

Multi Material Lightweight Vehicle (**MMLV**)

Cosma International, the metalforming group of **Magna**, in cooperation with **Ford Motor Company** and the **US Department of Energy**, has developed a multi-material lightweight vehicle concept that effectively achieves a 23.3% weight reduction compared to the current production Ford Fusion.

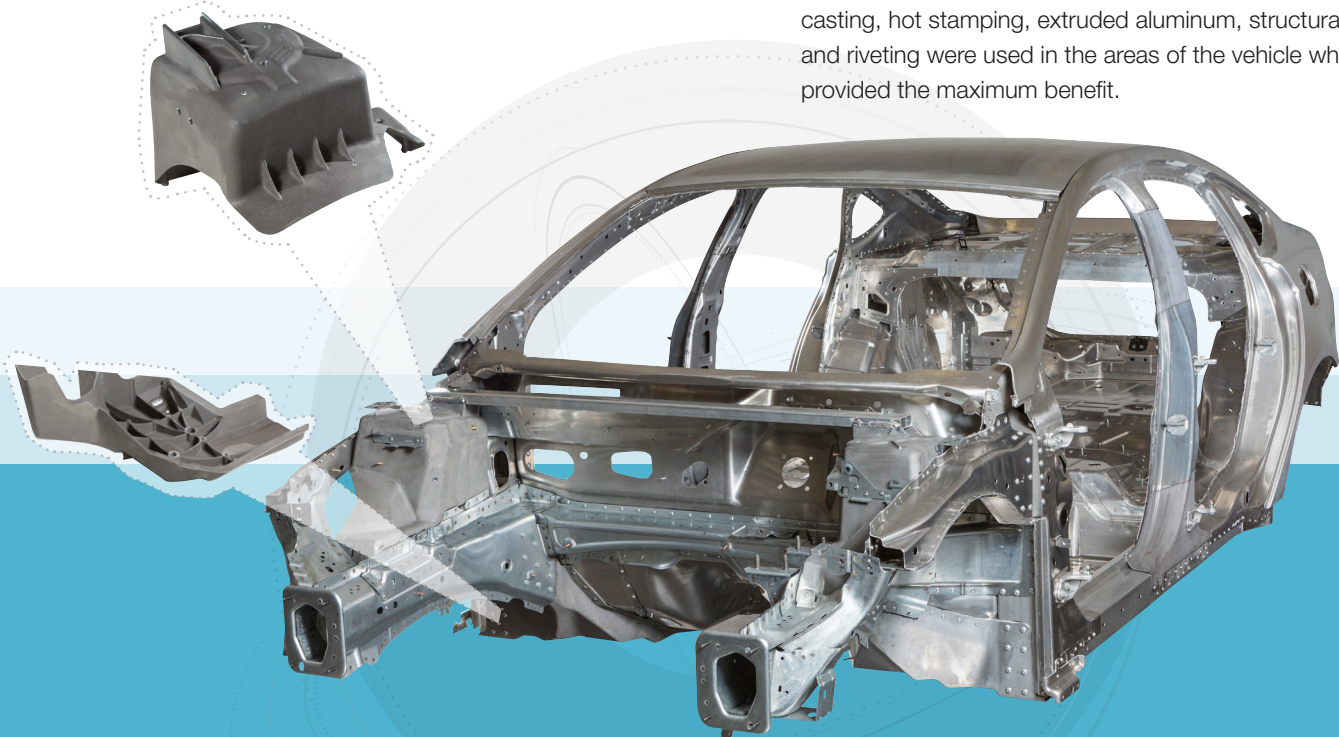
Engineering

Cosma reengineered the body-in-white, closures and chassis structure incorporating new joining technologies and an optimal mix of materials including several grades of wrought and cast aluminum, magnesium, and high strength steels. Vehicle performance parameters, durability, and safety of the production vehicle were maintained.

Prototype

Once the vehicle design was complete, **Cosma** fully prototyped and built eight complete and drivable vehicles to be crashed and tested. Production intent materials and processes were used to ensure these lightweight concepts would meet the standards required for future high volume production.

Innovative processes such as high pressure vacuum die casting, hot stamping, extruded aluminum, structural adhesive, and riveting were used in the areas of the vehicle where they provided the maximum benefit.



Concept and design become reality.

Test / Validate

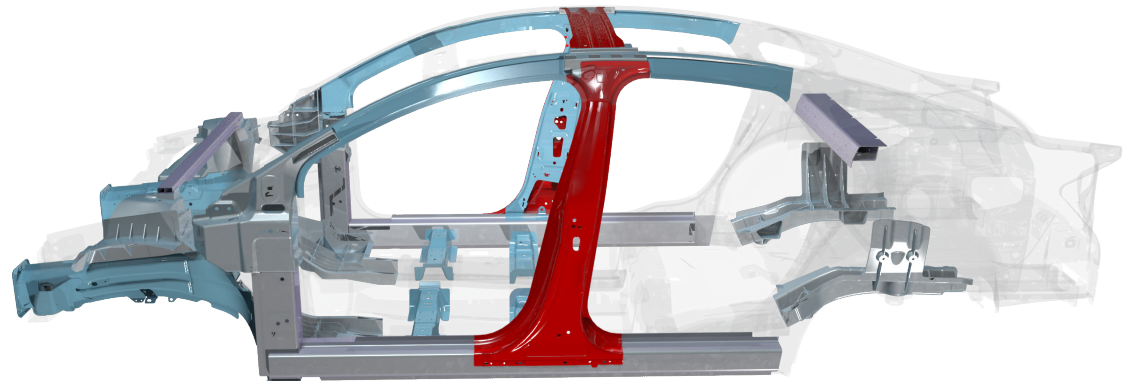
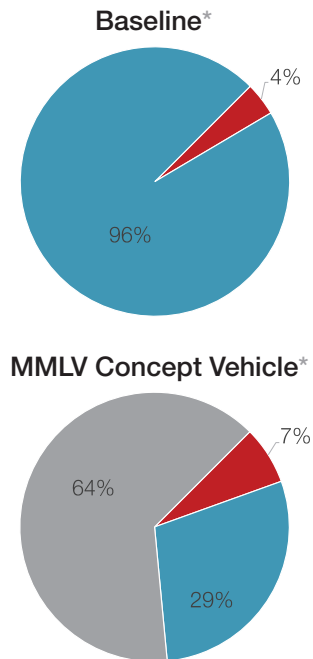
Going beyond design and build, **Cosma** participated in all aspects of vehicle testing, no different than any production intent vehicle. All crash, durability, and performance testing results met or exceeded expectations. Concept and design become reality.

Summary

The substantial environmental and fuel economy benefits gained by taking this initiative into future production programs would be impactful on a global scale. Through the strong partnership between **Cosma**, **Ford**, and the **DOE**, it has been demonstrated and proven that effective lightweight alternatives exist today.

The MMLV points the way to a more sustainable future. We at Magna are working diligently to make these lightweight technologies affordable for high volume production.

Swamy Kotagiri, Chief Technology Officer, Magna



● Steel ● Aluminum ● Hot Stamping

*Body-in-white only

Weight Save Compared to 2013 Fusion 23.3%



| Vehicle Subsystem | 2013 Fusion (kg) | MMLV Mach I (kg) | Mass Reduction (kg) |
|-----------------------------------|------------------|------------------|---------------------|
| Body Exterior and Closures | 594 | 456 | 138 |
| Powertrain | 340 | 267 | 73 |
| Chassis | 350 | 252 | 97 |
| Body Interior and Climate Control | 206 | 161 | 45 |
| Electrical | 69 | 59 | 10 |
| Total Vehicle | 1559 | 1195 | 363 |

16% reduction in global warming potential and total primary energy.

Greener.



Lighter.



For more information contact: MMLV@magna.com

