

NSE Composites is an engineering company specializing in the field of composite structures. NSE provides services in the areas of design, analysis, testing, applied R&D, and structural certification. Our broad experience with composites enables us to bring an applied, results-oriented approach to a wide variety of composite product development problems.

STRUCTURAL ANALYSIS CAPABILITIES

- Strength and stability analysis for composite structures using approaches ranging from ‘best practices’ based on years of experience to detailed modeling with advanced failure criteria. Strength predictions for composites with damage (e.g., notches, impact, etc.) using semi-empirical closed-form solutions and/or detailed finite element modeling (FEM).
- FEM using ABAQUS® including progressive damage analysis using stress-based and/or fracture mechanics failure criteria for making in-plane or interlaminar damage growth predictions. Extensive experience with cohesive and VCCT interface elements as well as custom user-defined materials and elements.
- Analysis methods and allowables development. Can also provide critical assessment and validation of analysis approaches and failure criteria.
- Consulting, including recommendations on structural configurations, design details, joints, cost-weight-performance optimization, test plan development, and certification.

RELATED EXPERIENCE

- Extensive experience with 2D and 3D, non-linear FEMs of structural details such as skin-stringer configurations (Boeing, GE, PDS/Alenia), engine blades (GE Global R&D), helicopter rotor blades and fuselage structures (Bell), and wind turbine blades (GE Wind, Knight & Carver, Dynamic Design).
- Composite fuselage optimization software development for preliminary sizing on the Boeing 787. Software uses over 50 analysis checks to provide optimum ply layups for every skin-stringer fuselage bay. Work has included the development and software implementation of numerous new analysis methods. Analysis routines will also be used by Boeing for final sizing of the fuselage.
- Damage tolerance analysis methods development including FEM vs. test correlation. Examples include skin-stringer applications with large notches/damage (787 wing and fuselage, NASA/ATCAS) and impacted sandwich structure (Boeing 787 and 737). Work has included development of non-linear FEA techniques as well as the development of relatively simple, semi-empirical methods for quickly assessing many configurations.
- Bonded joint and delamination analysis using both stress-based and fracture mechanics approaches (Boeing, GE, Bell, others). Experience includes bonded and co-cured joints in aircraft, rotorcraft, and wind-turbine blade applications. Work has addressed damage initiation and growth under both static and fatigue loadings.
- Test and analysis of bolted joints, including damage evolution studies, semi-empirical method development, and critical evaluation of progressive damage methods (Boeing, GE).

THE BOEING COMPANY

Airplane Programs–787, 777F
New Airplanes Product Development
Commercial Aviation Services
Stress Methods and Allowables
Structural Damage Tolerance
Advanced Structures Technology
Phantom Works
Composites Affordability Initiative (CAI)
Accelerated Insertion of Materials-Composites (AIM-C)

OTHER AEROSPACE

General Electric Global R&D
Bell Helicopter/Textron, Inc.
Federal Aviation Administration (FAA)
PDS Engineering/Alenia Aeronautica
Wichita State University (WSU)
National Institute for Aviation Research (NIAR)
Fatigue Technology Inc. (FTI)
Integrated Technologies, Inc. (Intec)
Hexcel Composites
The Lancair Company
Aviation Partners, Inc.
Aerospace Consulting Engineering, Inc (ACE)

WIND ENERGY

Knight & Carver Wind Blade Division
Dynamic Design
General Electric Wind
Global Energy Concepts
Frontier Wind (Energy Unlimited)
Kenetech Windpower, Inc.

OTHER

BMW Oracle Racing (America's Cup)
Communication Structures

**SMALL BUSINESS INNOVATION
RESEARCH GRANTS**

SBIR A98-0029 - Fatigue Life Modeling of
Composite Bonded Joints in Rotorcraft
Structures
STTR AF96T009 - Characterization of Notched
Composites Strength with Empirical and
Analytical Methods