INTALES
AS 9100 certified

R&D Programmes Space

1st Workshop on Nonlinear Analysis of Shell Structures

INTALES GmbH Engineering Solutions

University of Innsbruck, Faculty of Civil Engineering

University of Innsbruck, Faculty of Mathematics, Informatics and Physics

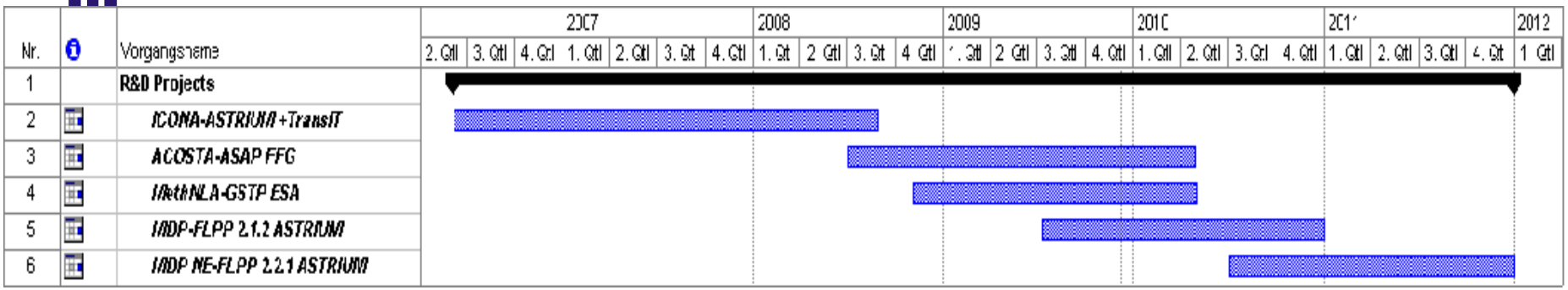
R&D History and Milestones

December 2004	INTALES becomes a CAST Team
Summer 2005	ASTRIUM, INTALES and UIBK studies improvements for NLA
March 2006	ICONA proposal to TransIdee
	Supported by national and international aerospace industry: FACC, ASTRIUM Ottobrunn, ASTRIUM Les Mureaux EADS MAS, EADS Innovation Works
May 2006	Release of ICONA by the TransIdee Board Order letter from ASTRIUM Les Mureaux
July 2006	**ICONA Kick off**

R&D History and Milestones

2007	Presentation of preliminary ICONA results to aerospace industry (supporting companies) Discussion about further developments
September 2007	ACOSTA Proposal to FFG for ASAP 5 again with powerful support of aerospace industry
July 2008	MethNLA proposal to ESA/ESTEC for GSTP 5
August 2008	**ACOSTA Kick-off**
November 2008	**MethNLA Kick-off**
October 2008	MDP Proposal to ASTRIUM GmbH Ottobrunn for FLPP2
July 2009	**MDP Kick-off**
September 2009	MDP-NE Proposal

Research Projects - Planning



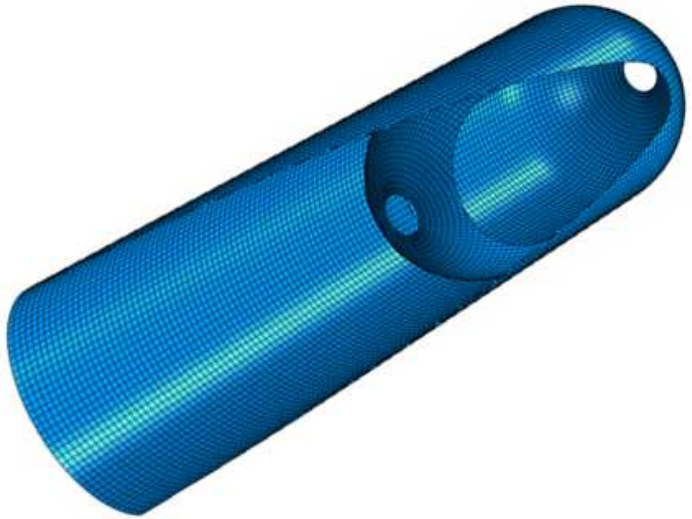
List of Abbreviations

CAST	**Center of Academic Spin-Offs Tyrol**
TransIdee	**Transferzentrum Universität Innsbruck**
GSTP	**General Support Technology Programme**
FLPP	**Future Launchers Preparatory Programme**
ICONA	**Innovative COncept for Nonlinear Analysis of Lightweight Structures**
ACOSTA	**Advanced Concepts for STructure Analysis of large Lightweigt Structures**
MethNLA	**Methodology for NonLinear Analysis of Large Launcher and Spacecraft Structures**
MDP	**Mechanical Dimensioning Philosophy for Large Liquid Rocket Engine Nozzle Extensions**
MDP-NE	**Mechanical Dimensioning Philosophy - Nozzle Extension**

ICONA - Boost Project

Major tasks:

- Tools to simplify the handling of large amounts of data
- Analysis methods for large and complex structures
- Improved shell-element routines and solutions for robust analysis results
- Tools for sensitivity analysis



ICONA Team

Team:
INTALES GmbH
Faculty of Civil Engineering
- Unit for Engineering Mathematics
Faculty of Mathematics, Informatics and Physics
- Department of Mathematics
- Department of Computer Science
ASTRIUM ST (F)
TU-Delft (NL) Department of Aerospace Structures

Promoted by :
TransIdee -Transferzentrum Universität Innsbruck
ASTRIUM ST Les Mureaux

ACOSTA – Basic Research

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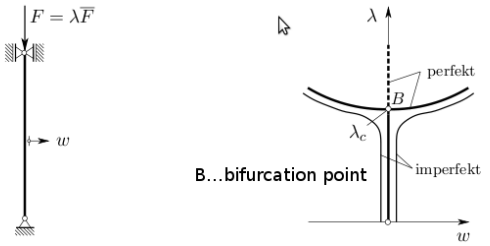
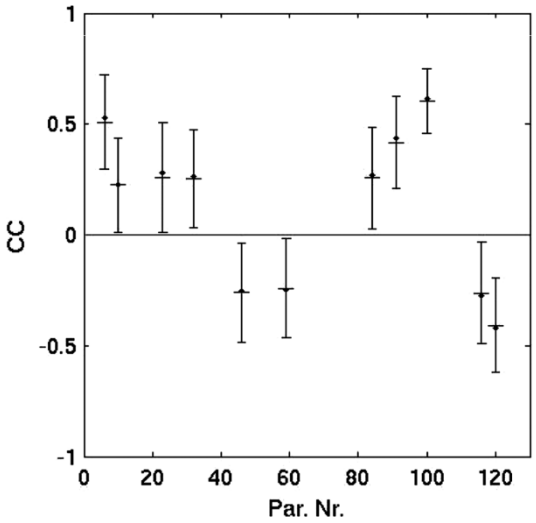
Major tasks:

- Domain decomposition and bifurcation analysis
- Further understanding of local failure modes
- Sensitivity to input parameters
- Robust design or redesign
- Improved shell-element routines and solutions for robust analysis results





ACOSTA Team

Team:

INTALES GmbH

Faculty of Civil Engineering

- Unit for Engineering Mathematics
- Unit for Applied Mechanics

Faculty of Mathematics, Informatics and Physics

- Department of Mathematics
- Department of Computer Science

Promoted by:

FFG- Aeronautics and Space Agency

- Project in the

  Austrian Space Applications Programme **–ASAP-**

MethNLA - Prototyping

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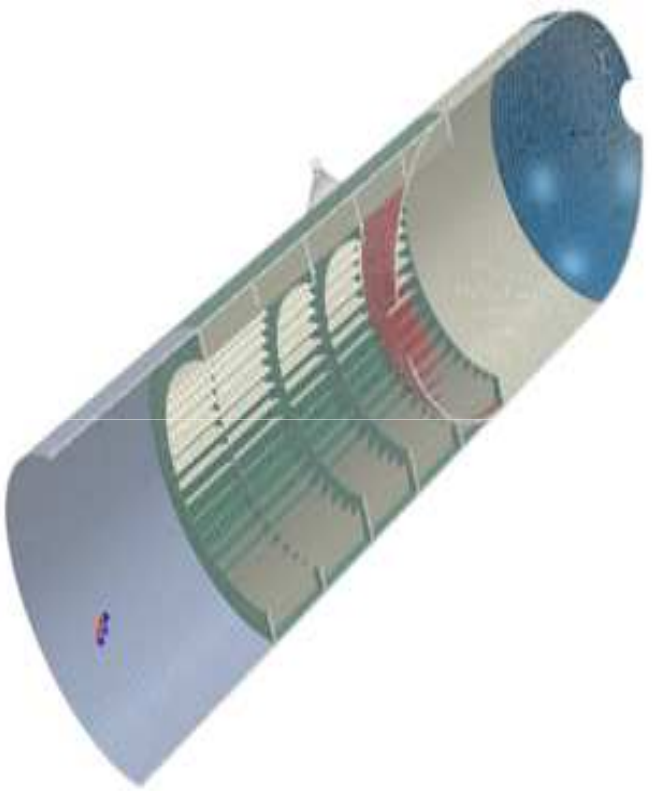
Institut für mathematik Universität Innsbruck

Major tasks:

- Engineering flow chart for the nonlinear analysis of large and complex light weight structures
- General load case selection criteria
- Methods and explanations for subdivision of large structures
- Questionnaire to select failure modes
- Solver and element benchmark-tests, element capabilities, effects from solvers and elements on analysis results



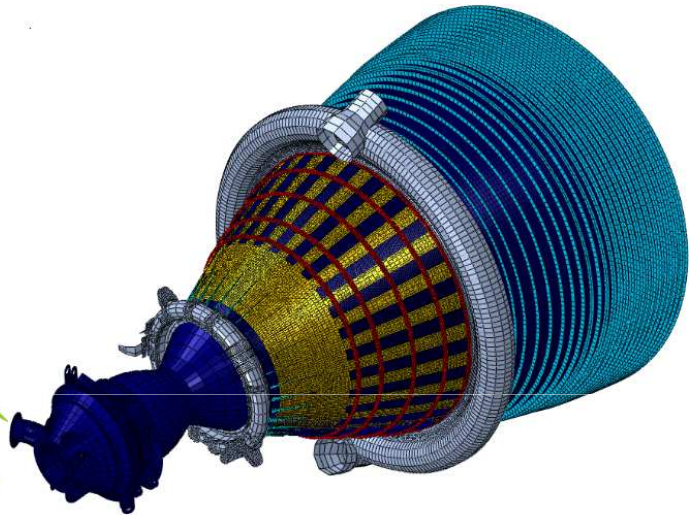
MethNLA Team

Team:
ESA/ESTEC Dept. TEC/MCS
INTALES GmbH

Supported by:
Faculty of Civil Engineering
- Unit for Engineering Mathematics
Faculty of Mathematics, Informatics and Physics
- Department of Mathematics

Assigned by:
ESA/ESTEC
- Project in **GSTP 5**

MDP and MDP NE
1st Application of tools



VULCAIN 2 ASTRIUM ST GmbH

Handbook for the mechanical dimensioning of large liquid rocked extensions:

- Modelling of structure
- Load scenarios
- Definition of failure modes
- Mesh sufficency
- Parameters for sensitivity analysis
- Determination of driving failure modes
- Sensitivity analysis
- Assessment of results
- Cross checking standards

MDP Team

Team:
ASTRIUM ST GmbH Ottobrunn
INTALES GmbH

Supported by:
Faculty of Civil Engineering
- Unit for Engineering Mathematics

Faculty of Mathematics, Informatics and Physics
- Department of Mathematics

Contract from:
ASTRIUM ST GmbH
Project in: **FLPP 2.1.2**
Task 8 Advanced Nozzle technologies

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We hope that we will arouse your interest in our activities and that the workshop will meet your expectations.

Your questions and your feedback will be most welcome.