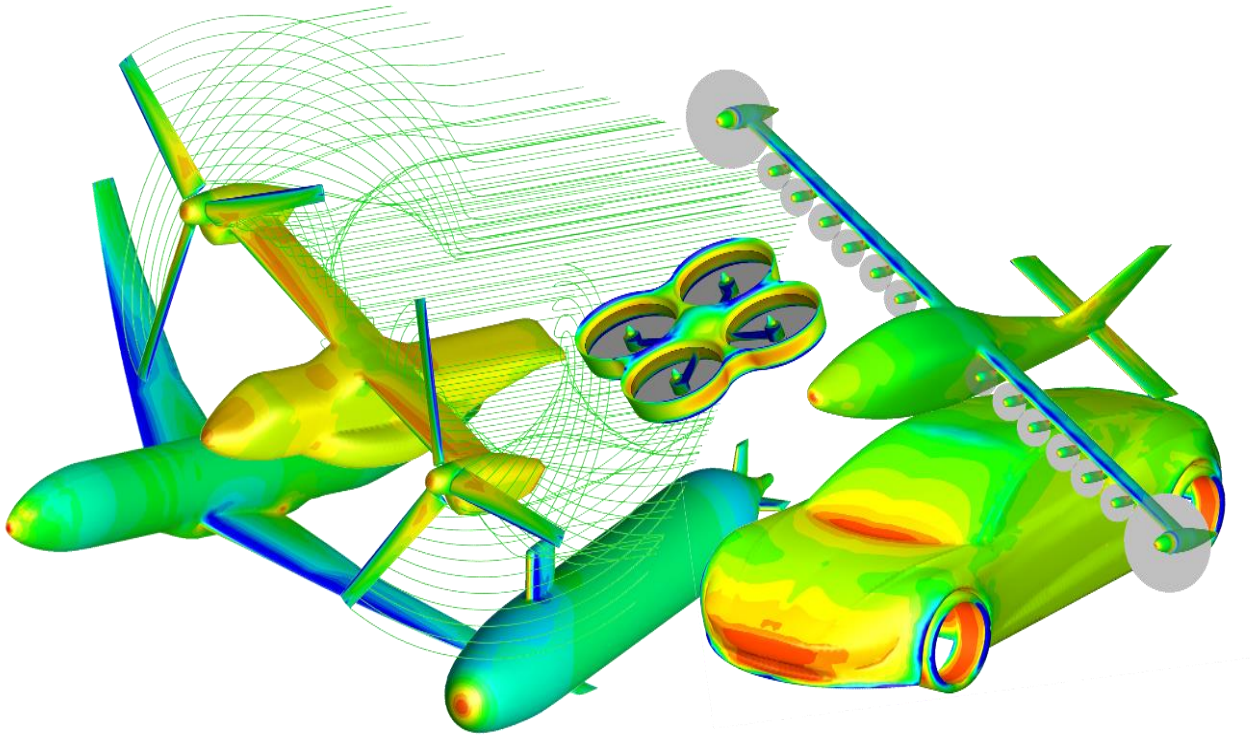
RESEARCH IN FLIGHT



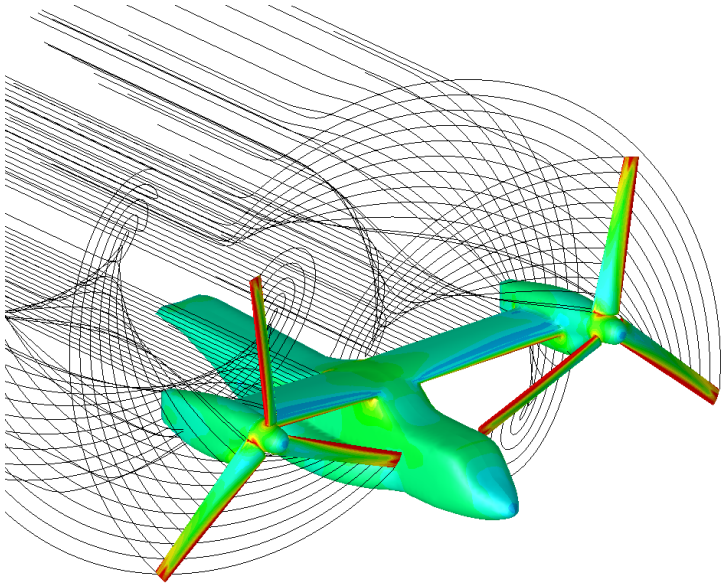
FlightStream 11.2

Release Notes

Release Features

Unsteady Solver

A powerful new feature in FlightStream® 11.2 is the solver's new ability to compute true time-dependent and motion-driven unsteady flow results. The new solver mode uses the unsteady formulation of surface vorticity and time-dependent wake propagation methods to shed vorticity as a function of time, generating the necessary temporal pressure fluctuations needed for this type of analysis. This solver mode is coupled with the existing non-linear solver mode from earlier versions of FlightStream®. This results in FlightStream® being able to generate time-dependent stall effects as well. Motion is prescribed directly on boundary surfaces of the geometry, and can either be steady-state translations, rotations and accelerations, or custom user-defined motion tables that are provided by the users. An example result is shown here for the MV-22 VTOL aircraft in forward flight:

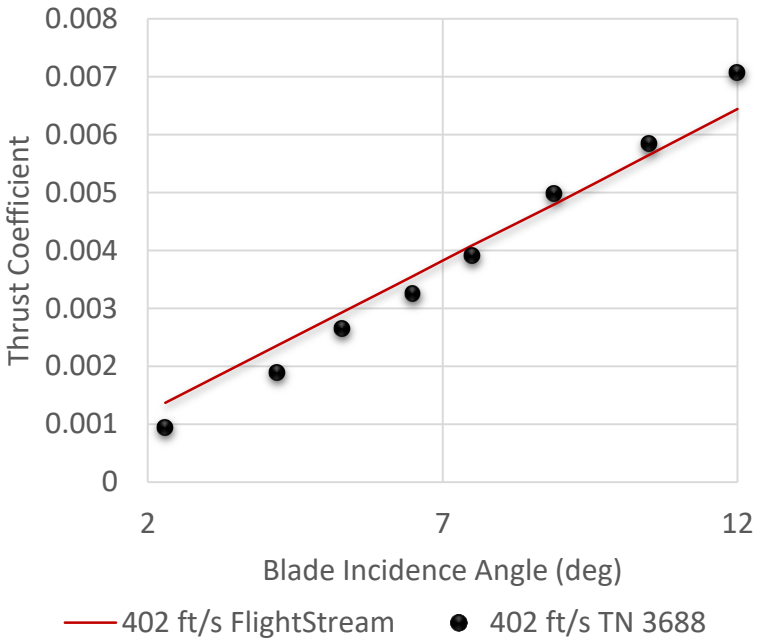


A full motion animation of this aircraft using FlightStream® unsteady solver can be found here:

http://www.researchinflight.com/Images/MV-22_Horizontal.gif

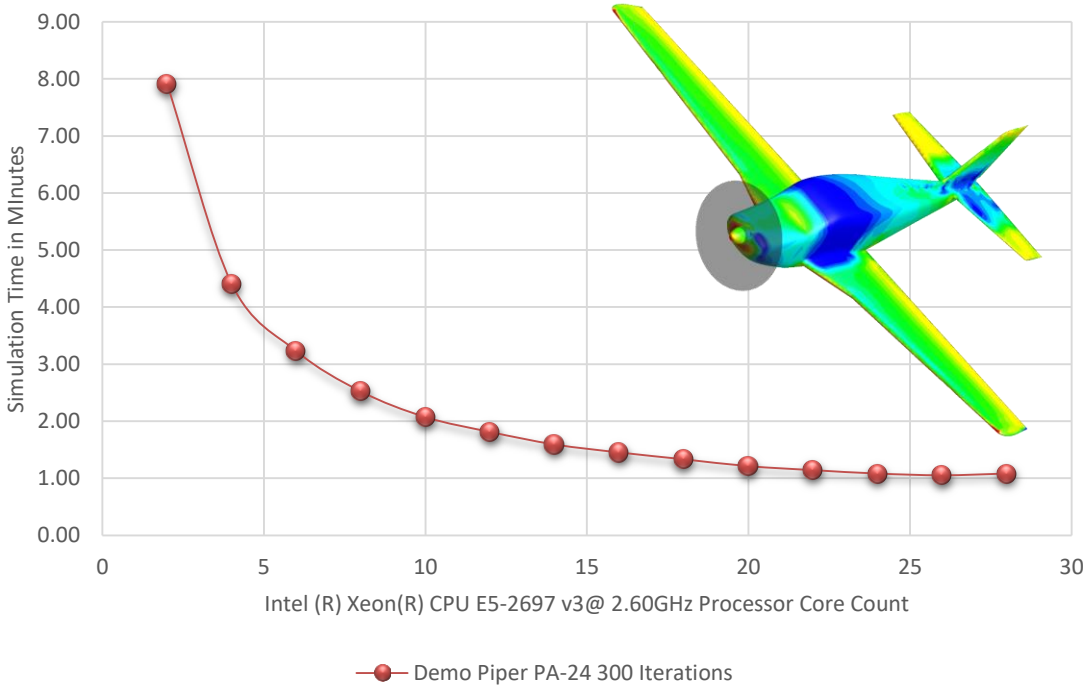
Improved Rotor Induced Velocity Models

FlightStream® now features the ability to compute the induced velocities through a steady-state rotor or propeller. This allows improved analysis results for low advance ratio propellers and rotors, as shown in the example below. This new capability extends FlightStream® solver capability for low-advance-ratio propellers, helicopter rotors and ducted fans.



Parallel Performance at High Core Counts

FlightStream® 11.2 adds new parallel computing capabilities that allow users the full utilization of the available parallel processing hardware. The improved scaling of the solver run times with increasing core counts dramatically reduces the solver run times, making this feature a valuable asset in fast-turnaround of design iterations. An example of this new feature is shown here for the Piper Pa-24 test case:

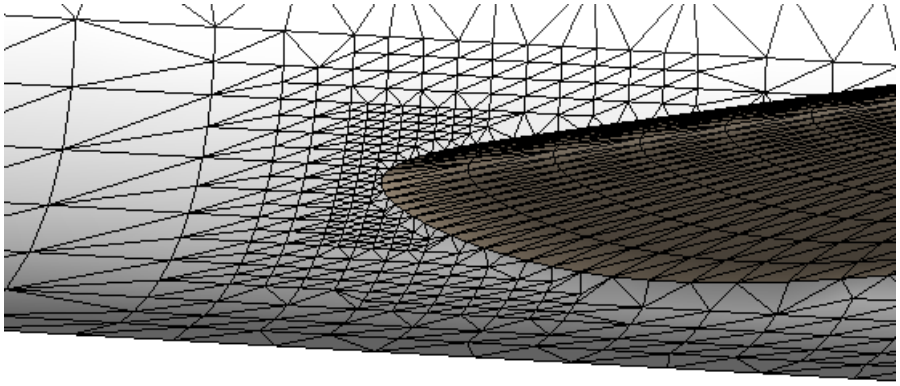


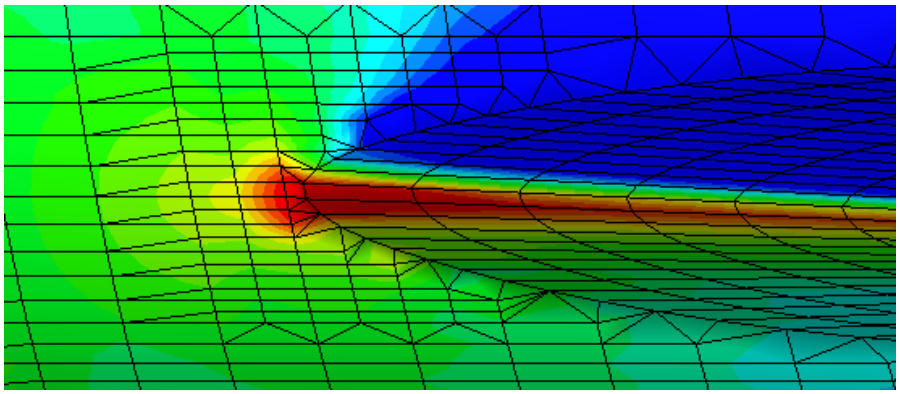
Enhancements

Compatibility Refinement Meshing Tools

FlightStream® 11.2 enhances the existing meshing tools by adding a new feature called Compatibility Refinement. This option for the unstructured Trimmer tool now allows users to generate mesh sizes automatically refined to the sizes of the face's perimeter curves. This allows users to use the Aligned Mesher tool to generate very high aspect-ratio anisotropic mesh faces and use the Compatibility refinement option to automatically refine the topologically connected faces next to the anisotropic faces. This leads to the generation of much better size transitions and the improvement of mesh face quality. This feature also automates the capability originally offered in FlightStream 11.0 using volume controls.

An example is shown here for the junction between the wing and fuselage (notice the refinement created by the Compatibility Refinement feature near the leading-edge wing junction with the fuselage):





Structural Finite Element Modeling Pressure Export

FlightStream® 11.2 has increased integration support for Structural Finite Element Modeling and Analysis (FEM). This includes the new export FEM CSV file format for the surface pressure distributions on specified mesh nodes in a variety of available formats, units and the choice of surface boundaries. This file format is compatible with most commercial FEM software and has been shown to be a powerful asset to the aero-structural engineer. This feature is also supported via the FlightStream® 11.2 scripting API, allowing for a robust, automated integration with the structural analysis pipeline.

Abaqus Input File (*.inp) Geometry Import

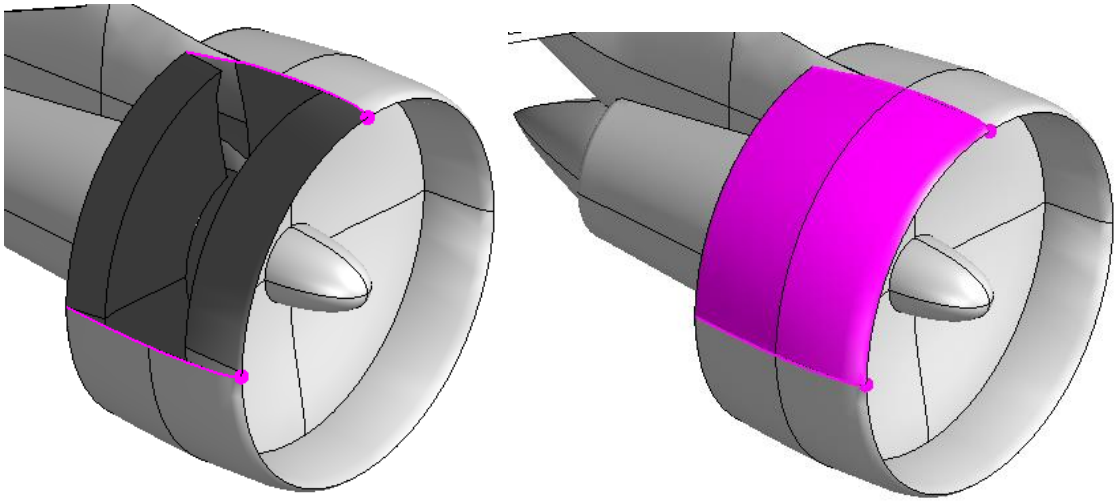
FlightStream® 11.2 also allows users to now import their Abaqus Input File (.inp) to generate the geometry in FlightStream®. This feature allows the conversion of the Input File to an unstructured surface mesh usable by the FlightStream® solver and then exporting the surface pressure computations for structural modeling and analysis in Abaqus.*

Plot3D CAD Reconstruction Import

Another enhancement to the CAD Create tools in FlightStream® 11.2 is the addition of Plot3D (.p3d) file format import capabilities. This feature allows users to import Plot3D files and reconstruct the CAD surfaces from the PLOT3D structured surface meshes. The reconstructed CAD faces can then be used inside the CAD models as standalone faces or merged with existing faces. This feature thus allows users to reconstruct CAD for geometries. It also serves as a feature to generate clean CAD parametrizations for geometries that have erroneous or poor tessellations at their export source.*

CAD *Create* Tools: Rotational Surfaces between Drawing Curves

FlightStream® *11.2 now allows users to generate rotational surfaces between a pair of curves. This extension to the existing rotational surfaces capability allows users to generate clean rotational CAD faces while matching the neighboring topology of the face, as shown in the example here:*



CAD *Create* Tools: Transfer meshing curves to Drawing Curves

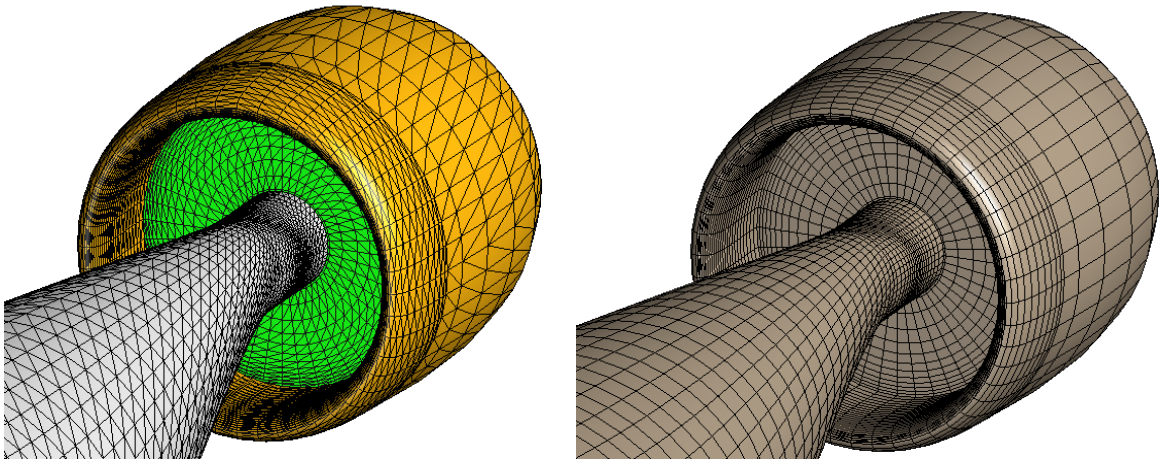
Another enhancement to the FlightStream® 11.2 CAD Create toolbox is the option to transfer selected mesh curves directly to the CAD Create toolbox in the form of drawing curves. This is a further extension of the increasing repertoire of CAD reconstruction tools in FlightStream® that allow the user to generate clean CAD surfaces out of discretized mesh faces and edges.

Mass-flow Inlet Boundaries

FlightStream® 11.2 allows users to specify inlet boundaries as Mass-flow inlets, in addition to the existing Velocity Inlet option. Users can toggle between inlet boundary options at any time, with FlightStream® converting the boundary conditions based on specified fluid properties.

Inlet Boundary Meshing Tools

FlightStream® 11.2 features a new meshing tool directly applicable to the mesh faces on an inlet boundary. This option allows users to generate detailed radial meshes for inlet boundaries, with prismatic faces near the neighboring wall boundaries, as shown in the example below. This meshing tool is available directly at the discretized mesh level and does not require the associated CAD model. The generated mesh replaces the existing mesh on the inlet boundary, and can be repeatedly changed, as needed.



Scripting-based Solver Sweep Runs

The FlightStream® Solver Sweeper Toolbox has been enhanced to include the addition of a scripting call between each run of the specified matrix of solver runs. This scripting call can be used to perform any geometry transformation, motion, change in boundary conditions or exporting solver or analysis results.

Updated scripting API

The scripting API has been updated to allow access to all of the new features and enhancements for FlightStream® 11.2.

Fixes

Improved CAD orientation on Import

FlightStream® 11.2 has fixed issues related to the orientation of CAD faces on some geometries. The new capability orients the CAD faces consistently in scenarios where the imported CAD face has an opposite orientation to the rest of the CAD model.

Compressibility issues at very high subsonic Mach Numbers

Fixes have been added to FlightStream® higher-order flow compressibility models to handle very high subsonic Mach Numbers. Flow conditions up to Critical Mach Number are now possible with the higher-order models as well as the low-order models.

Simulation File Saves on Network Drives

FlightStream® 11.2 fixes issues with saving simulation files to Network Drives.

Miscellaneous bug fixes

FlightStream® 11.2 features many minor fixes to bugs reported with version 11.0.

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