

Environmental Control Systems

The Fastest and Deepest Physics Simulation Solution on the Market

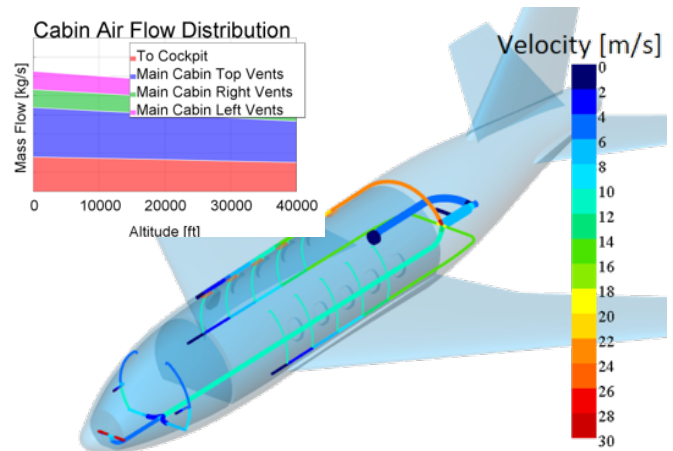


GT-SUITE offers a comprehensive solution for modeling and optimizing environmental control systems (ECS). By utilizing an extensive library of multi-physics components, GT-SUITE provides the ideal environment to create models for Air Cycle Machines (ACM), Vapor Compression Systems (VCS), pipe ducting, life support, 3D cabins, electronics cooling bays, electrically-assisted ECS, and more. Build models faster than any other tool directly from CAD, and solve complex problems with the most robust 1D Navier-Stokes solution on the market.

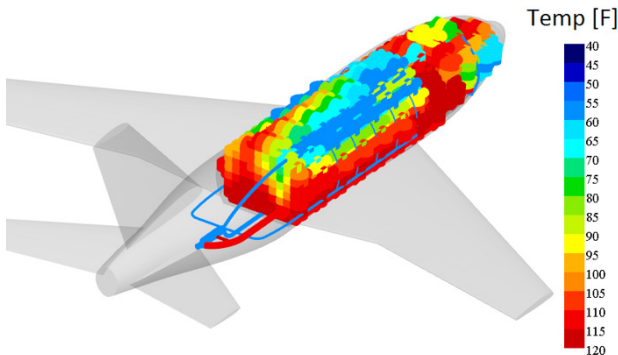
Quickly Optimize Cabin Air Flow Distribution

Quickly create 1D flow system models of the cabin air distribution system directly from 3D CAD. Run optimization and DoE to determine the optimal distribution between the cockpit and different parts of the cabin. Deep physics allows users to analyze humidity and thermal effects within the ducting and cabin throughout a complete flight mission.

Visually inspect the ducting system by viewing mass flow and velocity results on top of the original 3D CAD to ensure velocities are low enough for a quiet cabin.



Temperature During Pulldown on Hot Day



Temperature Regulation in the Cabin

Challenge: Regulating and optimizing temperature in the cabin in transient scenarios is a critical task involved in ECS. As cabin systems become more complex, the need for stable cabin simulation becomes even greater.

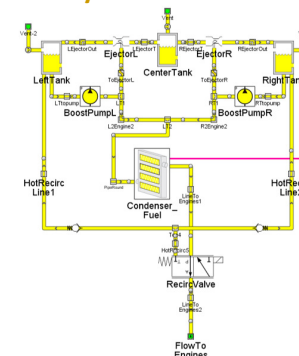
Solution: GT-SUITE integrates ducting with various levels of cabin modeling fidelity from 0D to coarse 3D CFD. Multiple methods to model and optimize cabins are offered to satisfy comfort requirements and operational temperature constraints. Build temperature controllers natively in GT or co-sim with Simulink.

Cooling Electronics

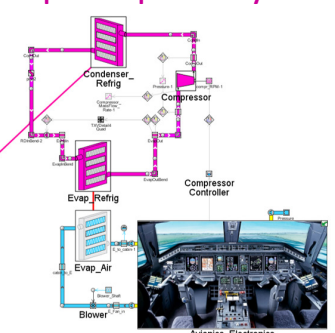
Challenge: Modern aircrafts are dependent upon large quantities of electronics. These electronics are packed together in small spaces, producing heat and therefore requiring cooling mechanisms to stay operational during flight.

Solution: Keep those electronics bays cool by optimizing the cooling from air cycle or vapor cycle systems, and predict the cooling requirement by modeling the thermal loads from electronics. Integration with other systems including the fuel system as a heat sink is a popular option for cooling electronics and hydraulic heat loads.

Fuel System as Heat Sink



Vapor Compression System

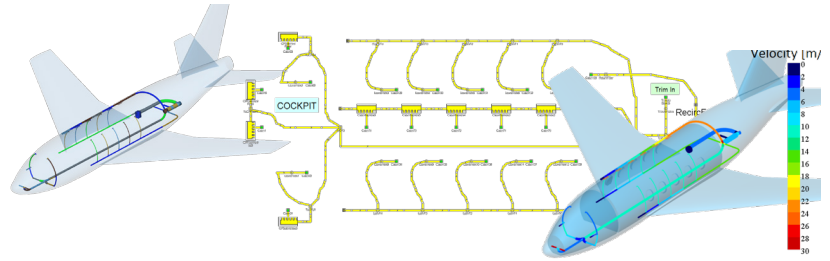


Avionics Cooling

Powerful Features

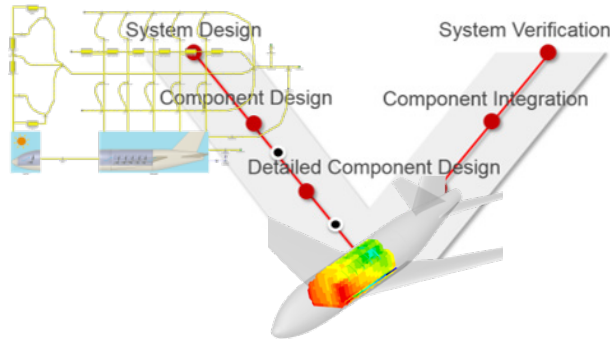
CAD to 1D

Quickly create 1D flow system models directly from 3D CAD for the complete ECS air distribution system including the cabin. Visualize and animate results in 3D.



Cabin Modeling from 0D to 3D

Utilize GT-SUITE throughout the entire development cycle. Start with 0D cabin models early in the design phase, then hone in on optimal designs deep in the V cycle using coarse 3D cabin modeling, or co-sim with external tools for 3D CFD.



Key Benefits

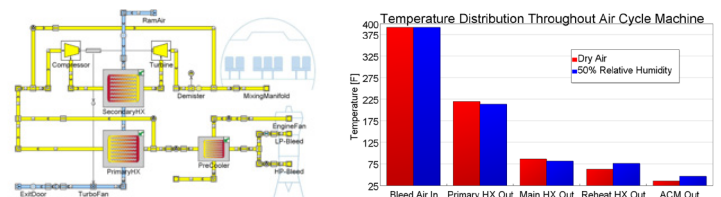
- Tracking of humidity and phase change throughout
- Most stable and robust two phase solution on the market. Stable even at zero flow
- Deep physics including full Navier-Stokes equations
- Unrival technical support- questions answered within 1 business day
- GT-SUITE is the leader in multi-physics system simulation.

Thermal Modeling from Lumped Parameter to FE

Choose your level of thermal fidelity by accounting for flow system interactions with thermal structures. Modeling fidelities range from simple lumped parameters to full finite element (FE).

Transient Air Cycle Machine

Model the Air Cycle Machine pack to accurately predict transient response and interaction with the entire ECS system. Model water separators, turbomachinery, heat exchangers, and the flow network and optimize the complete system.



Transient Vapor Compression Systems

Using the most stable and robust 2-phase refrigerant solution on the market, model transient VCS performance. Access the NIST RefProp library with a database of refrigerant properties, which is included in GT-SUITE.

