Seven Deadly Sins
of Part Modelling in Inventor & Fusion 360

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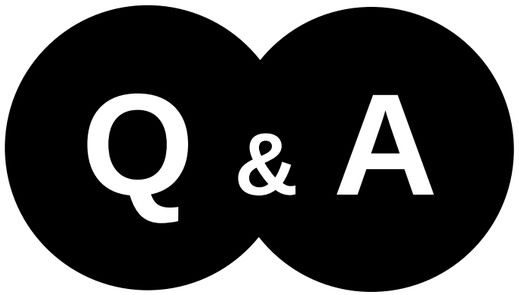
Co-presenters

Paul Munford

Jean Flower

Agenda

ASM



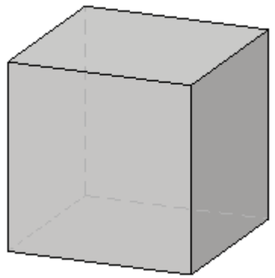
Objectives

- Describe bad modelling practices
- Diagnose and fix unexpected failures
- Create stable 3D models
- Tips to ensure modelling success

What is the ASM?

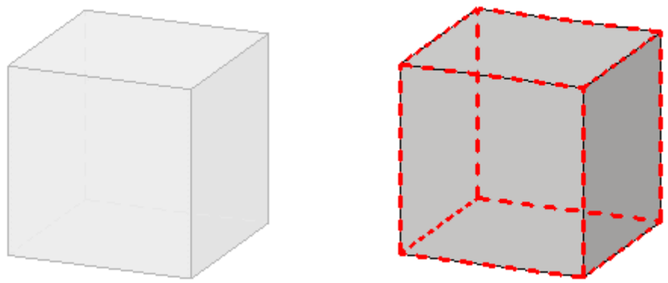
Autodesk Shape Manager, ASM

- 3D geometry kernel
- Boundary representation, B-rep



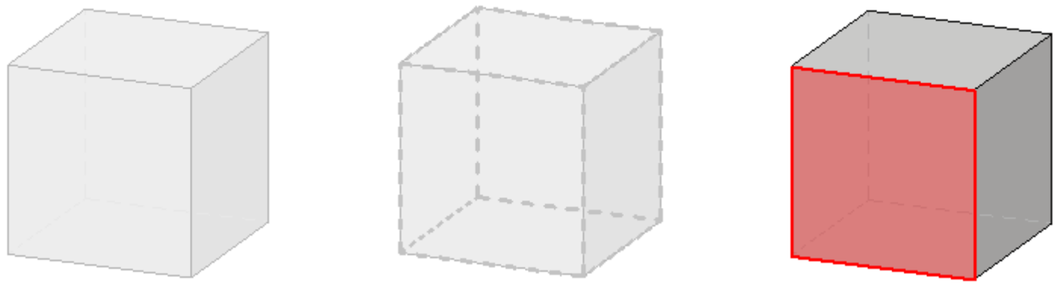
Autodesk Shape Manager, ASM

- 3D geometry kernel
- Boundary representation – **Part**, Face, Edge, Vertex



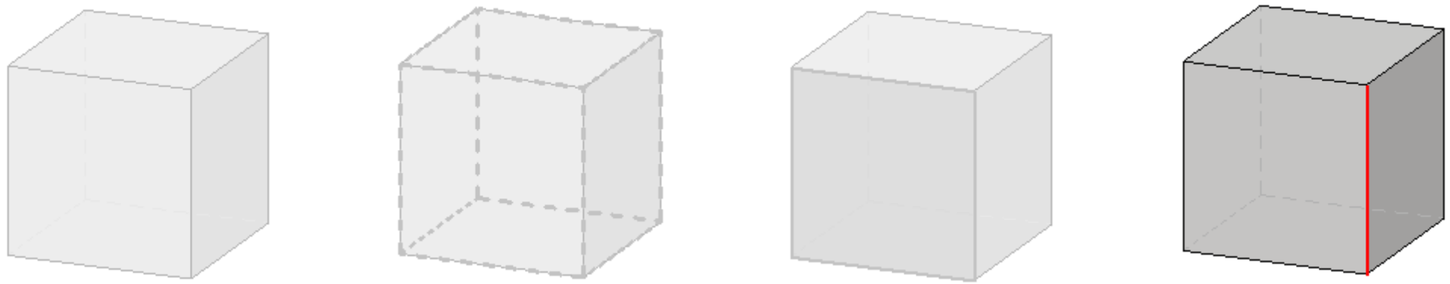
Autodesk Shape Manager, ASM

- 3D geometry kernel
- Boundary representation – Part, **Face**, Edge, Vertex



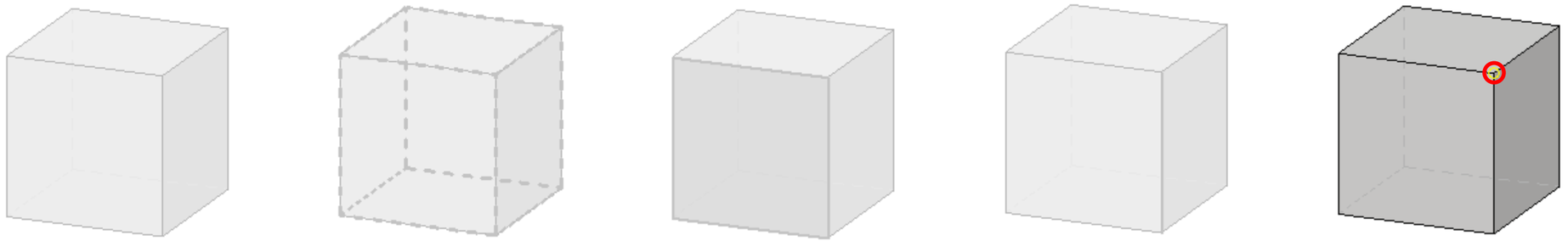
Autodesk Shape Manager, ASM

- 3D geometry kernel
- Boundary representation – Part, Face, **Edge**, Vertex



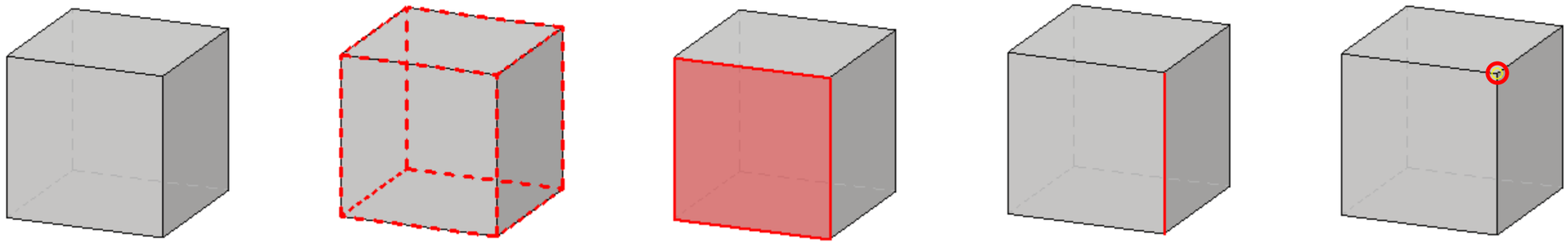
Autodesk Shape Manager, ASM

- 3D geometry kernel
- Boundary representation – Part, Face, Edge, **Vertex**



Autodesk Shape Manager, ASM

- 3D geometry kernel
- Boundary representation – Part, Face, Edge, Vertex



Seven Deadly Sins

Seven Deadly Sins

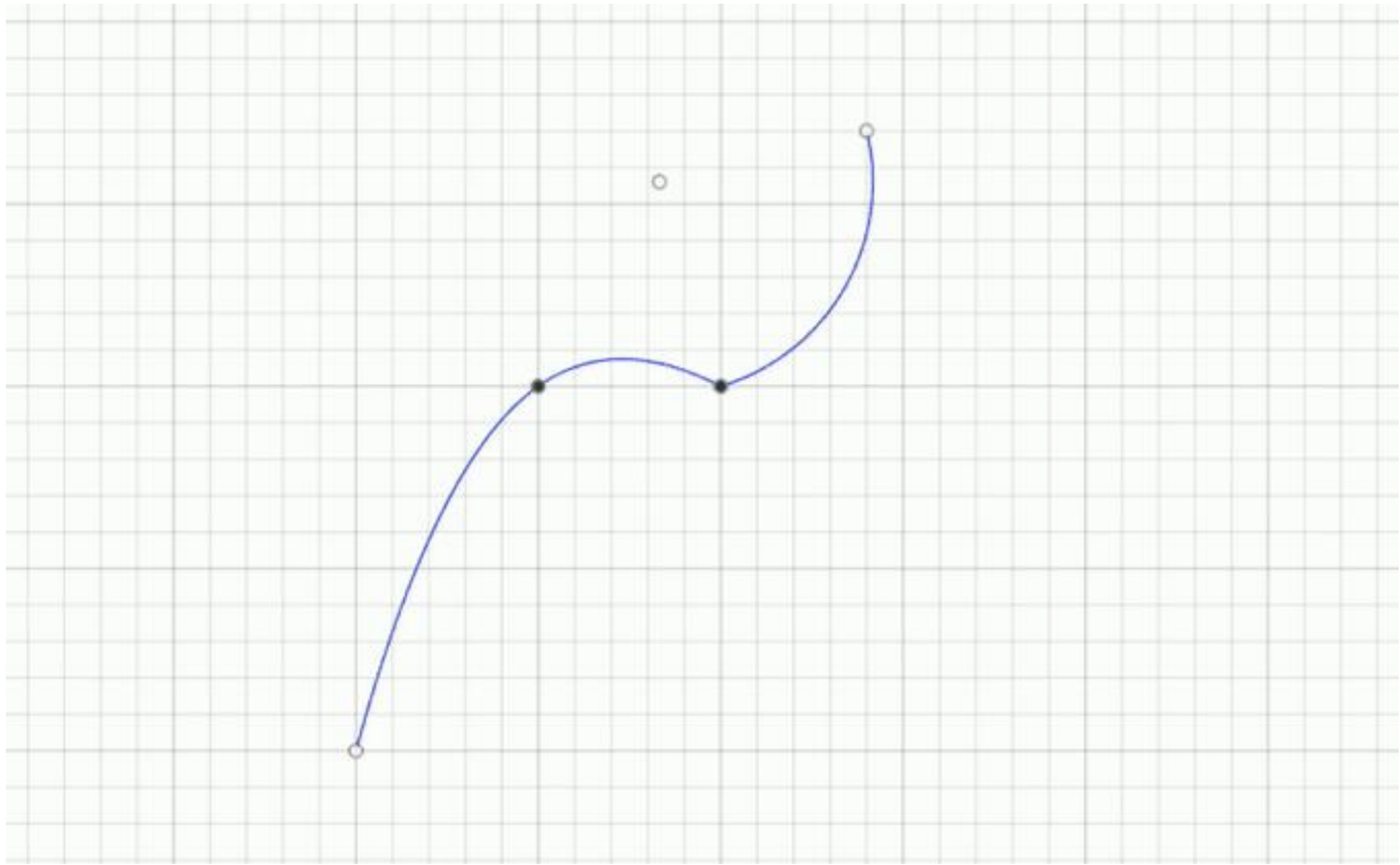
1. High curvature
2. Near-tangency
3. Near-coincidence
4. Sliver faces
5. Singularities
6. Non-manifold topology
7. Loose tolerant geometry

Source: The Simpsons

1. High Curvature

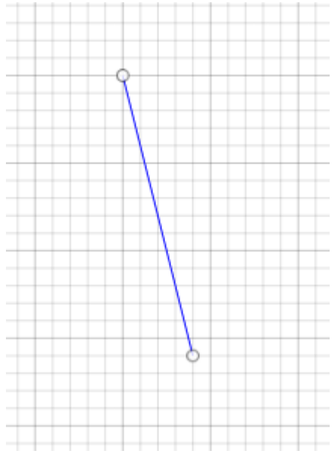
Curvature

Animation

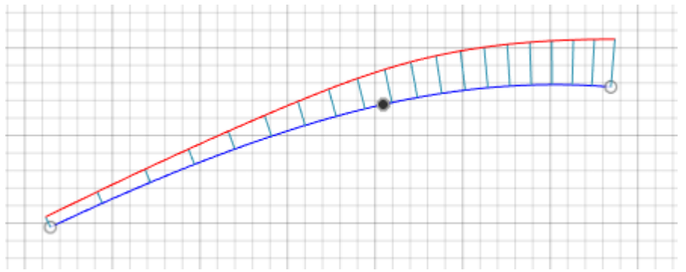


Types of curvature

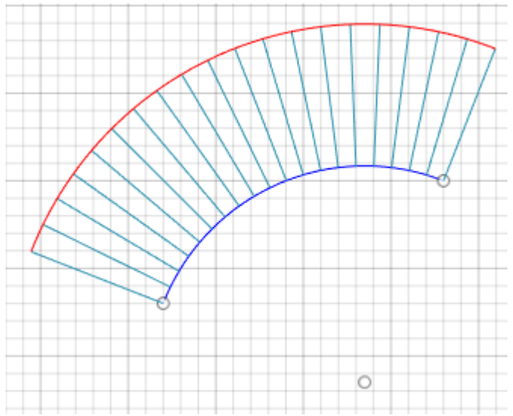
Zero curvature



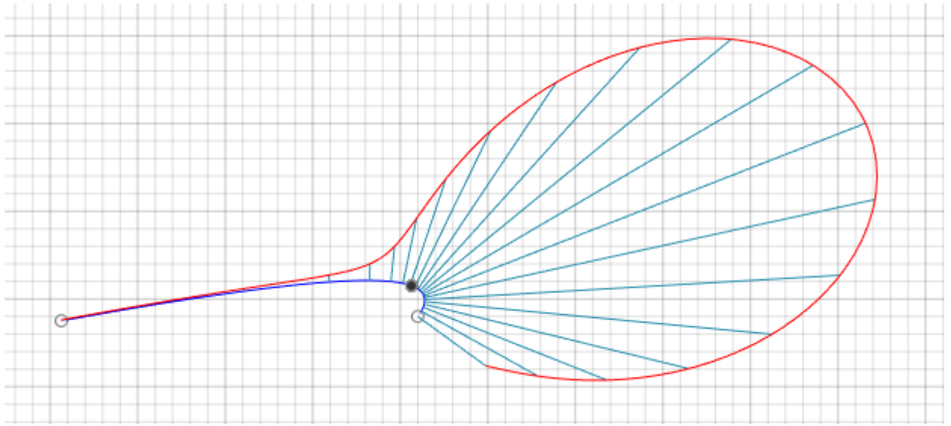
Low curvature



Constant curvature



High curvature

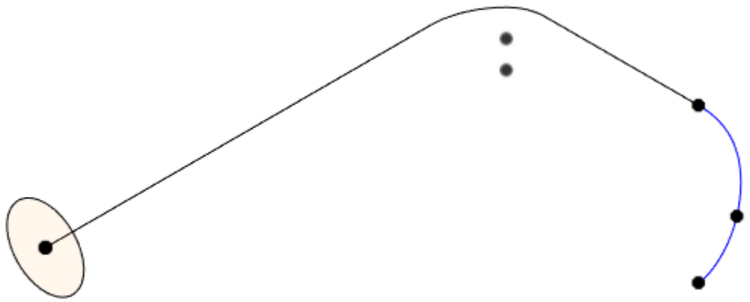


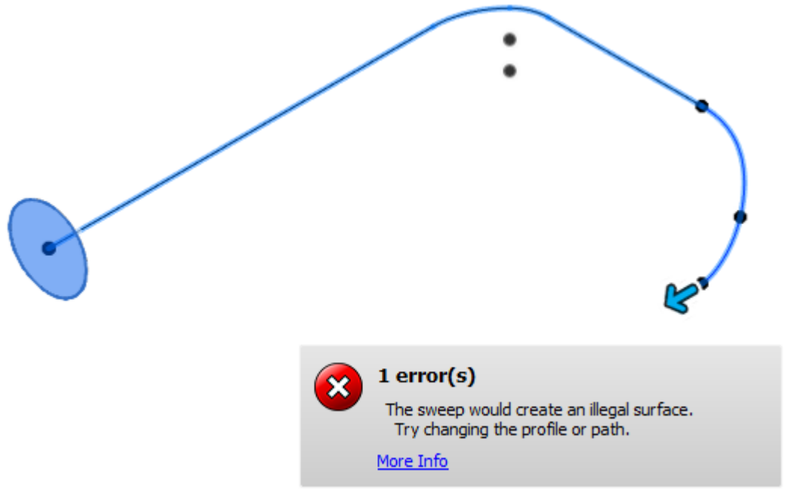
Hands-on

High Curvature

a. Open *1-PipeSweep.**

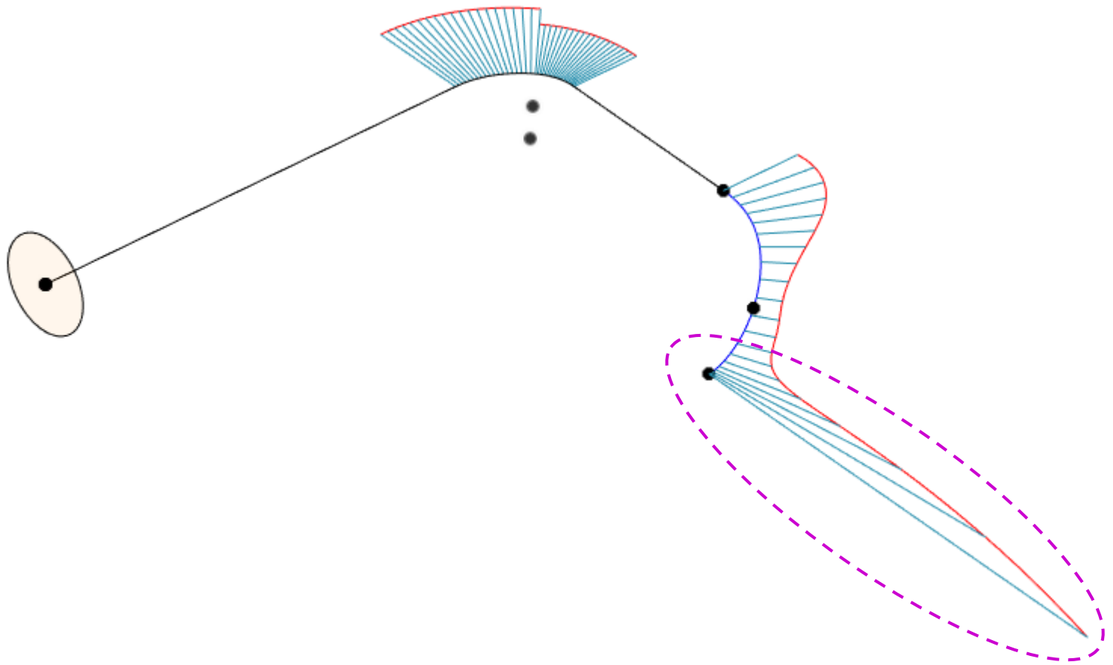
b. Sweep the circle





High Curvature

Tip: Inspect curvature combs



2. Near-tangency

Geometric Continuity

G0 **G1** **G2** **…** **G*n***

Continuity

Not connected

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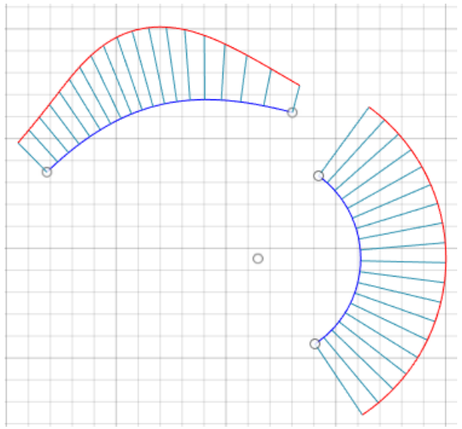
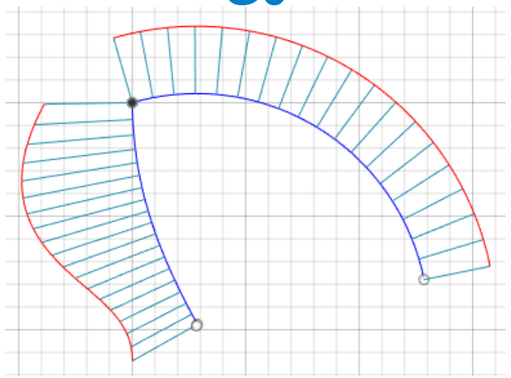


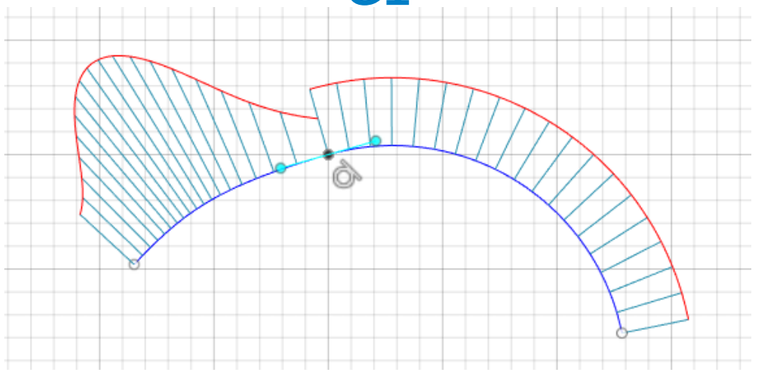
Connected

G0



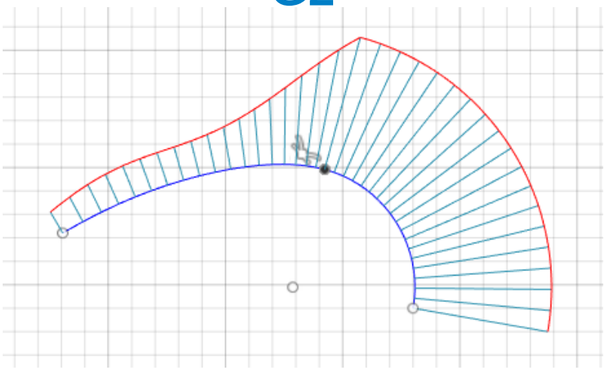
Connected, Tangent

G1

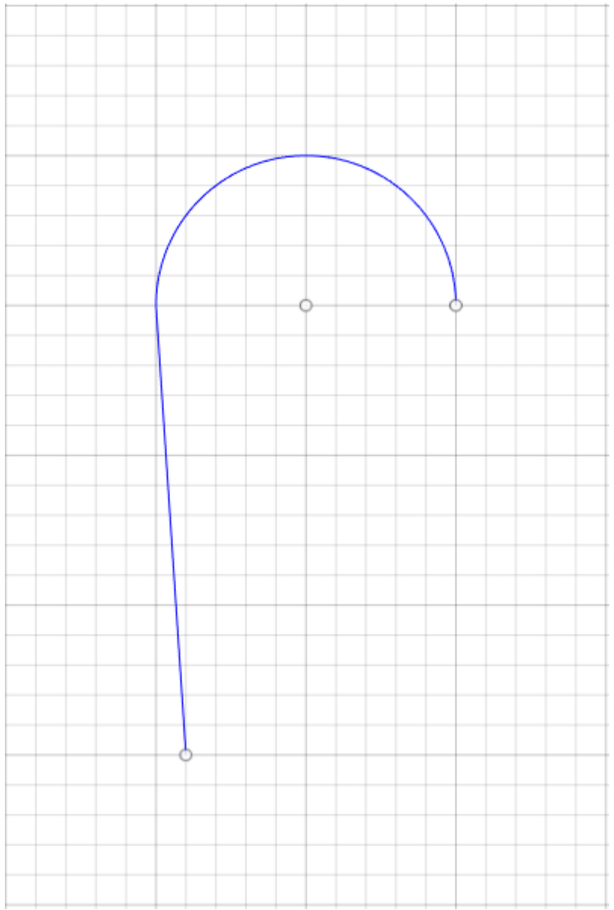


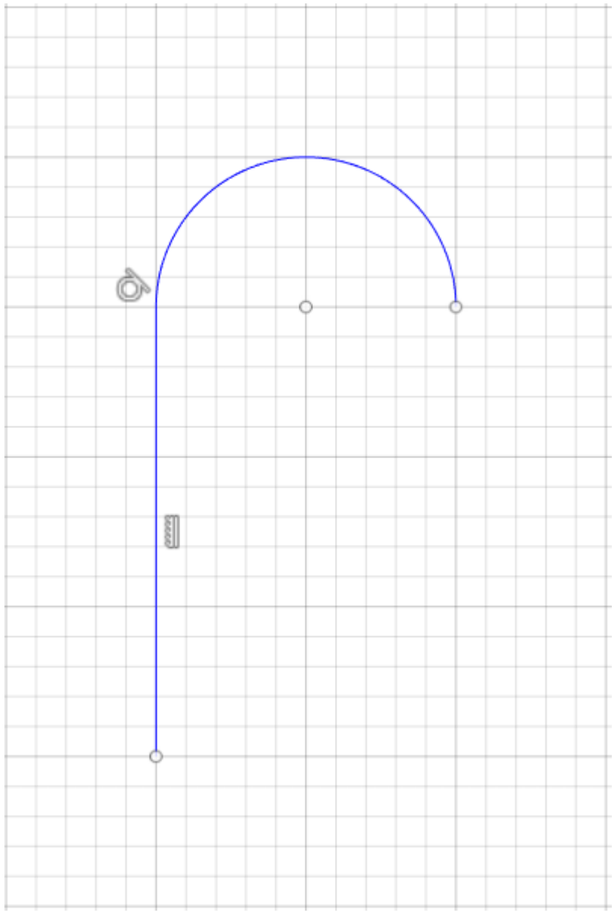
Connected, Tangent, Smooth

G2



Near-tangency





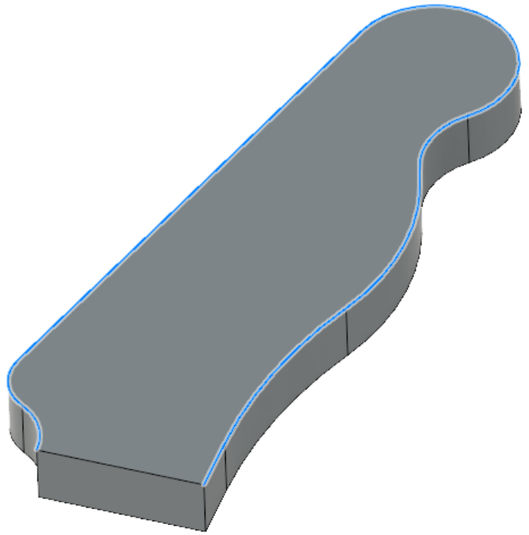
Hands-on

Near-tangency

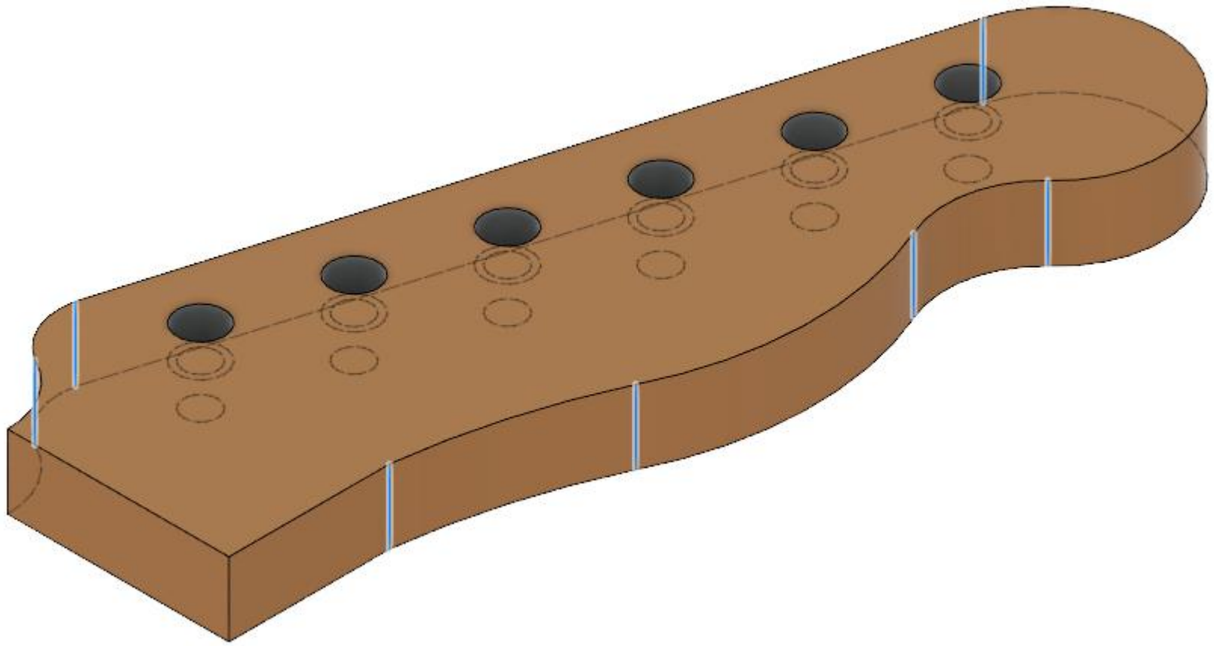
a. Open *2-Headstocks.smt*

b. On the grey body, add 5mm fillet

c. Add a similar fillet on the gold body

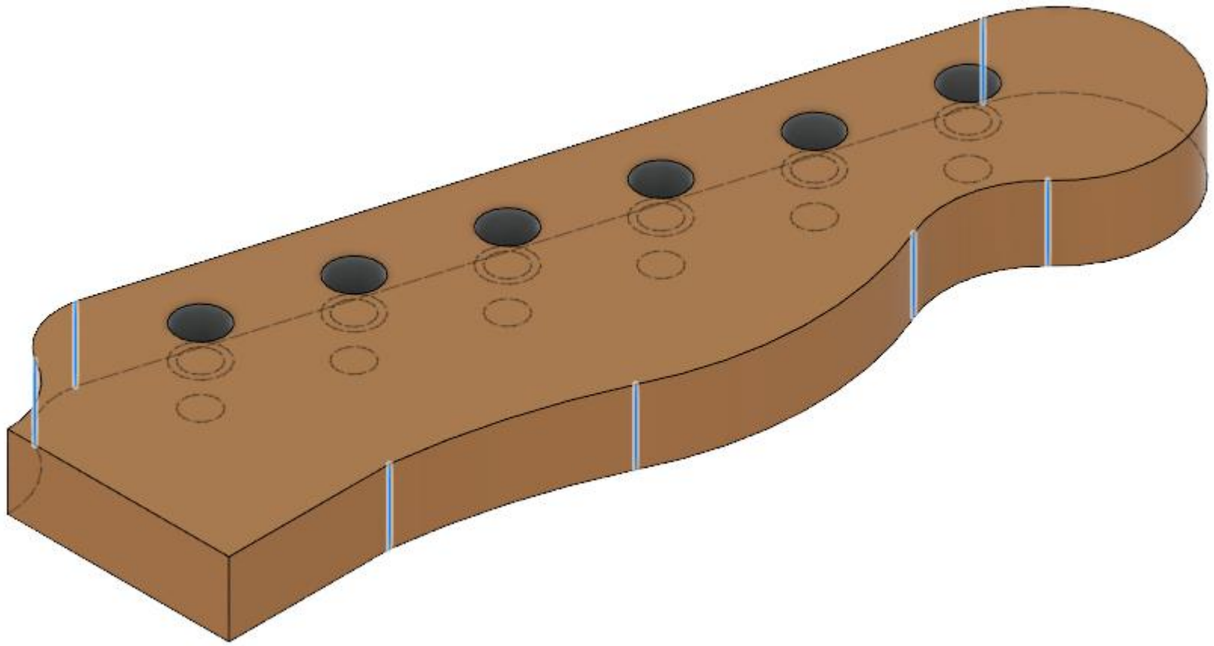


Near-tangency



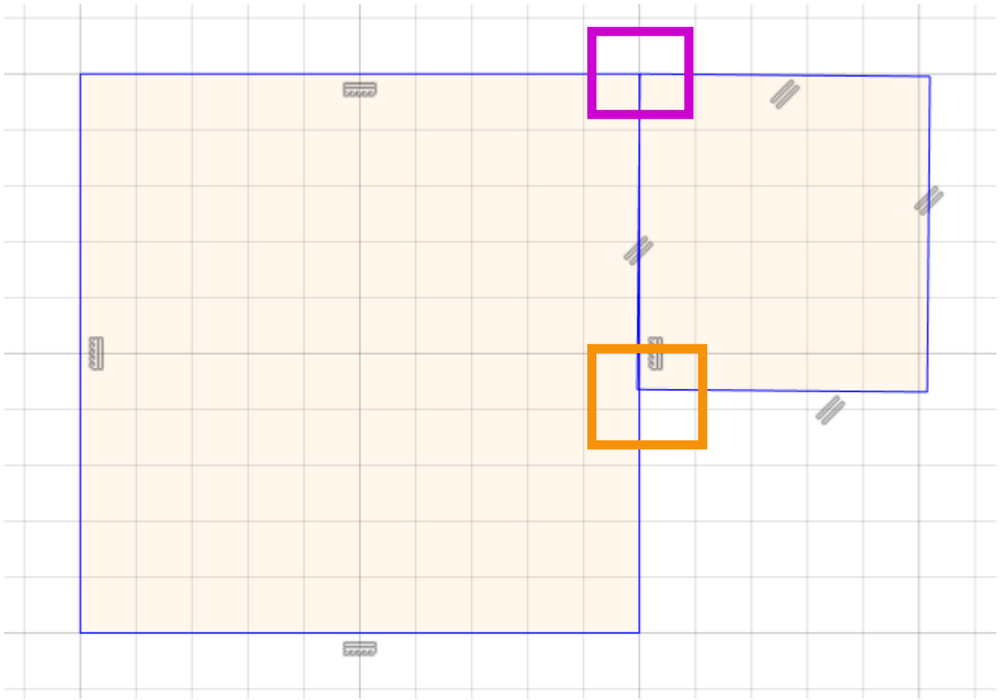
Near-tangency

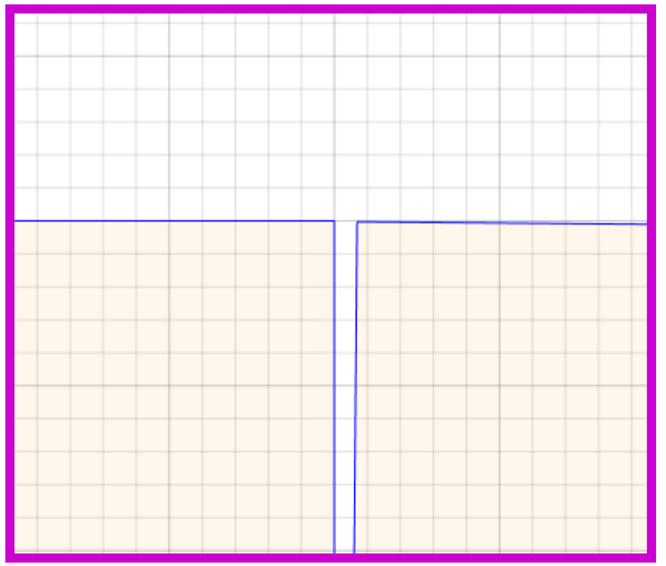
Tip: Fillet command only chooses G0 edges

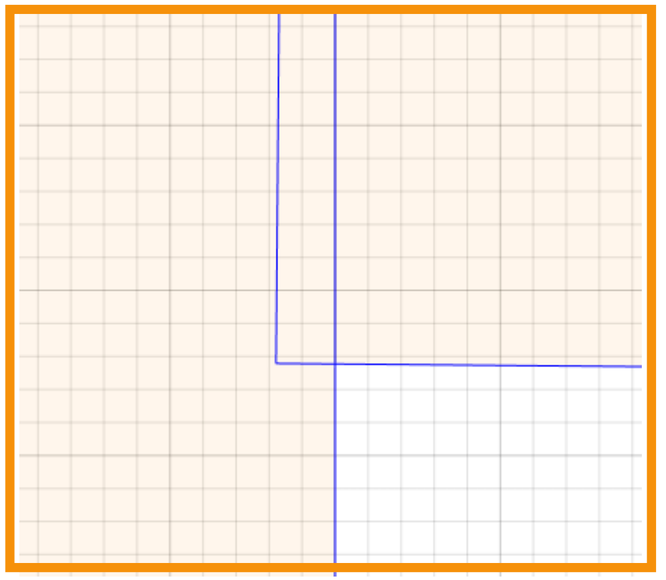


3. Near-coincidence

Near-coincidence





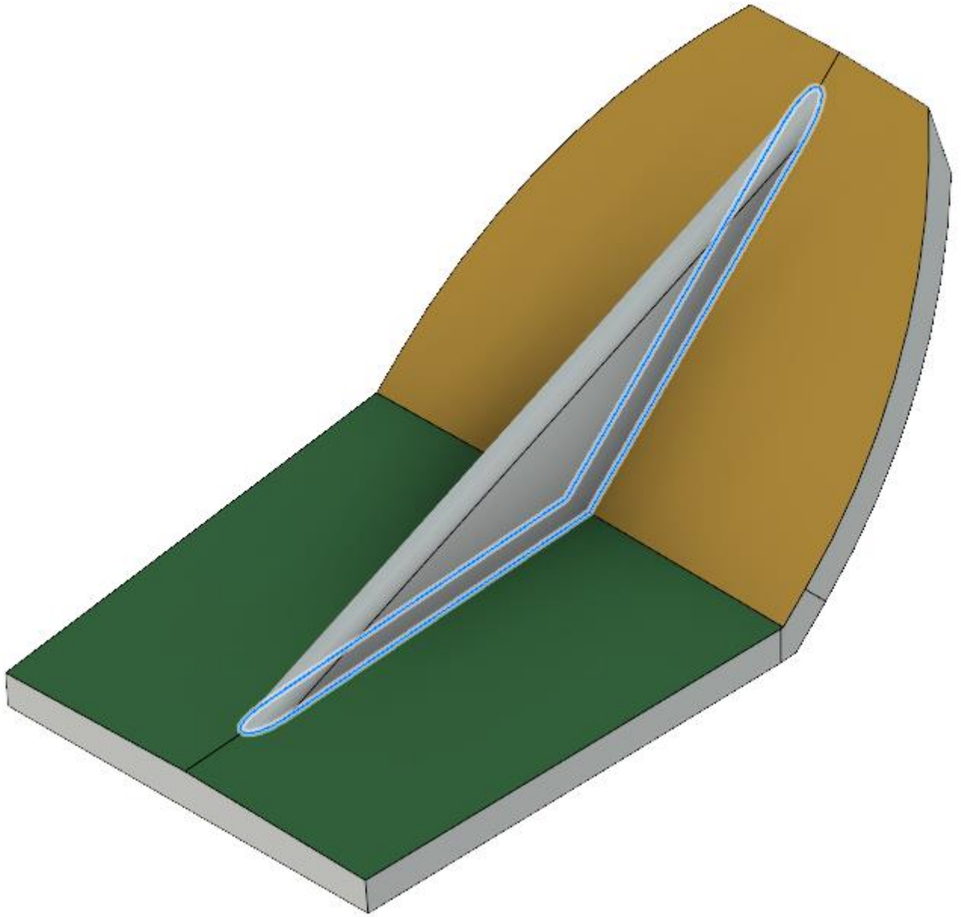


Hands-on

Near-coincidence

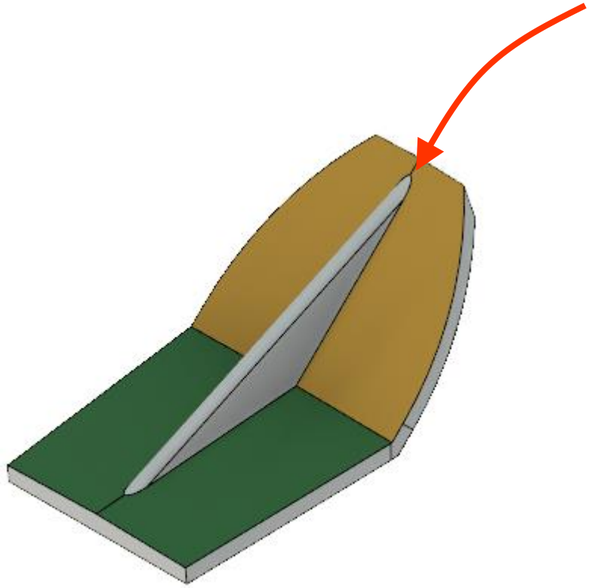
a. Open *3-RibFillet.**

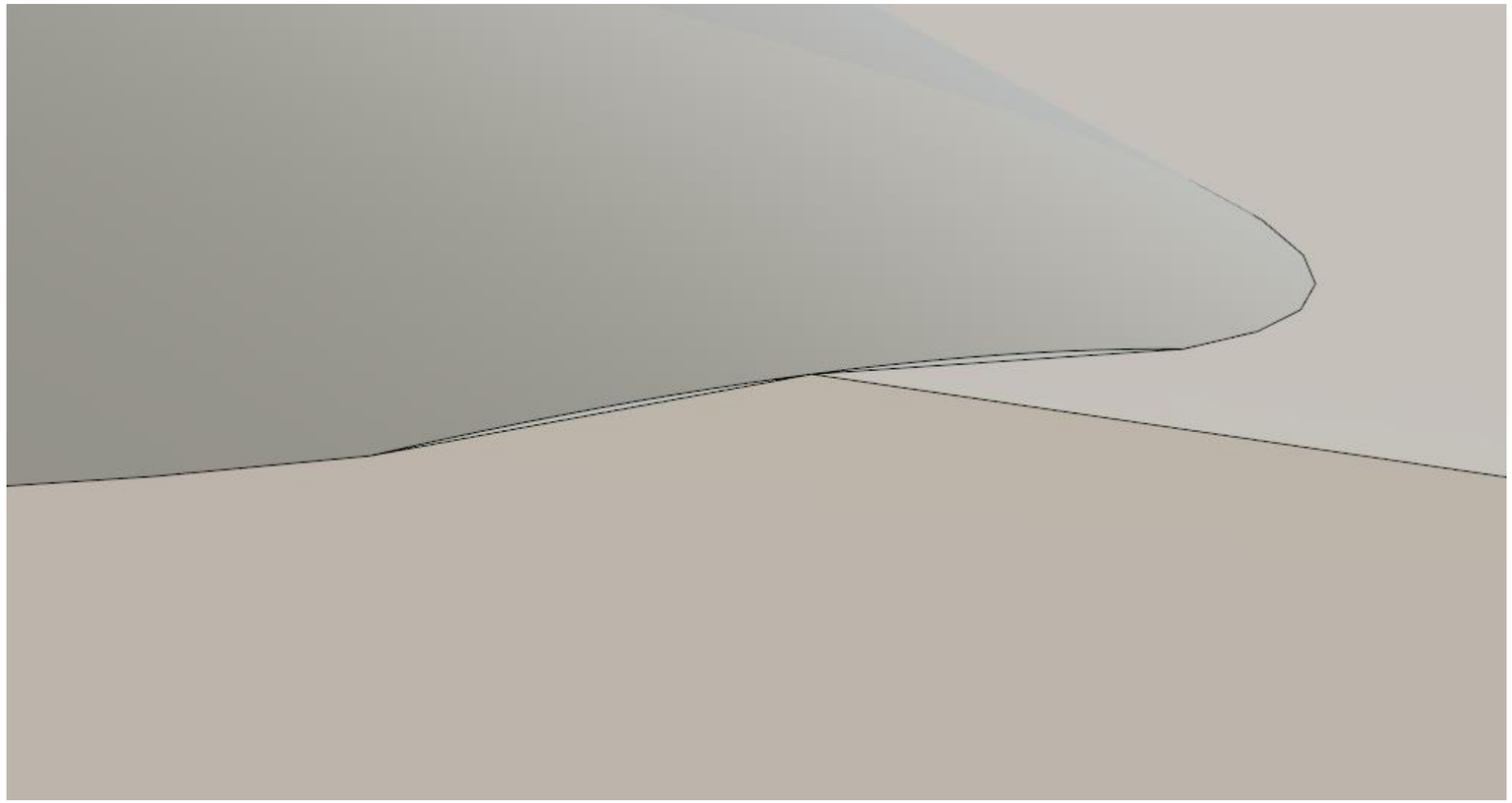
b. Add 1mm fillet around rib



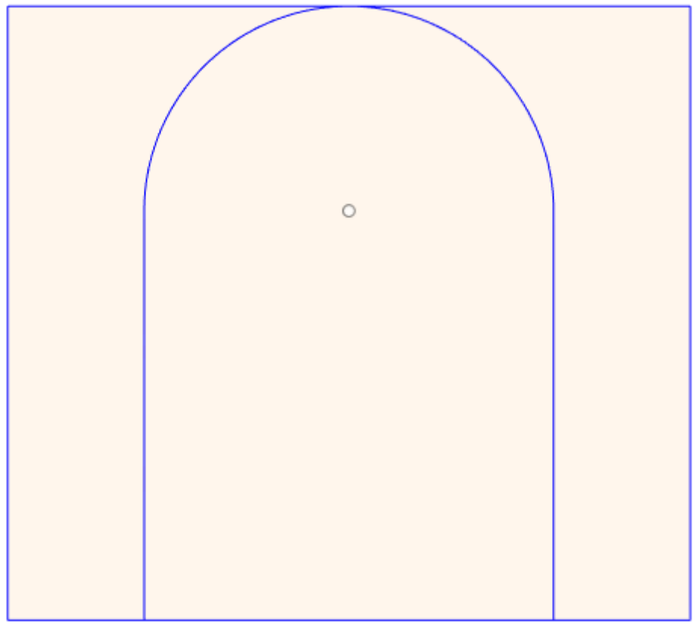
Near-coincidence

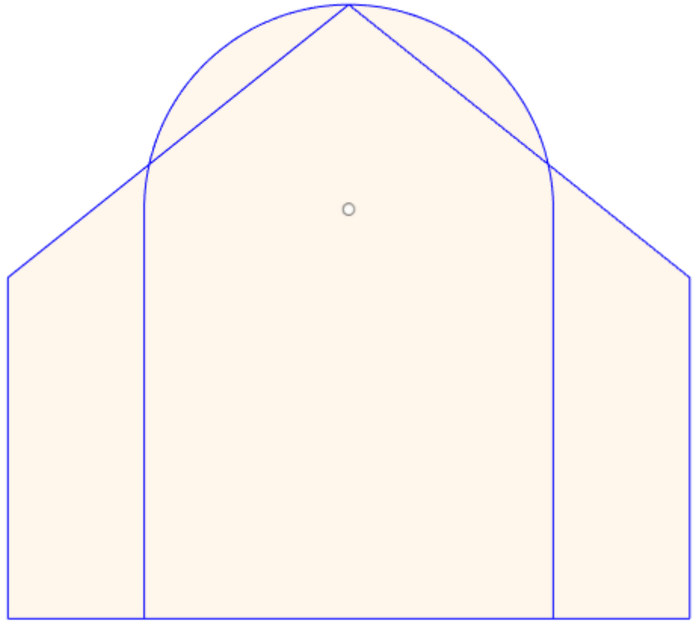
Tip: Zoom in at transitions





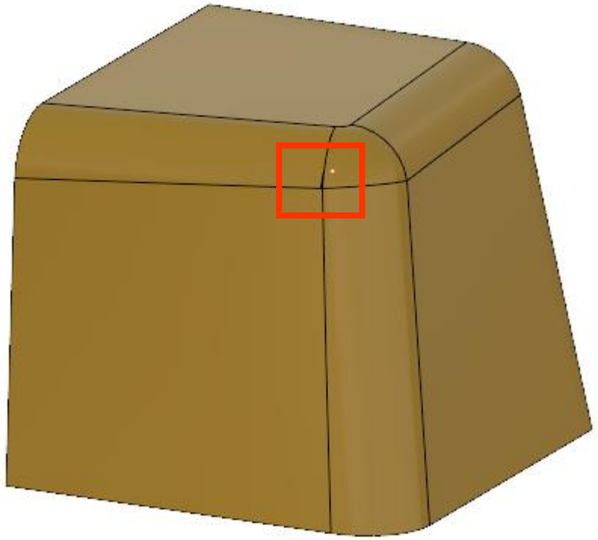
Near-coincidence

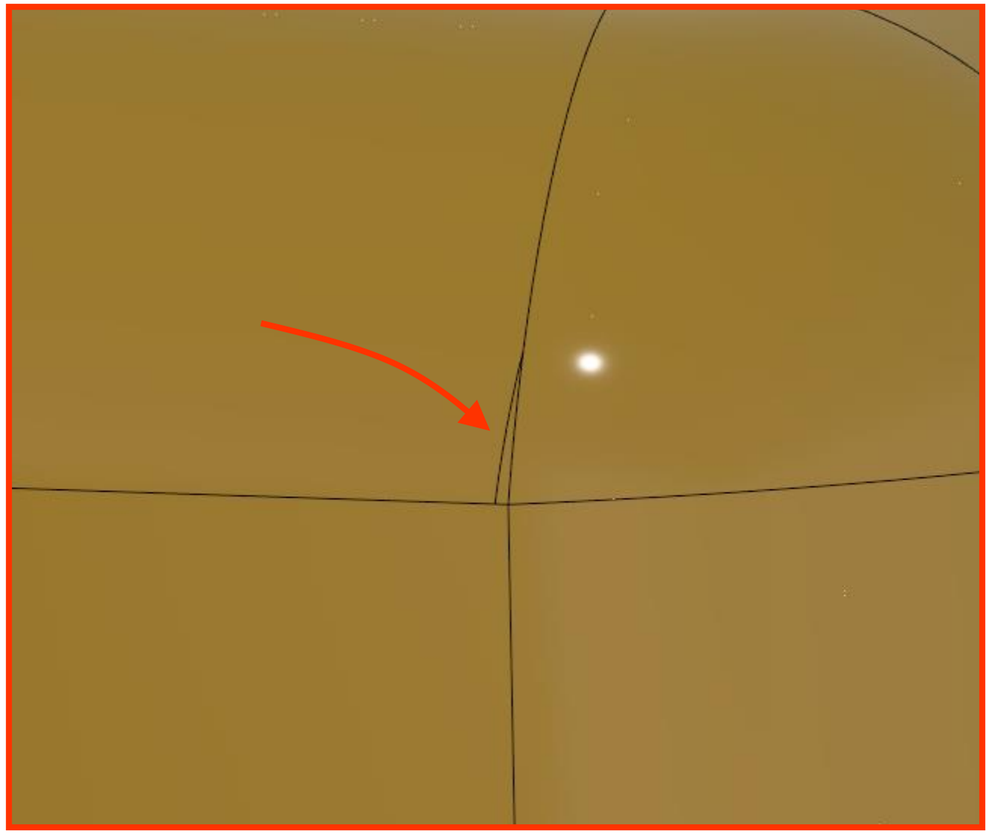




4. Sliver faces

Sliver faces





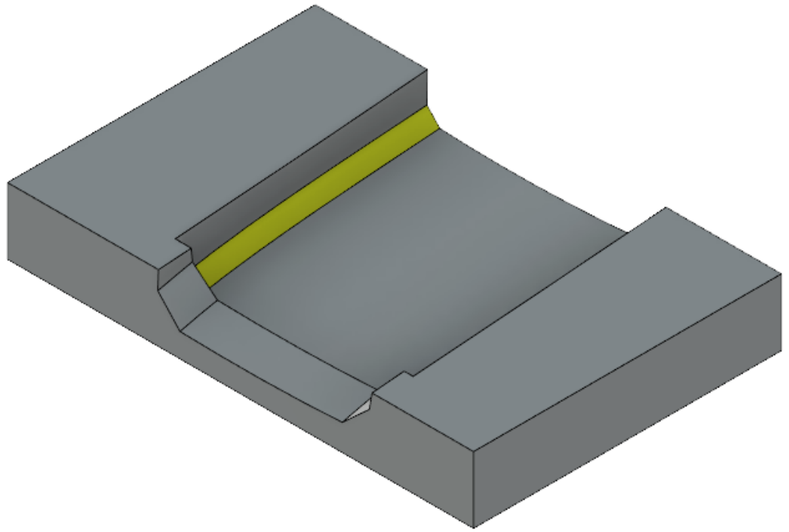
Hands-on

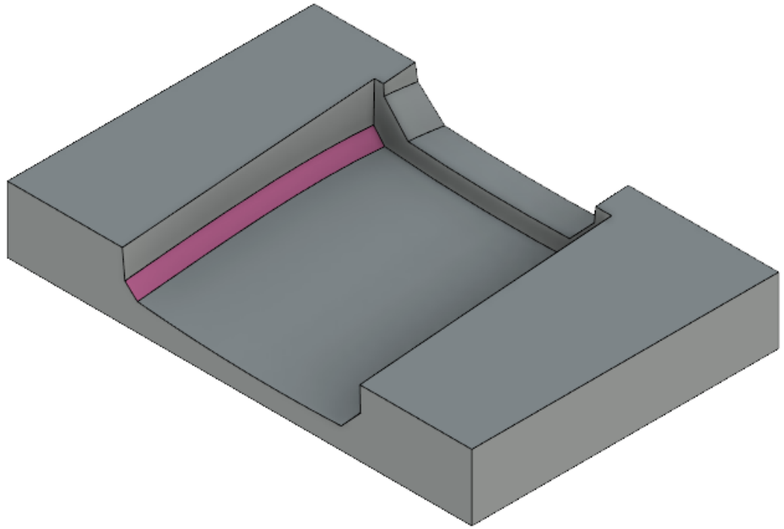
Sliver faces

a. Open *4-Mold.stp*

b. Increase the yellow chamfer by 1mm

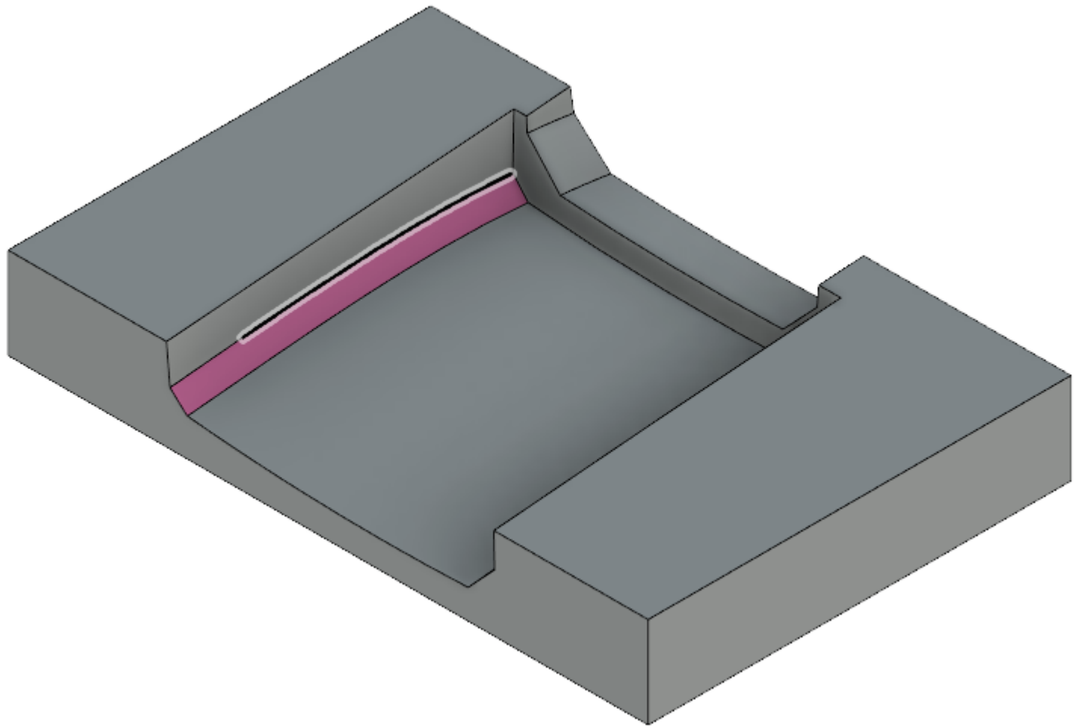
c. Increase the pink chamfer by 1mm



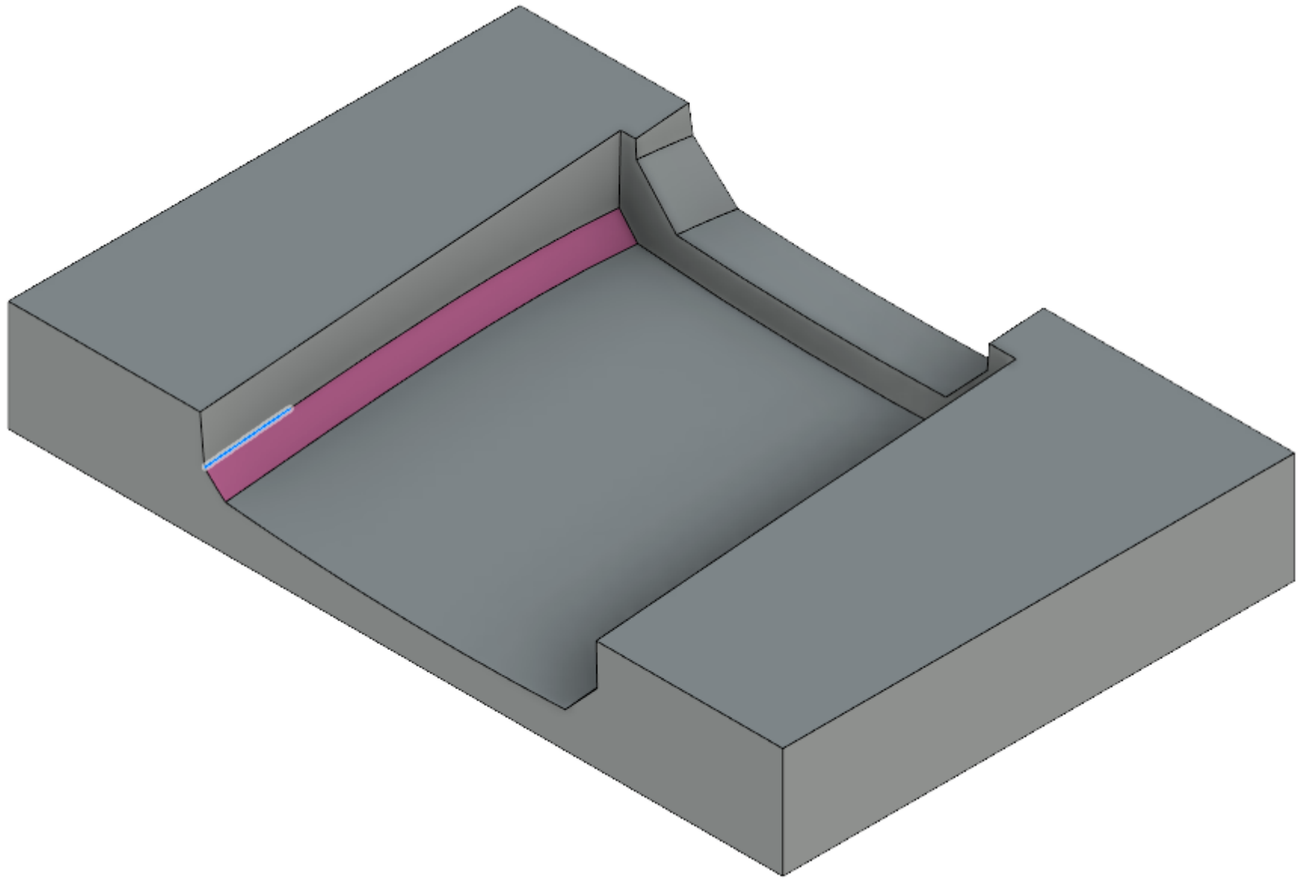


Sliver faces

Tip: Look for broken edges



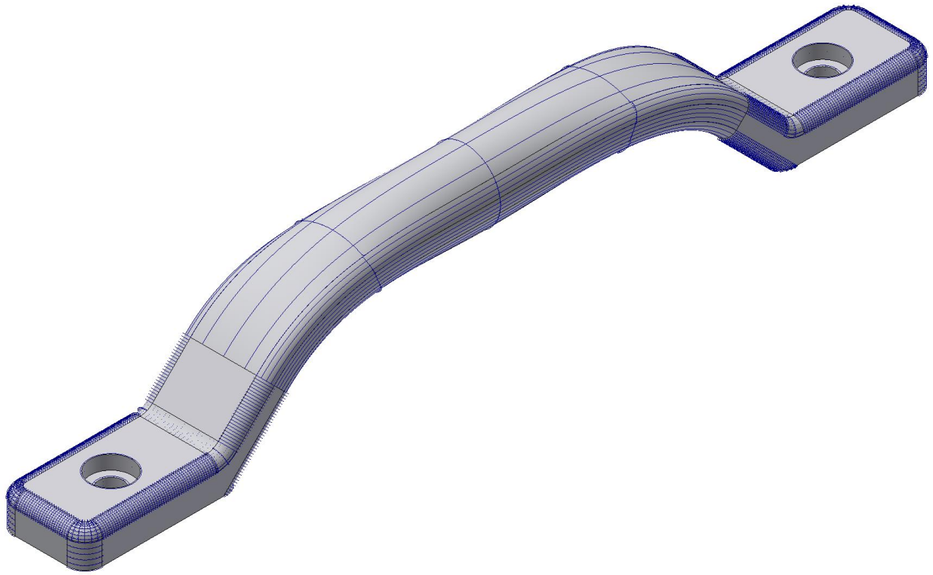
Sliver faces



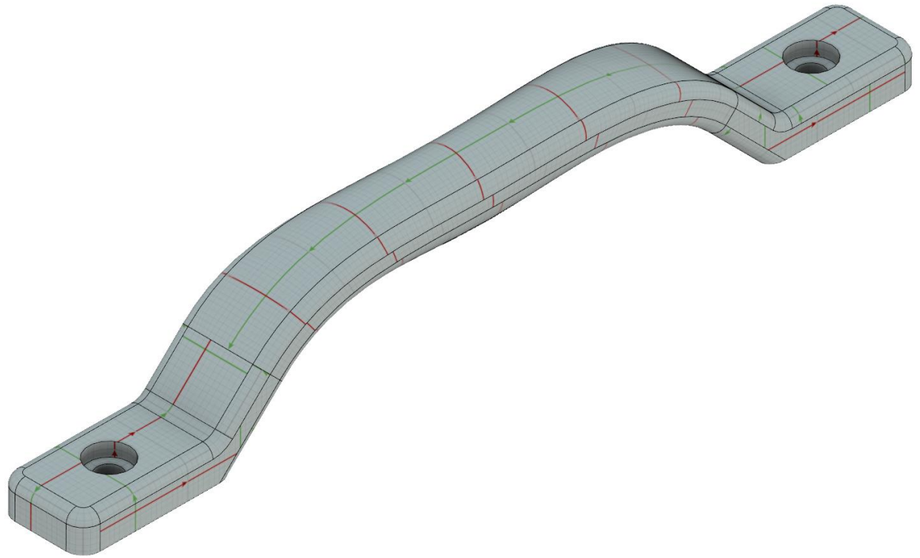
5. Singularities

Parameter lines

Inventor

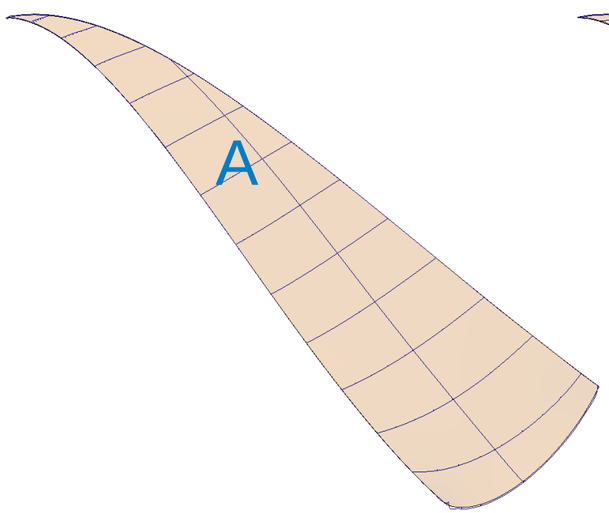


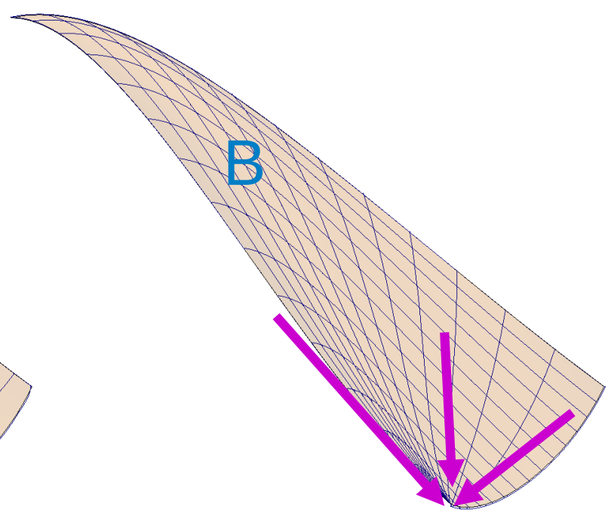
Fusion



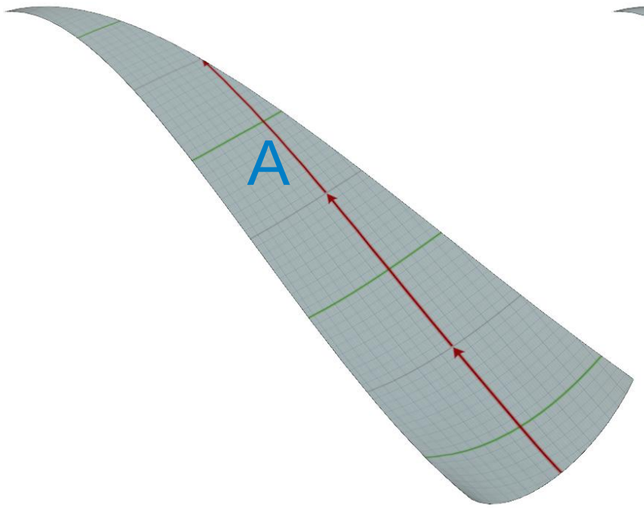
Singularities

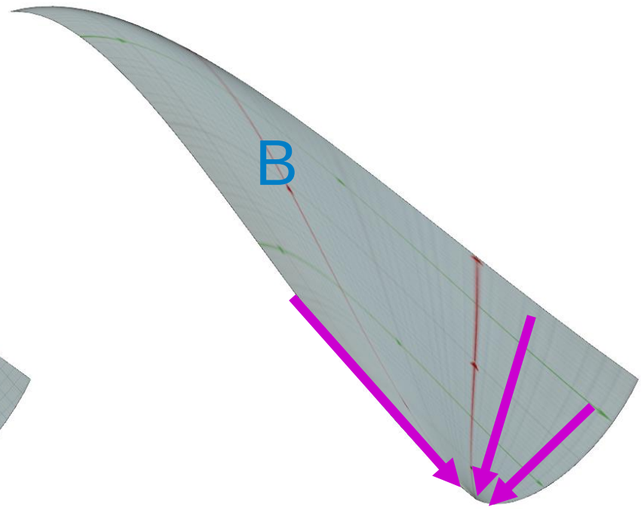
Inventor



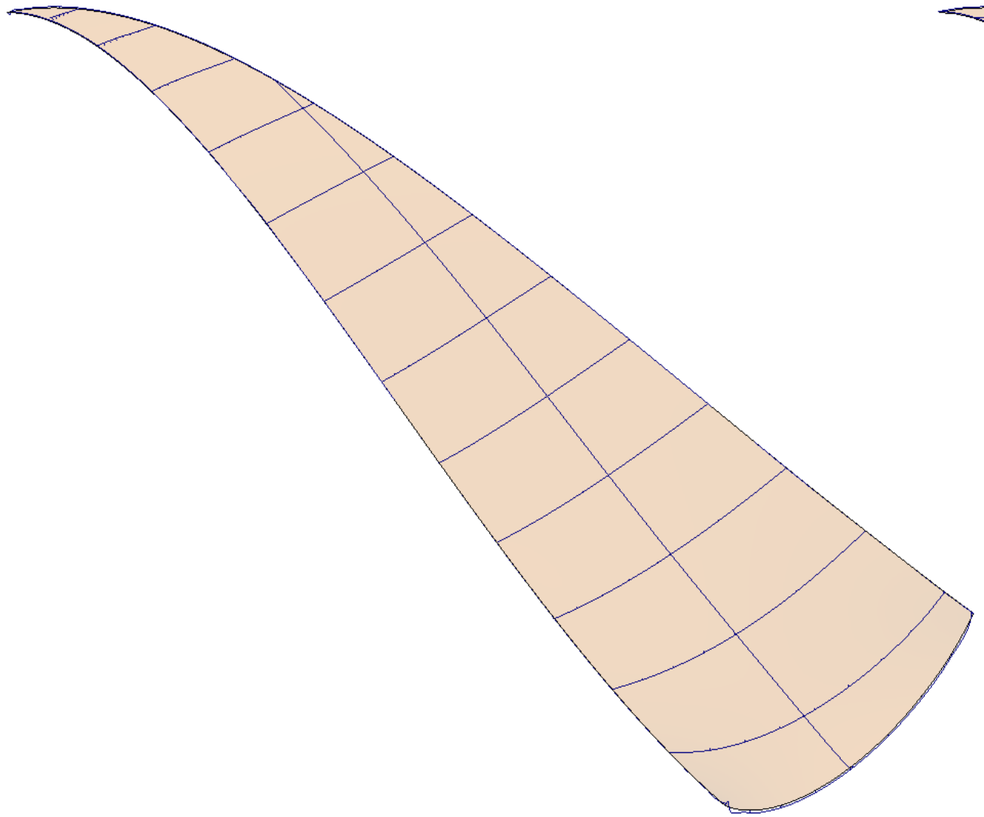


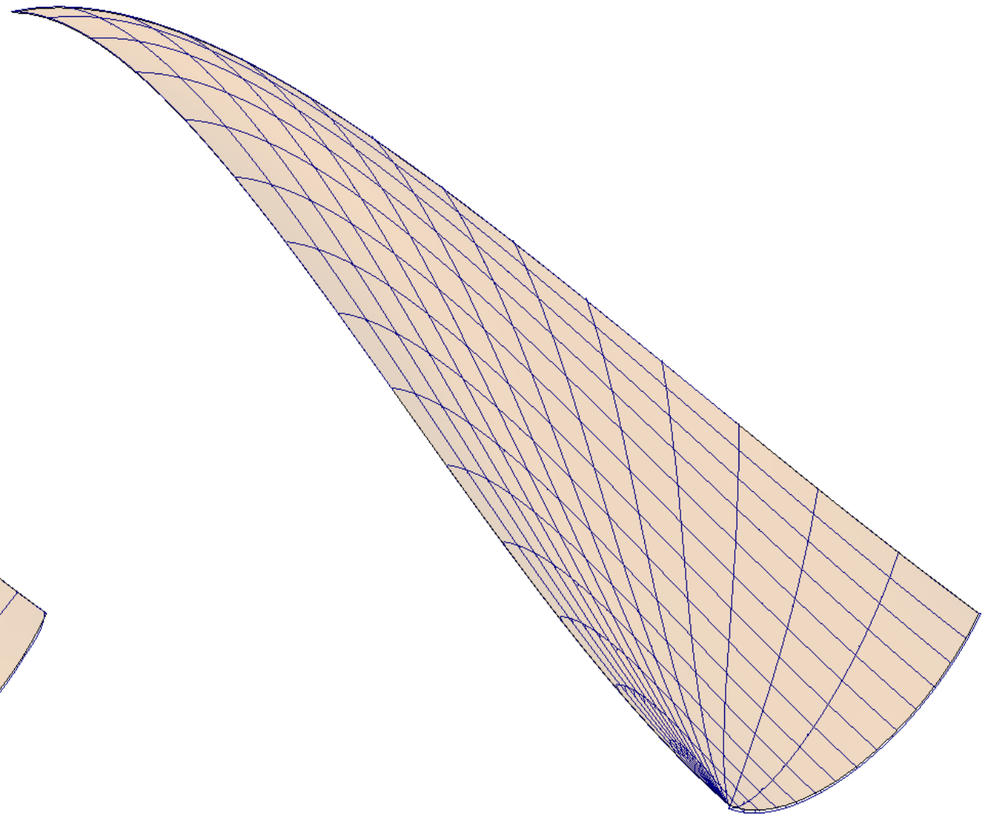
Fusion





Singularities



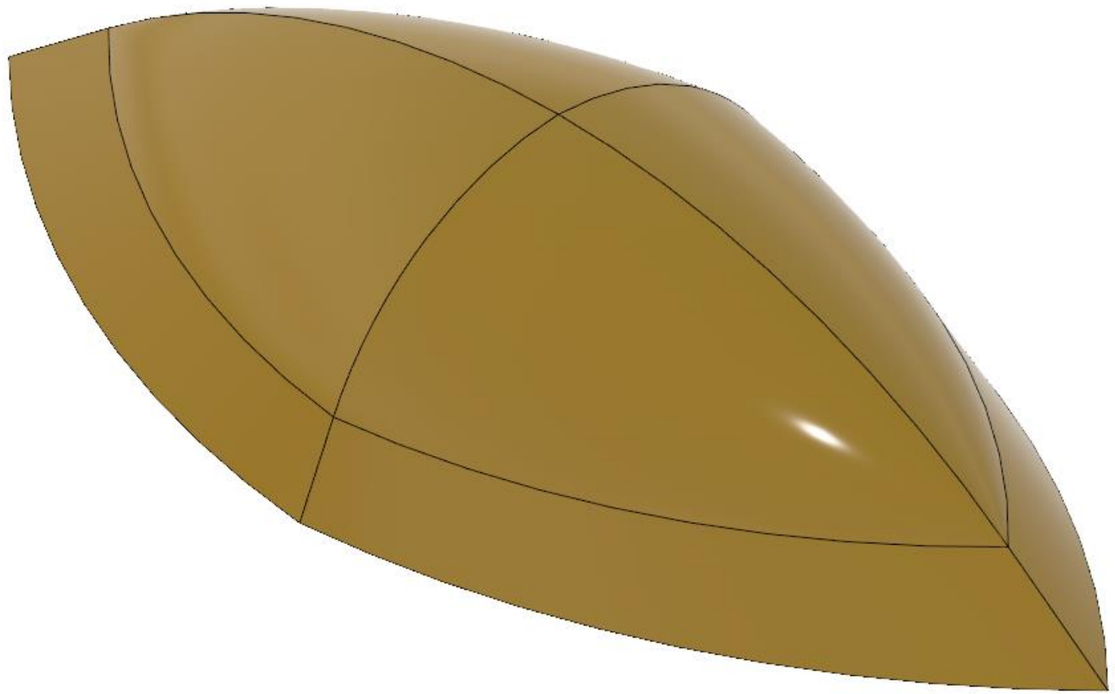


Hands-on

Singularities

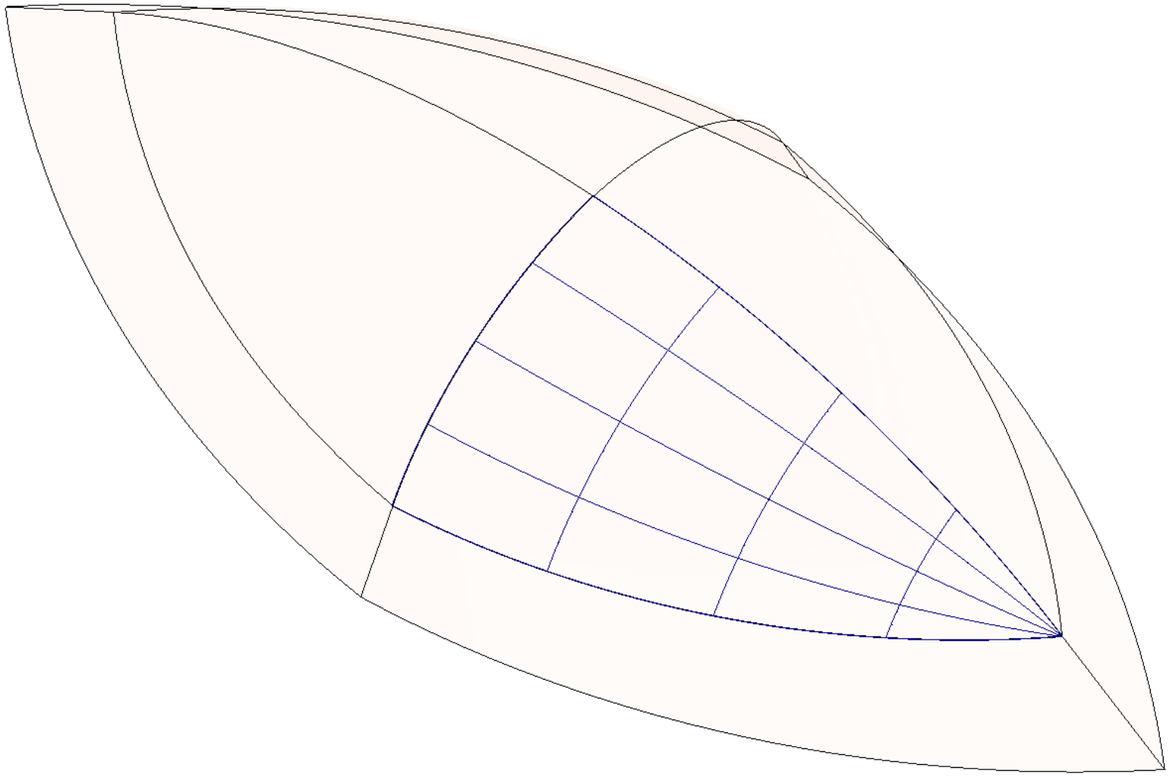
a. Open *5-Boat.stp*

b. Thicken to create a solid

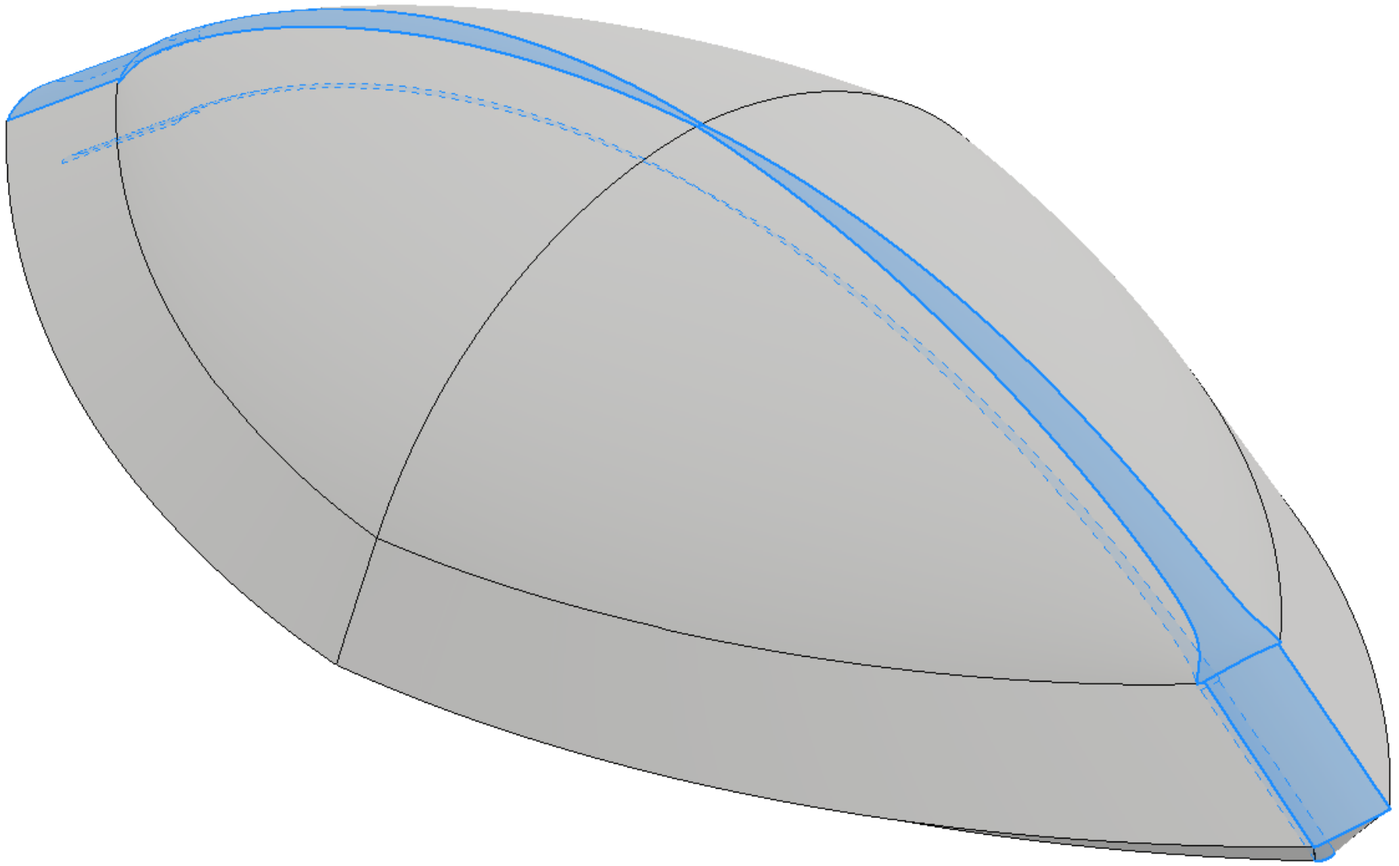


Singularities

Tip: Inspect parameter lines of three-sided faces

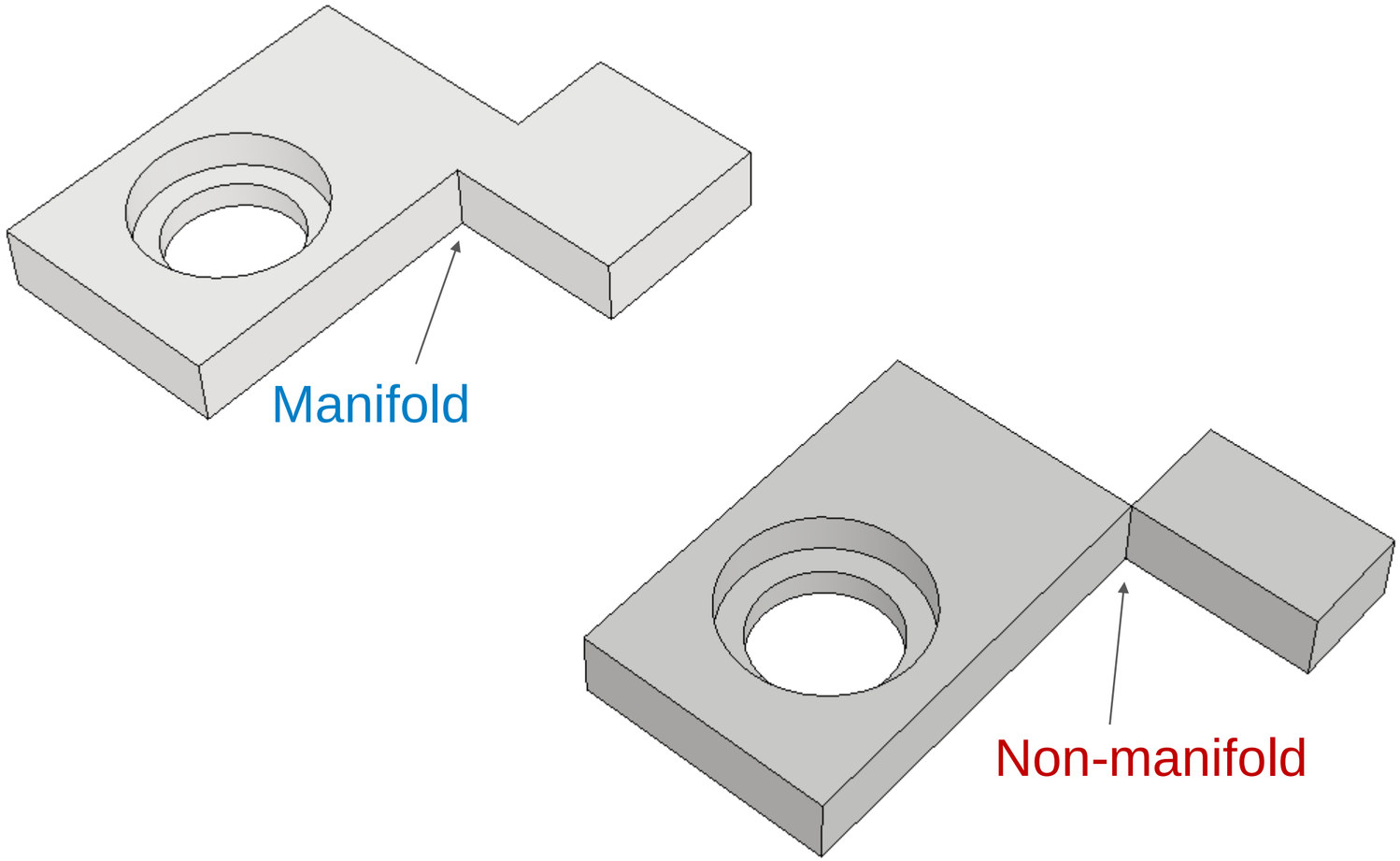


Singularities



6. Non-manifold topology

Non-manifold topology

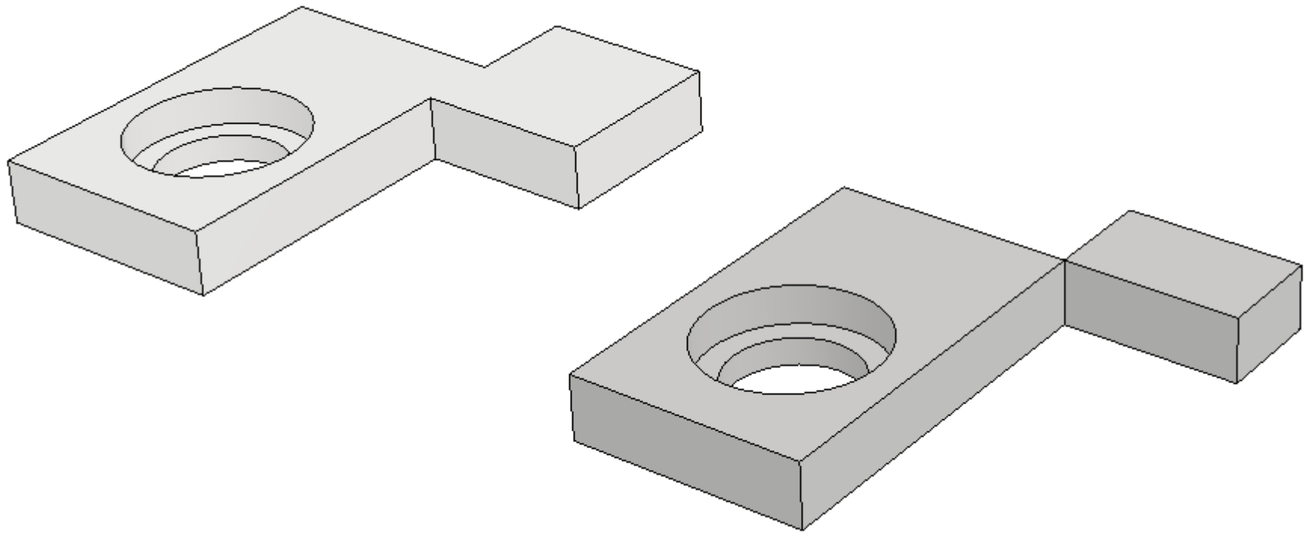


Hands-on

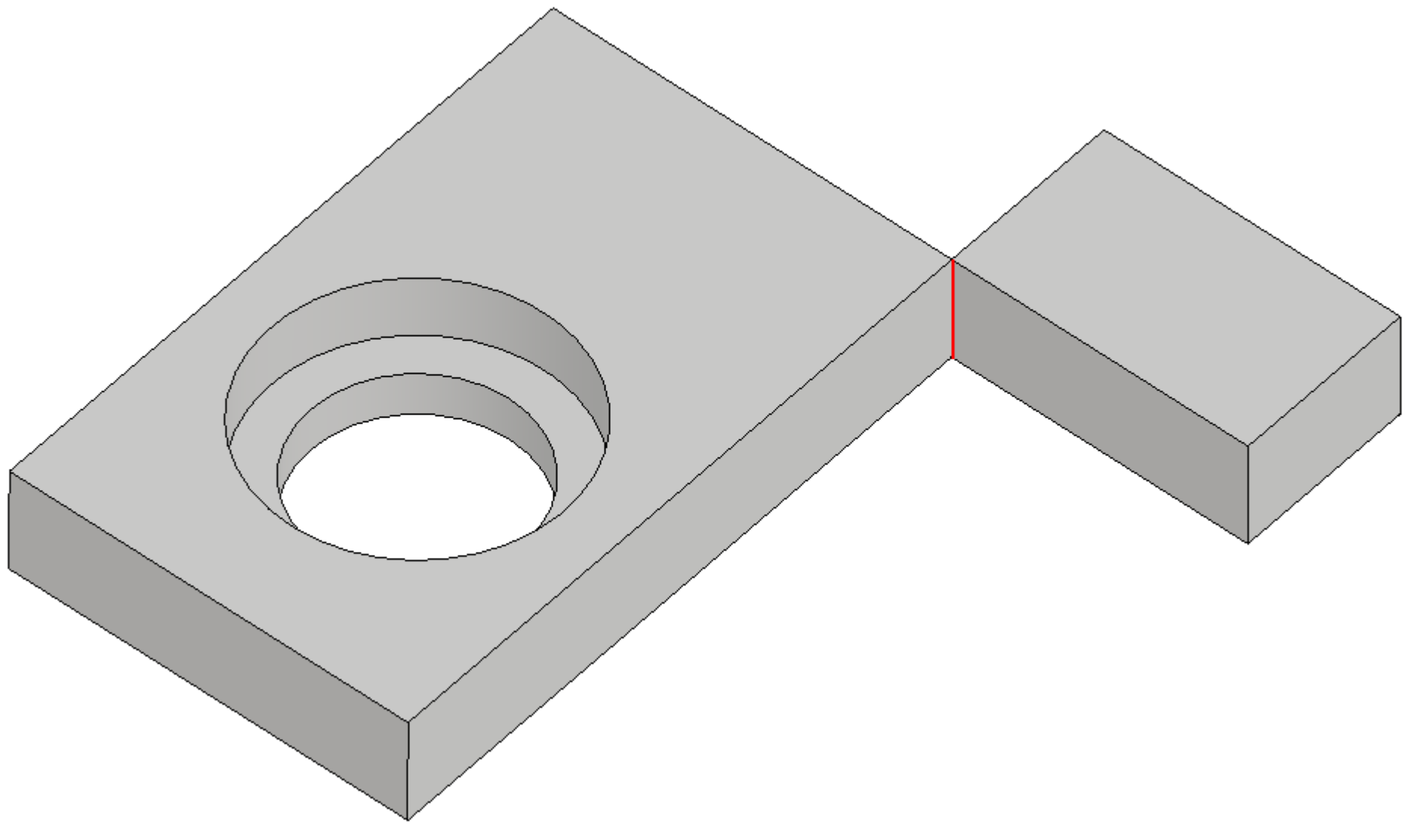
Non-manifold topology

a. Open *6-FixingPlate.smt*

b. Add 2mm fillets to vertical edges

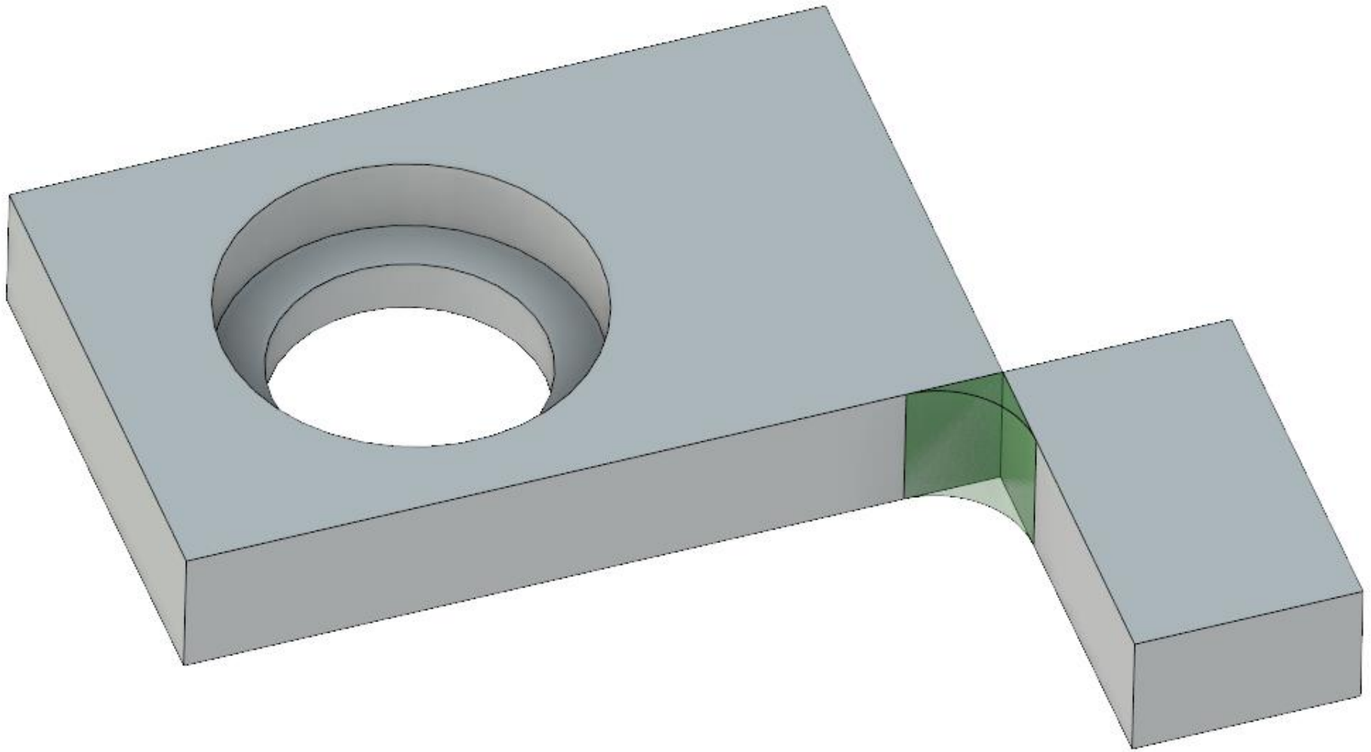


Non-manifold topology



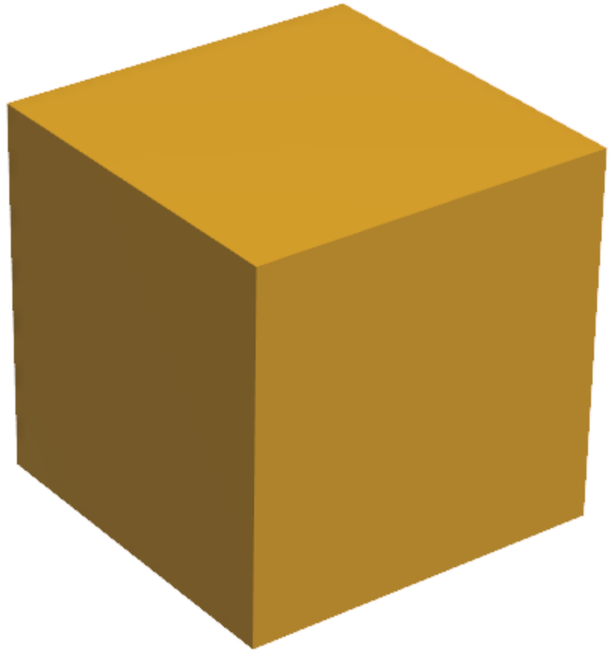
Non-manifold topology

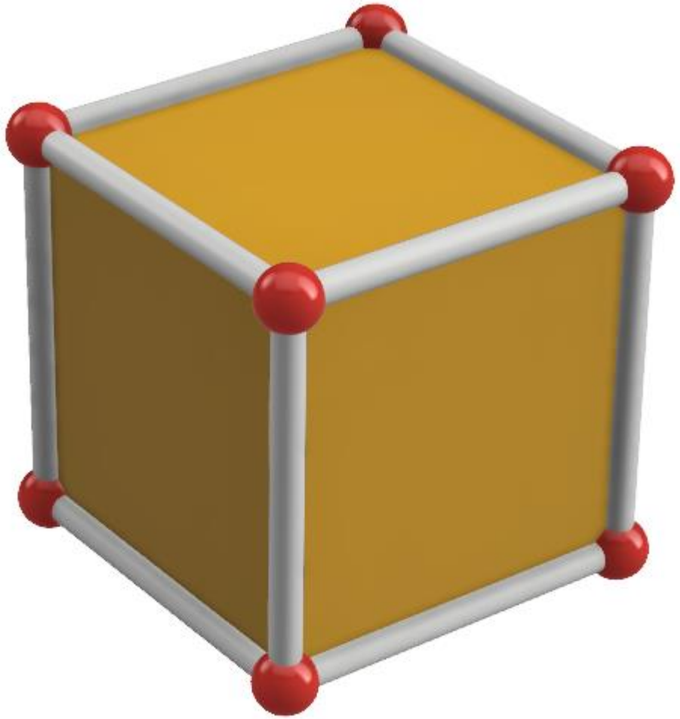
Tip: Add support geometry



7. Loose tolerant geometry

Tolerant geometry



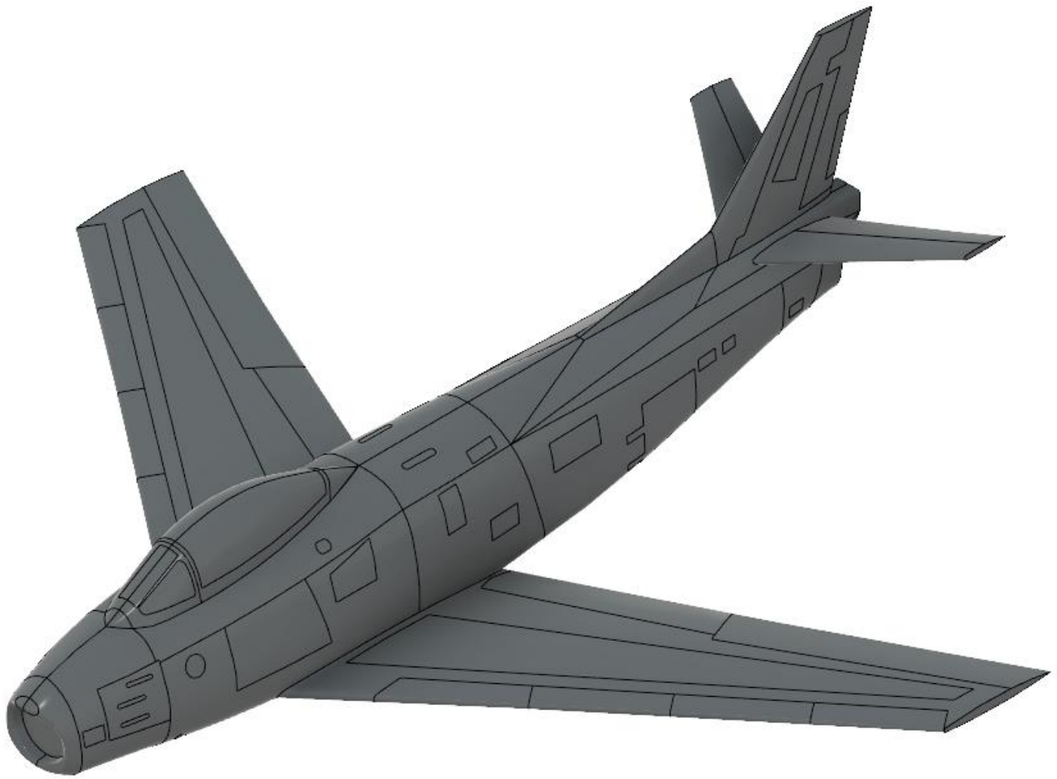


Hands-on

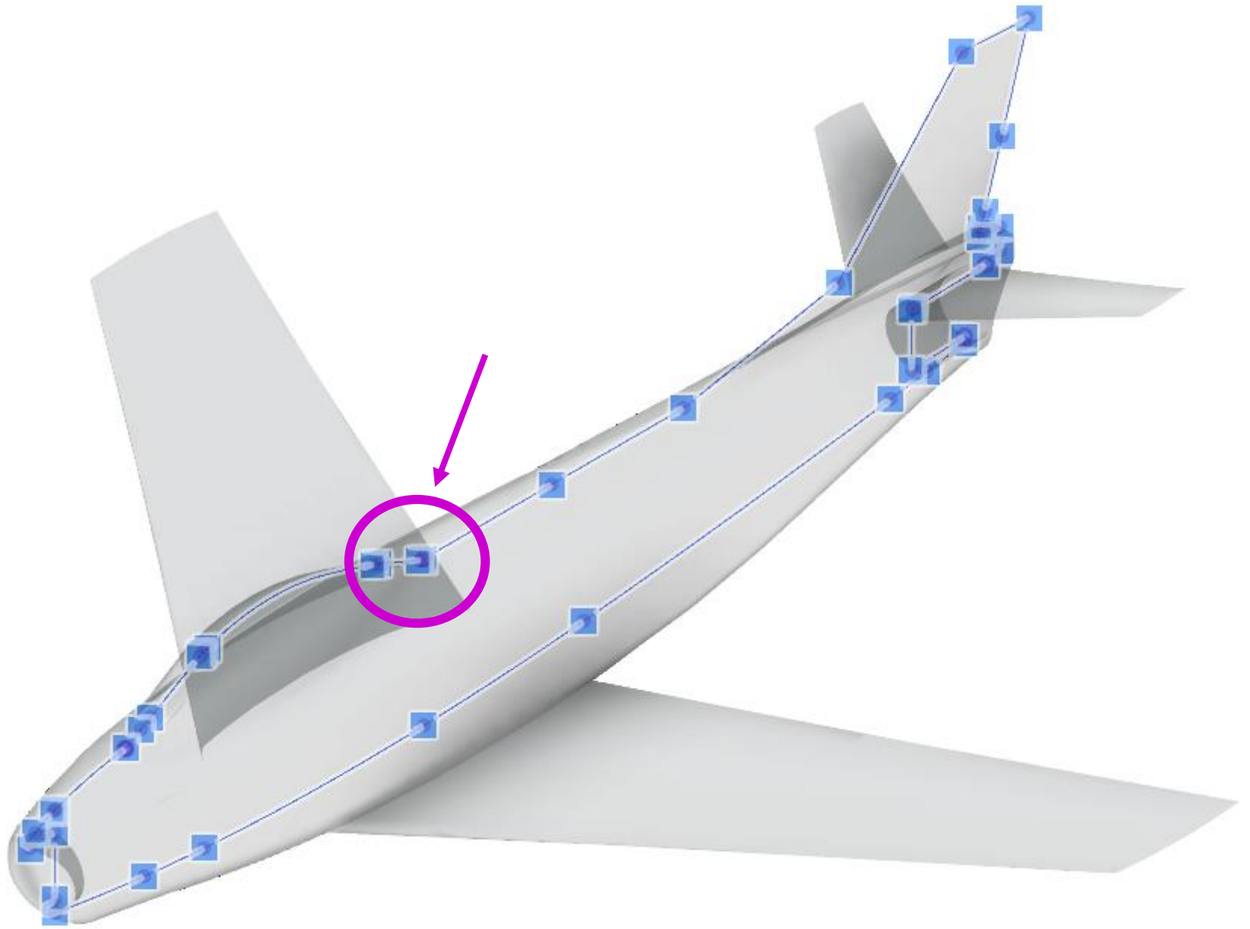
Loose tolerant geometry

a. Open *7-FixingPlate.smt*

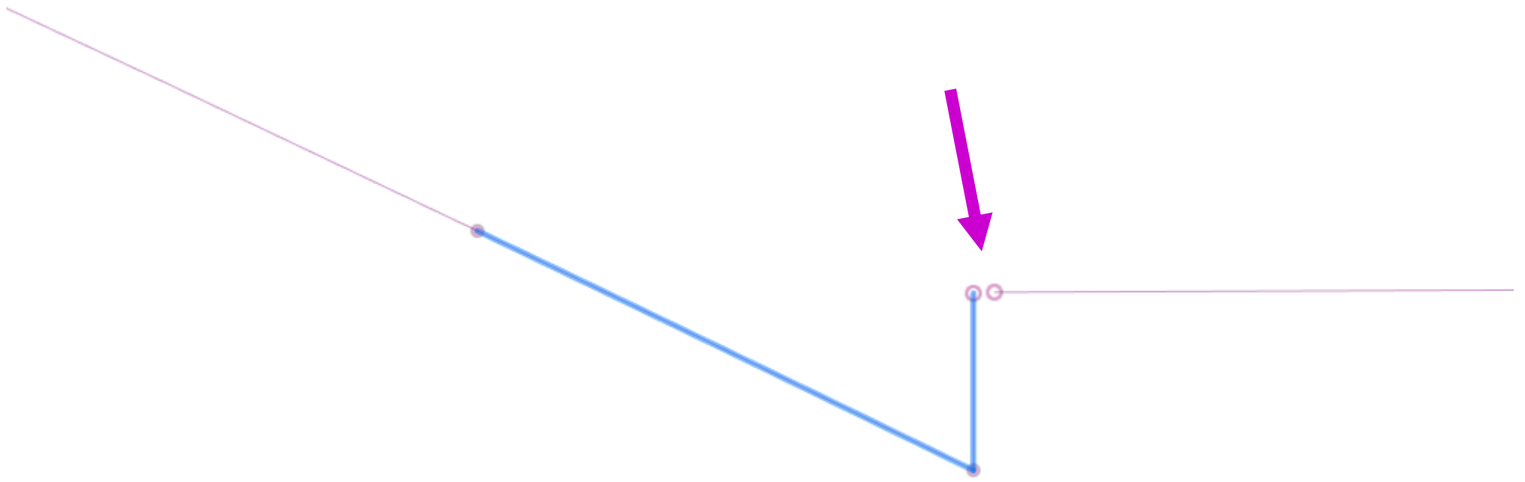
b. Create intersection sketch on YZ



Loose tolerant geometry



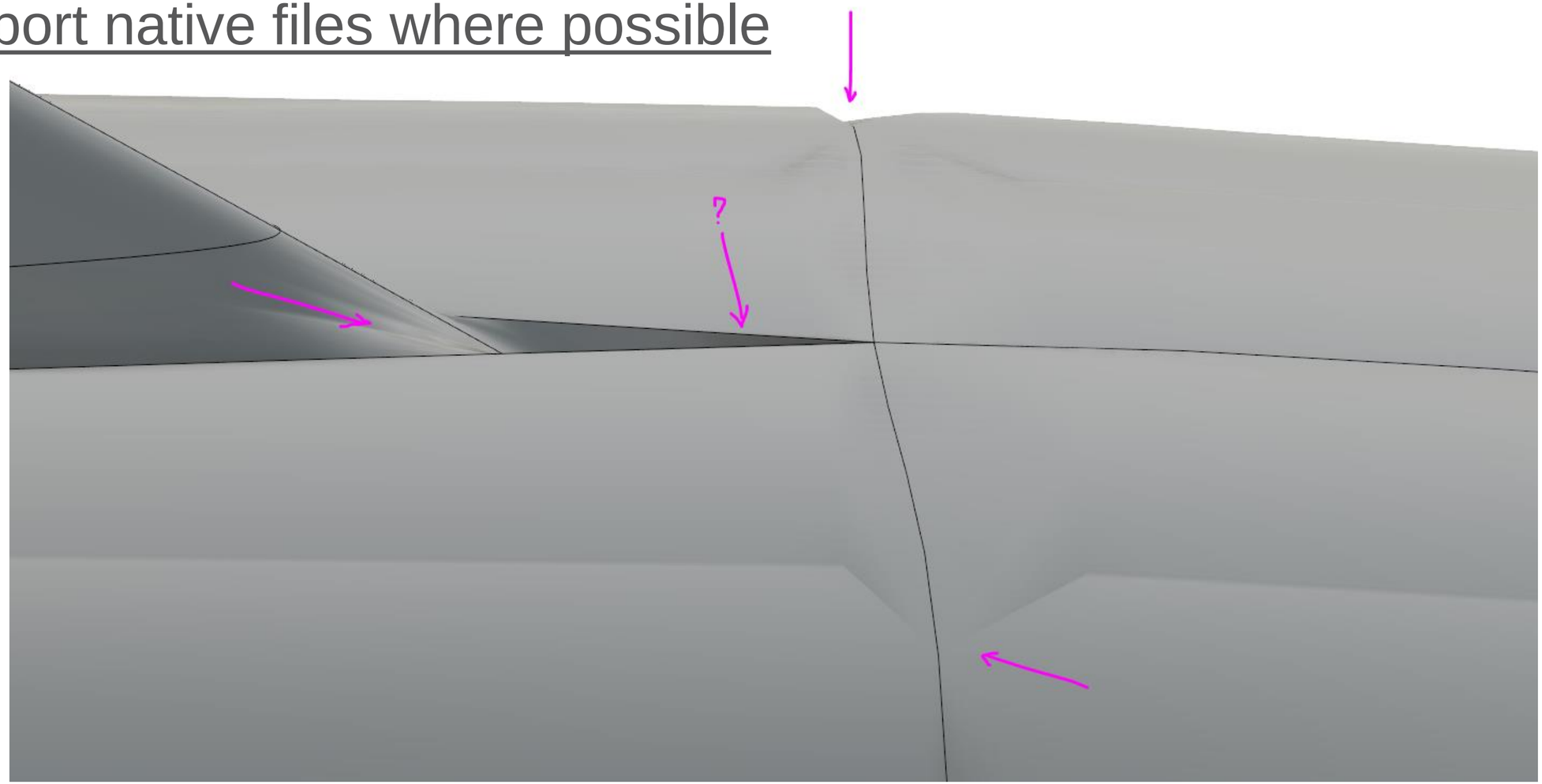
Loose tolerant geometry



Loose tolerant geometry

Tip: Look for weird graphics

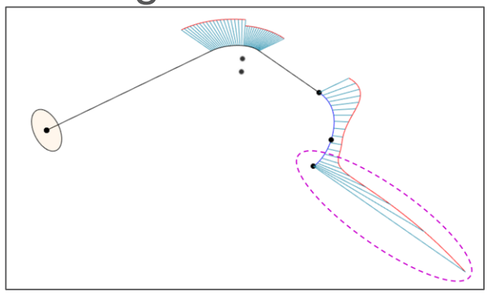
Tip: Import native files where possible



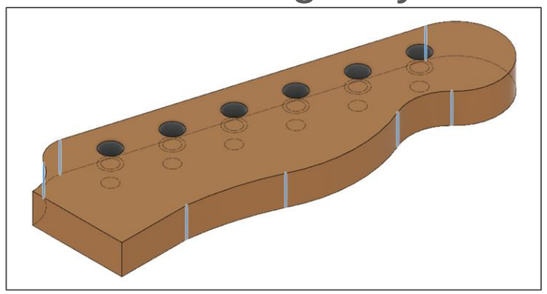
Source: The Simpsons

Seven Deadly Sins

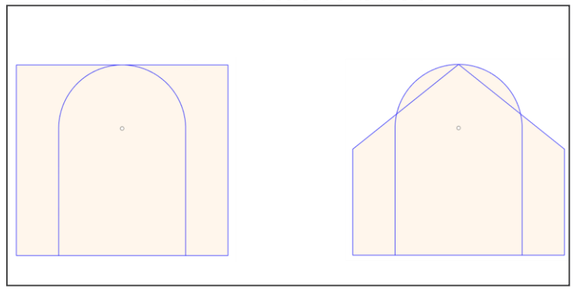
High curvature



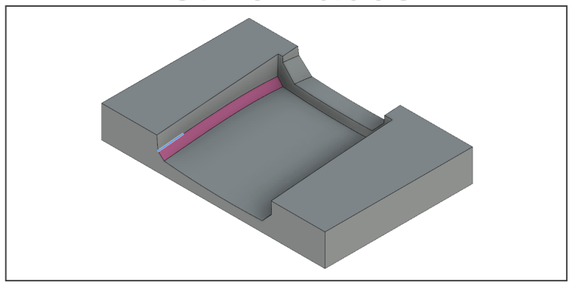
Near-tangency



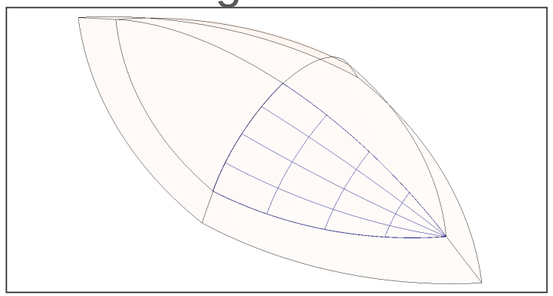
Near-coincidence



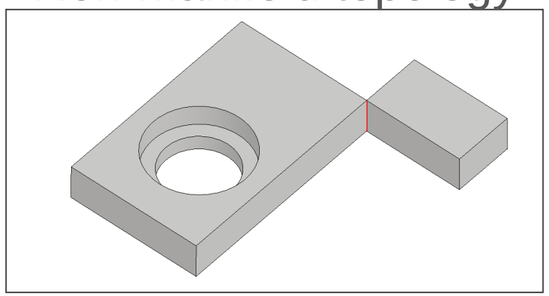
Sliver faces



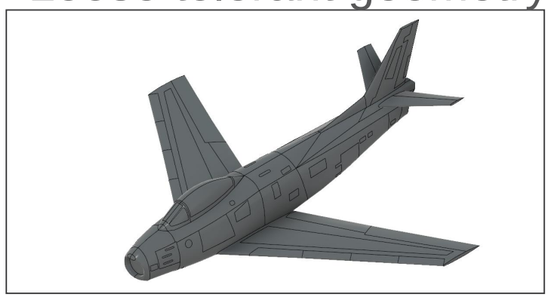
Singularities



Non-manifold topology



Loose tolerant geometry



Additional resources

Additional resources

Search AU Online: http://au.autodesk.com/au-online/

- Jake Fowler – *Get Smart with Autodesk Inventor Modeling*
- Paul Munford – *Complex Topology and Class-A Surface Modeling with Inventor*
- Brad Tallis – *Use Direct Modeling in Fusion 360 to Take Your Models to the Next Level*

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