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Ensuring the Safety of Future PCIVs Paper 09-0316

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Congressional Guidance for PCIV Safety Research 2006-09

- **ESV** 2009
- The Committee recognizes the development of plastics and polymer-based composites in the automotive industry and the important role these technologies play in improving and enabling automobile performance.
- [Conduct] research into the possible safety benefits of lightweight plastics and composite intensive vehicles (PCIV) and to help facilitate a foundation of cooperation between DOT, the Department of Energy, and industry stakeholders for the development of safety-centered approaches for future lightweight automotive design."

Congressional Funding History

- Congressional funding levels for NHTSA PCIV safety research have been modest:
 - FY06: \$248K
 - FY07: \$250K
 - FY08: \$292K
 - FY09: \$475K (Pending)

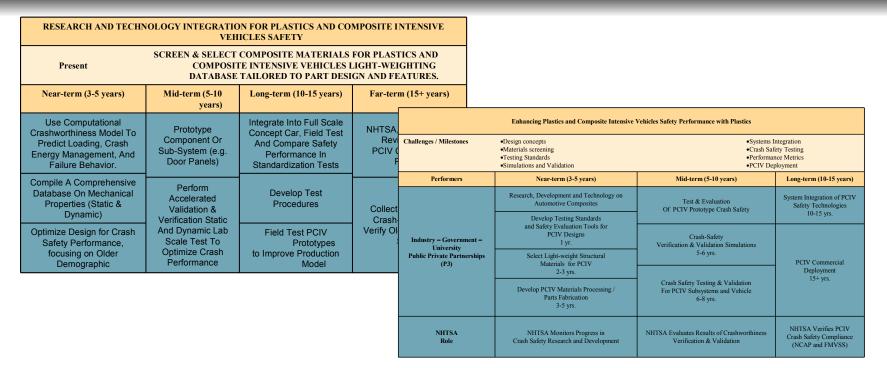
Accomplishments to date

- Surveyed Subject Matter Experts on: crash safety, advanced composite materials, and simulation tools
- Developed 2020 PCIV Safety Vision
- Identified and prioritized:
 - Barriers to/opportunities for PCIV development
 - R&D needs, gaps, collaboration opportunities
- Developed a safety-centered PCIV Safety R&D Roadmap to 2020 to complement industry plan
- Conducted August 2008 workshop to refine nearterm safety R&D priorities

Vision For PCIV Safety in 2020

"NHTSA, in partnership with Federal agencies, industry, and academia, will support research on safety-centered design and performance modeling and validation to enable and foster superior, integrated safety performance of future light-weight Plastics and Composite Intensive Vehicles (PCIVs)."

PCIV Safety Research Roadmap



PCIV Roadmap Report is available at www.volpe.dot.gov/library/published/4680pciv_s afetyroadmap-nov2007.pdf

August 2008 PCIV Safety Workshop: Knowledge Gaps and Research Priorities

- Monitor ongoing efforts to analyze and predict crash failure of composite materials and structures
- Develop relevant testing standards (CMH-17, SAE, ASTM)
- Develop and refine predictive tools for:
 - Structural characterization of advanced materials
 - Multi-scale damage characterization
 - Failure predictions
 - Crash energy absorption of component and vehicle structures
- Workshop prospectus, agenda, presentations, and summary are posted at <u>http://www.volpe.dot.gov/safety/pciv/index.html</u>

Research Collaboration for PCIV Safety

- NHTSA Vehicle Safety Research:
 - Program Managers: Stephen Summers/Sanjay Patel
 - USDOT/RITA Volpe Center: Aviva Brecher (Principal Investigator), John Brewer, Samuel Toma
 - Related NHTSA Research Areas:
 - Integrated Safety Research
 - CAFE Fuel Efficiency Regulations
 - Safety R&D (e.g. H₂ and other advanced vehicles)
- American Chemistry Council Plastics Division (ACC-PD):
 - 2002 Technology Integration Roadmap
 - 2006 Workshop ("Enhancing Automotive Safety With Plastics")
 - 2008 Updated Roadmap Development
- DOE/USCAR FreedomCar Partnership: R&D Consortia for Automotive Lightweighting Materials
- Standards Developing Organizations (SAE, CMH-17/ASTM)
- University Centers of Excellence

Current PCIV Safety Project Tasks

- Partner with the automotive industry: Continue collaboration with the American Chemistry Council-Plastics Division (ACC-PD) and DOE/USCAR consortia on crashworthiness issues
- Partner with Standards Developing Organizations: Support SAE, ASTM, and CMH-17 in developing appropriate testing standards for automotive structural plastics and composites to improve crash energy management (CEM)
- Partner with DOE on light-weighting materials R&D and crash performance models validation
- Partner with University Centers of Excellence
- Conduct pilot crash analysis on composite-body vehicles to derive safety benefits estimates

Call for International Collaboration & Coordination

- The NHTSA/Volpe approach focuses on "partnering" with stakeholders
- We are inviting collaborations to leverage modest funding:
 - Ideas for projects
 - Interest in co-funding
 - Committee participation
 - Standards development by ISO TCs, others



BACK-UP SLIDES

SAE Compressive Test Standard for Composites- A Priority Need

- The SAE High Strain Rate Plastics Consortium (HSRPC) developed "Recommended Practice J-2749 - High Strain Rate Tensile Testing of Polymers" (November 2008)
- Volpe Center seeks to leverage SAE/HSRPC experience to develop a compressive test standard relevant to crash performance
 - Would require multi-year commitment
 - May require collaborative funding (e.g., ACC-PD, DOE, NIST) for timely results

Research Project for a University Center of Excellence

- Volpe SOW: "Crash Safety Assurance Strategies for Future Plastics and Composite Intensive Vehicles (PCIV)"
- Leverages related expertise
- Procurement currently in process
 - May require multi-year funding or collaborative funding

Pilot Crash Analysis for PCIV analogs

- ESV 2009 STUTTGART
- Need to evaluate safety benefits of structural composites in real car crashes
- Compiled a list of contemporary automotive composite components and structures
- Industry and experts inputs on suitable vehicles PCIV analogs were solicited and received
- Perform relevant crash injury analysis against 3 similar vehicles for 3 model years
- Volpe Center invites industry "lessons learned"
- Volpe Center may perform this analysis with contractor support