STRUCTURES

LS-DYNA Models

Ansys LS-DYNA — the most used explicit simulation program — offers a wide range of dummy, barrier and tire models for automotive collision testing. Featuring a vast array of capabilities to simulate extreme deformation problems using its explicit solver, LS-DYNA enables you to model material failure and analyze how the failure progresses through a part or system.

LS-DYNA models are available free of charge to current licensees and are provided in unencrypted, fully accessible formats and include a manual.

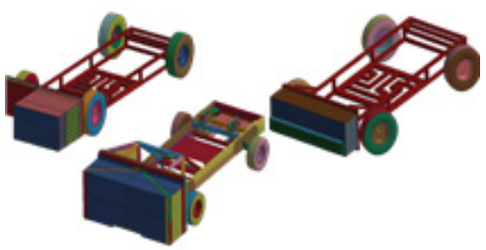
Barrier Models

- Barrier models for most Federal Motor Vehicle Safety Standards (FMVSS) test scenarios.
- Additional barriers are available to go beyond FMVSS requirements.
- Models are validated with publicly available data and proprietary tests obtained from customers.
- Solid and shell mesh models of most barriers are available.

Dummy Models

- Dummy models cover most automotive regulations.
- Models are validated with publicly available data and proprietary tests obtained from customers.
- Coarse and detailed mesh models are available.

(left to right) Hybrid III 50th male, Hybrid III 5th female and WorldSID 50th are commonly used dummy models.



A look at barrier models — (left to right) Mobile Progressive Deformable Barrier, Oblique/Small Overlap Moving Deformable Barrier and FMVSS 214 Barrier.

Other dummy models include Free Motion Headform (left) and Hybrid III 6-year-old (right).

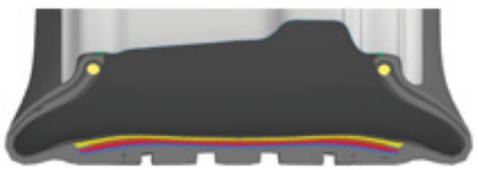
/ Tire Models:

- Jointly developed with Fiat Chrysler Automobiles (FCA) and based on a series of material, verification and component-level tests.
- Finite element mesh developed based on 2D CAD data included in the tire section
- Different tire sizes were developed using geometrical resizing of the reference tire
- Air loss modeled using a combination of sensors and porosity and venting
- 240,000 hexahedron solid elements formulation
- Inflation based on AIRBAG_HYBRID
- Deflation based on sensor to triggering leakage
- Plug and play with no additional contacts when using in vehicle
- Elastomer modeling using MAT_SIMPLIFIED_RUBBER with rate dependency
- Ply modeling using MAT_ORTHOTROPIC_ELASTIC
- Wheel mounting modeling using LOAD_THERMAL_VARIABLE

In the small-overlap load case, the tire plays a significant role during the early stages of impact. Tire compression and subsequent deflation (shown here) are represented in a full 3D stress state.

The new solid tire model improves the predictive capability due to its accurate discretization, material properties and pressure-based interface with the wheel.

The right image displays the tire section during the maximum compression. LS-DYNA's superior material properties and contact-impact using segment-based contact was key in simulating this event.



A look at the sectional view of the tire in a component simulation used for validating the tire's pressure and stiffness. The dark and light grey components represent the homogenous elastomeric parts such as tread, sidewall, etc. The red and yellow parts represent the orthotropic plies.

An example of the library of tire models currently available. Based on several experiments, tires of same size but from different manufacturers displayed similar stiffness. This was also reflected by tires of different sizes and from different manufacturers. This data was used to geometrically morph a single validated tire (above, with blue digits) to generate tires of other sizes.