



**GENOA 3DP Simulation** is an additive manufacturing design tool and software suite that simulates the 3D printing process to accurately predict the net shape, residual stress, deformation, damage initiation, and propagation associated with as-built 3D printed parts. Advanced Multi-Scale Progressive Failure (global/local) modeling and analysis methods are used to replicate the entire 3D printing process from the level of Material Characterization to Advanced FE Analysis by either predicting or utilizing manufacturing anomalies, and other irregularities and inefficiencies from micro to macro scales. More significantly, GENOA 3DP Simulation provides the end user with an ability to generate a structural mesh, run analysis and optimize the build in order to reduce weight, reduce scrap rate, improve performance and meet specification.

### Key Features

- ✓ Supports Metal Powder and Polymer Material Systems – validated material databases for Metals/Polymers/Ceramics
- ✓ Predicts Mechanical Properties with Voids and Anomalies at Room and Elevated Temperatures
- ✓ Assesses both Material and Process Parameter Sensitivities to be Optimized to Improve Manufacturing Process
- ✓ In-service Qualification of Printed Part, Effect of Voids and Defects on In-service Life, Strength and Durability
- ✓ Predicts Manufacturing Anomalies (e.g. Residual Stress, Warpage, Heat Affected Zone, Delamination, etc.)
- ✓ Visualizes/Assesses Printer Path Quality and Highlights Problematic Bald Spots, 2D/3D Voids Visualization
- ✓ Creep Diffusion Model to Predict Local Anomalies, Voids and Local Surface Roughness
- ✓ Predict Transient Temperature & Material Phase / States - Zeroth Order Model for Thermal Analysis (ZOM)
- ✓ Predict Damage/Failure Type, Location and Percentage of Contribution of Each Failure Type to Fracture

### Key Benefits

- ✓ Reduces Scrap Rate of Materials in Additive Manufacturing, Trial and Error in Manufacturing Process
- ✓ Characterizes AM Materials in Coordination with an ICME Framework
- ✓ Integrates 3D Printing Process Simulation with Assessment of Properties, Design Evaluation and Structural Analysis
- ✓ Provides Improvements for Process Parameters and Robust Design Optimization in Order to Minimize Defects
- ✓ Addresses Manufacturing Constraints to Minimize Processing Defects to Improve Performance
- ✓ Validates Developed/Enhanced Models for AS-IS Performance of 3DP Parts