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CORE TEAM AND PROGRAMME HEADS

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GOVERNANCE STRUCTURE AND ORGANIZATION

The centre is governed by
- Centre Board (representation from industry and research partners)
- Scientific Advisory Board of international experts
- Centre Management
- Research programmes Management

Budget
- The centre budget is NOK 27 millions annually over 8 years including the Research Council of Norway funding of NOK 10 millions annually

The Centre organization will comprise
- 20 man-years from scientists from NTNU, SINTEF and partners
- 7 Professors at NTNU will work part-time in the Centre
- 10 PhD students over a period of 8 years
- Scientists from cooperating universities

NTNU serves as host institution. The Centre hub is located at the Department of Structural Engineering, NTNU.

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Industrial partners

Audi · BMW · Renault · Hydro · Statens vegvesen · Forsvarsbygg

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Structural Impact Laboratory (SIMLab)

sfi Centre for Research-based Innovation

Established by the Research Council of Norway

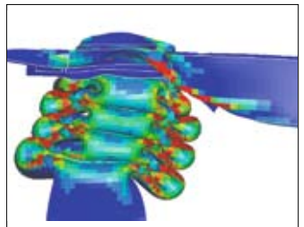
NTNU

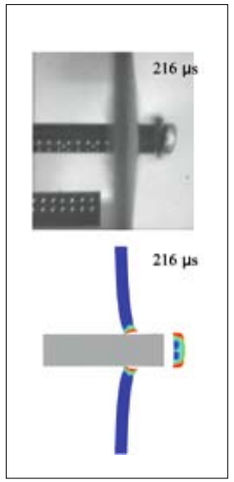
SINTEF

NTNU and SINTEF in cooperation with Hydro Aluminium, Audi, BMW, Renault, Norwegian Defence Estates Agency, Norwegian Public Roads Administration and the Research Council of Norway.

VISION Our vision is to establish SIMLab as a world leading research centre on design of **Crashworthy and Protective Structures**

OBJECTIVE To provide a technology platform for development of safe and cost effective structures



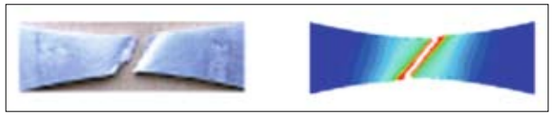


GOALS

The main quantitative goals of the Centre are as follows:

- **Industrial:**
  1. To implement the developed technology by mutual exchange of personnel between the Centre and the user partners.
  2. To arrange annual courses for the user partners.
  3. To facilitate employment of M.Sc. and Ph.D. candidates at the user partners.

- **Academic:**
  1. To graduate 10 Ph.D. students where at least three are female students.
  2. To graduate 10 M.Sc.students annually.
  3. To attract 5 foreign professors/scientists over the Centre period.
  4. To publish on average 8 papers in international journals with peer review annually in addition to conference papers.
  5. To arrange two international conferences, the first one in 2008.



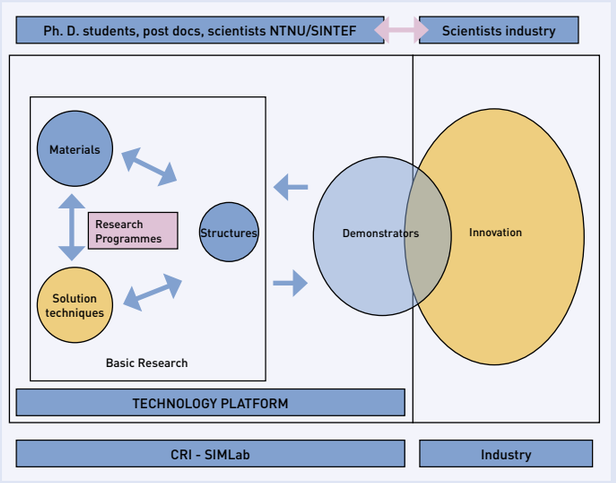
INTERNATIONAL COOPERATION

SIMLab has established cooperation with three international scientific institutions:

- **Ecole Normale Supérieure de Cachan/Laboratoire de Mécanique et Technologie (ENS/LMT), France.**
  The cooperation is linked to activities in constitutive modelling.
- **University of Linköping, Department of Solid Mechanics, Sweden.**
  The cooperation is linked to methods for optimum and robust design of component and structures.
- **European Commission - Directorate General (DG) Joint Resarch Centre (JRC), Ispra site, Italy.**
  This cooperation is linked to the behaviour and design of protective structures as well as research related to identification methods for materials at elevated rates of strain.

Furthermore, the participation of the large European car companies in the centre, which are customers of the Norwegian light-metal industry, will ensure an international industrial focus on the research.

RESEARCH IN THE CENTRE



The technology platform, as shown in the figure, will be developed through advances in the following research areas:

- **Materials:** Development of improved quantitative constitutive models and failure criteria for large scale analyses as well as identification methods.
- **Solution techniques:** Establishment of accurate and robust solution techniques for simulation of impact problems
- **Structures:** Investigation of fundamental response mechanisms of generic components and structures as well as the behaviour and modelling of joints.
- **Demonstrators:** Selection of demonstrators in close cooperation with user partners. The interaction between the activities denoted 'Basic Research' and 'Demonstrators' is crucial with respect to validation and possible refinement of the technology developed in the Centre.

The Centre will deal with aluminium extrusions and plates, aluminium and magnesium castings, high-strength steels and polymers.

The basic research areas **Materials, Solution techniques** and **Structures** will be linked by establishing **Research programmes.** The number of research programmes and the content in each programme can vary dependent upon the interest of the partners. At present the following five programmes are defined:

- **Fracture and Crack Propagation:** Validated models for fracture and crack propagation in ductile materials including rolled and extruded aluminium alloys, high-strength steels, cast aluminium and magnesium and polymers will be developed. Formulations for shell structures and solid bodies will be established and implemented in LS-DYNA for verification and validation. Accuracy, robustness and efficiency are considered to be the major success criteria for the models.
- **Connector and Joints:** Information about the behaviour and modelling of self piercing rivet connections subjected to static and dynamic loading conditions will be obtained. Special focus is placed on the establishment of models to be used for large scale shell analyses as well as the behaviour of joints using dissimilar materials.
- **Polymers:** Validated models for polymers subjected to impact loading conditions will be developed. An important prerequisite is to establish a set of test methods for material characterization and generate an impact test database. The programme is for the time being limited to thermoplastics.
- **Multiscale Modelling of Metallic Materials:**
  Phenomenological constitutive models of metals are available in commercial FE codes, but they do not provide any information about the physical mechanisms responsible for the observed material response. Thus, in this programme the material response is described on the basis of the elementary mechanisms governing the macroscopically observed phenomena. This approach is required for the design of optimised process chains, for the development of next-generation phenomenological models, and for reducing material characterisation costs.
- **Optimal Energy Absorption and Protection:** A basis for the design of safer, more cost effective and more light-weighted protective structures for both civilian and military applications subjected to impact and blast loading will be developed. This includes also road restraint systems.