***GS Engineering** is an agile small business with corporate offices in **Houghton, Michigan** delivering advanced engineering solutions to military and commercial transportation markets through structural design, analysis, product development, and correlated testing services.*

MILITARY / DEFENSE

WHEELED & TRACKED VEHICLES, COMPONENT/SYSTEM DESIGN, WEIGHT/COST REDUCTION, PROTOTYPING, TESTING

GS ENGINEERING™

COMMERCIAL / OFF-HIGHWAY

GROUND-UP VEHICLE DESIGN, DESIGN FOR COST/MFG/ASSEMBLY, COMPONENT SOURCING & INTEGRATION, BUILD SUPPORT

2013 Tibbett's Award Recipient for SBIR Excellence

Specializing in Commercial & Off-Highway Engineering

CAD – CAE – FEA

3D Solid Modeling:
- SolidWorks 2010 / 2011
- ProEngineer, Catia, Siemens NX
- Behavioral Modeling
- Skeleton Modeling
- Reverse Engineering
- Detailed Drawing Packages

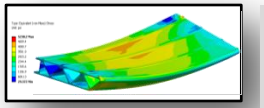
Electrical Engineering & Design:
- 3D Harness Routing & Connector Integration
- Detailed Flat Harness Drawings
- 2D Electrical Schematics
- Electrical Circuit Load Auditing
- Hardware Component Selection
- Circuit Board Development & Design
- CAN-BUS Integration & Programming
- Proprietary Microprocessor Programming

Reverse Engineering:
- Faro Arm Capabilities
- Support On-site & Remote Measuring
- IGES Data for 3D Model Creation
- ATOS White Light Camera:
- Develop 3D Models From Point Cloud

Finite Element Analysis:
- Ansys 13.0
- Altair Hyperworks
- Load Case Determination
- Topology Optimization
- Dynamic & Thermal Analysis
- Linear/Nonlinear Stress Analysis
- Composite Materials

Iterative Design Tools:
- MathCAD & In-House Processes

Dynamic Simulation Modeling (ADAMS):
- ADAMS Car Template Development / Modeling
- Vehicle/System Kinematics & Dynamics
- Handling, Ride, Durability & Stability Analysis
- Suspension Tuning
- Component Forces to Support FEA

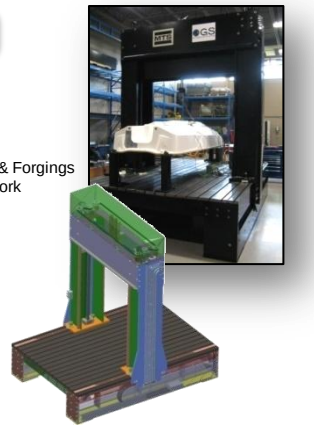


PROTOTYPE BUILD

Prototype & Procurement Support:
- Accelerated Development for Build
- Sourcing of COTS Components
- Prototype Manufacturing: (Weldments, Sheet metal, Castings, & Forgings
- Established & Audited Supplier Network
- Quality Control Plans
- Quality Inspections & Verification

Assembly & Installation:
- 6000 sq. ft. High Bay Facility
- On-site Installation Assistance

Low Volume Production:
- Production Level Quantity Builds
- Supply Chain Management
- MIL-STD Packaging Design



ADVANCED MATERIALS

GS Engineering integrates design analysis and advanced materials technologies to offer innovative applied solutions.

Benefits:
- Weight Reduction
- Corrosion Resistance
- Wear Resistance
- Part & Process Compatibility
- Part Quality Improvement

Materials Expertise:
- Metal Matrix Composites (MMCs)
- Forged, Investment & Squeeze Cast Al & Mg
- High Strength Steel
- Austempered Ductile Iron
- Investment Cast Titanium

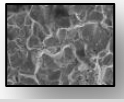
Process Engineering:
- Heat Treat
- Casting
- Extrusion
- Material Joining (Welding)
- Coatings

Metallurgical Testing:
- Mechanical Testing
- Metallography
- Microstructural Analysis
- Corrosion Testing
- Elemental Characterization

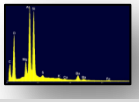
Failure Analysis:
- Fatigue Life
- Fracture Mechanics
- FEA Integration
- Fractography

Mechanical Testing

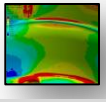
SEM Imaging



Energy-Dispersive Spectroscopy



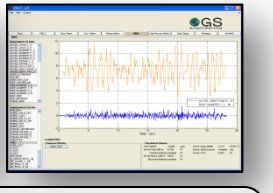
FEA Integration



TESTING – VALIDATION

GS Engineering's 500+ acre vehicle test course features a low visibility location, ideal for private vehicle testing and development.

Customizable Courses:
- Gravel & Paved Slopes of 15% - 40%, 60%
- Paved 1" & 2" RMS Courses – 500'
- Vertical Steps of 18", 24" & 36"
- Paved Side Slopes of 20%, 30% & 40%
- Stability Tilt Table (~20 ton)
- Multiple Secondary Road Endurance Areas
- Multiple Off-Road Endurance Areas
- Gravel Frame Twist
- Paved Half Rounds 4", 6", 8", 10"
- Paved Vehicle Dynamics Area



In-Vehicle Data Acquisition

Standard Test Scenarios:
- Performance Testing
- Strain & Torque Measurement
- Suspension Testing/Tuning
- Brake System Testing
- Power-train Development
- Fuel Economy (Meter Based)
- Vehicle Comparison
- Correlation of FEA
- Noise, Vibration, & Ride Quality
- Simulation Correlation
- Endurance Testing

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