Flightloads™

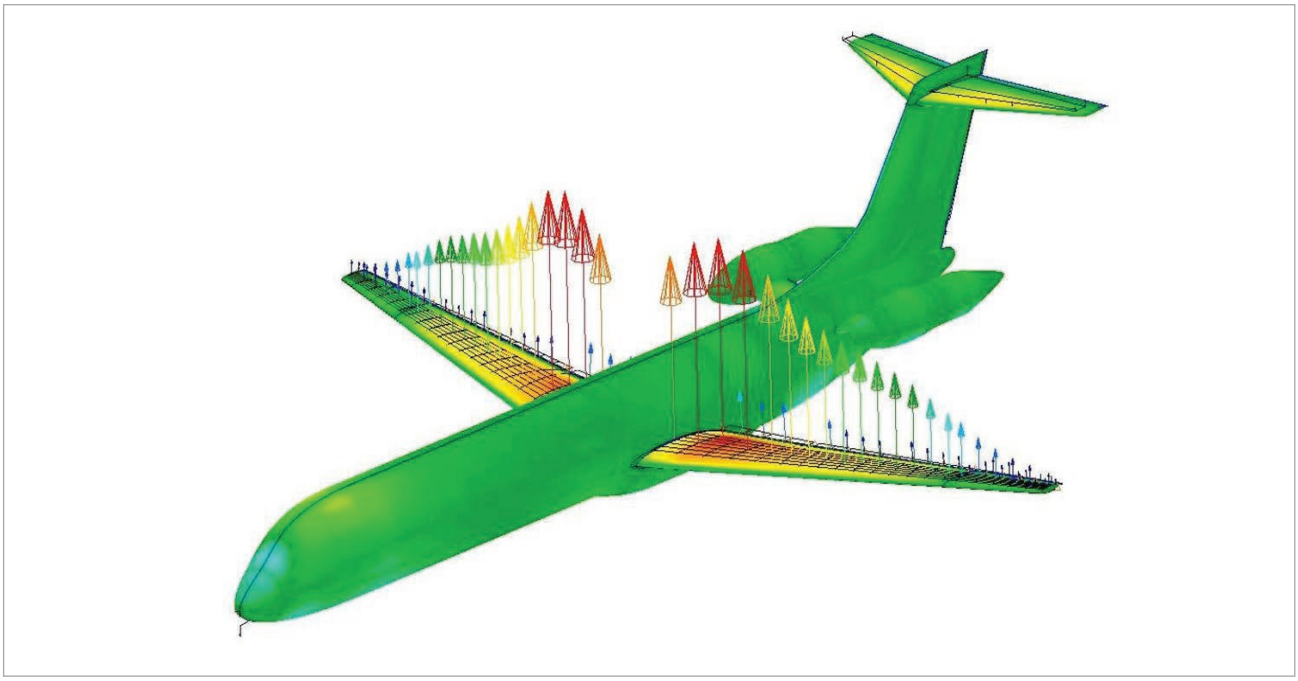
Determine external maneuver, dynamic and internal loads on air vehicles

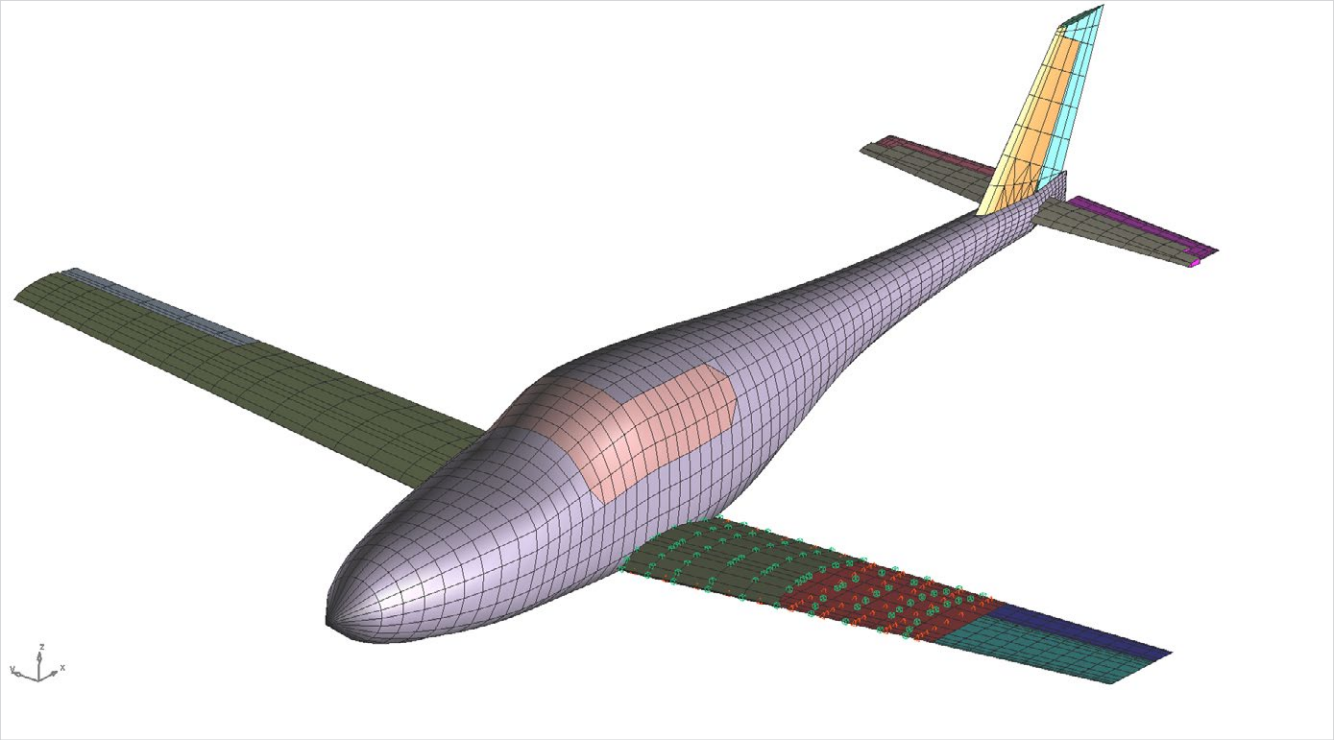
Overview

Flightloads is a user interface that integrates the aeroelasticity capabilities of MSC Nastran and the FEM modeling functionality of Patran. Flightloads is useful for the prediction of external maneuver and dynamic loads on air vehicles. Typical modeling and analysis processes are supported, which emulate the workflow commonly found across the aerospace engineering community in the discipline of aeroelasticity (coupling of aerodynamics and structural response).

The Flightloads system provides the capability to:

- Start with native geometry from user-preferred sources such as CAD applications.
- Define the aerodynamic and structural models.
- Perform aerodynamic calculations.
- Analyze the combined structural-aerodynamic model to provide both component and total vehicle aeroelastic responses.
- View the results and produce external loads that can be passed to the stress group
- for detailed design and verification.
- Store intermediate results for subsequent retrieval in further analyses.





Benefits

Flightloads provides a tool that allows engineers to accurately, efficiently and confidently predict external air vehicle loads. Current loads cycle processes will be dramatically impacted by Flightloads.

Flightloads provides improved aero-structural coupling technology and validation tools. These tools also allow for improved throughput and understanding of the operating environment.

Flightloads supports structural and aerodynamic model evolution from preliminary and conceptual design through detailed design, and external sources of aerodynamics data (i.e., wind tunnel, flight test and other aerodynamics software).

Nonlinear aerodynamics can be defined over aerodynamic meshes and used in nonlinear trim analysis. External Integrated Loads Monitor Points are available to compute data for critical loads survey.

Tools provide efficient graphical user interface, robust modeling tools to simplify the construction of aerodynamic model building. HTML help pages, accessible from the graphical user interface, are easily customized to document and distribute in-house best practices and procedures.

Graphical tools help with model verification.

External loads are better understood through Loads Browser capabilities, and aero structural coupling is easy through interactive spline definition and verification.

Capabilities

- Aerodynamic Modeling
- Aero-Structural Coupling
- Aerodynamics
- Static Aeroelasticity Support
- Flutter Support
- Loads Browser/Post Processing

Flightloads provides seamless integration of external and internal loads.

One common structural model is now practical – customers can reduce or even eliminate model validation efforts between different structural representations.

Numerical efficiencies now make MSC Nastran Aeroelasticity computer resource usage comparable to those of linear statics analysis.

Maintain competitive advantage through integration of in-house, proprietary tools with Flightloads. Open architecture supports integration with both the graphics and solver tools.

Flightloads leverages the capabilities of MSC Nastran and Patran to deliver unmatched capabilities for external loads prediction.

Aerodynamic modeling

- Uses Doublet Lattice Method surfaces and bodies (MSC Nastran CAERO1 & CAERO2)
- Gives control surfaces, position and hinge moment limits
- Automates modeling with error detection and correction methods
- Displays extensive model visualization and query capabilities
- Supports multiple aerodynamic mesh representations
- Creates external integrated loads monitor points over the mesh

Aero-structural coupling

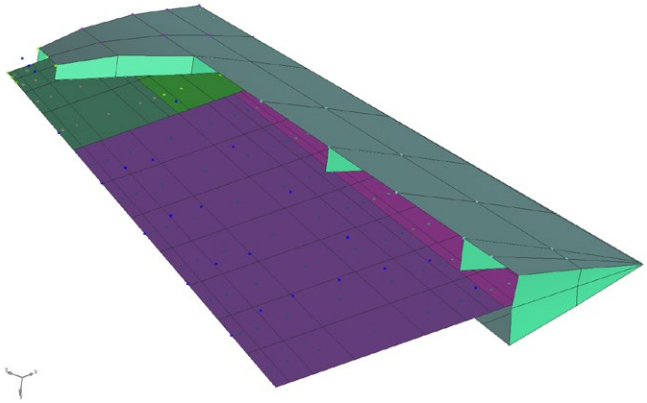
- Defines and verifies spline relationships interactively using existing or automatically generated structural displacements
- Results of aero-structural coupling are automatically displayed and animated
- Aerodynamics
- Stores aerodynamic database for data archive and reuse in a hierarchical format allowing for multiple models and multiple conditions
- Supports full nonlinear data over all trim parameters

Static aeroelasticity support

- Computes subsonic and supersonic aerodynamics internally
- Creates simultaneous symmetric and anti-symmetric boundary conditions
- Provides three analysis methods: flexible trim, flexible increments and rigid trim
- Uses nonlinear aeroelastic trim when nonlinear aerodynamics are present

Flutter support

- Allows simplified input across the flight envelope for M-k pair set definition
- Sets multiple boundary conditions and M-k pair sets in a single execution
- Supports PK, PKNL, K and KE flutter eigenvalue analysis methods fully



Loads browser/post processing

- Runs Loads Plots and Load Summations, including automatic report generation, CSV export to spreadsheets
- Browses loads on either aerodynamic or structural models
- Retrieves model and loads data from database
- Sources of loads information: aerodynamics database, static aeroelastic analysis results, and loads/boundary conditions are applied to structural models
- Exports text file of MSC Nastran FORCE Bulk Data entries for selected loads
- Provides standard Patran results tools

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

MSC Software, part of Hexagon's Manufacturing Intelligence division, is one of the ten original software companies and a global leader in helping product manufacturers to advance their engineering methods with simulation software and services. Learn more at mscsoftware.com. Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter.

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