



## ULSAB-AVC Overview

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**Ronald P. Krupitzer**  
American Iron and Steel Institute

**Climate Vision Workshop**  
Washington DC  
February 14, 2006

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## Project Phases



### ULSAB - TWO PHASES

- Concept Phase
- Validation Phase

Porsche Engineering Services, Inc. contracted to provide design and manufacturing management




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## Design Benchmarking




- Acura Legend
- BMW 5-Series
- Chevrolet Lumina
- Ford Taurus
- Honda Accord
- Lexus LS400
- Mazda 929
- Mercedes 190 E
- Toyota Cressida






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## Holistic Process Paid Dividends




- Typical part count: 200
- ULSAB part count: 158





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## Project Performance




### Validation

- Computer-aided engineering (CAE)
- Manufacturing
- Physical testing

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## Project Results



### ULSAB vs. Benchmark Average

▪ Mass	- 25%
▪ Static torsional rigidity	+ 80%
▪ Static bending rigidity	+ 52%
▪ First body structure mode	+ 58%

- Meets all mandated crash requirements
- Costs no more than other body structures in its class

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**Economic Analysis**

**RESULTS**

- ULSAB US \$947
- Reference US \$979

Sophisticated steel body structure design can achieve lightweight at no cost penalty and with potential cost savings

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**Conclusion**

**The UltraLight Steel Auto Body (ULSAB) (1998) has proven to be:**


- Lightweight
- Structurally sound
- Safe
- Executable
- Affordable



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**ULSAC - CLOSURES**

- Lightweight
  - weigh up to 32% less than average
  - weigh 10% less than best-in-class
- Structurally sound
  - meet stringent performance standards
- Manufacturable
  - use current materials and processes
- Affordable
  - all at competitive costs



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**ULSAS - SUSPENSIONS**



**LOTUS**

**MULTI-LINK**

**LOTUS UNIQUE**

**TWISTBEAM**

**STRUT & LINKS**

**DOUBLE WISHBONE**


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**ULSAS - SUSPENSIONS**

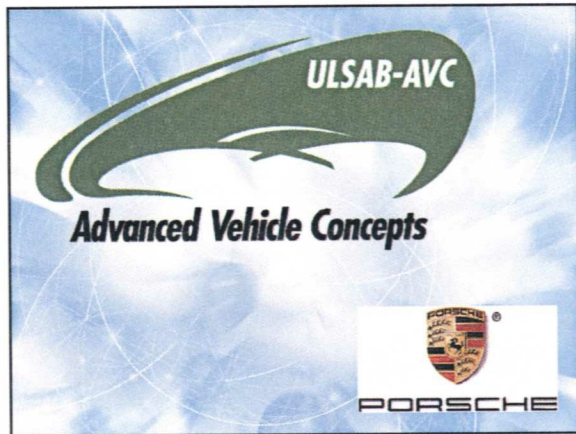
- Weight savings of up to 34 percent over current steel designs at no additional cost
- Match the mass of an aluminum system, while achieving a 30 percent cost benefit
- Performance not compromised
- Currently available steel grades and technologies are key enablers to the success of ULSAS

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**Shifting the focus.....from components  
1998-2002**



**...to overall vehicle concepts**

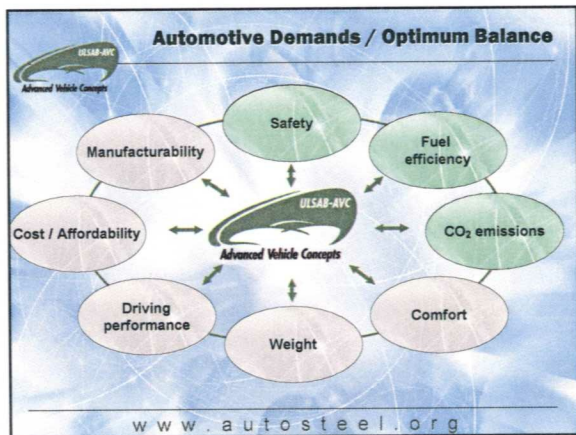


**Key Objectives**

Structural Platform For Achieving:

- Anticipated future crash safety requirements
- Improved fuel efficiency
- Optimized environmental performance
- High volume manufacture/affordable costs

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**Global Vehicle Concepts**

- Safe
- Affordable
- Fuel Efficient
- Environmentally Responsible

**PNGV-Class**

**C-Class**

- Project Drivers:
- U.S. Partnership for a New Generation of Vehicles (PNGV)
- EUCAR

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**Benchmarking**

**American PNGV Class**

❖ American midsize class

- Reference vehicles:  
Chrysler Concorde  
Ford Taurus  
GM Lumina  
(reference weight : 3,200 lb / 1,450 kg)
- PNGV target weight: 2,000 lb (corresponding to 906 kg)

❖ Fuel consumption target: 80 mpg

**PNGV prototypes**

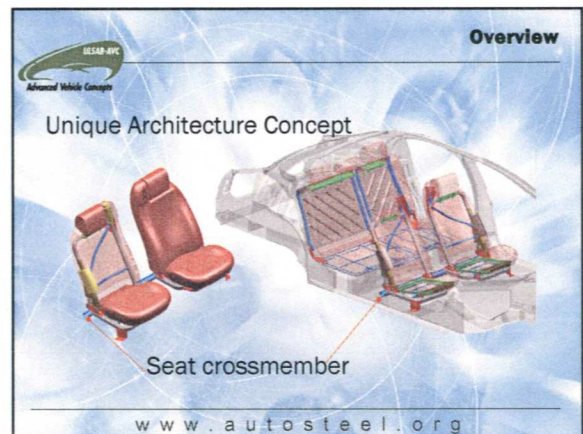
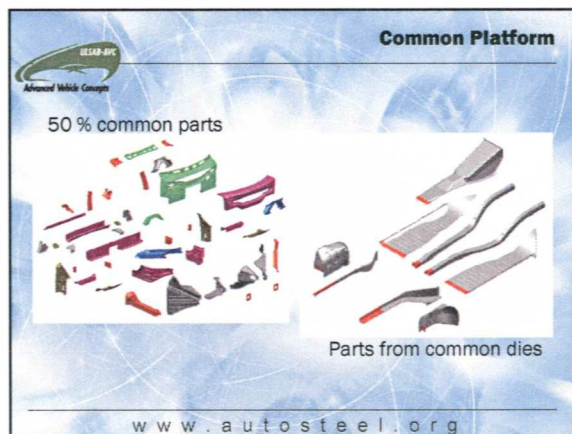
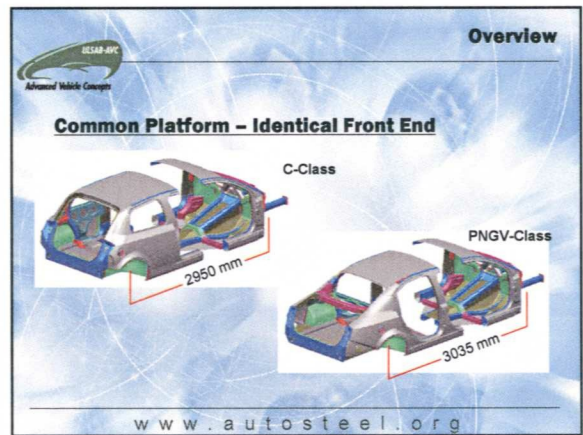
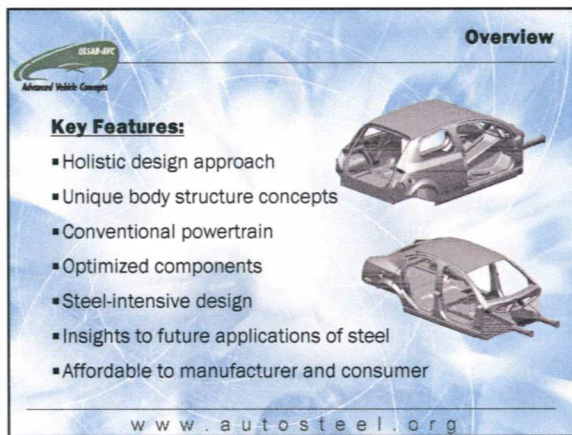
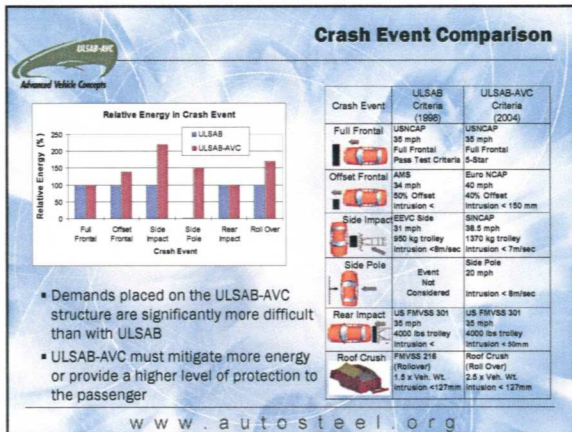
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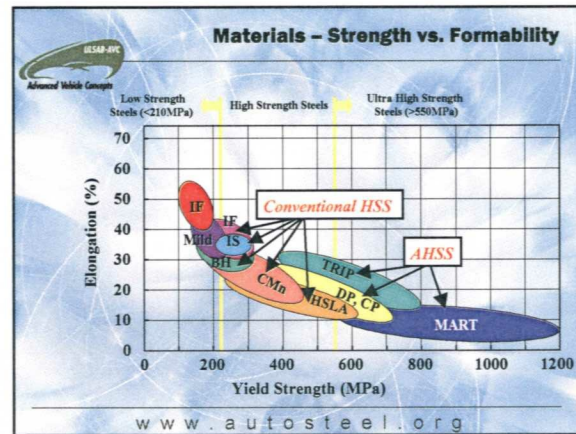
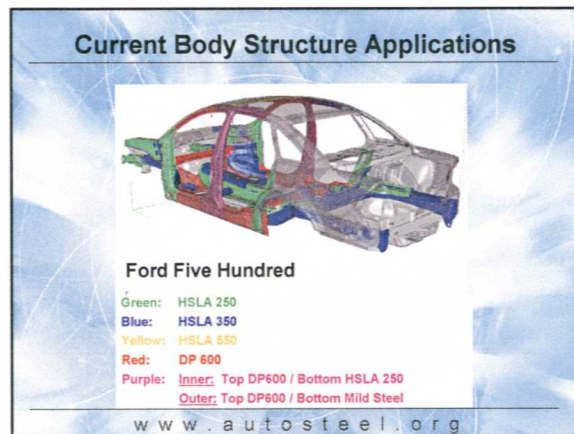
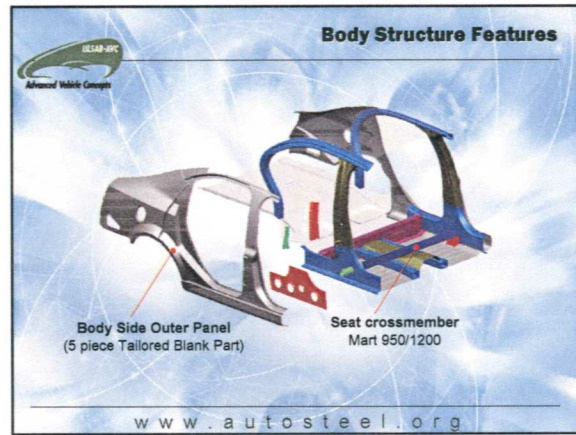
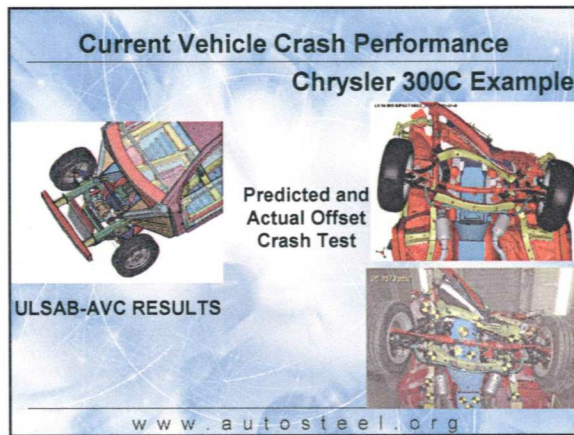
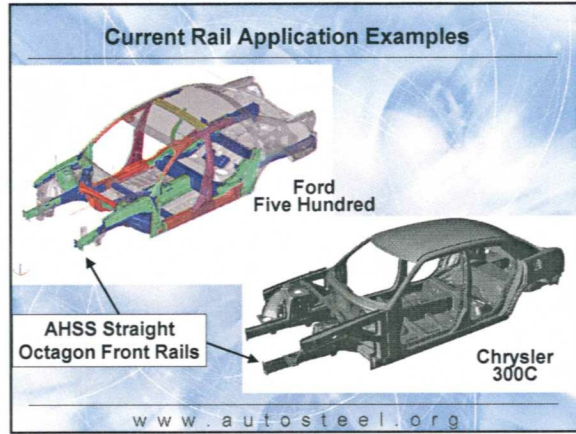
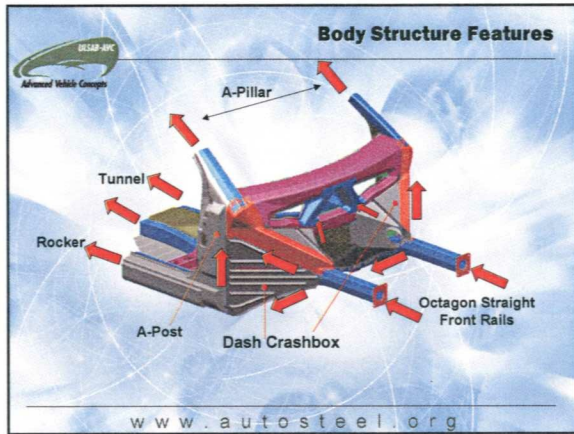
**Overview**

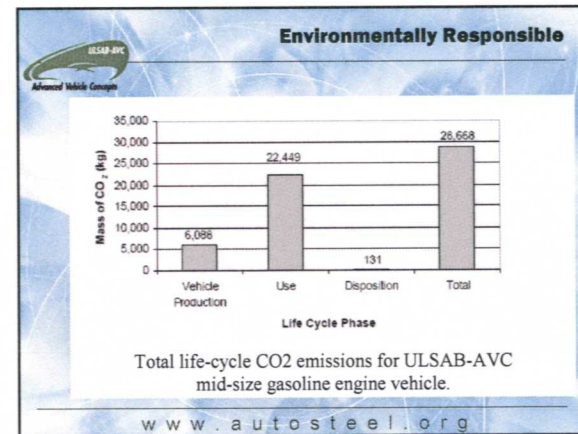
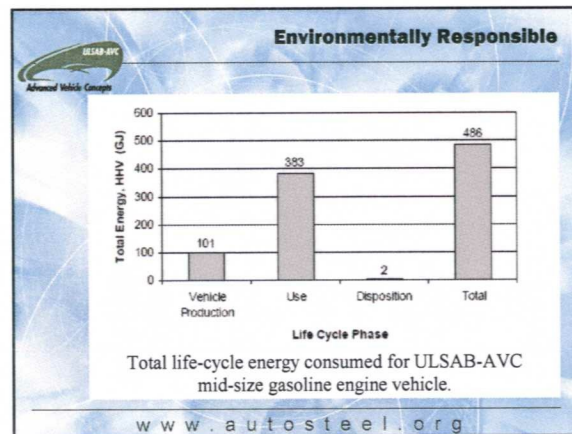
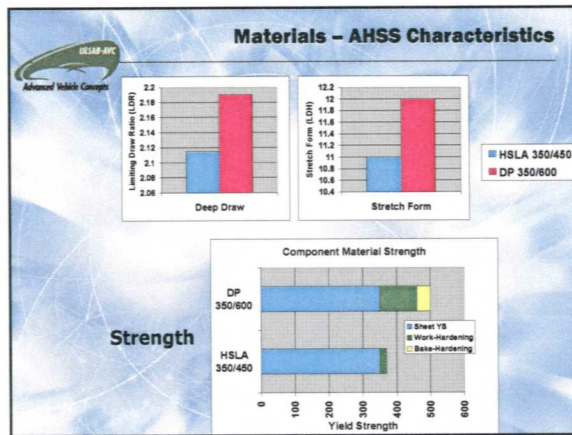
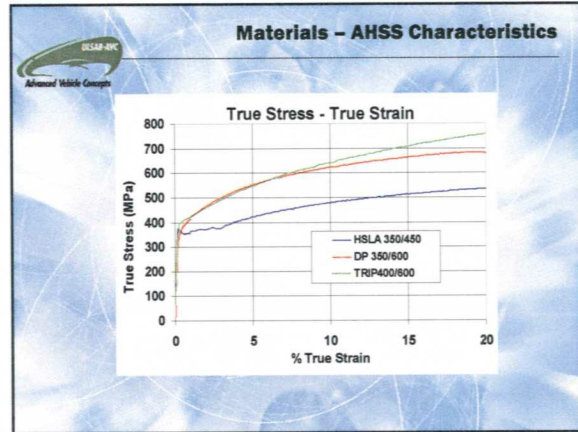
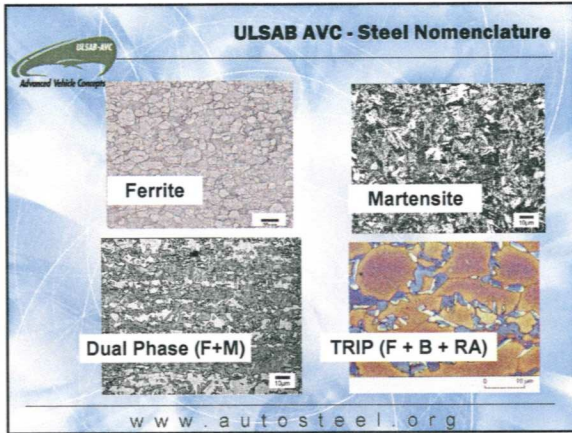
**Designed for Future Safety Requirements**

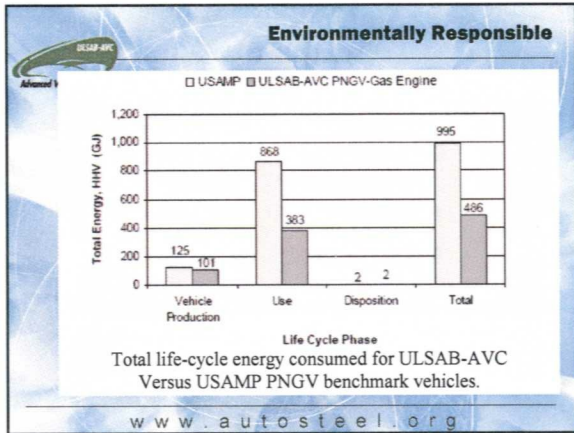
- US-NCAP 100% Frontal Crash
- Euro-NCAP 40% Offset Frontal Crash
- US-SINCAP
- Side Pole Impact
- Rear Impact
- Roof Crush/Rollover
- Low Speed Front Impact

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**S** High Star-Rating Potential ★★★★★

**A** Manufacturing Costs: \$9,200 to \$10,200

**F** Fuel Consumption: 3.2 - 4.5 L/100 km  
52 - 72 mpg

**E** Environment: 86 -108 g/km CO<sub>2</sub>

with **STEEL**

