



*USAMP MMV 701 – Multi-Materials Vehicle  
R&D Initiative*



# *MMV 701 – Multi-Materials Vehicle R&D Initiative (MMV R&D)*

**USAMP  
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## *MMV R&D Initiative - Vision*

- A **USAMP** umbrella focal project, supporting FreedomCAR goals and timeline, investigating vehicle weight reduction opportunities and issues associated with incorporating multiple materials in multiple locations.
- MMV emphasizes ***design, joining, corrosion, energy management, manufacturing processes, and other technologies*** that facilitate mixed material systems that support delivery of FreedomCAR goals by 2015.
- **KEY METRICS:**
  - **50%** mass savings at vehicle level
  - Cost implications to vehicle quantified
  - Ongoing component/sub-system demonstrations (as appropriate)
  - First Focal Project integrated substructures by 2010

## *MMV R&D- The Business Challenge*

- ❑ **Developing lightweight materials technologies for cost-effective, implementation in vehicles that meet consumers' needs and the FreedomCar goals.**

## *MMV R&D- 2007 Technical Objectives*

- ❑ **Align three “Seed Projects” to baseline MMV vehicle**
- ❑ **Share baseline design, CAE, cost and weight information**
- ❑ **Achieve efficiencies on cost model, CAE, etc.**
  - **ACC Composite Underbody**
  - **USAMP Magnesium Front End**
  - **A/SP Future Generation Passenger Compartment**

## *MMV R&D – Attributes & Guiding Principles*

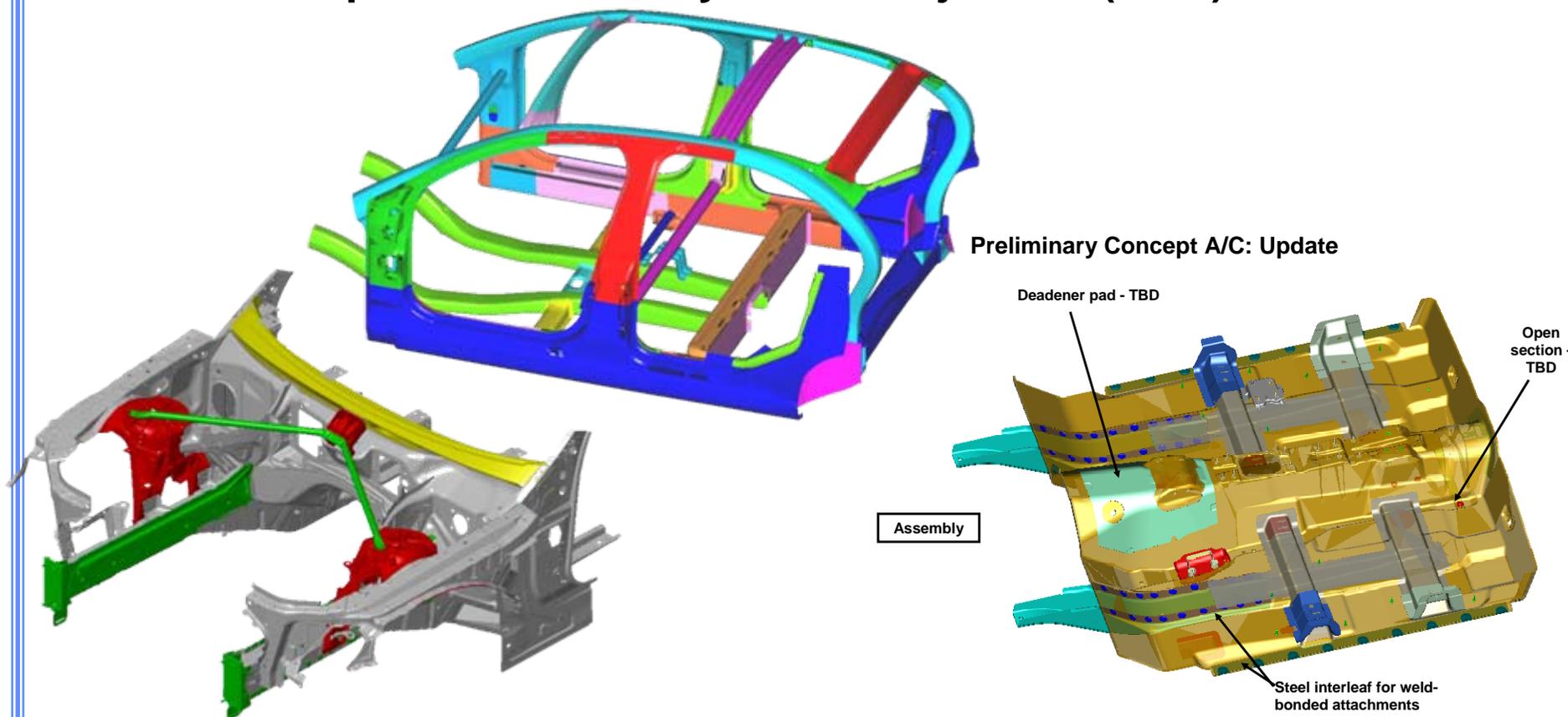
- ❑ Synergistically supports FreedomCAR 2015 goal of 50% weight-save (total vehicle) by using lightweight materials, and drives affordability.
- ❑ Provides a framework for efficient, coordinated decision-making for development of advanced technologies associated with MMV that can be aligned for vehicle production in 2018 of 100+k units/year.
- ❑ Focuses on integration of lightweight materials technologies intended for discrete parts and sub-assemblies [vs. “bulk” materials issues that are addressed by other USAMP groups (ACC, AMD, A/SP, NDE)].
- ❑ Facilitates an evolutionary vehicle architecture that can accommodate future alternative energy powertrains, and exploits opportunities for secondary weight savings.
- ❑ Uses demonstrations of selected components (NOT full vehicles) to move proven ideas back to OEMs’ commercial levels

## *MMV R&D Strategy*

- Achieve consensus USAMP OEM vision**
- Select donor vehicle architecture(s)**
- Focus initially on core technology ‘Seed’ projects**
- Identify technology gaps**
- Build on common interfaces**
- Set MMV ground rules, short-term goals & collaboration metrics/milestones**
- Communicate program with stakeholders**
- Outreach via USAMP groups to suppliers, national labs, and academia concerning unmet needs**
- Review MMV progress annually**

## Multi Materials Vehicle “Seed” Design Projects

- ❑ Magnesium Front End (AMD)
- ❑ Next Generation Passenger Compartment (A/SP)
- ❑ Composite Underbody Focal Project #4 (ACC)



## *MMV Spec Sets Consistent Functional Targets*

- Applicable to all three MMV “seed” or “focus” design projects**
- Based on donor vehicle performance and anticipated federal requirements**
- Functional targets address:**
  - Structural performance (stiffness, frequencies, mode shapes)
  - Safety (front, side, rear, roof, restraints, retention, bumper)
  - Manufacturability (cycle time, paint, repair)
  - Durability and target Life
  - Ride and Handling
  - Towing and Trailer

## *MMV Summary & Status (Through 12/31/2007)*

- Selected a baseline common donor vehicle based on GM large rear wheel drive platform (July 2006)
- Developed a consensus technical specification (September 2006)
- Instituted key mechanisms for consistent project comparisons
- Began tracking design & compliance of MMV “seed” project developments to the MMV specifications
  - Matrix identifies design- & performance- Critical load cases critical for vehicle performance modeling prior to module “design freeze”
  - Matrix is maintained by Multimatic, updated regularly by MMV Team

## *MMV Summary & Status (Through 12/31/2007)*

### **Began baseline donor vehicle assembly cost model**

- Focus on vehicle systems cost model via subject matter experts
- Inputs on Bill of Process and Bill of Materials are channeled from GM through Multimatic to Camanoe Associates

### **Approved project for “Multi-Material Metallurgical Bond Joining to Steel”**

- Utilizes new technology to metallurgically bond aluminum and/or magnesium to steel during “insert” casting process
- Official kick off December 18, 2007

## *MMV R&D - Future Plans*

- ❑ **Anticipate & Address Seed Project Data Needs for MMV Vendors**
  - Full-Vehicle performance modeling studies (vs. MMV Tech Spec)
  - Baseline donor vehicle manufacturing cost model development
- ❑ **Identify Gaps, Communicate MMV Priority Areas Across USAMP**
  - Work with 3 'Seed' project leaders and lead design vendors
- ❑ **Expand MMV Research Projects (Subject to New Funding):**
  - New multi-material joining & integration projects
  - Clean-sheet vehicle design/architecture configuration studies
  - Address vehicle interiors and alternative powertrains
  - Support development of design guide tool and database for Multi-Material Vehicle incorporating lightweight materials