What's New in STAR-CCM+ 2019.3

Date:

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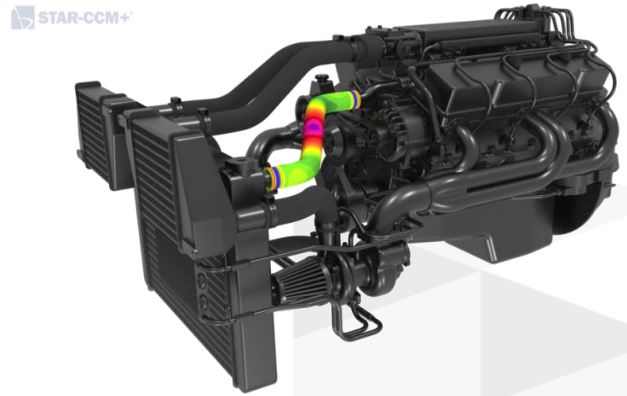
Major Feature Additions in STAR-CCM+ 2019.3

- Search Tool in 3D-CAD
- Multiple Time Scales
  - Multiphysics with different time scales
- Photon Monte Carlo Surface Radiation
  - Alternative to Discrete Ordinate Method (DOM)
- Conformal Tet Mesh Between Operations
- Adaptive Time-Step for VOF Multi-Step
- Improved Mass Balance for VOF
- ECFM-32 Combustion with FI Spark Model
- Single Mesh Operation for Same Geometry Variants
- ODB++ Import
- Generalized Cylinder Mesher
- Recently Used Field Functions
- Groups for Parameters
- Graphics Checker
- Motion Support in Graphics Transformations
  - Preview motion
- First Person Interaction
- NX 1847 and Simcenter 3D 12 & 2019.1 CAD Clients
- Simcenter Nastran Cosim



Coupled Simcenter STAR-CCM+ and NASTRAN simulation of a cooling duct

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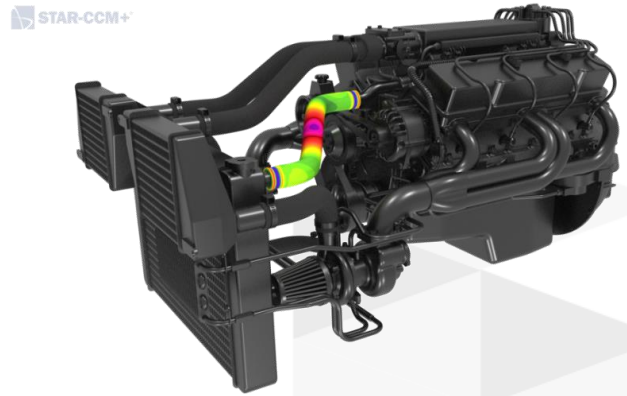

Coupled Simcenter STAR-CCM+ and NASTRAN simulation of a cooling duct

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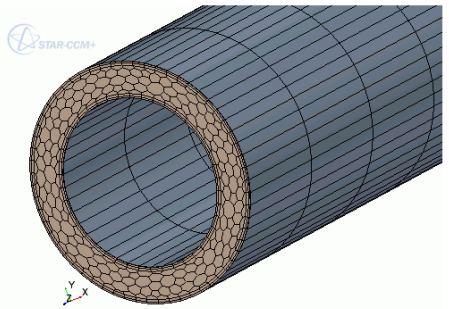
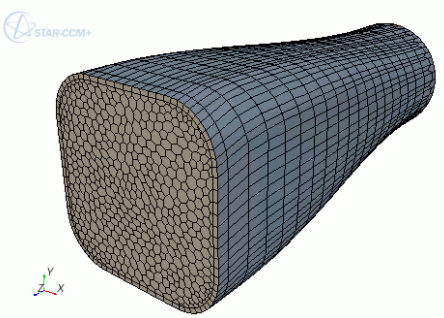
Generalized Cylinder Mesher

- Used with the polyhedral volume mesher to generate an extruded mesh along generalized cylinders
- Generalized cylinders: bounding wall with closed loop at each end
- Generalized cylinder mesher automatically detects suitable geometries





- Cells are extruded along the axis of the cylinder
- Extruded prismatic cells reduce overall cell count and can improve the convergence rate in some cases

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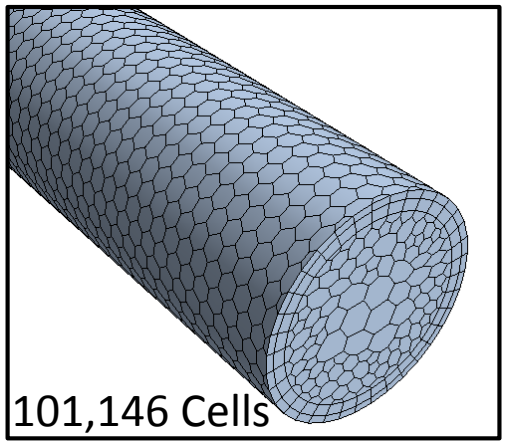
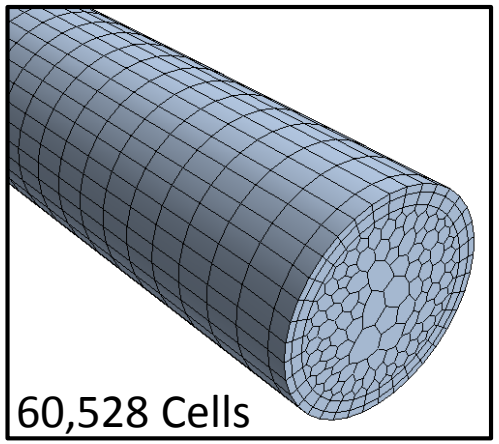
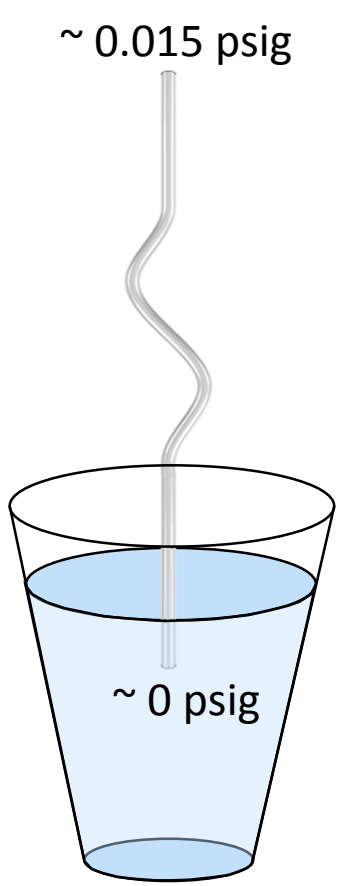
Example: Crazy Straw

- Crazy straw simple example of generalized cylinder
- Generalized cylinder mesher results in 40% smaller mesh



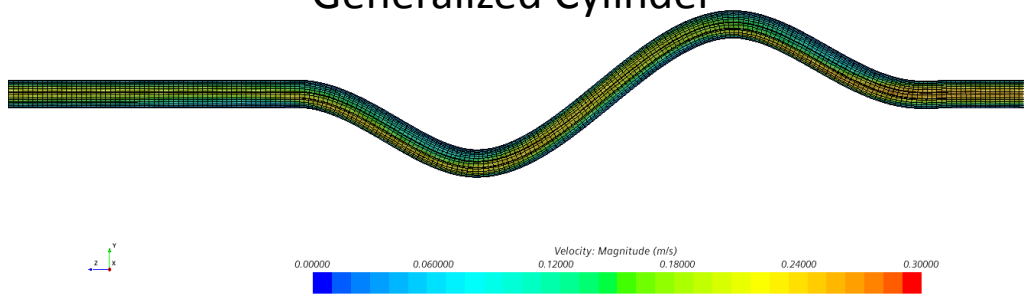




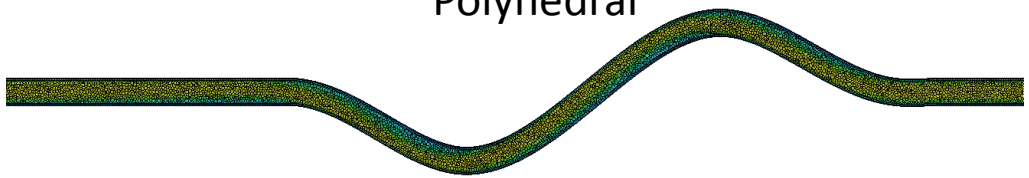
Generalized Cylinder Mesher

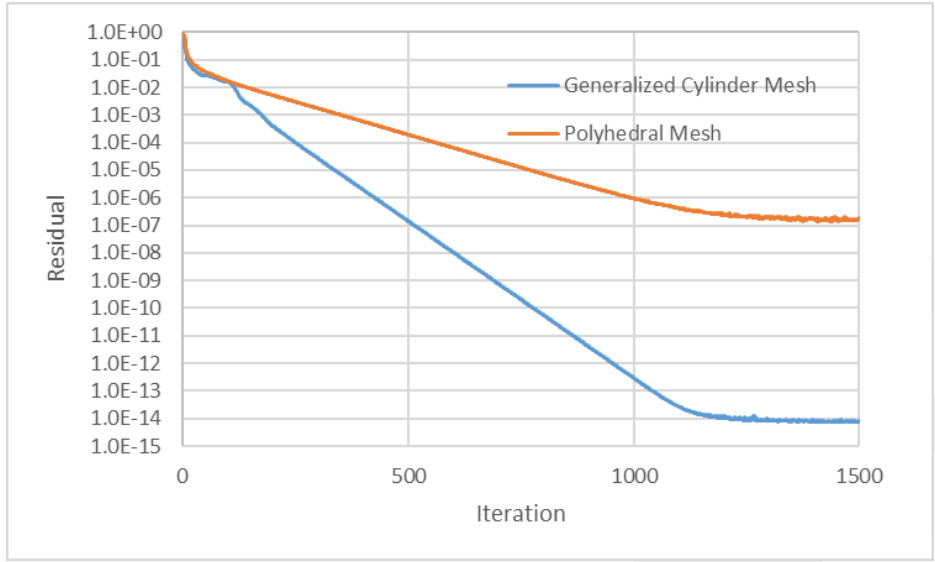
- Generalized cylinder and polyhedral mesh produced similar results
- With 40% less cells, generalized cylinder mesh ran much faster
- From same IC, generalized cylinder mesh converged at a much faster rate

Generalized Cylinder



Polyhedral





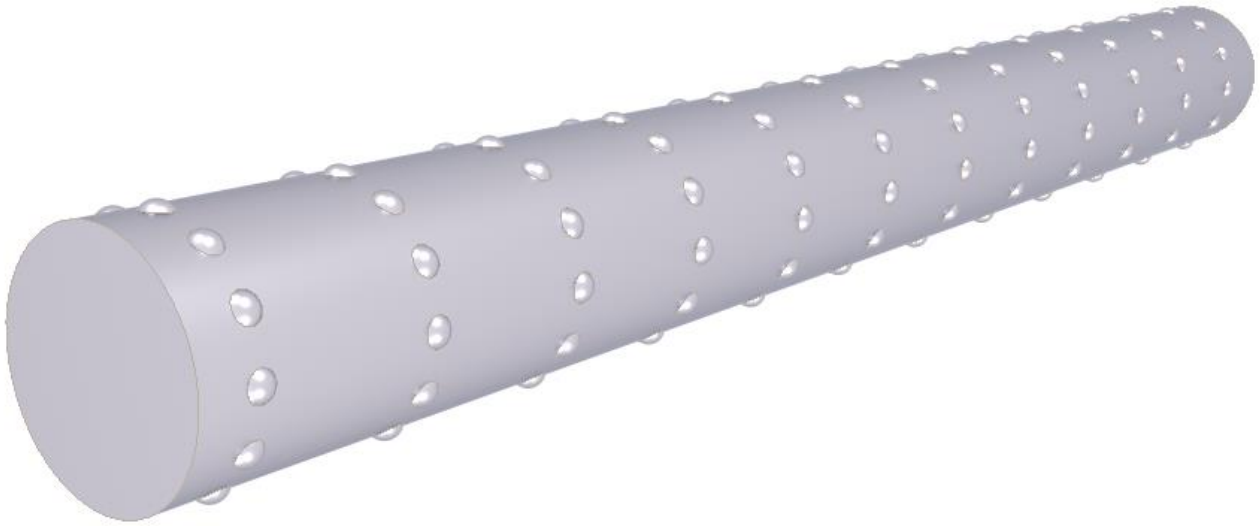
Questions?

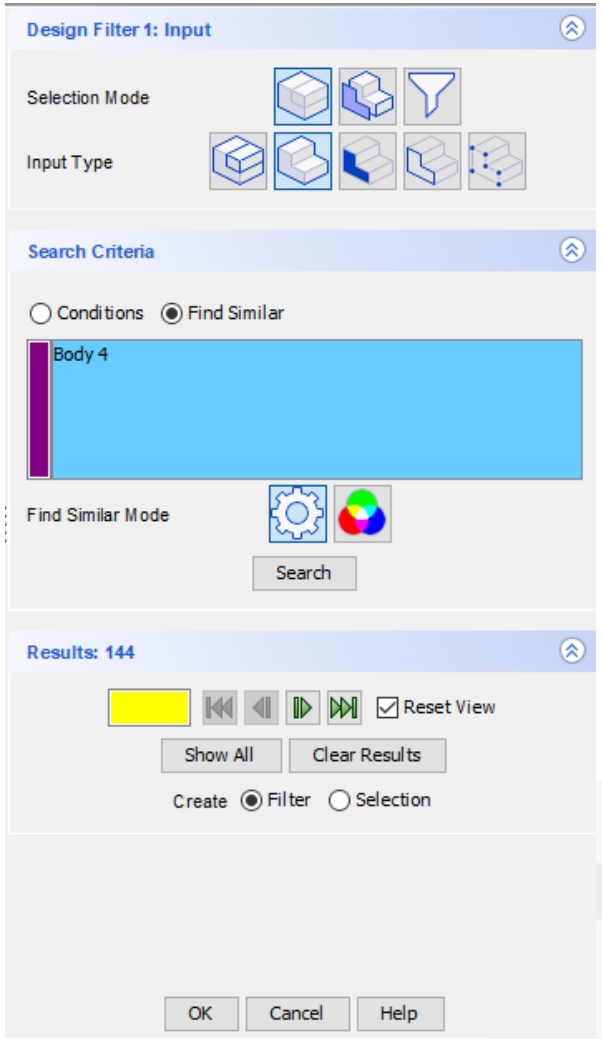
Search Tool in 3D-CAD

- Search Tool helps to find and organize geometric entities using search criteria based on
  - Geometry
  - Features
  - Similarities
- Can also be used to detect clashes between features
- Similarity based on surface area, volume, perimeter, etc.
- Can significantly aid in geometry preparation

Example: Riveted Object

- A CFD analyst wants to defeature a geometry before meshing
- Two options:
  - 144 Ctrl-clicks
  - Use Search Tool to find similar features

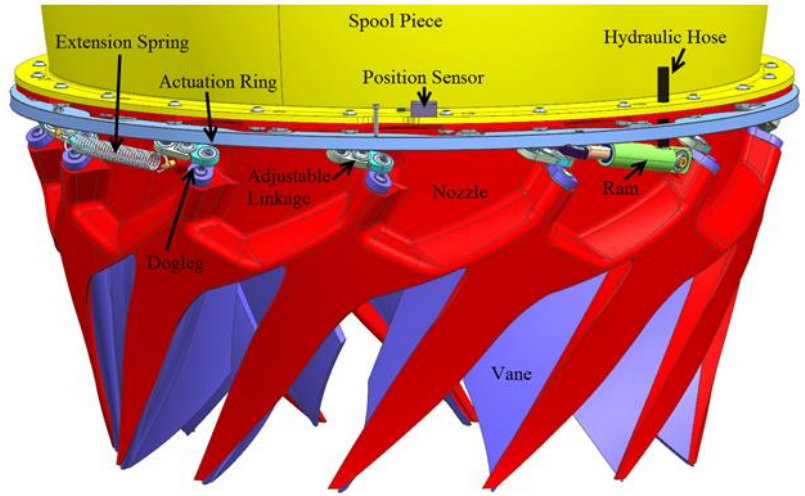


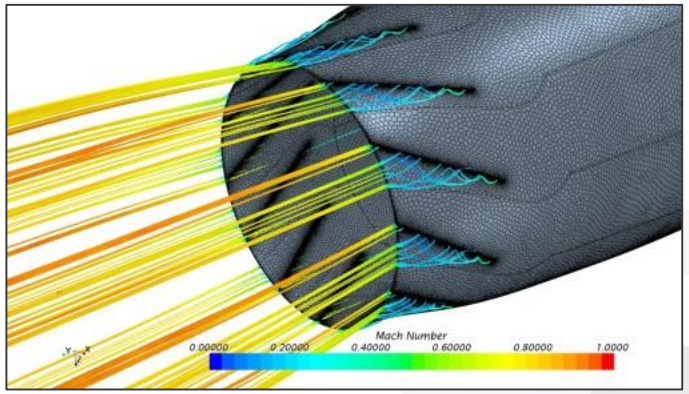


Questions?

NX 1847 CAD Client

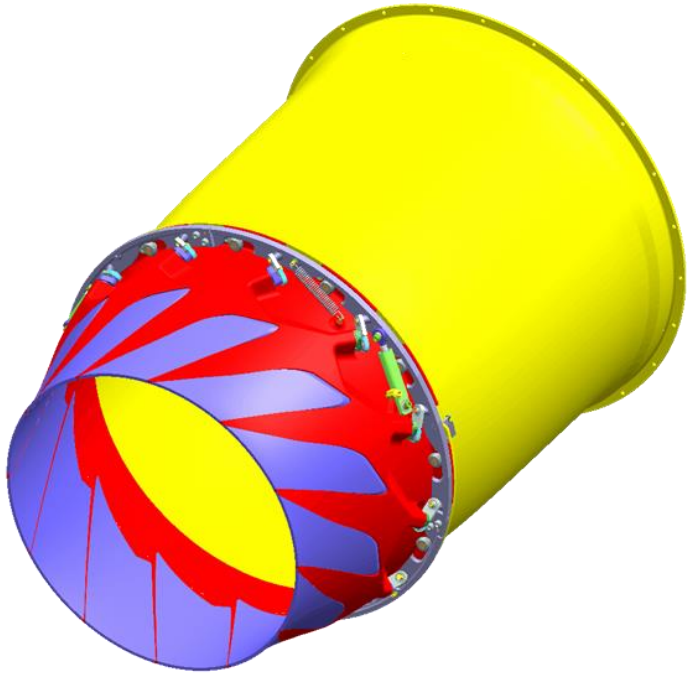
- NX CAD Client enables complicated geometries to be parametrized and modified within STAR-CCM+
- CAD Client in combination with STAR-CCM+ features enables efficiency gains
  - With STAR-CCM+ powerful mesh operation pipeline design changes **easily automated**
  - Large **parameter studies** can be automatically accomplished with Design Manager
  - **Automated design optimization** possible with additional STAR-CCM+ Innovate license





Example: ATA Engine Air Brake

- ATA developed engine air brake nozzle
  - Uses deployable swirl vane mechanism
  - Convert engine exhaust from thrust production to drag production
  - Enables slower, steeper, and **quieter** flight on landing approach
- Analysis-driven design required **numerous** manual CFD/CAD iterations
  - 150 CAD models and CFD simulations taken to arrive at final design
  - Several hundred engineering hours in model preparation, mesh, and simulation



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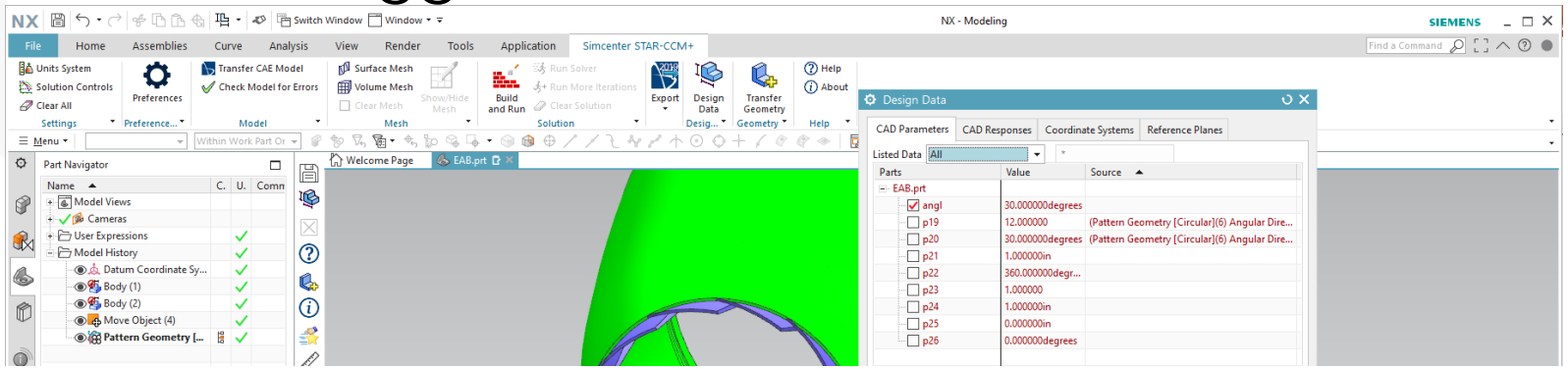
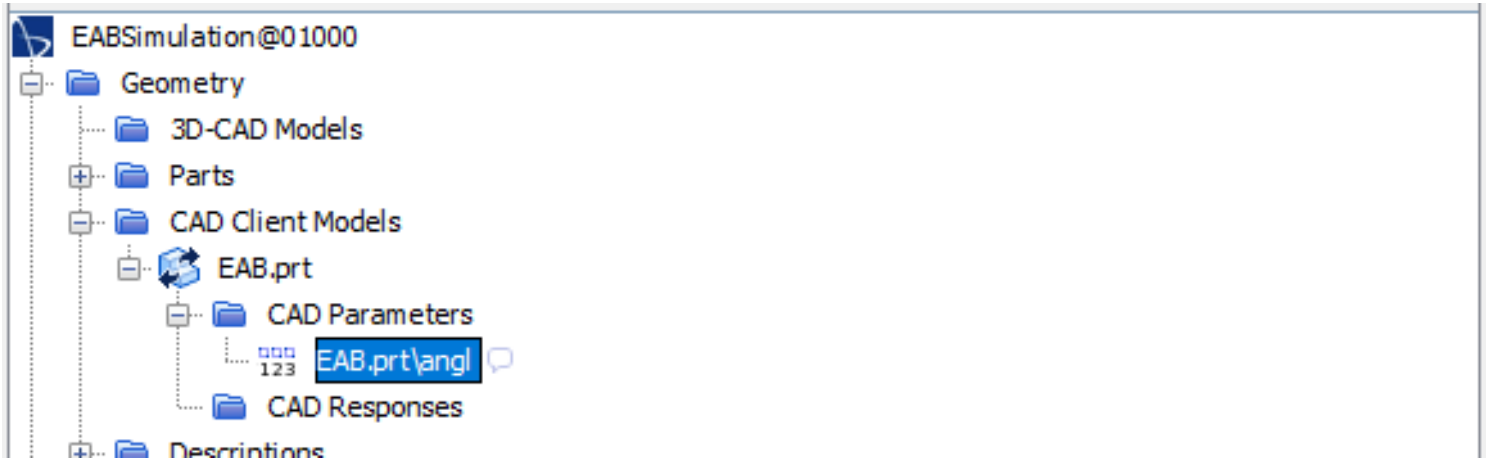
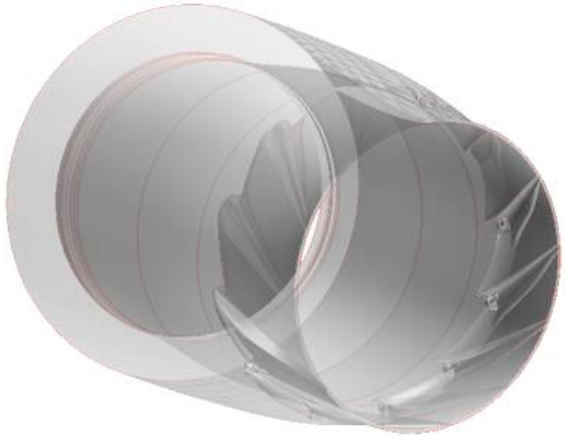
Example: ATA Engine Air Brake

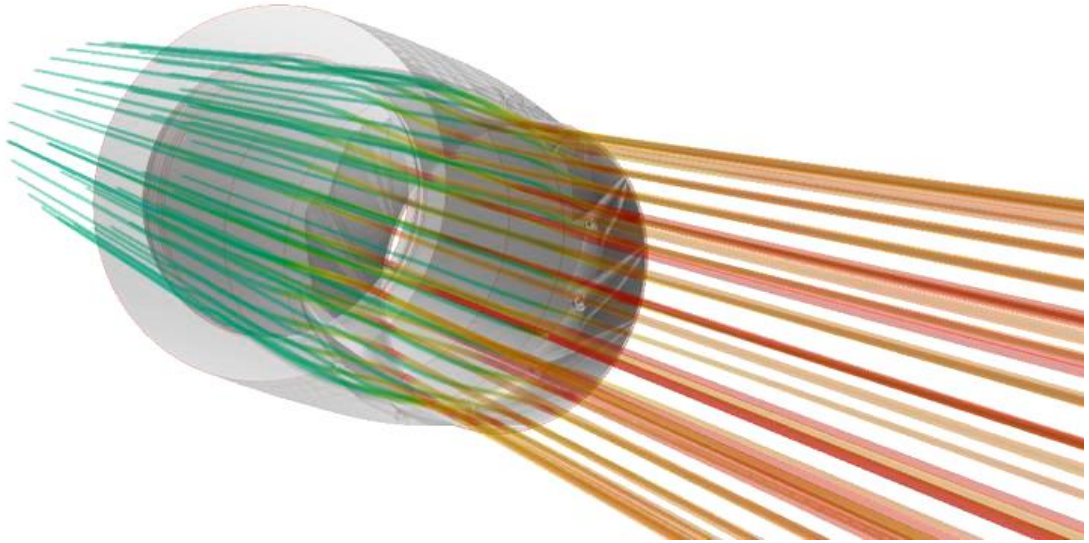
- Parameters flagged in NX to become available in STAR-CCM+



- Parameter changes in STAR-CCM+ start NX in batch to update CAD

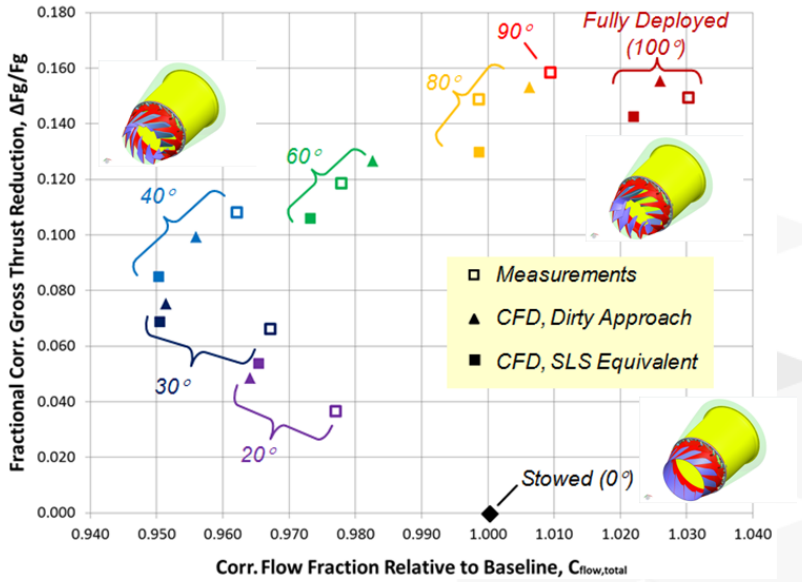






Example: ATA Engine Air Brake

- Analysis-driven design utilizing NX and STAR-CCM+ produced successful engine air brake design
- Technology matured to a TRL of 6 with demonstration of a fully functional prototype
- Hundreds of manual engineering hours could have been saved at different stages of design with the use of NX CAD Client in an automated workflow



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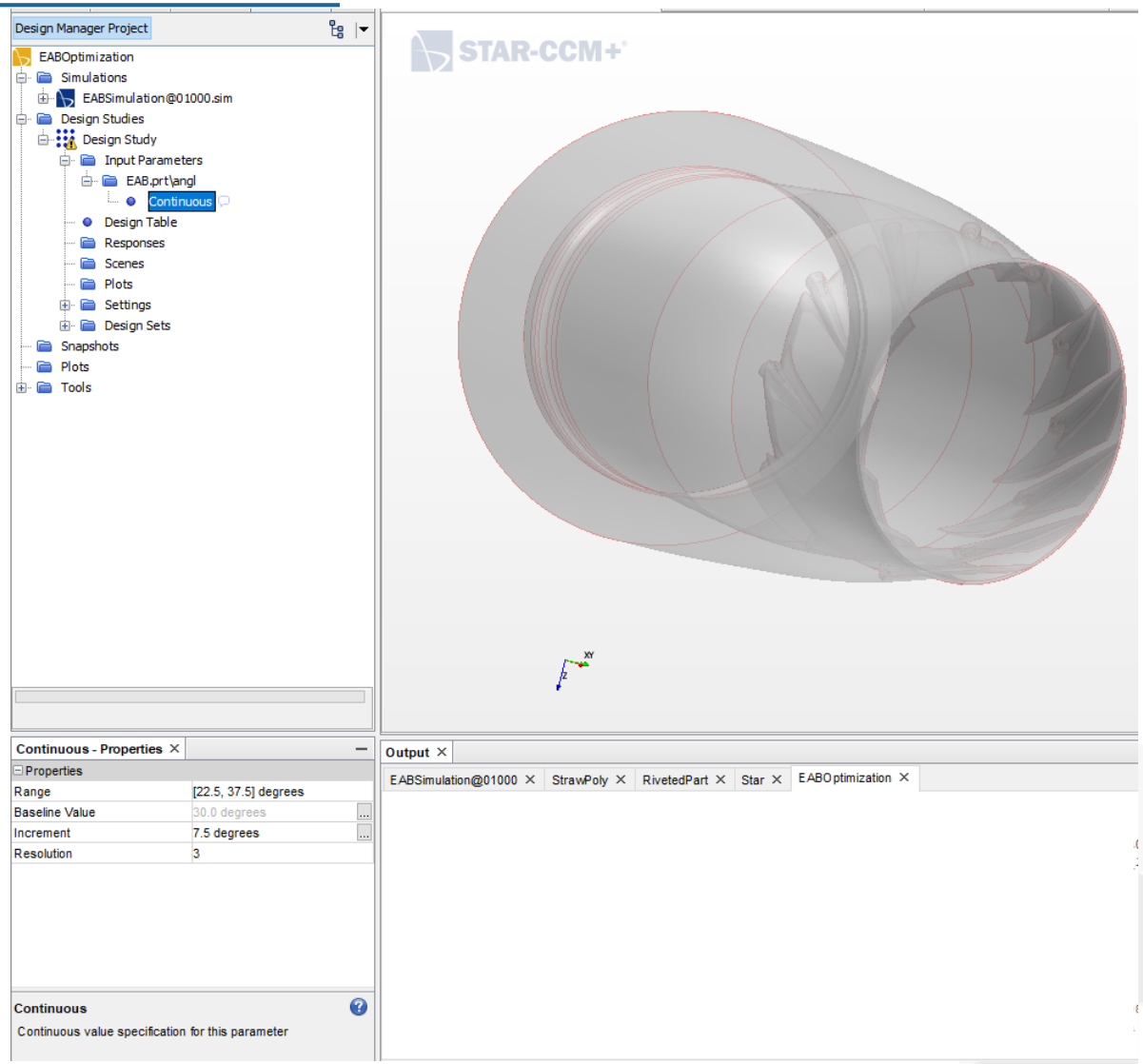
Design Optimization

- Next iteration is optimization from demonstration prototype to optimized product
- STAR-CCM+ Innovate can search CAD parameter space
  - Optimize brake using robust, high-performance proprietary algorithm



Questions?

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