CREO Parametric Surfacing

Working with Scanned Data

Prepared By: Sebastian Ionita
Date: 12 November 2015

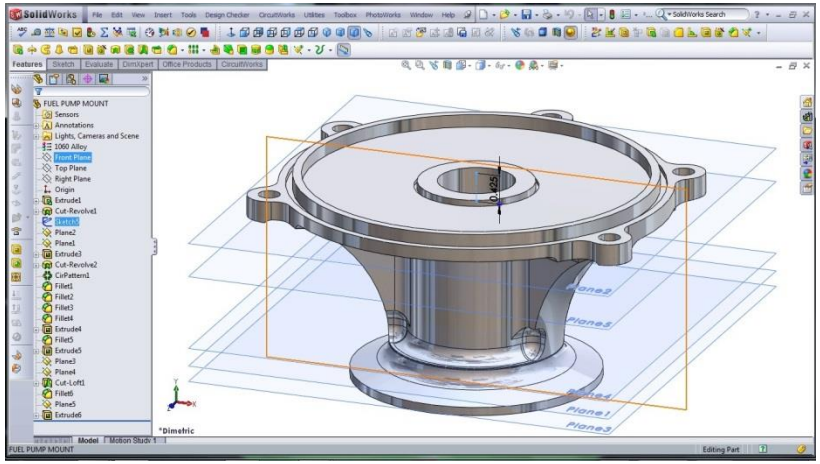
CAE
one step ahead

Agenda

- 3D Scanning Quick Overview!
- 3D Printing Raw Scanned Items. What can go wrong?
- How to prepare your STL file?
- Tips and tricks to getting the best surfaces.

The 3D Revolution!

- 3D CAD Software, 3D Animation, 3D TVs and Home movies, Virtual Reality!



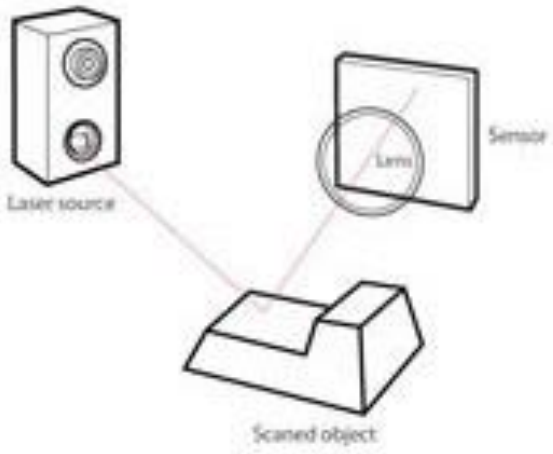
CAE

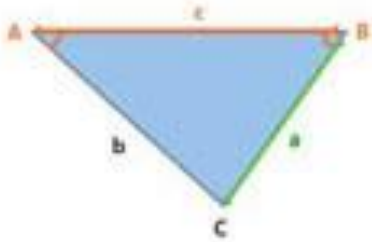
3D Scanning

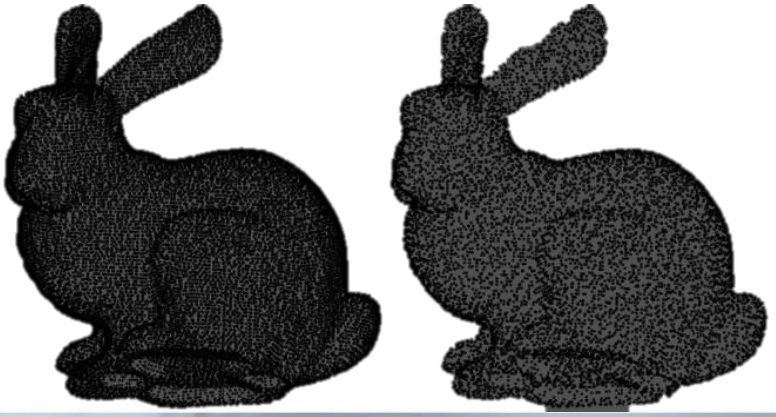
- Thousands of companies are using scanners
  - Bulk of usage is for inspection and verifying product quality
  - More and more reverse engineering (real parts to CAD)
  - Scanning buildings and Environments

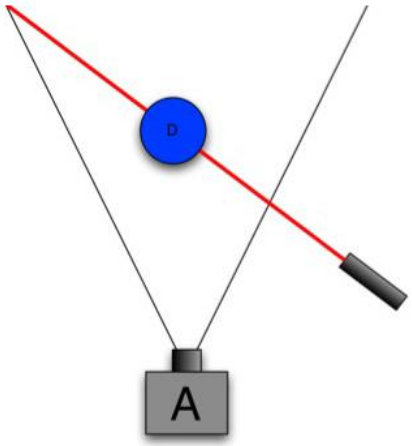
3D Scanning – Triangulation Scanners

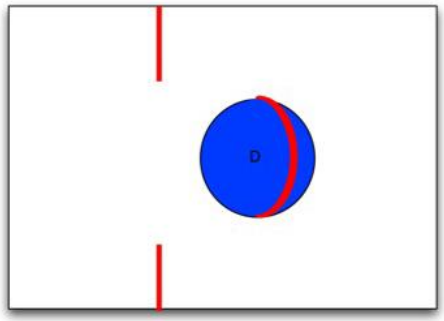
- Sweeping laser and captor sensor
- Distance & angle between Laser Source and Sensor is precisely known
- Capability to discern the angle at which the laser is returning





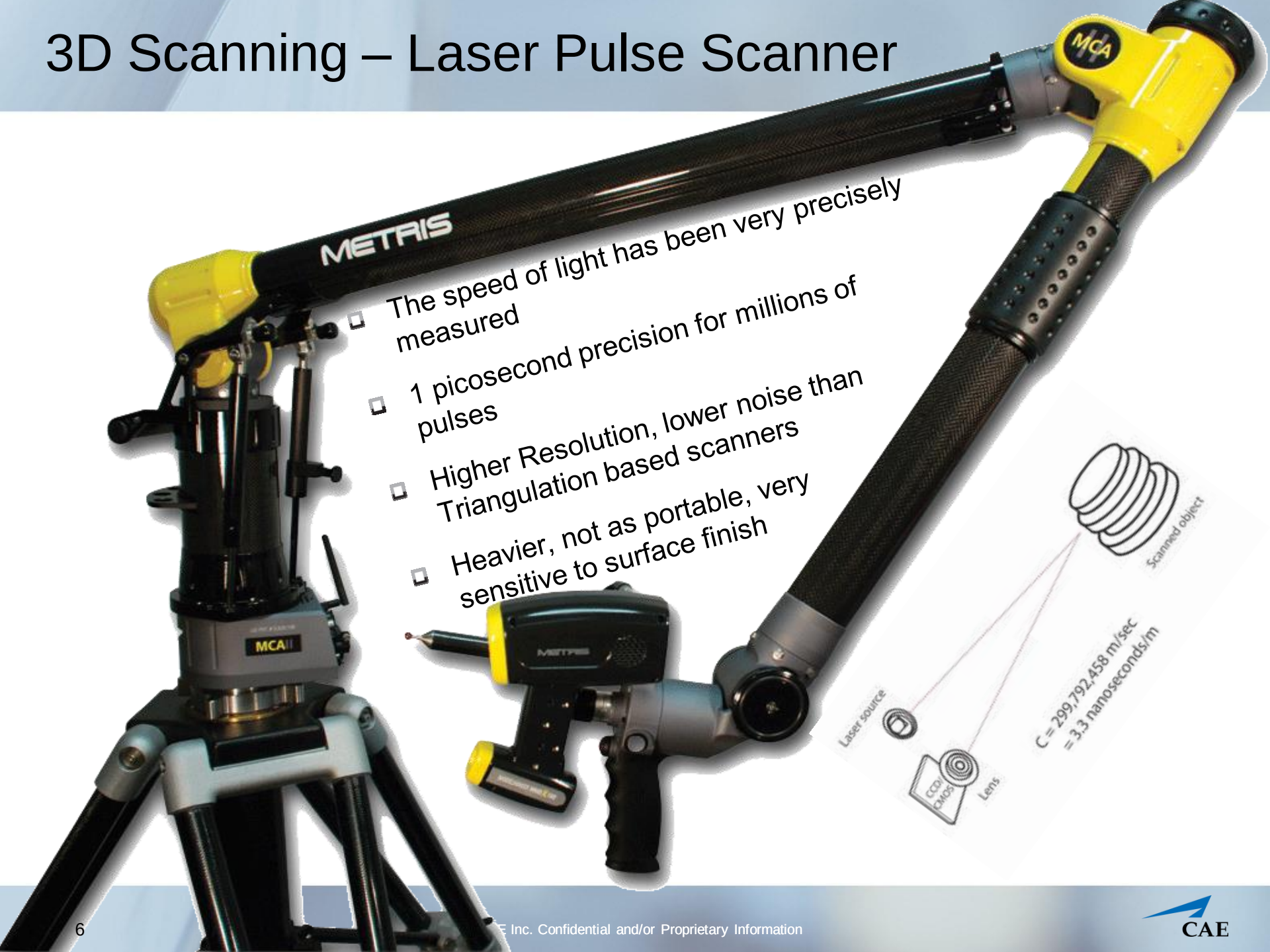




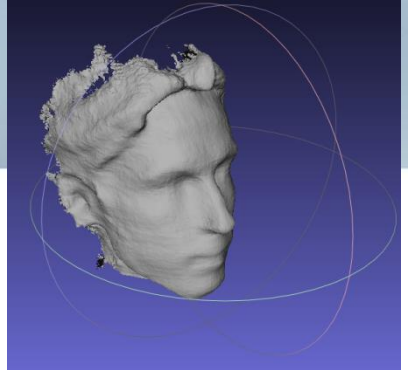


3D Scanning – Laser Pulse Scanner

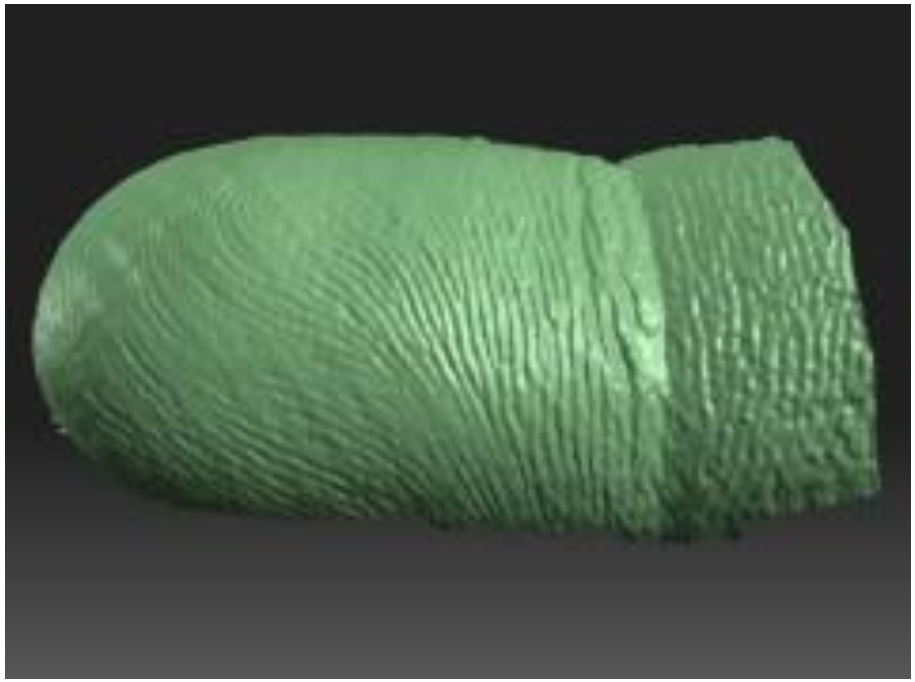
- The speed of light has been very precisely measured
- 1 picosecond precision for millions of pulses
- Higher Resolution, lower noise than Triangulation based scanners
- Heavier, not as portable, very sensitive to surface finish



3D Scan to 3D Print? (SPOILER: No...)

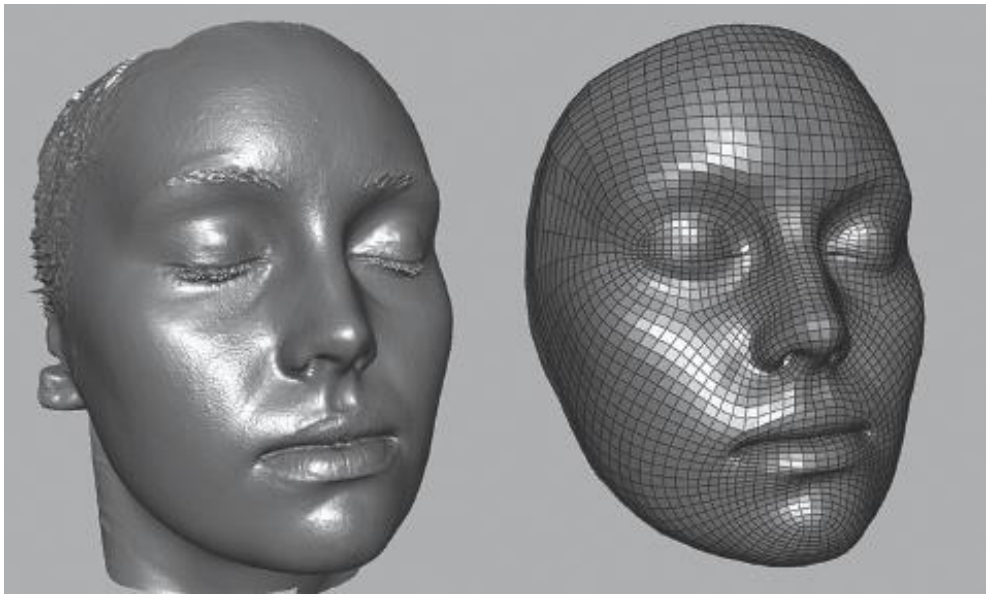


- Can we print Form-Fit-Function precision parts?
- Can we control tolerances?
- 100 microns scanning accuracy (can go as low as 1µ!!)
- 100 microns printing accuracy (can go as low as 16µ!!)



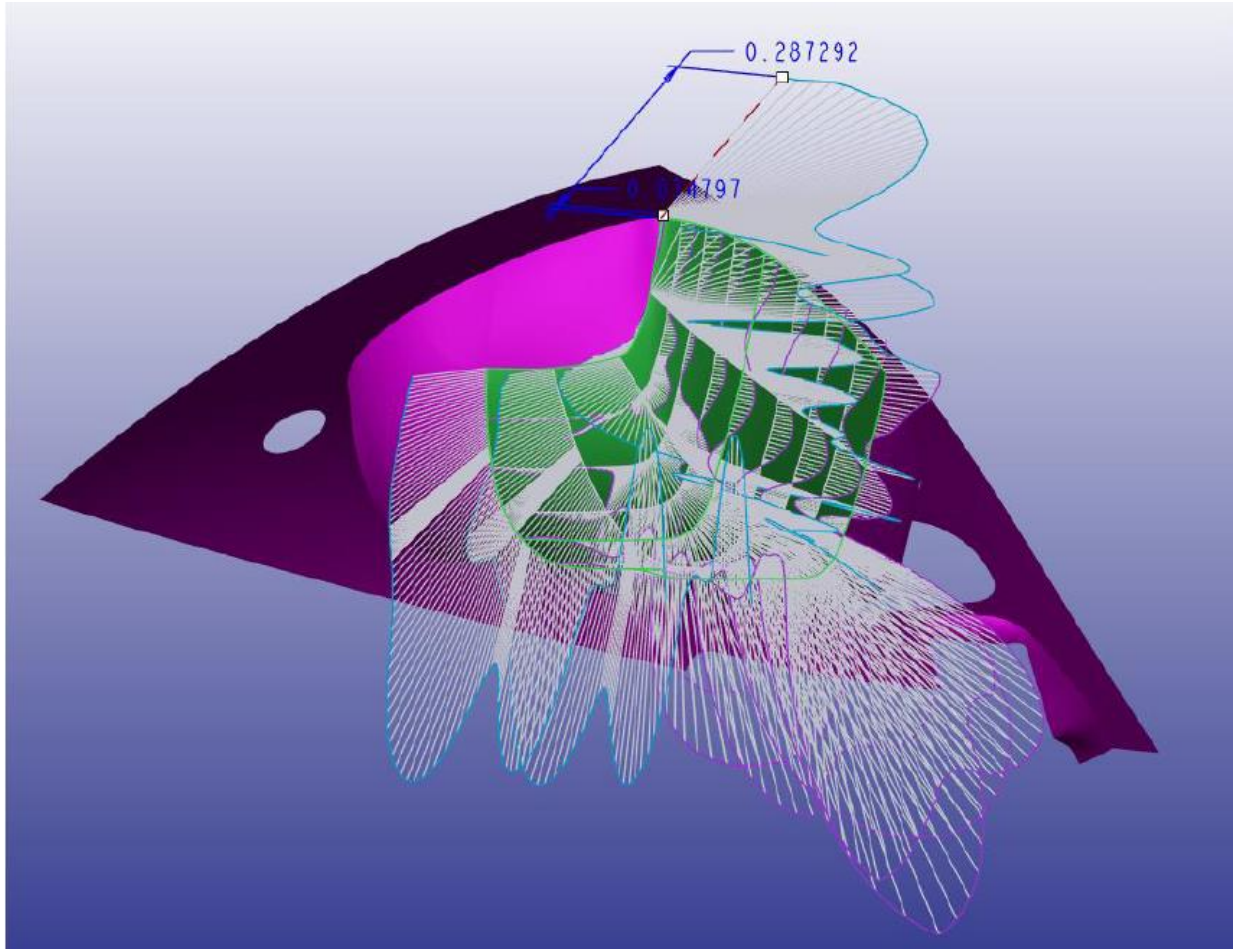
Noise noise noise!

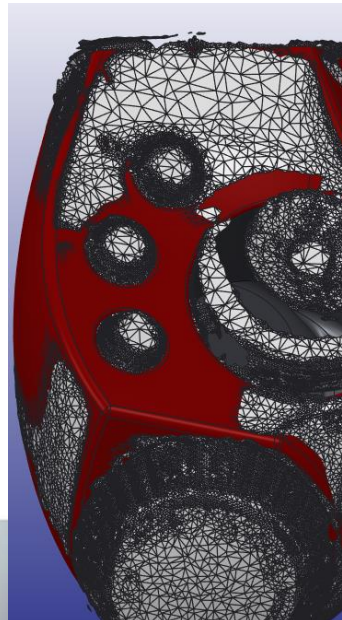
- 3D Scanning software not powerful enough to paramatrize features real-time (holes, flats, rounds
- How much detail do we need? Decimate your STL to make it lighter.



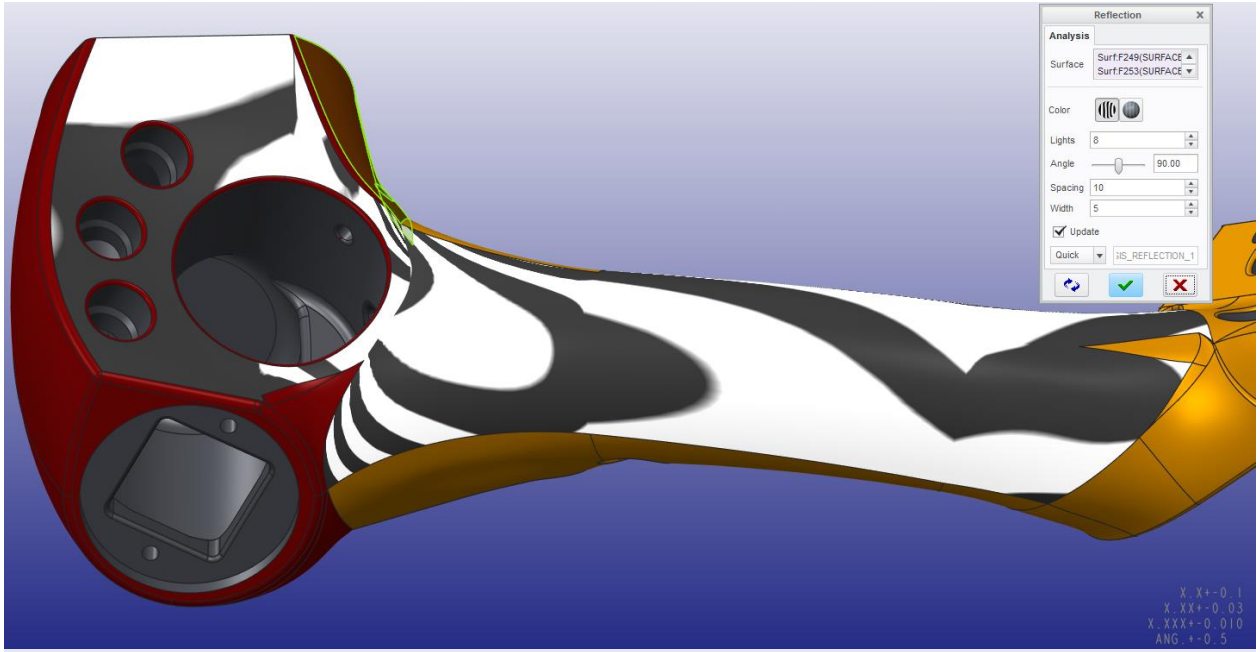
Noise noise noise!

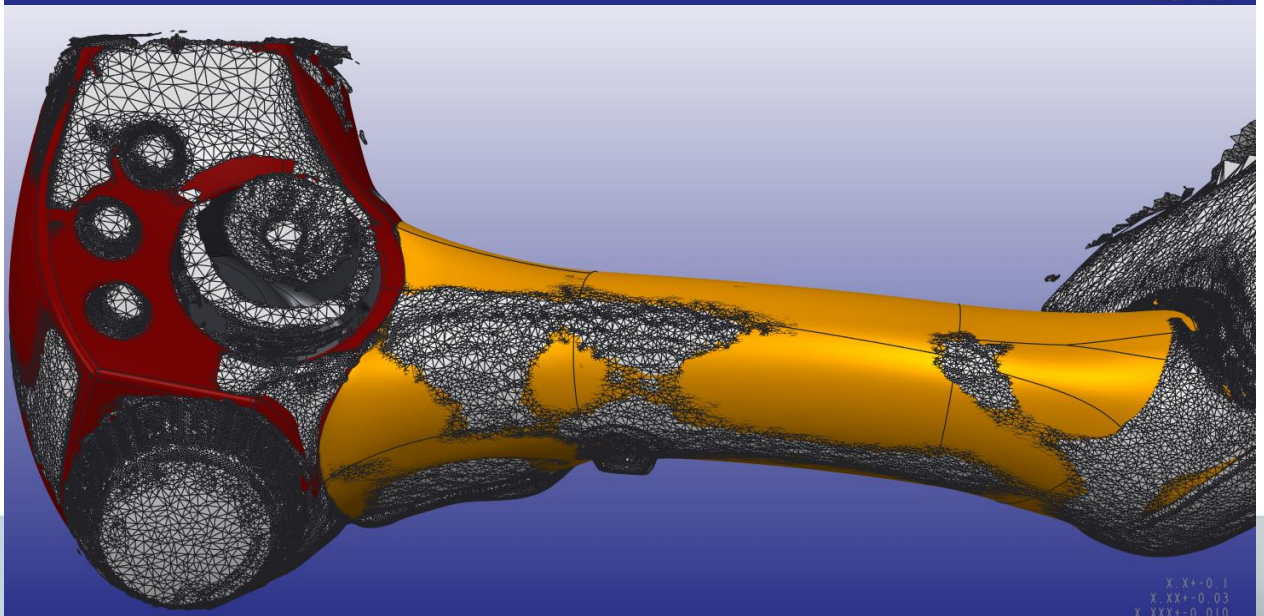
- There are functions that average out a surface based on a scan. Even if it looks nice. Its probably not.

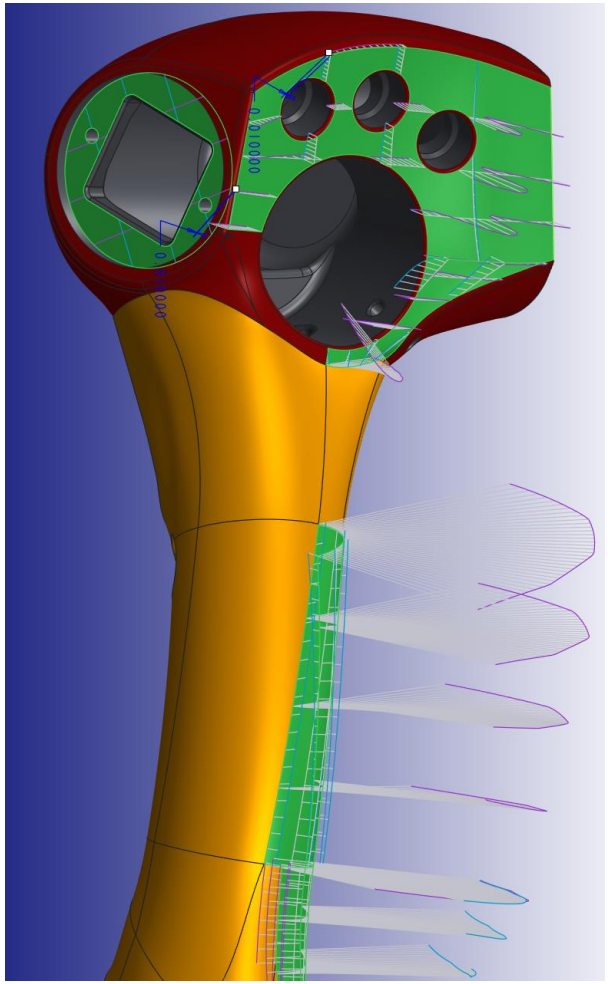




Noise noise noise!

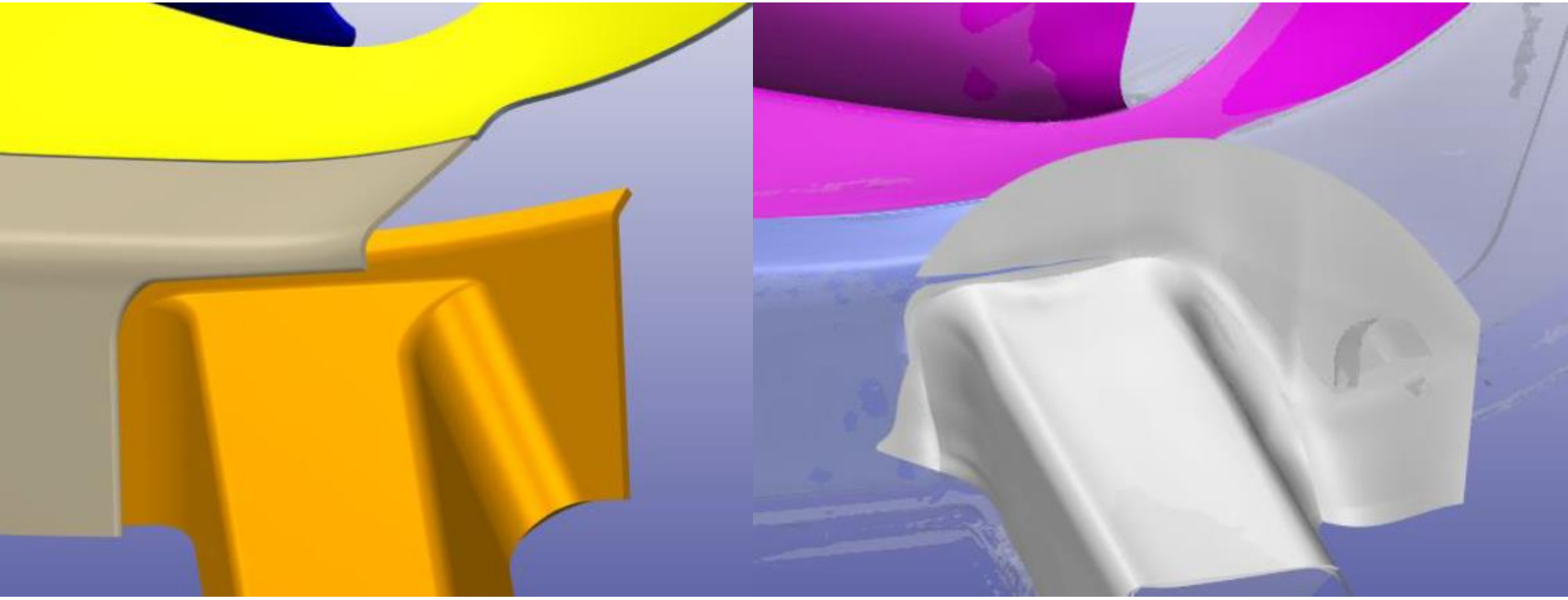




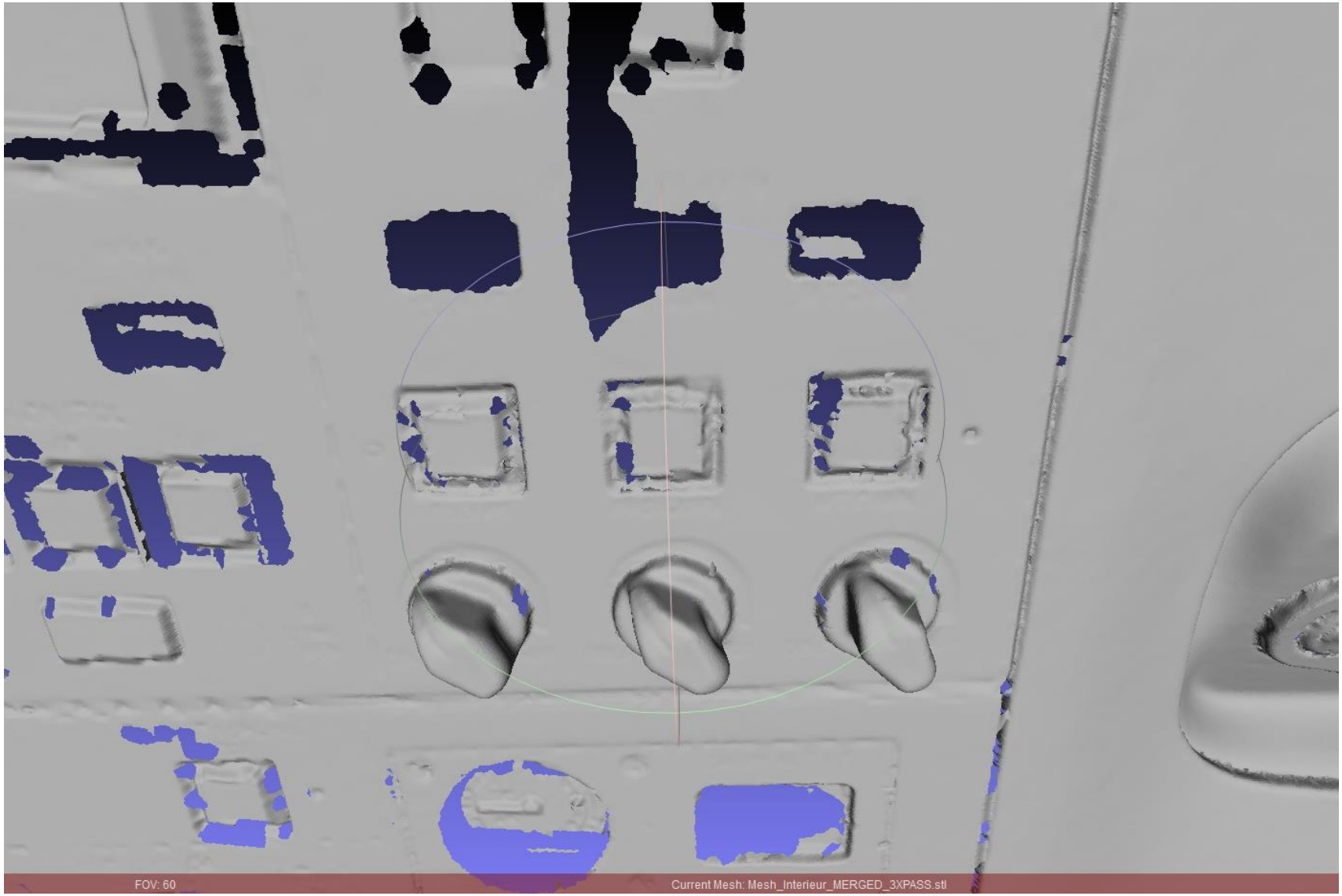


CAE

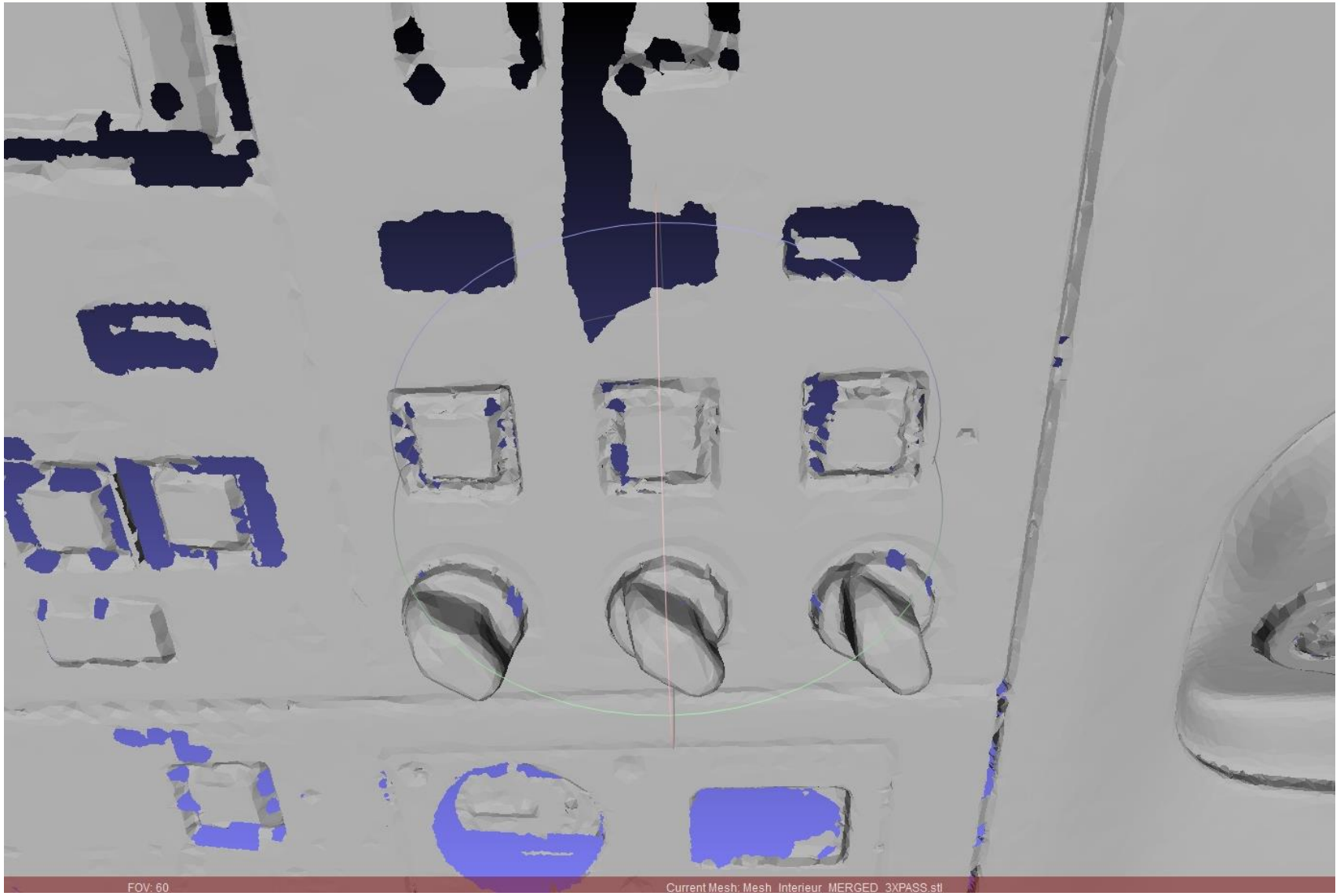
Noise noise noise!



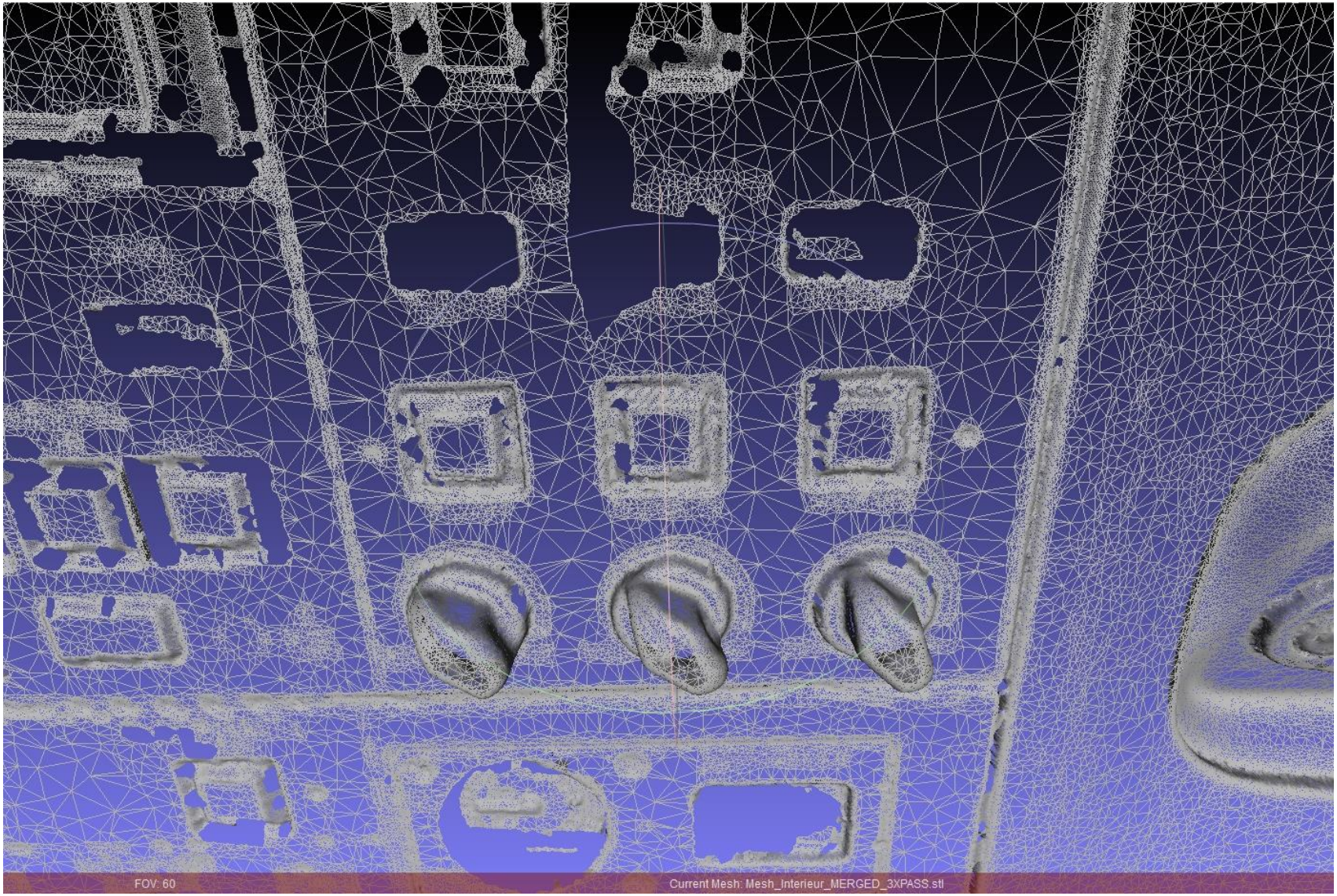
Native Scan – Overhead Panel



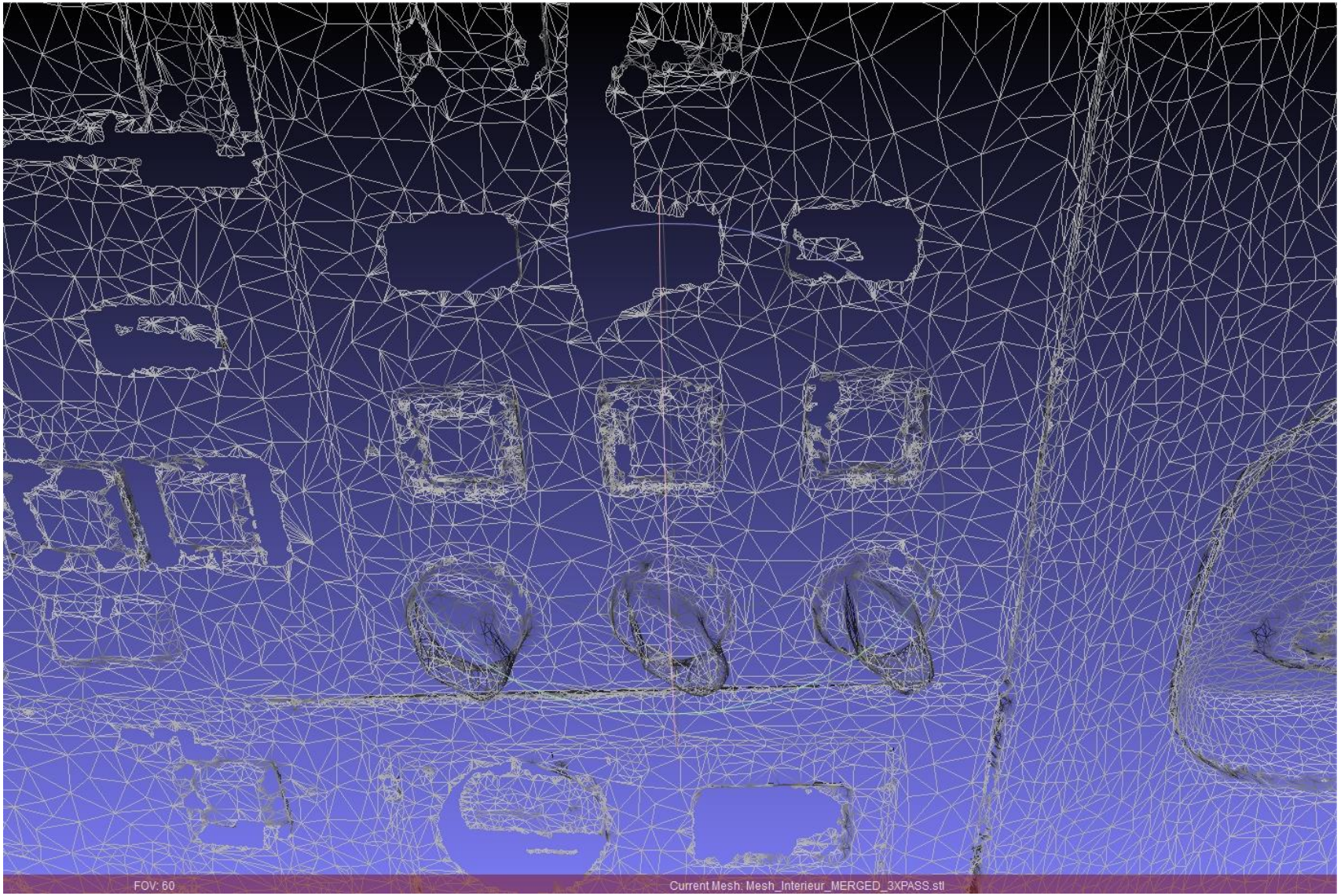
Decimated Scan – Overhead Panel



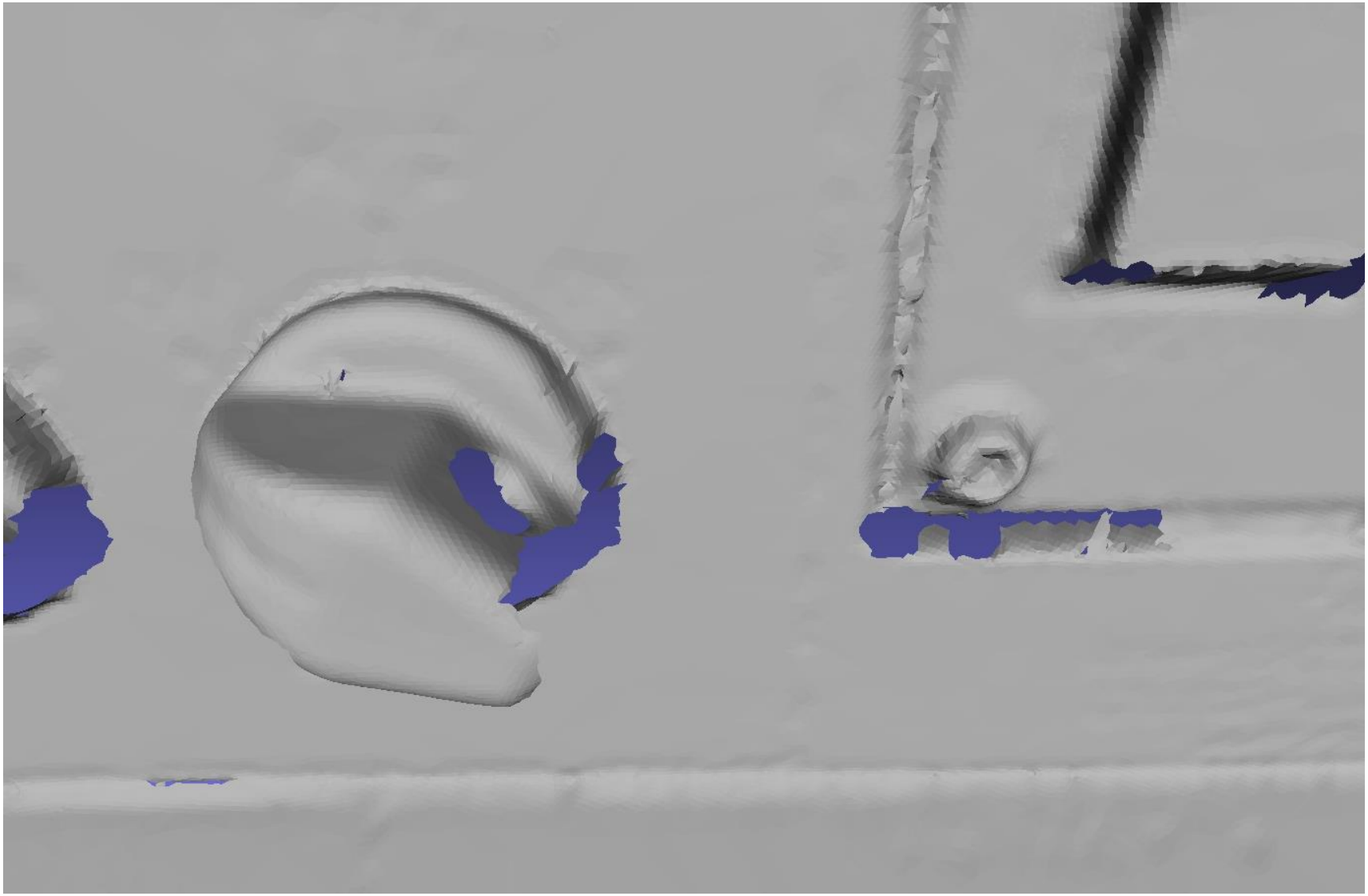
Native Scan – Overhead Panel Wireframe



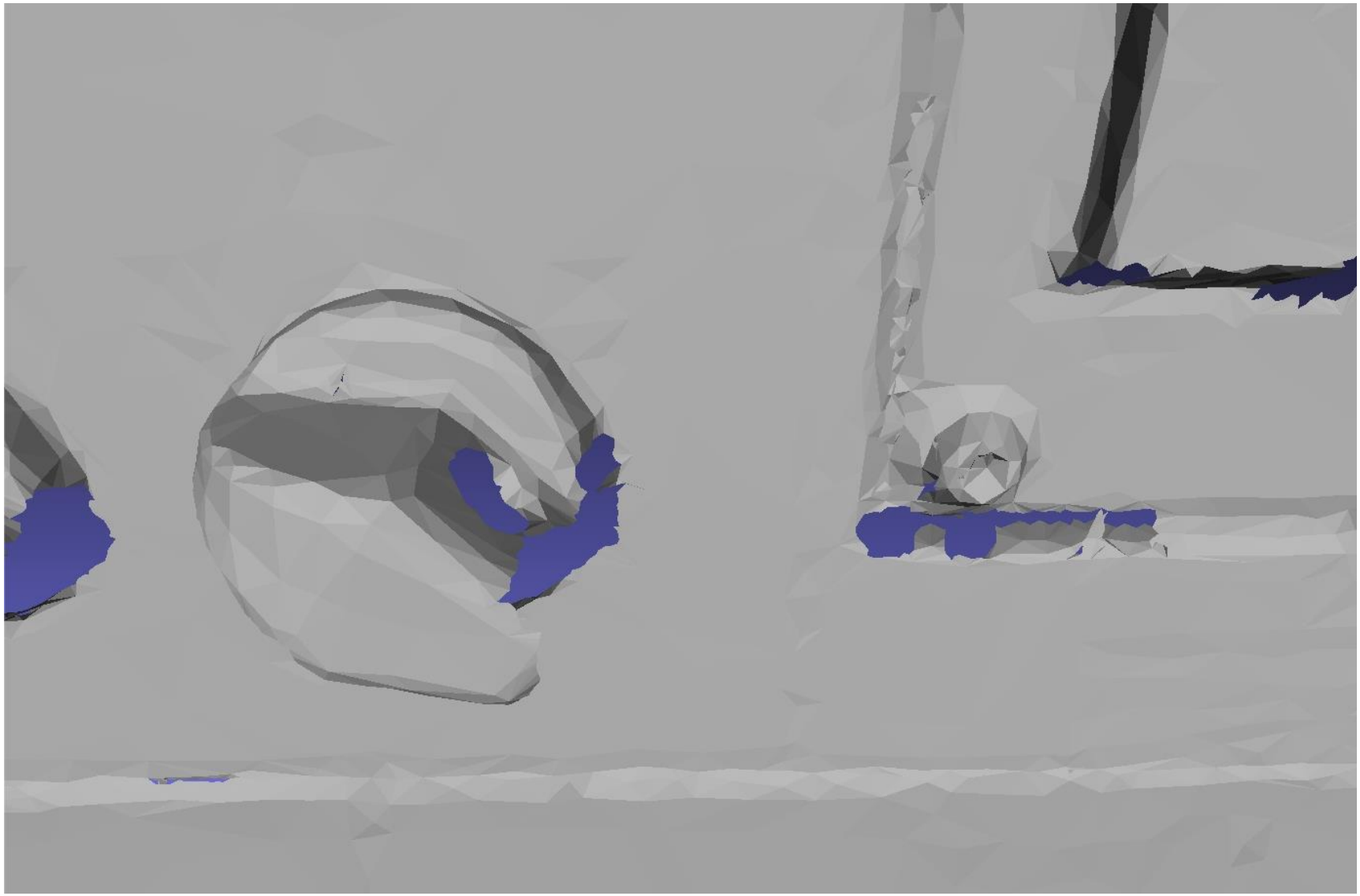
Decimated Scan – Overhead Panel Wireframe



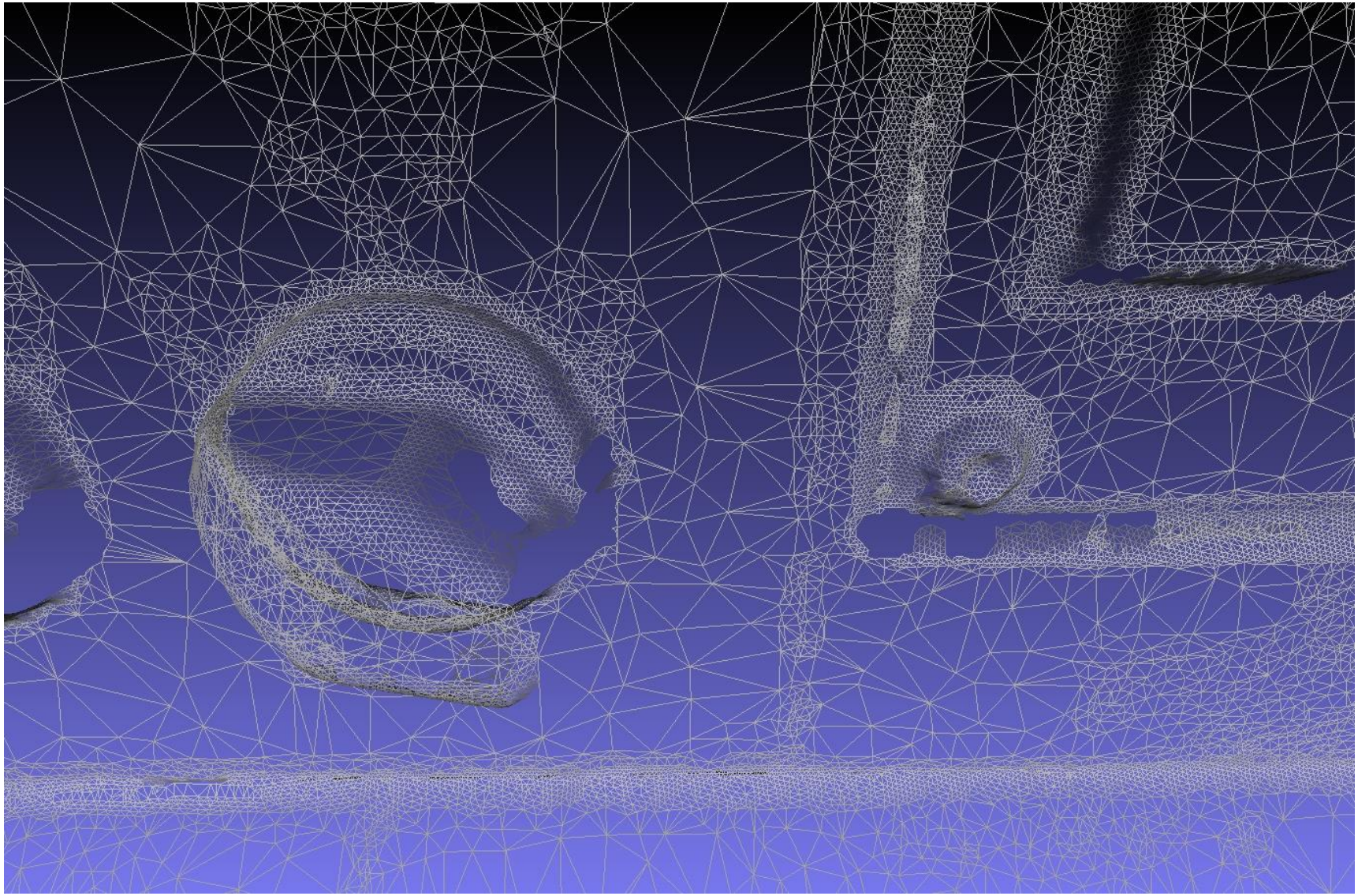
Native Scan - Detail



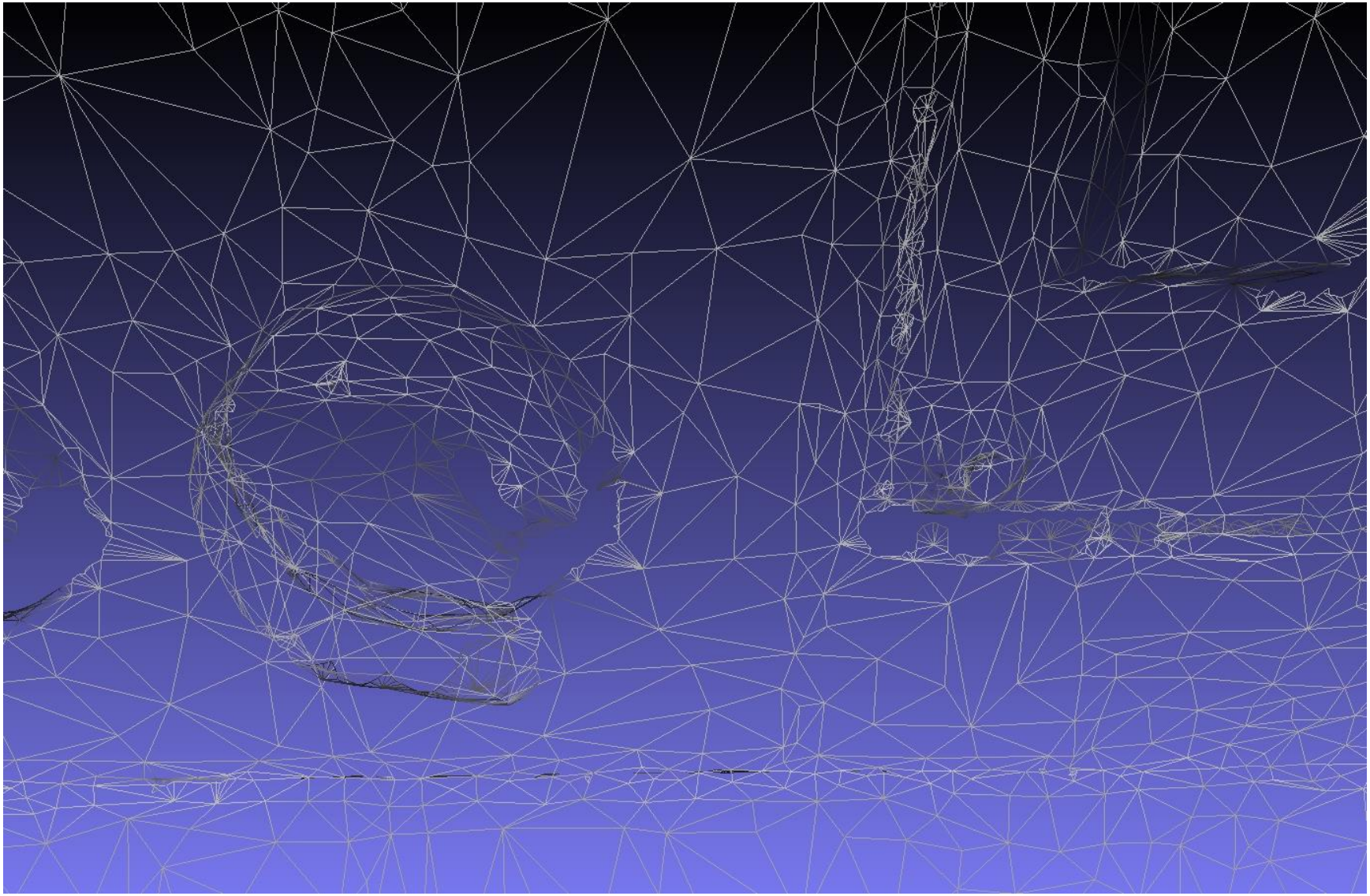
Decimated Scan - Detail



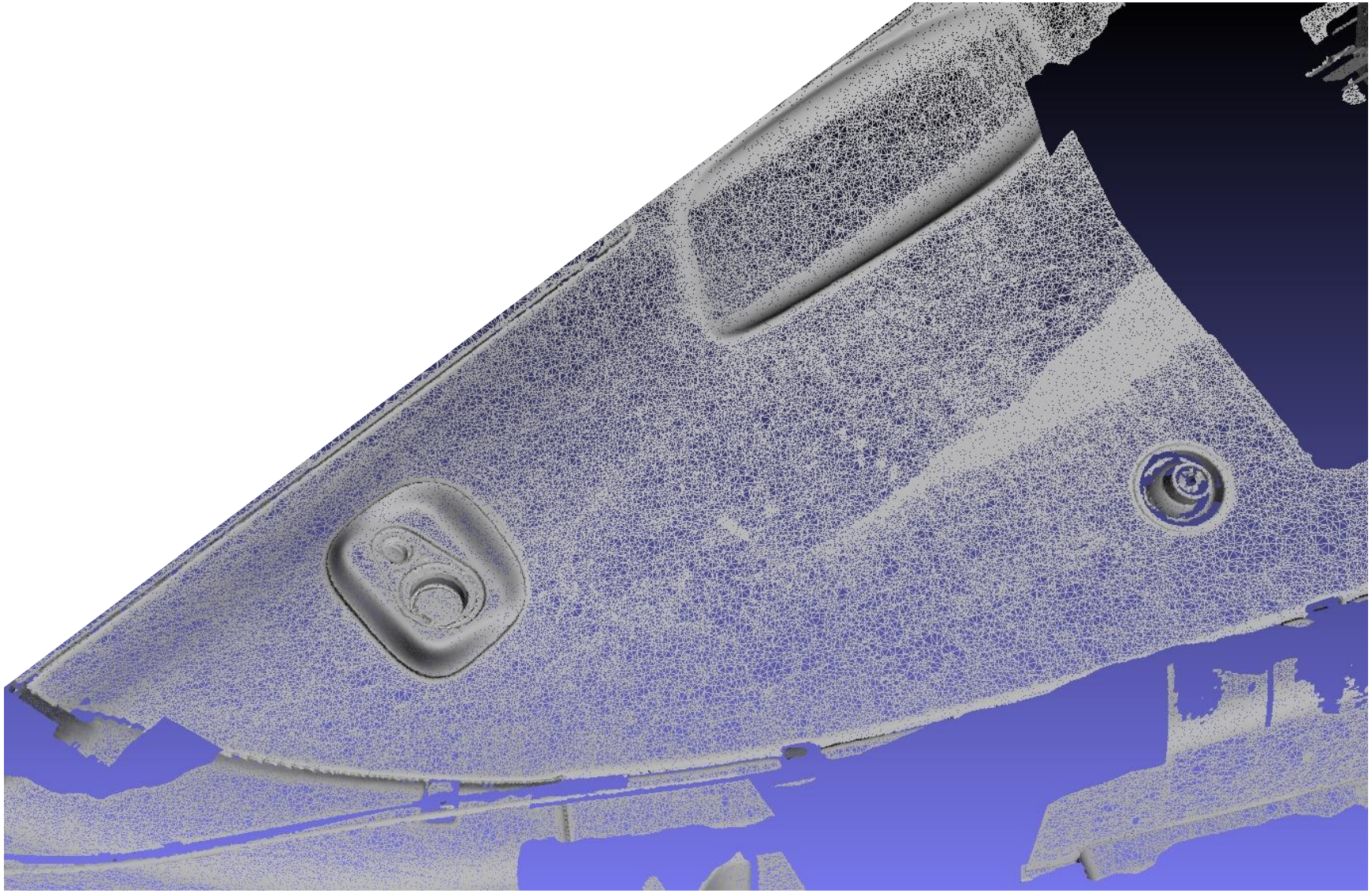
Native Scan – Detail Wireframe



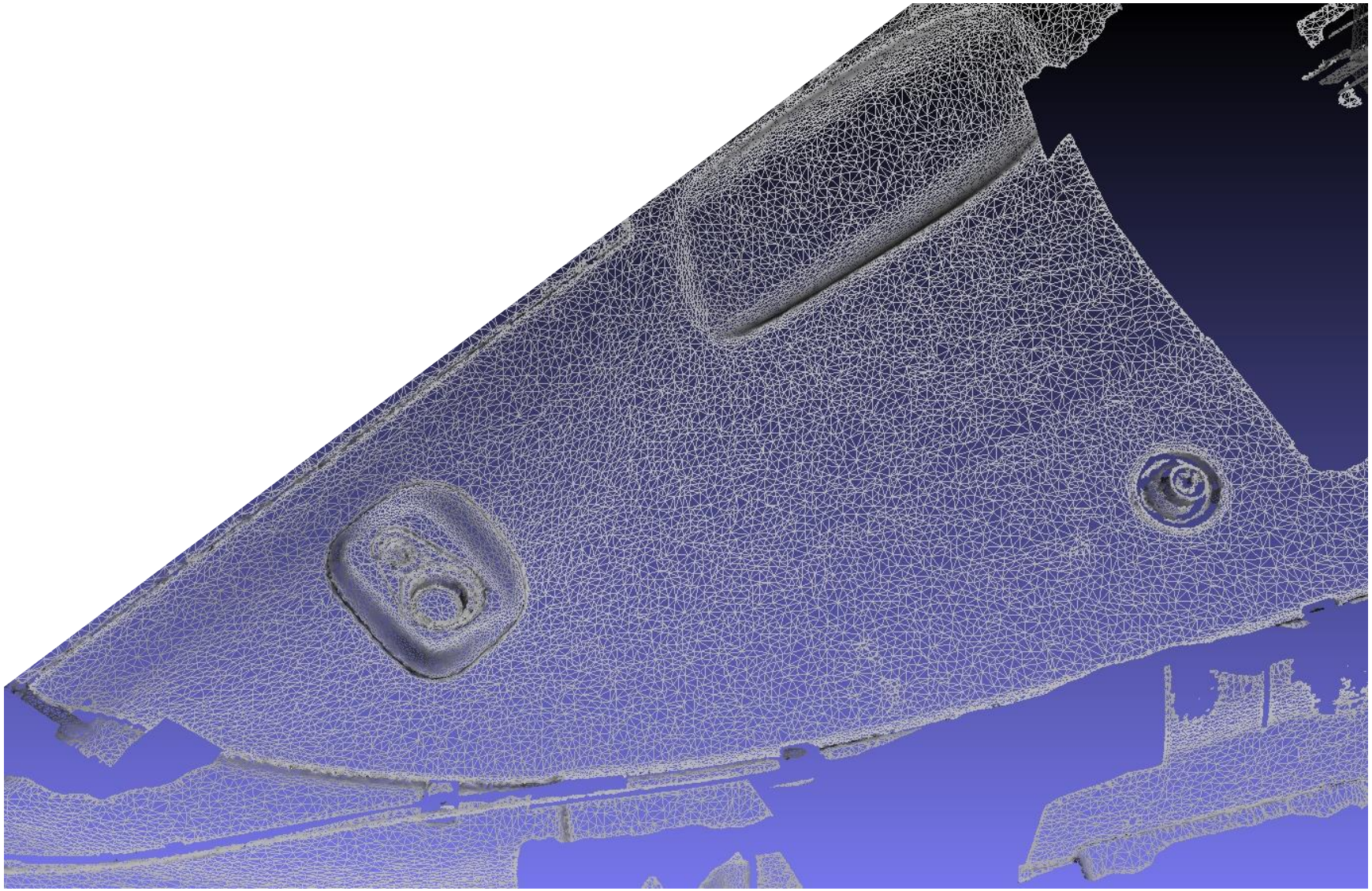
Decimated Scan – Detail



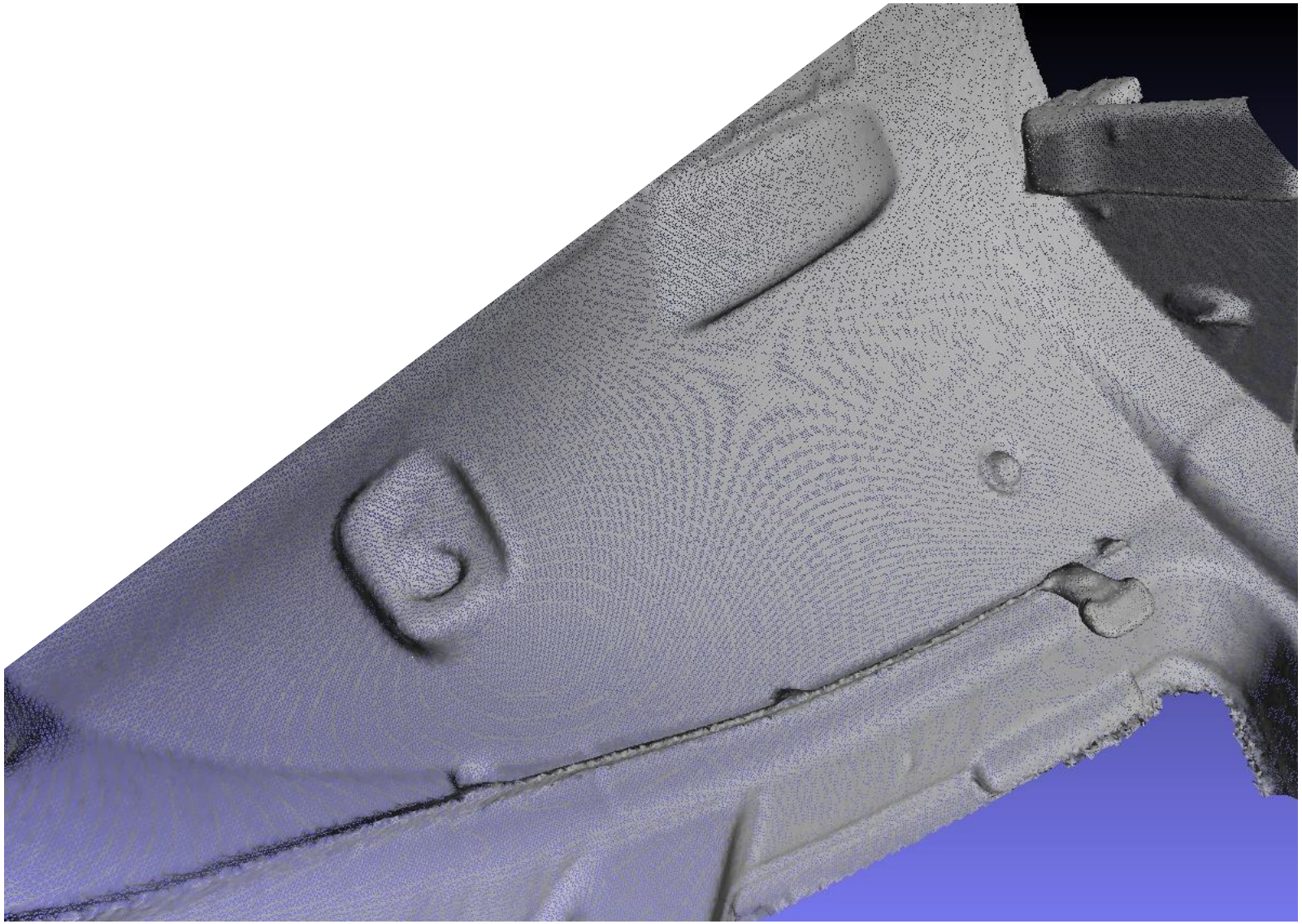
Native Scan – Overhead lining



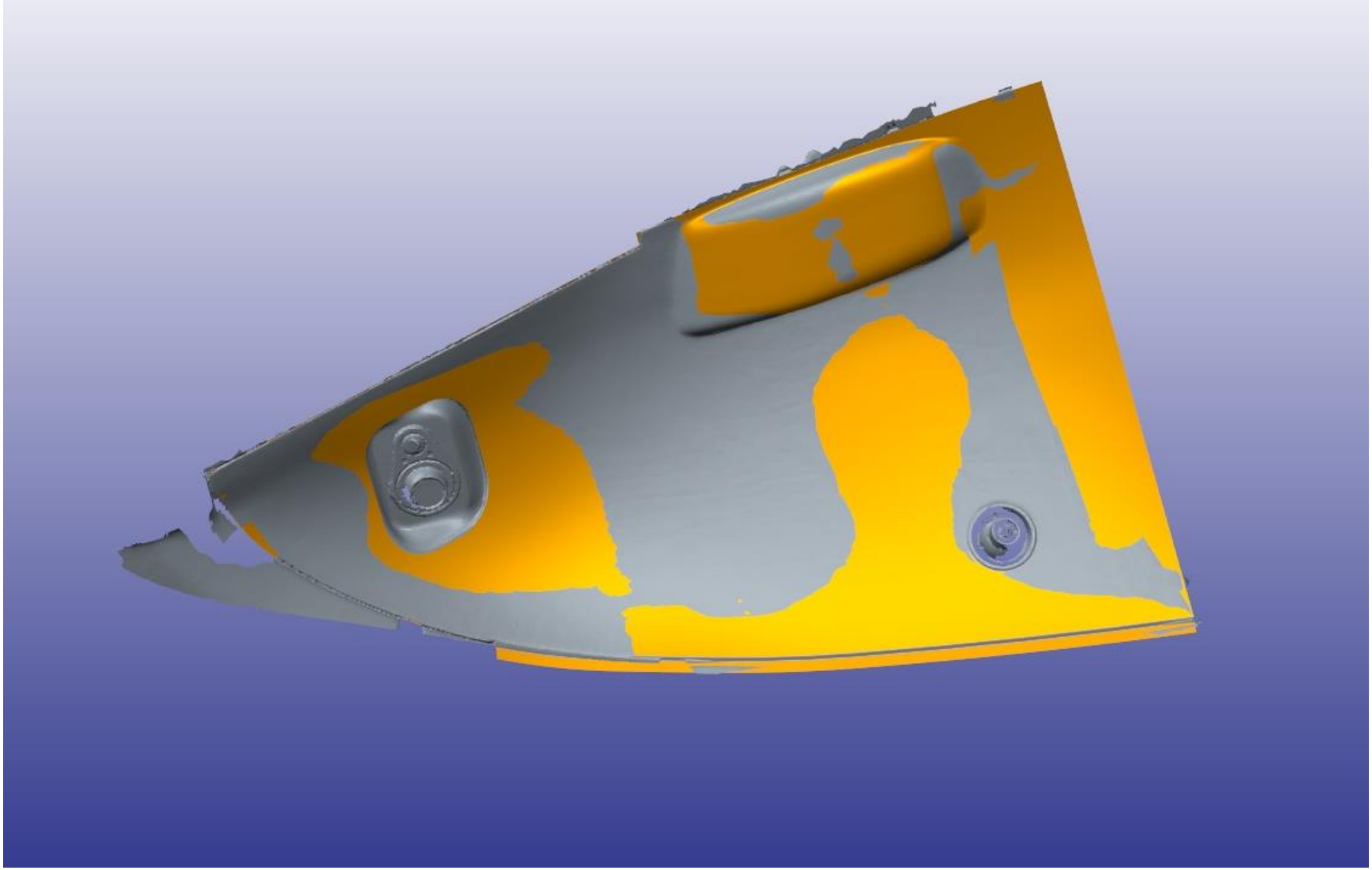
Simplified Scan – Overhead lining



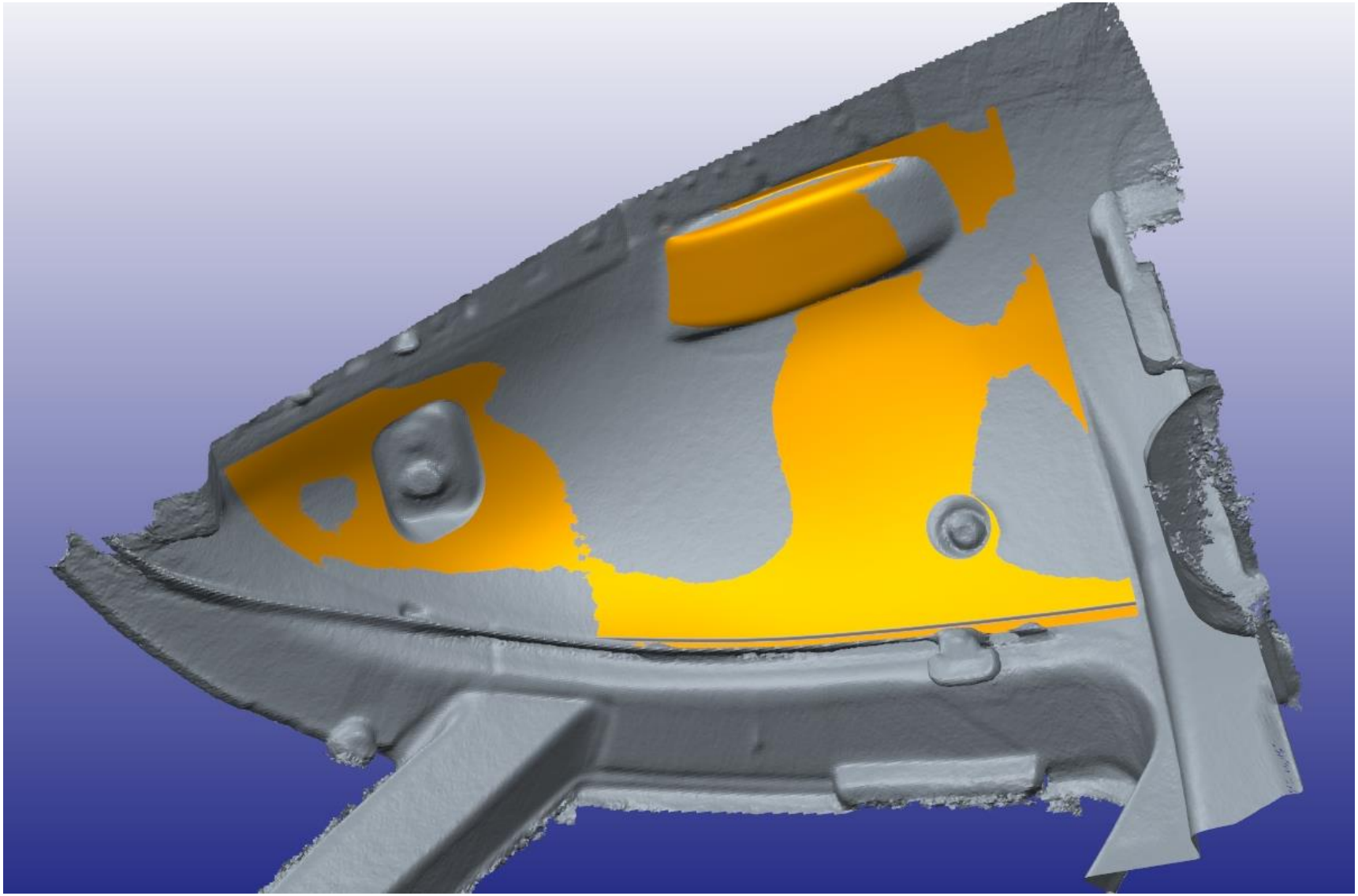
Kinect Scan – Overhead lining



Final Part vs Simplified Scan

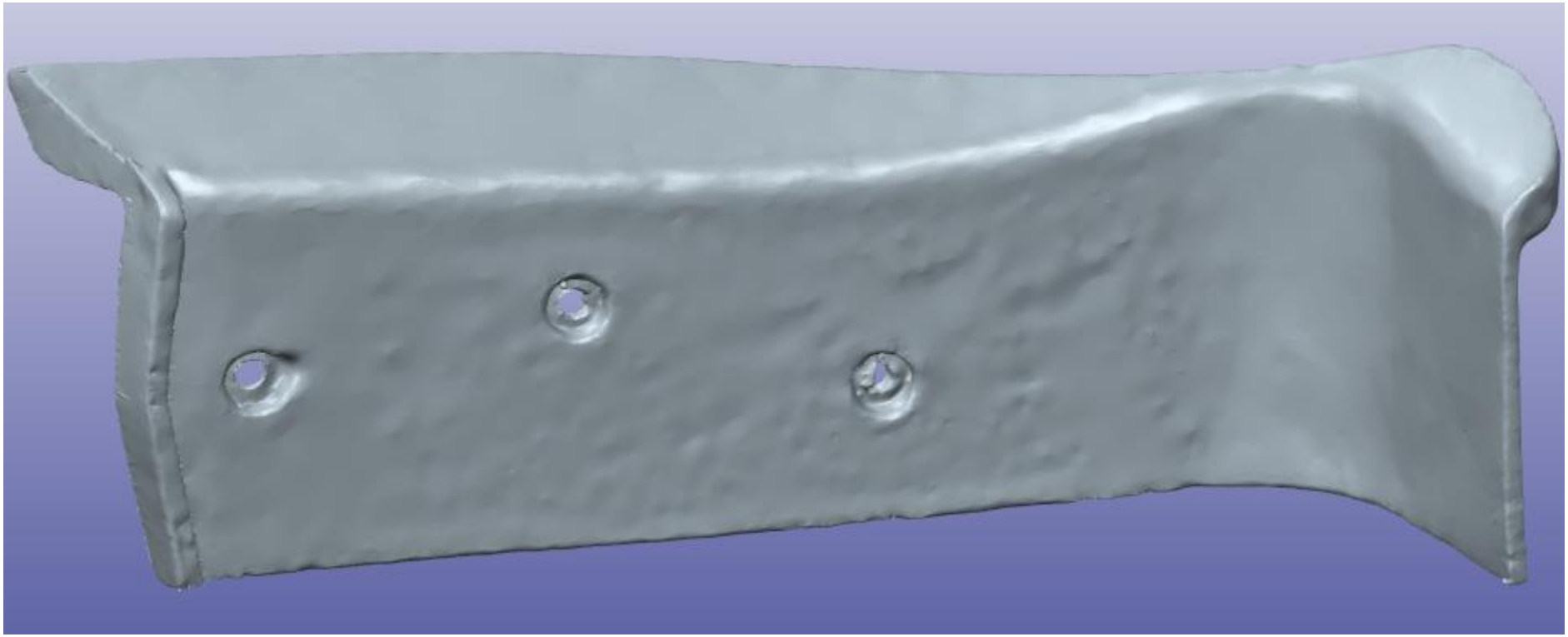


Final Part vs Kinect Scan



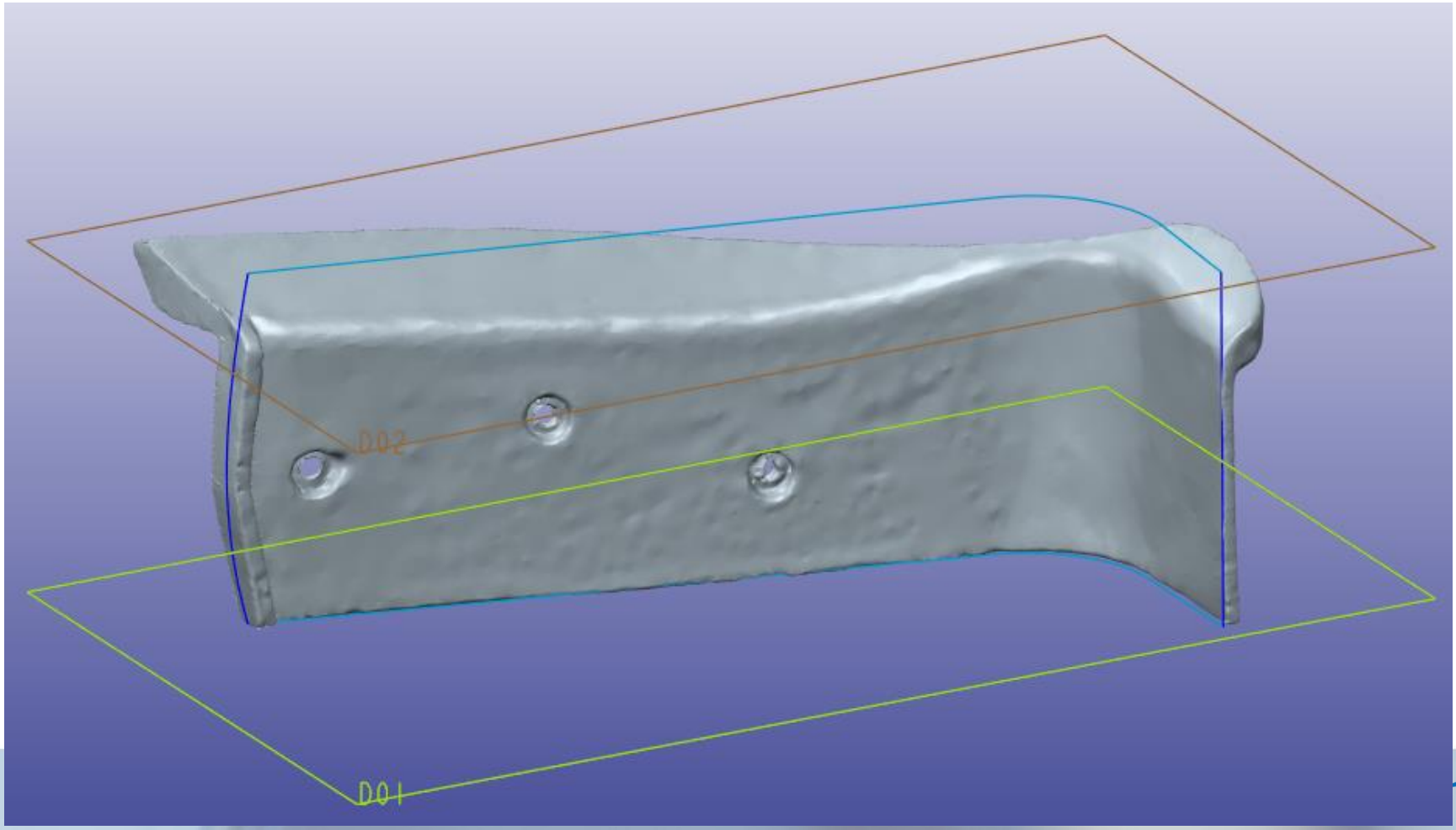
Converting parts from a scan

- Native scan had many surface defects
- Easy to reproduce and complex features were identified



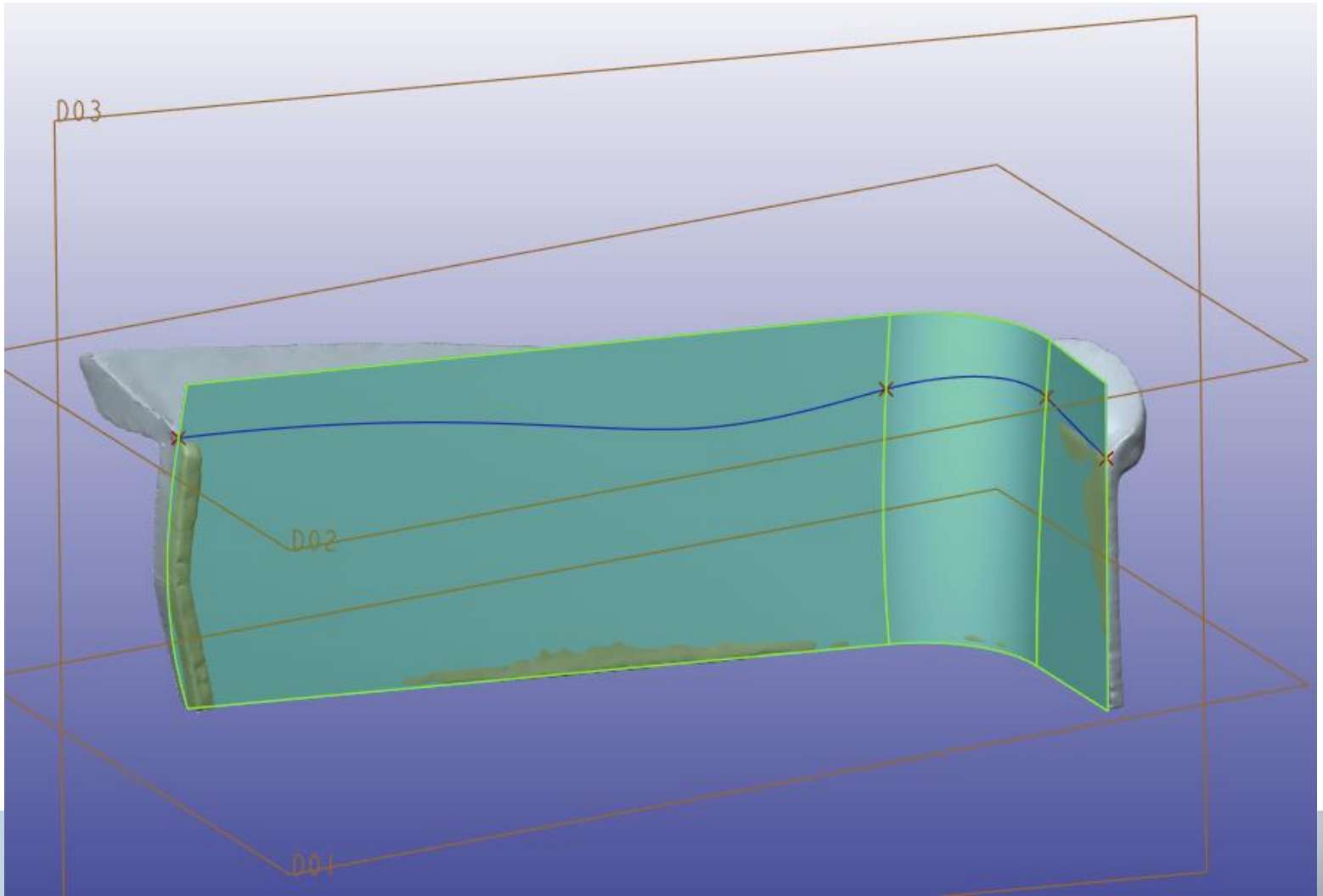
Converting parts from a scan (low accuracy)

- Datum D01 was created from points on the scanned surface
- Top and bottom boundary blend chains are sketches (3 segments each)
- Right side curve is a 2 point segment that has been tweaked



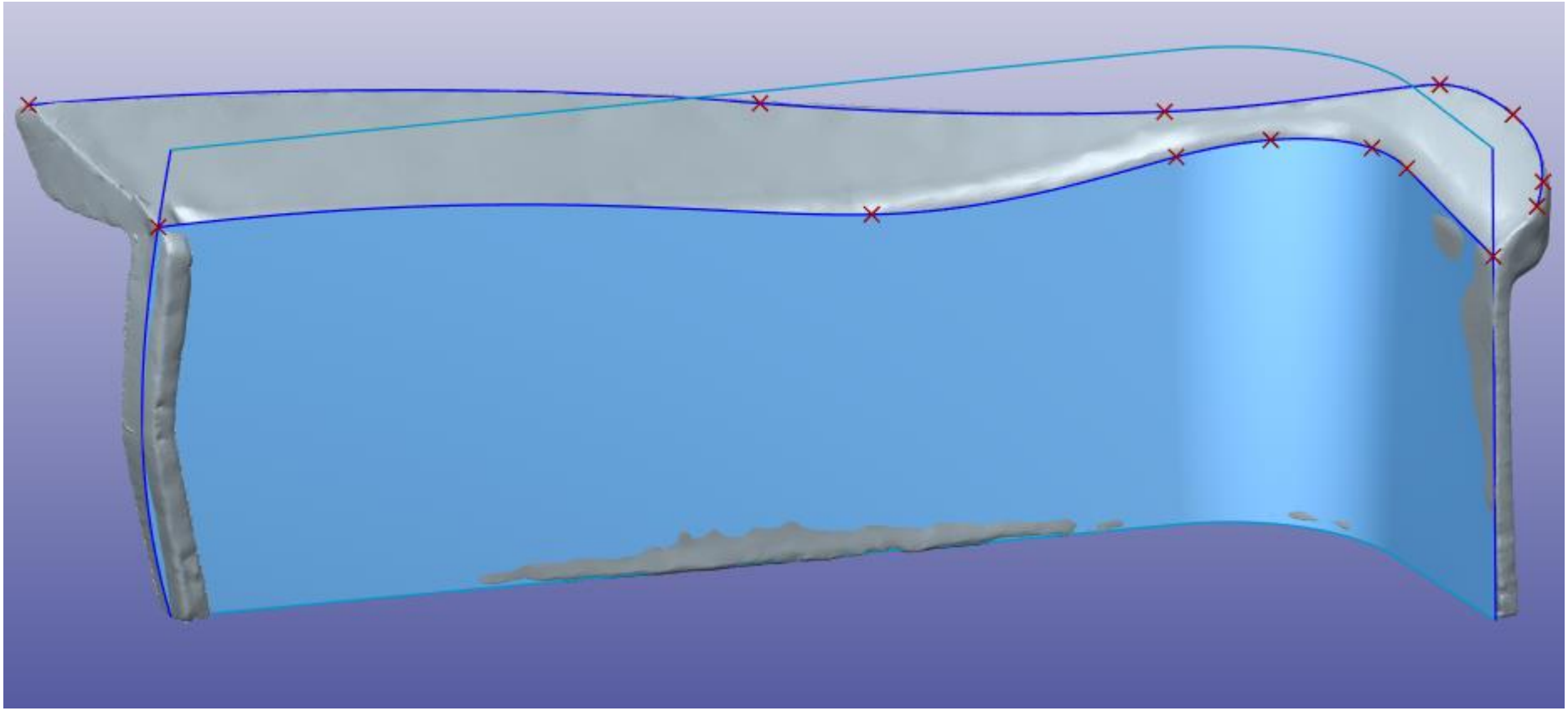
Converting parts from a scan (low accuracy)

- Points were defined to serve as supports for trimming curve.
- 3 Curves individually tweaked to follow shape



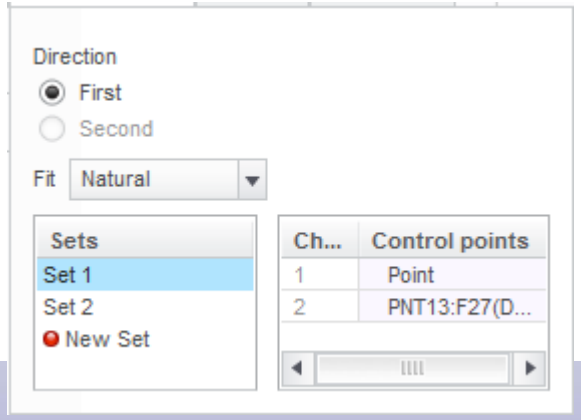
Converting parts from a scan (low accuracy)

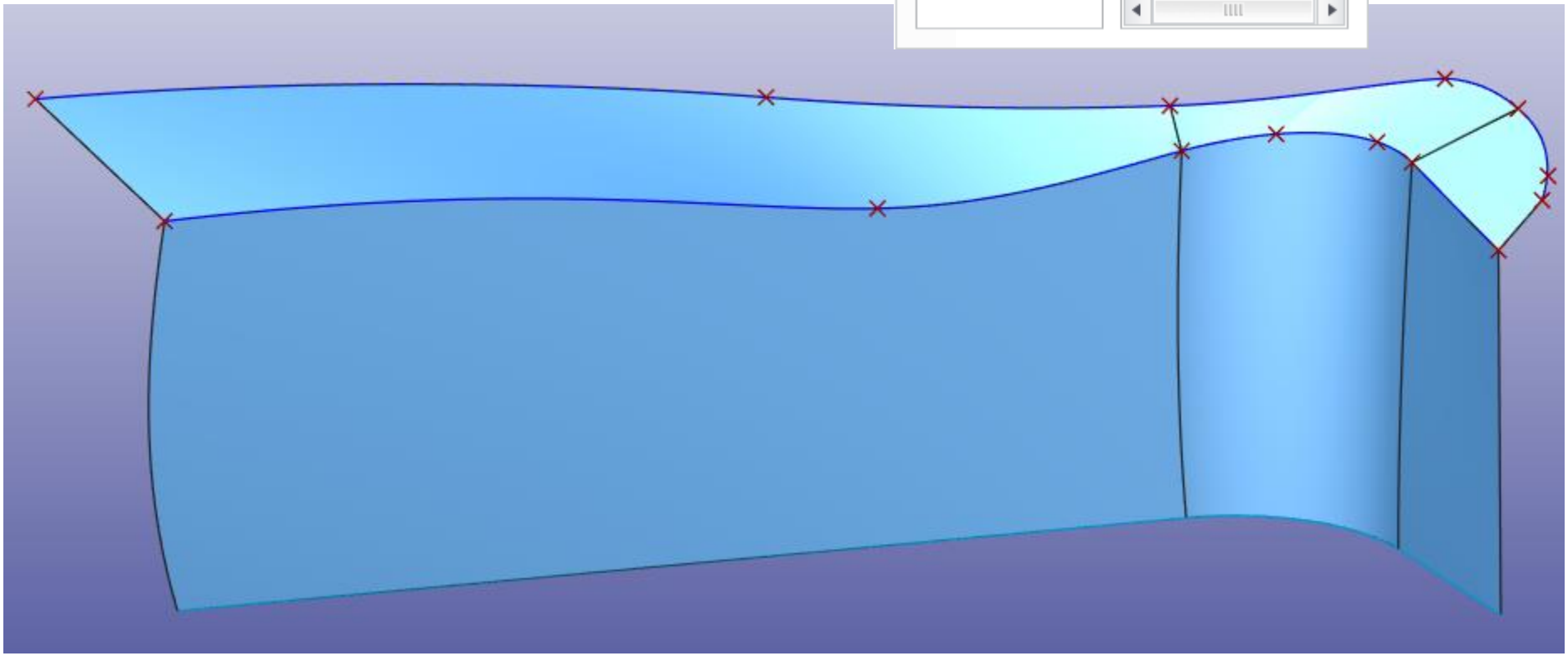
- Curves on top lip are picked directly from the scan
- Curve through multiple points (notice increased point density toward right side where radius gets smaller)



Converting parts from a scan (low accuracy)

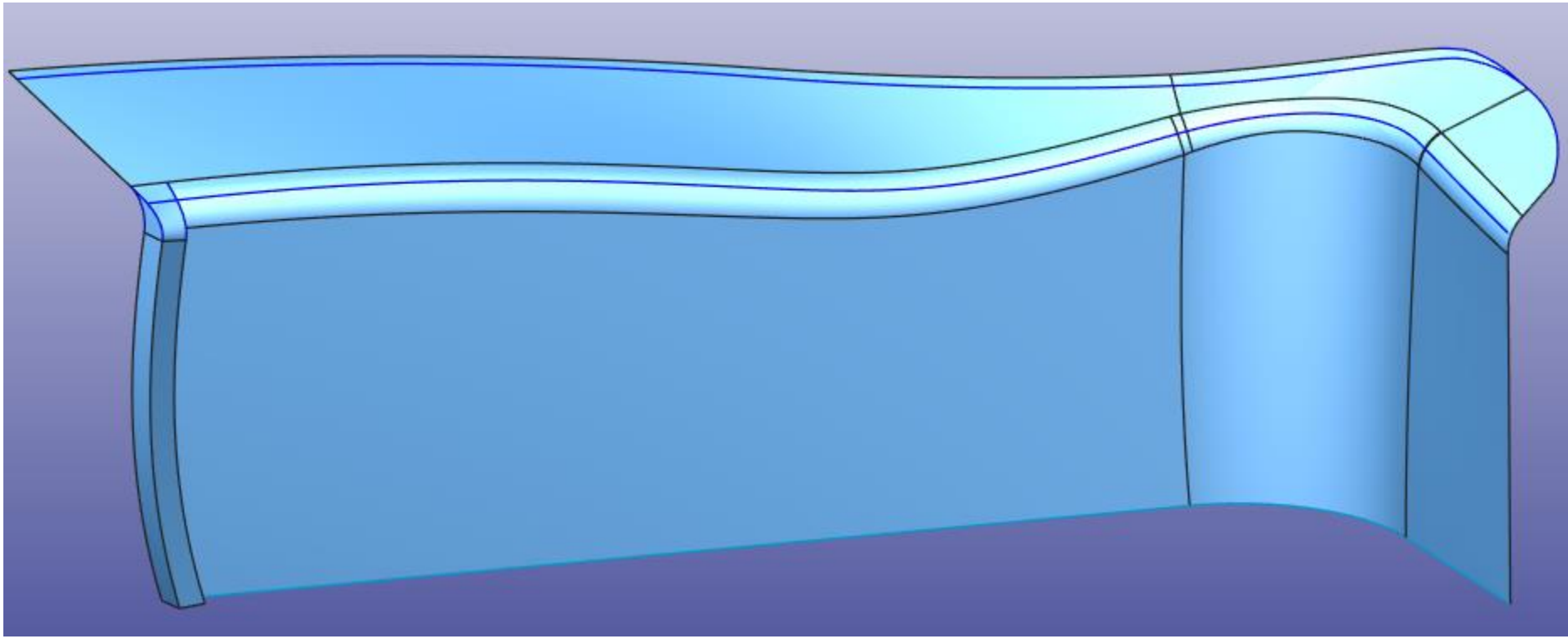
- Boundary blends control fit should be kept to “Piece-to-Piece” => Results in cleaner surface
- If Piece-To-Piece is not possible extra vertices can be created as control points





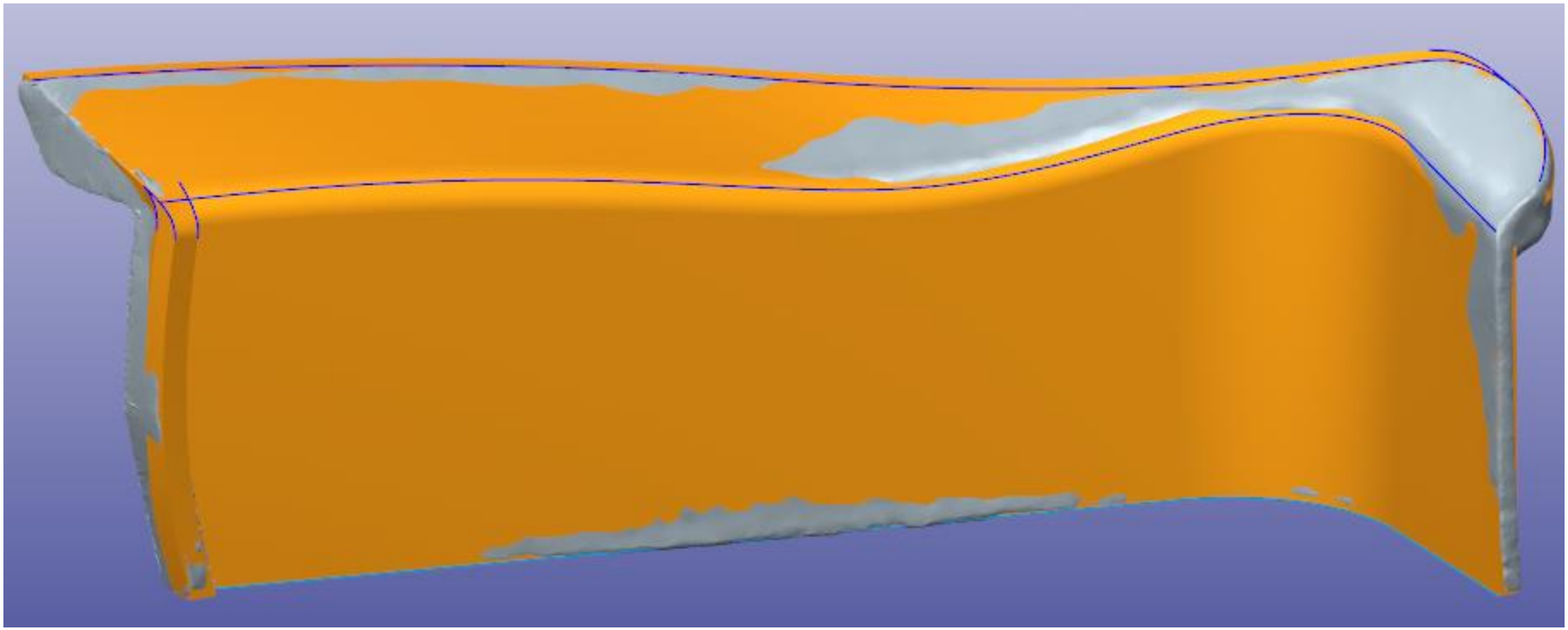
Converting parts from a scan (low accuracy)

- Easier to add refinement features to a clean surface than to get it first time right
  - Refining rounds, extending edges, adding variable thickness features



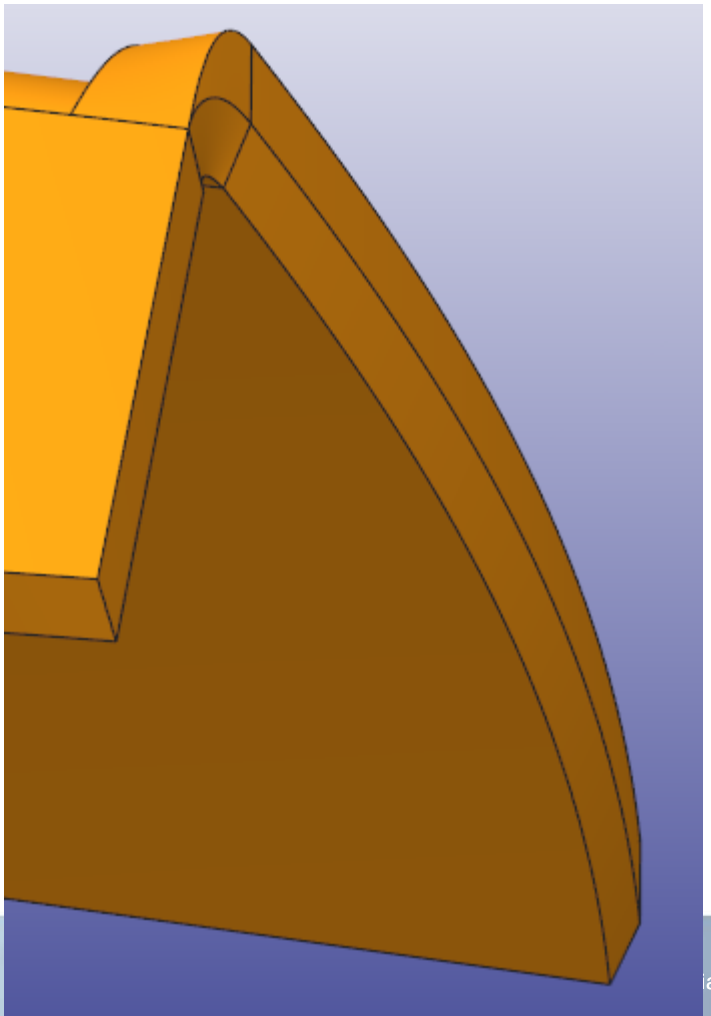
Converting parts from a scan (low accuracy)

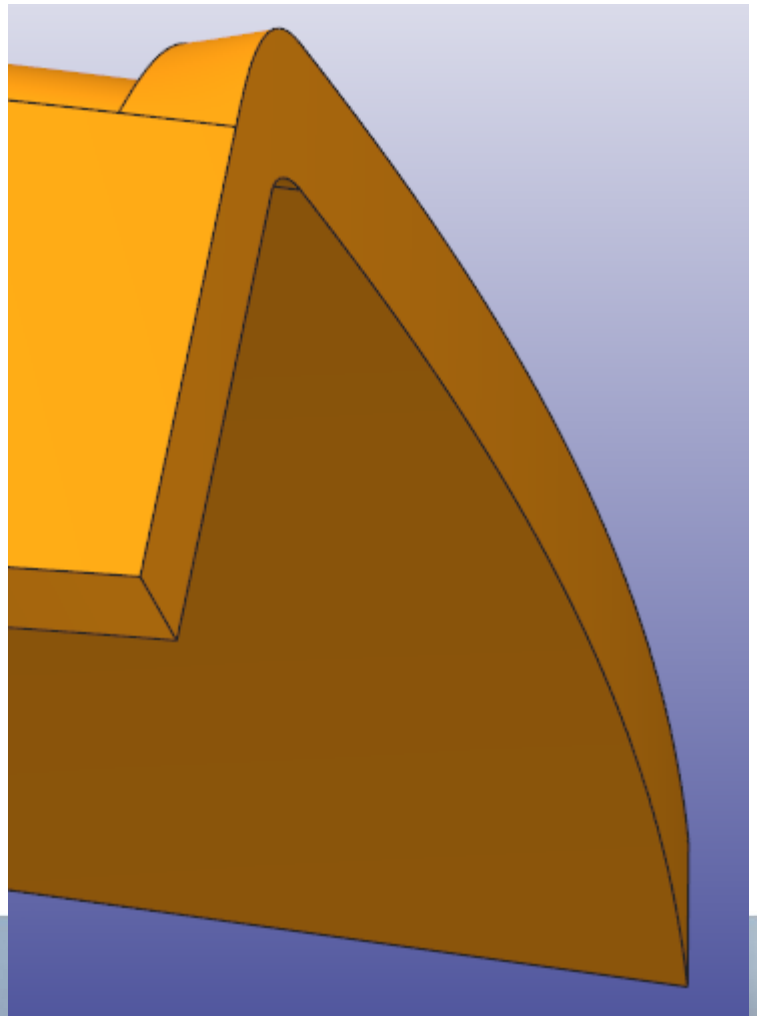
- Always try and plan to thicken a surface in such a way that is not restricted by rounds (outward of round) so that the radius of a round increases. (Not possible in our case)



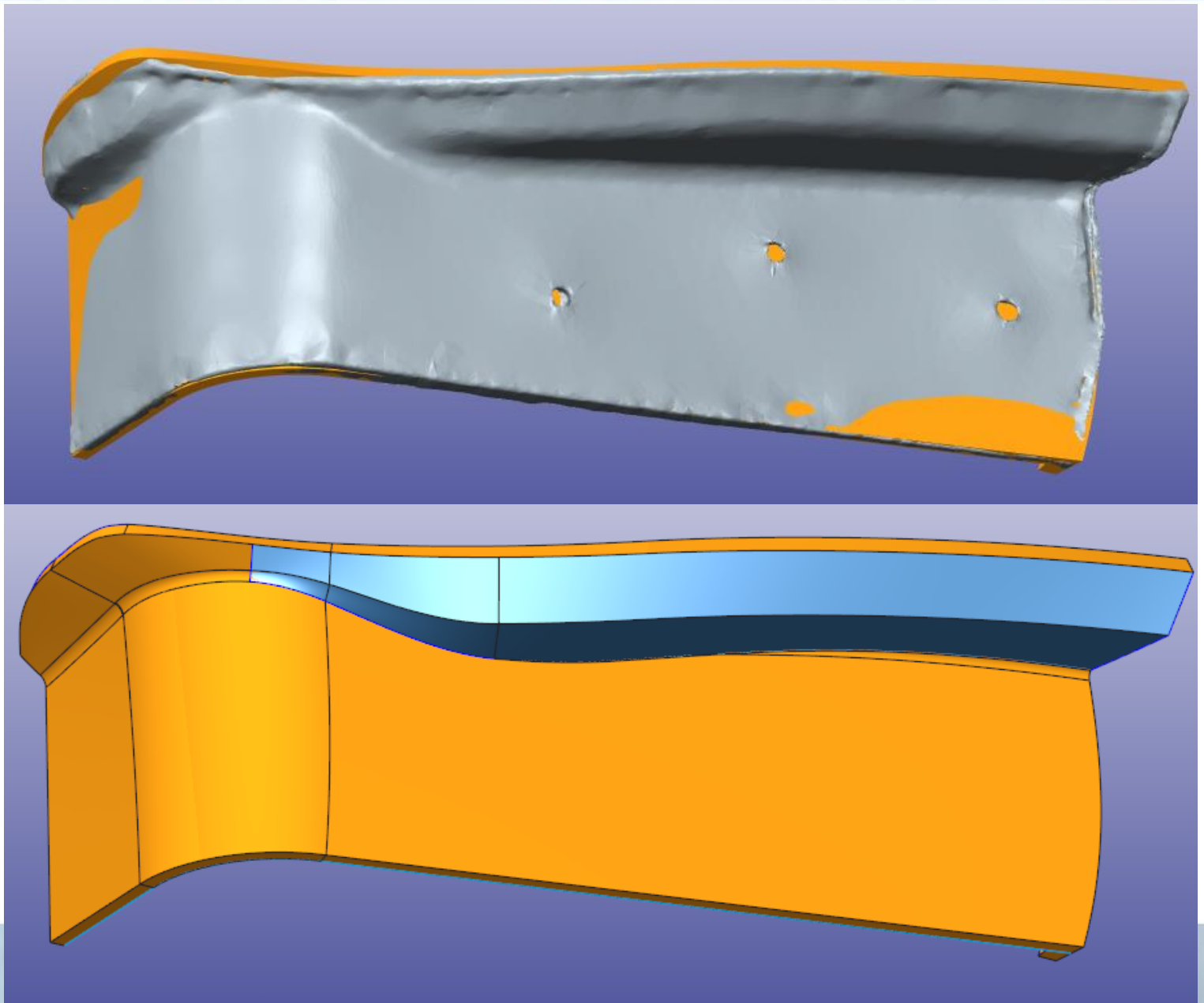
Converting parts from a scan (low accuracy)

- The REMOVE tool can be used to remove segments from a continuous surface, close surface, remove rounds, get surfaces to align to a certain angle and many more applications



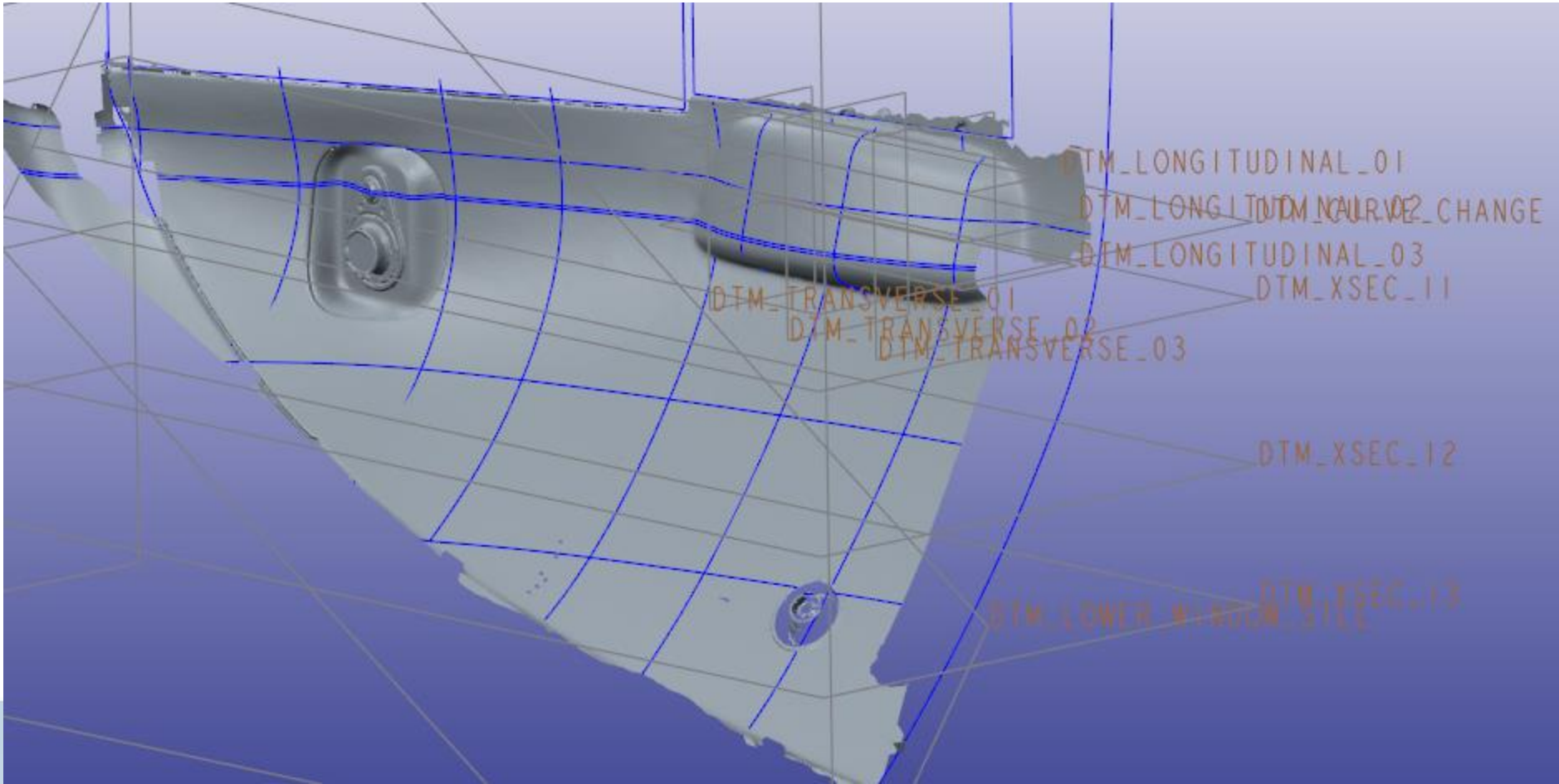


Converting parts from a scan (low accuracy)



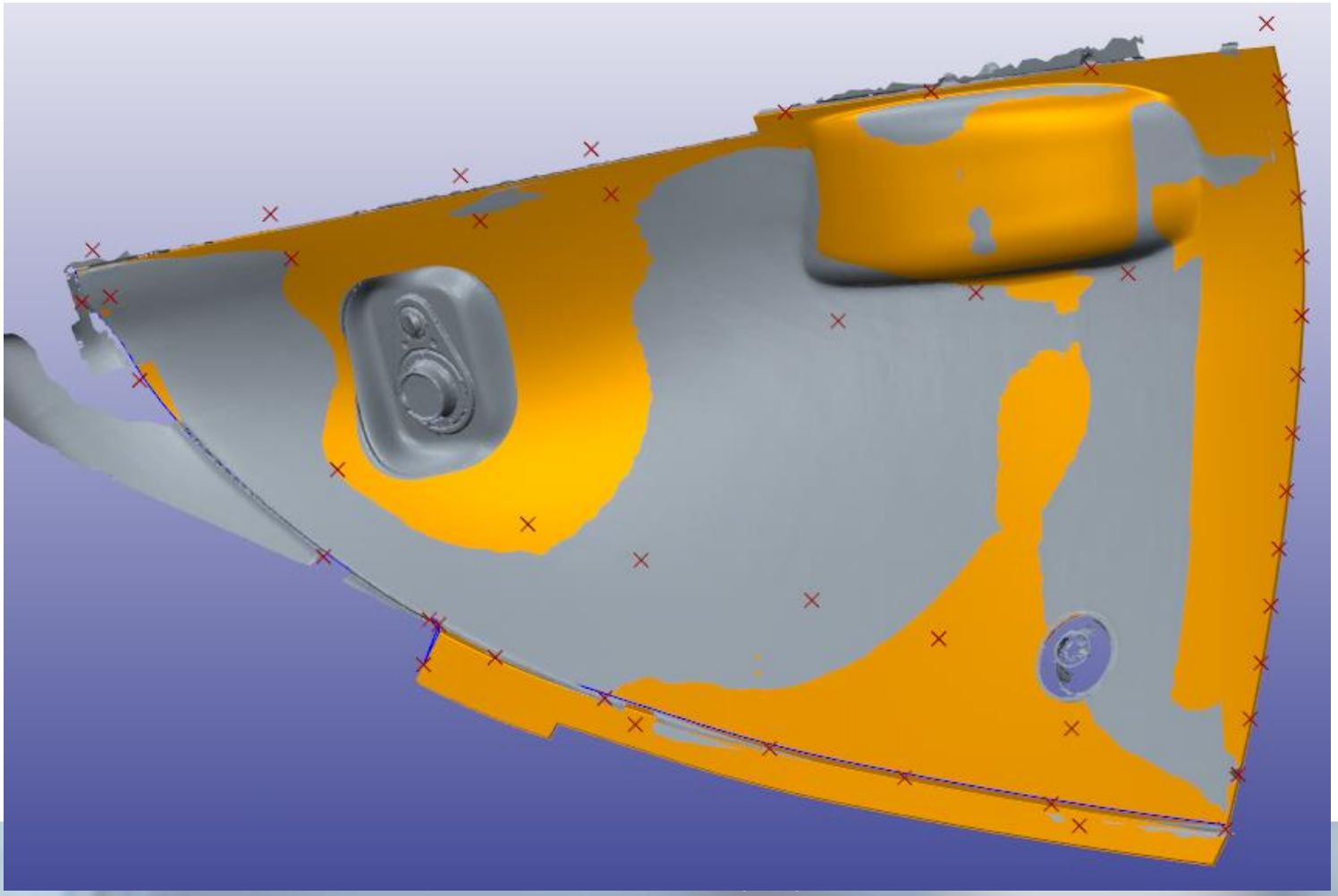
Converting parts from a scan (X-Section)

- Creating X-Sec on larger parts can be burdensome and challenging
- Some curves contain artifacts or missing information
- Requires extra step of cleaning curves (Approximate Copies)



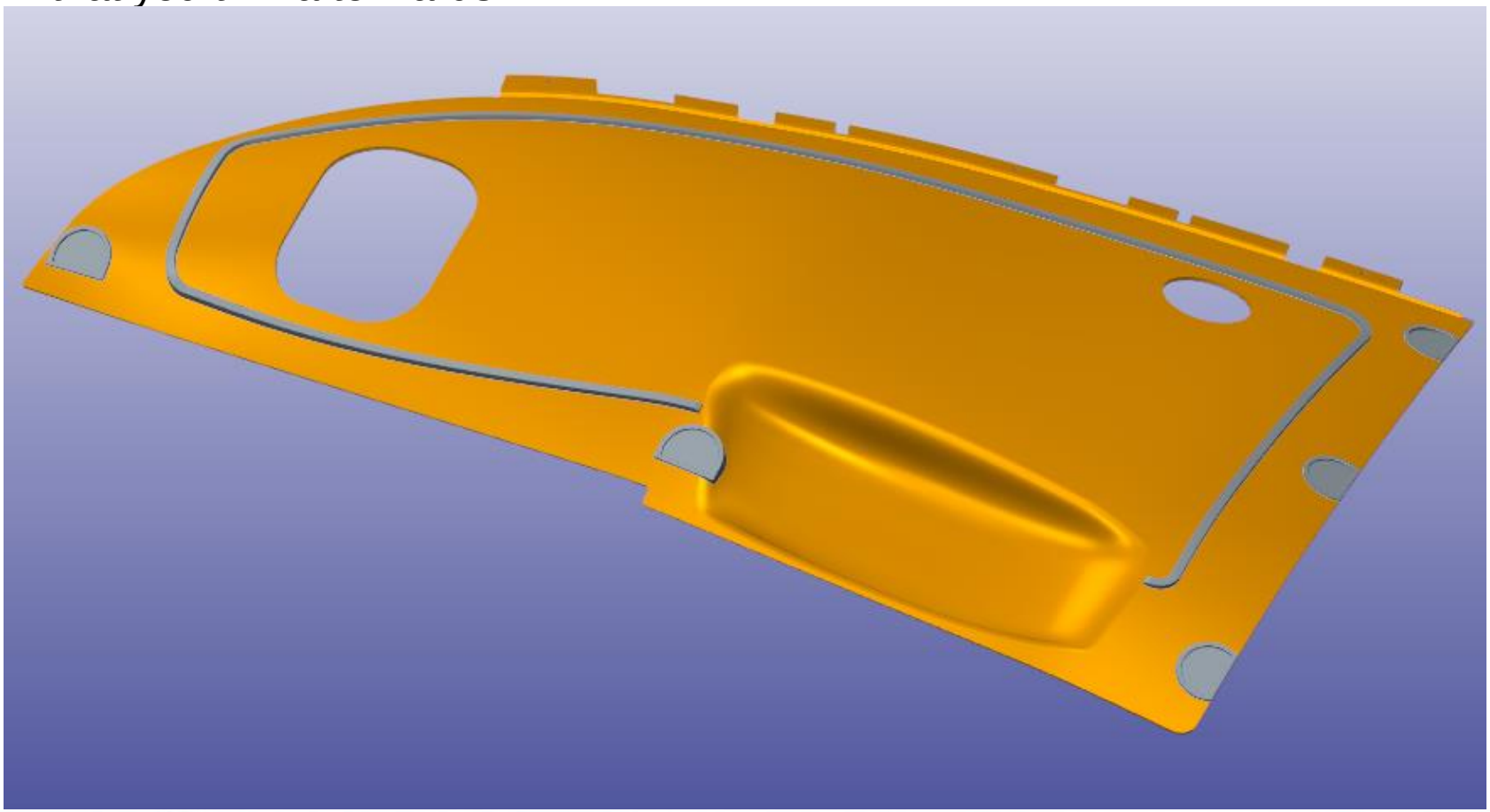
Converting parts from a scan (X-Section)

- It however gives the closest possible surface.
- If mating sides are important, these should be defined independently of the scan to make sure they are consistent and easily repeatable in the mating part

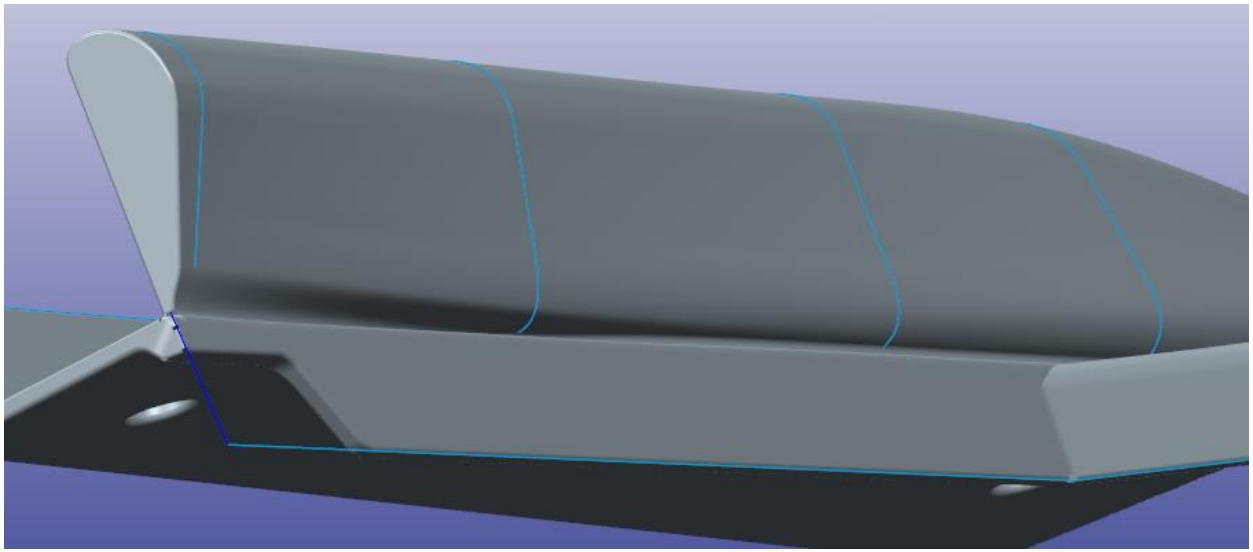


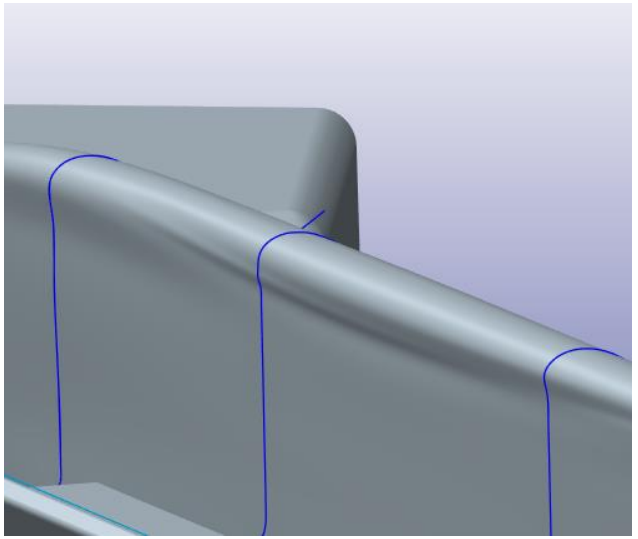
Converting parts from a scan (X-Section)

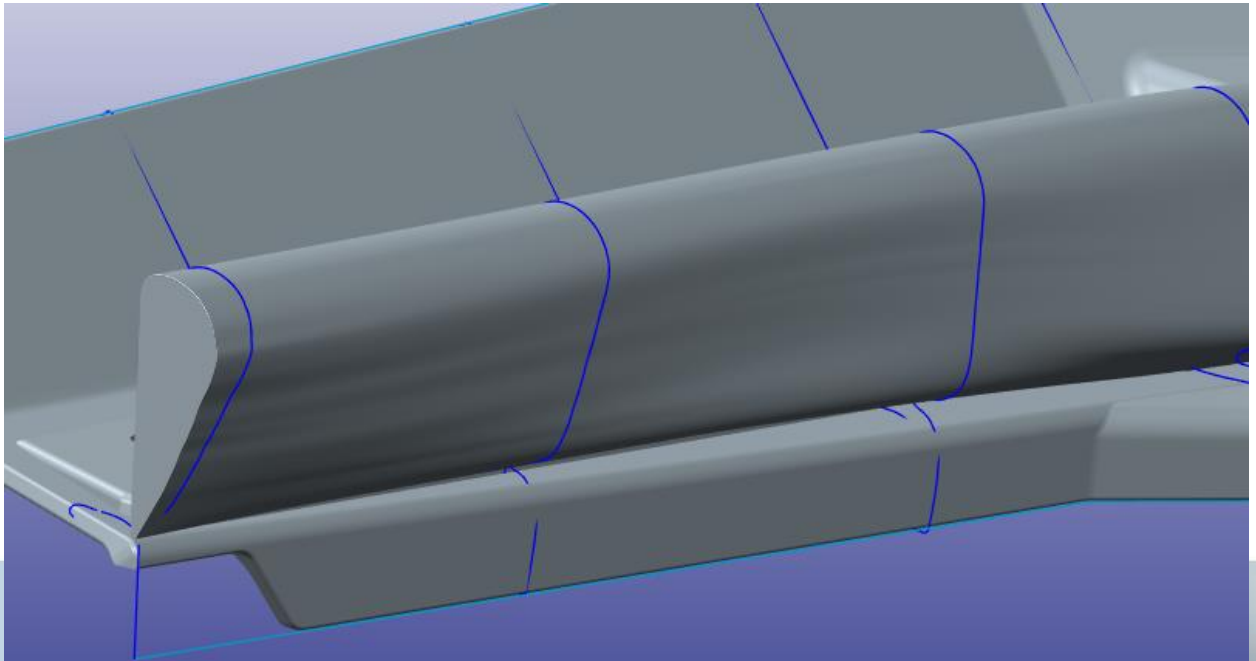
- Details, mounting features, extra cutouts, ribs can all be easily added once a clean thickened surface has been completed. Avoid at all cost including cutouts, triangular shapes and rounds in your main surface. Make a trapezoid that you trim afterwards.

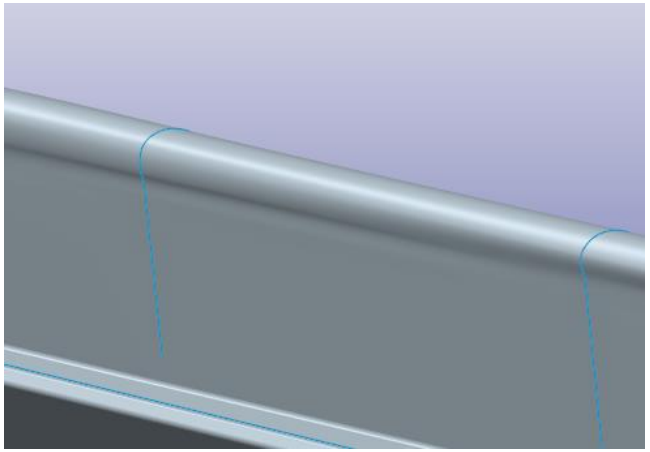


X-Section Artifacts/Defects



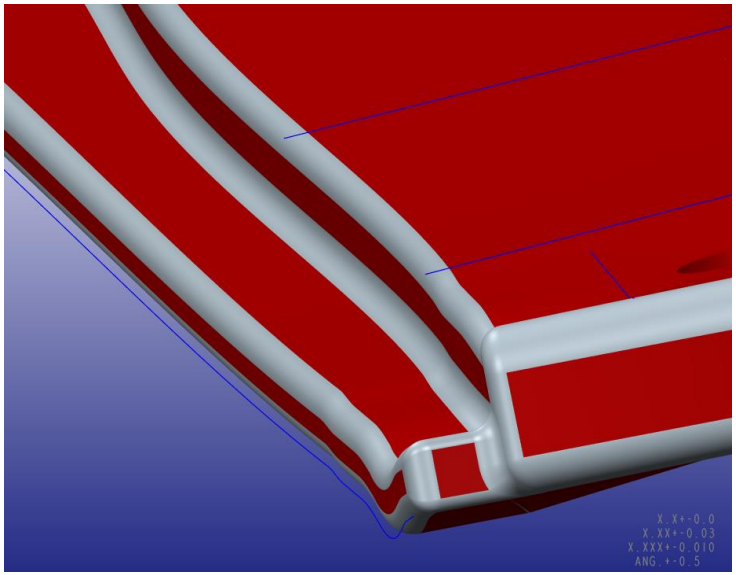


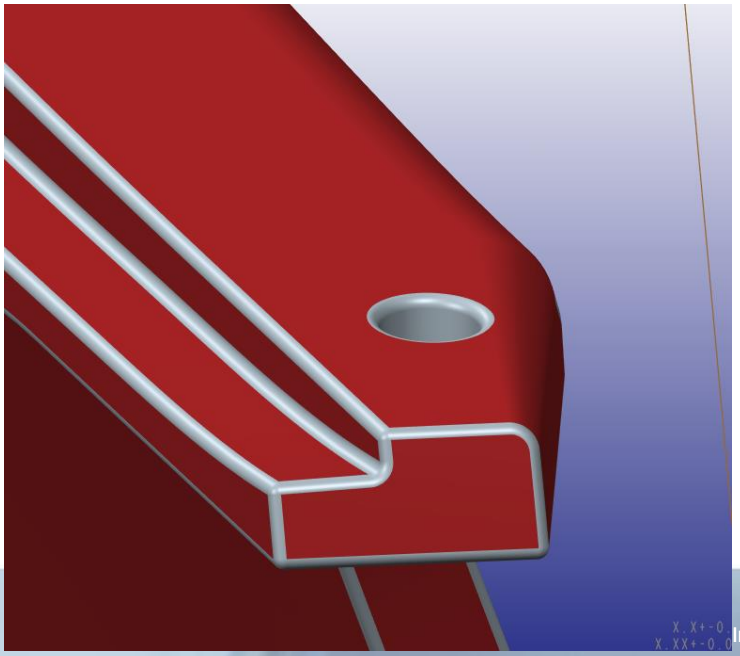


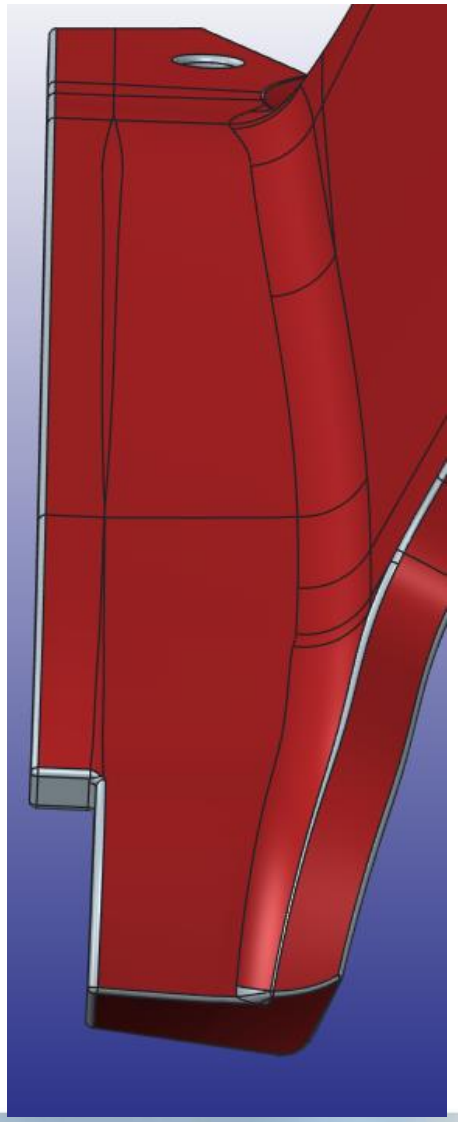


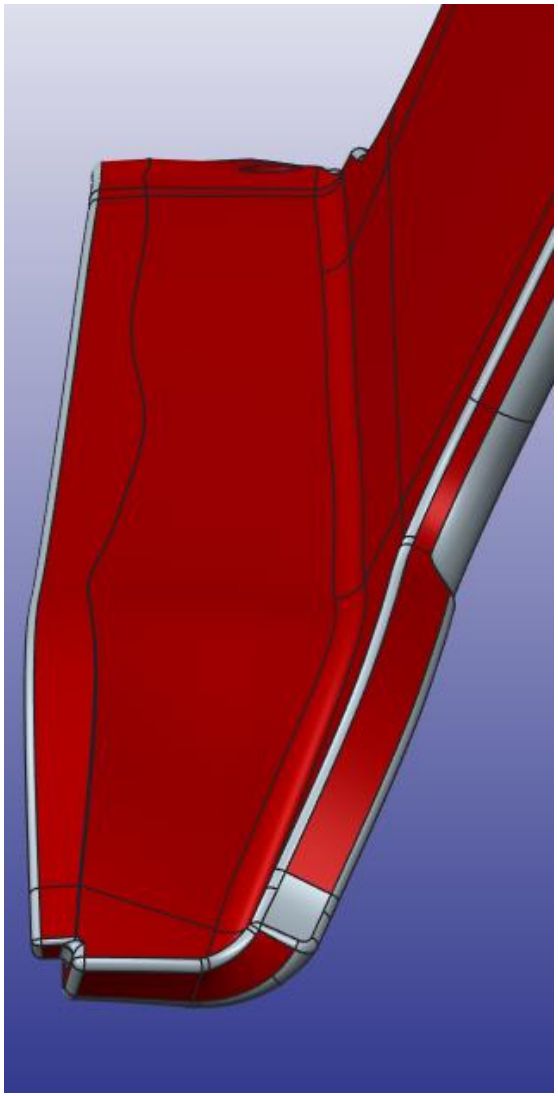
CAE

X-Section Artifacts/Defects

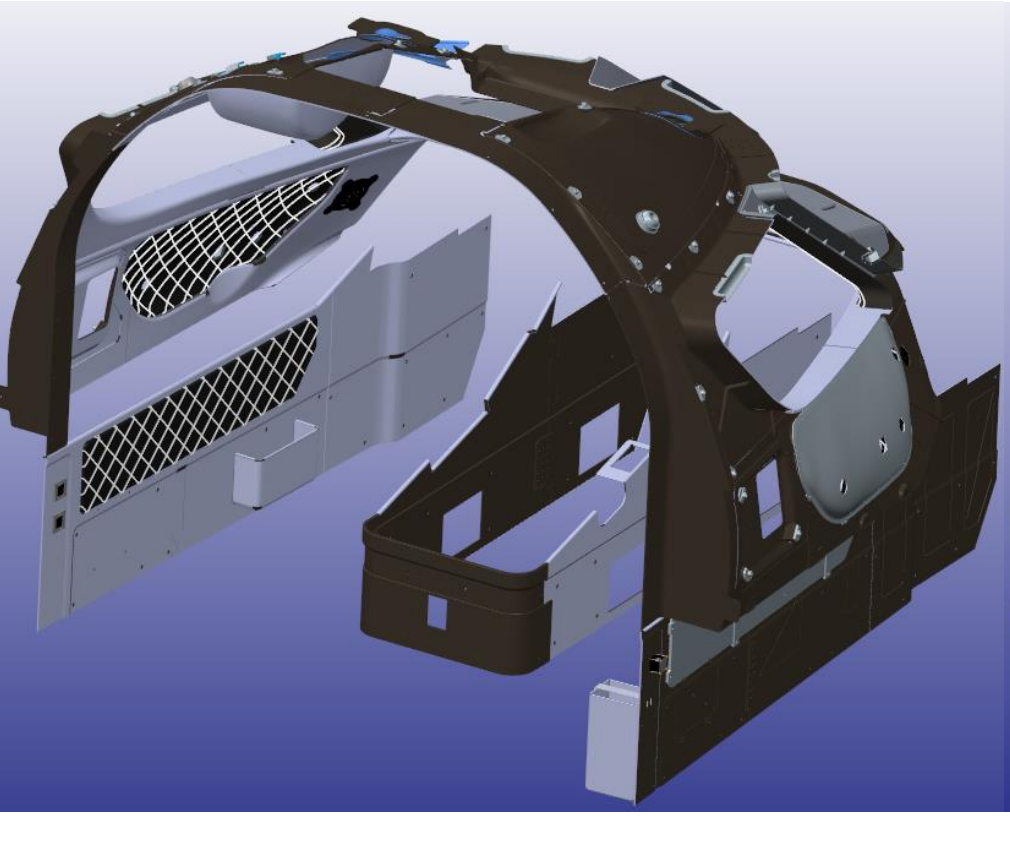


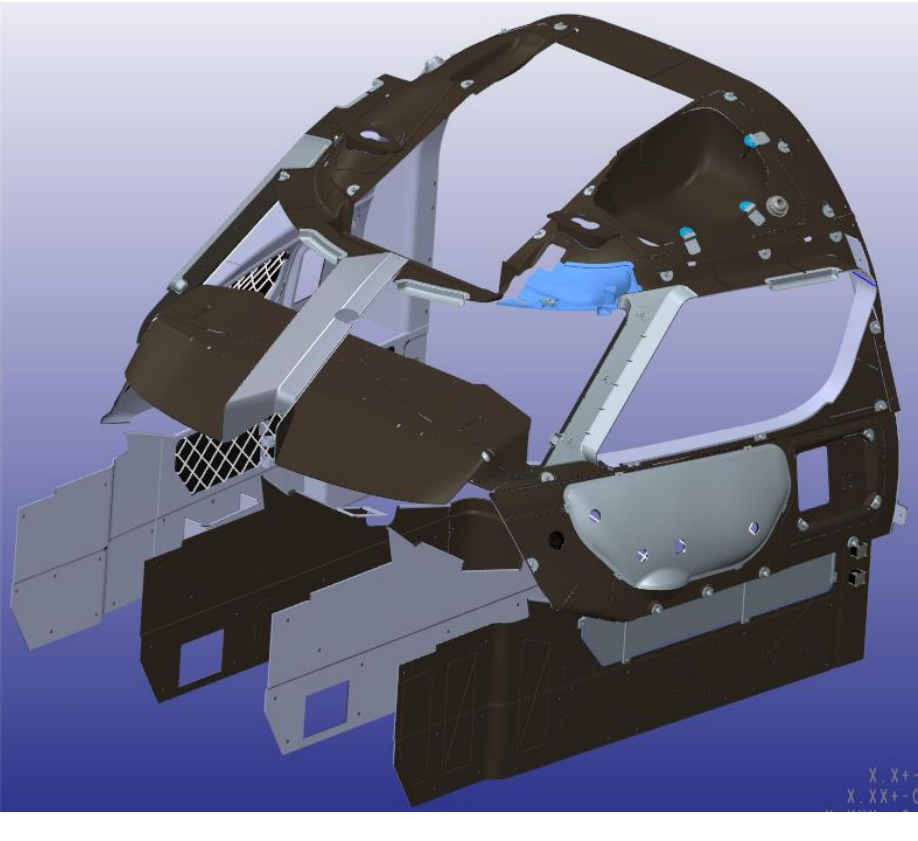






Completed Surfaces





CAE