Light-weight metal-monocoque vehicle body

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Vehicles of the German Aerospace Center?

- Lunar rover
- Aircraft for flight testing
DLR Institute of Vehicle Concepts

Lightweight & Hybrid Design Methods

- Development of resource-efficient, novel vehicles
- Safe, light and cost-effective vehicle concepts
- Adaptation to alternative drive train concepts
Lightweight & Hybrid Design Methods
Passive safety / crash simulation and testing
Motivation for the metal monocoque body
Politics, Society / Environment und legislation

- Shortage of resources
- Climate change
- Population and mobility growth
- Decrease of consumption and emissions
- Increasing demand for more efficient mobility

Source: wanttoknowaboutindia.blogspot.com/2011/04/car...
Potential car buyers in India

Income pyramid - India [Mio households]

67% increase in the population of potential car buyers projected by FY 2014

Source: NCAER, Tata Strategic & Roland Berger analysis
Metal monocoque development

- Very low weight
- High crashworthiness
- Low investment costs
- Low initial requirements for production facilities
- Use of conventional materials (no CFRP)
- Construction method similar to a race car
# Possible positioning of drive train components

(example: fuel cell drive train)

1. fuel cell
2. fuel cell control module
3. ECU for electric motor
4. ECU for lighting
5. ECU for cooling
6. cooling module
7. air supply module
8. $\text{H}_2$-storage
9. batteries
10. $\text{H}_2$-supply-module
Modular body shell

- Plastic body shell, similar to race-cars
- Underlying structure can be optimised to crash loads, no need to compromise with aerodynamics or design
- Outer shell can easily be modified without the need of changing the structure
Crash-Simulation, example 1

- Damage tolerant crash-behaviour, even when overloaded, little tendency for catastrophic collapse
- Weight of the body in white approx. 80 kg
Crash-Simulation, example 2

- Good overall crash behaviour under highly concentrated loads
- Low intrusion, no collapse
Assembly and manufacture

- Part count around 40-50 parts vs. 200-300 parts in a conventional car body

- Simply shaped parts -> low costs for tooling and machinery

- Parts are made of aluminium sheets instead of expensive CFRP

- Mostly cold joining methods
Target group:

- OEMs wishing to expand their portfolio
- Component manufacturers wishing to produce an entire vehicle
- Automotive suppliers
- Companies with experience in the production of structural components that wish to enter the automotive market

Cooperation opportunities:

- Technology transfer through pilot-project for the Indian market by DLR
- Licensing of the vehicle structure and the manufacturing process
German High Tech Champion 2012

Thank you for your attention!

Knowledge for Tomorrow