

MSC Nastran Hybrid Static Aeroelasticity

Integrated, Accurate Static Aeroelastic Analysis with CFD data



Overview

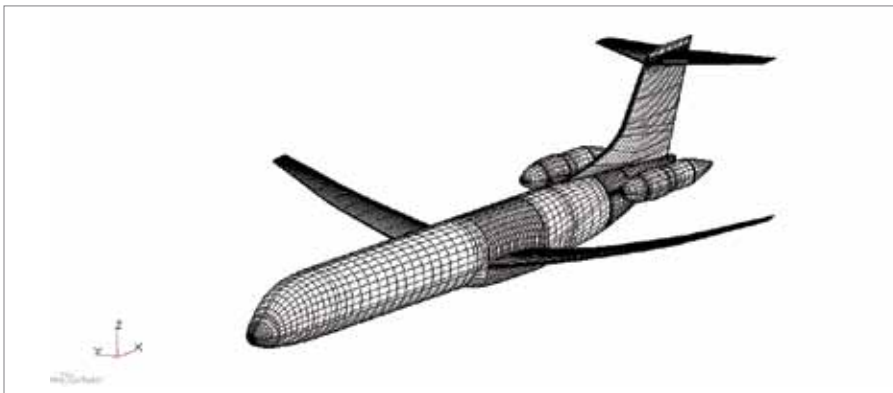
Hybrid Static Aeroelasticity (HSA) is an MSC Nastran toolkit developed in close collaboration with engineers in order to efficiently integrate computational fluid dynamics (CFD) result data and MSC Nastran's Aeroelasticity analysis capabilities. The toolkit enables users to perform an accurate hybrid simulation for pre-design evaluation. HSA lets the user create the model in Patran's Flight Loads environment and then simulate the hybrid solution by using MSC Nastran aeroelasticity analysis capabilities.

MSC Nastran performs the analysis by utilizing the Rigid/Flexible Mesh concept. MSC Nastran generates the rigid aerodynamic loads given by a general CFD code on a rigid aerodynamic mesh, while the aeroelastic increment is given by either the double-lattice method (DLM) or by the CFD solution. In order to map the CFD aerodynamic loads onto the structure, 6 degree of freedom (DOF) spline technologies were specially developed and are included in HSA. To ensure the aerodynamic loads are accurately mapped, the toolkit also enables users to define aerodynamic and structural monitor points. In addition, the HSA's spline technologies can be used to obtain the displacements of the 3D aerodynamic mesh (CFD Wetted surface).

With the HSA toolkit, engineers can better represent the aerodynamic loads acting on entire aircraft structures and determine both the static aeroelastic effect due to the airfoil characteristics, such as camber and thickness, and the aeroelastic increment given by the CFD solution. Ultimately, aerodynamic systems such as: nacelles, engines, high lift devices and aircraft fuselages, can be modeled and simulated together.

The HSA toolkit includes graphical user interface options that enable users to:

- Create rigid and flexible aerodynamic MSC Nastran databases from CFD aerodynamic data (DMIJ/DMIK).
- Construct the aeroelastic model, including splines and monitor points
- Setup the static aeroelasticity analysis
- View 3D aerodynamic mesh deformations (aerodynamic wetted surface)
- Visualize and verify the load mapping at specified flight conditions (AOA, Elevators, Ailerons, etc)



Capabilities

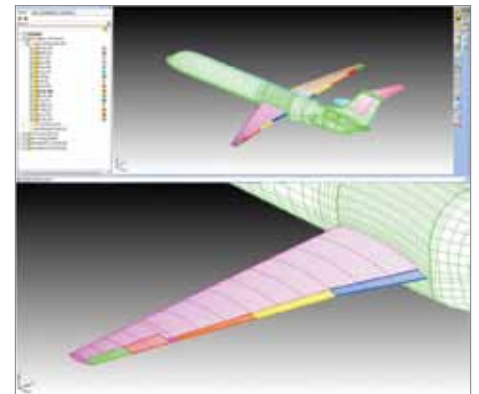
- Create automatic rigid and flexible aerodynamic databases from CFD results
- Setup rigid and flexible solution sequences
- Determine the deformation of aerodynamic meshes
- Ensure accurate load mapping onto the structure
- Define monitor points for aeroelasticity results
- Output prepared trim loads, force & moment cards, for stress analysis

Benefits

- Increase the accuracy of static aeroelasticity analysis by better representing aerodynamic loads arising from multiple aerodynamic components

Requirements

- Windows 32 & 64 bit - Linux
- Patran Versions:
- 2012
- SimXpert Versions:
- 2013



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