

SCAN → CAD · FIBERGLASS · AUTOMOTIVE

Two hoods. One **shared crown.**

A restoration client needed two custom fiberglass hoods remade. One has a raised dome, twin scoops and louvers. The other has heat-extractor vents and a bonded inner panel. There were no drawings and no molds, just the parts. We scanned both sides of both hoods and rebuilt them as editable CAD, then checked the CAD point by point against the scan.

**12_M**TRIANGLES SCANNED
4 MESHES, BOTH FACES**7**CAD SOLIDS DELIVERED
PLUGS, SKINS, INNER,
INSERTS**0.58_{mm}**SKIN RMS VS SCAN
VENTED HOOD, OUTSIDE
VENTS**1**BASE SURFACE
SHARED BY BOTH HOODS

Client and vehicle details withheld. Images and figures are shared with permission.

01 The brief

Two hand-laid fiberglass hoods for the same car, with no drawings and no molds left. The client wanted to remake them, so we had to deliver geometry a mold shop can use: **mold plugs** to machine and **part solids** with every opening in place.

Each hood came in as two scans, one of the top and one of the underside. Laminate thickness, how the inner panel bonds to the skin, and which details were deliberate all had to be read from the parts themselves, or asked about.

PARTS	2 fiberglass hoods
HOOD A	dome · twin scoops · louvers
HOOD B	vents · inner panel · inserts
INPUT	Einstar Vega · top + underside
OUTPUT	STEP · STL · 3MF
TOOLCHAIN	Python · OpenCascade
CHECKS	scan deviation · draft · sections

02 How we ran it

one loop · every part

01 Scan

Both faces of both hoods, with an Einstar Vega. Four meshes, about 12 million triangles in total.

02 Align

Each top scan is squared to its own mirror plane, with the front edge at zero. Each underside is matched to its top by the shared outer edge.

03 Read the intent

Before any modeling, we work out what the original maker was drawing: straight creases, constant flank angles, evenly spaced louvers, and a stock crown under the custom work.

04 Model

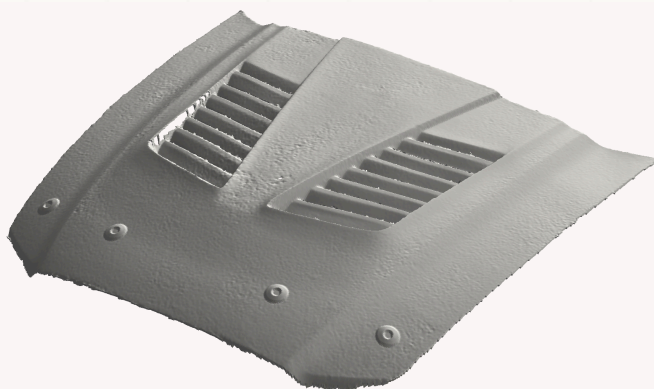
One parametric script per hood. The freeform surfaces are fitted to the scan. Every crease, angle, pitch and opening is a named parameter.

05 Verify

Signed deviation from scan to CAD on 250k points, section overlays, a draft check against the mold pull, and rebuilds with the parameters changed.

06 Deliver

STEP mold plugs for CNC, part solids with their trims, and a report that tags every dimension with where it came from.



SCAN Hood A as captured. The round plates are bolt-on hardware and stay out of the CAD.



CAD Hood A rebuilt as a mold plug: symmetric, drafted, every feature driven by a parameter.

03 Hood A · dome, scoops, louvers

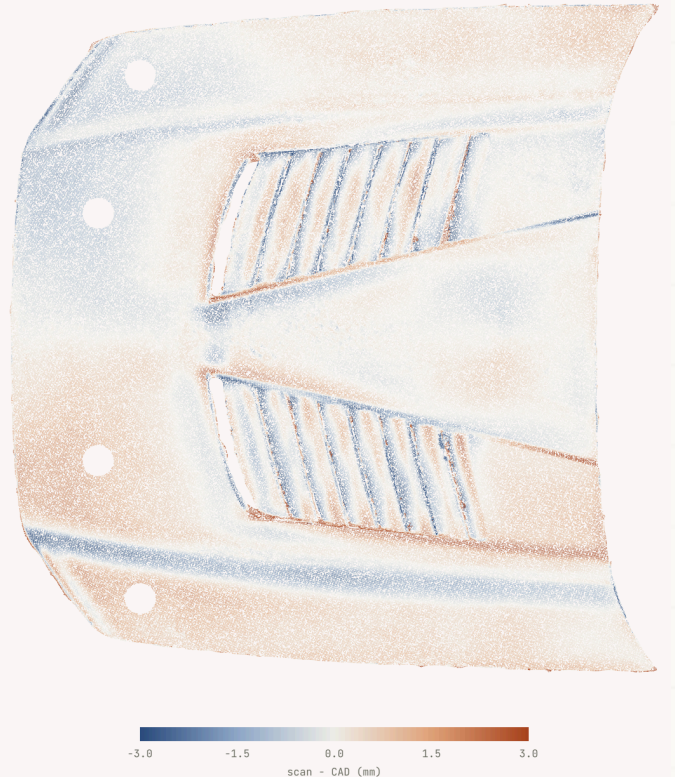
mold plug + skin

The custom hood. A wedge-shaped dome rises out of the stock crown. Twin recessed scoops sit on either side of it, and each scoop floor steps up through a row of louvers. The scan showed that every one of these features was drawn with straight lines and constant angles, so that's how we modeled them.

- Dome on two straight creases, 54° ruled flanks and an R8 crease
- Scoop pockets with 60° and 65° drafted walls
- 7 louvers a side at equal pitch (the client's call), with steps drafted at 75° so the part releases from the mold
- Open louver slots, scoop mouths and pin holes cut as a separate trim body
- Mold plug plus a skin built inward from the A-surface

SCAN → CAD	RMS MM	P95 MM
Whole surface	1.26	2.40
Outer crown	1.09	1.96
Dome	0.89	2.04
Scoops + louvers	1.71	3.67

The scanned hood is not perfectly symmetric: left and right differ by about **1 mm RMS**. The CAD is symmetric on purpose, which puts the outer crown at that floor. The louvers show the cost of equal spacing, because the hand-made originals wander by up to 5 mm.



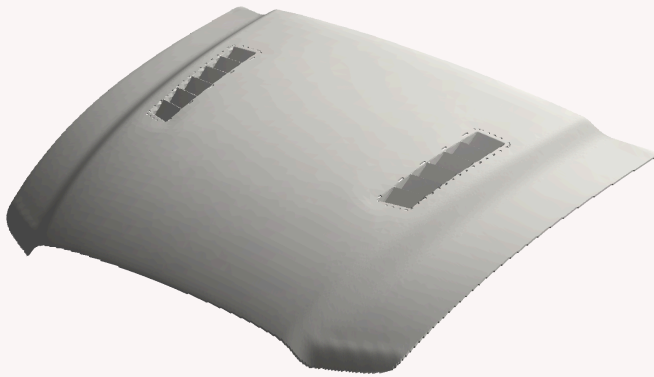
DEVIATION Plan view of signed distance from 250k scan points to the plug. Red = scan above CAD. Hardware plates excluded.



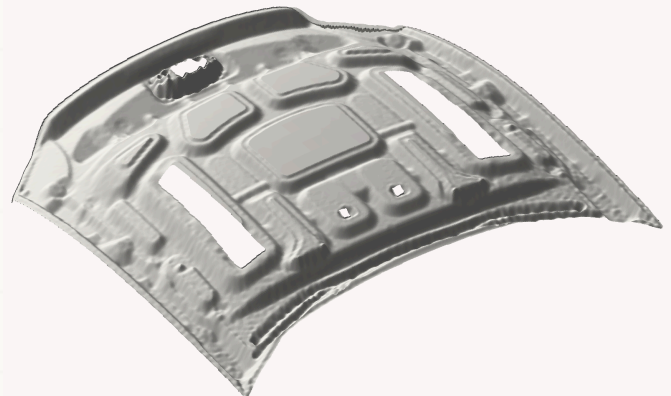
SECTION Through the louver row. Wide grey line = scan; black = CAD skin. Drafted steps, with the open slots in the step faces.

04 Hood B · vents, inner panel, inserts

3 parts · 1 stitched solid



SKIN + INSERTS Stock crown with two separate vent inserts dropped in.



INNER PANEL Seen from below: bond pads, hat-section beams, and the latch and vent openings.

The stock-shape hood is three molded parts. The **skin** carries openings for the vent inserts. The **inner panel** bonds to the back of the skin at its flat pads, and we stitched the two into one solid. Each **vent insert** is its own part: six gills on fanned step lines, with drafted step faces and open slots.

- Skin and inner panel have no undercuts against the mold pull
- Vent geometry is fully parametric: count, pitch, fan angle, depth, draft
- Inner panel follows the underside scan, with its openings modeled on top

SCAN → CAD	RMS MM	P95 MM
Skin vs top scan, outside the vents	0.58	1.33
Vent inserts	2.14	5.46
Inner panel vs underside*	2.61	2.89



BOND MAP Gap from the inner panel to the back of the skin. The bright pads are where the two parts bond; the darker the area, the deeper the beam.



SECTION Through one vent. Black = skin, grey = inner panel, green = insert, wide light grey = both scans.

* The inner panel's height depends on the laminate thickness. That number is a placeholder until we caliper the parts, so this result moves when it does.

05 One crown

The two hoods' outer edges agree to within about 2 mm: the same fenders and the same cowl. So hood B's top became the **stock surface**, and hood A was rebuilt as that surface plus its own raised centre. Edit the crown once and both hoods follow.

The trade-off is about 0.2 mm RMS on hood A compared with fitting it on its own. That number is in the report too.

06 Still open

- ☐ **Laminate thickness** is a placeholder until calipered. Scans of two separate faces can't measure it.
- ☐ **Louver crests** are left sharp for hand finishing, because the CAD kernel won't fillet them.
- ☐ **The inner panel** is a fitted surface. Its pads and beams aren't separate features yet.
- ☐ **Fit check** on the car after the first pull from the mold.

DELIVERED

MOLD PLUGS · STEP

SKINS · STEP / STL

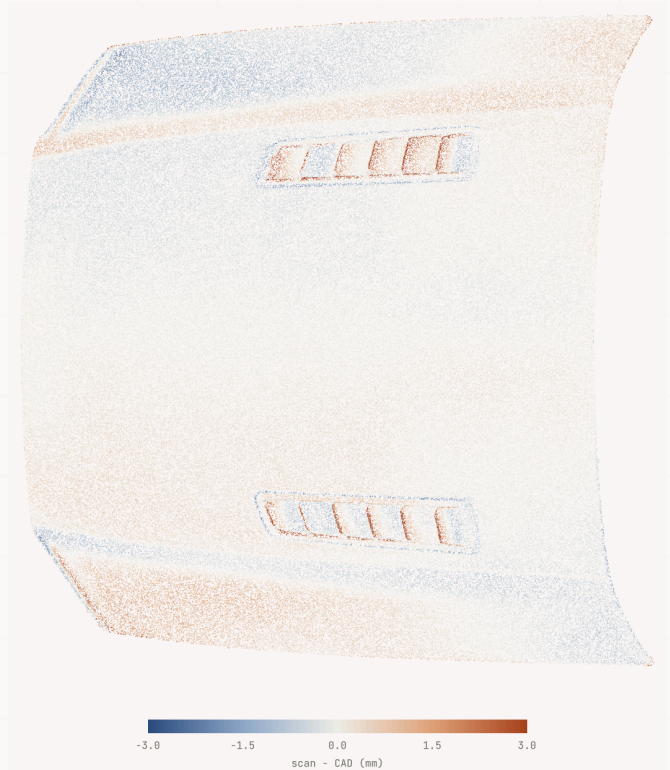
INNER PANEL · STEP

VENT INSERTS · STEP

TRIM BODIES

PARAMETRIC SCRIPTS

DEVIATION REPORT



DEVIATION Hood B, top scan to skin and inserts. Most of what's left is the original's own left/right twist.

**No drawings. No molds.
Mail it Monday.**

3D SCANNING · REVERSE ENGINEERING · PRODUCTION
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