

Using advanced manufacturing to recreate a classic engine block
Mickael Dernoncourt



METCAST
SERVICES

AFI – 60th Annual National Conference
8-10 October 2026



Mickael Dernoncourt - “a little bit about me”

Born and raised in France, Master Degree in Mechanical engineering speciality foundry, apprenticeship at Kuhn Farm machinery near Strasbourg – East of France



New Zealand “small nation, punching above its weight”.

Came to New Zealand in 2014 – worked at A&G Price, HamiltonJet and now at Metcast



Engineering
HamiltonJet

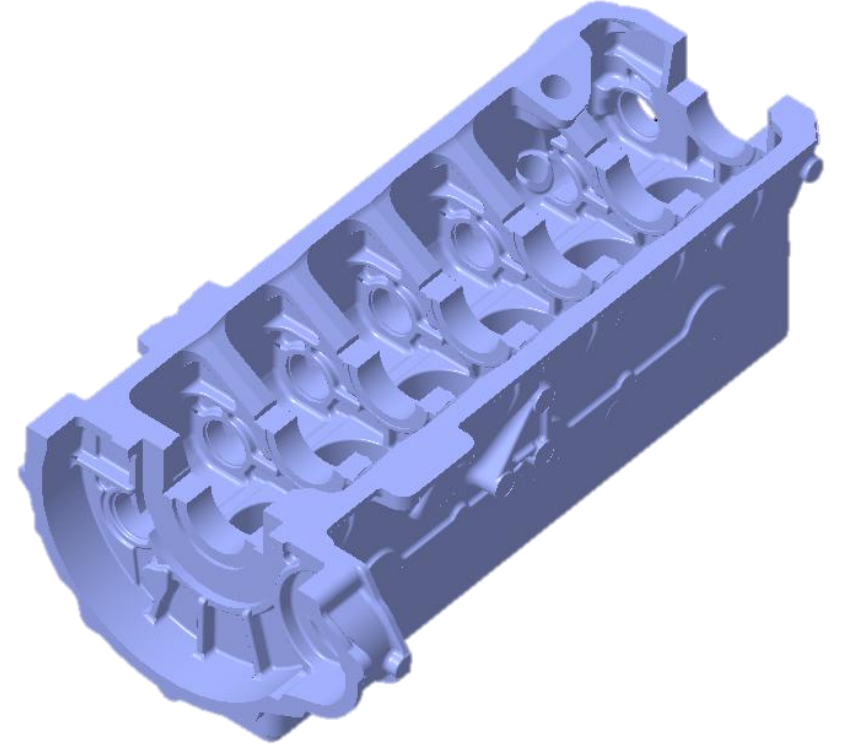
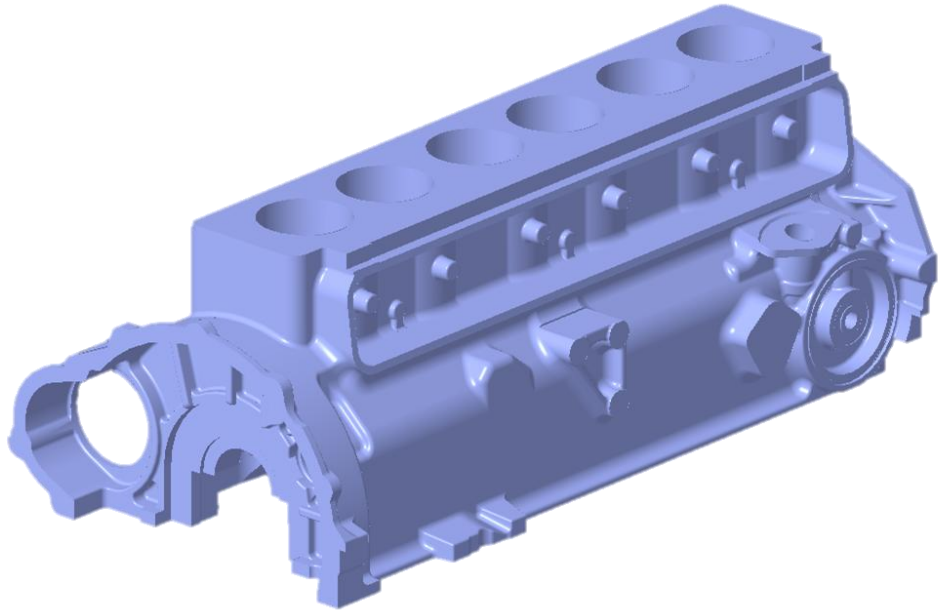


Technology
Rocket Lab



Rugby

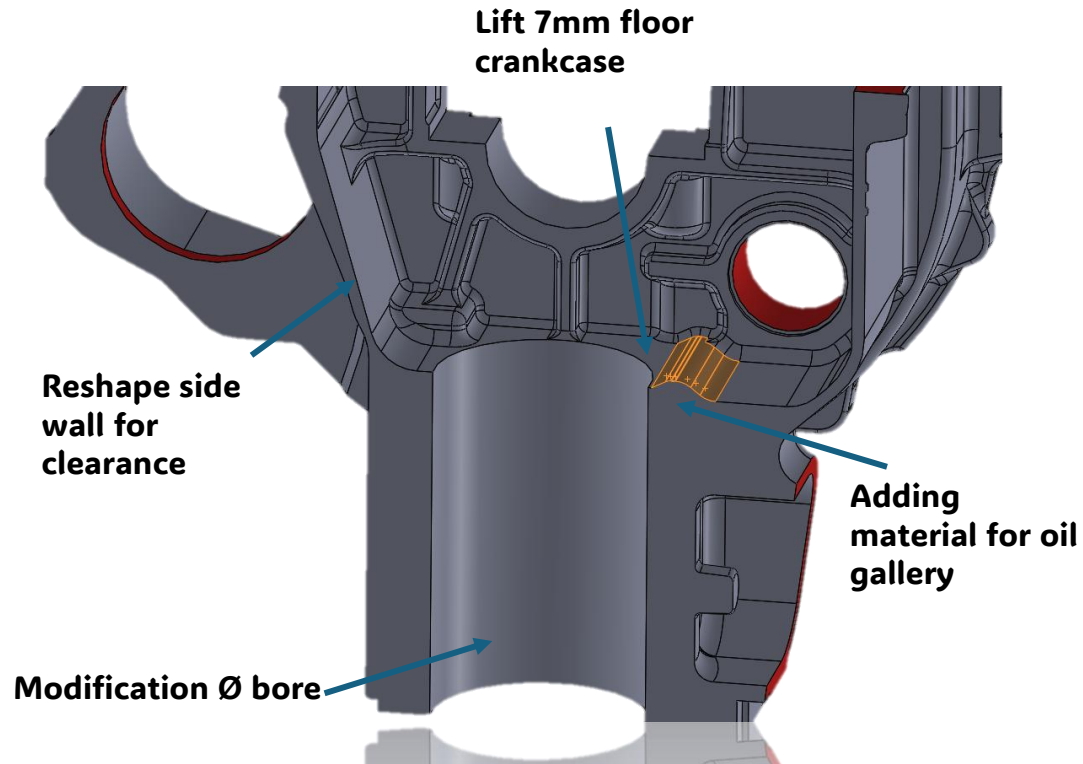
First Study: "It started with a Ford Zephyr..."



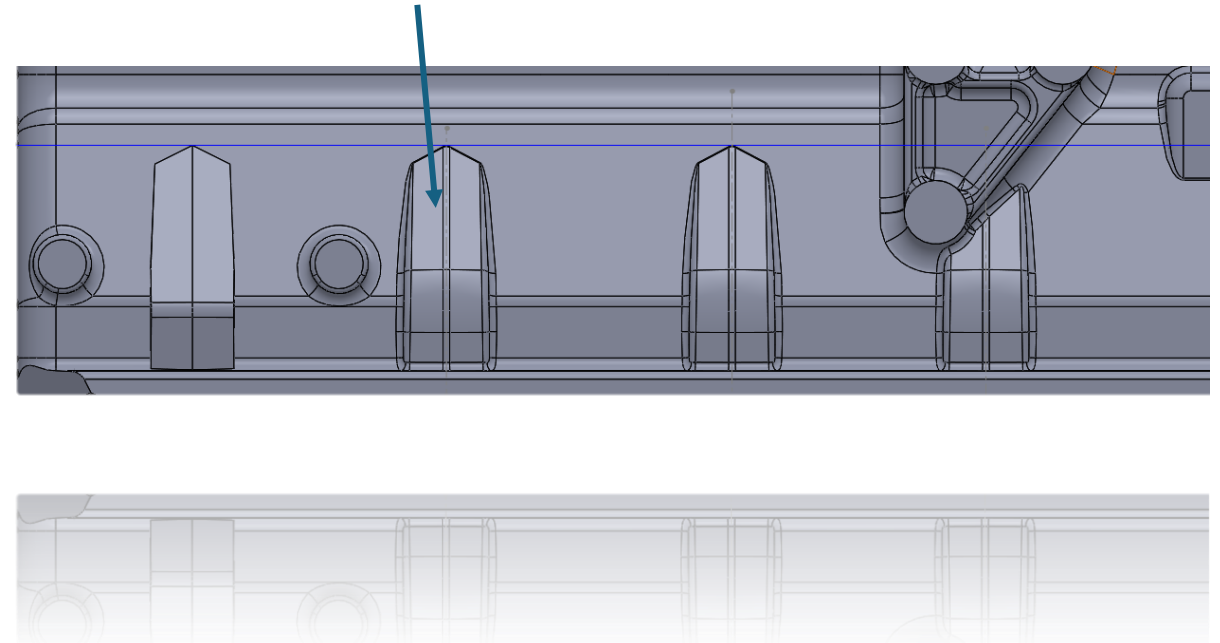
Recreate a Ford Zephyr 6-cylinder engine block
using 3D sand printing

From 3D scan → redesigned engine → printed mould → cast iron

Modification of the Engine

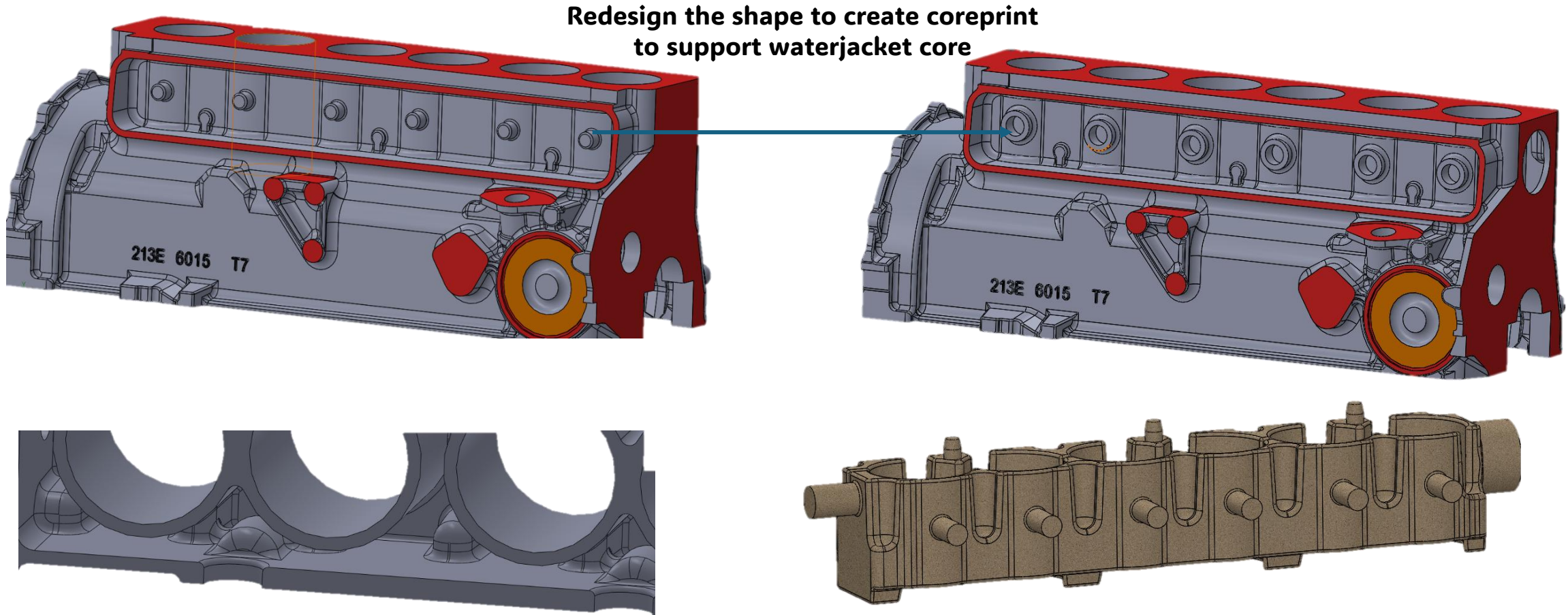


Creation 7 conrod block relief on the outside and remove material on the inside for clearance



Customer wanted to fit a Raymond Mays cylinder head; original engine block has 4 main bearing journals which doesn't support the transmission of the power toward the lower area of the engine. Modification to 7 mains to increase power and disperse the load, fitting of Toyota 2JZ componentry into the zephyr block (Piston, camshaft etc...)

Modification of the Engine



Designing of the internal shape such as the waterjacket as we couldn't via the 3D scan.

Simulation

NovaFlow&Solid 6.60r2
Irregular mesh
remp_v170223.psp
Date : 20/02/2023
YZ plane, mm

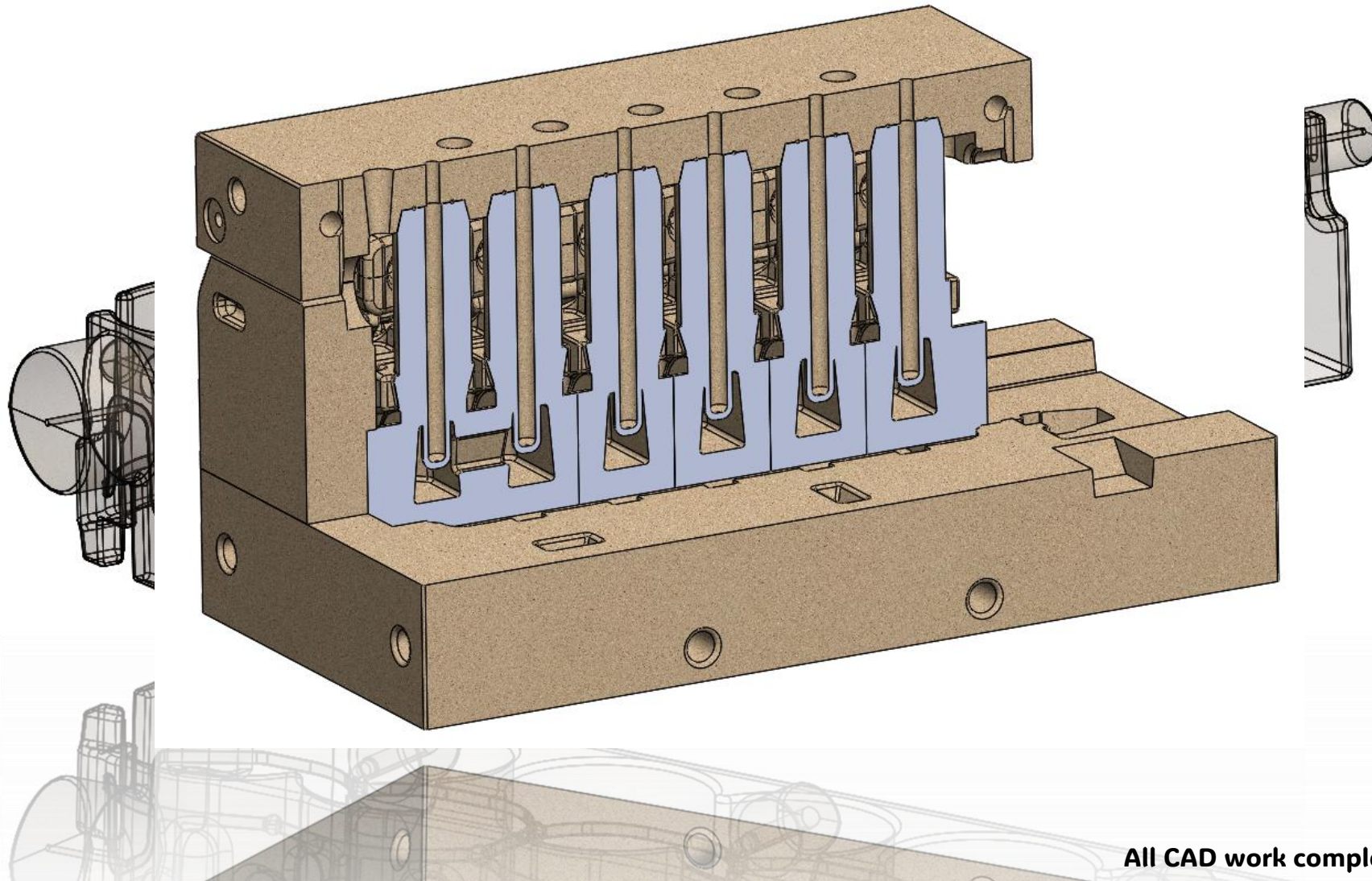
Box dimension, casting position and number of cells				Size of cells, mm	
along X, mm	450.162	225.947	97	Total cells:	4,739
along Y, mm	924.017	460.901	197	Casting cells:	2 204 475
along Z, mm	563.887	293.790	121		290 016

Boundary conditions		
	Low	High
YZ plane	Normal conditions	Normal conditions
XZ plane	Normal conditions	Normal conditions
XY plane	Normal conditions	Heat radiation

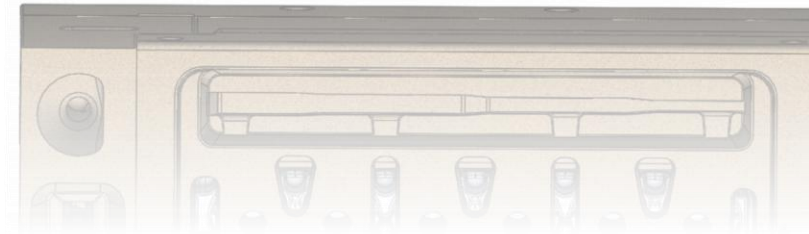
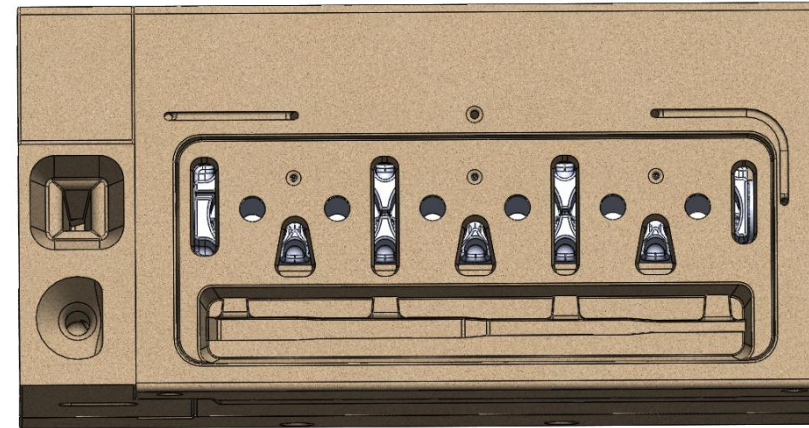
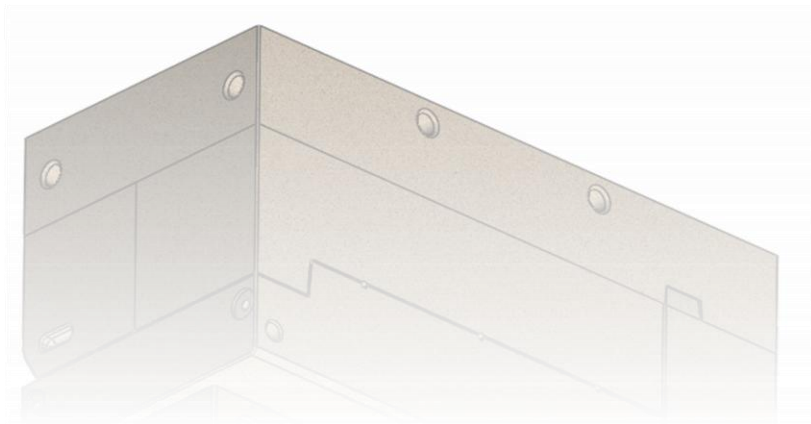
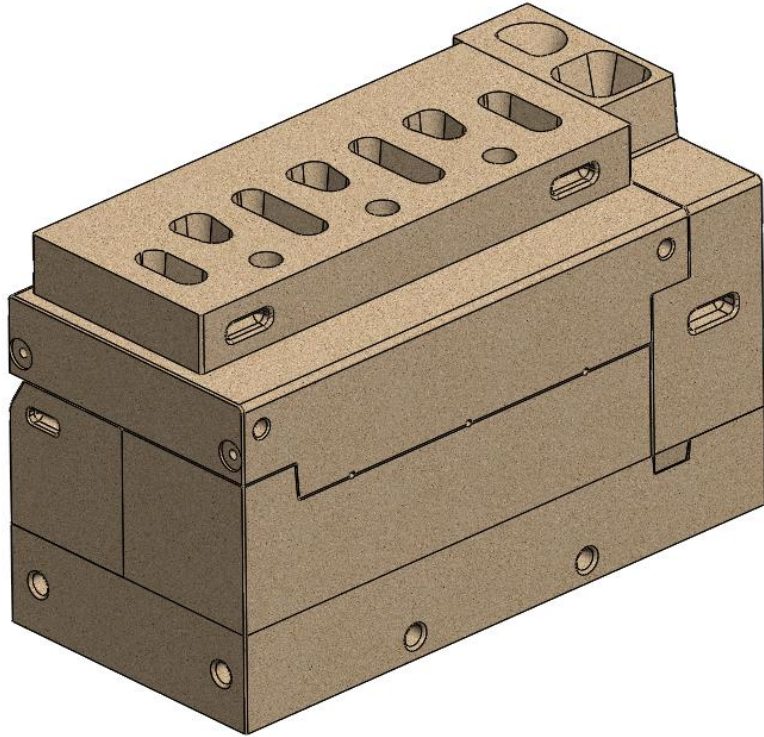
0 - quasi-equilibrium model calculation, without segregation
Without convection
Aggressive AMG

Mould materials	T, °C
EN-GJL-250 (VIGNON)##	1390.0
EN-GJL-250 (VIGNON)##	1390.0
EN-GJL-250 (VIGNON)##	1390.0
EN-GJL-250 (VIGNON)##	1390.0
Chill - Carbon Steel	20.0
Filter - 20 PPI	20.0
Mold - Furane Sand	20.0
Air - In mold	20.0

Mould Making – 3D printing



Mould Making – 3D printing



7 sections moulds
13 cores

Mould Making – 3D printing

- 2x Printer S-Max Pro with double job box
- printing dimension 1800 * 1000 * 700mm
- Up to 125L/h
- 1260 liters build box
- Approx 10 hrs to print full jobbox.



Mould Making – 3D printing



Final Casting



Engine block at machining

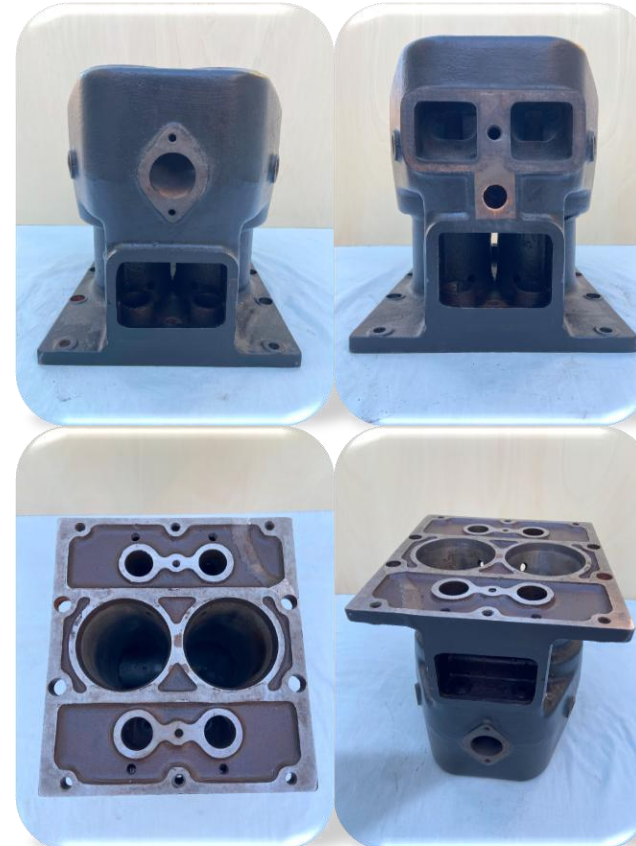


Second Study: An Ozzie collaboration



The 1910 Mitchell represents a unique piece of automotive history. With very few surviving models. 2 Cylinder with options to built up to 6 Cylinder, the engine block on the left failed. The owner of the car did try to source a spare engine without any success

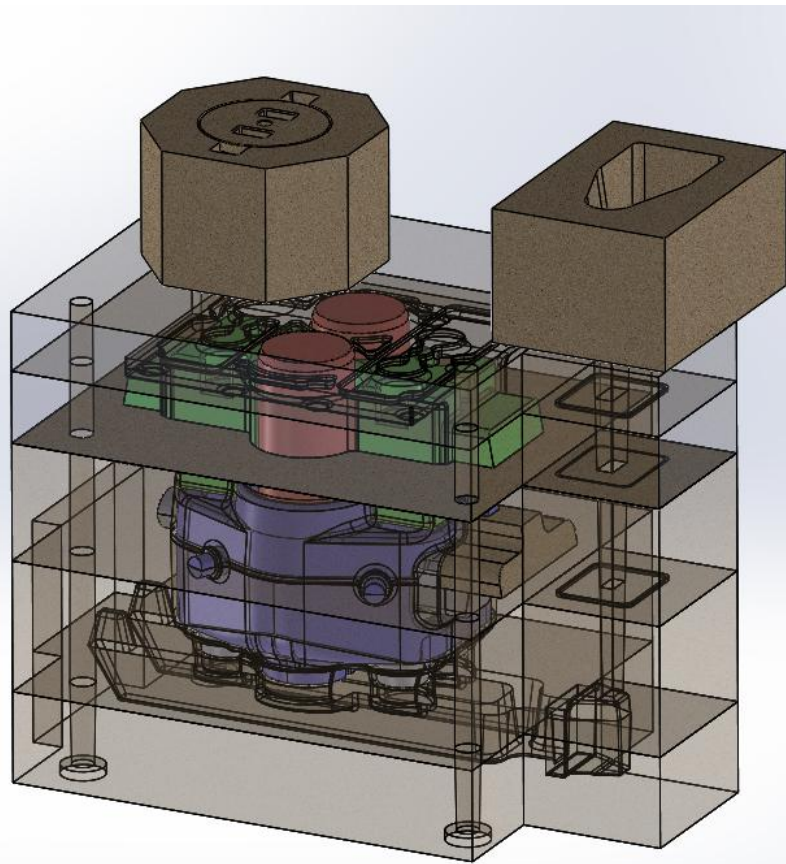
Original Engine



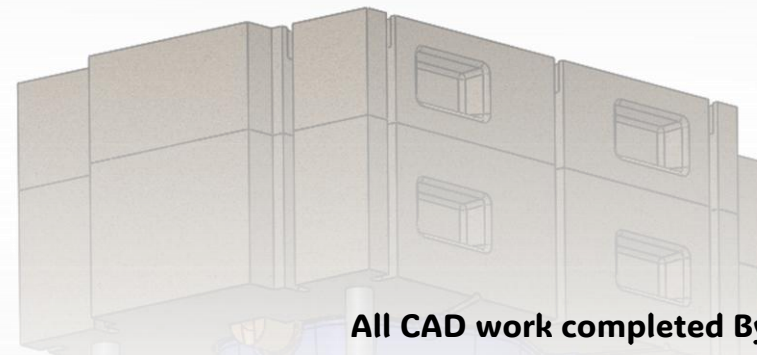
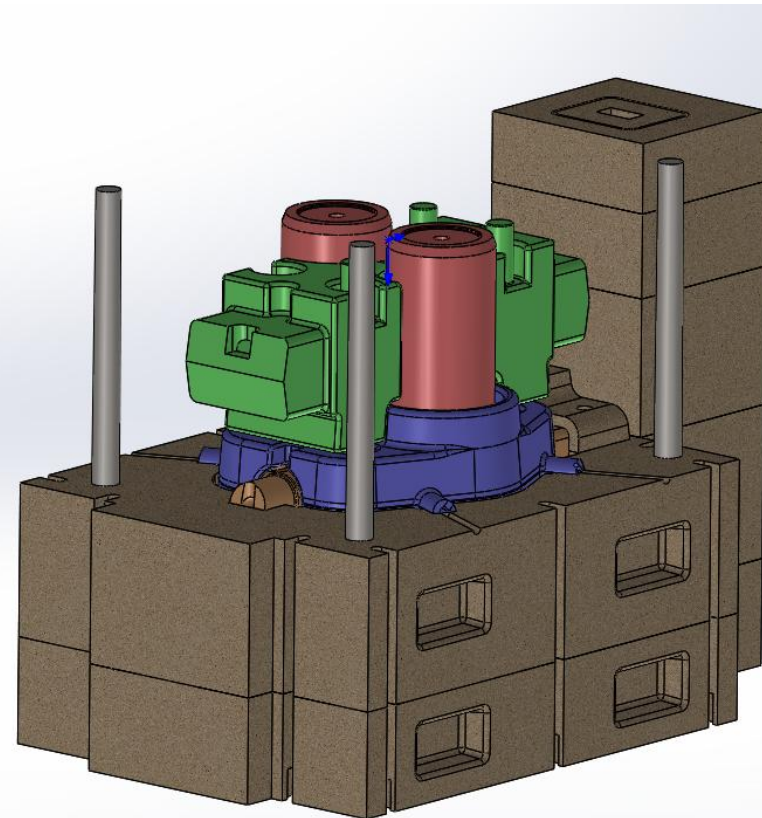
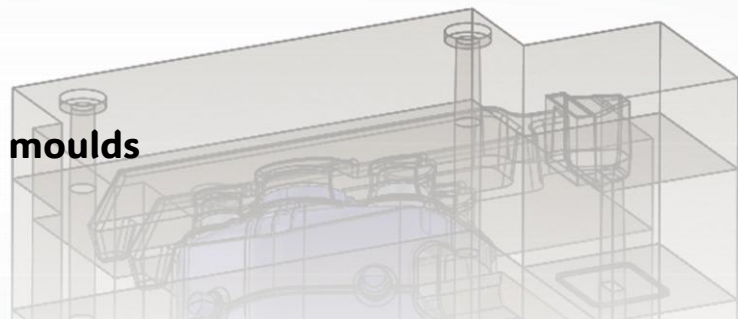
The original 6-cylinder engine was over 100 years old, showing extensive wear and internal damage. No original blueprints or CAD files were available, which posed significant challenges for reproduction.

The original engine was 3D scanned by Alex Lean from Devise Scanning in Auckland with the internal reconstruction done on the CAD

CAD / Methoding and mold design

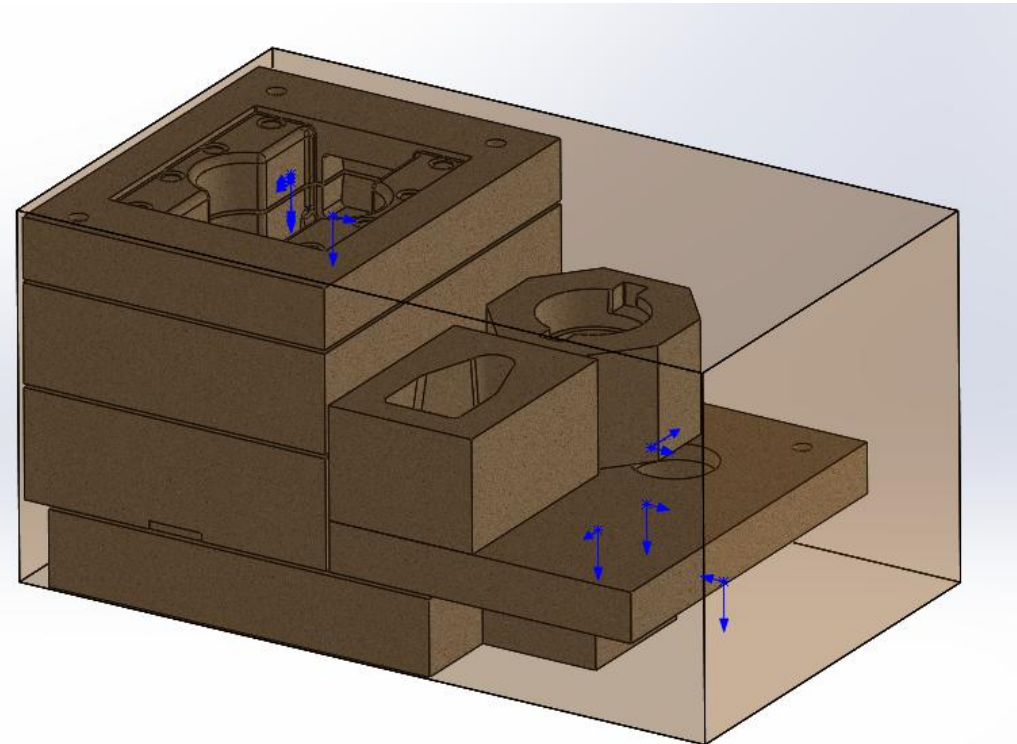
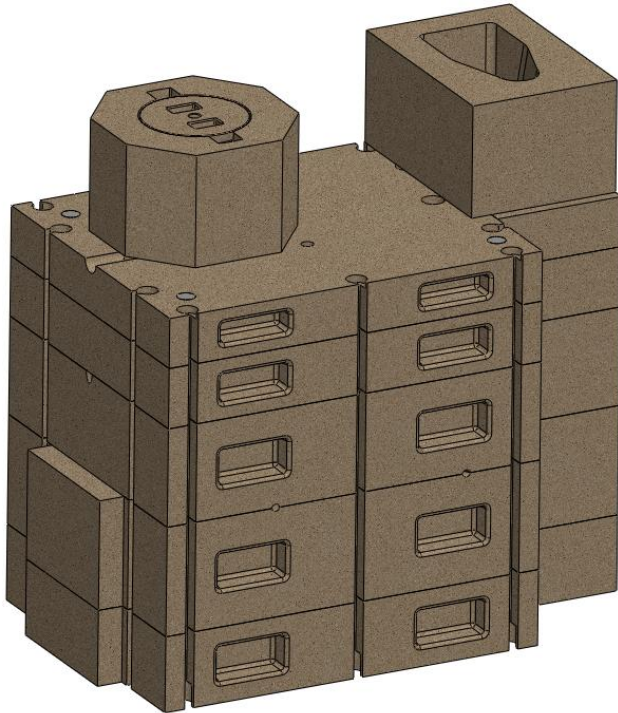


7 sections moulds
12 cores

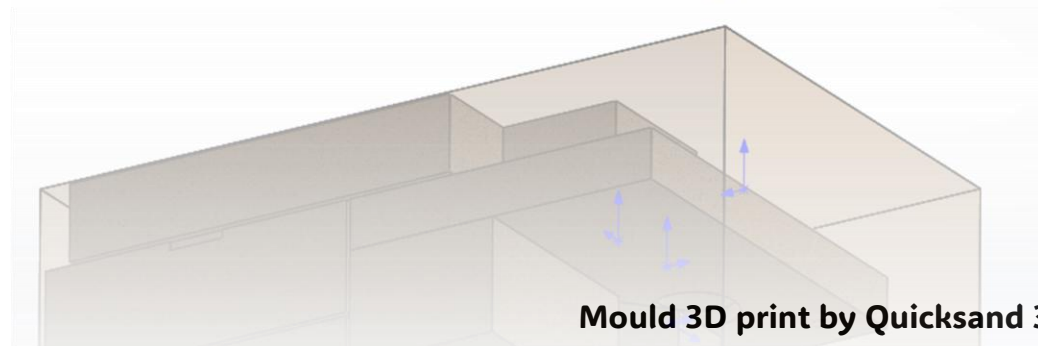
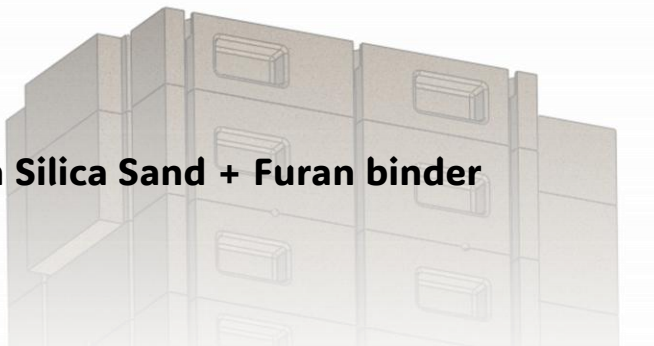


All CAD work completed By Mickael Dernoncourt

CAD / Methoding and mold design



Mould made in Silica Sand + Furan binder



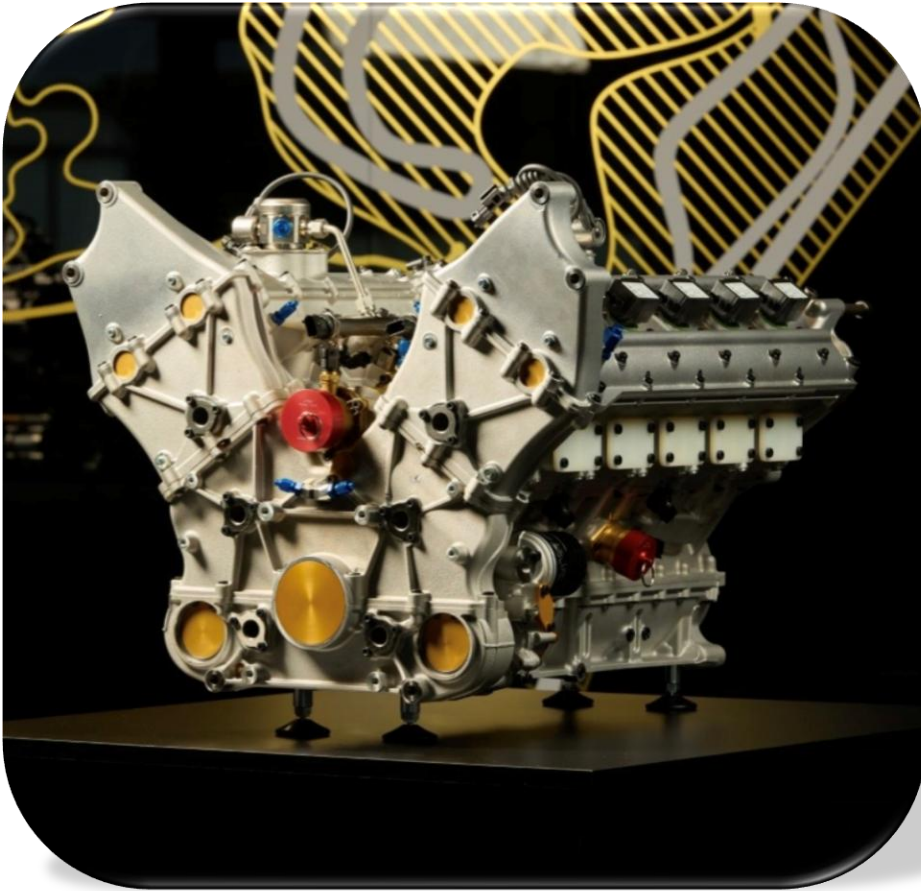
Mould 3D print by Quicksand 3D PTY Australia

Casting



**Casting made in Cast Iron
220 grade.**

Born in New Zealand



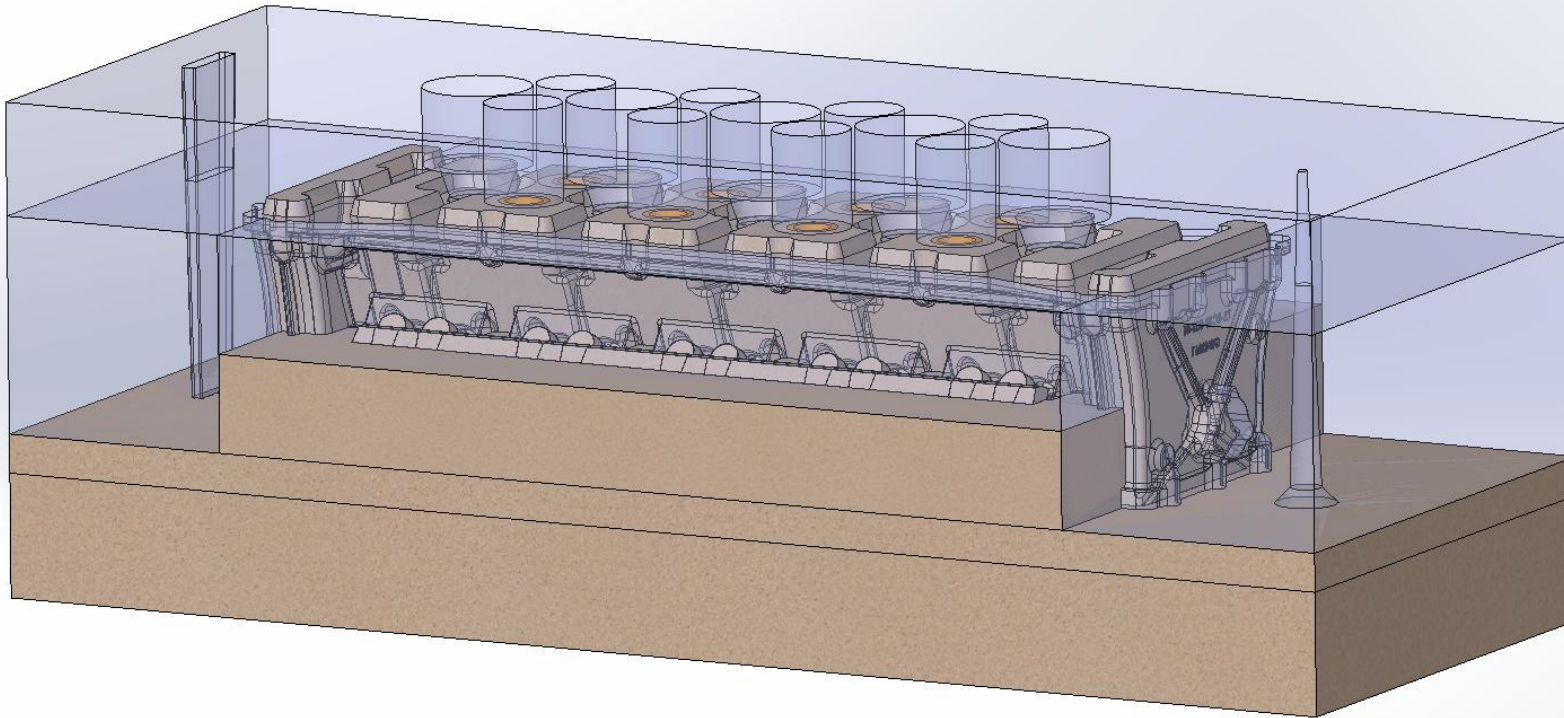
Rodin Cars RC TEN engine

Naturally Aspirated
720 bhp @ 11,000 rpm

4L V10
or

Twin Turbo
1000 bhp @ 9,500 rpm

Mould



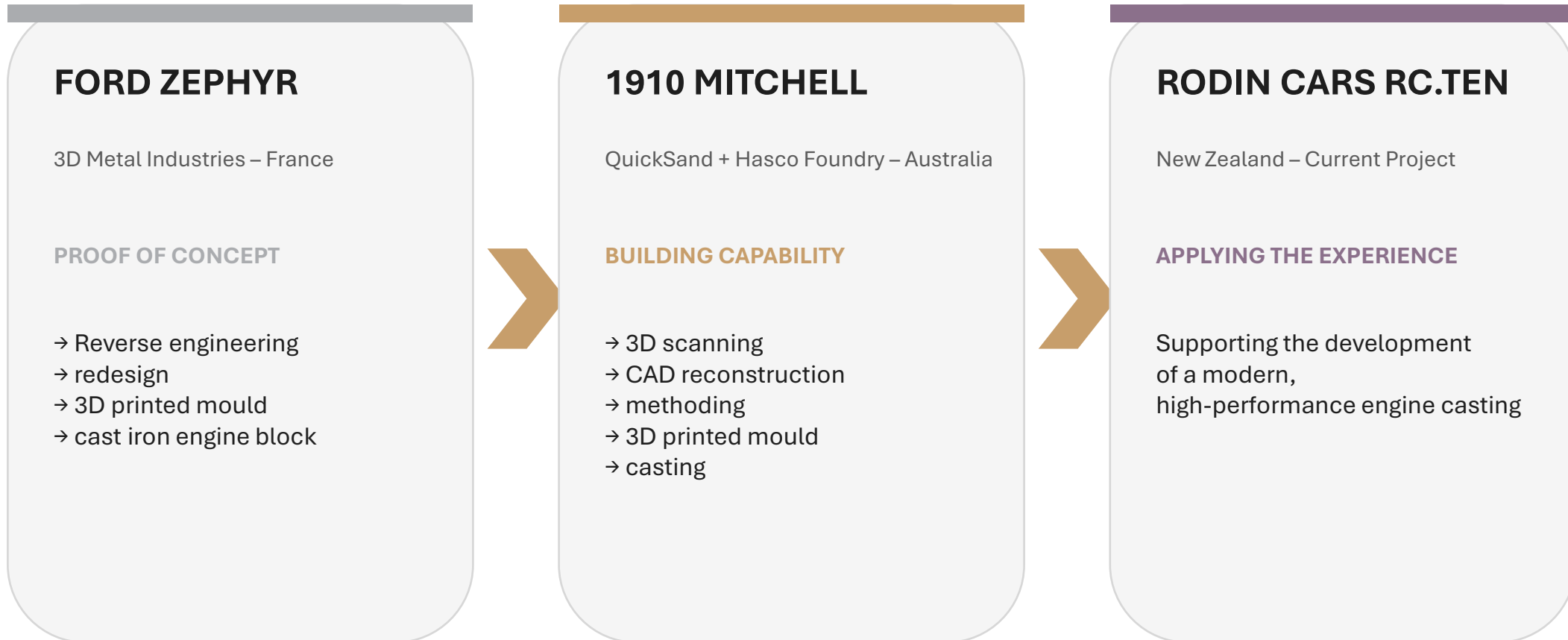
Furan mould binder

**33 cores
9 mould sections**



From Classic Engines to Modern Performance

Each project builds capability in digital casting development



Same engineering principles. Completely different applications.



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Supporting the foundry industry beyond products and equipment



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Questions ?

Thank you for your attention

