



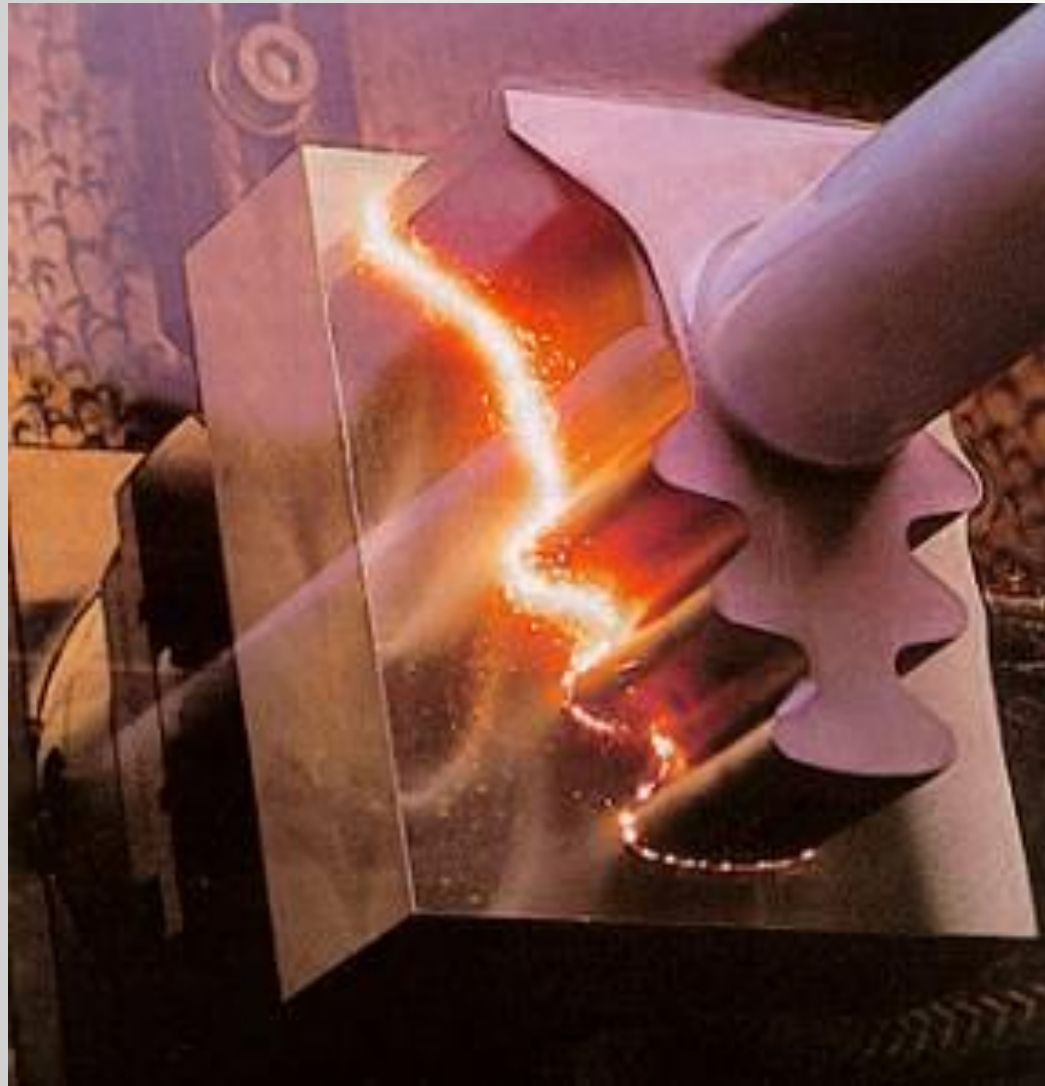
CAD for CAM

What Designers & Engineers Need to Know

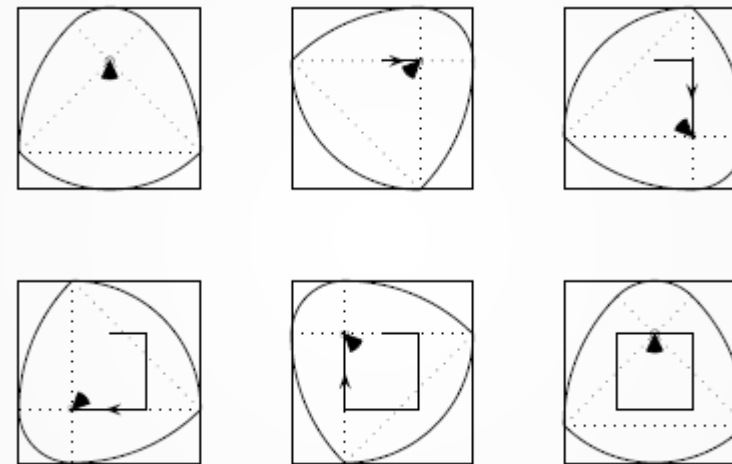
Jeff Walters

Autodesk Senior Support Engineer, CAM

Square Corners

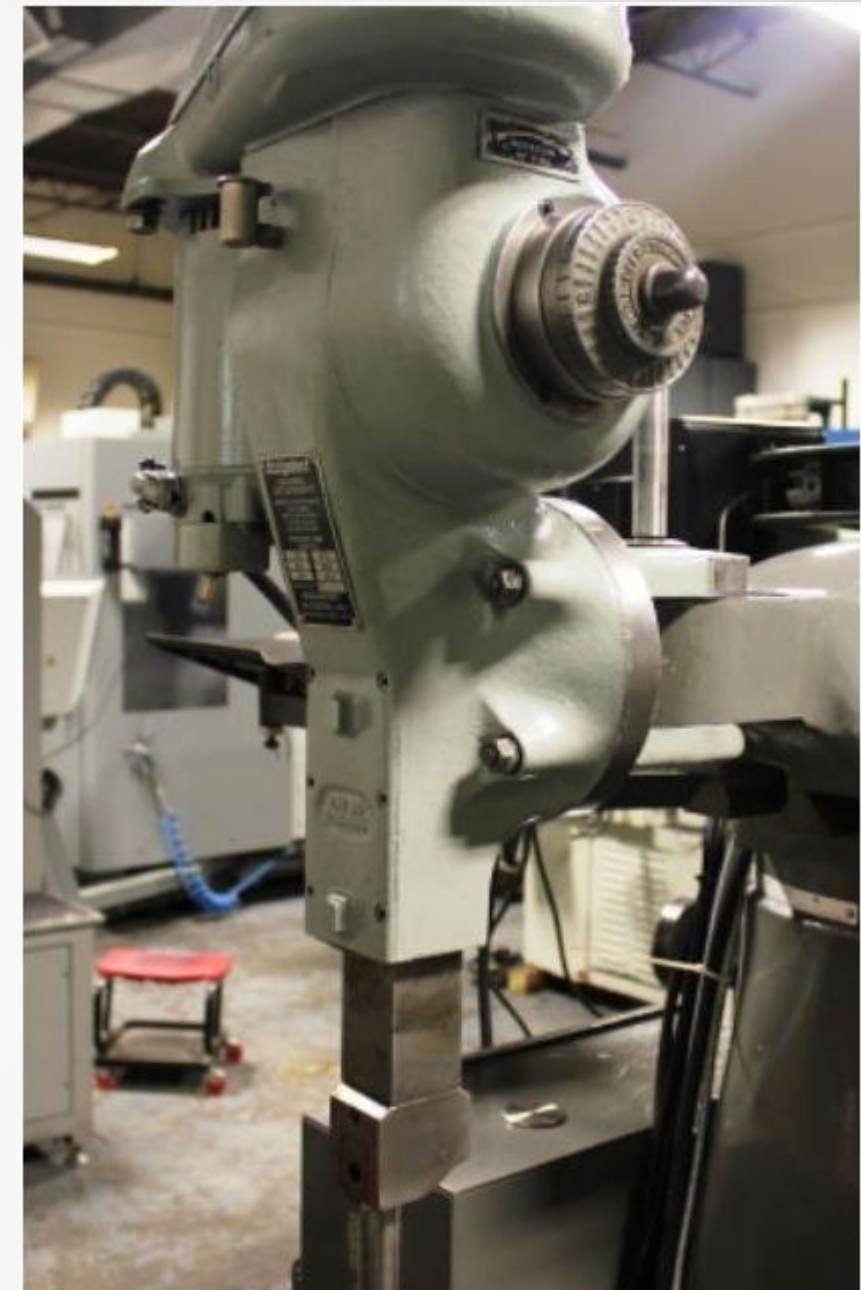


RAM EDM

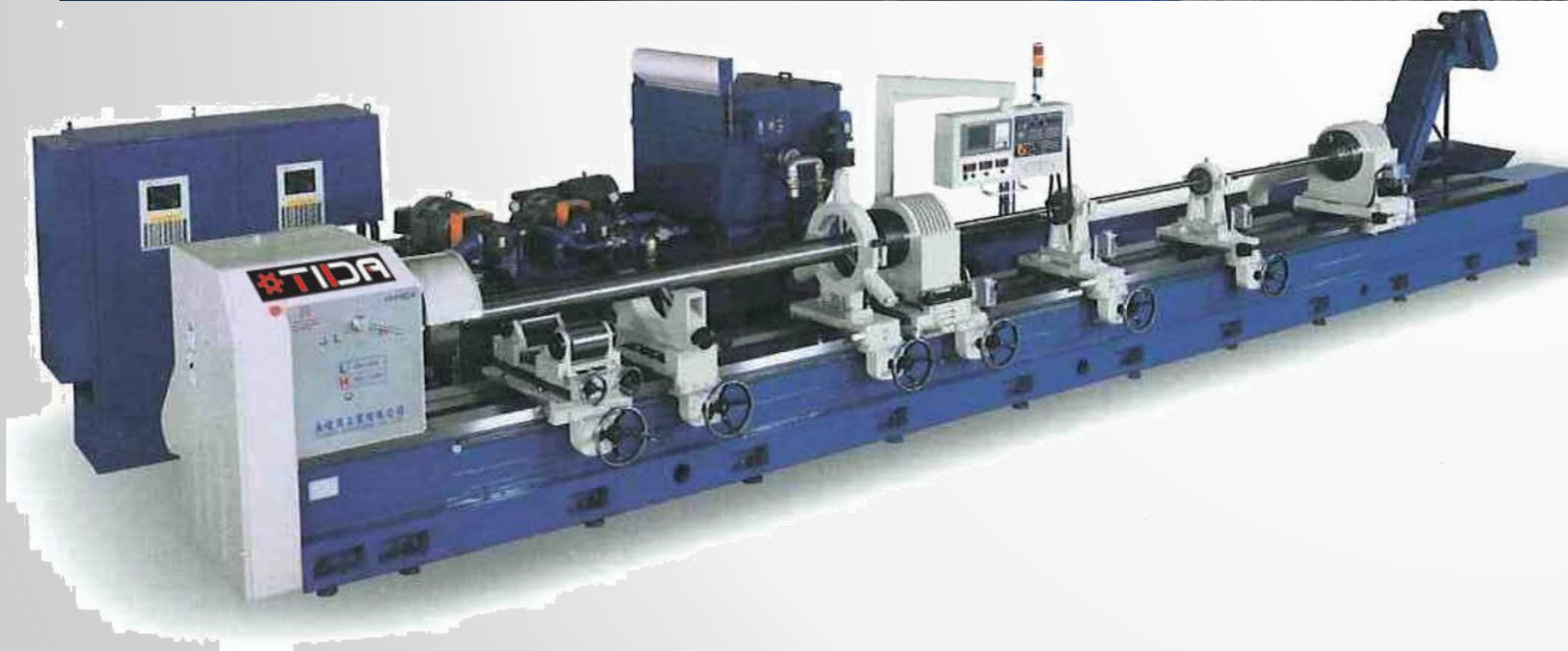






















Square Hole Drilling

Shaper attachment



Deep Hole Drilling



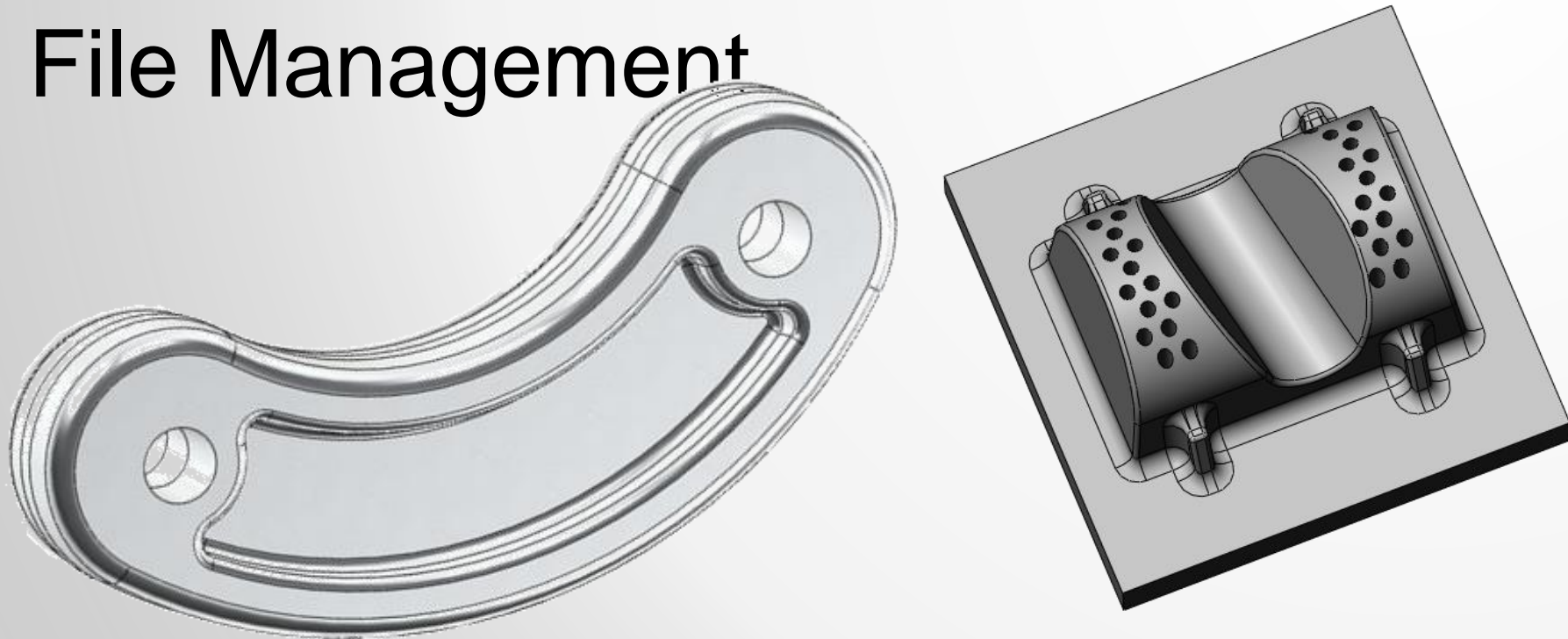
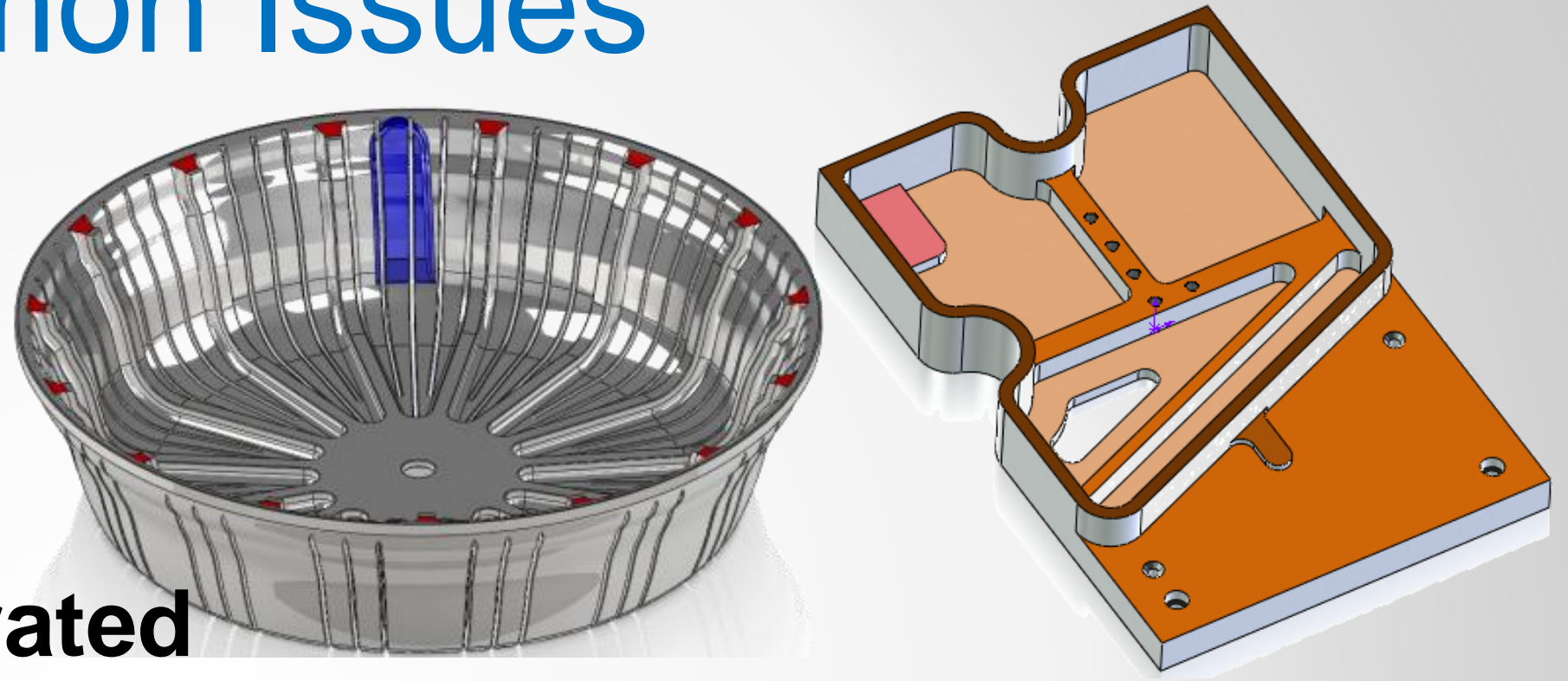
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Style	RT 100 T	RT 100 T	RT 100 T	RT 100 T	RT 100 T	EB 100	EB 100	EB 100	EB 80	EB 80
Point Angle	135°	135°	135°	135°	135°	Special	Special	Special	Special	Special
Length	15 x D	20 x D	25 x D	30 x D	40 x D	25 x D	50 x D	75 x D	45 x D	80 x D
Shank										
Coolant										
Carbide Grade	DK460UF	DK460UF	DK460UF	DK460UF	DK460UF	K30/K40	K30/K40	K30/K40	K30/K40	K30/K40
Surface Finish	TiAIN	TiAIN	TiAIN	TiAIN	TiAIN	nano-A™	nano-A™	nano-A™	TiCN	TiCN
Std. Dia. Range mm	3.0 - 14.0	3.0 - 14.0	3.0 - 12.0	3.0 - 10.0	3.0 - 8.0	1.2 - 3.2	1.2 - 5.0	1.5 - 5.0	3.9 - 12.7	4.95 - 12.65
Std. Dia. Range In.	0.1181-0.5512	0.1181-0.5512	0.1181-0.4724	0.1181-0.3937	0.1181-0.3150	0.0472-0.1260	0.0472-0.1969	0.0591-0.1969	0.1563-0.5000	0.1949-0.4980

What is CAD/CAM?

Acronym for **computer-aided design/computer-aided manufacturing**, computer systems used to design and manufacture products. The term CAD/CAM implies that an engineer can use the system both for designing a product and for controlling manufacturing processes. For example, once a design has been produced with the CAD component, **the design itself can control the machines that construct the part.**

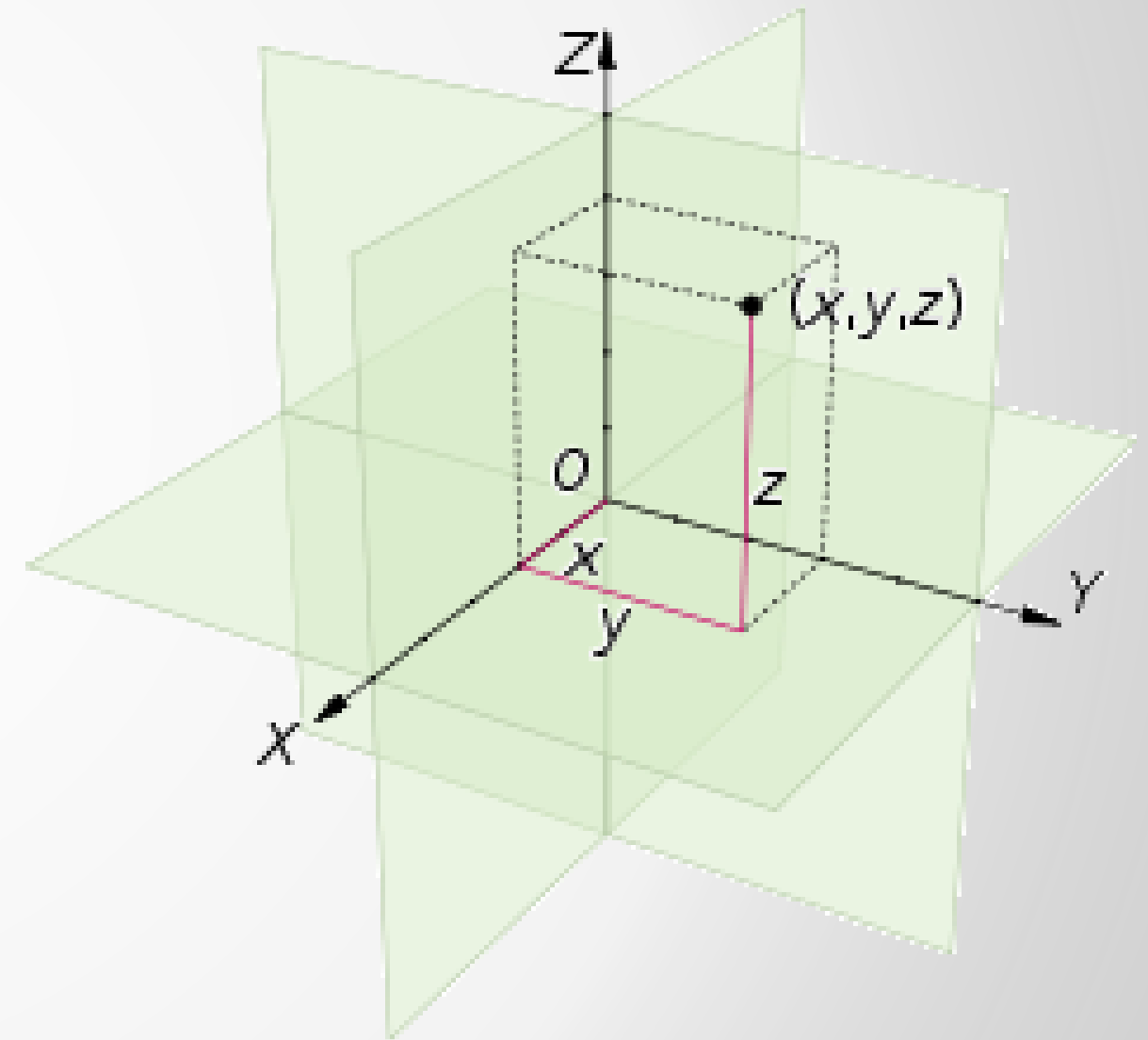
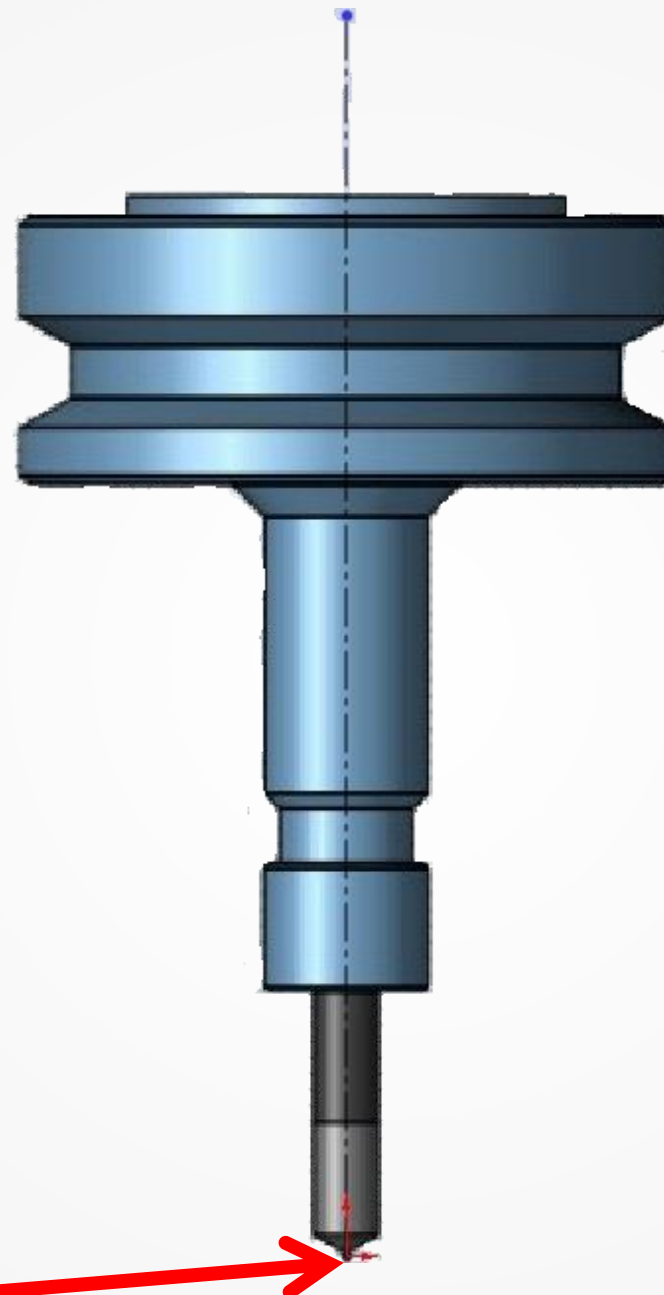
Common Issues

- Unwanted Fillets
- Unwanted Tapers
- Missing Faces (Gaps)
- Capping Holes
- Exporting Files (for **nonintegrated** CAM)
- File Management



CNC Programming ??? What's that

```
%  
O1234 (PART)  
(T1 D=0.5 CR=0.03 - ZMIN=-1.9485 - BULLNOSE END MILL)  
(T2 D=0.375 CR=0.1875 - ZMIN=-1.176 - BALL END MILL)  
(T3 D=0.3125 CR=0.1563 - ZMIN=-1.5748 - BALL END MILL)  
(T4 D=0.375 CR=0. - ZMIN=-1.5748 - FLAT END MILL)  
N1 G90 G94 G17  
N2 G20  
N3 G28 G91 Z0.  
N4 G90  
(ADAPTIVE1)  
N5 M09  
N6 T1 M06  
(12 3 FLUTE CB ROUGH ENDMILL)  
N7 T2  
N8 S6000 M03  
N9 G54  
N10 M08  
N11 G00 X-0.2741 Y-4.364  
N12 G43 Z0.6399 H01  
N13 G00 Z0.2399  
N14 Z-0.78  
N15 G01 X-0.2739 Y-4.3637 Z-0.7856 F20.  
N16 X-0.2732 Y-4.3631 Z-0.7911  
N17 X-0.2721 Y-4.362 Z-0.7965  
N18 X-0.2706 Y-4.3604 Z-0.8017  
N19 X-0.2687 Y-4.3585 Z-0.8066  
N20 X-0.2664 Y-4.3562 Z-0.8112  
N21 X-0.2638 Y-4.3536 Z-0.8154
```



Mill Tools



Its always the bottom center.

%
O1234 (PART)
(T1 D=0.5 CR=0.03 - ZMIN=-1.9485 - BULLNOSE END MILL)
(T2 D=0.375 CR=0.1875 - ZMIN=-1.176 - BALL END MILL)
(T3 D=0.3125 CR=0.1563 - ZMIN=-1.5748 - BALL END MILL)
(T4 D=0.375 CR=0. - ZMIN=-1.5748 - FLAT END MILL)

N1 G90 G94 G17

N2 G20

N3 G28 G91 Z0.

N4 G90

(ADAPTIVE1)

N5 M09

N6 T1 M06

(12 3 FLUTE CB ROUGH ENDMILL)

N7 T2

N8 S6000 M03

N9 G54

N10 M08

N11 G00 **X-0.2741 Y-4.364**

N12 G43 **Z0.6399** H01

N13 G00 **Z0.2399**

N14 **Z-0.78**

N15 G01 **X-0.2739 Y-4.3637 Z-0.7856** F20.

N16 **X-0.2732 Y-4.3631 Z-0.7911**

N17 **X-0.2721 Y-4.362 Z-0.7965**

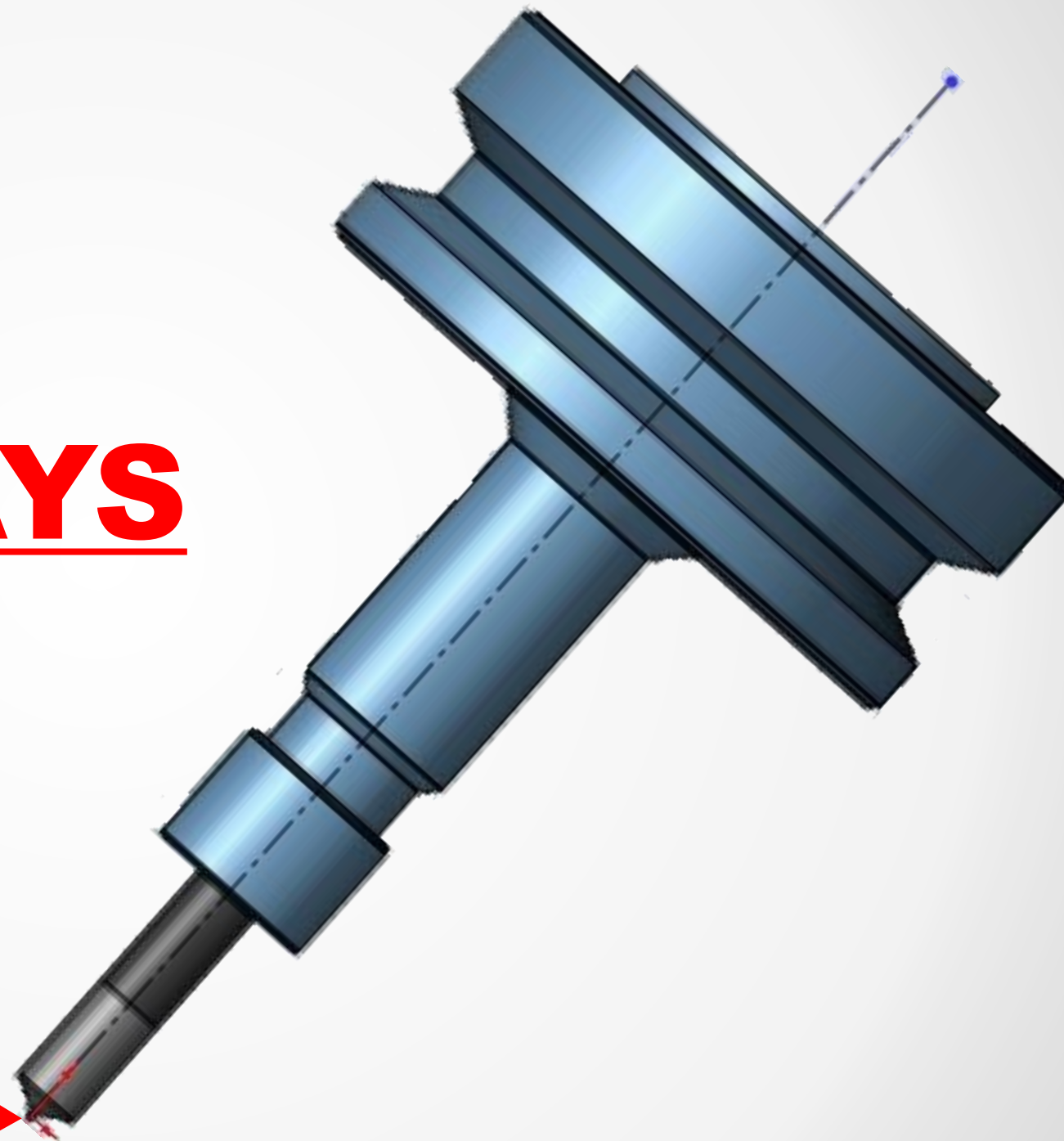
N18 **X-0.2706 Y-4.3604 Z-0.8017**

N19 **X-0.2687 Y-4.3585 Z-0.8066**

N20 **X-0.2664 Y-4.3562 Z-0.8112**

N21 **X-0.2638 Y-4.3536 Z-0.8154**

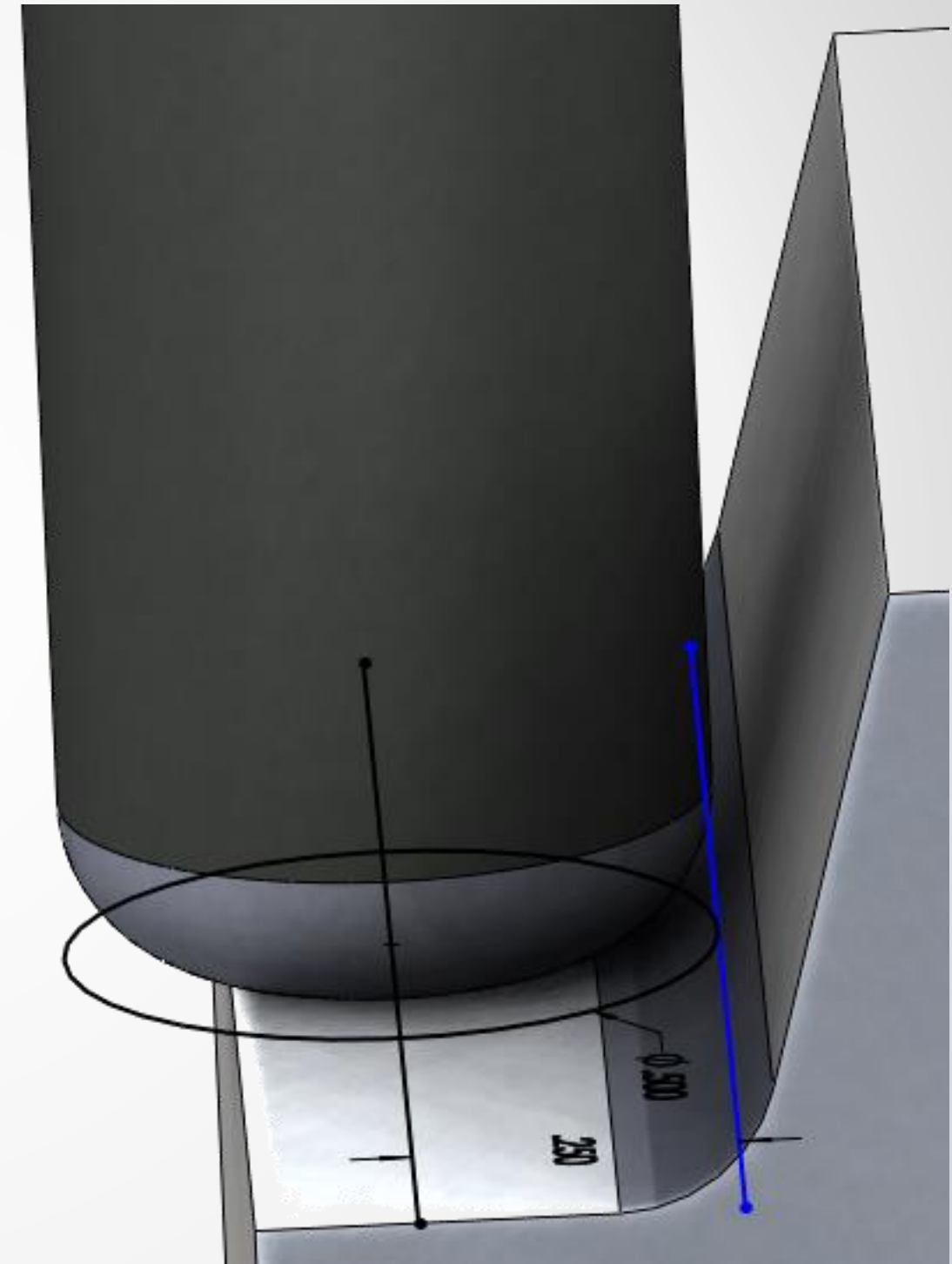
ALWAYS



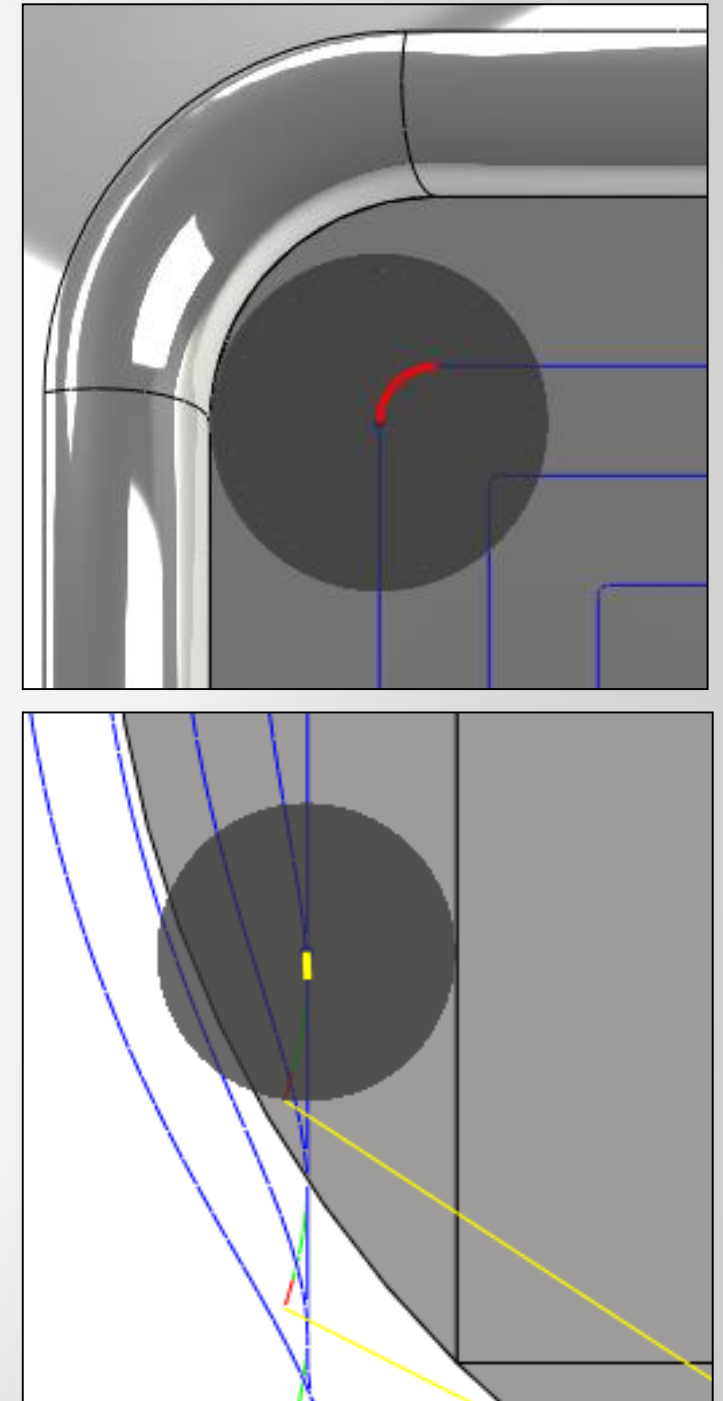
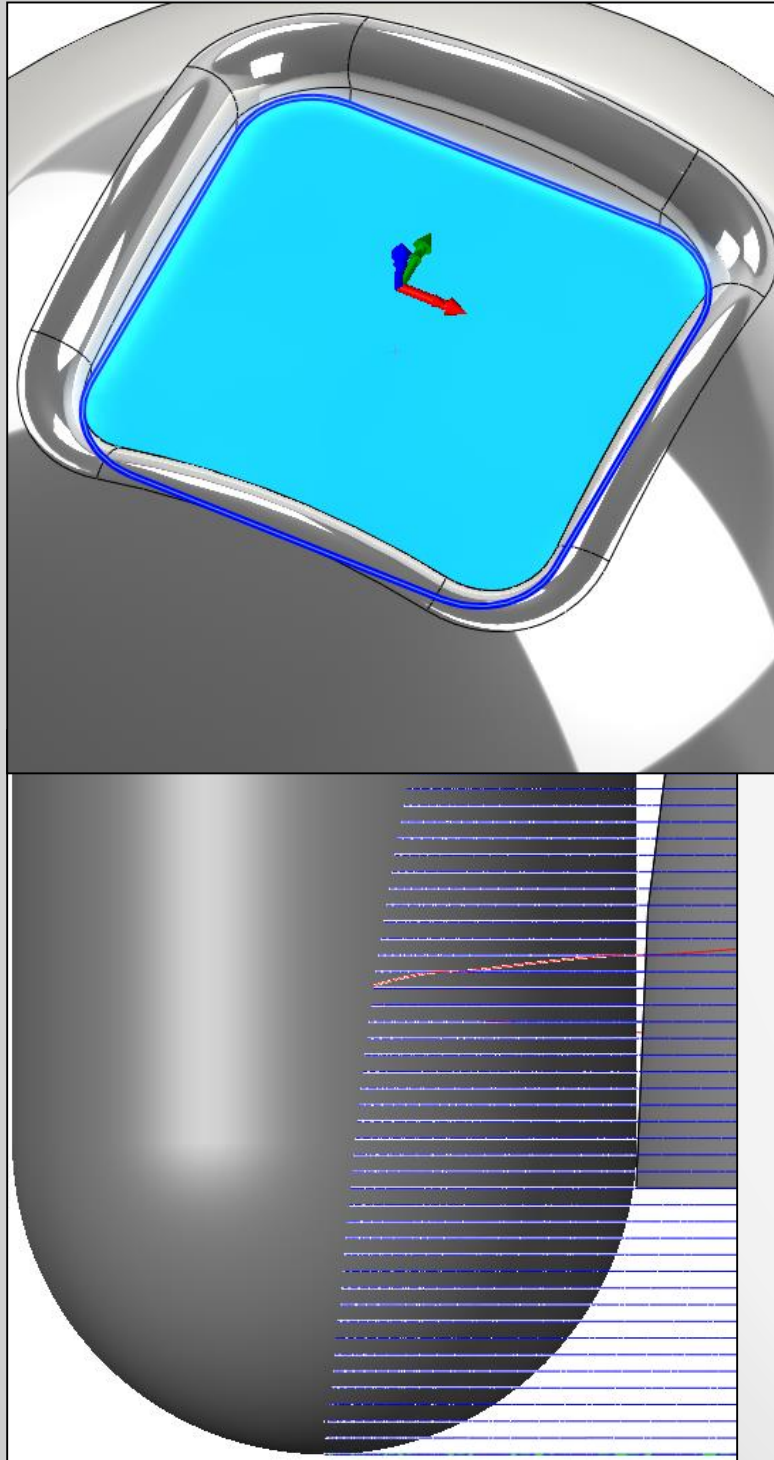
Finding the Center



Where did the edge go ???

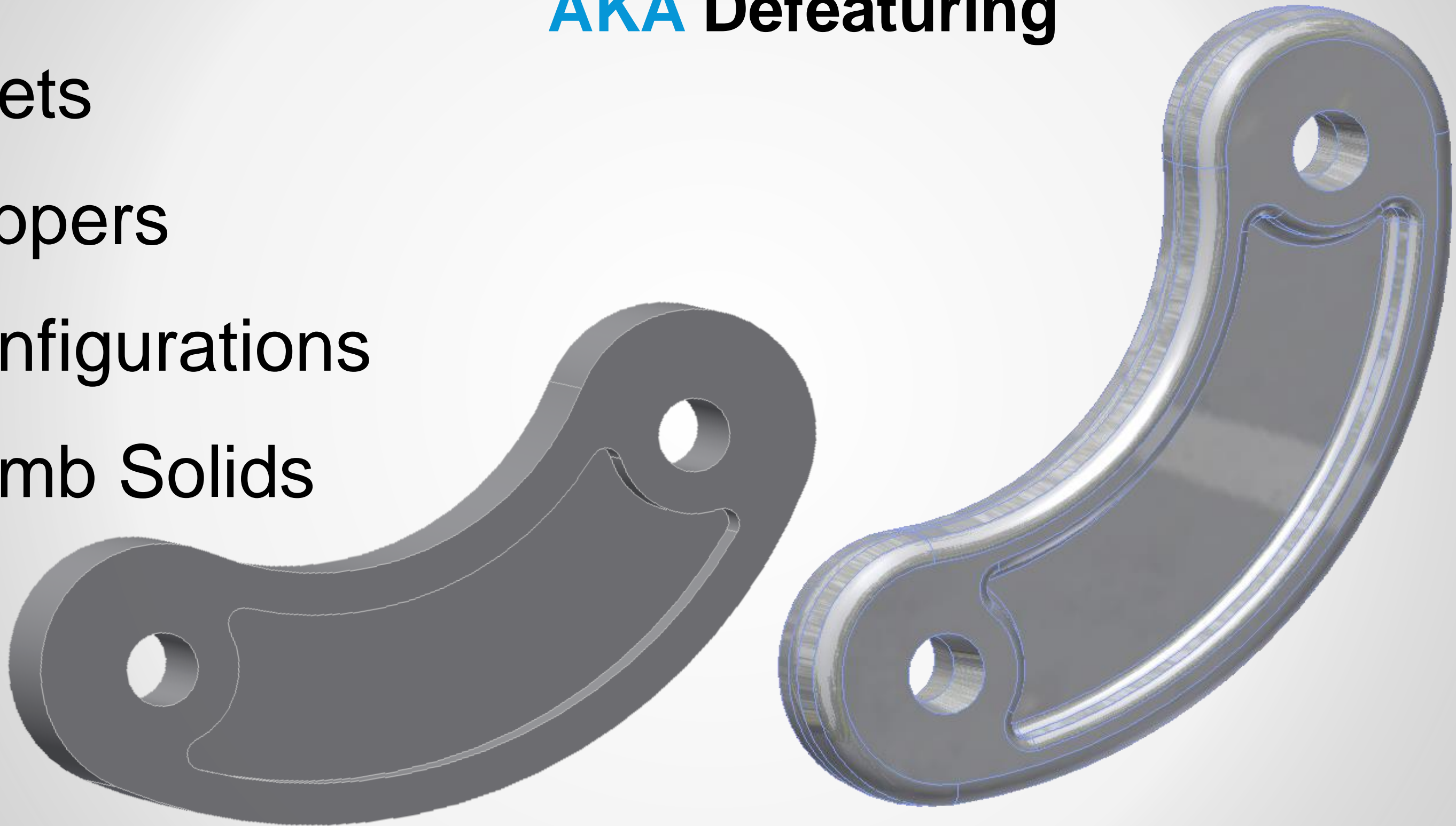


How does CAM work



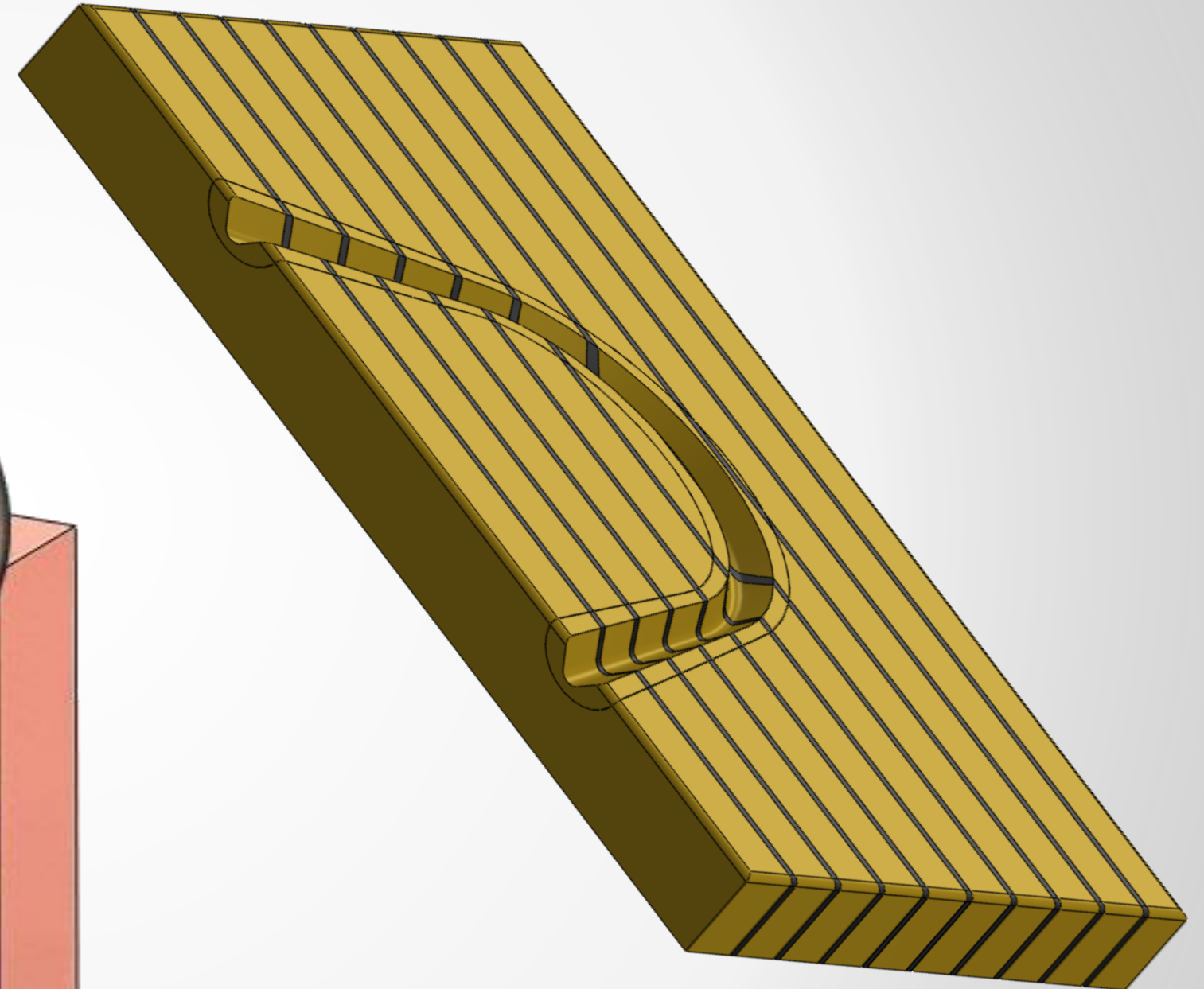
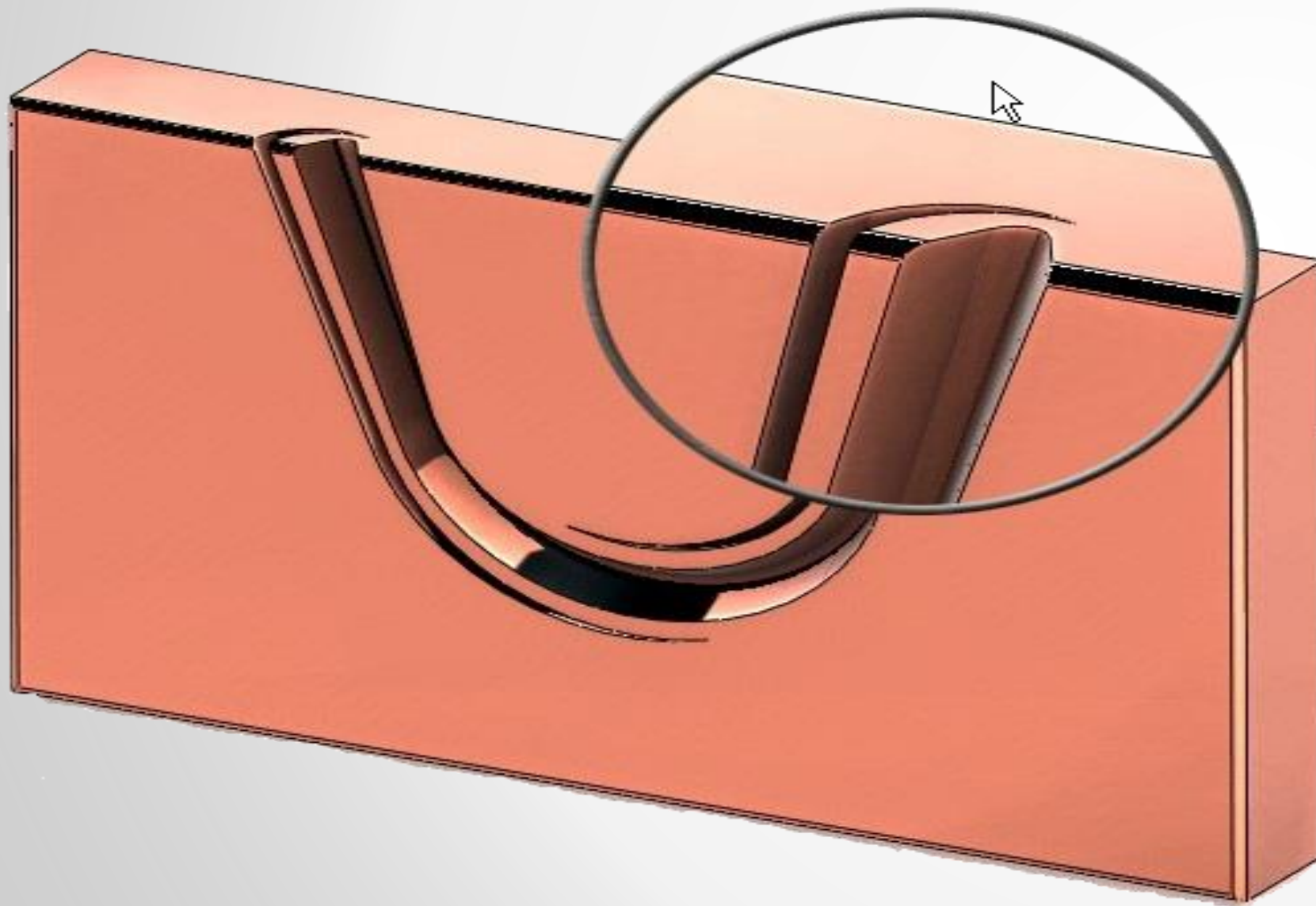
Removing Unwanted Features AKA Defeaturing

- Fillets
- Tappers
- Configurations
- Dumb Solids

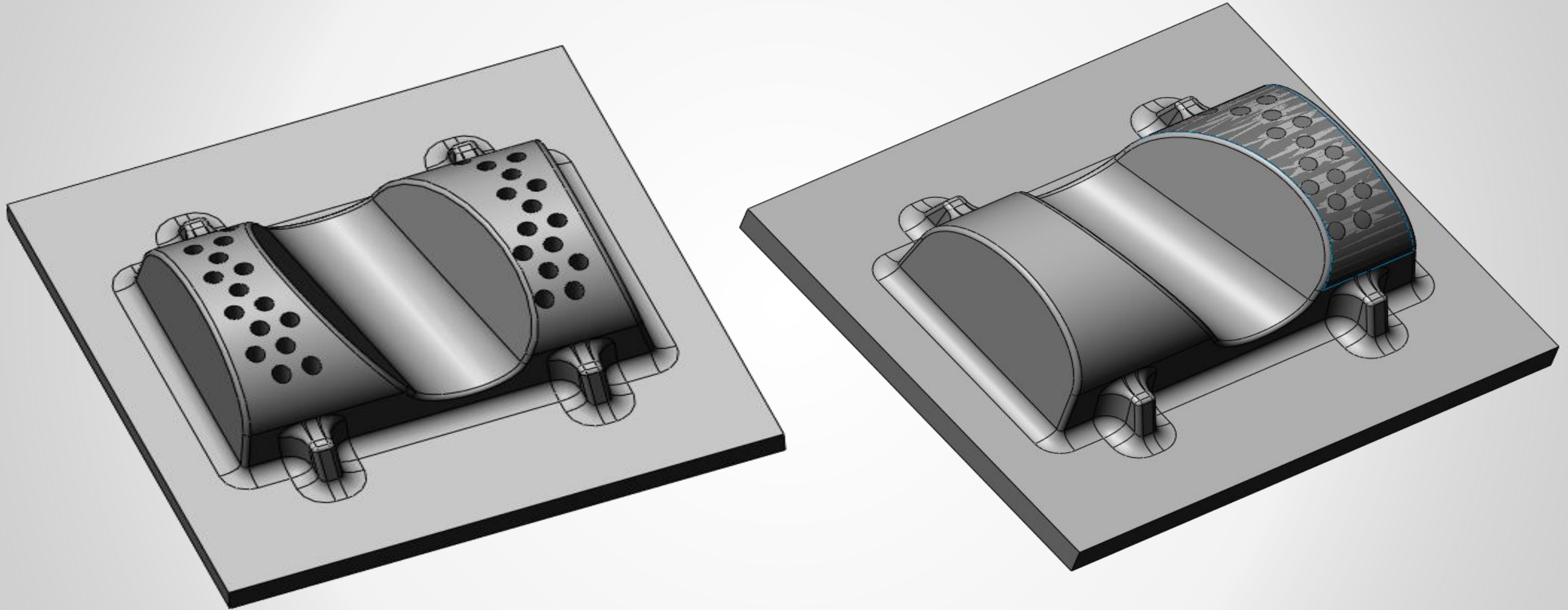


Bad imported files

- Missing Faces (Gaps)

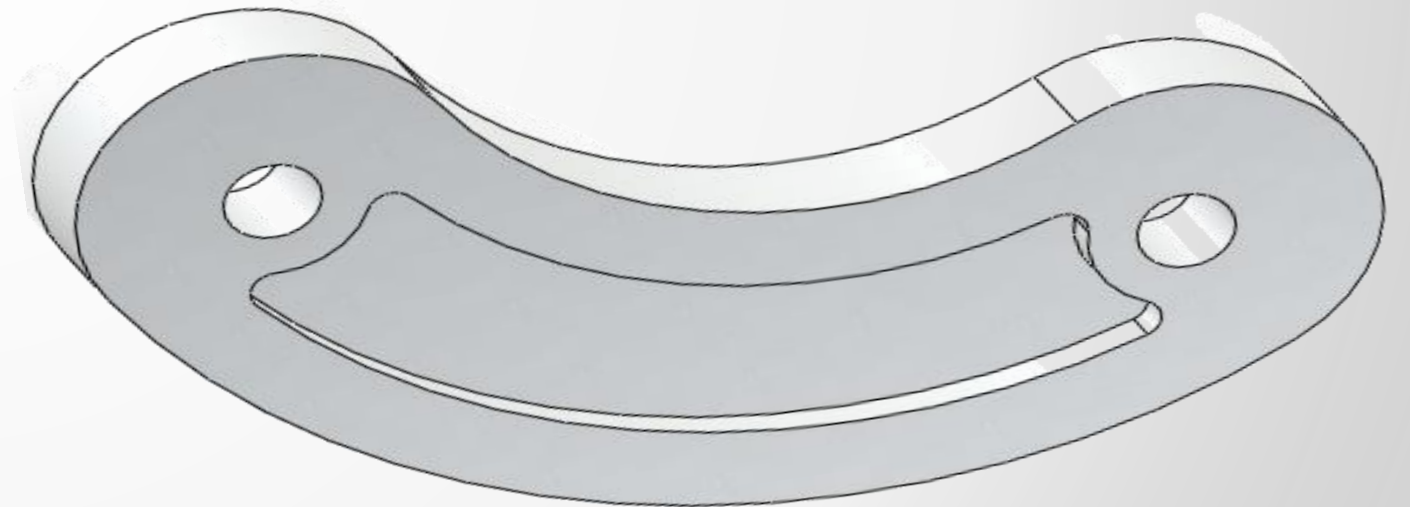
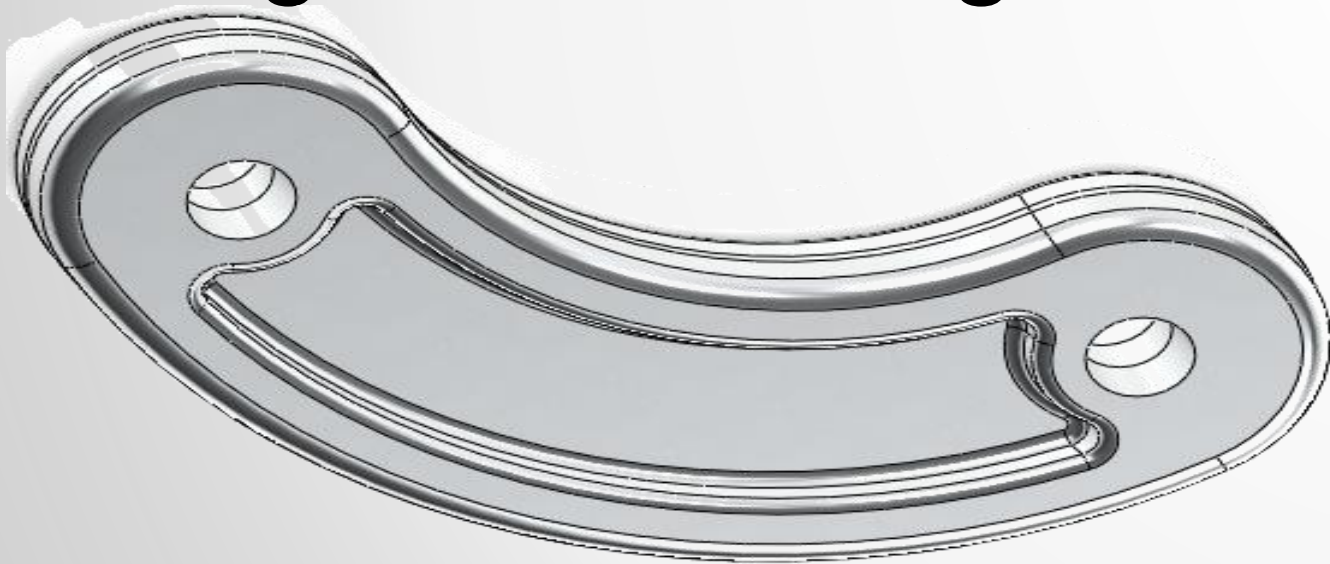


Capping Holes



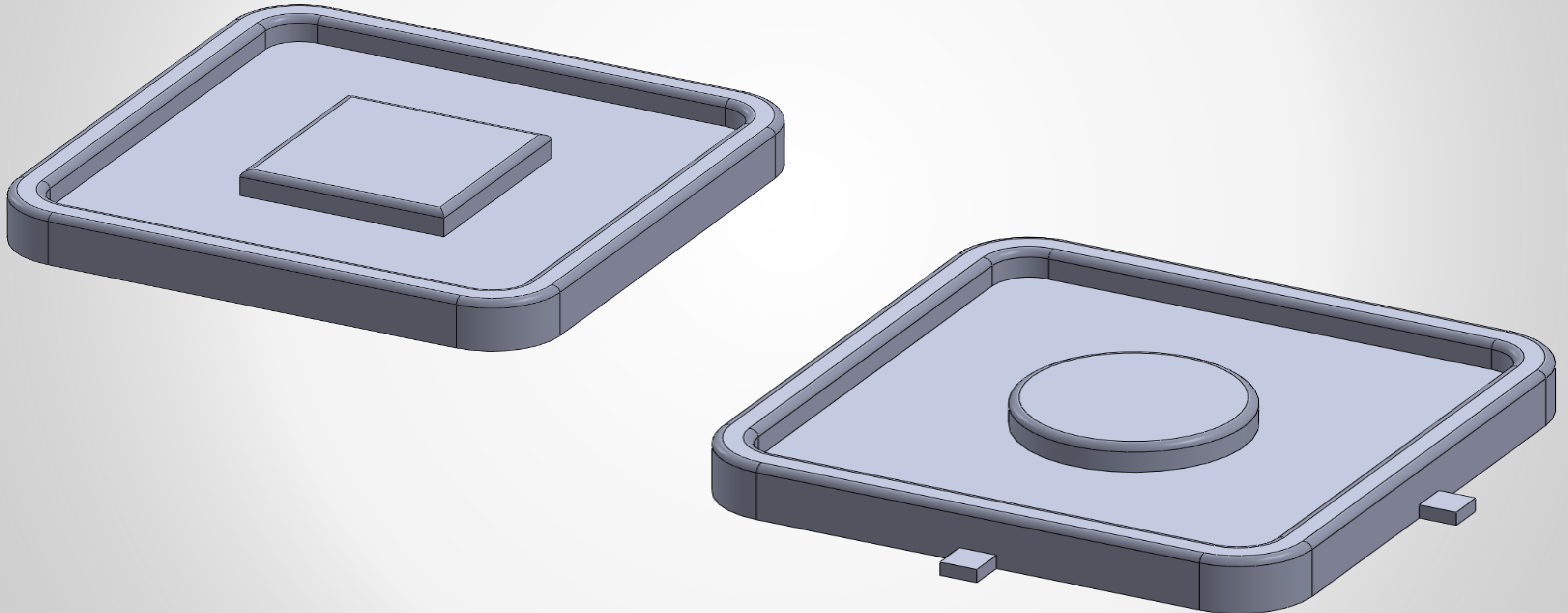
File Management: Configurations

- **Configurations**
- **Pros:** One file to manage.
- **Cons:** Chance of manufacturing changes being done in engineering configuration, or wrong configuration being used in assembly.



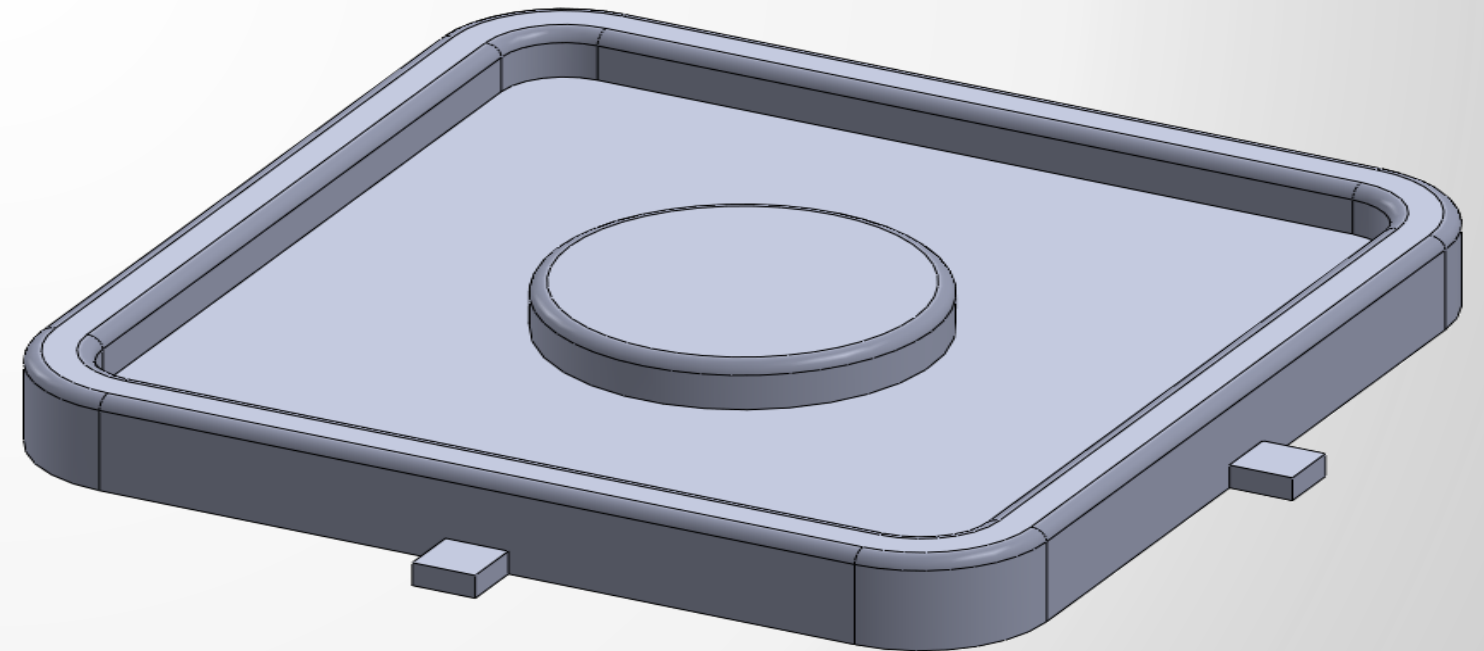
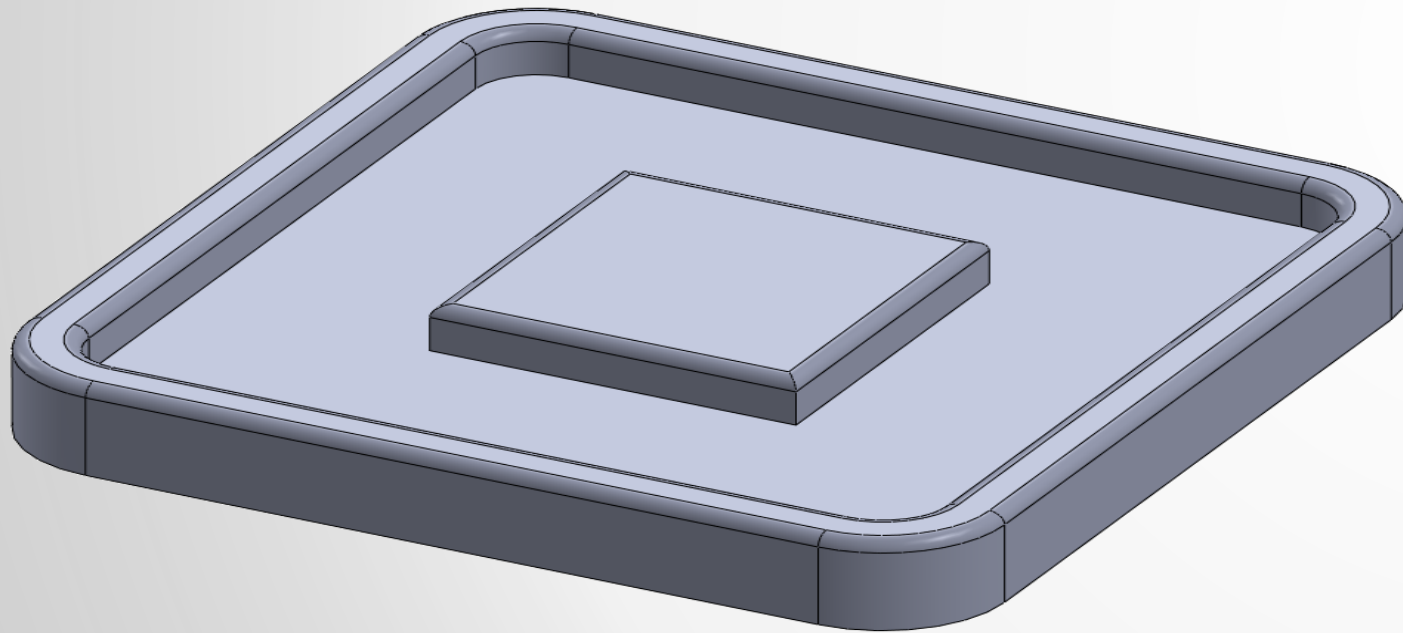
File Management: Derived Part

- **Derived Part**



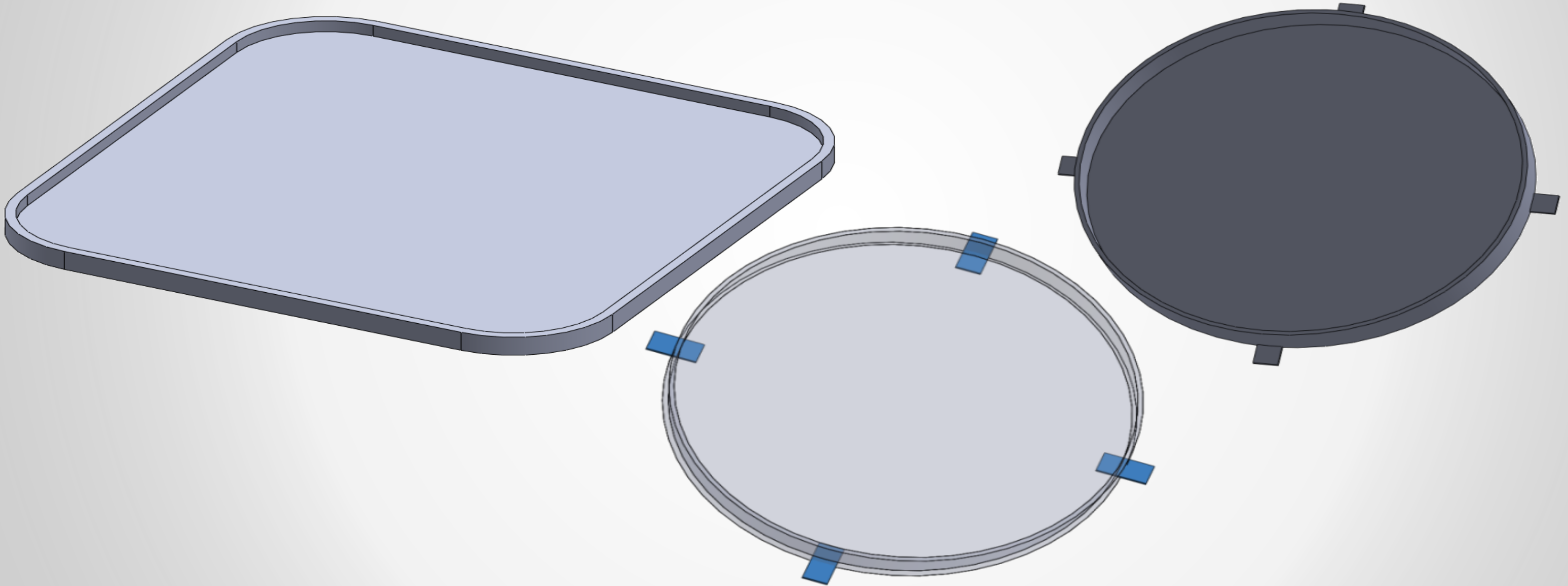
File Management: Derived Part

- **Derived Part**
- **Pros:** Engineering changes to manufacturing part, Manufacturing changes stay in the manufacturing part.
- **Cons:** Harder to remove unwanted fillets and radiuses, Two files to manage.



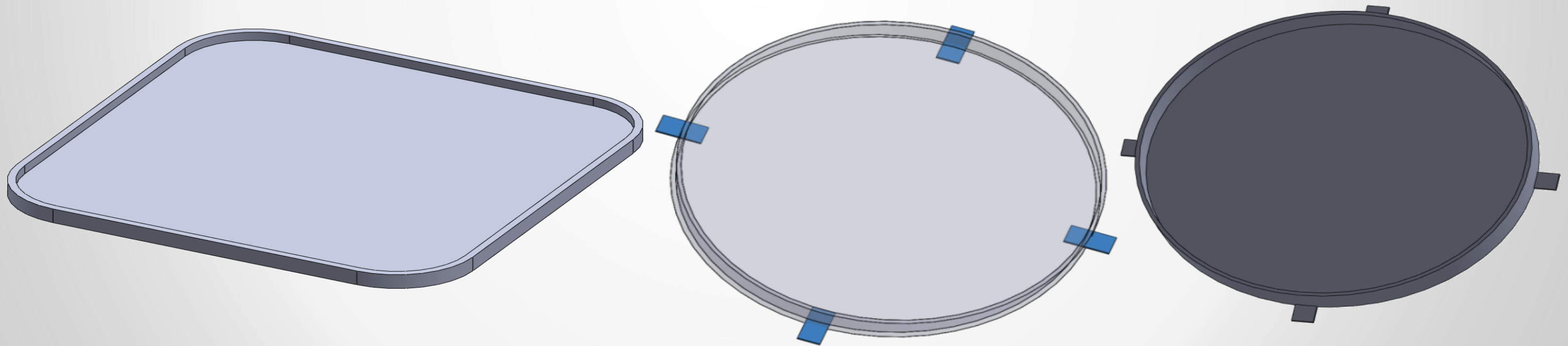
File Management: Assembly

- **Assembly (Shrinkwrap)**

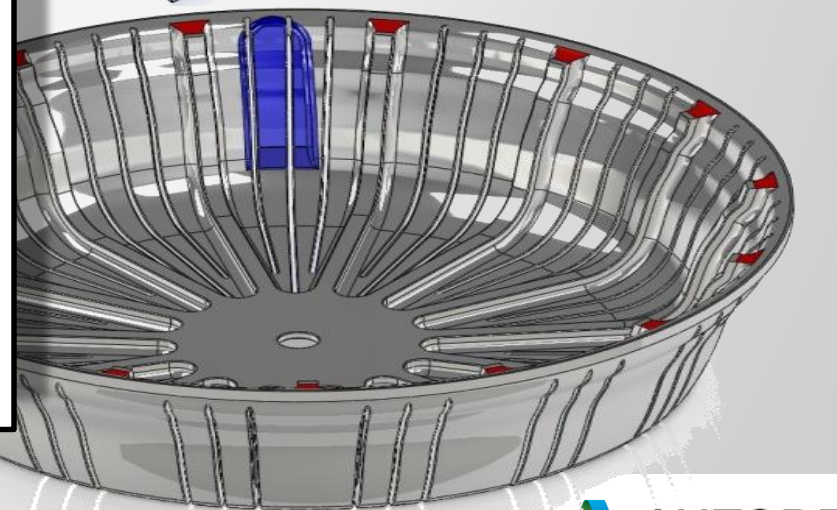
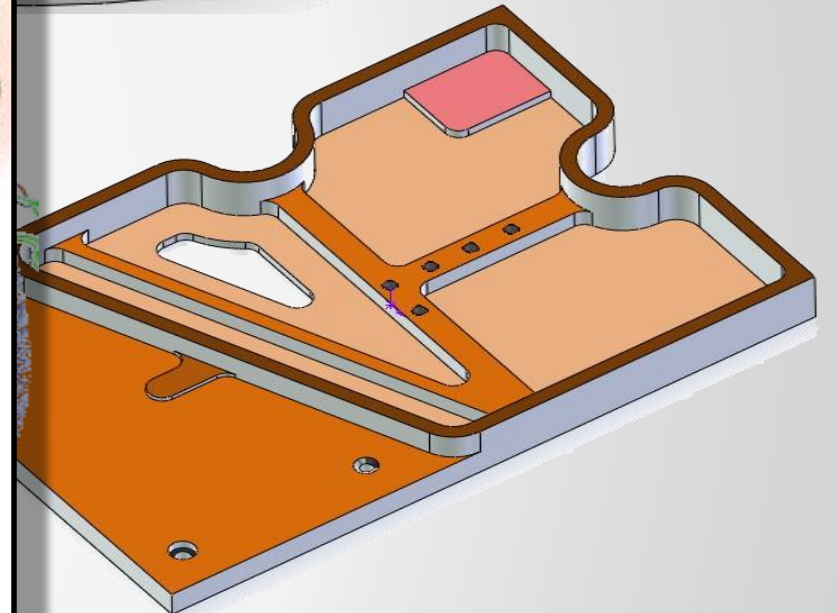
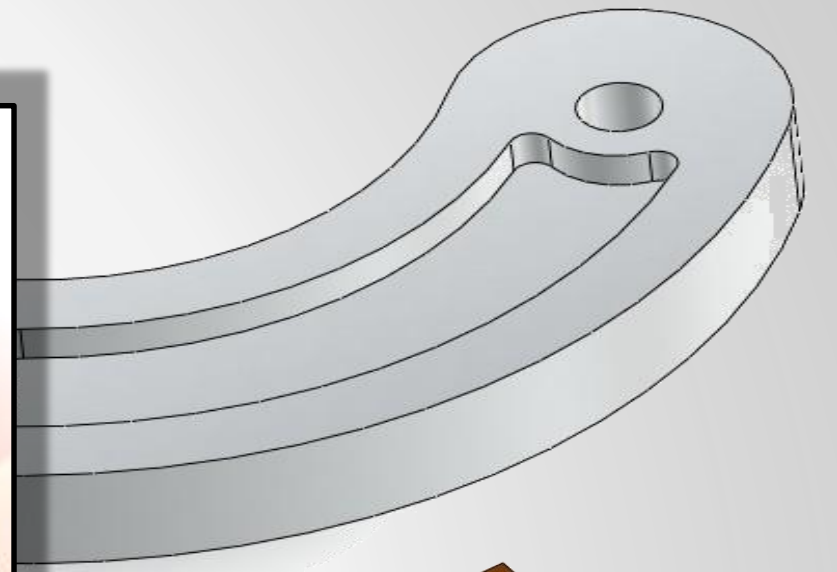
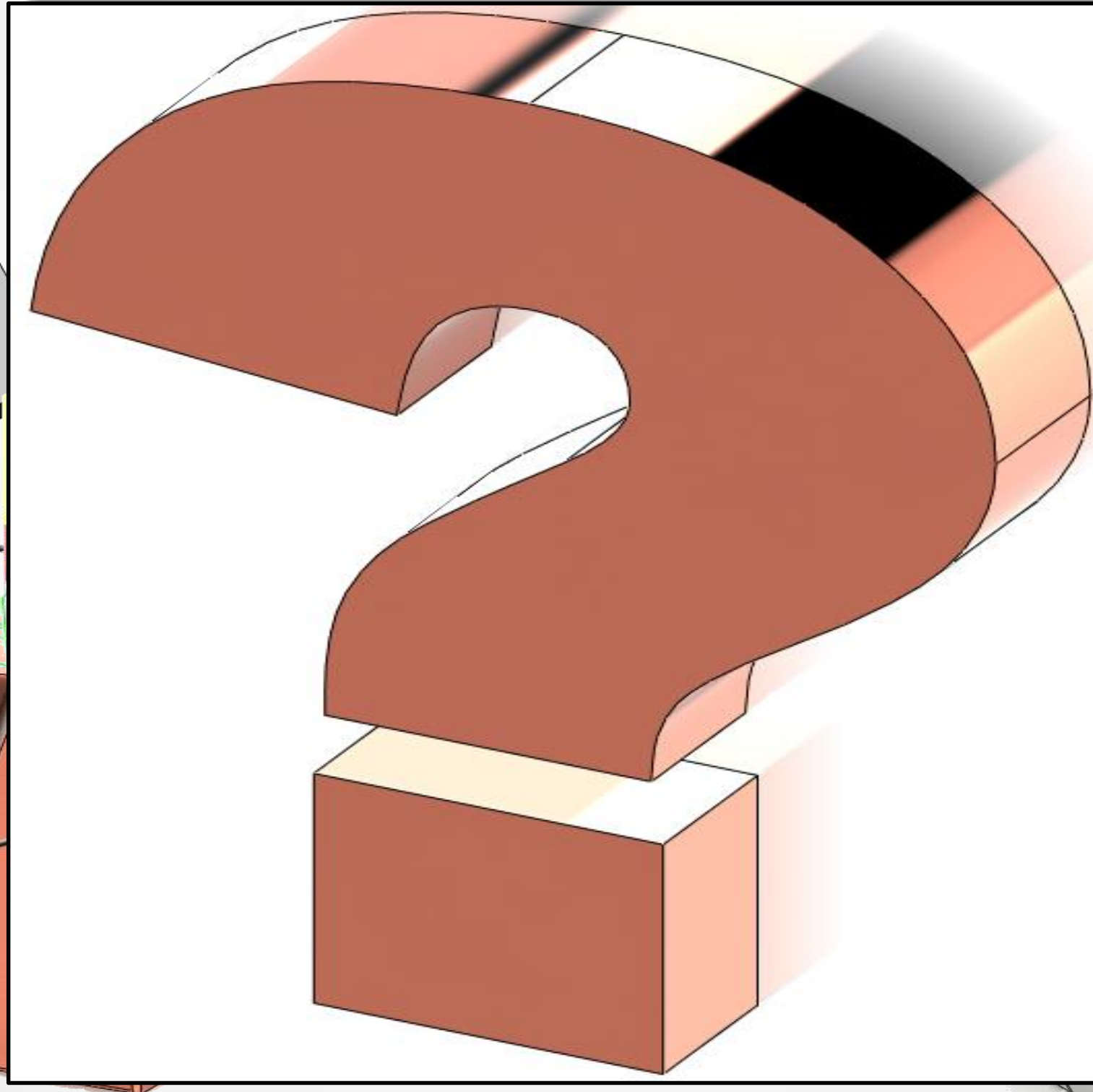
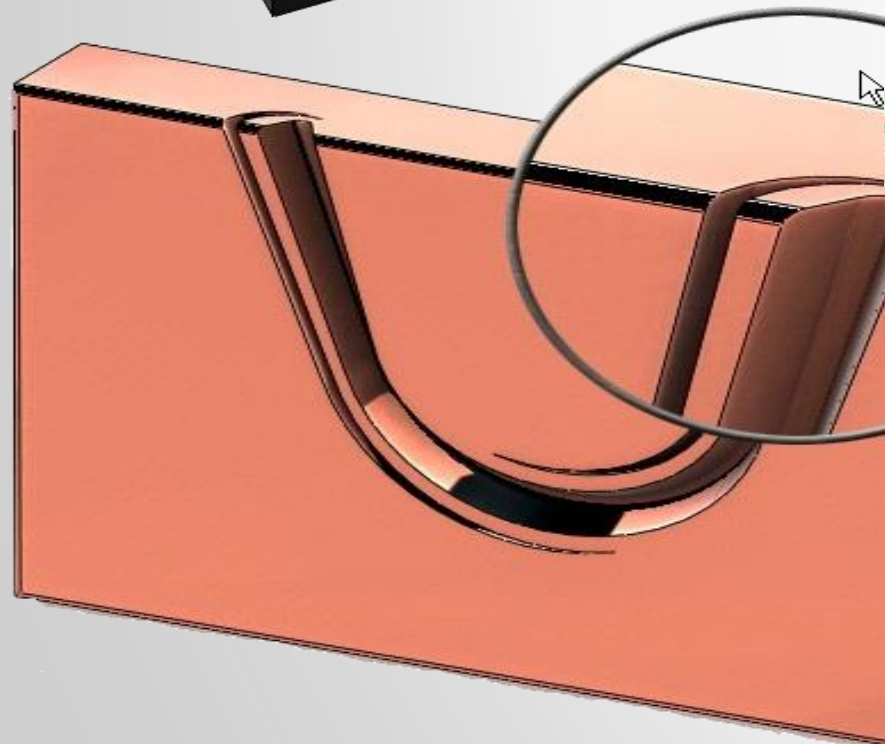
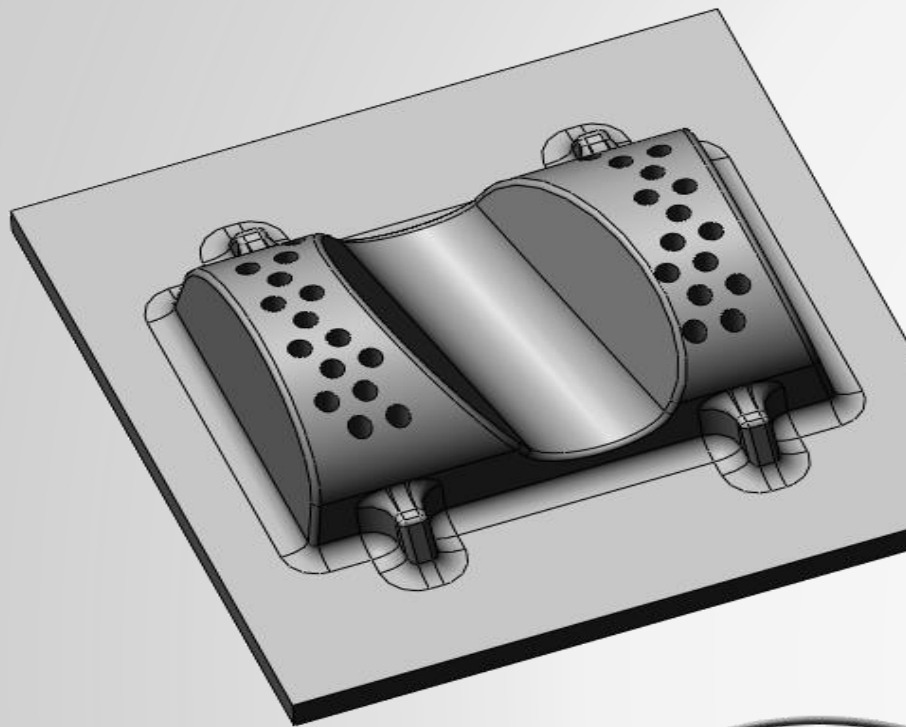


File Management: Assembly

- **Assembly** (Shrinkwrap)
- **Pros:** Can add fixtures, clamps, and tabs without modifying the engineering part. Can replace base part and keep existing fixtures, clamps, and tabs (with minor edits). Engineering part can be kept read only.
- **Cons:** 3 (or more) files to manage and more steps involved. Still a risk of changing the Engineers part



Questions ?



Session Feedback

- Via the Survey Stations, email or mobile device
- AU 2015 passes given out each day!
- Best to do it right after the session
- Instructors see results in real-time



