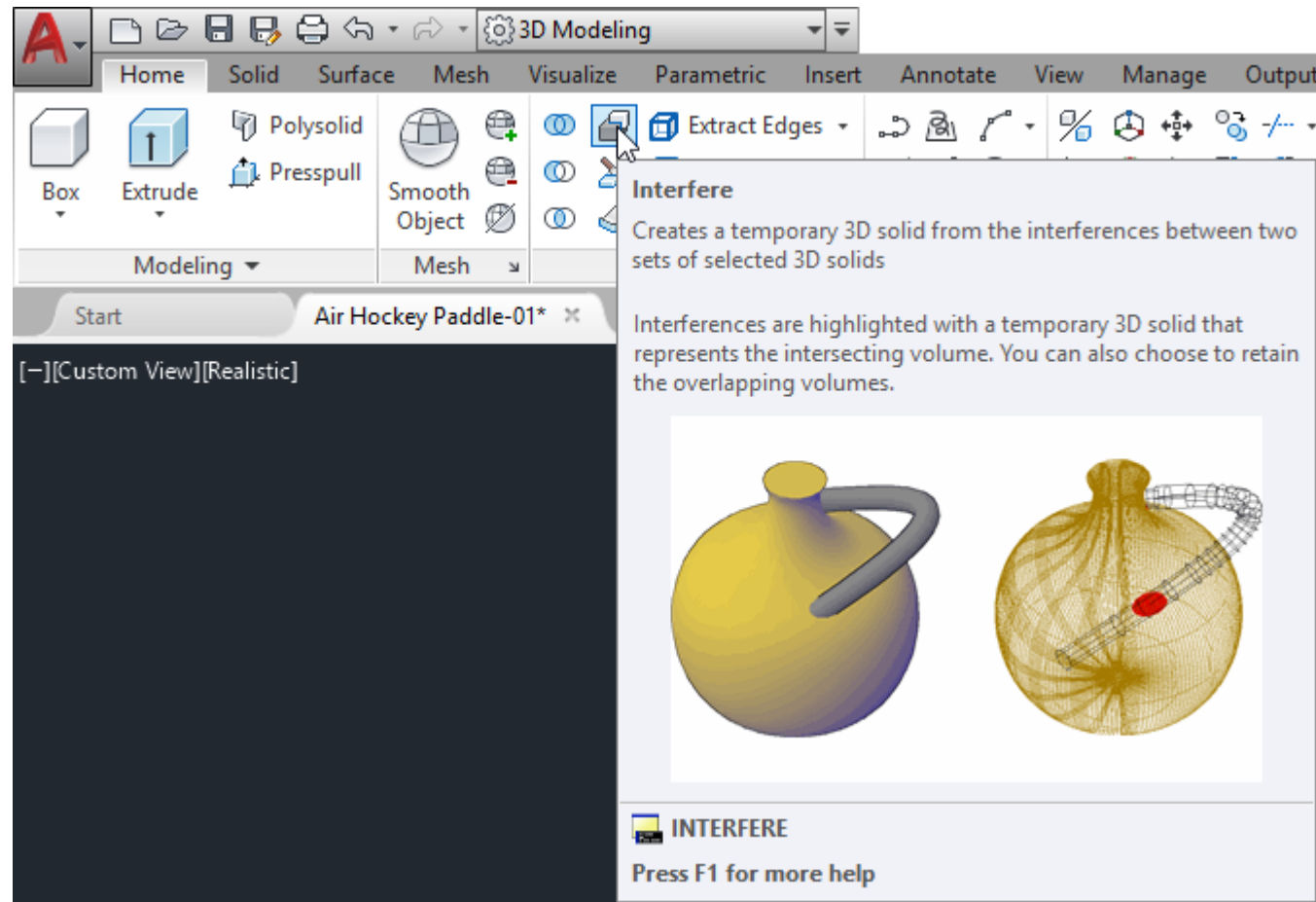


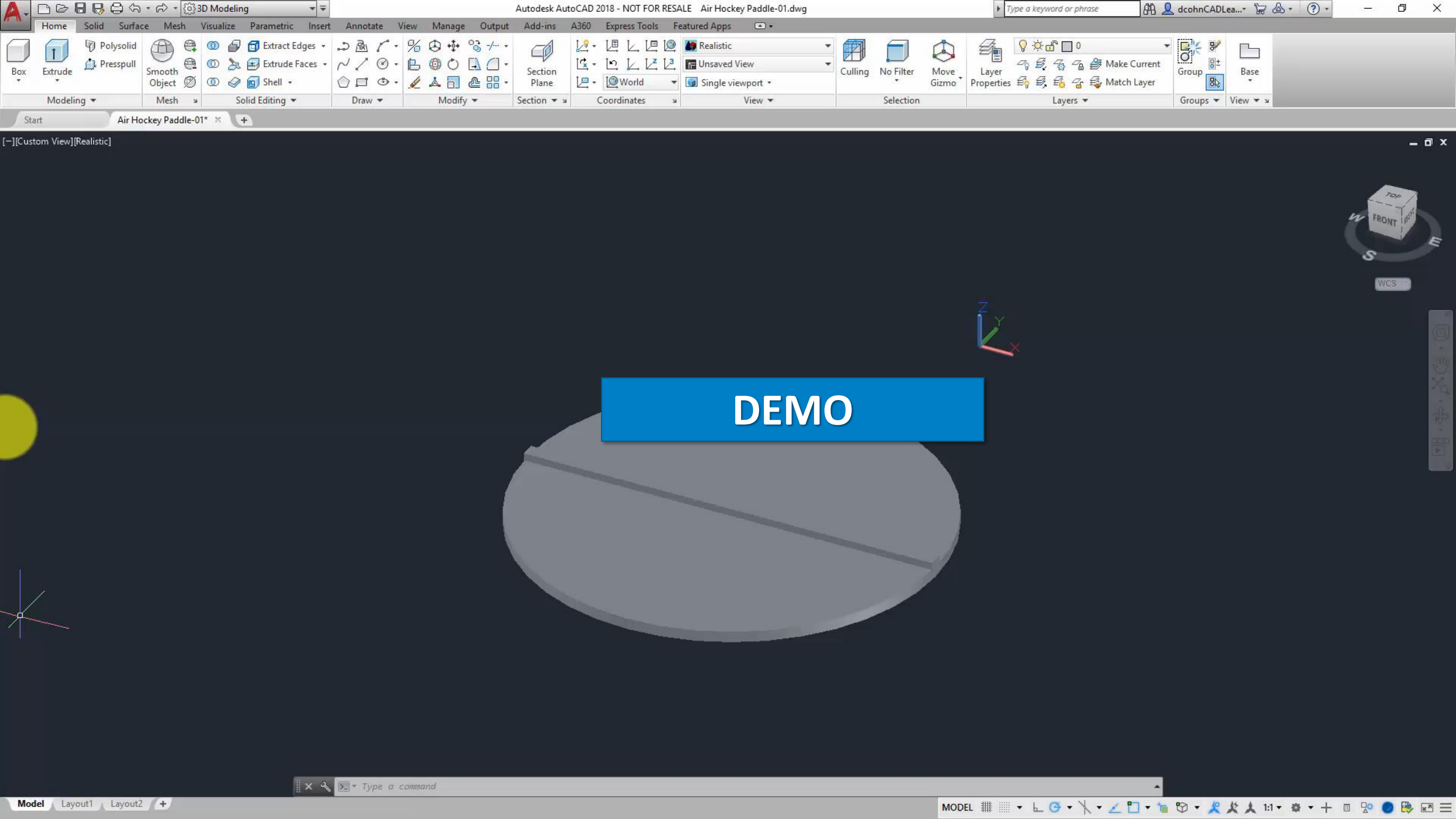


# Checking for Interferences

If you look closely, the corners of the box extend past the cylinder, which will prevent the part from being inserted into the base of the paddle

- Use the INTERFERE command to fix this



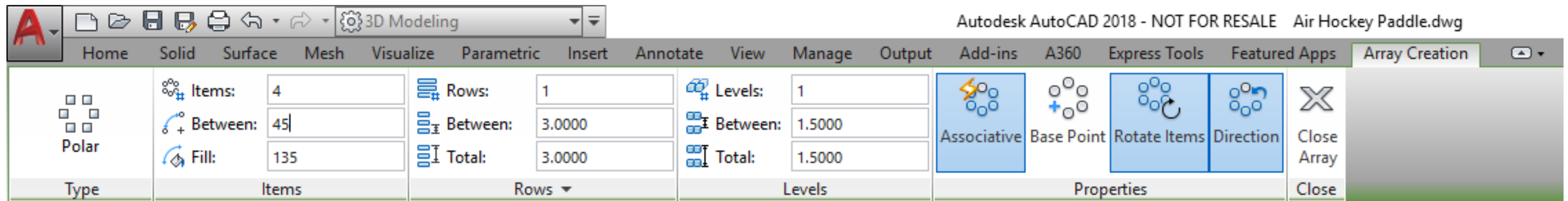
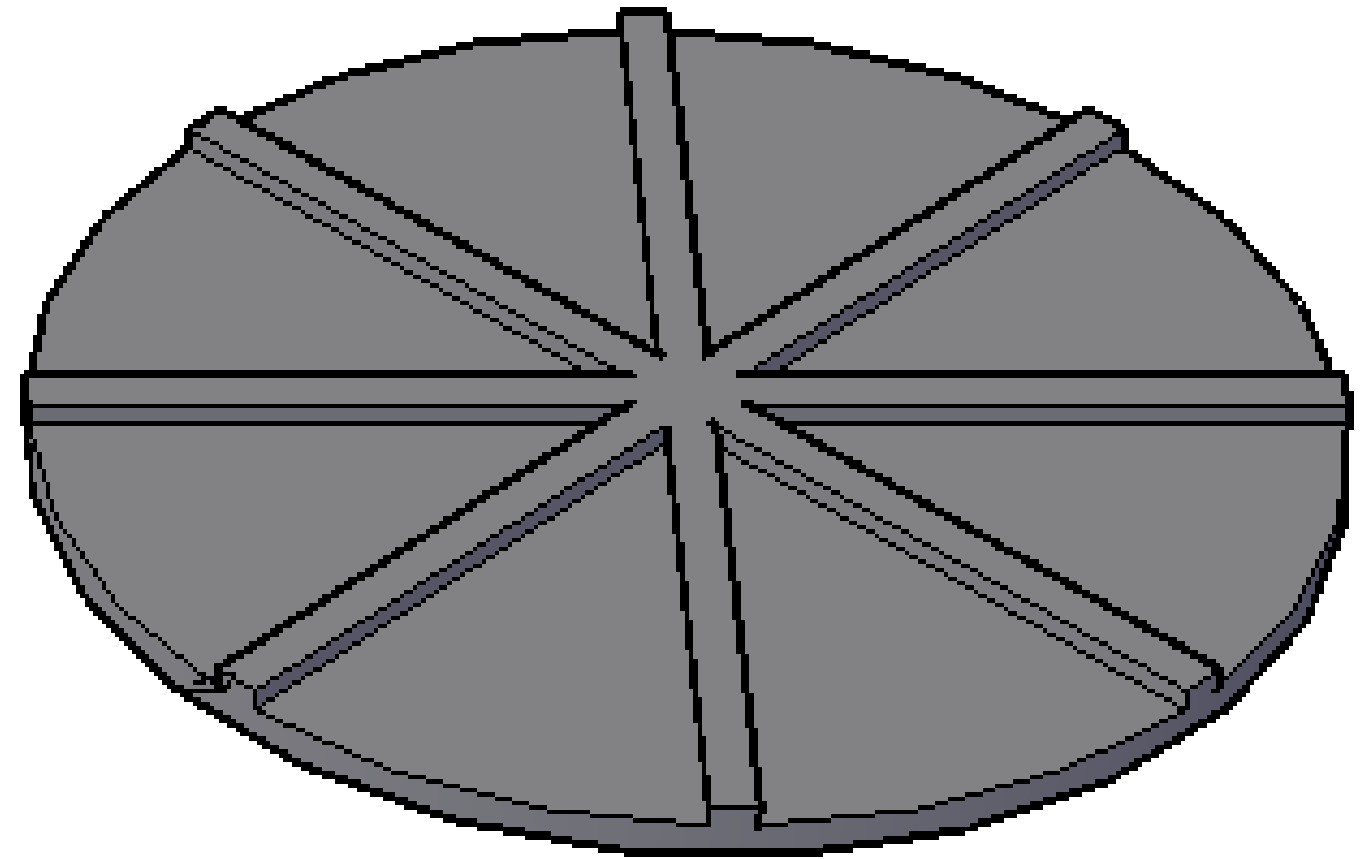


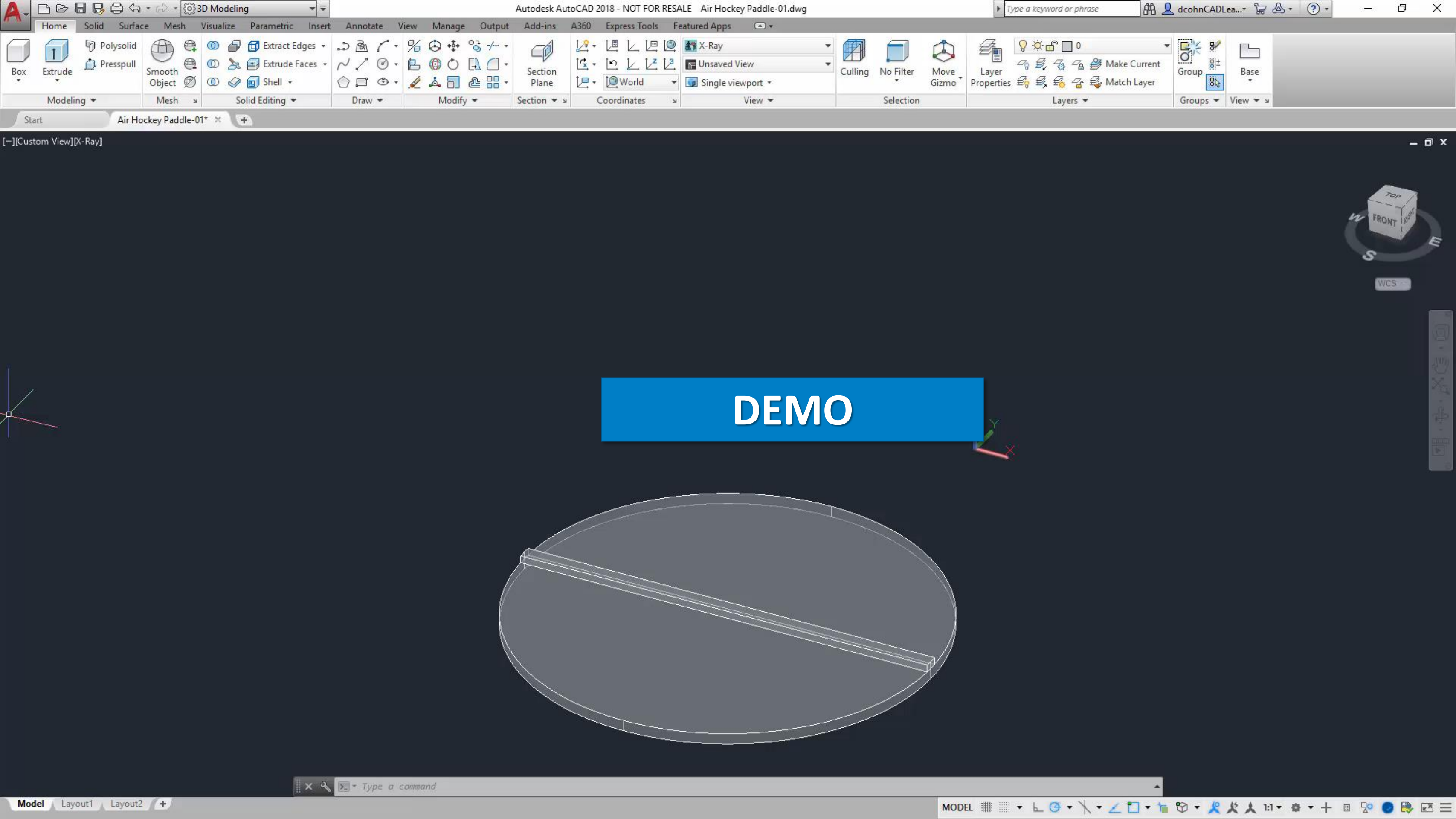


# Array the Box

Make additional copies of the rib

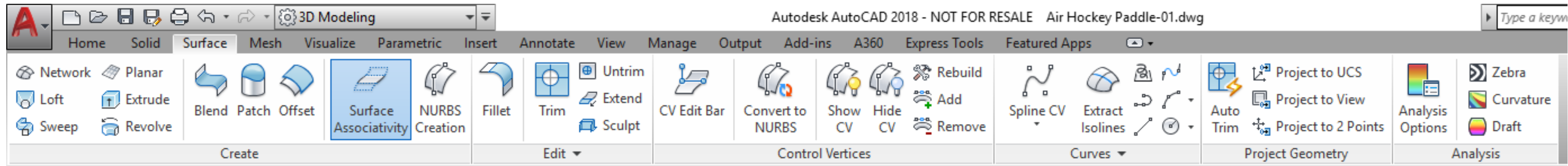
1. Create a polar array
2. Explode the associative array
3. Union the parts



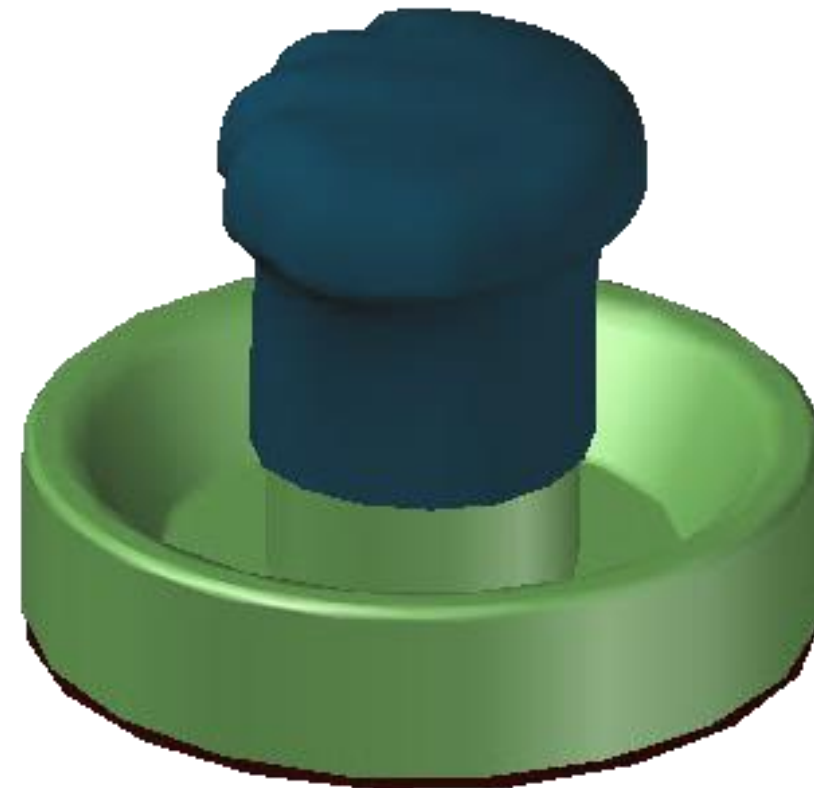


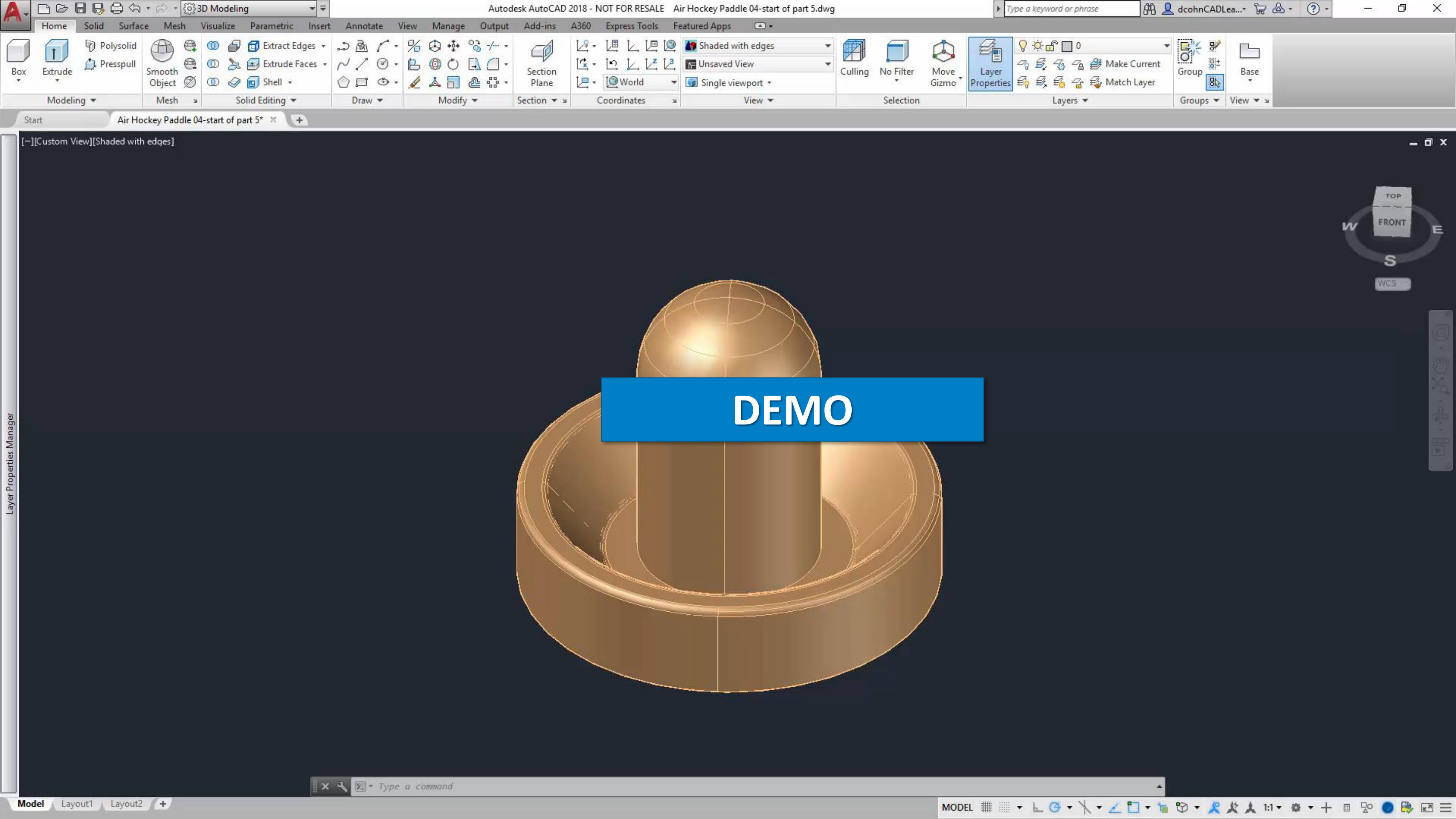
# Creating a Surface

Create a rubber grip on the end of the paddle using surface modeling tools



- Make sure Surface Associativity is enabled
- Surfaces remain associated with the curves used to create them







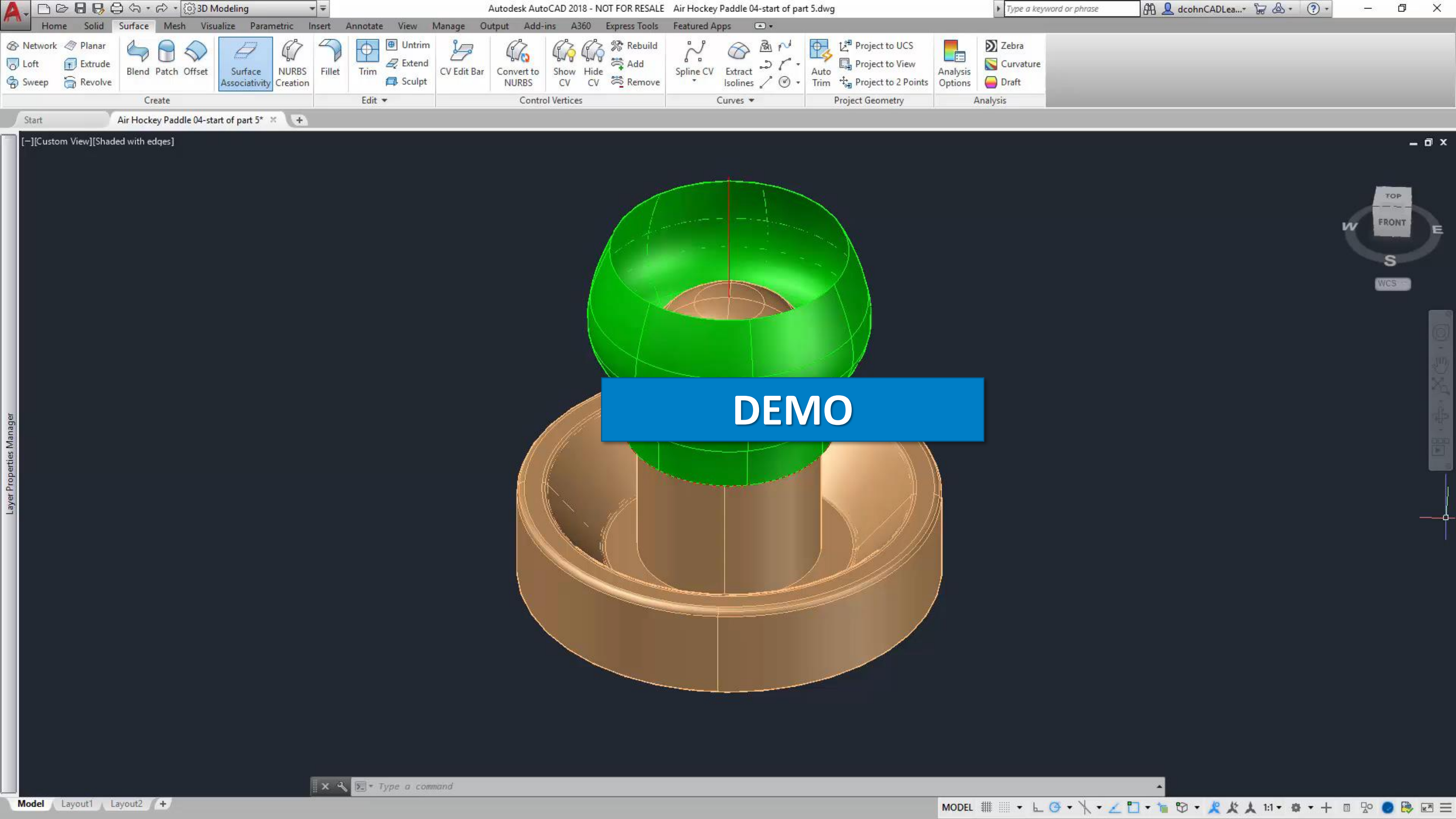
# Editing the Associated Curves

When you modify the underlying curve, the surface automatically updates

To modify the surface:

- Use subobject selection filters, 3D osnap, and gizmos

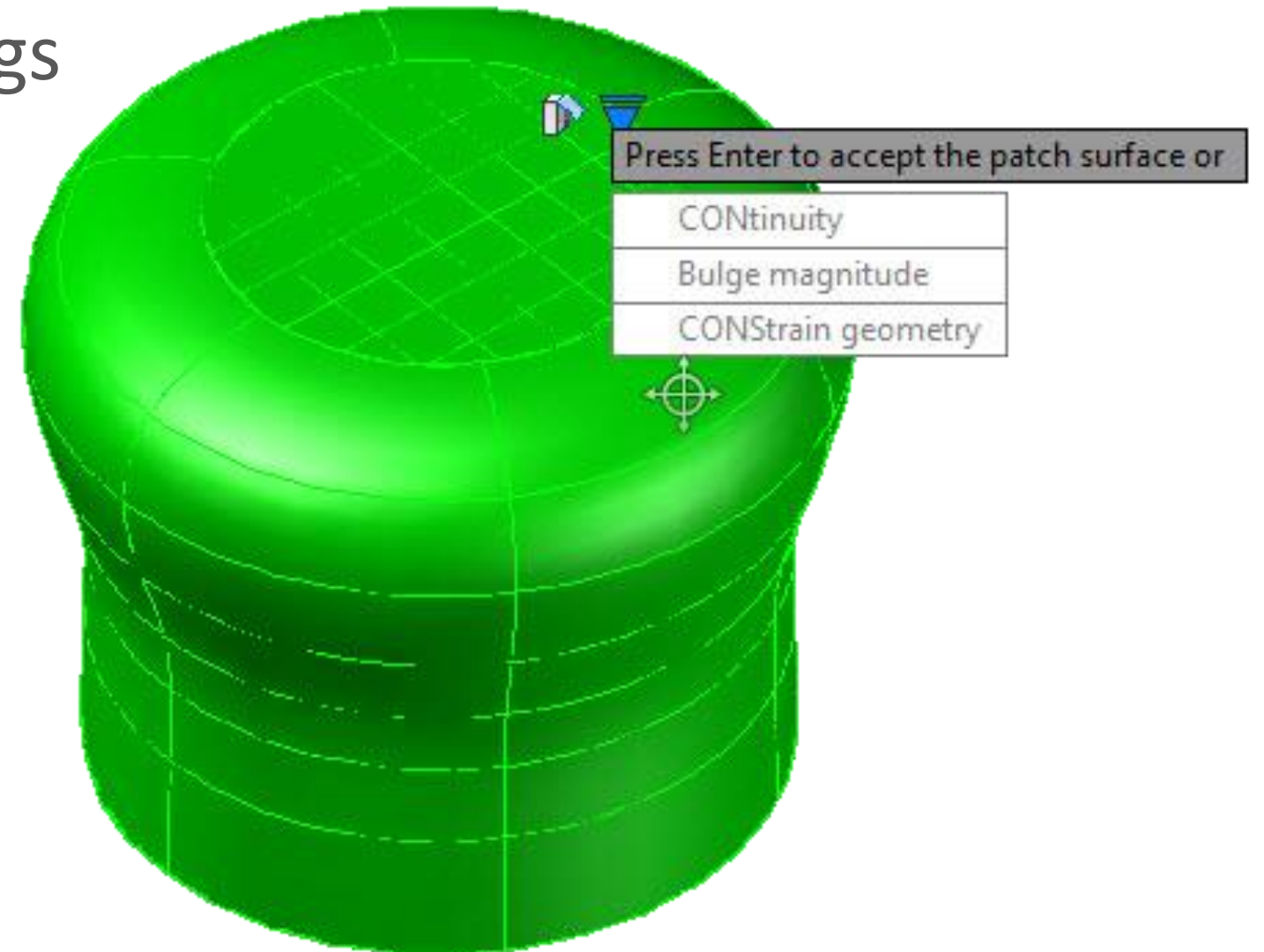




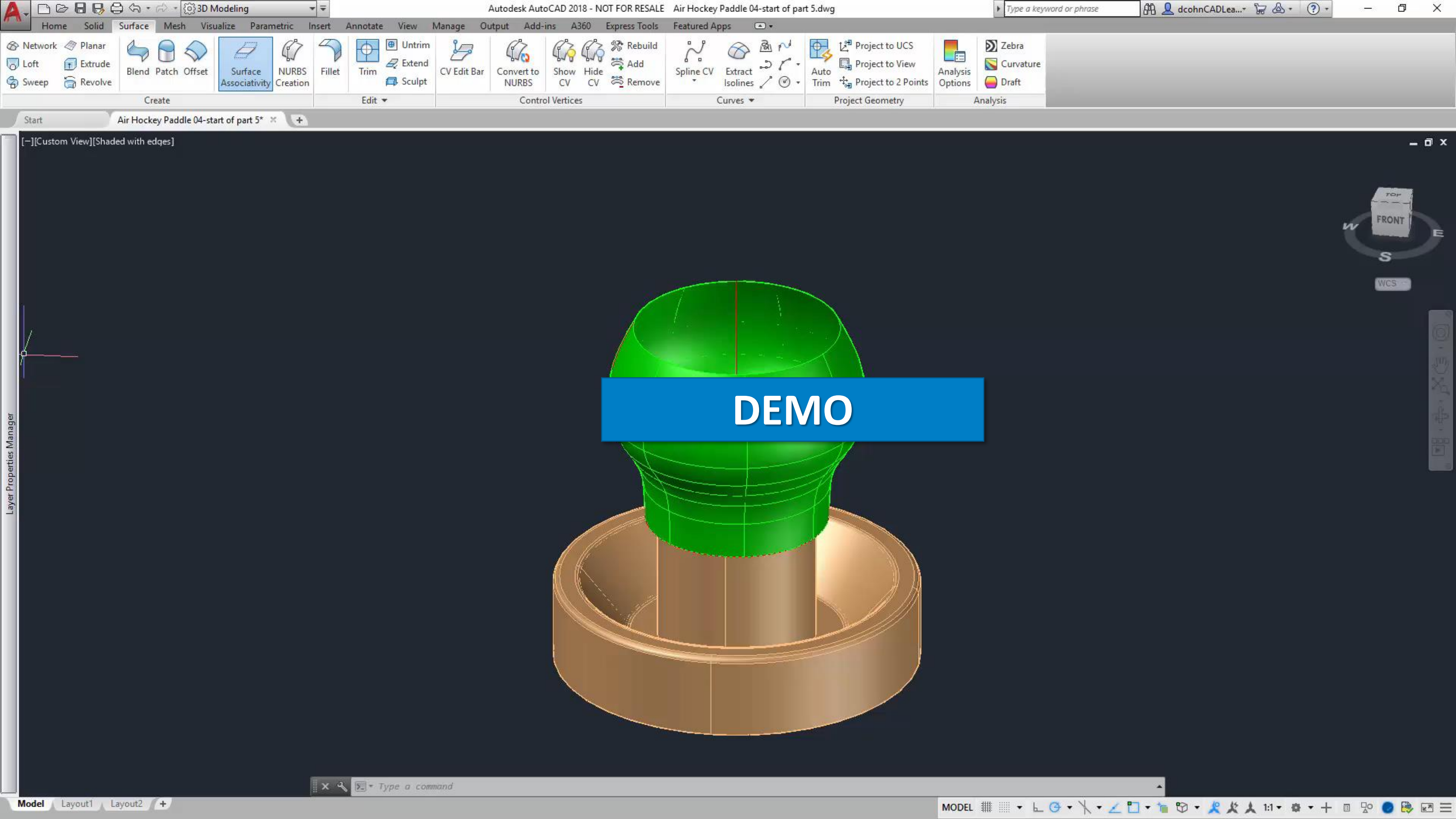
# Making a Watertight Surface

Before you can convert the surface into a solid, it must be completely enclosed, forming a “watertight” surface.

- Use the Surface Patch tool to close openings





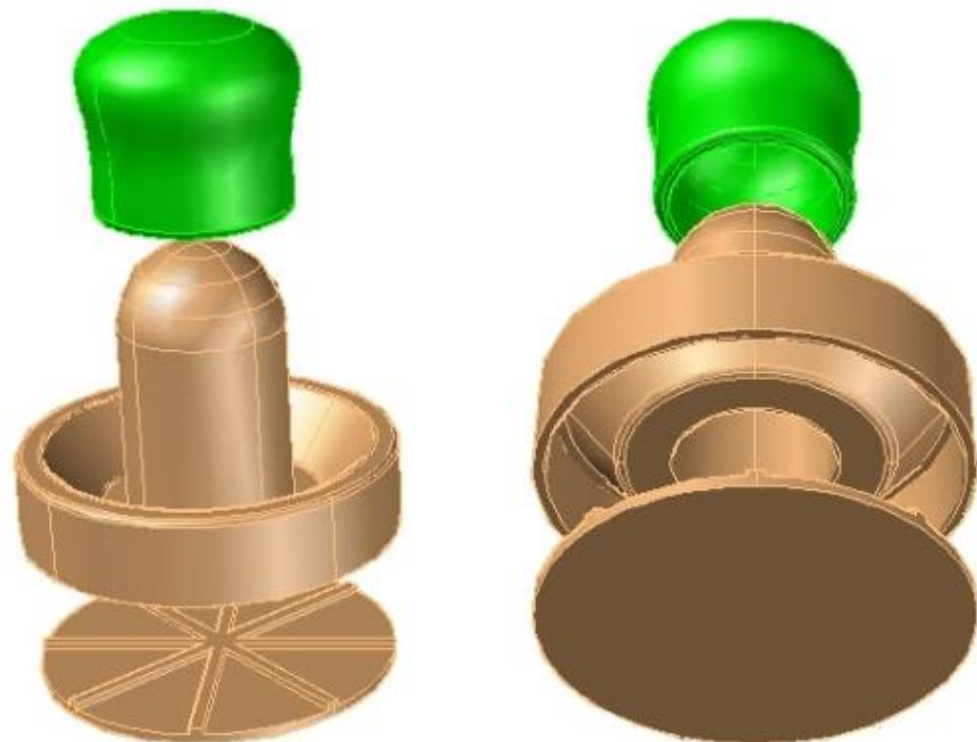


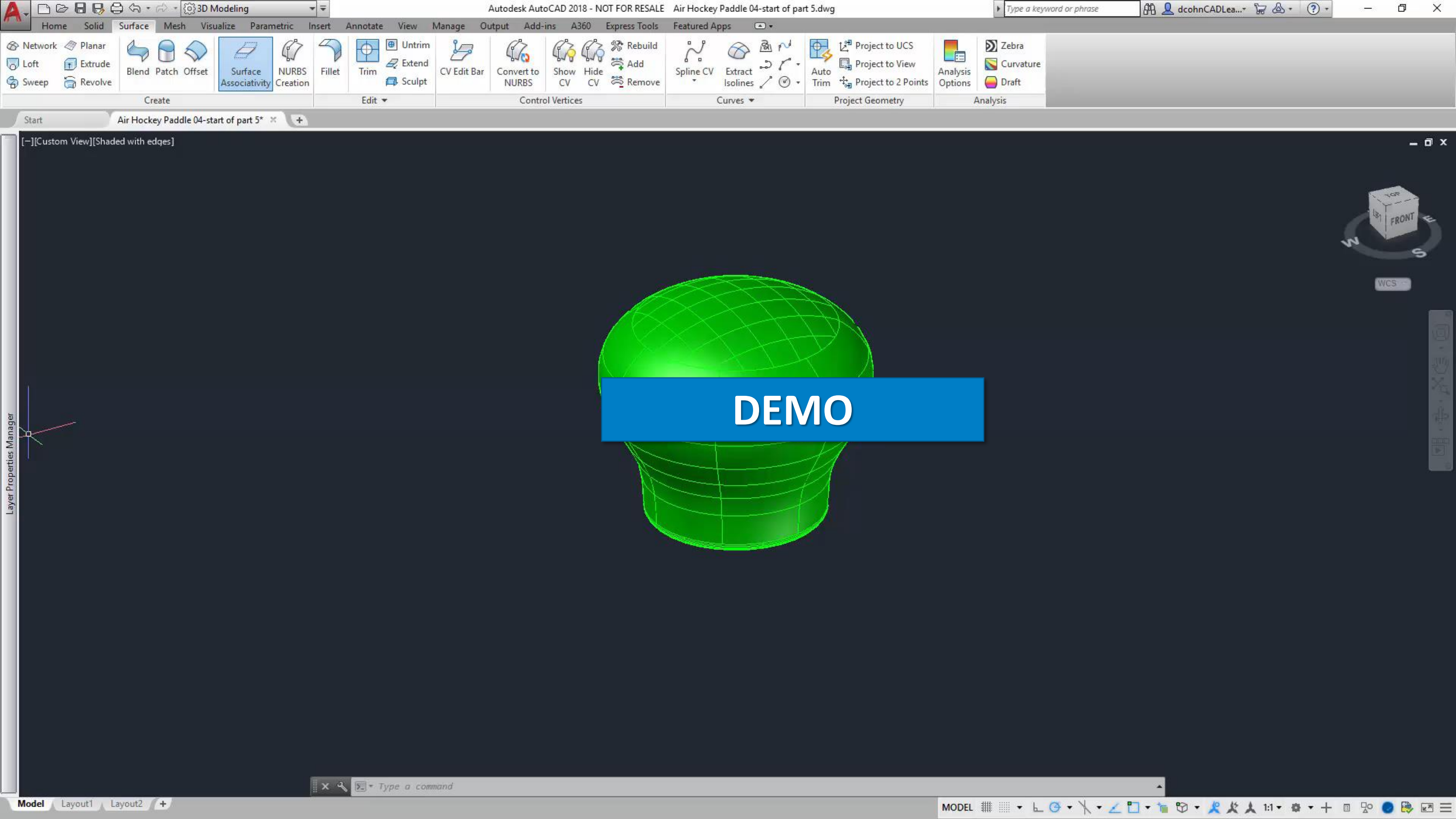


# Integrating Surfaces with Solids

To integrate the free-form surface with the precision solid:

1. Convert the surface into a solid
2. Subtract the plastic paddle from the rubber handle
3. Separate the resulting solid

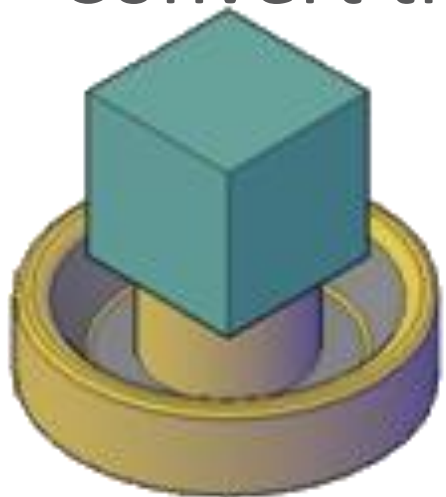




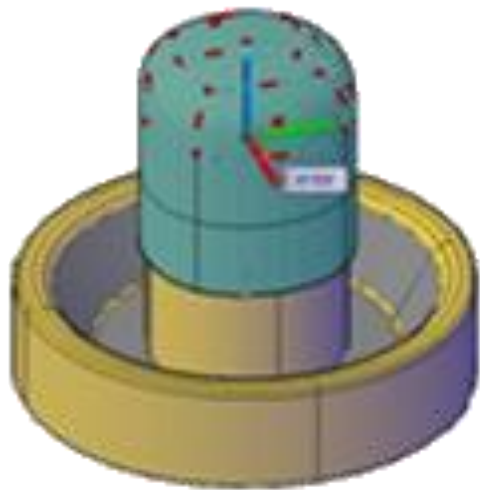
# Working with Meshes

The rubber grip could also have been created using a mesh object

1. Create a mesh box
2. Make the box smoother
3. Create a bulge
4. Increase the faces
5. Move mesh vertices
6. Convert the mesh into a solid



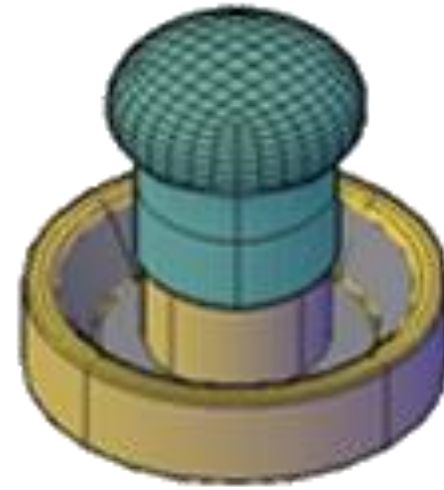
**Step 1**



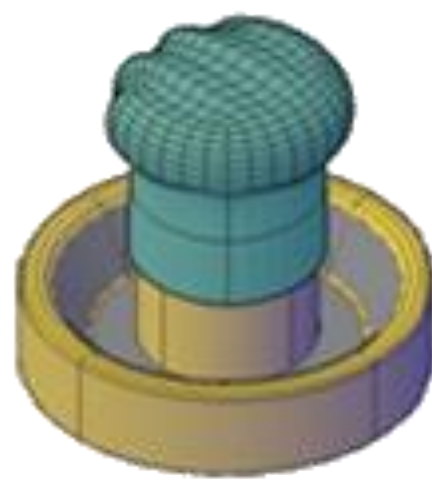
**Step 2**



**Step 3**



**Step 4**

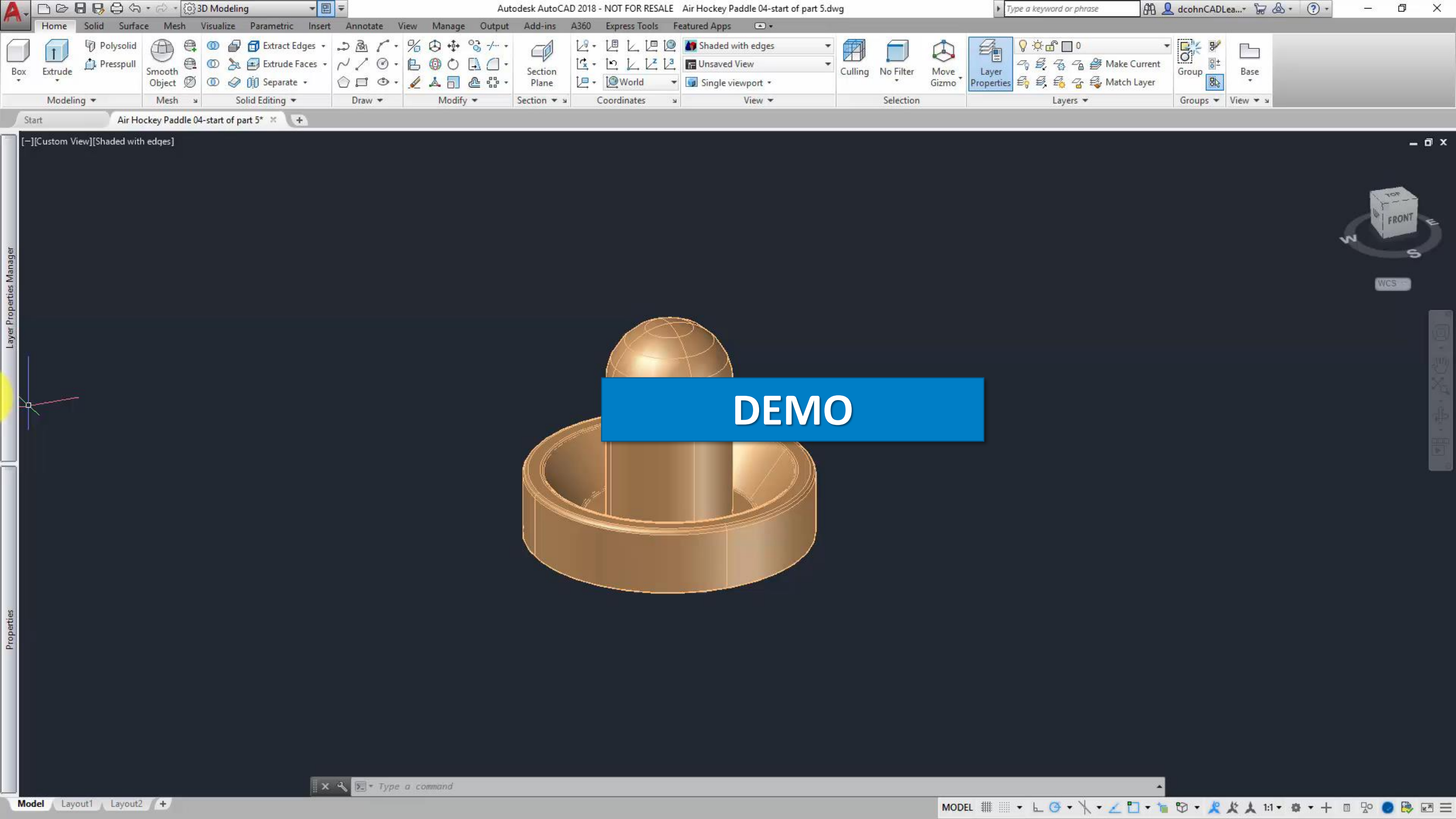


**Step 5**



**Step 6**



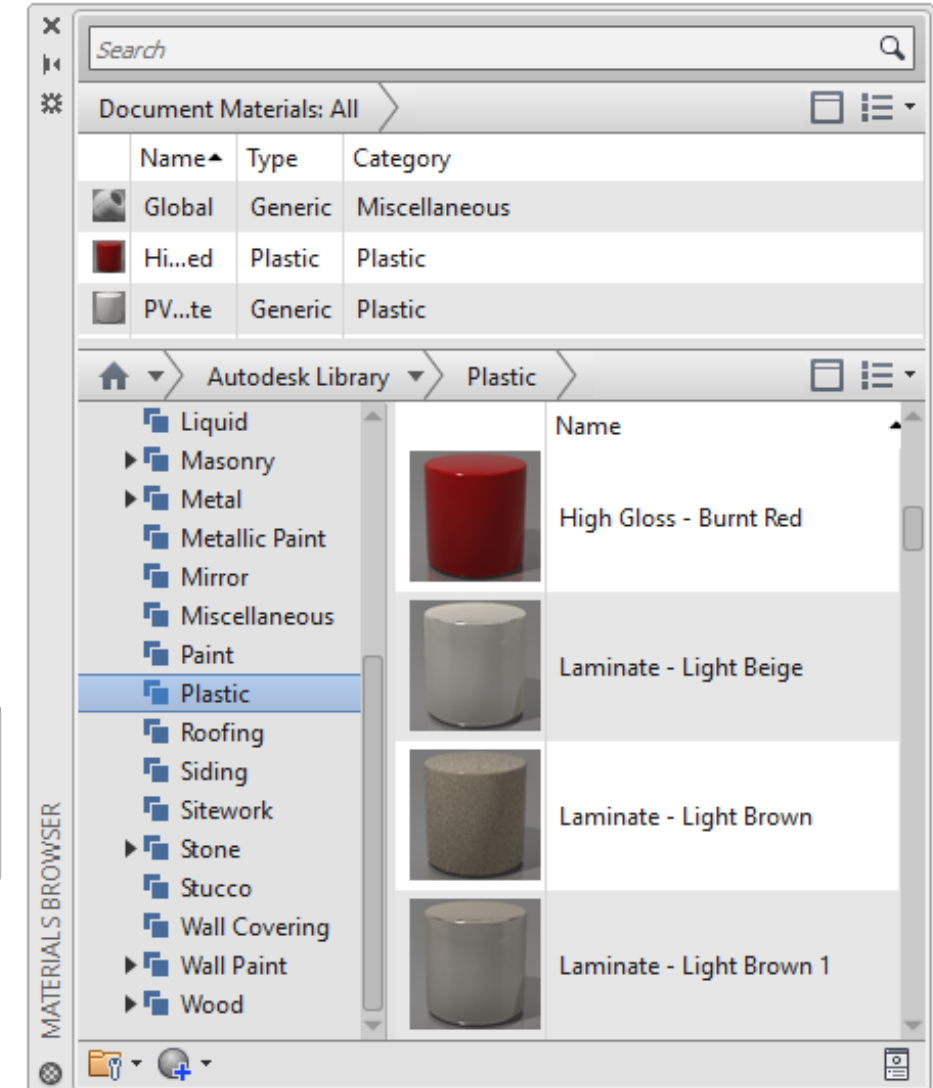
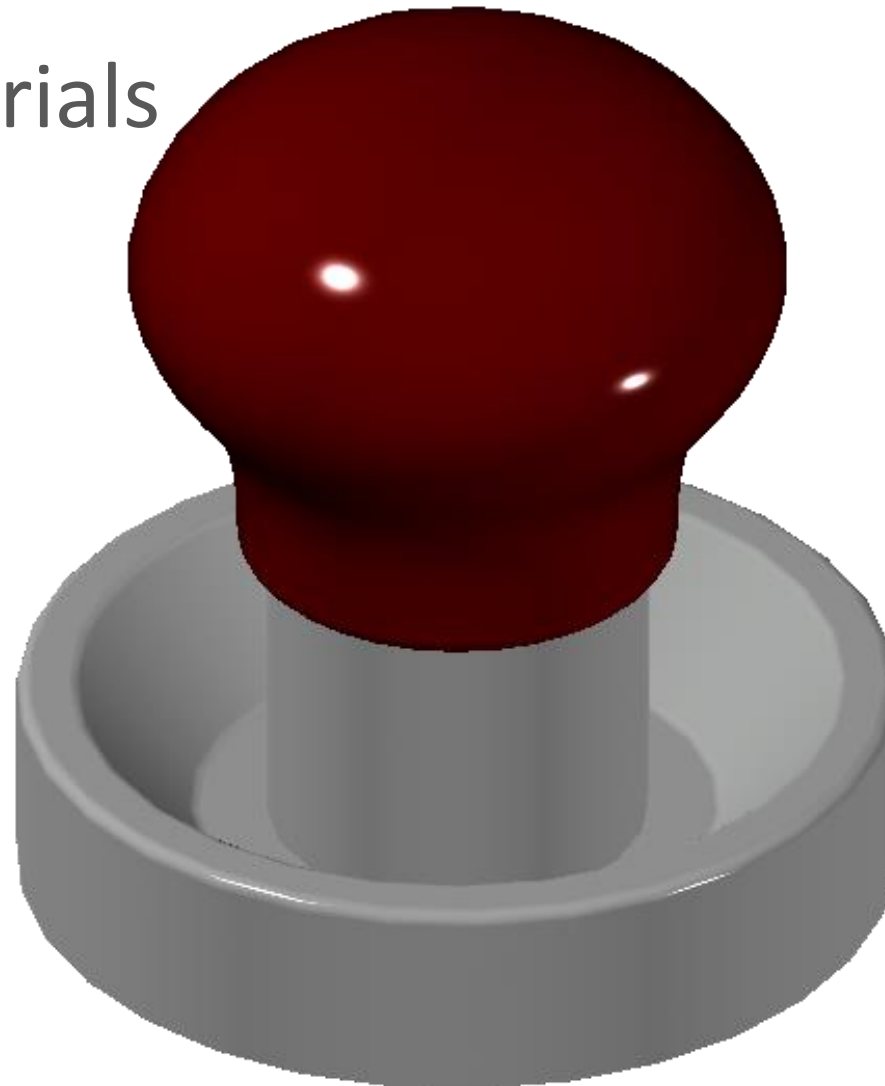


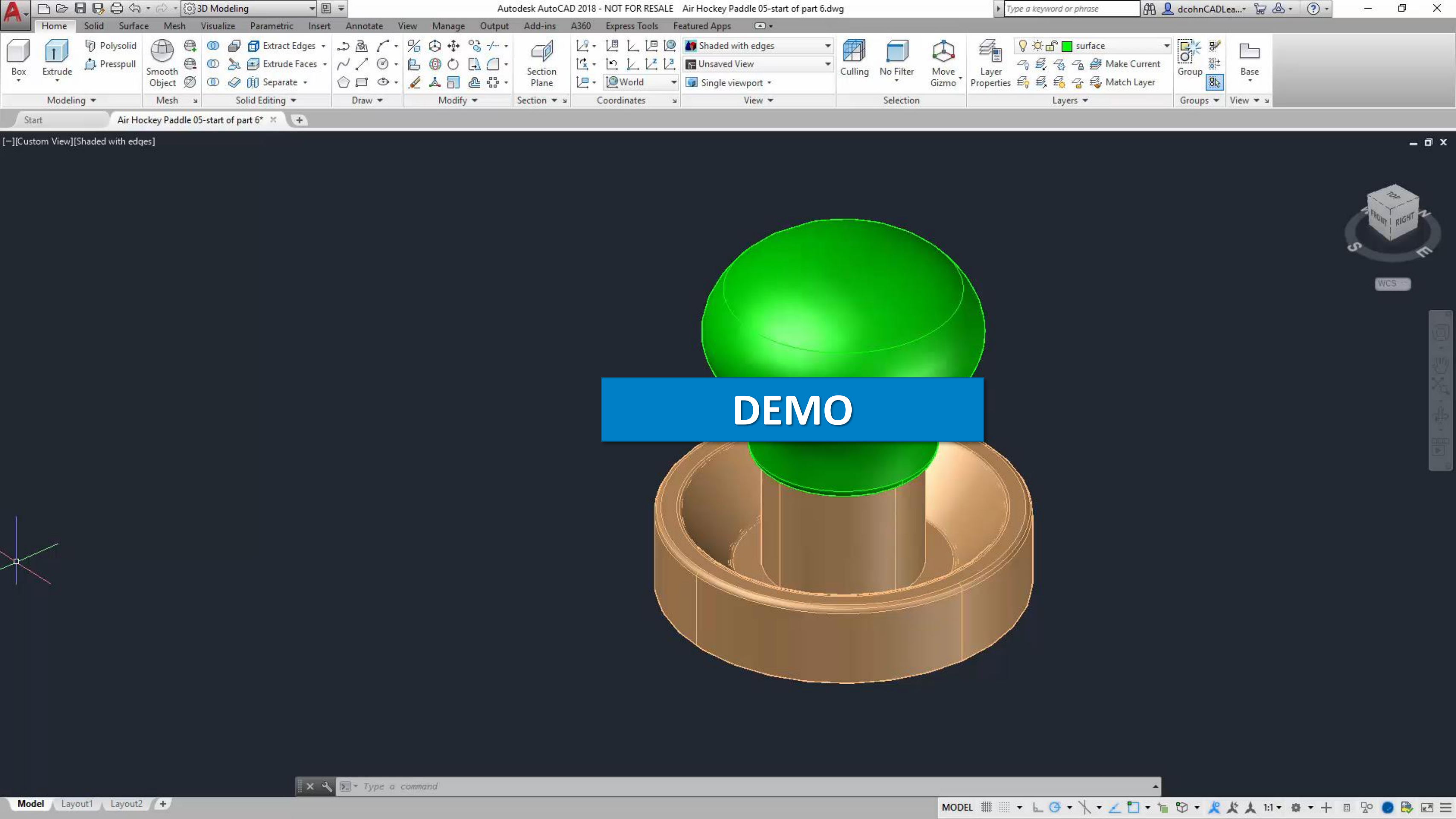


# Applying Materials

You can apply materials to your parts to help convey your design intent.

- Accessible from the Materials Browser
  - Contains 700+ predefined materials
  - 1000+ textures
  - Can create your own
  - Use drag-and-drop
  - Use Realistic visual style to see materials

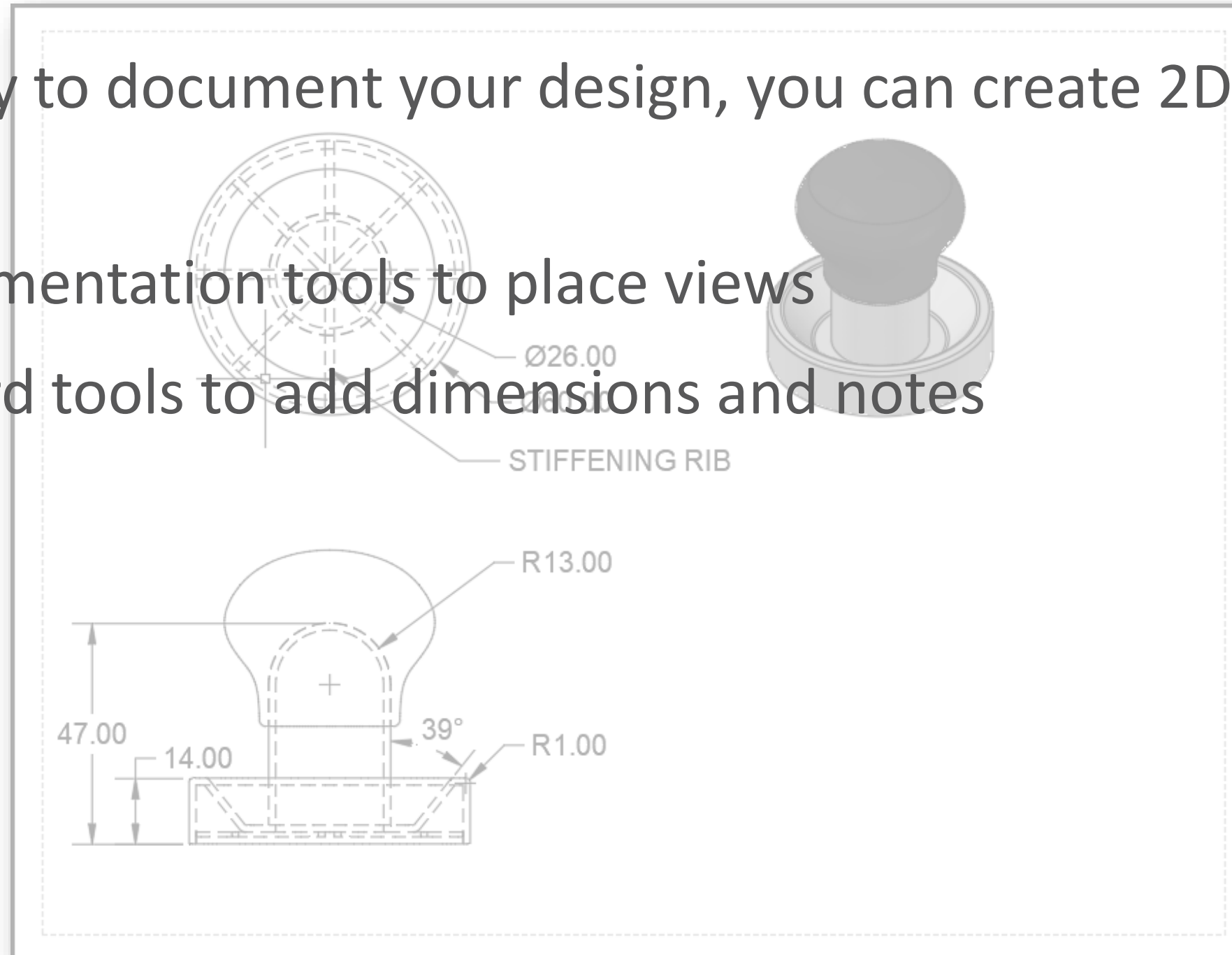


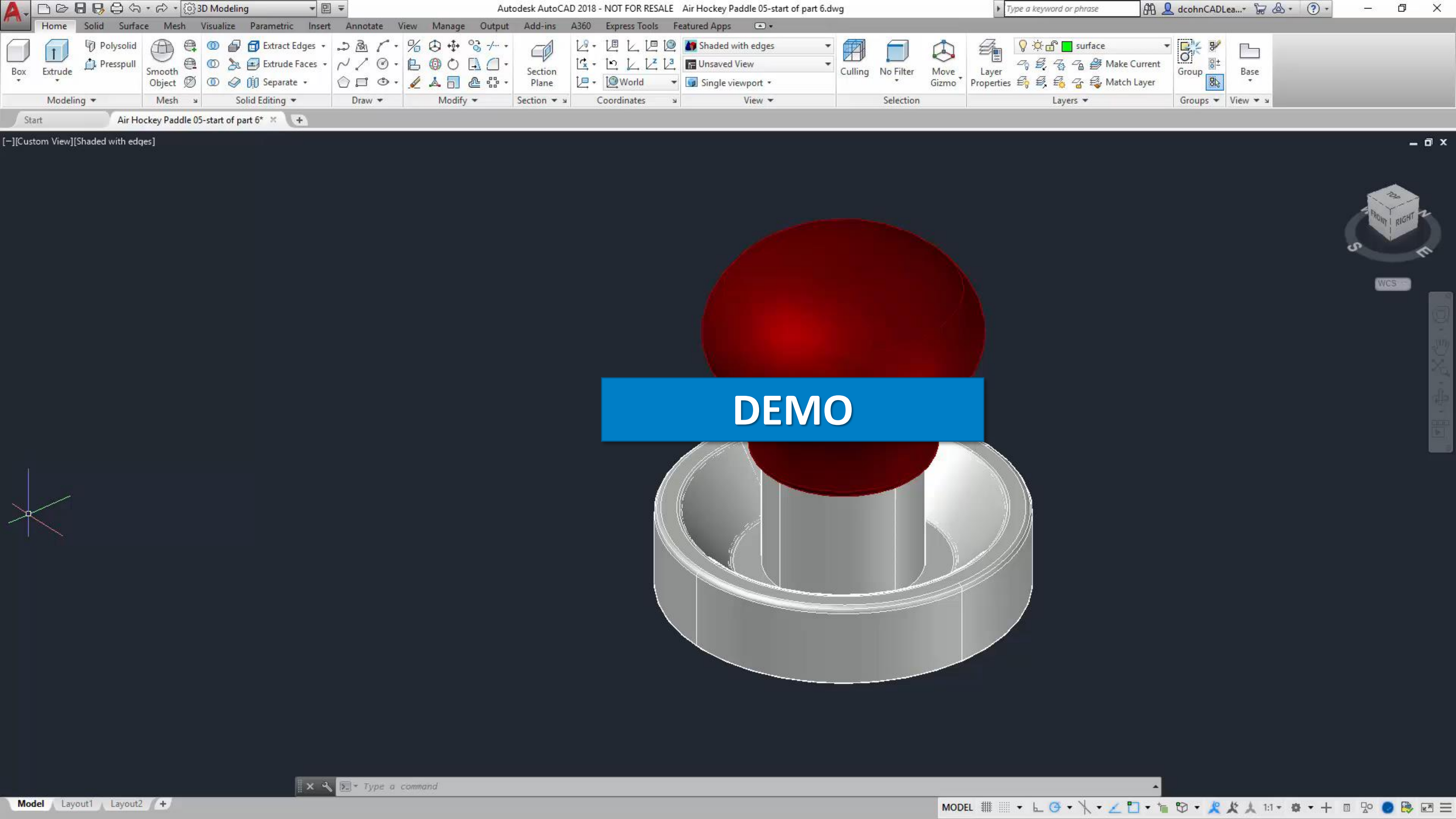


# Creating a 2D Drawing from a 3D Model

When you are ready to document your design, you can create 2D drawings directly from the 3D model:

- Use Model Documentation tools to place views
- Then use standard tools to add dimensions and notes







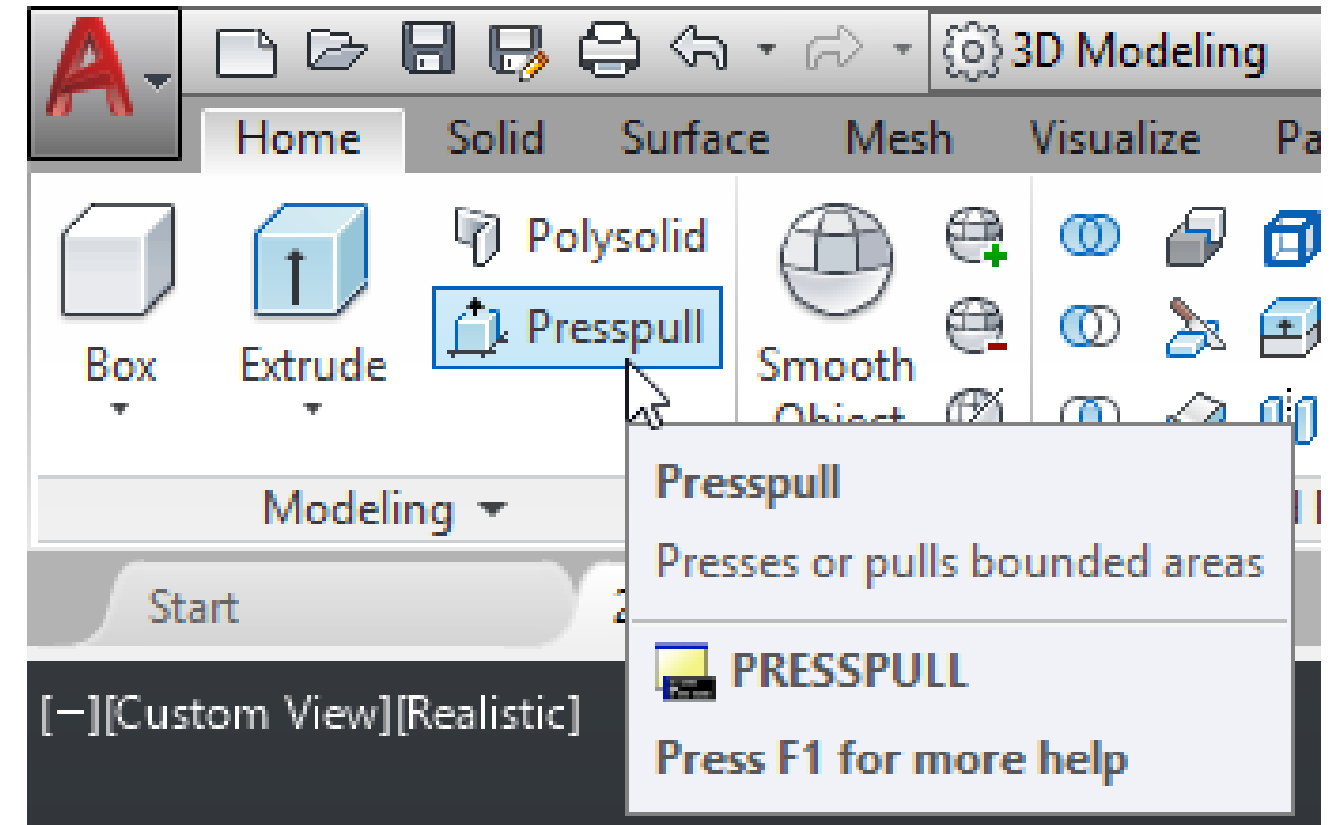
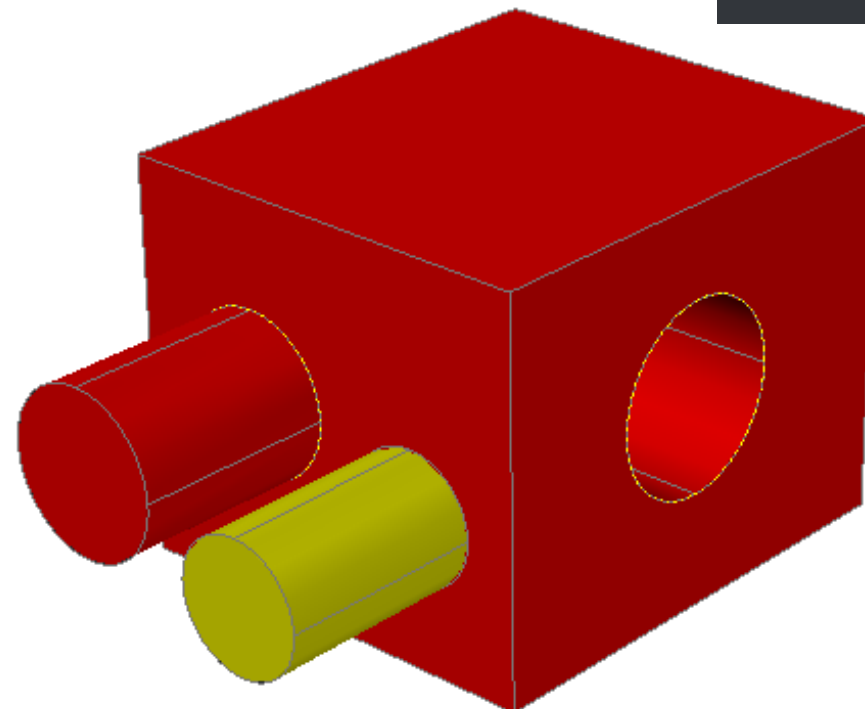
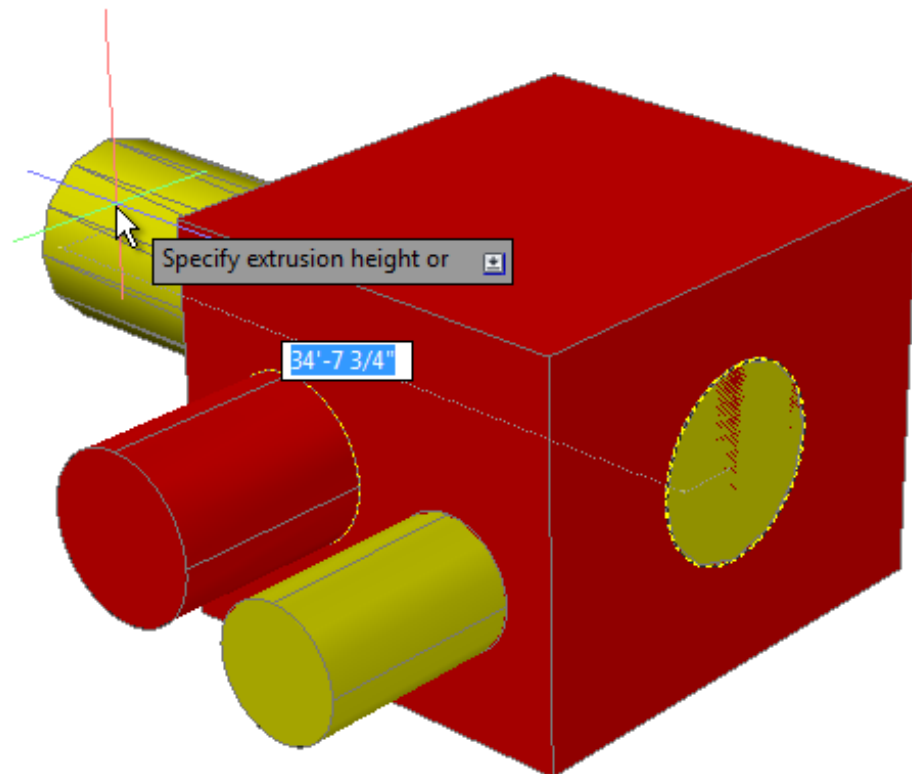
The background of the slide is a complex, abstract 3D wireframe mesh. It consists of a dense network of interconnected lines forming a series of interconnected, flowing, and undulating shapes that resemble a liquid or organic structure. The mesh is rendered in a light gray color against a white background. A solid blue horizontal band is positioned across the lower third of the image, serving as a backdrop for the text.

# Other 3D Modeling Tools

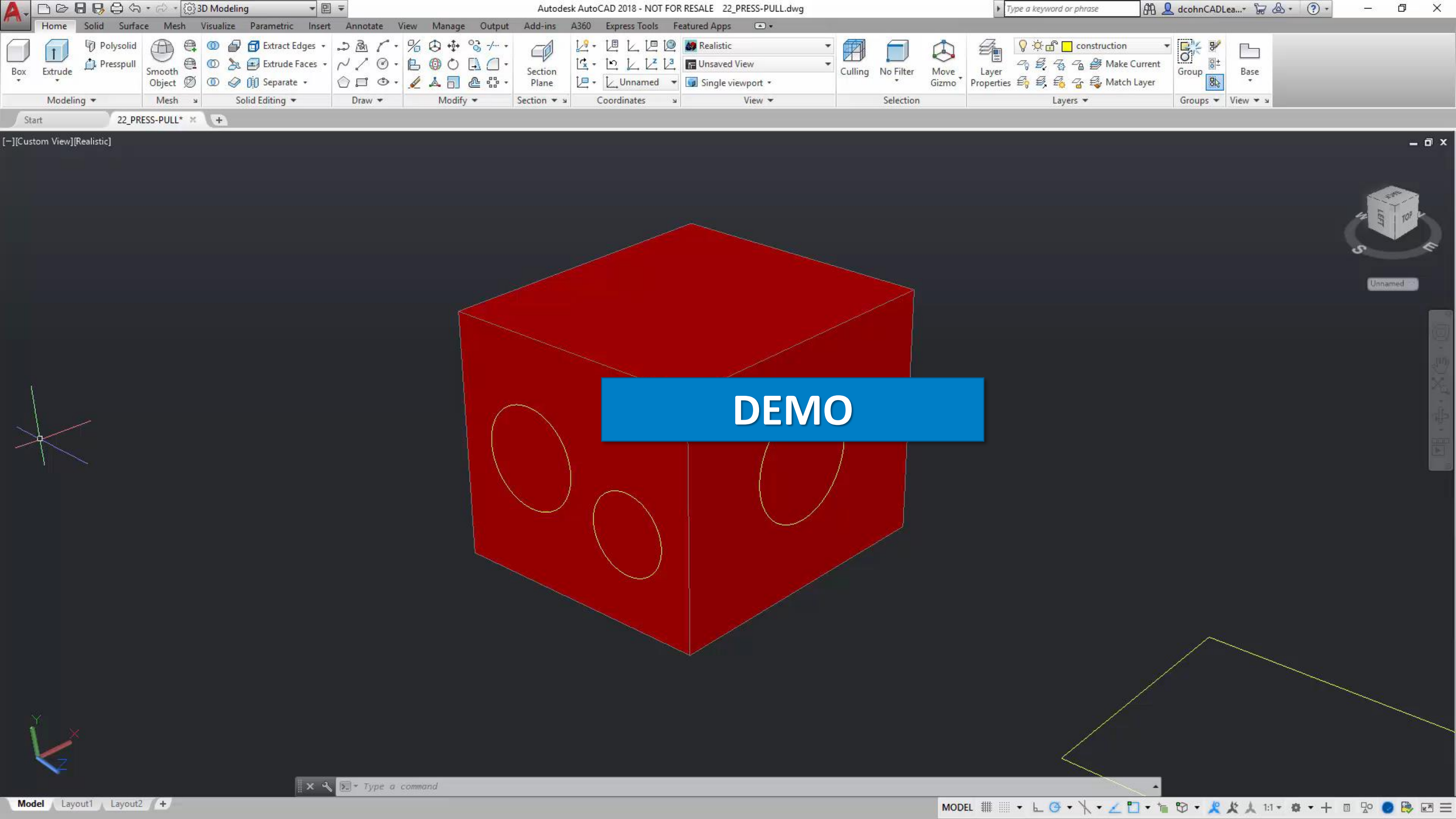
# Press/Pull

A very versatile tool for manipulating objects

- Push/pull 2D objects sketched on solids
- Closed objects become solids
- Open objects become surfaces



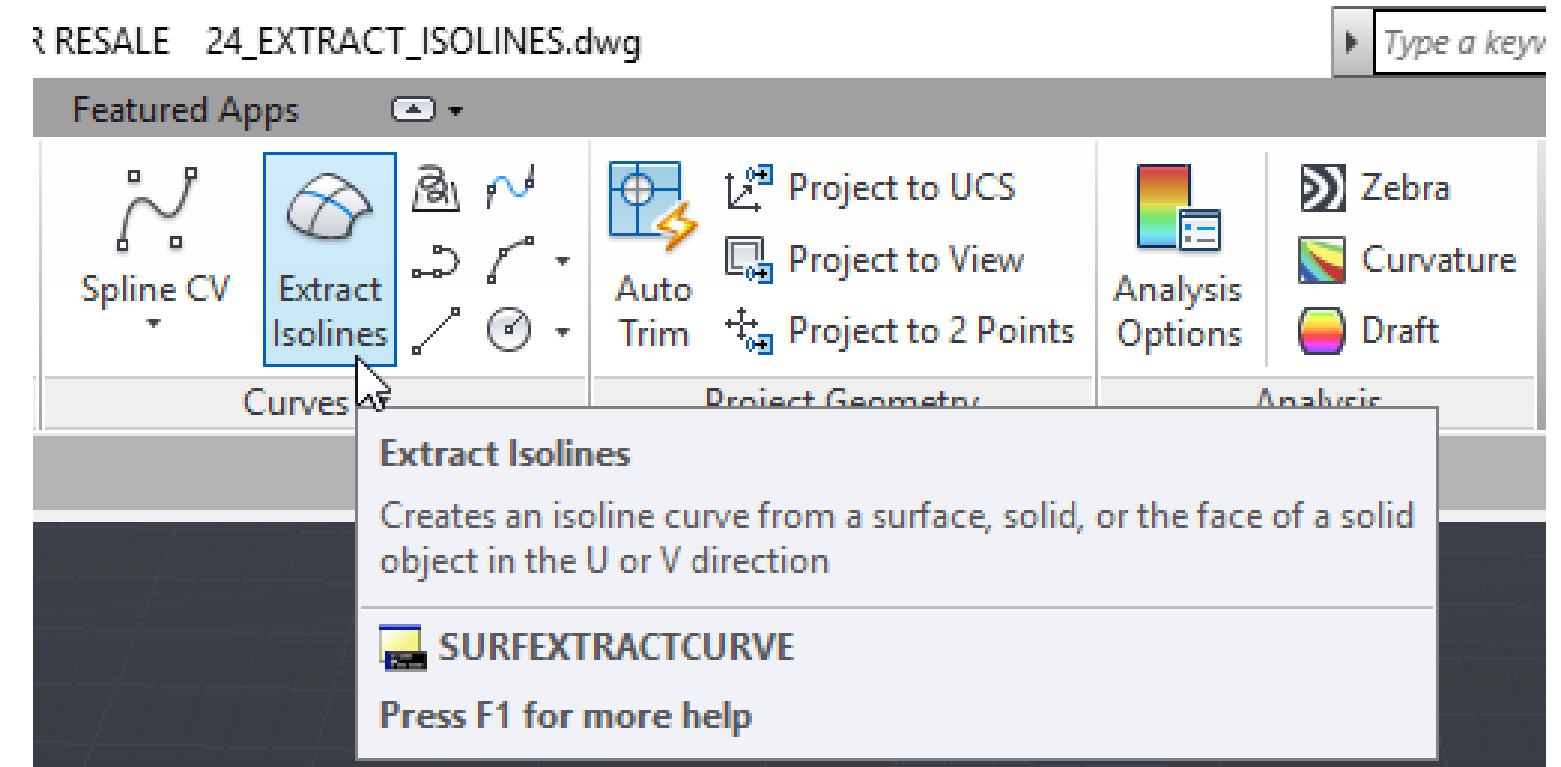
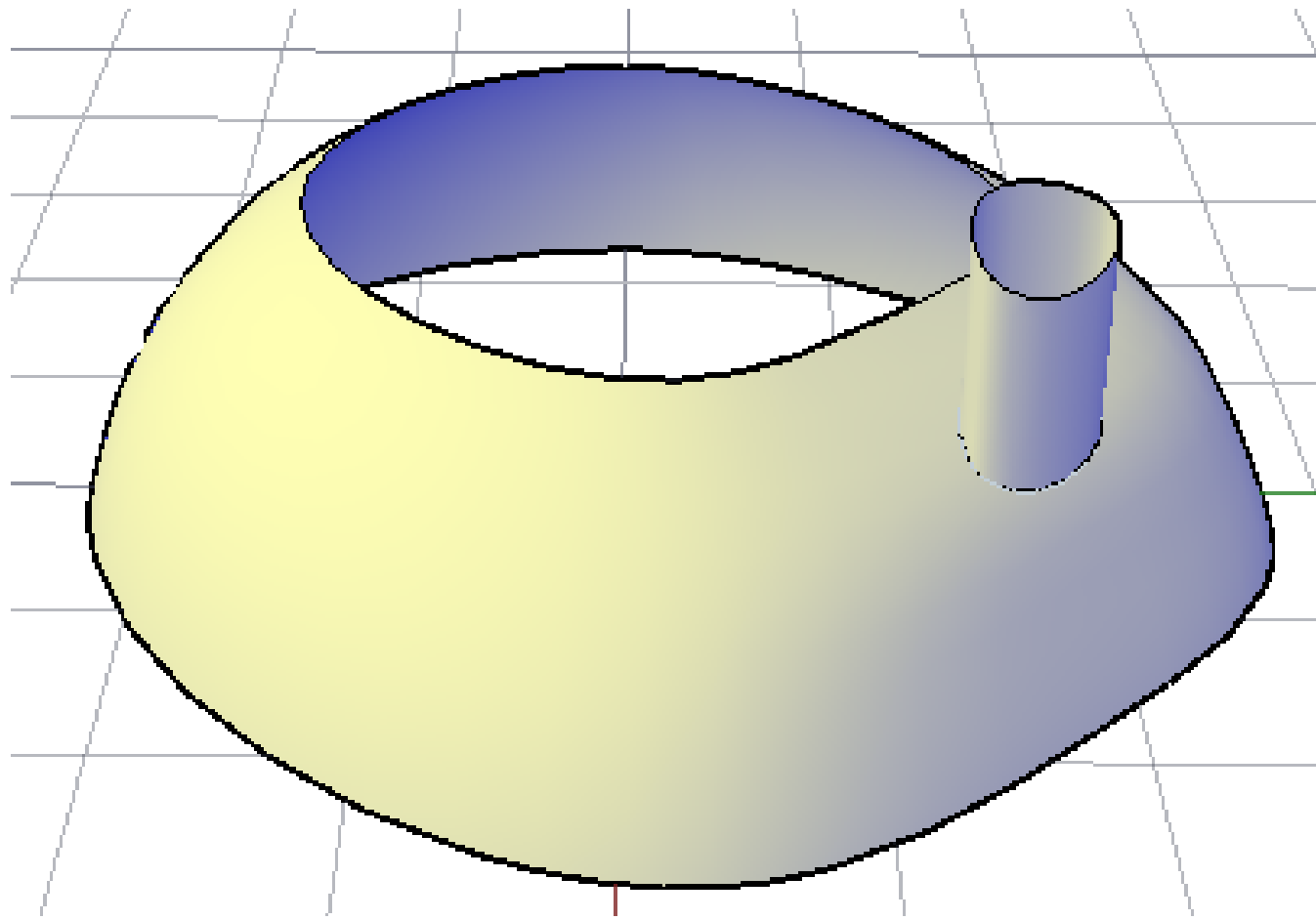




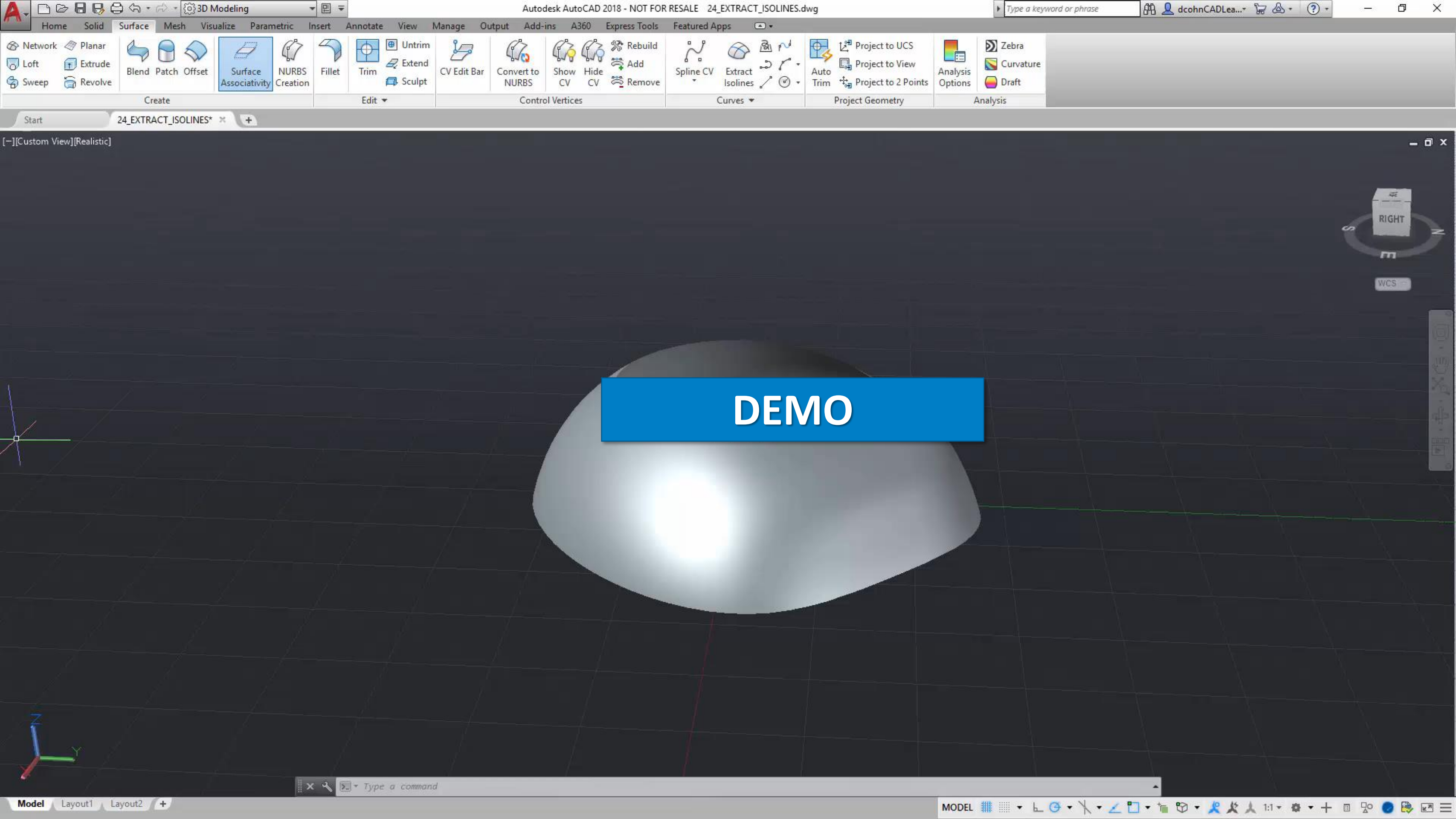
# Extract Isolines

Enables you to create curves directly on surfaces

- Use those curves to create other objects



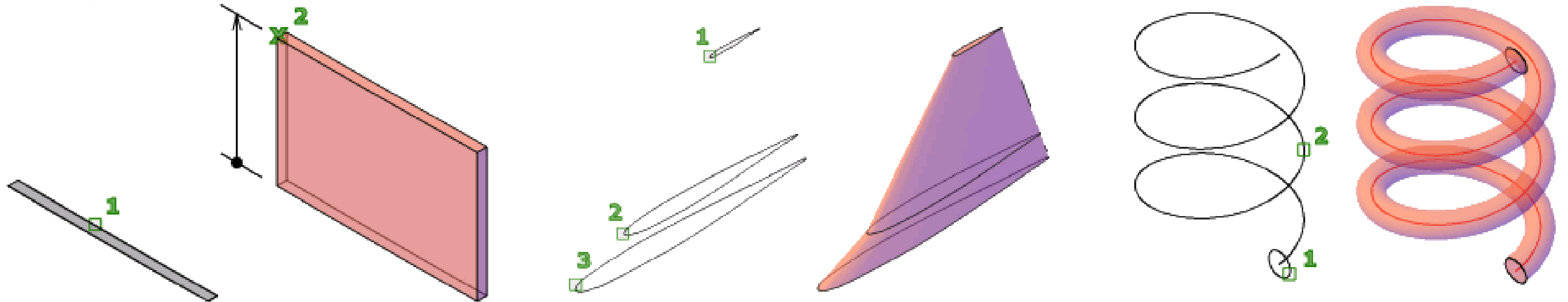


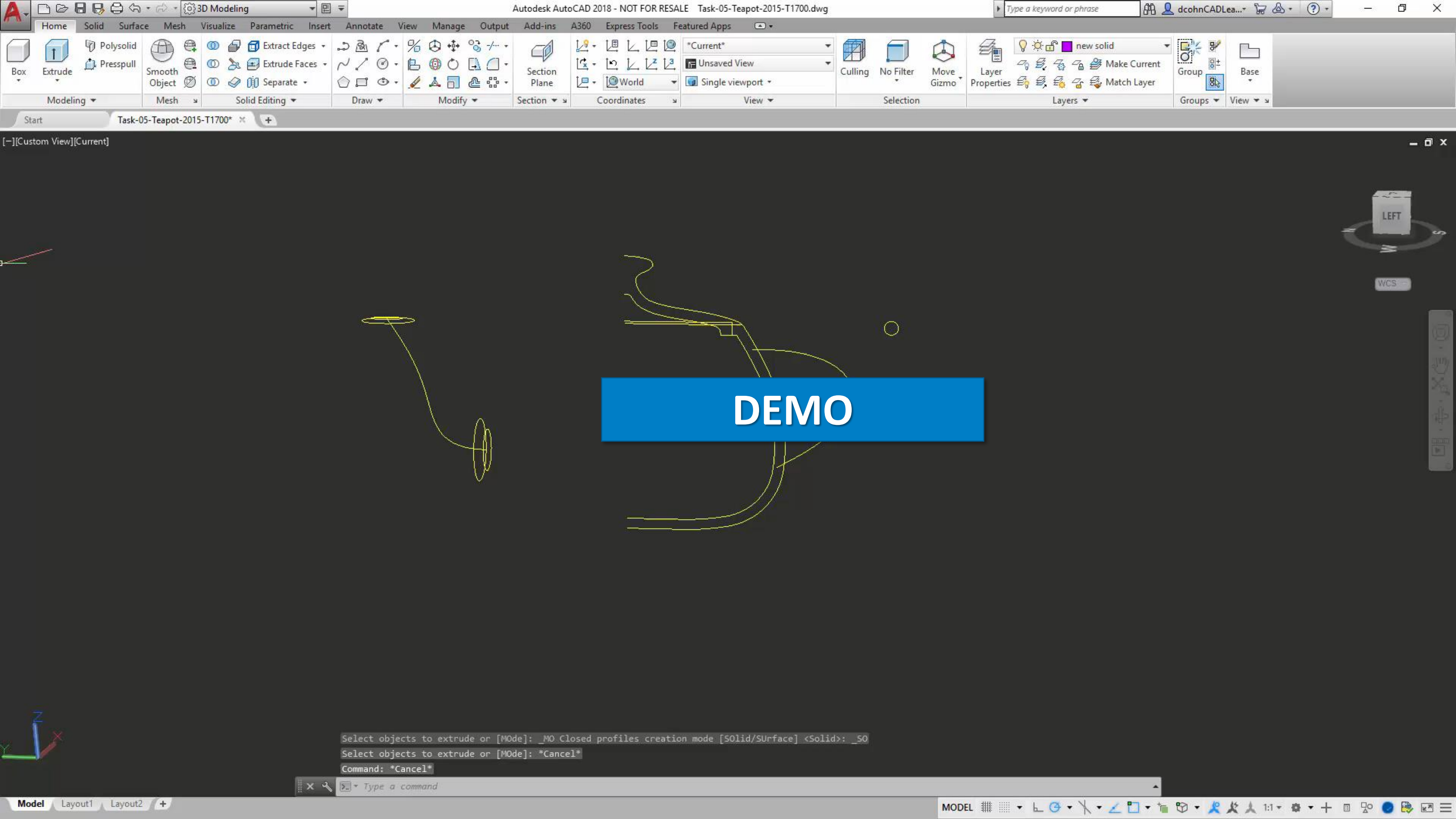


# Other 3D Modeling Tools

Combine tools to model almost anything

- Extrude
- Revolve
- Sweep
- Loft

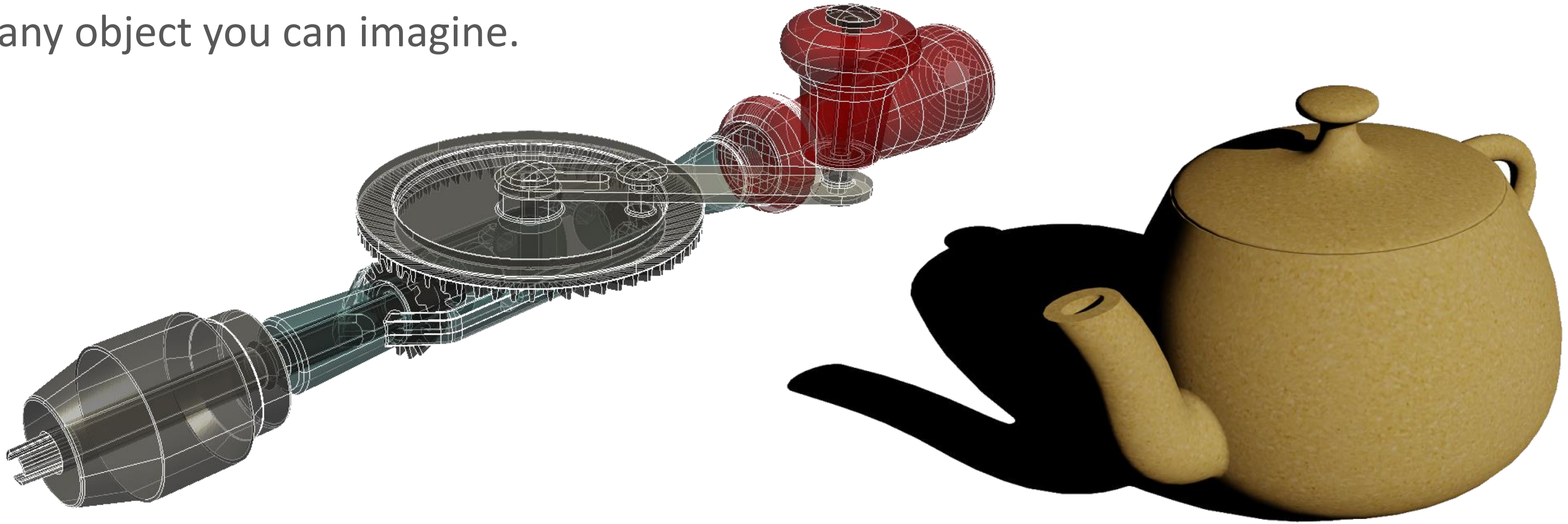






# Conclusion

Used alone or in combination, you can use tools in AutoCAD to model just about any object you can imagine.



These objects were modeled entirely in AutoCAD.



# To learn more...

The screenshot displays the CADLearning website interface. At the top, the logo 'CADLearning' with the tagline 'design your future' is on the left. Navigation links for 'Library', 'Small Business', 'Enterprise', and 'Education' are in the center, followed by a search bar and a 'Login' button on the right. A 'Free for 30 Days' promotional banner is visible. The main content area features a video player titled 'Creating Curves by Offsetting Edges'. The video player shows a title card with the same text and a background of blue dots forming a curve. Below the video player, a description reads: 'Creating new curves by offsetting edges of planar faces of solids. Creating Curves by Offsetting Edges. You can use the Offset Edge tool to create a closed polyline or spline object that is offset a specified distance from the edges of a planar face on a 3D solid or surface. You can then use tools, such as Presspull or Extrude, to easily add or remove the bounded area from a solid.' To the right of the video player is a vertical sidebar menu with the following items: 'Getting Started', '2D Drawing Basics', 'Drafting Settings', 'Display Control', 'Managing Layers', 'Object Properties', 'Utility and Inquiry Tools', 'Complex Objects', 'Annotation Objects', 'Modify Objects - Manipulation Commands', 'Modify Objects - Alteration Commands', 'Modify Objects - Grips', '2D Parametric Drawings', 'Dimensioning', and 'Interface Customization'.

[www.CADLearning.com](http://www.CADLearning.com)

