

Quarterly Tech Talk

Go Beyond Finite Element Analysis

February 15, 2018

Our Focus

AlphaSTAR Corporation is a leading engineering services and software company that provides innovative physics-based simulation technologies for additive manufacturing, structural modeling and analysis of advanced composite structures in the aerospace, automotive, defense, and energy industries worldwide. As a solution provider, AlphaSTAR proudly partners with DS SIMULIA, LSTC, ANSYS, MSC, ALTAIR and SIEMENS PLM. AlphaSTAR is headquartered in Long Beach, California and is the recipient of esteemed industry and technology awards for R&D and software development.

Inside this issue:

Webinar Recap	1,2
Reseller Highlight	2
Upcoming Events	3
Product Updates	3
GENOA Success Story	4

ASC Webinar Recap: The Leading Solution for Metal AM Process Modeling and Simulation

For all its promise, polymer and metal based additive manufacturing is still limited by costly trial and error production to optimize process parameters. Due to variability in AM machines and processes, quantifying and certifying mechanical properties of AM-fabricated can also present a challenge. In this regard, Additive Manufacturing (AM) process simulation may be used to predict as-built material characteristic and final part residual stress & deformation for certification and qualification purposes.

GENOA 3DP simulates the manufacturing process by generating a structural mesh from STL file or printer G-CODE and utilizing commercial FE thermal/stress analysis with a detailed multi-scale material model to predict build outcomes as related to the specified process parameters. In order to obtain accurate results, the methodology must take advantage



Lead, Structures Group
Cody Godines

GENOA Success Story:

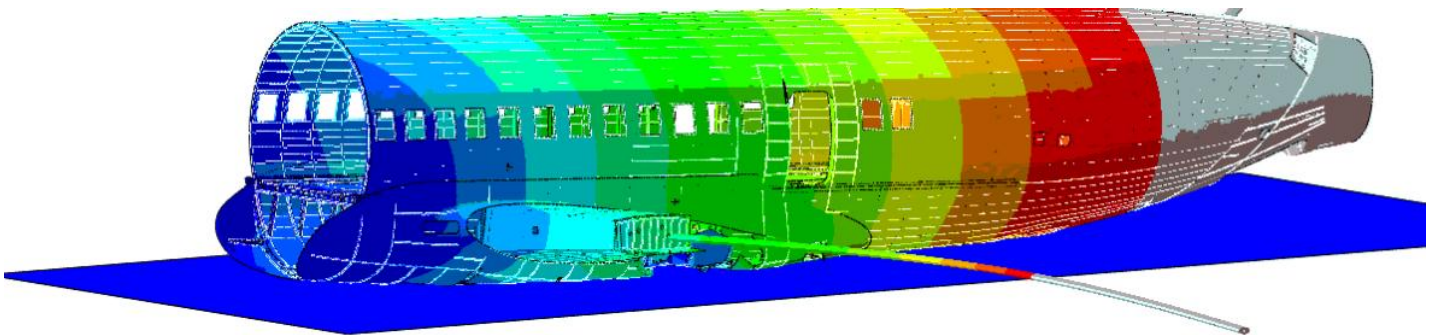
Certification by Analysis Supported by Test

AlphaSTAR recently used GENOA MS-PFA to assist in Certification by Analysis Supported by Test on a COMAC ARJ21 Regional Jet for Wheels-Up Landing drop test condition compliance.

Extensive testing of components and full parts is often needed to ensure aircraft design conformance with certification standards. In addition to the high cost and long development cycle associated with such destructive tests, difficulties arise in collecting data due to the short duration of the test window, and potential for damage to structures and measuring equipments.

Testing is further complicated by use of multi-material and design multi-functionality, which are common in modern aircrafts and exemplified in laminated and fiber reinforced composite structures as well as joining of metallic and composite sub elements and mitigate to full fuselage and other system design.

FAA recommends building block certification strategy which involves material characterization, simulations and validation at coupons, elements, sub-component and component levels. For this effort, AlphaSTAR utilizes GENOA Multi-Scale Progressive Failure Dynamic Analysis (MS-PFDA) and Virtual Testing numerical Finite Element based stress analysis tools to accurately predict how the structure would fail due to various loading conditions: a) Ability to predict the 5 stages of load-displacement curves; b) Ability to produce the damage foot print as combination of energy, stress, & strain and not just the stress per current industry practice; and c) Ability to identify materials exhibiting strain rate or limited strain rate effect.



Find Us at These Upcoming Events:

AMUG	April 8 – 12, 2018
Nanotech TechWorld	May 13 – 16, 2018
SAMPE Long Beach	May 21 – 24, 2018
NAFEMS Conference	June 5 – 7, 2018
LS-Dyna Conference	June 10 – 12, 2018
DS Science in the Age of Experience	June 18 – 21, 2018

Meet: Engineering Technology Associates

ETA is an Engineering Solutions and Consulting Company, headquartered in Troy, Michigan. A leading provider of FEA solutions, consulting, customization of products and software development services for the automotive, aerospace, energy & power, oil & gas, electronic packaging, biomedical and civil engineering industries. As one of the largest and fastest growing engineering service suppliers in the world, ETA offers CAE/FEA Analysis, Product Concept Development, The Accelerated Concept to Product Process (ACP) and much more.

ETA is committed to being an innovation leader in the development and implementation of cutting-edge tools and techniques. "We are eager to provide OEMs and suppliers in the auto industry an accurate software solution for designs with composite materials and structures. We expect that our customers will be able to reap the benefits of what AlphaSTAR has to offer", says ETA President and CEO, Abraham Keisoglou.

ABOUT ETA: ETA joined ASC as a channel partner in Q3 of 2017.

What's New with ASC Products?



- Laser Powder Bed Fusion Printing Process
- Prediction of Mechanical Properties at Different Temperatures
- Prediction of Delamination and Other Manufacturing Anomalies
- Asses Both Material and Process Parameter Sensitivties
- High Fidelity and Low Fidelity Solutions for Thermal and Thermal-Structural Analysis
- Automatic Mesh Generator from G-code
- Prediction of Environmental Effects, Scatter & Uncertainty
- Global/Local Material Modeling using Grain and Grain Boundary Approach
- Bottom Plate Removal Simulation
- Prediction of Performance for As-built Part
- Validated database for composites Thermoplastics, Thermoset and Metal Powder

"The unparalleled tool set allows engineers to improve their printing process by identifying damage & percentage contribution of each type of damage in order to minimize defects"

-Dr. Rashid Miraj

Phase II's for AlphaSTAR

In 2017, AlphaSTAR Corporation was awarded several Department of Defense Phase I SBIR awards and was awarded three Phase II SBIR award. In addition, AlphaSTAR continued work on an active Phase II award related to Damage Precursors and Structural Health Monitoring. Many of the awards were associated with the field of Additive Manufacturing highlighting the importance and high priority the Federal Government and Department of Defense have given to the subject of AM, which not only represents a new dawn for American manufacturing but also provides advanced tools & methods for multiple industries & applications. While topics varied between agencies, a common thread for all solicitations was a desire to fund the development of mechanisms and methodologies that improve quality of the finished product and meet existing product specifications.

Did You Know?

- The MCQ Suite of Softwares can reduce your testing, leading to cost savings
- MCQ has a material database for several validated classes of Thermoplastic, Elastomer and Thermoset
- You can identify scatter, uncertainty, sensitivity for process and material optimization with GENOA 3DP Simulation

Phase II --- MDA16-013 – 'Additive Manufacturing for Affordable Missile Defense':

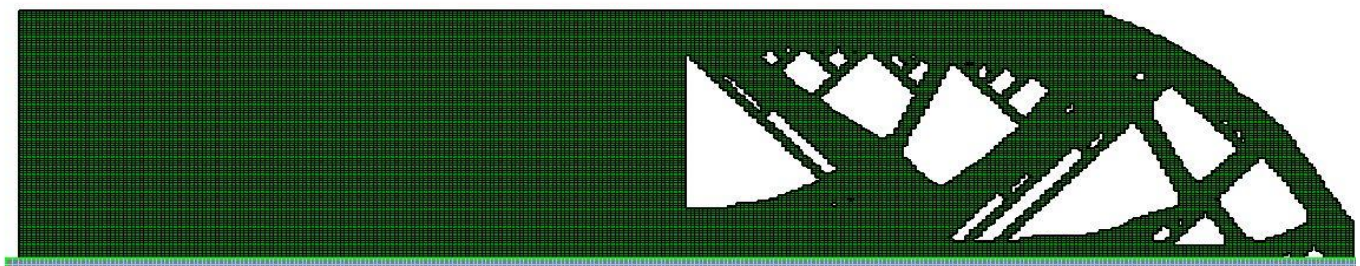
This effort will leverage advanced multi-scale material modeling and multi-physics additive manufacturing (AM) simulation technologies to suggest optimized AM process and build parameters prior to printing in order to deliver quality assured Direct Metal Laser Sintering parts.

Phase II --- N162-100 – "Integrated Hybrid Structural Health Monitoring (SHM)

System": In this effort, AlphaSTAR integrated SHM technology with multi-scale, multi-physics analysis to demonstrate the technical feasibility of an integrated hybrid SHM system that utilized networks of fiber optic (FO) sensors and piezoelectric (PZT) actuators to monitor loads and detect damage state on both non-rotating and rotating structural components for the V-22 platform.

Phase II --- A15-021 – "Health Conscious Structures for Zero-Maintenance Rotorcraft Platforms":

The active research program demonstrated an innovative Multiscale and Multiphysics Experimental Mechanics (MMEM) approach to identify early damage precursors and determine data trends to be used in a modeling framework for reliable Remaining Useful Life Predictions of active duty rotorcraft platforms and components.



Metal Beam Shown in GENOA3DP