

Project Outline

ADVISE addresses experimental validation of simulations of dynamic events using full-field optical methods of deformation measurement. Imaging techniques are powerful tools for the evaluation of the performance, reliability, and safety of primary structures, and for validating their design and computer simulations. The objectives of this pre-normative project are to address complex dynamic analysis and to use full-field data from experiments to validate in a quantitative manner numerical simulations. Dynamic events are especially important in safety aspects of the transportation industry. Whilst in engineering modelling the analysis of homogeneous materials has become fairly routine, recent advances have been made in modelling the impact of two-dimensional composites and three-dimensional analysis is under development. To bring together advances in optical techniques with the developments in the modelling of composites in order to establish high levels of confidence through rigorous validation lead to the objectives of the project:

- Development of reference materials for traceability and calibration of full-field optical measurements of deformation in cyclic, transient and non-linear dynamic events;
- Optimisation of methodologies for both optical measurement and computational modelling and simulation of linear modal vibrations and non-linear impact responses;
- Contributions to standardisation activity for experimental validation of dynamic simulations.

A unified approach throughout the design, simulation and validation processes is being taken. Partners include research laboratories, finite element analysis experts, instrument suppliers, and industrial end-users from the aerospace and automotive sectors.



ADVISE Partners

Empa – Swiss Federal Laboratories for Materials Testing and Research (CH)
www.empa.ch and www.empa.ch/abt173

Airbus UK (UK)
www.airbus.com

Dantec Dynamics GmbH (DE)
www.dantecdynamics.com

European Commission's Joint Research Centre (EU)
www.jrc.org

University of Liverpool (UK)
www.liv.ac.uk

University of Patras (EL)
www.mead.upatras.gr

High Performance Space Structure Systems GmbH (DE)
www.hps-gmbh.com

MSU – Michigan State University (USA)
www.egr.msu.edu/me/
www.experimentalstress.com

CRF – Centro Ricerche Fiat S.C.p.A. (IT)
www.crf.it

Project Co-ordination

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Project Website

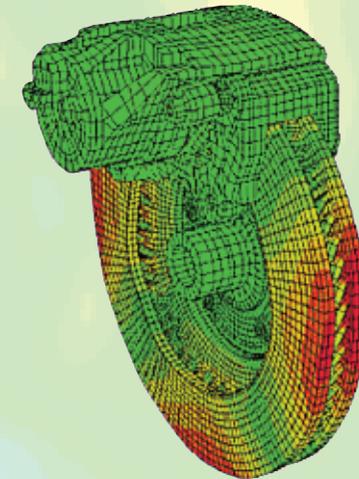
www.dynamicvalidation.org



Advanced Dynamic Validations using Integrated Simulation and Experimentation

ADVISE

Research project within the European Commission
7th Framework Programme Transport theme
under Grant Agreement No. SCP7-GA-2008-218595

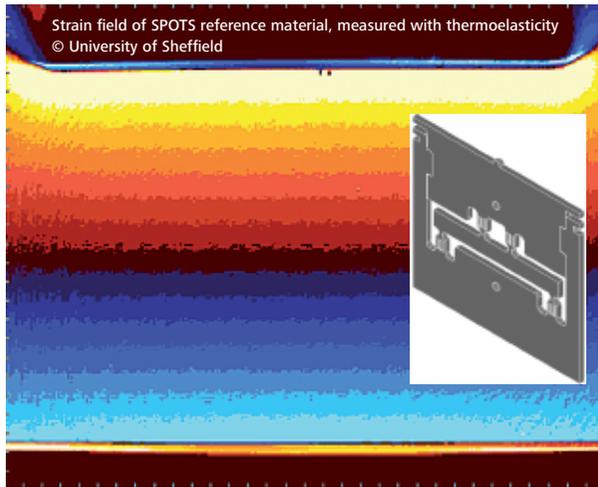


"optical measurements of engineering structures for validated simulations"



Project framework

ADVISE is an extension from static strain to dynamic events of the successful “Standardization Project for Optical Techniques of Strain measurement” under the European Commission’s FP 5 Growth programme (SPOTS, see www.opticalstrain.org). The project falls within the Activity “Improving Safety and Security; Area: Integrated Safety and security for surface transport systems (Safety and Security by design)” in response to an FP 7 call SUSTAINABLE SURFACE TRANSPORT.



A major issue is the safety of transport systems during critical events. The increasing number and capacity of transportation systems means an inevitable rise in the number of accidents and casualties unless there are substantial advances in design.

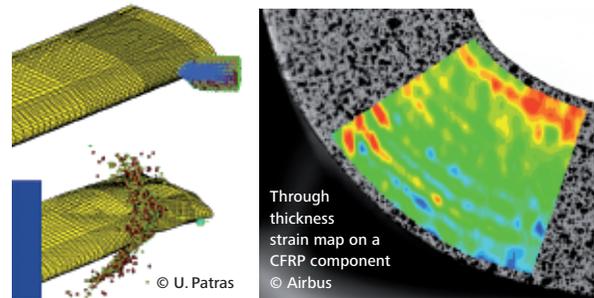
Innovative approaches to design are being utilised, but need to be validated in order to demonstrate reliability and provide confidence. Although numerical simulation is an essential and valuable tool, experimental verification is a fundamental requirement for safe design.



ADVISE objectives

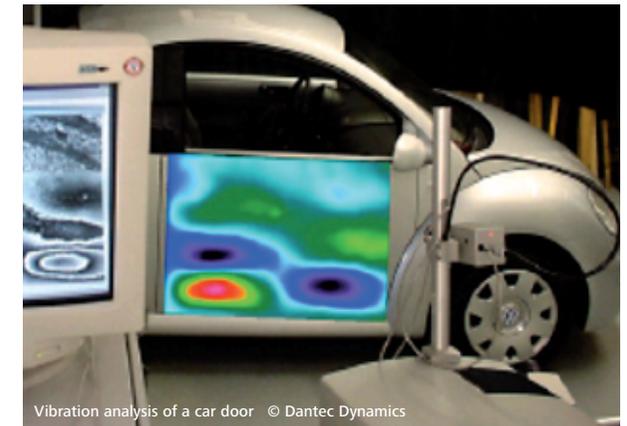
The objective of the ADVISE project will be to provide standardised procedures that allow confidence levels to be defined. While best practice guides exist for numerical modelling and static measurements of stress and strain, there are no international standards covering the validation of data from dynamic experiments and their use to validate numerical results in stress, vibration and impact response, i.e. to correlate finite element results with full-field experimental observations.

The ADVISE objectives are pursued in three technical work packages with additional work packages for “Co-ordination” and for “Dissemination”. “Advanced Tools for Simulation & Experimentation” focuses on suppliers for image processing, modelling and instrumentation; “Dynamic Calibration” focuses on research laboratories; and “Experimental Validation” focused on end-users.



Significant creativity will be required to develop the reference materials and to a lesser extent to optimise methodologies; however the verification and validation is crucial in generating confidence in the outputs. Industrially based case studies will be used to establish the transferability of the standards materials.

The main outcomes of the project will be: reference materials for optical methods of dynamic deformation measurement; optimised approaches for the application of optical methods and advanced modelling techniques to dynamic events; and a recommended methodology for experimental validation by correlation of predictions with measurements.



Six countries plus JRC are involved in the partnership. The partners have been selected to provide complementarity both in their role in the innovation process and their expertise.

We will work closely with CEN, ISO, NAFEMS and VAMAS TWA26 to ensure that these pre-normative materials can become quickly accepted globally thus providing worldwide traceability for validated designs. Dissemination through technical, professional and trade conference and exhibitions will be done. Direct dissemination to the EU industrial base will be a priority to maximise the benefits of the research.

