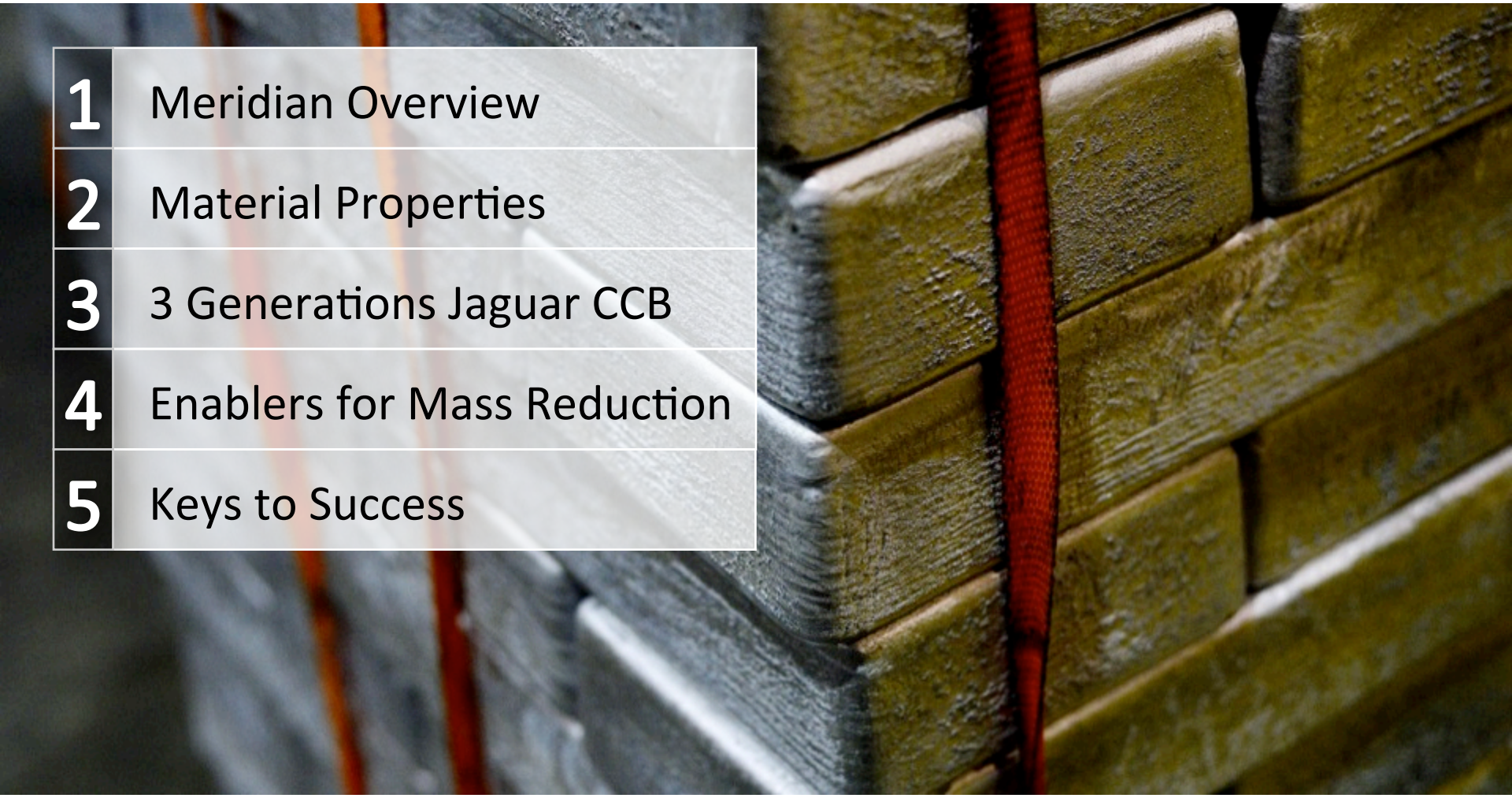
Meridian 萬豐·鎂瑞丁

The light weight heavyweight™

GALM 5th Annual GLOBAL AUTOMOTIVE LIGHTWEIGHT MATERIALS 2016
High Volume Multi-Material Supply, Design & Engineering EUROPE

Magnesium Cross Car Beam – 3 Generations

IMPROVING THE FUEL ECONOMY OF OUR AUTOMOBILES



1. Meridian Overview
2. Material Properties
3. 3 Generations Jaguar CCB
4. Enablers for Mass Reduction
5. Keys to Success

We Are The Lightweight Heavyweight

Meridian is the leading full service supplier of innovative lightweight magnesium die cast components and assemblies in the global automotive market.

- Magnesium and Aluminum alloy casting capability
- Worlds largest producer of magnesium components
- In-house design and advanced engineering
- Die casting magnesium since 1981
- Over 1,600 dedicated employees
- 63 total die-cast machines from 500 to 4,500 tons
- 28 die cast machines 2,500 tons and over
- Secondary machining, coating, and assembly capabilities

Global Manufacturing & Customer Service Footprint

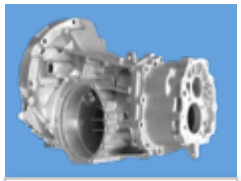
Our strategic global presence enables us to service the international needs of our automotive clients quickly and efficiently.

Product Development Timeline

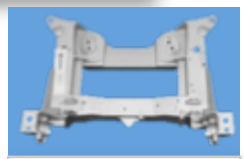

Transfer Case


Peddle Bracket


Seats


Transmission Case

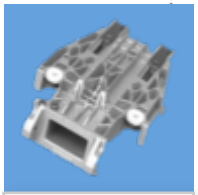

Header Bow


Engine Cradle


Steering Wheel


Liftgates

1985 | 1987 | 1990 | 1994 | 1998 | 2001 | 2003 | 2005 | 2006 | 2008 | 2009 | 2010

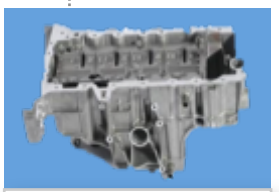

Steering Column Parts


Instrument Panels


Front of Dash


Center Console

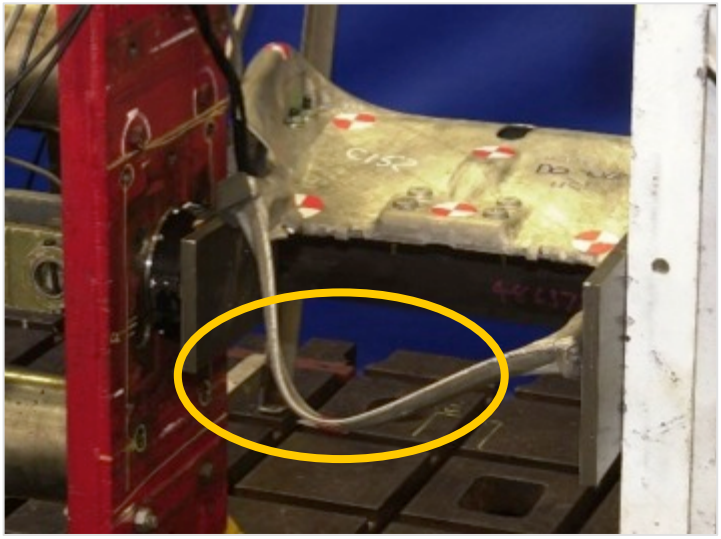

Front End Structures


Oil Pan

Material Property Comparison

Die Cast Magnesium Alloys

Lightest Structural Material	
Magnesium	1.8 g / cm³
Aluminum	2.7g / cm³
Steel	7.8g / cm³



Property	AZ91D	AM60B	AM50A
Tensile Strength (Mpa)	240	225	220
Yield Strength (Mpa)	160	130	125
Elongation (%)	3.0	6.0	8.0
Density (g/cm3)	1.81	1.80	1.77
Elastic Modulus (Gpa)	45	45	45

Benefits of Magnesium for Cross Car Beams

Why consider magnesium content for instrument panel design? Magnesium is the ideal material for applications where weight saving is a priority, as it has the lowest density of all structural metals. Almost as light in weight as plastic, magnesium has the advantage of greater strength and rigidity.

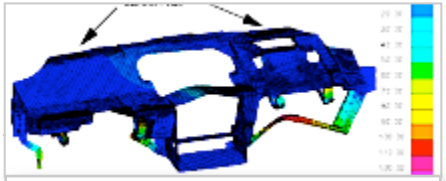
- High part complexity, low additional cost
- Part function integration to reduce or eliminate machining
- One piece designs are quieter than multi-piece designs
- Absorbs energy and reduces vibration (Crash and NVH)
- 5-6 Kg lighter than steel
- One tool, one casting, one tolerance stack
- Tunable through localized ribbing and wall stock adjustments
- Implementation ready technology
- 32 magnesium cross car beams currently in production

Cross Car Beam Development History

Jaguar Land Rover

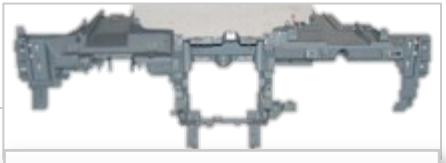
Development History

1998



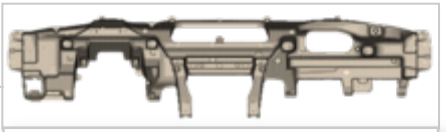
Initial development with JLR

2002



X202 XF Mg CCB Production

2008



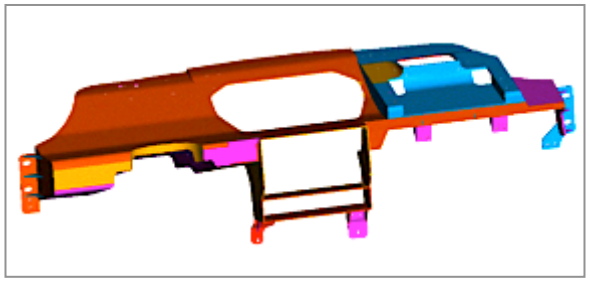
X250 Mg XF CCB Production

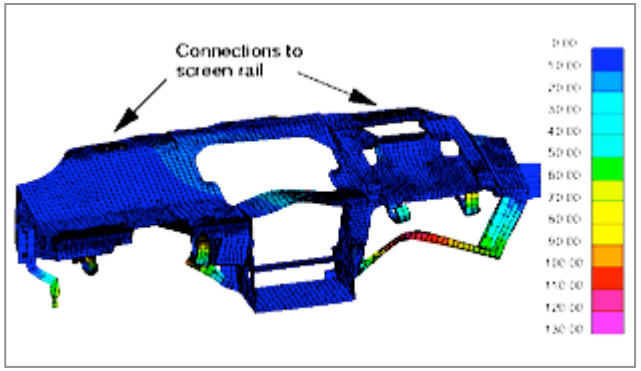
2015

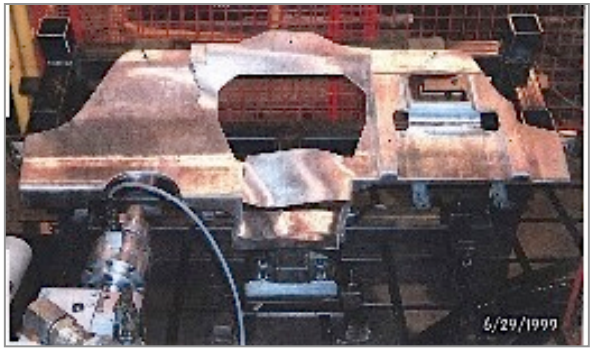
X260 XF Mg CCB Production

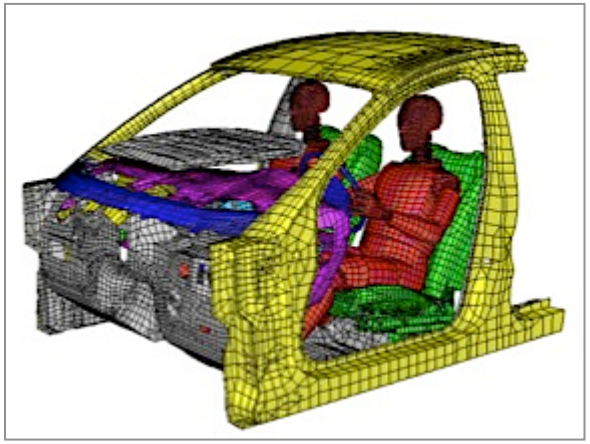
Initial Development Studies (1998)

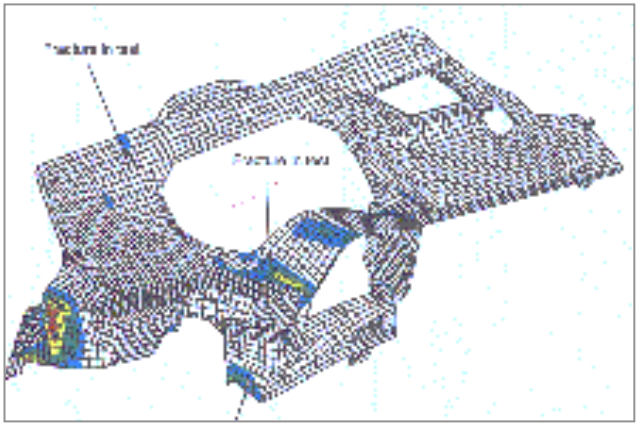
Jaguar Land Rover Cross Car Beam

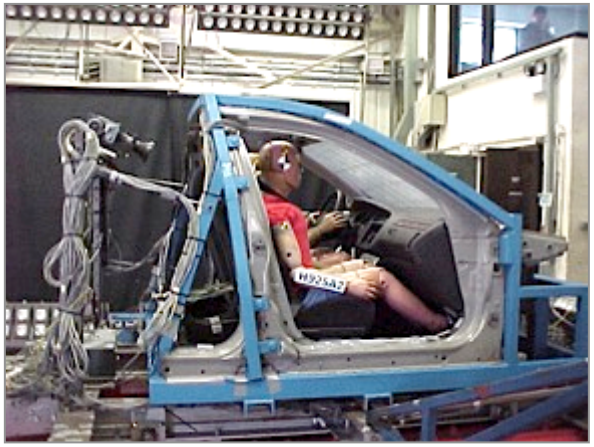










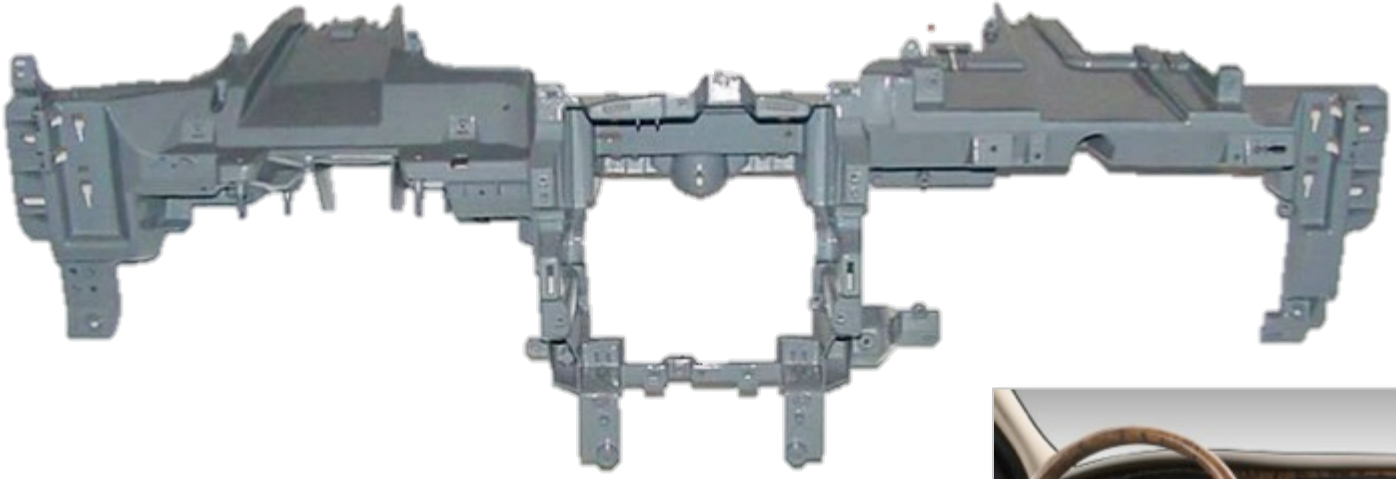


1st Generation Cross Car Beam

JAGUAR

2002-2008 Jaguar S Type X202

Part Weight: 5.2 kg
Alloy: AM60B

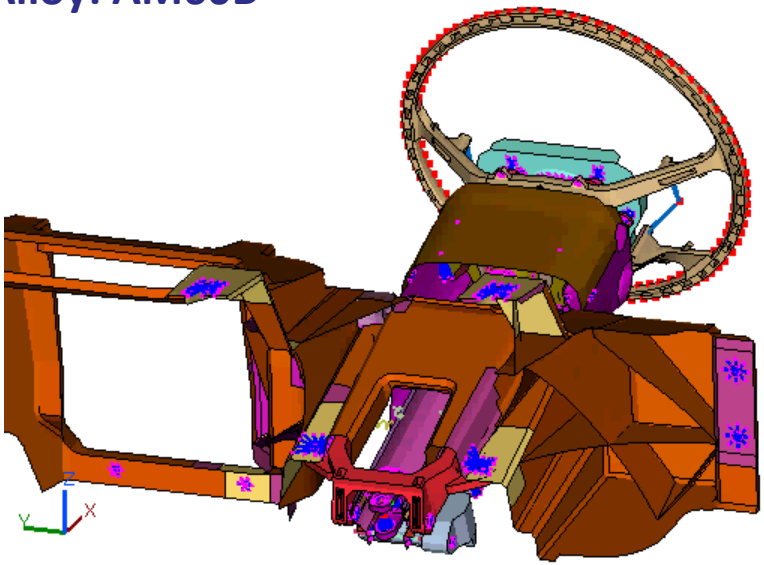


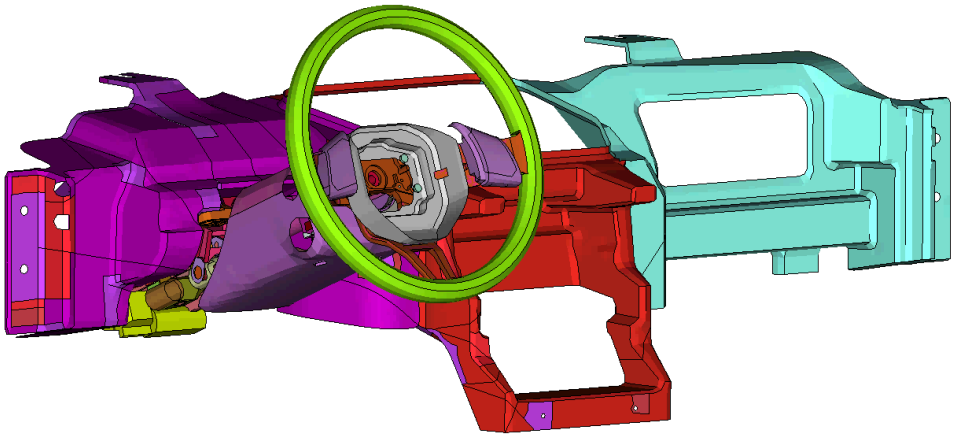
2nd Generation Cross Car Beam

JAGUAR

2007-2013 Jaguar XF X250

Part Weight: 5.7 kg
Alloy: AM60B





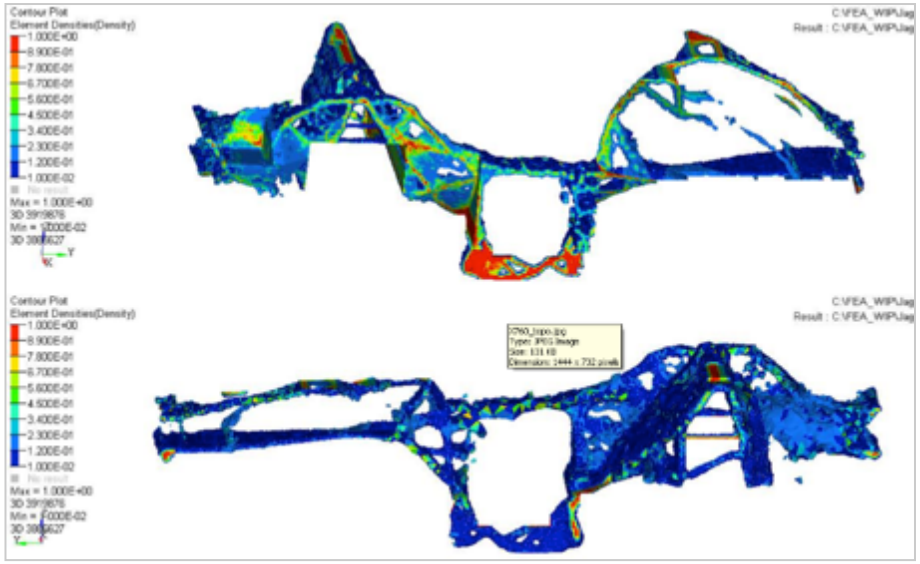
2015 Jaguar XF Cross Car Beam Development

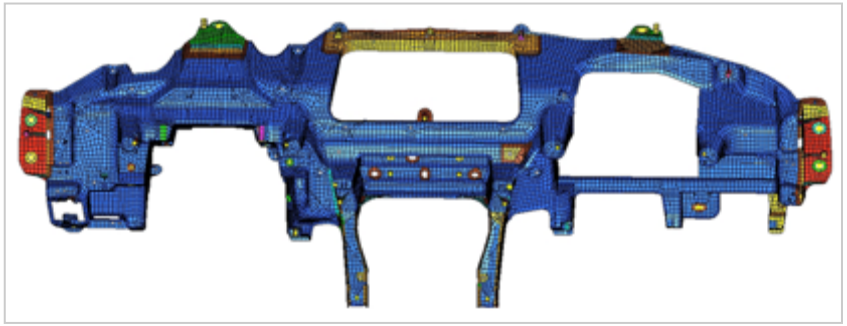
Step 1 - Benchmarking

Current Best-in-Class Around 4.0kg

2015 Jaguar XF Cross Car Beam Development

Step 2 - Optimizing Studies





Current functionality maintained

Weight Saving = 0.85kg

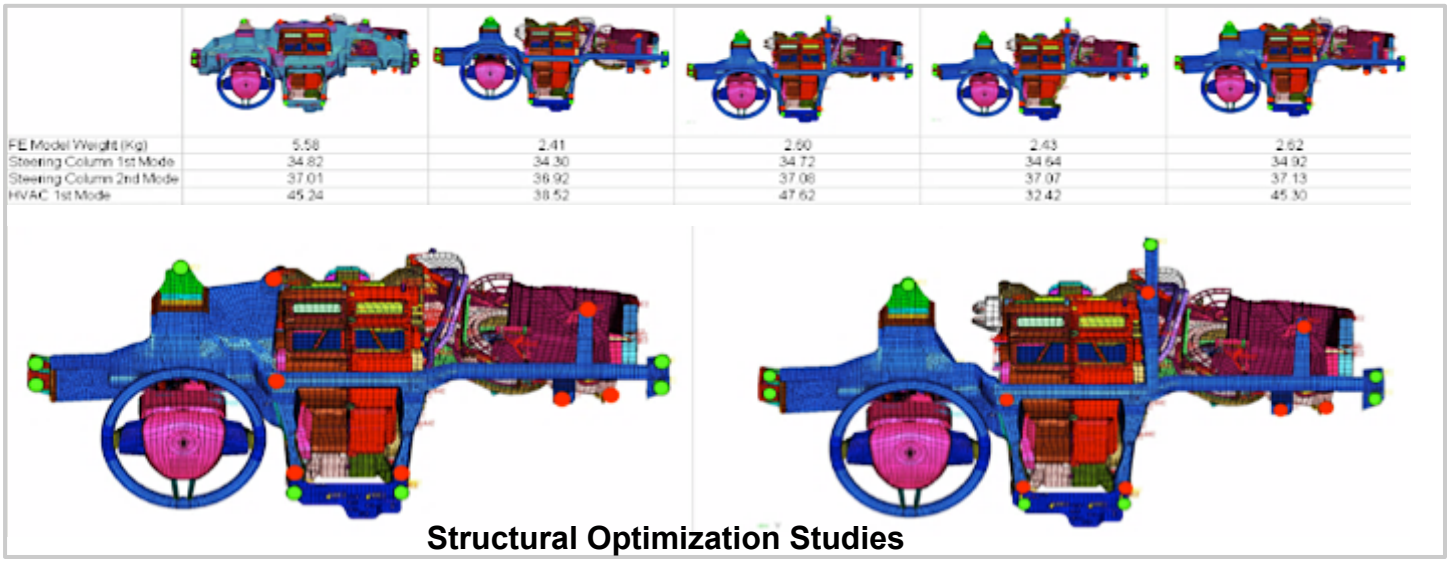
Final Weight = 4.85Kg (Current 5.7Kg)

2015 Jaguar XF Cross Car Beam Development

Step 3 – Setting Targets

Targets:

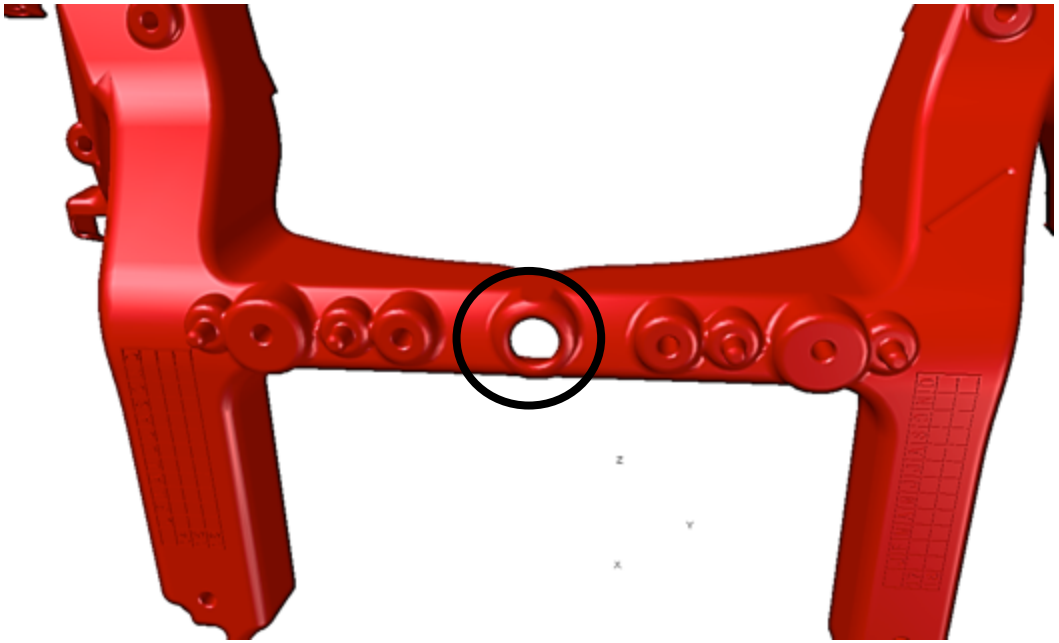
- Weight: 3.7kg – based on optimization studies
- Multi-platform design – X760 & X260
- Machining: Zero – based on business case
- Manufacturing: 2 Cavity – based on business case
- Boundary condition sensitivity analysis
- HVAC
- Steering column NVH
- HVAC NVH
- Side impact load path
- Tunnel leg traction load path



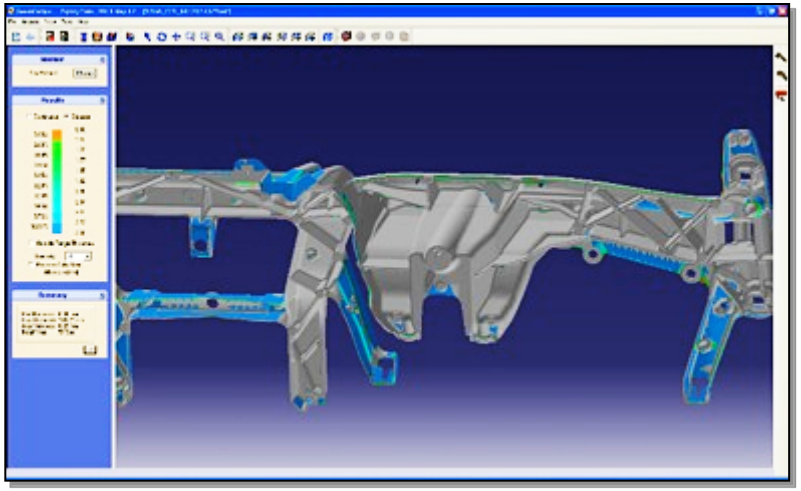
Structural Optimization Studies

2015 Jaguar XF Cross Car Beam Development

Weight Avoidance



Additional CCB “lift point alleviates the need for “unnecessary” material to meet “sag” structural requirements.



Geomcaliper Software

3rd Generation Cross Car Beam

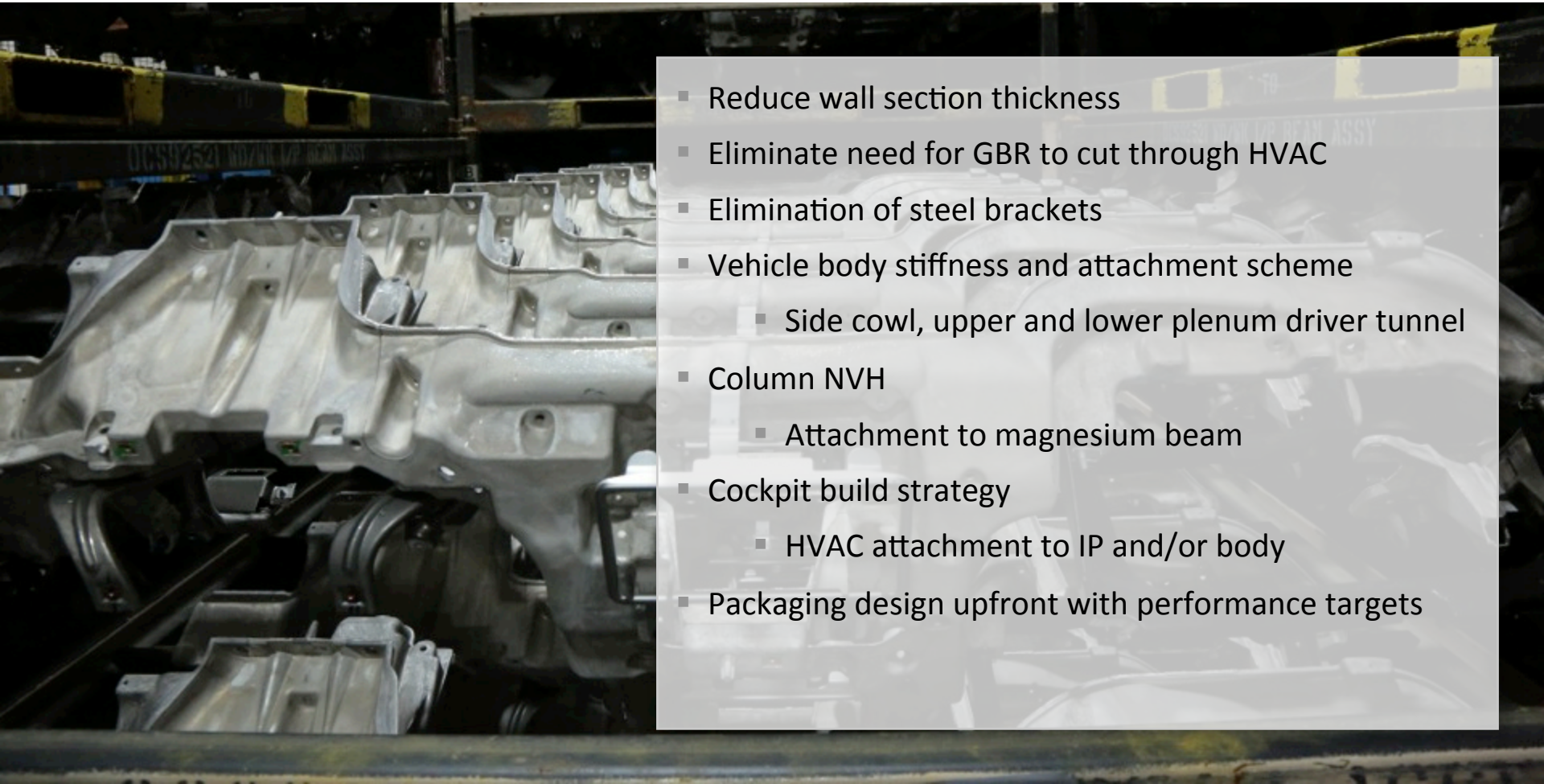
2015 X260 Jaguar XF and X760 XE

Part Weight: 3.64 kg
Alloy: AM60B

- New platform – clean sheet
- FEA technology
- FEA capability
- Aggressive biz case targets.
- Challenges from other technologies

Cross Car Beam Development

Enablers for Mass Reduction



- Reduce wall section thickness
- Eliminate need for GBR to cut through HVAC
- Elimination of steel brackets
- Vehicle body stiffness and attachment scheme
  - Side cowl, upper and lower plenum driver tunnel
- Column NVH
  - Attachment to magnesium beam
- Cockpit build strategy
  - HVAC attachment to IP and/or body
- Packaging design upfront with performance targets

Cross Car Beam Development

Keys to Success

- Experienced JLR Cross Car Beam engineer with Magnesium know-how
- Experienced supplier with design development capability with multiple OEM's
- Advancements in FEA software
- Growing experience in optimization for weight & performance
- Benchmarking and optimization studies conducted
- Realistic target weight established
- Clear vehicle architecture strategy
- Business case established at the outset
  - 3.7 kg
  - No Machining
  - 2 cavity tooling
- Release Engineer managing the weight and machining content


Meridian
萬豐·鎂瑞丁
Let it be Light

Contact Information

We extend our sincere appreciation to you for taking the time to learn about our company and the services we provide. We welcome the opportunity to discuss future business opportunities and relationships, please contact us to learn more.

Herbert Fackler

Advanced Engineering Manager Europe

Address: Meridian Lightweight Technologies Deutschland GmbH
Leopoldstrasse 244
80807 Muenchen
Germany

Email: hfackler@meridian-mag.com

Phone: +49 172 6102786

Thank you for your time.
For more information, please visit www.meridian-mag.com