Nonlinear, Transient Dynamic Analysis

LS-DYNA – Engineering Services, Sales and Training

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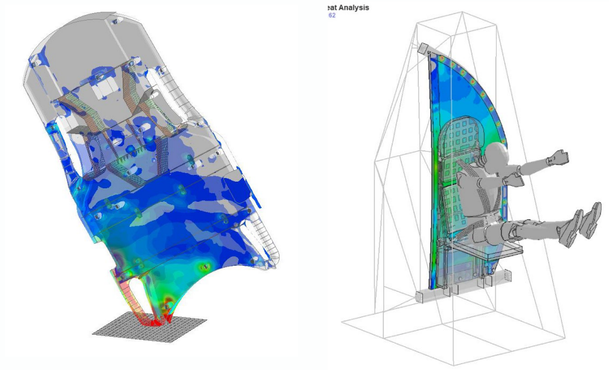
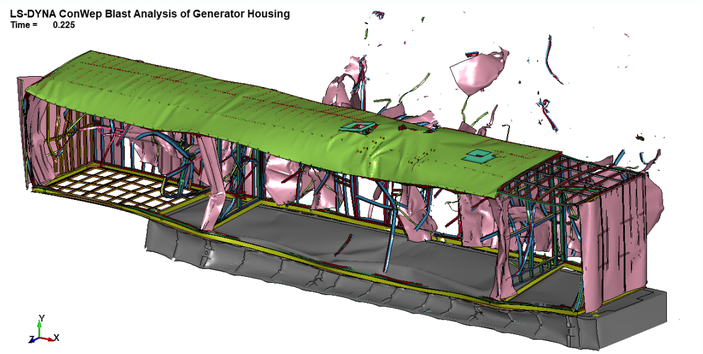
FINITE ELEMENT ANALYSIS
PredictiveEngineering

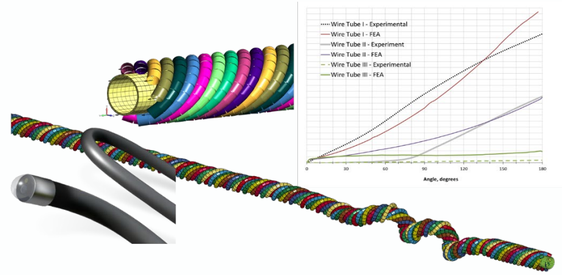
At Predictive Engineering, we pride ourselves for our ability to idealized complex structures and systems into accurate numerical models. When it comes to nonlinear, transient dynamic analysis, we are experts in getting LS-DYNA to do the near impossible.



We have direct validated experience in:

- Drop-test analysis per 49 CFR 173 or MIL-STD-810E
- Airplane seat analysis per TSO-C127a / SAE AS8049A / 14 CFR Part 25.562 for the 16g sled test
- Blast analysis for protective design per PDC-TR 06-08 and CSA S850-12
- Nonlinear material modeling of plastic, elastomeric and foam modeling for the sporting goods industry
- Simulation of medical equipment from orthopedic screws, endoscopic tools (cables and tubes), syringes, cardiac tools and dental equipment
- Extensive experience in nonlinear analysis of plastics from multi-shot assemblies, thread designs and even drink cups
- Impact analysis of a broad range of systems from composite structures, structural steel frames, engine stands, mining digger teeth, cameras and locomotive fuel tanks
- Burst containment analysis of high-speed rotating turbines and medical equipment (x-ray scanning equipment)
- Fracture simulation in glass and ceramic composites
- Pyro-shock analysis of military devices
- Hyperelastic seal design (e.g., O-rings) for medical devices, truck components and coffee cups

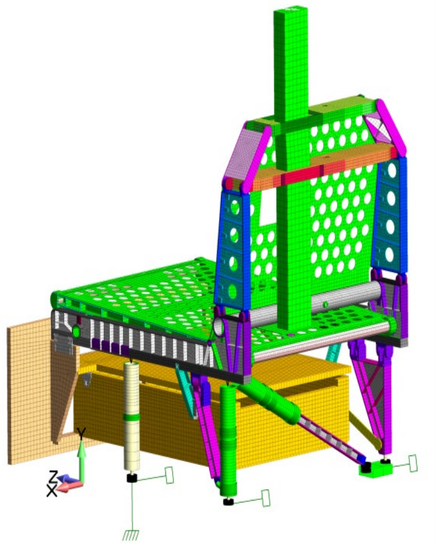




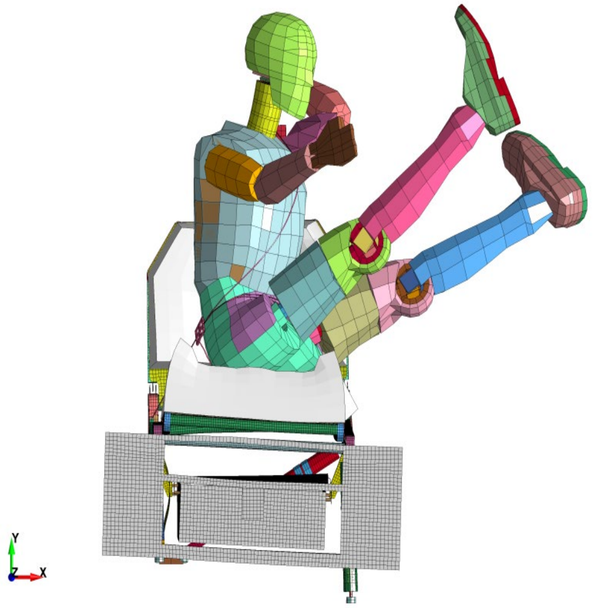
Our hard-fought experience comes from over 20 years of continuous use of LS-DYNA in solving some of the toughest nonlinear static and dynamic analysis problems. If you would like to know more, please feel free to contact us.

16g Seat Crash Test
TSO-C127a / SAE AS8049A / 14 CFR Part 25.562

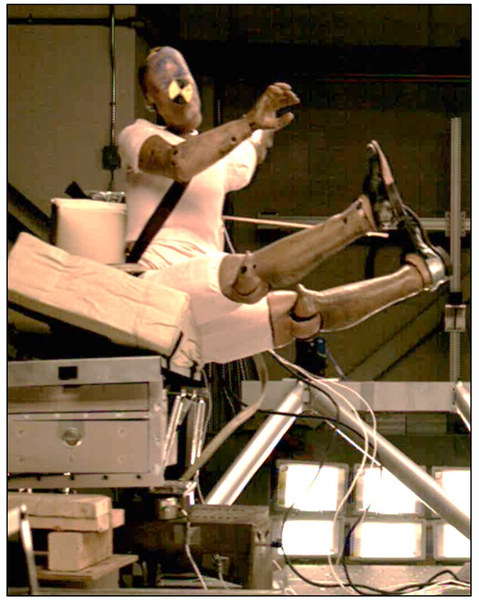
FEA Model



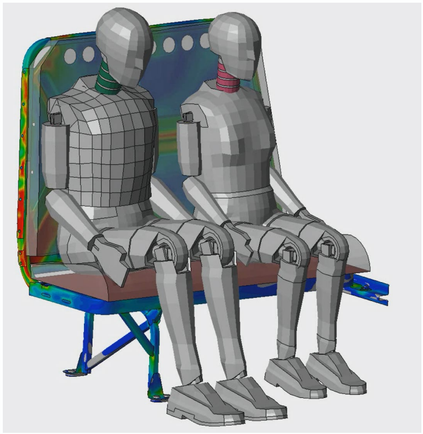
FEA + LS-DYNA Model



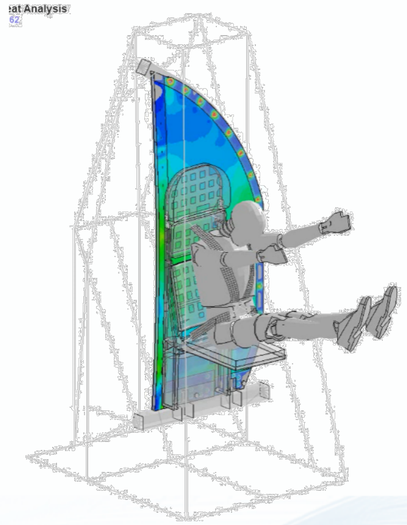
Validation is Gold



Bus Seat Durability Simulation and FMVSS 210

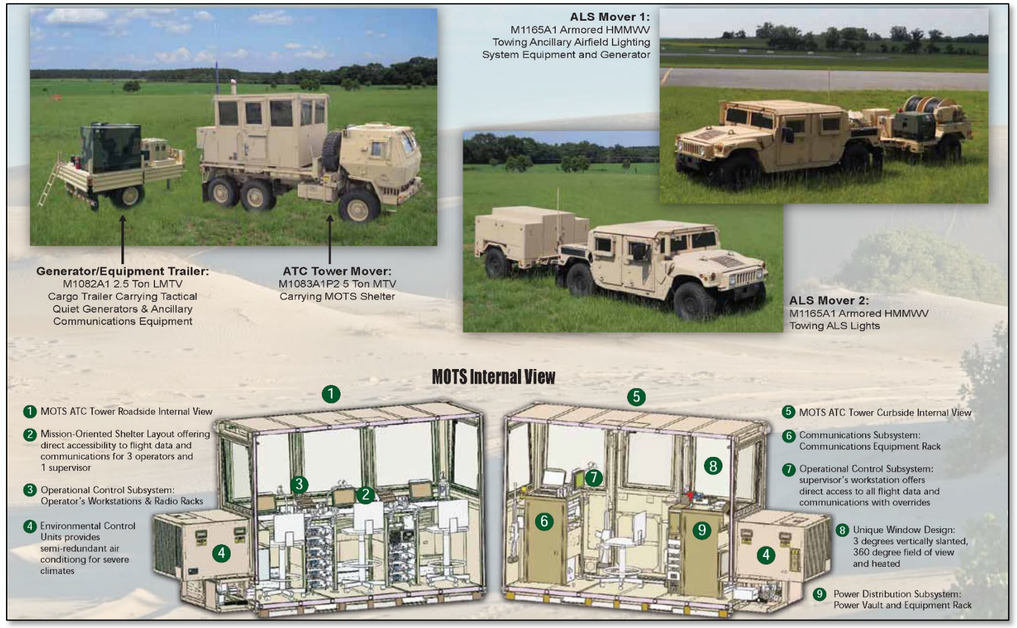


Aviation Attendants Seat – 16g

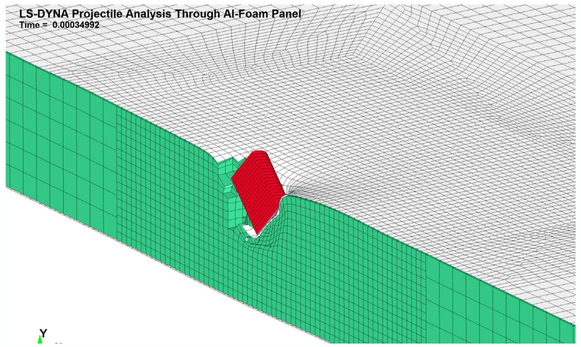


Passing the FAA 16g sled test is no trivial matter for highly optimized aluminum and composite airplane seats. The objective of this LS-DYNA study was to ensure that the client's seat could be validated against the test sled results and that subsequent seat versions would pass "the first time".

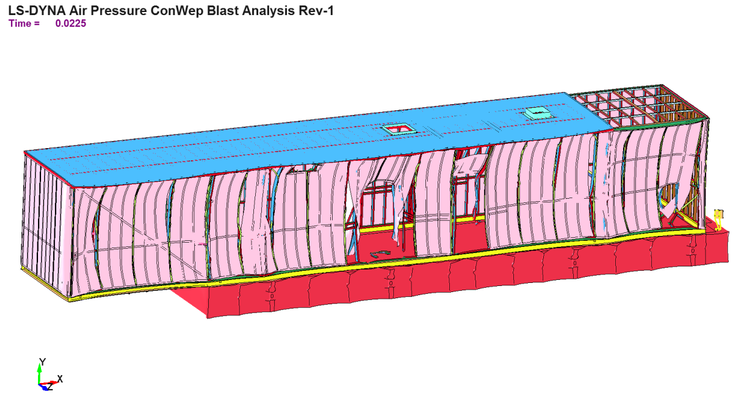
Projectile Penetration and Blast Survivability Analysis

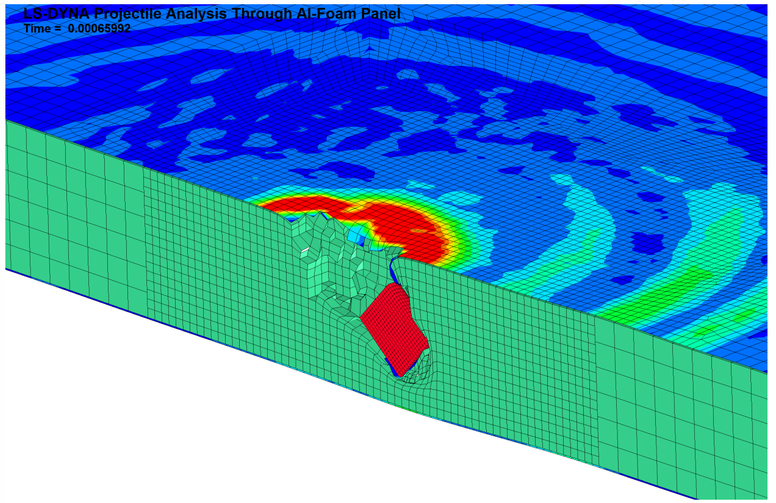


Projectile Penetration



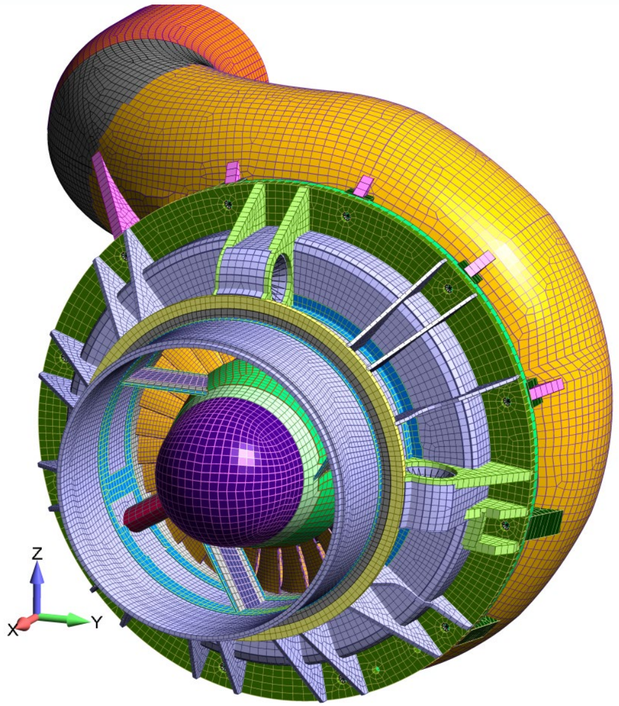
CONWEP Blast Survivability

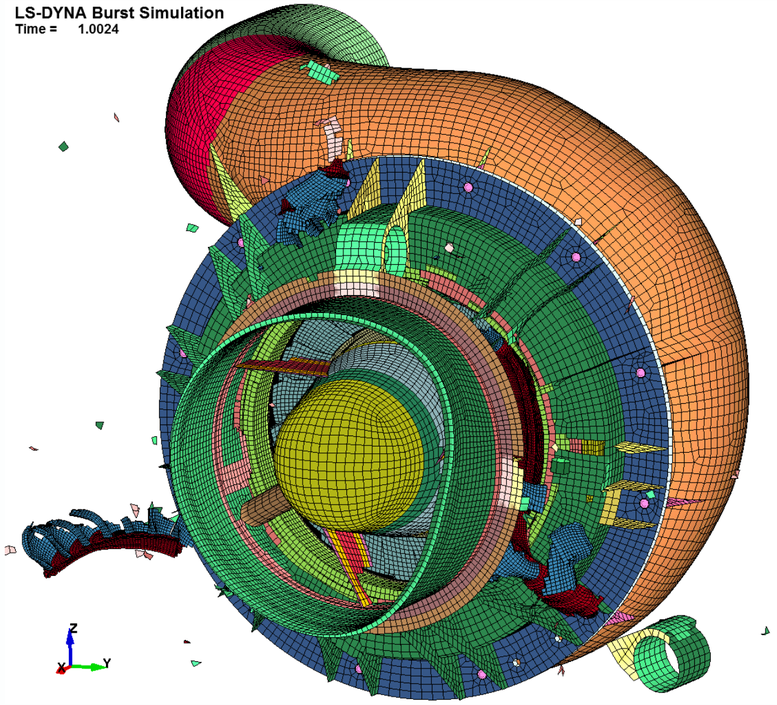




A projectile penetration study was conducted to assess the protective capabilities of a standard aluminum skinned foam sandwich panel. These types of panels are commonly used to create lightweight truck-mounted mobile shelters. For this analysis work, a section of the panel was idealized into a shell and brick FEA model. The panel was subjected to a secondary ballistic impact penetration of a grenade fragment falling at terminal velocity. The results allowed the client to meet their design requirements without experimental testing.

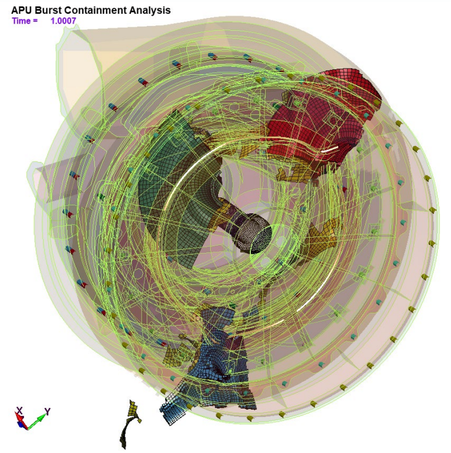
Turbine Blade-Out and Rotor Burst Simulations



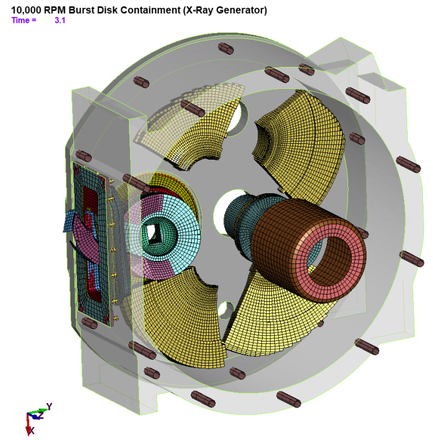


LS-DYNA turbine burst simulation of an air drive power turbine. Analysis work led to significant costs and schedule savings; e.g., each simulation was approximately $5k and four days as compared to the burst tests at over $100k and 30 days.

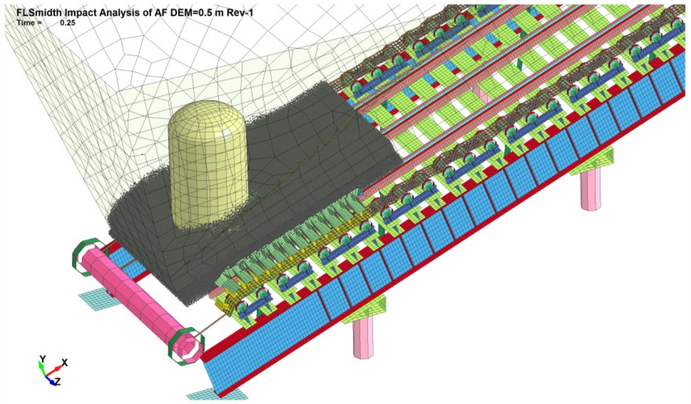
APU Blade-Out Containment



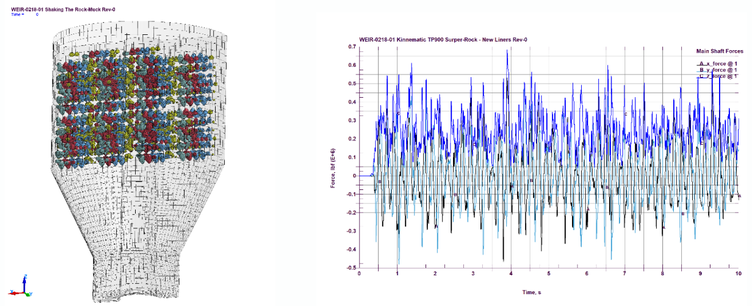
Tri-Burst Rotor Containment



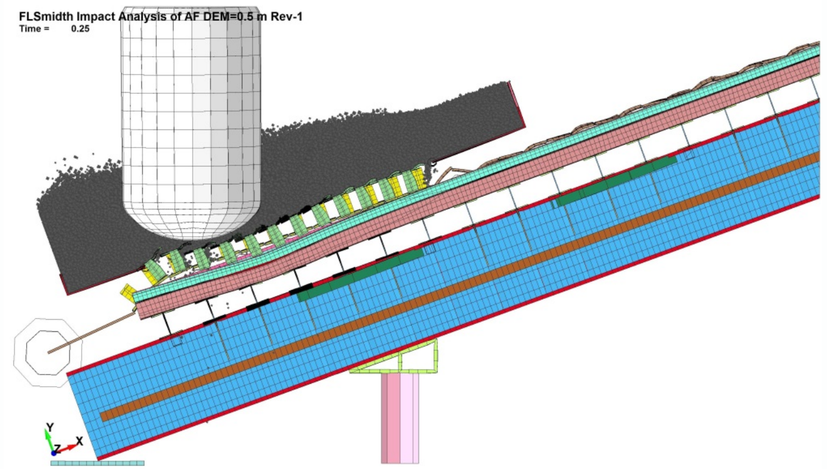
Mining and Mineral Comminution Simulations

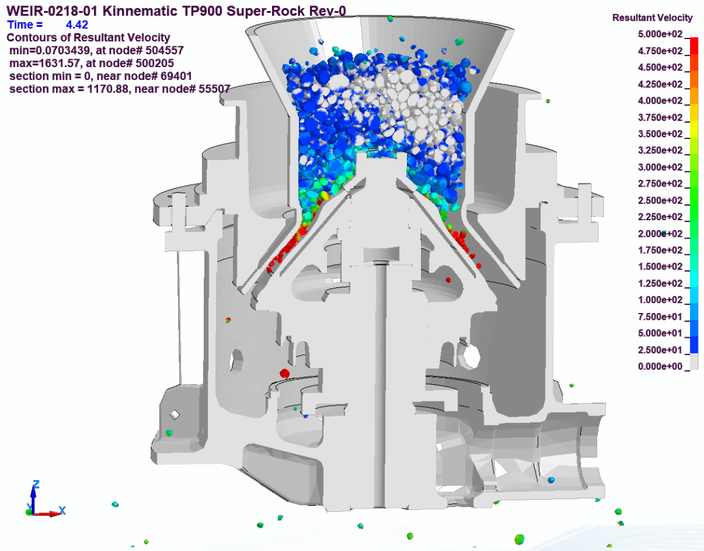


Dynamic simulation of high-speed cone crusher to extract loads for fatigue analysis

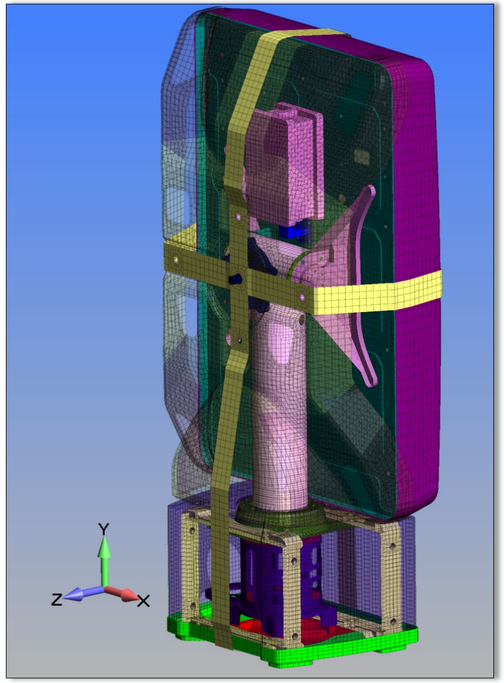


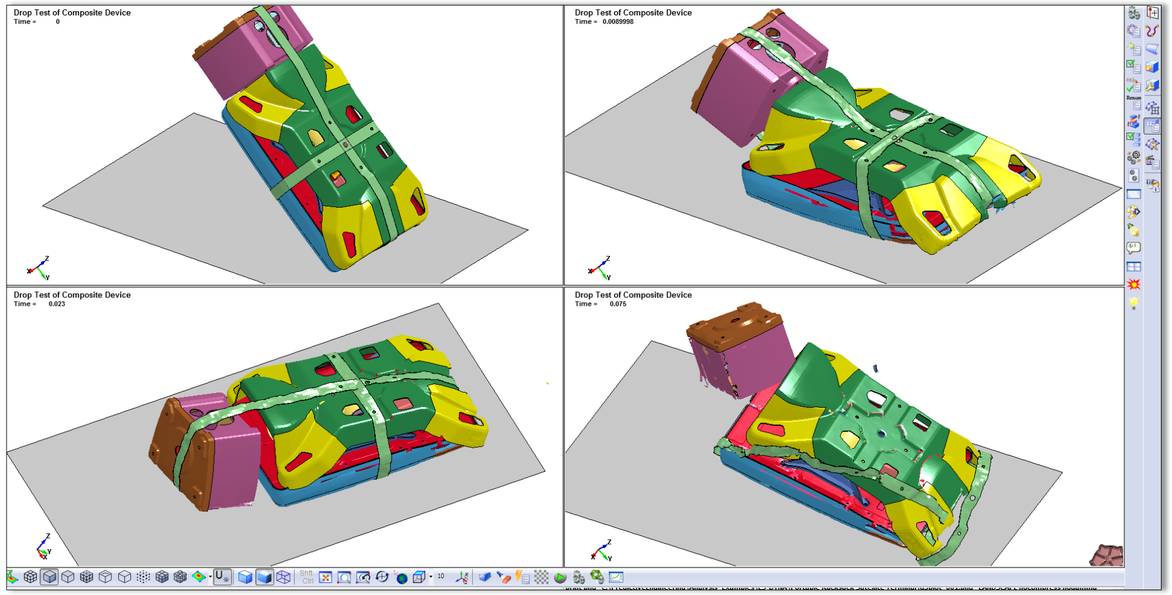
LS-DYNA was used in a combined structural / DEM model for the simulation of a large rock-drop on an apron feeder (AF) commonly used within the mining industry. Results show that if the AF is kept full of material, damage from the impact of large rocks is almost completely mitigated.





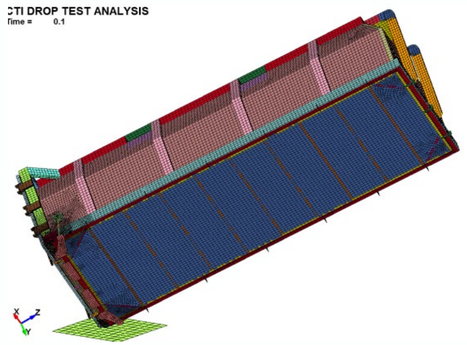
Virtual Drop Test of Electronics, Composites and Containers



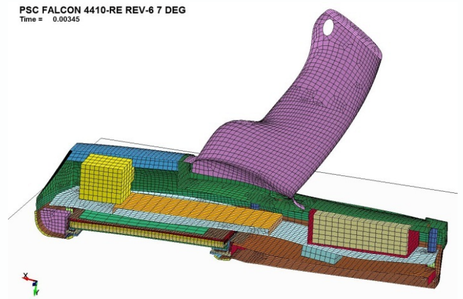


An ultra light-weight carbon fiber composite electronic device was drop tested through a range of 26 positions (MIL-STD 810e). The shell of the unit was a blend of carbon and Kevlar layers for increased impact resistance. The finite element model was used to document experimental drop test failures and then to implement solutions. The modeling results were reviewed by a team of external experts and accepted for production.

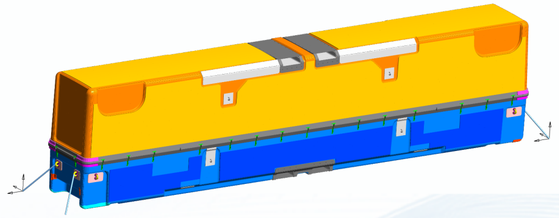
Nuclear Waste Containers



Hand-Held Electronics

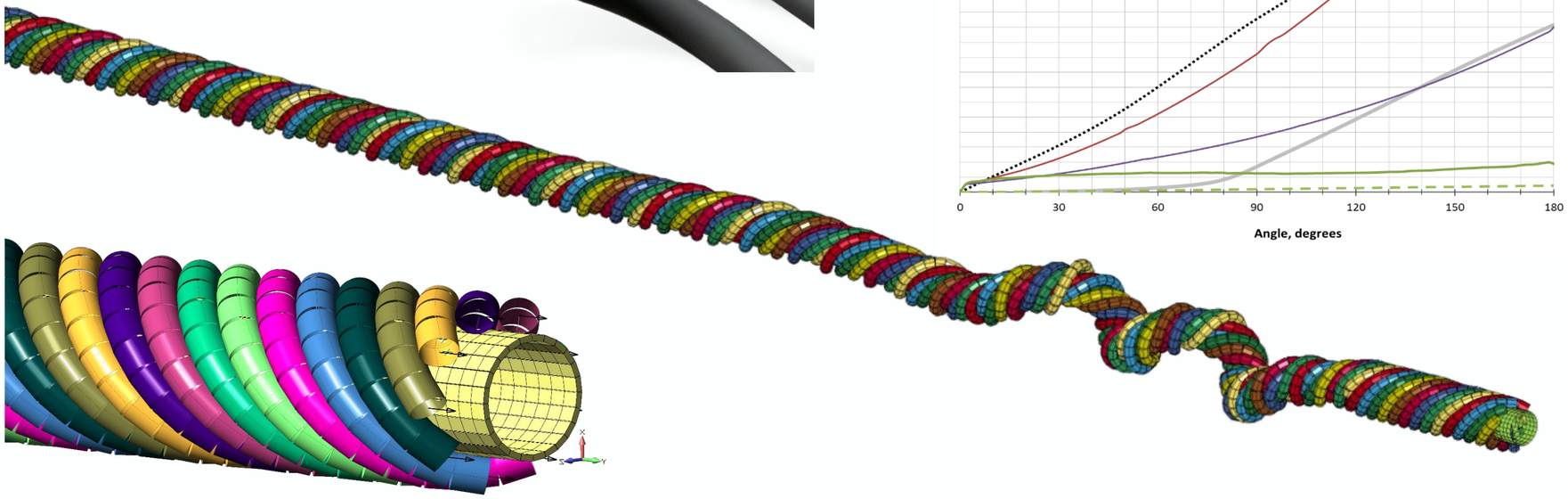


Large Composite Aerospace Structures



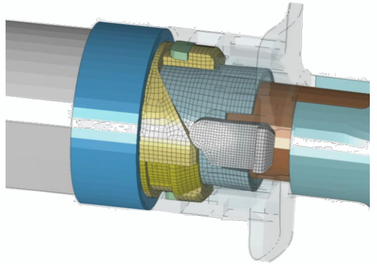
Medical Simulations – Endoscopic, Orthopedic, Syringes,

FORT WAYNE METALS
Turning knowledge into solutions.

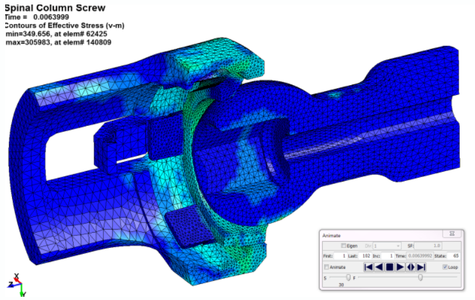


Robotic endoscopic surgery requires the use of highly engineered steel micro-cables and helical hollow strand (HHS) tubes. The wire tube shown above is the main structural component that allows endoscopic probes to navigate through arterial systems. It must be flexible yet capable of sustaining high torque loads without buckling. An LS-DYNA model was constructed and correlated to one set of experiment data. Based on these results, two other HHS models were created and shown to correlate directly to the experimental results. This out-of-the-gate correlation demonstrates that FEA modeling can be a predictive tool for the development of the next generation of these tools.

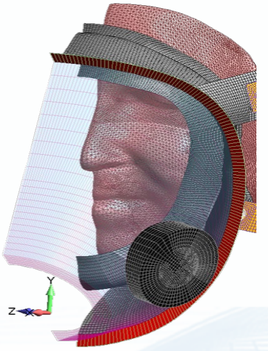
All-Plastic Snap-Fit Syringe



Titanium Ceramic Spine Screw



Human Biometrics Fit and Function



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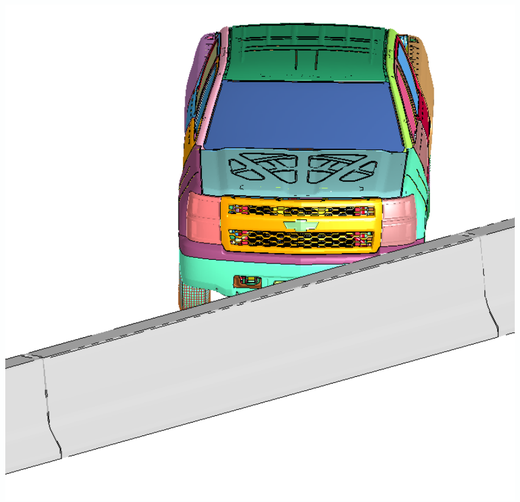
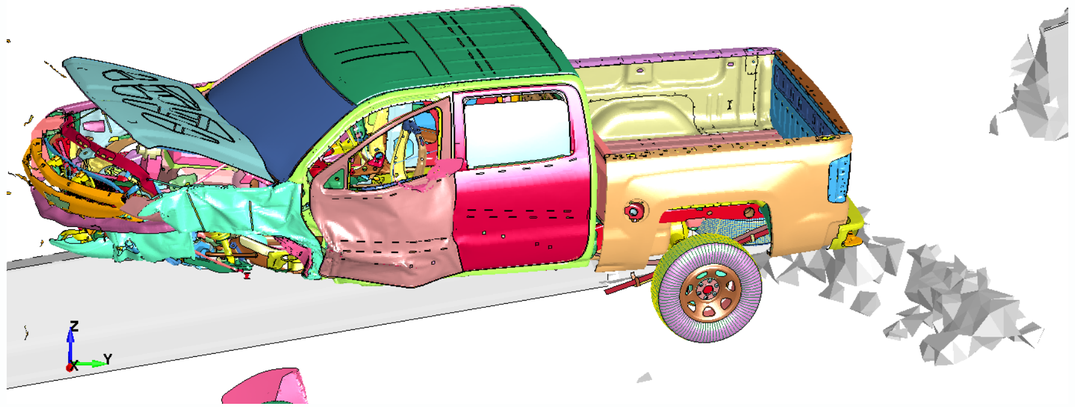
Crash Simulations (Std and Composites) and MASH 2016 TL-3

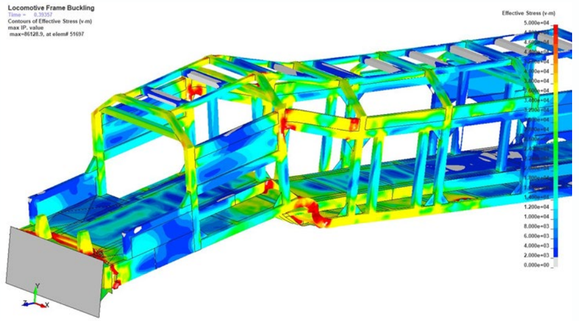
MASH 2016 TL-3 25 Degree Barrier Crash





Large Vehicle Crash Simulations

ASME RT-2-2014 – Rail Crash Stability



Crash simulations represent the combination of extensive material modeling expertise with core LS-DYNA experience. Predictive Engineering has experience in crash simulations across various industries outside of the standard automotive business. Our understanding of barrier materials, from concrete to steel, is derived from our engineering team's background in material science and we specialize in the construction of complicated simulations, whether for MASH 2016, large-vehicle crash simulations or composite "crash" simulations.

ITAR Composite “Crash” {That we can’t talk about…}

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