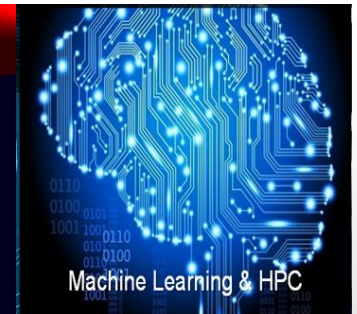
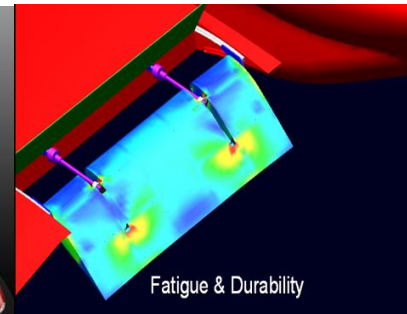
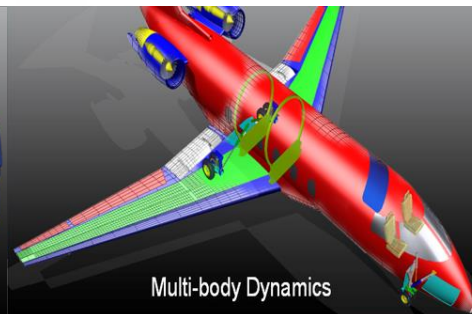
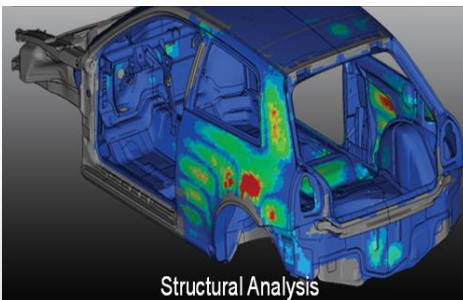


METHODOLOGY AND SIMULATION TOOLS FOR MULTIDISCIPLINARY DESIGN AND ANALYSIS

Brief Introduction

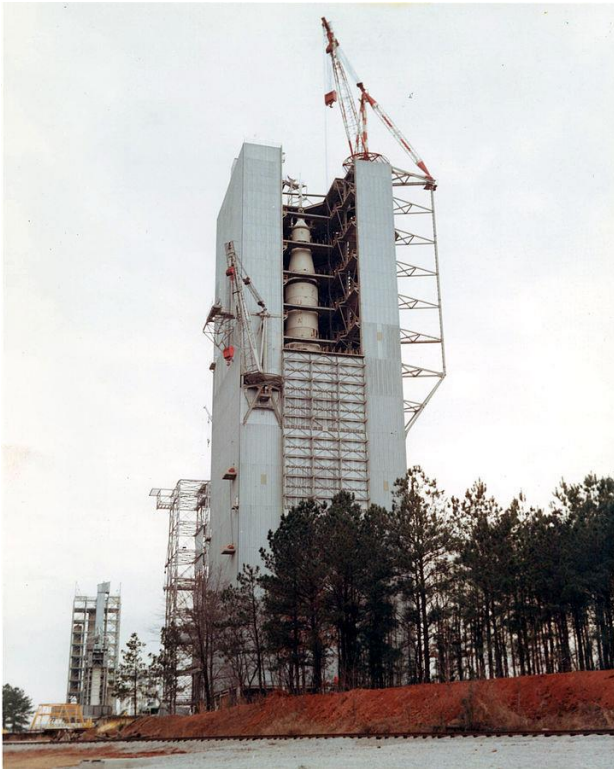
Daniele Catelani

Senior Project Managers MSC Software



The Early Beginnings of CAE

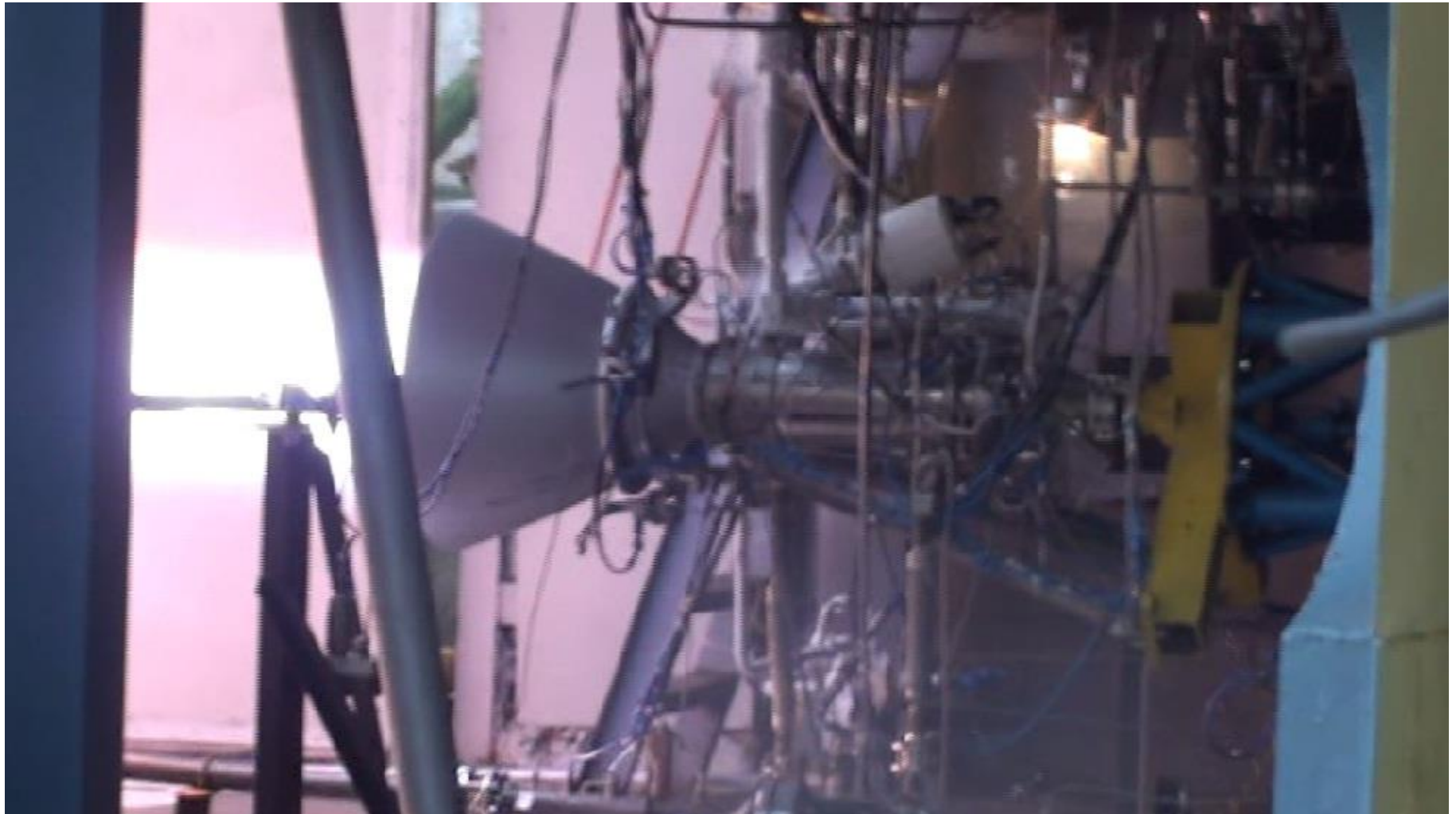
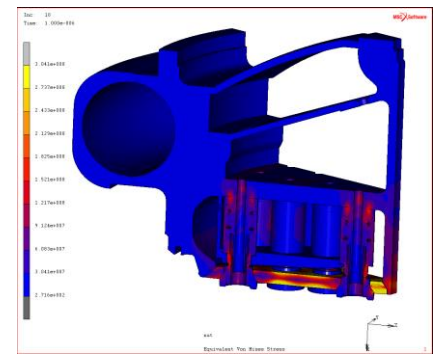
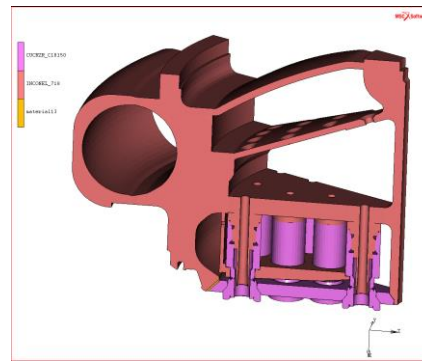
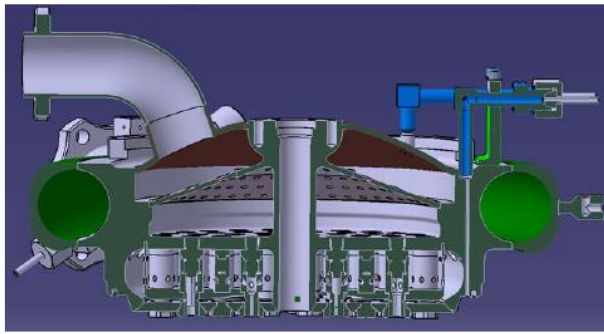
Saturn V Dynamic Test Stand



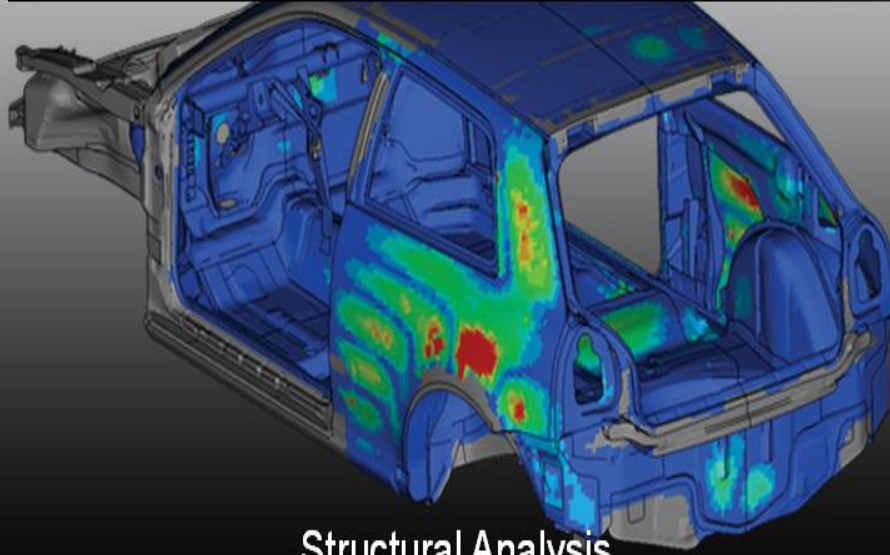


esa

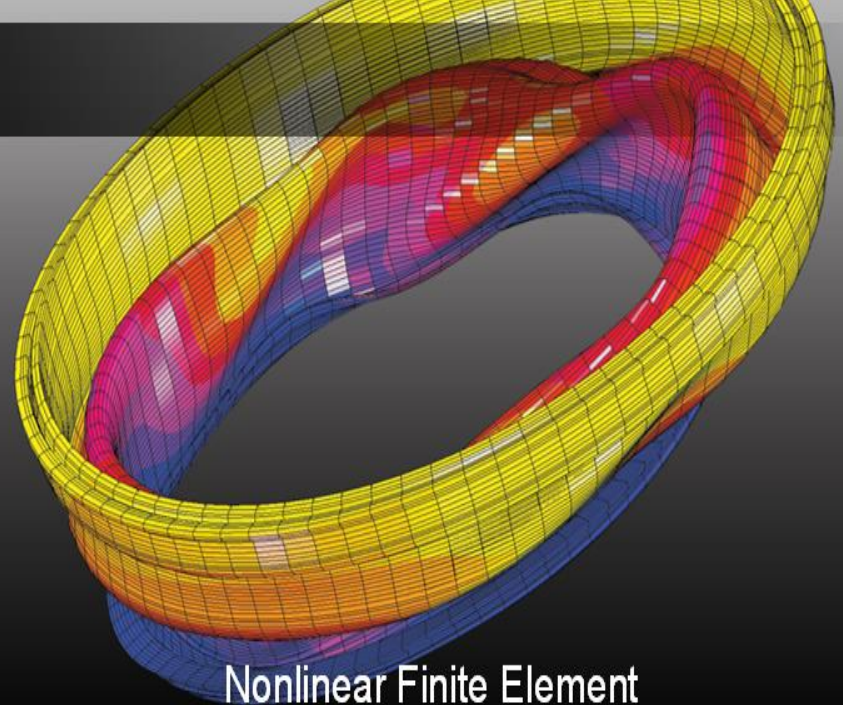
vega



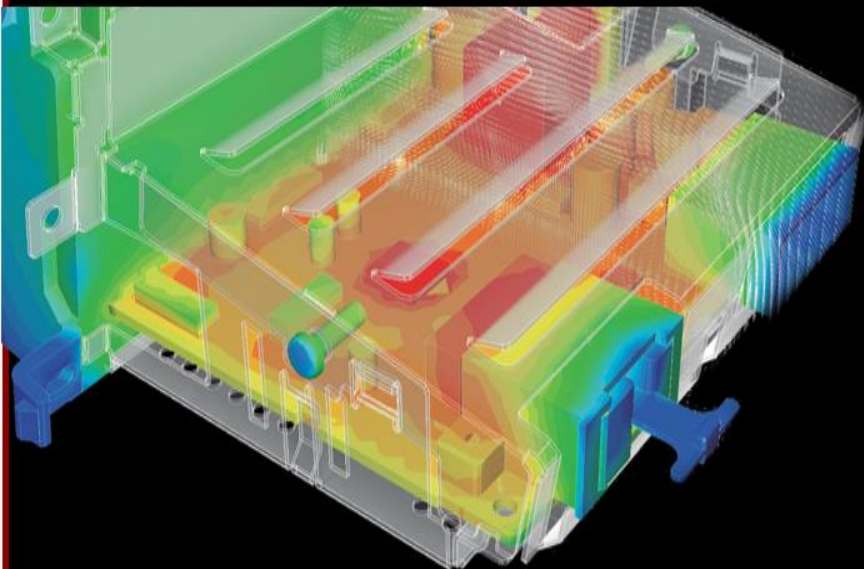
Pioneering Innovation: 1960's - Today



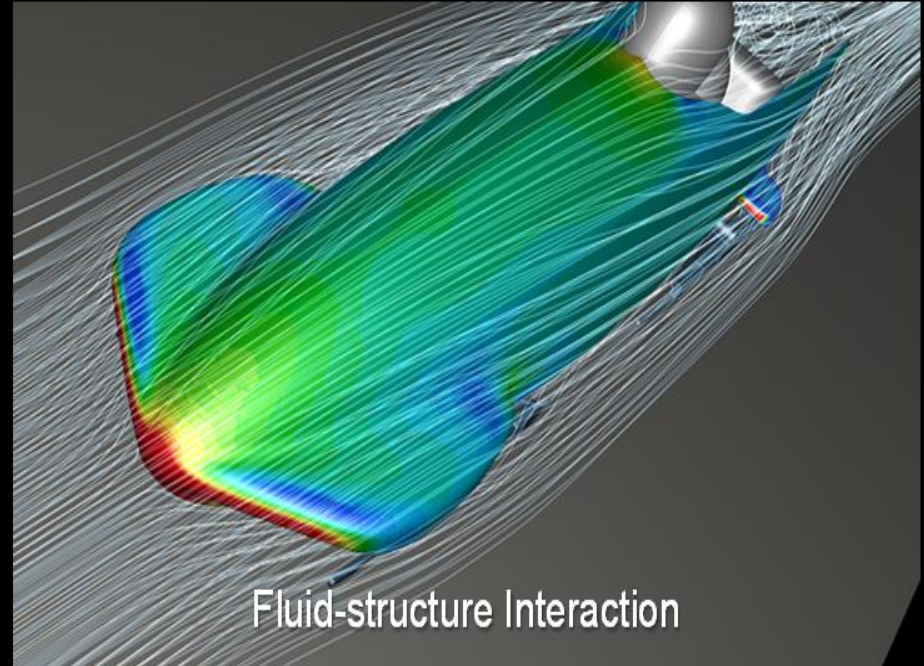
Structural Analysis



Nonlinear Finite Element



Thermo-fluid Analysis



Fluid-structure Interaction

Company History and Evolution



1969
Man Lands on Moon



1963
MacNeal Schwendler Corporation Founded

1971
First Commercial Version of NASTRAN



1973
MSC goes Global



1987
Nasa utilizes MSC Nastran for structural analysis of the International Space Station (ISS) - NASA

1979
First Release of Adams



1999
MSC Acquires Marc (nonlinear FEA)



2011
MSC Acquires Acoft (acoustics)



2014
MSC Announces MSC Apex (Next Generation CAE System)



2016
MSC Acquires Cradle (CFD)



2017
On Feb 2nd 2017, MSC Software signed an agreement to be acquired by Hexagon AB. Closing on 25th April.



1962
JFK's speech

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NASA Contracts MSC to develop NASTRAN



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McDonnell Douglas adopts MSC Nastran technology to design the Space Shuttle



1983
MSC goes Public IPO NYSE

1980
Auto Industry adopts FEA Technology

1994
MSC Acquires PDA (pre/post processing)



2002
MSC Acquires MDI (mechanical dynamics)



2009
STG takes over MSC private

2012
MSC Acquires e-Xstream engineering (materials)



2015
MSC Acquires Simufact engineering (manufacturing process)



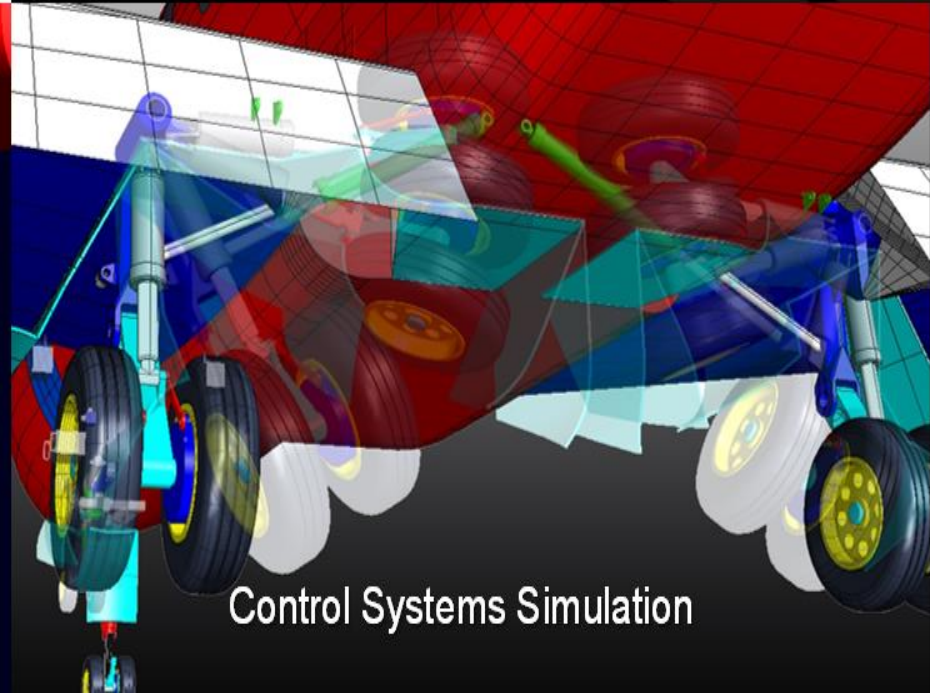
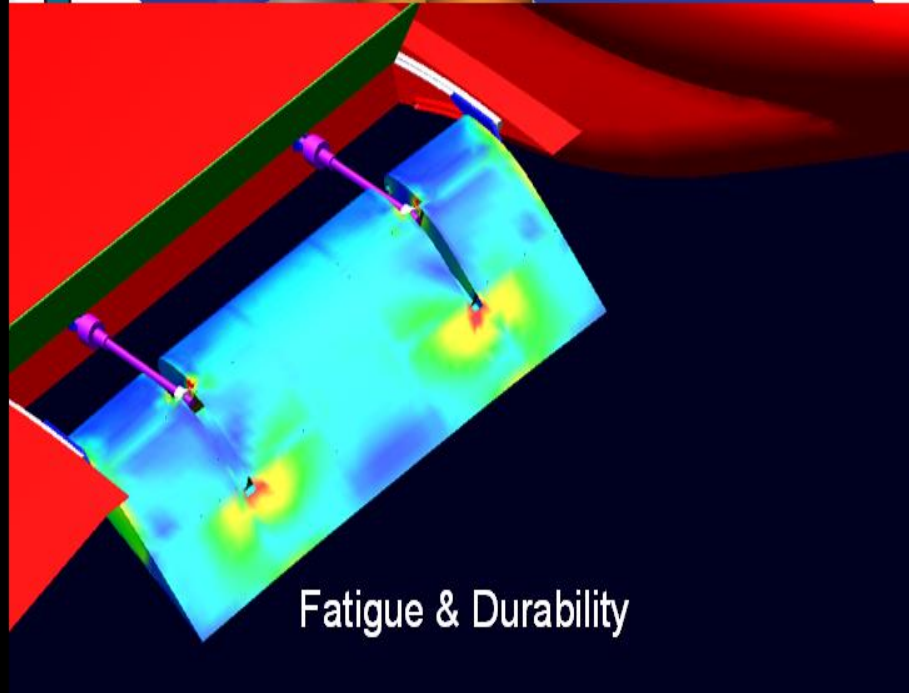
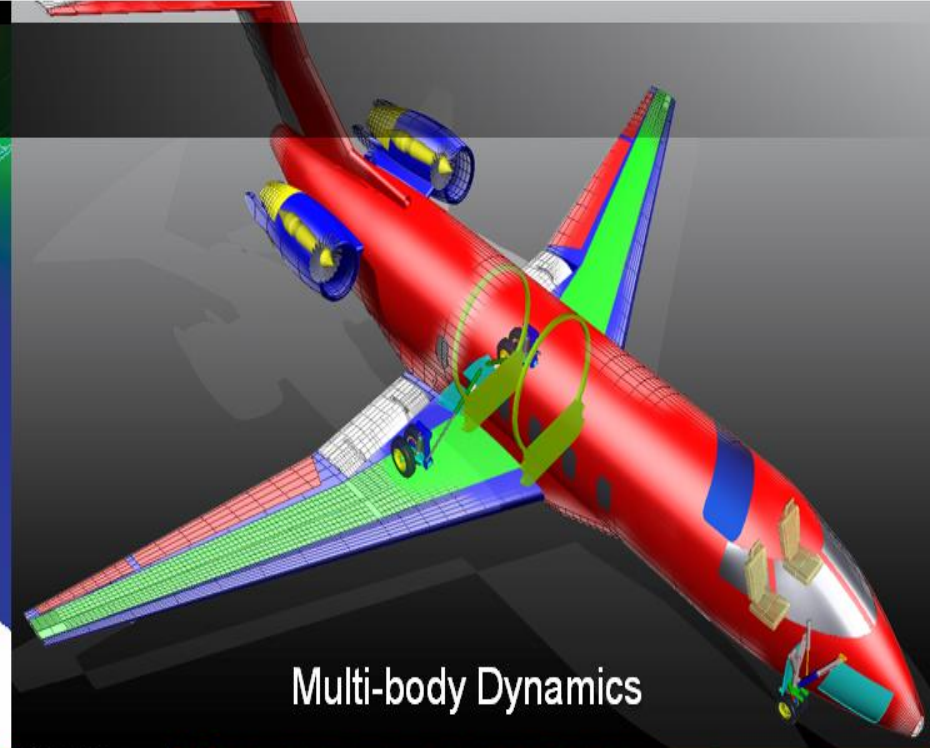
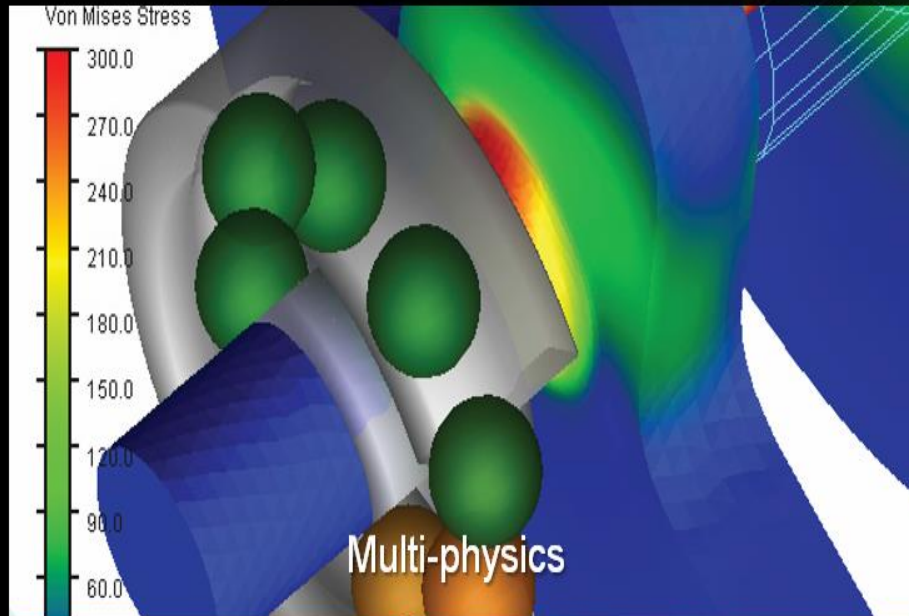
1960's – 1980's

1990's

2000's

2010's

Advancing Innovation: 1980's - Today



Company History and Evolution



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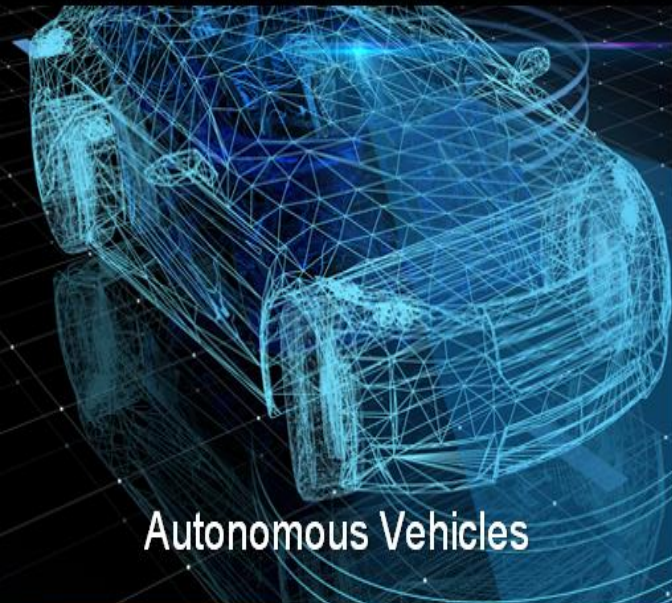
1960's – 1980's

1990's

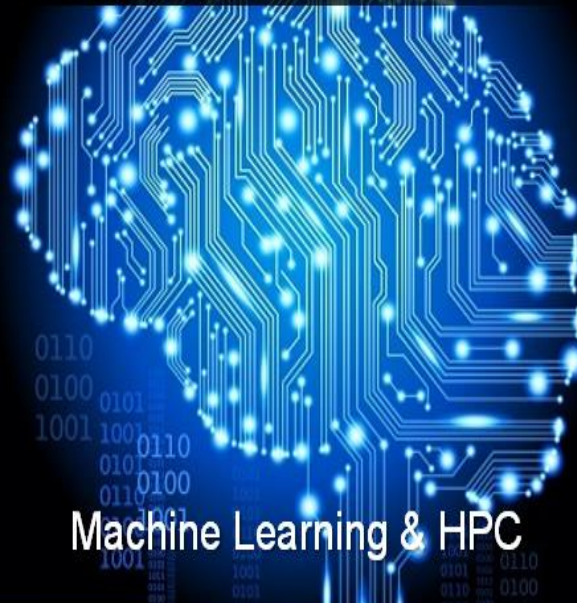
2000's

2010's

Accelerating Innovation: 2018 – Future ready!



Autonomous Vehicles



Machine Learning & HPC



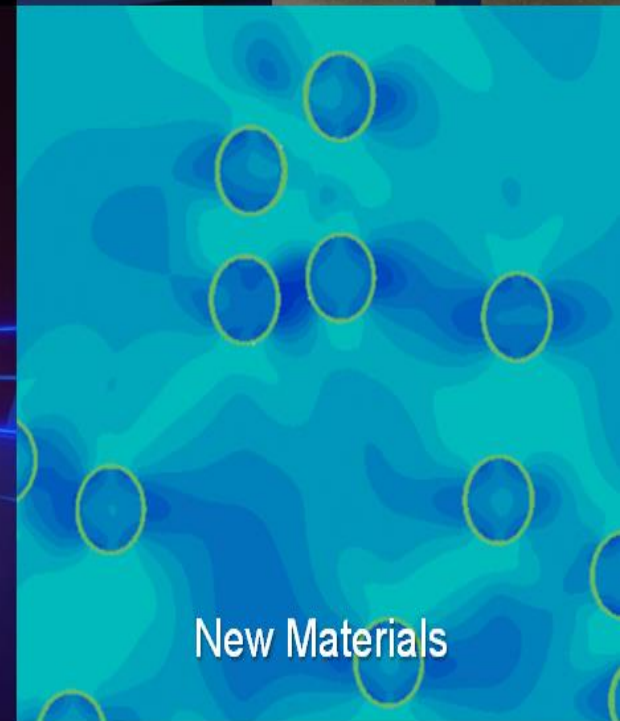
Virtual Reality



Additive Manufacturing

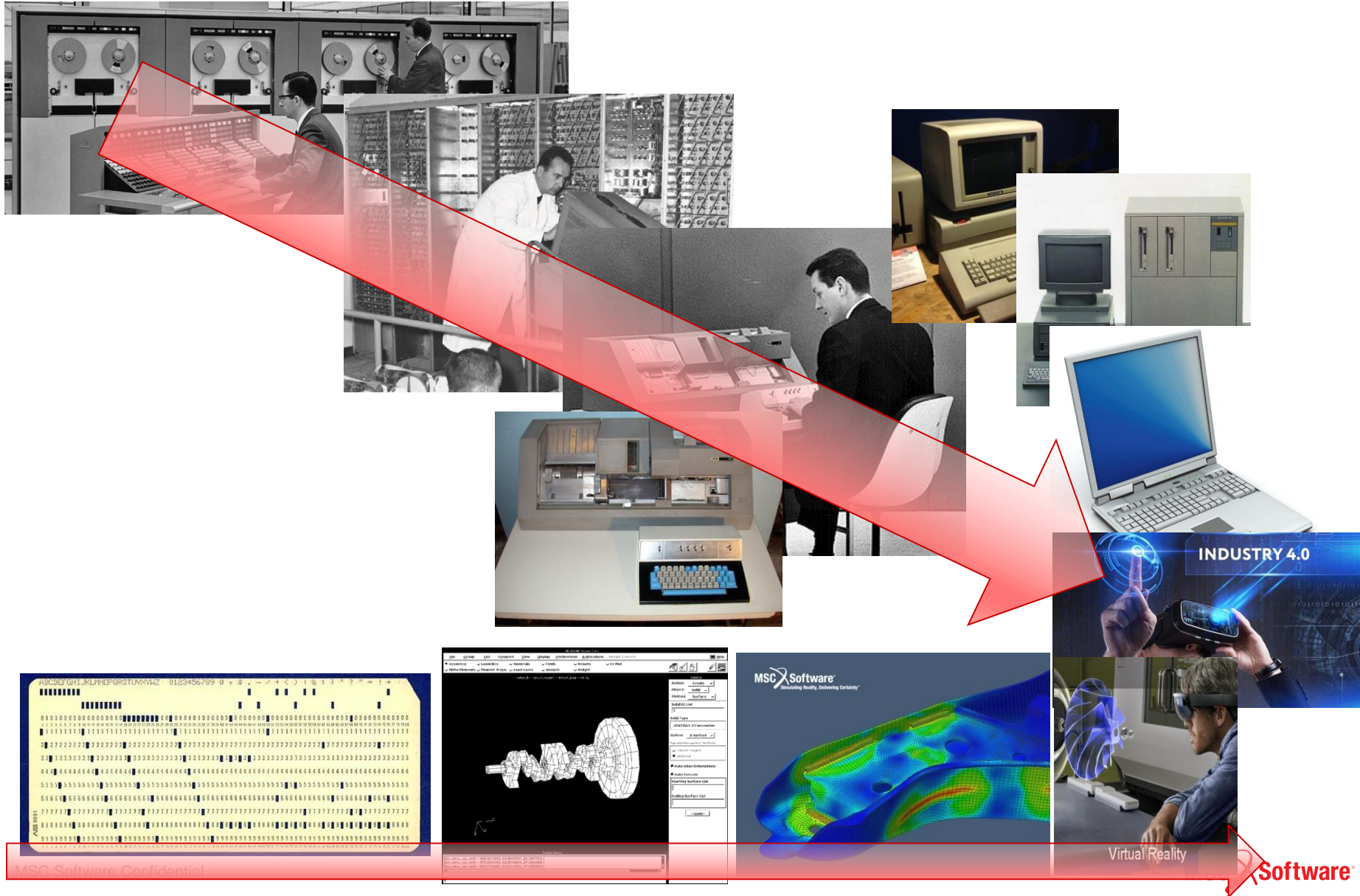


Electric Vehicle & Lightweighting



New Materials

Computer & tools evolution



Simulation Relied upon by Manufacturers Worldwide



The World of CAE

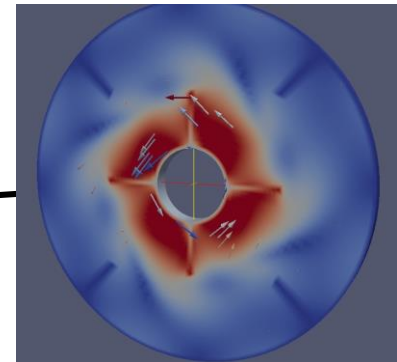
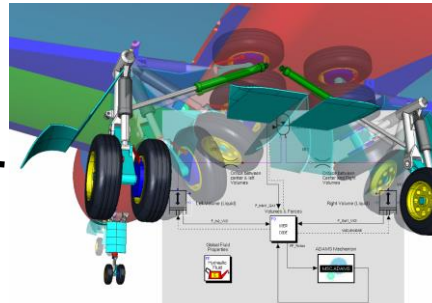
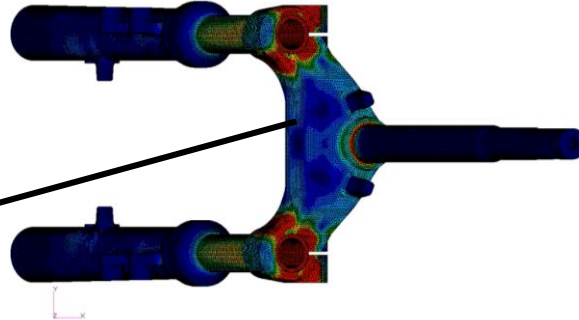
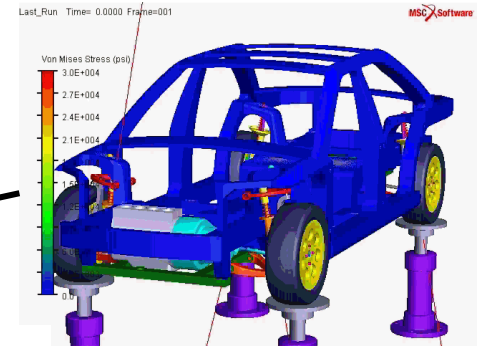
Multibody
Dynamics (MBD)

Finite Element Analysis
(FEA)

Fluids

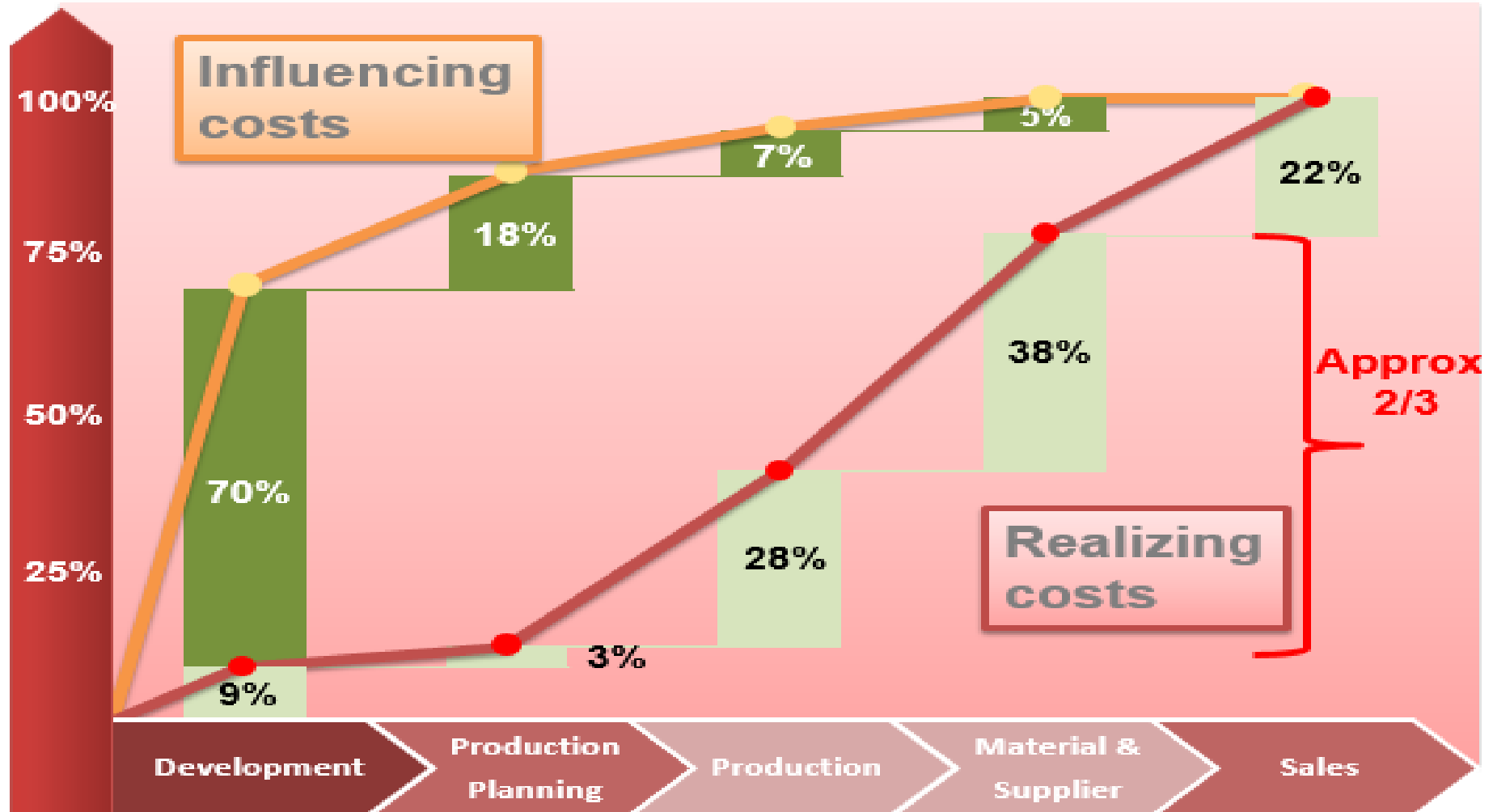
Controls

Acoustics

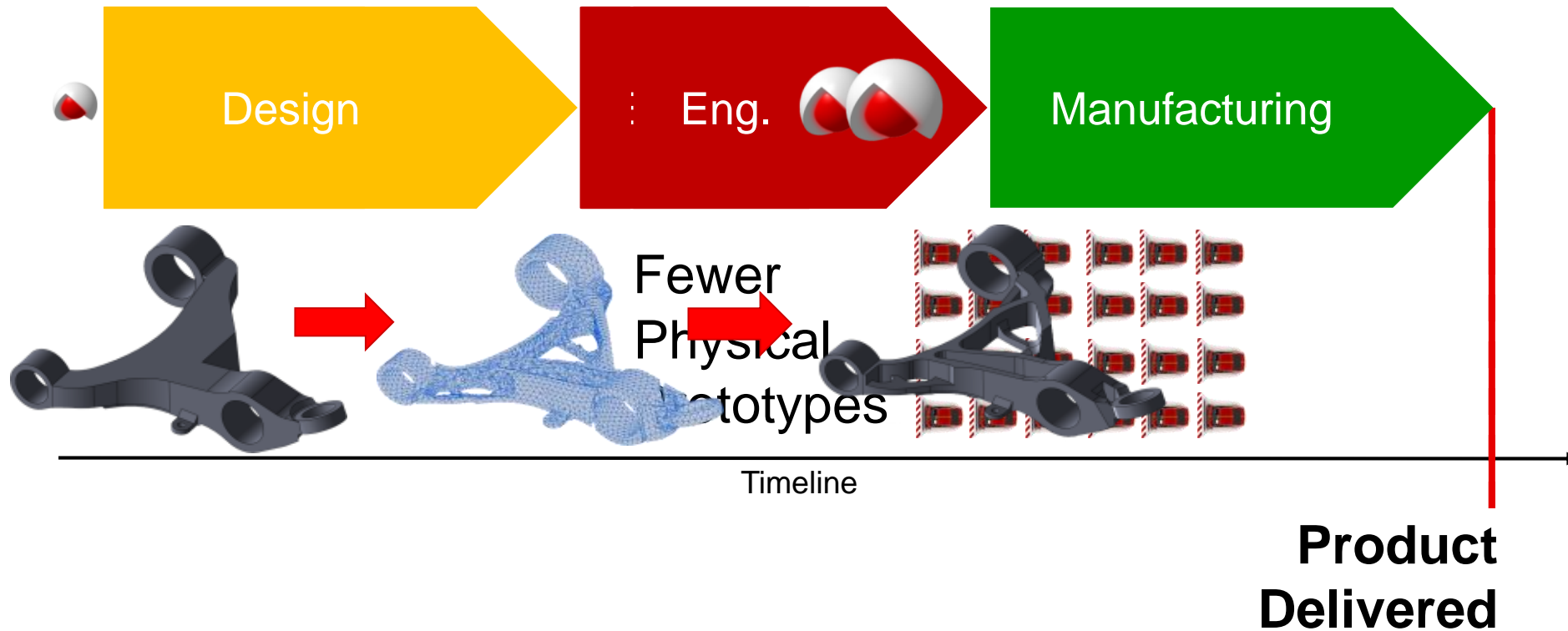


Computer Aided Engineering (CAE)

Investment in Process Development



Computer Aided Engineering (CAE)



Simulation is Helping Product Manufacturers

- Physics-based engineering simulation of computer generated prototypes that can predict product performance

Will it work?

Will it break? Will it last?

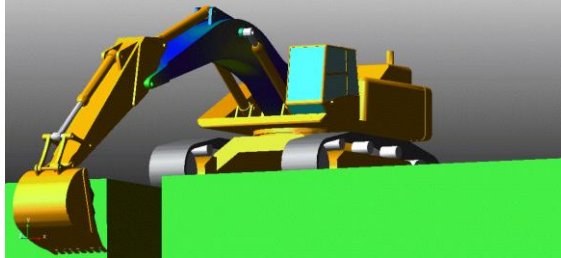
Will it operate safely?

Will it meet comfort requirements?

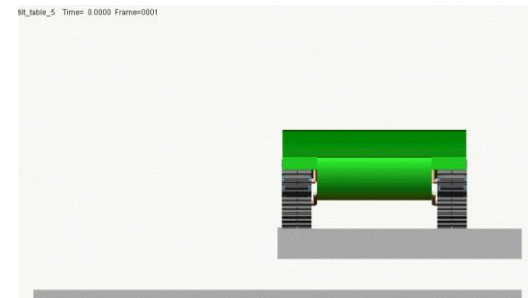
Can we make it?



Last_Run Time= 0.0000 Equilibrium Frame=0001

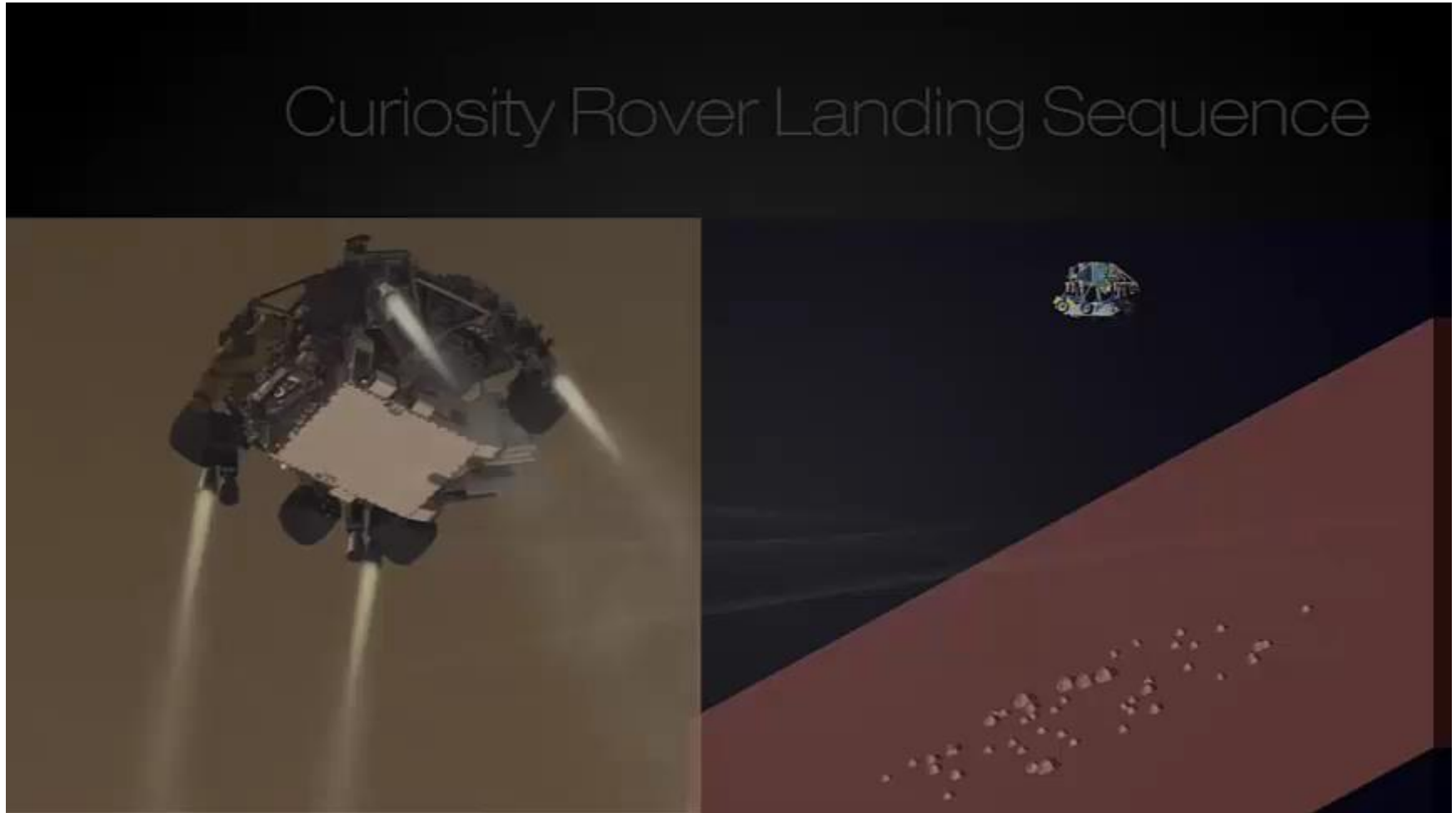


tilt_sim_5 Time= 0.0000 Frame=0001

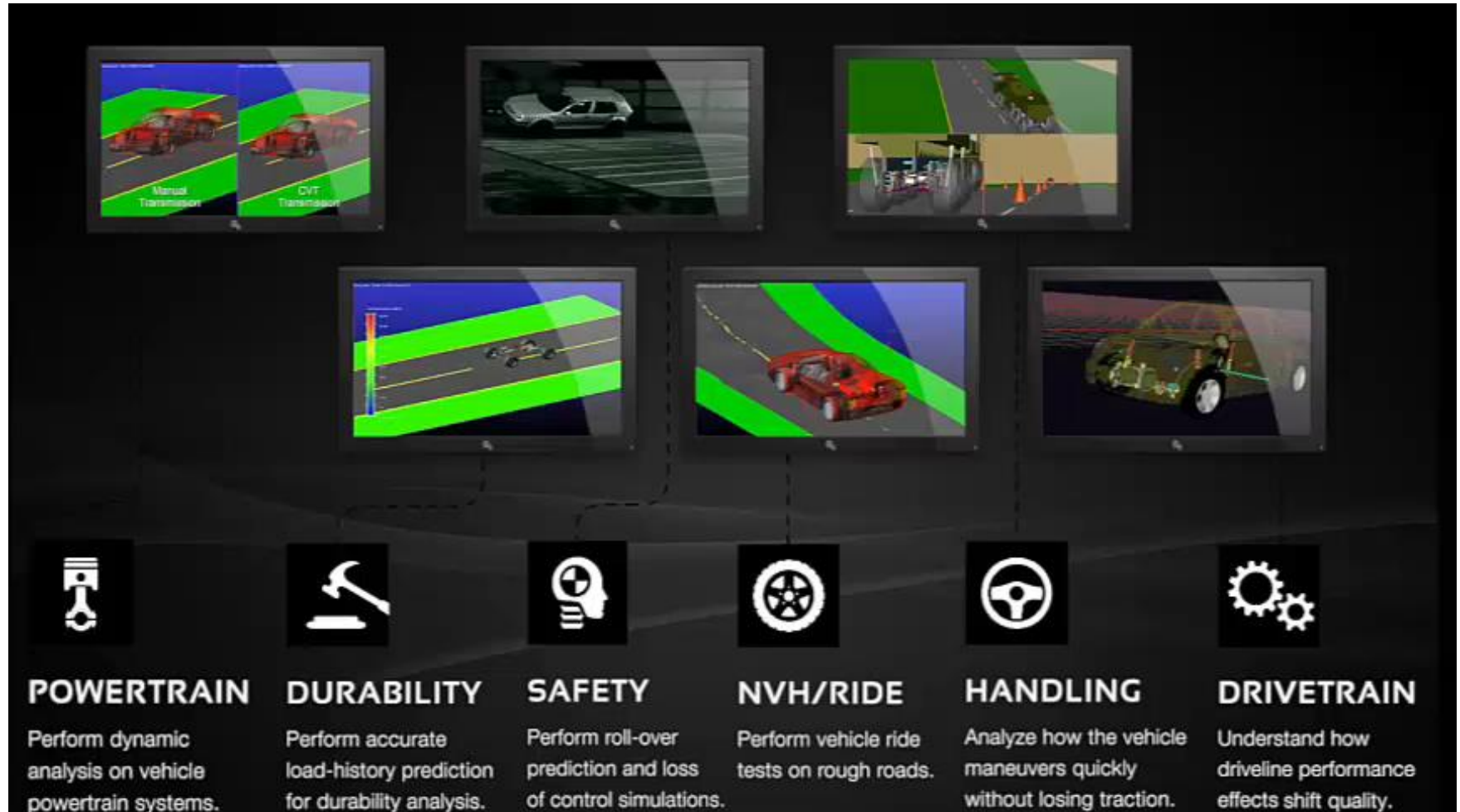


- Predictive, virtual assessment of new innovations early in the development cycle leads to smarter decisions

Applications for Adams at NASA



Applications in Automotive, Aerospace & Machinery



Automotive

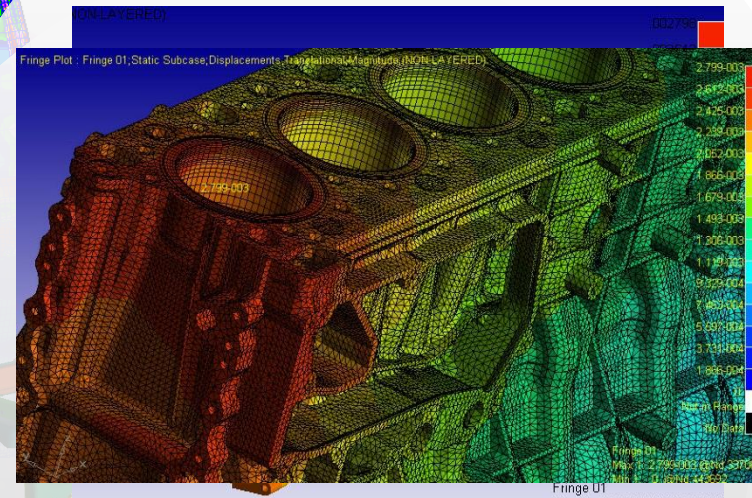
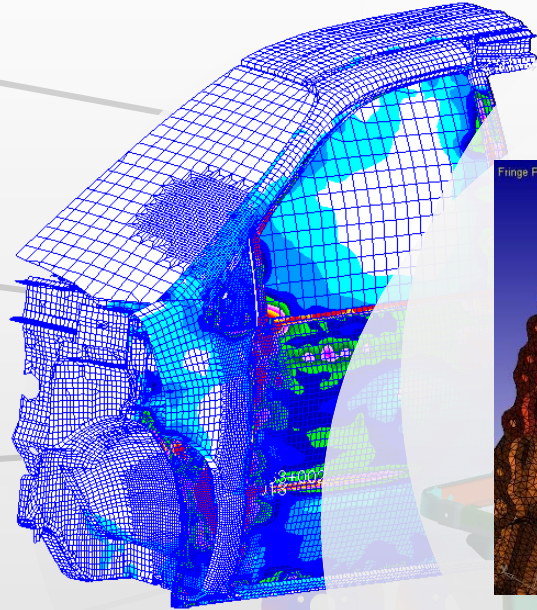
Virtual test track with
SmartDriver

Door sag
analysis automation

Brake squeal analysis
with chaining

Engine block analysis
with automatic assembly

Common model crash
and N&V modeling



30 Automotive Customers

Aerospace



Higher fidelity detailed stress process

Window sealing – nonlinear materials

Bird strike, FBO, heat transfer

System modeling with FE and motion data exchange

Landing gear system analysis with optimization



Non-Transportation



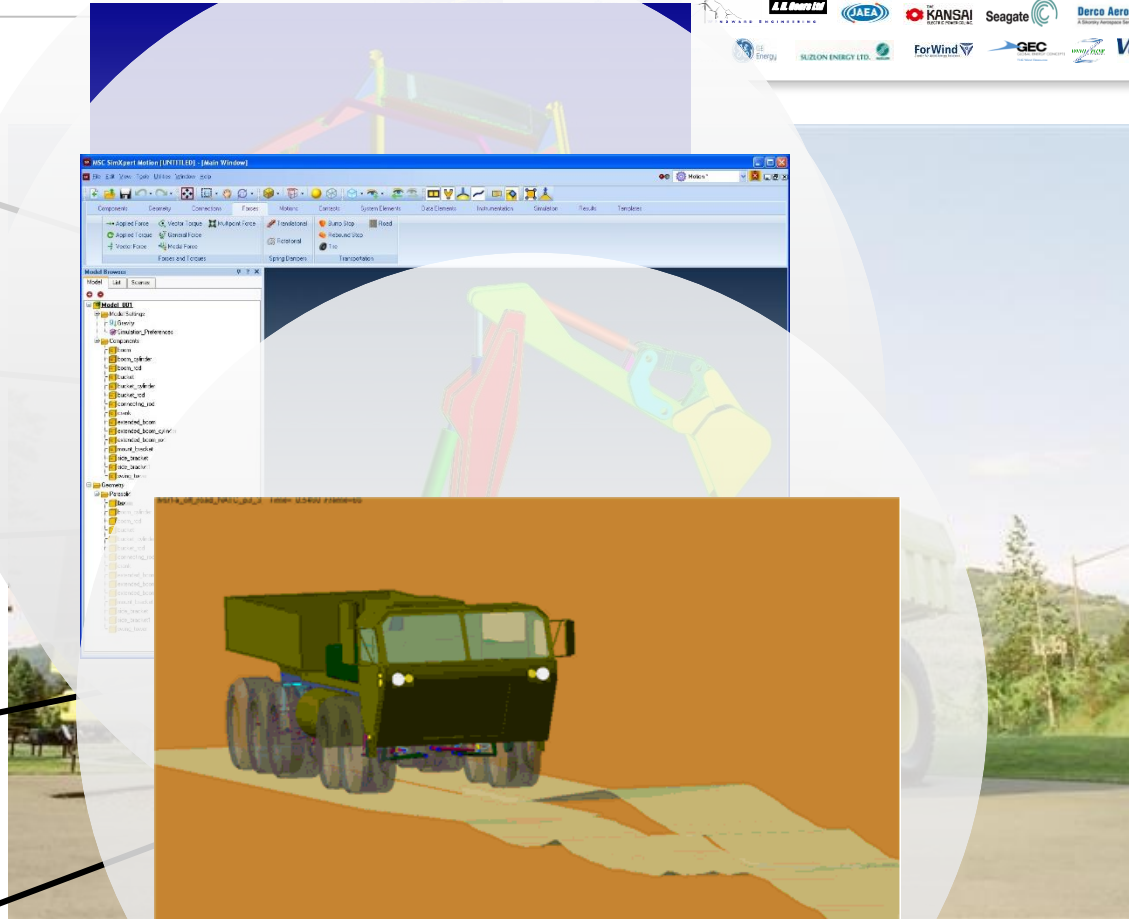
Welded body and ROPS
stresses and durability

Pneumatic
system controls

Cooling system analysis

Automated cylinder design,
analysis, and reporting

Transient road
loads analysis



Non-Transportation

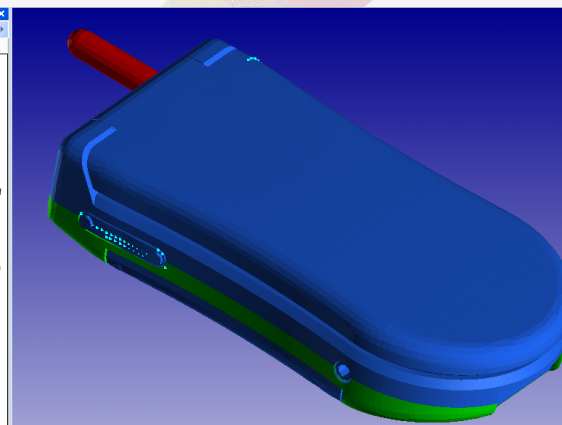
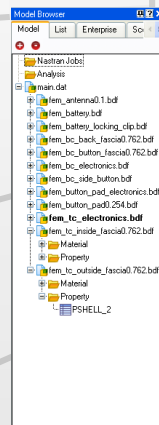
Solder joint thermal stress analysis

Seal analysis

Printer circuit board random vibration analysis

Mechanism analysis with flexible bodies

Explicit drop test analysis





EADS INNOVATION WORKS

Virtual Design & Analysis of innovative Aeronautic Structures: From Research to Application



PETER MIDDENDORF

Structures Engineering, Production & Aeromechanics

MSC Aerospace Summit, 07.-08.10.2008



Caserta, May 22nd 2013

Design Simulation Technologies:
Need of a continuous Innovation

Generoso Iannuzzo



50 YEARS
OF INNOVATION

A NEW ERA BEGINS
LEARN MORE >>

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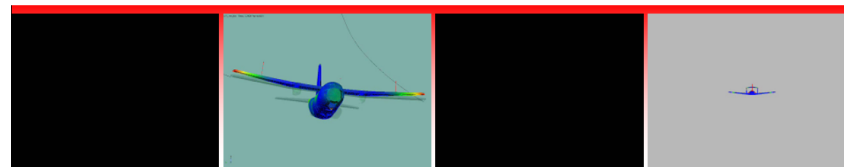
Virtual Test and Engineering Simulation In Aerospace and Defense Conference



Round Table:

Industry Panel: Engineering Simulation Trends in Virtual Certification and Validation

Naples, 6th May2010



YOUR PARTNER TO SHARE THE CHALLENGES.

**Simulation leads Innovation
in Aerospace**

Ing. Danilo Malacaria
Head of Research and Innovation
Member of ACARE Italia Council



Thank you