



ISO 9001:2000

# Aerospace

Engineering Service Offered By AEG Through Joint Venture Partner In India  
**Premium Components...Without The Premium Price**

## Design

- Feasibility Study
- Concept Design
- Detail Design
- Design and development of fuselage, wing, empennage, control surfaces, landing gear, transmission systems, helicopter rotors, hydraulic system components and flight control mechanisms
- Design of composite structures
- Design of gas turbine components, assembly and systems
- Design of nacelle, thrust reversers and piston engine DMU
- Digital assembly
- Electrical harness routing
- The design scope includes Computer Aided Design and Manufacturing
- Design and development of repair schemes
- Design Modification for mid-life upgrade
- Role conversion
- Loft and Mylar preparation
- Damage tolerance design



## Analysis & Simulation (CAE, CFD, Multi-body Dynamics, Aeroelasticity, Composite Structures, PDM)

### Computer Aided Engineering Solutions

- Finite element meshing of structures
- Structural analysis
- Non-Linear Analysis (Crash, Contact-Impact, Material, Geometric)
- Instability Analysis
- Dynamic analysis of aerospace structures, systems and components
- Damage tolerance analysis
- Thermal Analysis of gas turbine engine, components and systems
- Viscoelastic analysis of solid propellant
- Crack propagation (fracture) analysis

### Computational Fluid Dynamics (CFD) Solutions

- External aerodynamics
- Aero thermal analysis
- Helicopter aerodynamics
- Turbo machinery flow simulation
- Combustion flow studies



### Multi-Body Dynamics Solutions

- Full aircraft / Space vehicle simulation
- Motion data calculations (Forces, Accelerations and Velocities)
- Dynamic simulations
- Motion simulations of moving parts
- Rigid and flexible body dynamics simulations

- Thermo-mechanical analysis
- Analysis of spinning structure
- Flight loads estimations
- Aeroelasticity, flutter and gust response of aircraft structures
- Control system analysis
- Crash analysis, impact and blade-off studies
- Bird strike and bird ingestion studies
- Design sensitivity analysis and optimization study
- Composite structure F.E. modeling and analysis
- FLUID-structure interaction
- SLOSH/POGO analysis



- Conjugate heat transfer analysis
- Primary and secondary flow studies
- Store separation and trajectory predictions
- Aircraft/Store aerodynamic load predictions
- Aerospace vehicle drag and performance predictions etc.

- Control performance and load evaluations
- Stability and control analysis
- Time responses calculations
- Landing gear simulations
- Control surface and mechanism simulations



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# American Engineering Group

A Global Supplier of Engineering Components

\*Engineering Services Offered By AEG Through Affiliates In India

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## Advanced Engineering Solutions

### Composite Structure Design

- Design
- Lay-up sequencing
- Material selection
- Evolution of factors like stiffness and bending behavior

### Structural Integrity

- Life estimation study of components, systems and full aircraft
- Life extension programs (TBO & TTL)
- Fracture mechanics/crack growth analysis
  - Stress intensity factors
  - Crack growth models
  - Cycle-by-cycle crack growth analysis
  - Residual strength

### Aeroelasticity

Some of our solutions include:

- Panel, wing & empennage flutter
- Limit cycle oscillations
- Tail buffeting
- Wake and tail interaction
- Dynamic interface
- Fluid-structure interaction
- Aeroelastic wing studies



### Other Services

- Manufacturing: CNC modeling, planning and programing
- Testing: test plan, design of test rigs
- Life extension & upgradation
- Structural modification
- Design support for manufacture / testing
- Value engineering & reverse engineering

### Software Expertise

- CAD**
- Catia
  - Pro/E
  - Unigraphics
  - I-Deas
  - Solidworks
  - AutoCAD
- CAE**
- MSC.Nastran
  - MSC.Patran
  - MSC.Dytran
  - MSC.Fatigue
  - ANSYS
  - LS-Dyna
  - MSC.Marc
  - MSC.ADAMS
  - Hypermesh
  - Ansa
  - OptiStruct
  - ABAQUS
  - SYSNOISE
- Simulations**
- MSC. Superform
  - MSC. Superforge
  - Hyperform
  - Moldflow

### Product Data Management

- Project management
- Requirement analysis, gap analysis, process analysis
- System design, workflow design, architectural design
- System Implementation, installation and customization
- Data conversion, data loading
- System interfaces, documentation, system support



### Manufacturing Simulations & Digital Manufacturing

- Tool & die design
- Casting / structural fabrication / forging simulation
- Precision machining simulations
- Design of jigs & fixtures
- Rapid prototyping
- Process planning, machine tool programing, and NC code generations
- Machine tool modeling - modeling of errors and prediction of machine tool performance
- Production system engineering - material flow, production line layout, and mechanical assembly process
- Ergonomic modeling – simulation of manual assembly operations
- Shop-floor simulations
- Documentation for certification
- Design evaluation, Test plan approval
- Accident / incident Investigations and failure studies
- MIL spec and standards DEFSTAN, FAR, AIR, JAR, BCAR, GOST, ASTM, ESDU Data Sheets & Pacs, JIS, DDP MAS ñ 2002, DIN

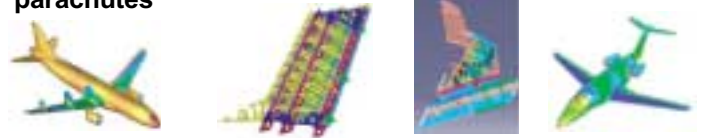
### Digital Manufacturing

- Delmia (ENVISION, IGRIP, QUEST, VIRTUAL NC)
- PDM**
- TeamCenter
  - Smarteam
  - Enovia
  - Windchill
- CFD**
- STAR-CD
  - CFX
  - FLUENT

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## Aerospace Project Experience

- Design / development and modifications of airframe including fuselage, wing, empennage and control surfaces made of metallic, fiber reinforced composites and non-metallic (rubber, plastics, Perspex TM ), components in fuselage like bulkhead / pressure bulkhead, frames, longerons, shear walls, skin & stringer, integral fuel tanks, floors, doors and hatches, air intakes, engine shroud, fairings, splicing, mounting for systems, etc.
- Conceptual, design & development of composite empennage structure for a small passenger aircraft
- Structural integration of all systems on aircraft
- Bird strike analysis on wind screen / gas turbine engine
- Thermal and random response analysis of electronics packages mounted on aircraft
- Fatigue analysis of all fuselage components
- Flutter analysis and support for flight testing for confirmation
- Optimization of wing using weight, design, stress and manufacturing constraints
- Analysis of engine mount, main landing gear, wing fuselage interface and control surface torsion tubes
- Created geometrical and FE model for full aircraft from NMG level
- Linear and buckling analysis of full aircraft assembly and components
- Analysis of control surfaces
- Engine mount analysis for piston engine
- Engine mount analysis for turboprop engine
- Optimization of aircraft engine components
- Critical evaluation of high temperature zones and re-engineering of the components
- Static analysis of compressor and turbine rotor
- Structural integrity of gas turbine engine
- Bird impact studies on rotating bullet nose, rotor system of a gas turbine engine
- Disk growth analysis of LP turbine disk of a gas turbine engine
- Detail design of main rotor and control system of a helicopter
- Structural analysis of helicopter rotors, fuselage, tailboom, etc.
- Main and nose landing gear analysis of helicopters
- Structural integrity of emergency flotation structure for a helicopter
- Concept design and analysis of integral fuel tank
- Design and analysis of composite structures (wing & fuselage)
- Space craft thermal stability studies
- Optimization of missile sections for weight reduction
- Loading and analysis of fuel tanks engine mounts and in-house developed actuators
- Stress analysis of support structures for various system installations like – hydraulics, electrical, avionics, ECS, FCS, armament, fuel and power plant
- Windscreen and canopy analysis
- Crash survivability analysis – seat anchoring and related support structure for harness and equipment
- Ground handling equipment's design and analysis
- Analysis of deploying mechanism for drag and anti-spin parachutes



## Engineering Design Analysis Services Warranty Offered By AEG

This warranty is expressly in lieu of all other warranties, express or implied, and whether statutory or otherwise, including any implied warranty of merchantability or fitness for a particular purpose, and no warranties are expressed or implied which extend beyond the description of the face hereof, in no event shall AEG be liable to buyer for collateral, indirect, incidental or consequential damages of any kind. This exclusive remedy will not be deemed to have failed of its essential design purpose so long as AEG is willing and able to repeat the engineering analysis or refund the purchase price of warranted engineering services as provided herein.

AEG can only provide recommendations for buyer's design consideration because:

- AEG does not accept design responsibility as part of its role as a contract analyst of the customer design.
- AEG does not have familiarity with, nor can it anticipate or control process or product variation, or variation in service environments which may affect or impact design considerations.
- AEG cannot fully analyze the functionality of the current design regarding foreseeable uses or misuse of the part.
- AEG does not know, nor can it fully appreciate the design safety factor issues that are incumbent on the buyer design
- AEG recommend buyers to verify this computer-based engineering design analysis and simulation results using component testing in the laboratory.

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