



Aircraft External Loads

Course Syllabus

Description

This course provides an overview of aircraft external loads analysis, including flight (maneuver, gust, buffet), ground, and landing impact. Theory as well as practical, “real world” examples will be presented and solved using industry standard loads and aeroelastic software tools (MSC.Nastran, ZAERO, and Matlab). Attendees will get hands-on loads development experience. Analysis, design, and criteria will be covered.

Who Should Attend

Engineers and engineering managers who need to learn more about aircraft external loads analysis and its role in aircraft design and life management.

Course Duration

1 week (40 hrs).

Cost

\$1595.00 (USD) per attendee. 15% discount for 3 or more attendees from the same organization.

Course Dates

Please contact us at training@tda-i.com for course scheduling and availability.

Course Authors

Technical Data Analysis, Inc. (TDA).

Course Location

Based on the number of attendees, the course may be hosted onsite at your location, at an offsite location, or at TDA's Falls Church, VA, Lexington Park, MD, or Marietta, GA offices.

Technical Data Analysis, Inc. (TDA)

Falls Church:

7600 Leesburg Pike
West Building, Suite 204
Falls Church, VA 22043
703.237.1300 (tel); 703.237.0301 (fax)
www.tda-i.com

Lexington Park:

22289 Exploration Drive, Suite 304
Lexington Park, MD 20653
301.866.9400 (tel); 301.866.9411 (fax)

Marietta:

3750 Palladian Village Drive, Suite 500
Marietta, GA 30066
770.516.7750 (tel); 770.516.4255 (fax)

Course Topics

- I. Overview
- II. Airworthiness/criteria
- III. Terminology
- IV. Basic data derivation
 - a. Mass, stiffness, damping
- V. Finite element analysis
- VI. Structural model development
 - a. Modal analysis
 - b. Structure, fuel, payload, stores
- VII. Aerodynamics
- VIII. Aeroelasticity, aeroelastic model development
 - a. Geometry, splining
 - b. Aeroelastic corrections, balancing
- IX. Load sources summary
- X. Flight maneuver loads
 - a. Trimmed flight; longitudinal, lateral, directional maneuvers
 - b. Dynamic maneuvers
 - c. Asymmetric tail loads
- XI. Gust loads
 - a. Static gust
 - b. Dynamic gust (tuned discrete gust, continuous turbulence)
 - c. Gust criteria
- XII. Aeroservoelastics
- XIII. Buffet loads
- XIV. Ground loads
 - a. Gear model development
 - b. Ground handling loads
 - c. Dynamic taxi
- XV. Landing impact loads
- XVI. Miscellaneous loads, load sources
 - a. Bird strike
 - b. Control system failure
 - c. Nacelle/engine loads
 - d. Control surface loads
 - e. Stores, pylons, external attachments
 - f. Radomes, cavities, bomb bays, inlets
- XVII. Loads verification/validation
 - a. GVT
 - b. Wind tunnel testing
 - c. Computational fluid dynamics (CFD)
 - d. Flight dynamics simulator
 - e. Flight testing (flight + ground)
- XVIII. Critical load case survey and definition
- XIX. Fatigue loads
 - a. Loads-to-stress conversion (balanced loads)
 - i. Static, dynamic (time history or PSD);
 - ii. Dynamic load-to-quasi-static load conversion
- XX. Turnkey loads development using MSC.Nastran, ZAERO, and Matlab

Course Materials

The following materials will be provided to each attendee:

1. Course notebook, documenting all covered topics as well as “real world” example problems.
2. D. Howe; “Aircraft Loading and Structural Layout;” AIAA Publications; 2004.

Instructor

Chance McColl
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Mr. McColl has over 15 years of combined experience in aeronautical engineering and software development. He obtained his BS in Aerospace Engineering Sciences from The University of Colorado at Boulder and his MS in Aerospace Engineering from The Georgia Institute of Technology. He currently serves as Director of Engineering for the Marietta, GA branch of TDA where he provides loads, usage, and fatigue/DTA engineering support to customers such as the USN (C-130, P-8, P-3, EPX), Canadian Forces, Royal Australian Air Force, Royal Netherlands Navy, and Royal Norwegian Air Force. His current focus is loads development for the USN/USMC C-130 aircraft. Prior to joining TDA, Mr. McColl has served as a senior consultant at Aelera Corporation, an Integrated Product Team (IPT) technical lead for Lockheed Martin with overall responsibility for the Operational Loads and Usage IPT for the P-3C Service Life Assessment Program (SLAP), and as a technical lead for the Boeing Company in charge of dynamic loads development for a number of commercial aircraft, including the 737-600/700/800/900 and 757-200/300 models.

Other experts in industry may be involved in instruction as well.