



TEN WAYS IN WHICH ALTAIR IS SAVING THE PLANET WITH HPC

Dr Rosemary Francis, Chief Scientist HPC

About Altair

\$459M

FY19
Revenue

3,000+

Engineers, Scientists,
and Creative Thinkers

1985

Founded and
Headquartered in
Troy, MI U.S.

11,000+

Customers
Globally

86

Offices in
25 Countries

150+

Altair and Partner
Software Products

Altair

Transforming the Future Through Computational Science and Artificial Intelligence (AI)



Transform decision making with simulation, data analytics, and high-performance computing.”

Jim Scapa, Founder and CEO



Sustainable product design

Altair® simulation has reduced many **millions of tons** of CO2 emissions

- Manufacturing materials and processes
- Transportation and logics
- Product life span and fault tracking

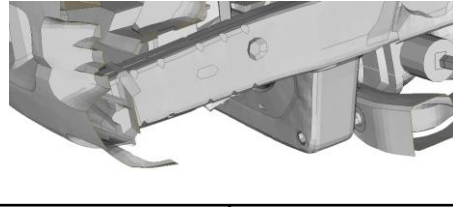
Crash & Safety

Health and safety is critical to sustainability

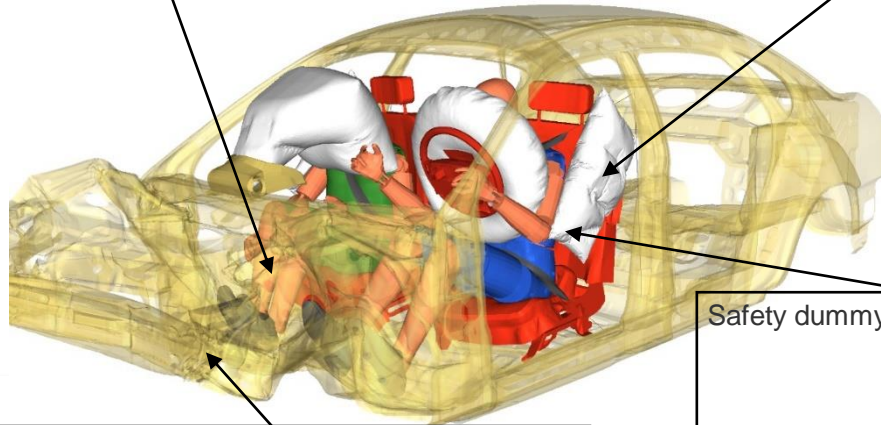
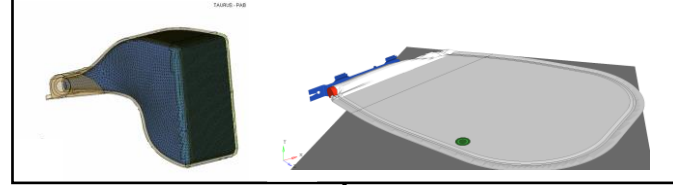
Simulation is more sustainable than physical testing



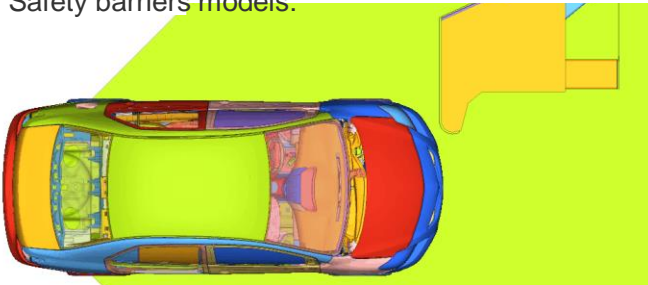
Failure risk assessment:



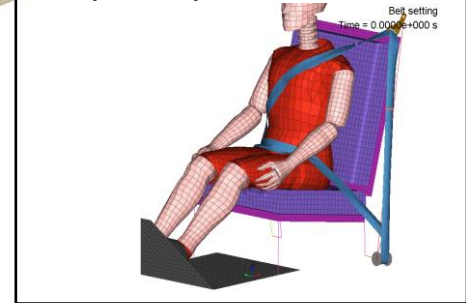
Airbag Folding & Deployment:



Safety barriers models:

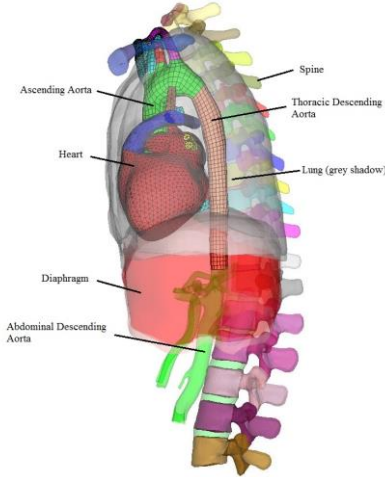


Safety dummy models:

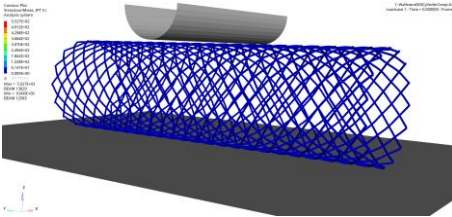


Biomechanics

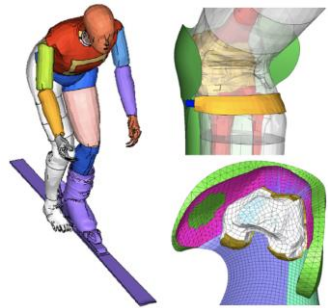
Improving safety with accurate models



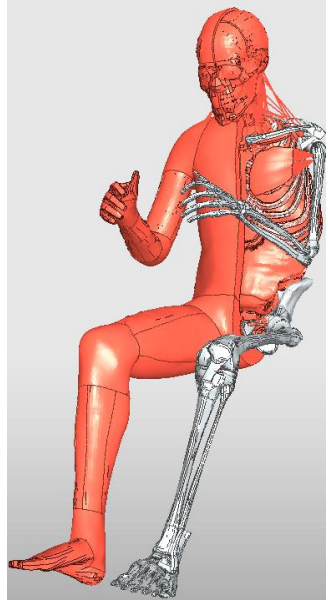
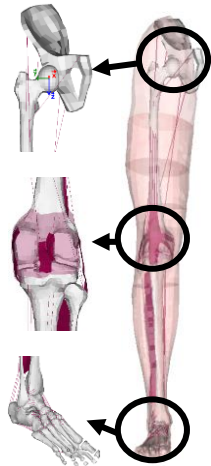
LBA Heart Model



Stent with Shape Memory Alloy material (Nitinol)



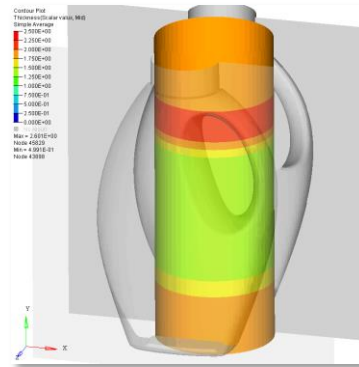
LBA Lower Limb Model for Safety (LLMS)



HBM - THUMS AM50 v6.1

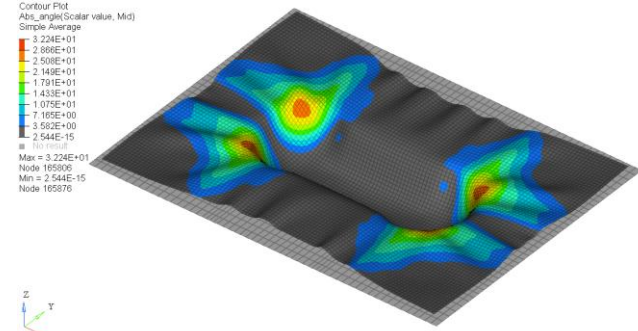
Manufacturing

Choosing more sustainable processes and materials

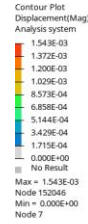


Blow molding

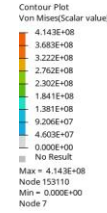
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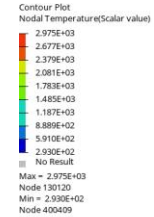
Composite forming



Residual deformation



Stresses



Temperature

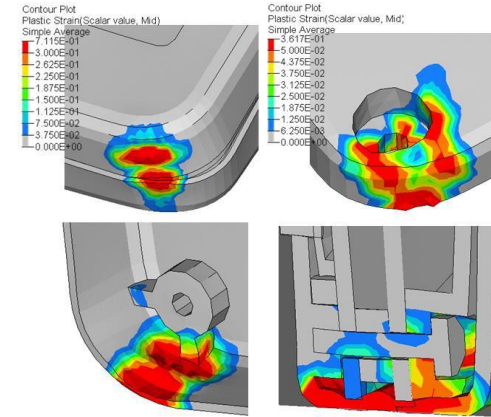
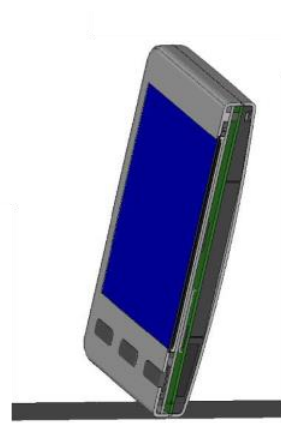


Additive Manufacturing for knuckle part

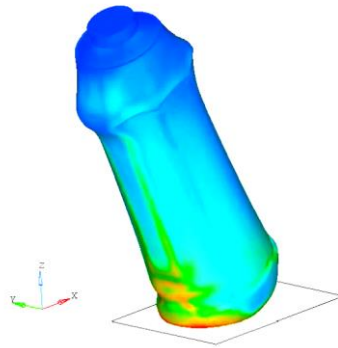


Drop and Impact

Increasing the product life span



Cellphone



Bottle



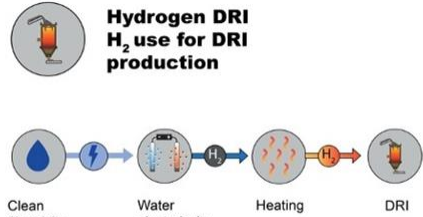
Moto helmet

The Altair Enlighten Award

Great Minds Think Light



Nemak, Recycled Materials for Sustainable Manufacturing & Products, Sustainable Materials Winner



ArcelorMittal, First Industrial Large Scale H2 DRI Test, Sustainable Process Runner-up



Lacks Enterprises, Composite Wheel Technology, Sustainable Product Runner-up

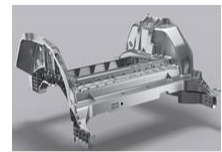
Adient Design & Technology, UltraThin Seating, Future of Lightweighting Runner-up



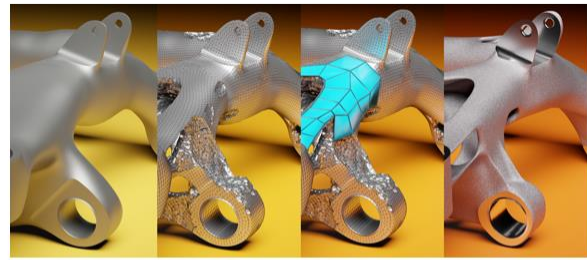
Nucor Corporation, Econiq – The World's First Net Zero Carbon Steel at Scale, Sustainable Material Runner-up



Bocar Group, Tundra Rear End Post – Lightweight Design, Module Runner-up



Human Horizons, Integrated HPDC rear cabin, Enabling Technology Runner-up



Bionic Mesh Design, Lightweight Design without Compromises, Enabling Technology Runner-up



csi entwicklungstechnik GmbH, AMC, BMW M, DITF, NaMiKo – Biobased Automotive Center Console, Future of Lightweighting Honorable Mention

Yanfeng International, IP PAB Integration, Future of Lightweighting Runner-up



The Altair Enlighten Award

Great Minds Think Light

- **Sustainable Product**
 - **Ford Motor Company**
 - 100% Post-Consumer Recycled (PCR) Ocean Plastic Wiring Harness Clips (PA6)
 - 2022 F-150 Lightning



The Altair Enlighten Award

Great Minds Think Light

- **Module Lightweighting**
 - **BASF Corp., Toyota, and L&L Products Toyota Tundra Second Row Seat Structure**



In 2020, electric and hybrid models accounted for just 2% of new car sales.

We need to stop selling petrol cars **this year to meet the <2C goals**

Electric vehicles

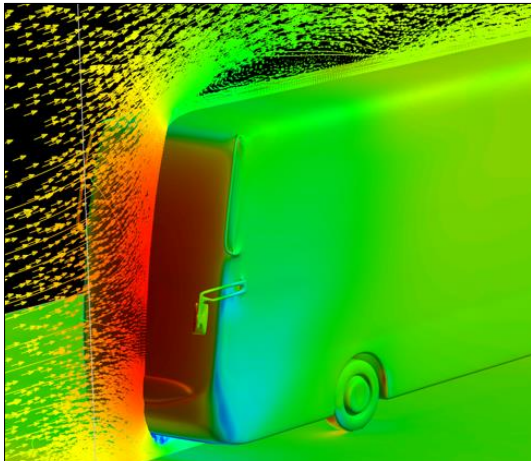
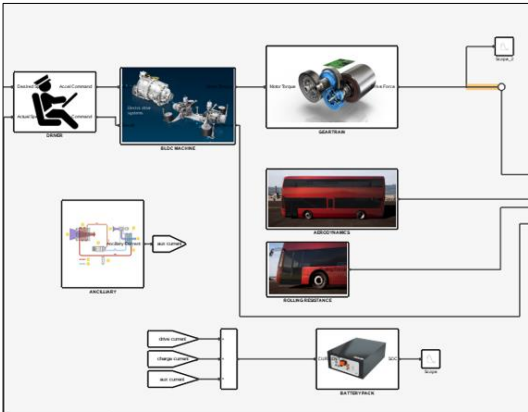
At Altair we work on

- Battery technology
- Lightweighting and manufacturing
- Vehicle range
- Charger technology
- Charging infrastructure
- Adoption and incentive efficacy

SWITCH

Worked with Switch Mobility to create a digital twin of electric buses to **predict range in real world use conditions.**

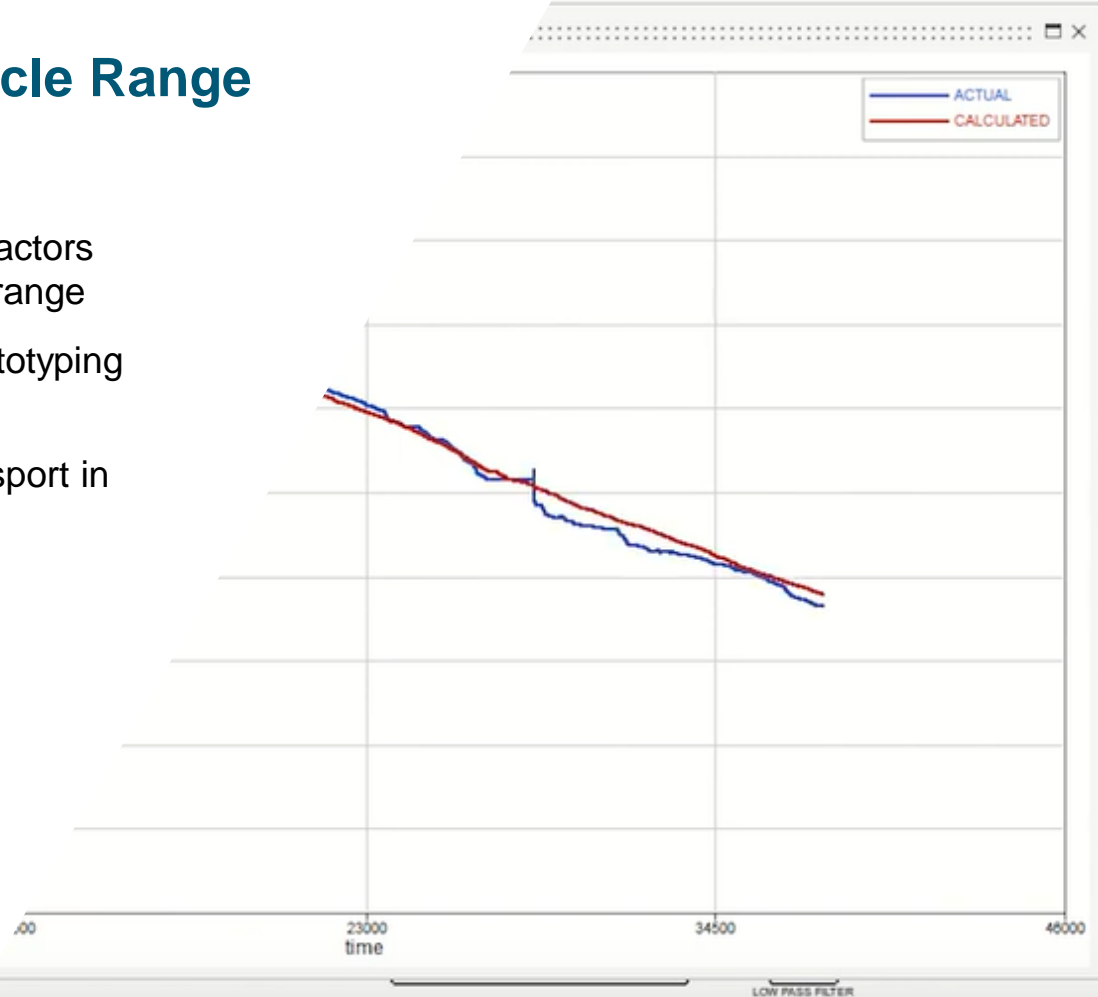
Accurate range prediction gives **confidence to transport authority clients**, helping them to meet their green mobility objectives.



Predicting Electric Vehicle Range

Through Digital Twins

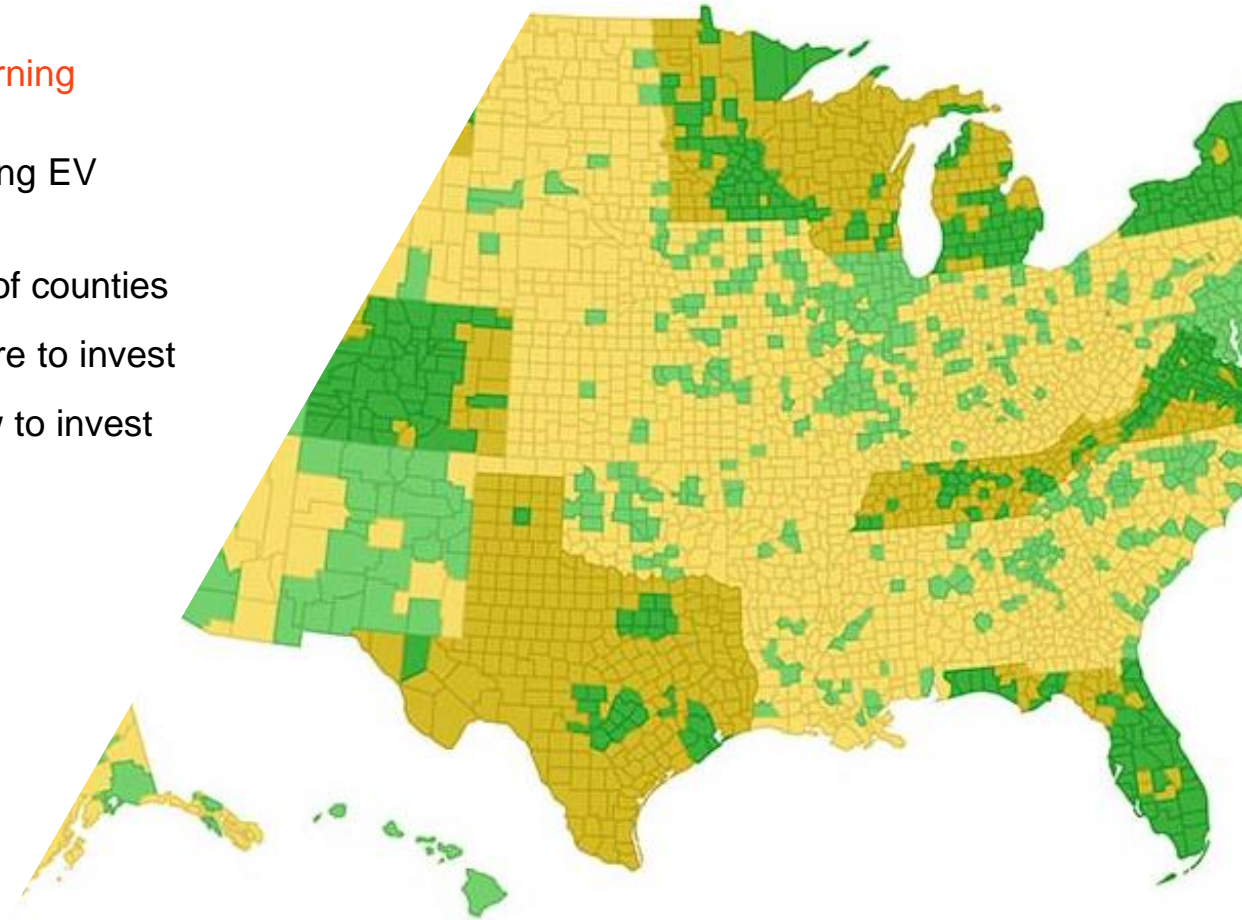
- **Switch** looked at how different factors affected battery life and vehicle range
- Provided confidence prior to prototyping and physical testing
- Proved the feasibility of EV transport in London



Electric vehicles

Driving adoption with machine learning

- Altair looked at factors predicting EV adoption in US counties
- Data was collected from 15% of counties
- Results show businesses where to invest
- Results show government how to invest in infrastructure and incentives



GREENER HPC

Altair is the leader in HPC

- 19 of the top 20 **Automotive** companies
- 24 of the top **Aerospace** companies
- 27 of the top **Weather / Earth Sciences** organizations
- 15 of the top **Life Science** companies
- 11 of the top **Oil & Gas** companies
- 21 of the top **Government and Research** Organizations
- 3 of the top 4 **IaaS Cloud** providers
- 2 of the top 4 **IaaS Cloud** providers for their own Semiconductor Design

Efficient scheduling for HPC and Cloud

Altair HPC and Cloud software is used to schedule **billions of core-hours** per year.

Today's high-performance processors can consume **more than 200 watts of power** per processor

Efficient scheduling for HPC and Cloud

Advanced job scheduling can
improve system utilization by 15%

Applying power profiles has been
shown to **decrease power
consumption by up to 18%**

Green scheduling with NCAR and PBS Professional

- NCAR-Wyoming Supercomputing Center, HPE Cray EX system
- 19.87 petaflops with a combination of CPU and GPU nodes
- Funded by the National Science Foundation (NSF)
- **Green scheduling and energy aware scheduling** with Altair PBS Professional and Altair Accelerator Plus

Cylc & Altair's PBS Professional™

Weather Modeling at Australia's Bureau of Meteorology

- Bureau of Meteorology models the often-harsh natural environment: drought, floods, storms, and tropical cyclones throughout Australia.
- **Cylc** is an open-source Python workflow engine for cycling systems
 - executes tasks with detailed schedules and dependencies
 - used in climate modeling, weather forecast, data processing.
- The Cylc + PBS Professional integration unifies a large production system with many workflows

Maximising System Utilisation with Altair Grid Engine

Information Sciences Institute, Viterbi School of Engineering

- ISI have extensive use of machine learning, but suffered from low system utilization
- ISI chose Altair Grid Engine due to the built-in advanced GPU support, detailed documentation, ongoing product upgrades and customer support.

“With Altair Grid Engine, we have an infrastructure that schedules workloads to GPUs. We operate our infrastructure at 95% capacity with lower overall costs.”

Stephen Rawls, Research Analyst

Maximising System Utilisation

Higher utilisation and lower total cost of ownership

- Support for GPUs, Containers and MPI technology
- Cloud bursting automation
- High system reliability and world-class support
- Support for heterogeneous systems

Ten ways in which Altair is saving the planet

1. **Reducing the environmental cost of manufacture** through simulation and optimisation
2. **Increasing product lifetime** with digital twin and AI
3. **Improving safety through simulation** with real human models
4. **Making electric vehicles a reality** through lightweighting and battery simulation
5. **Enabling innovative use of green materials and processes** such as recycled plastics

Ten ways in which Altair is saving the planet

- 6. Power-aware and green scheduling**
- 7. Improving system utilisation**
- 8. Reducing cloud waste** though benchmarking, automation and budget tracking
- 9. Solutions for climate modelling**
- 10. Increase lifespan of hardware investment**