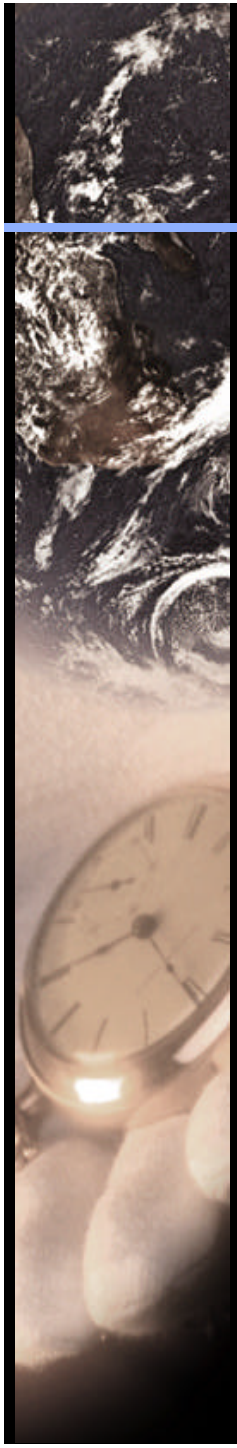


Integrated Modeling

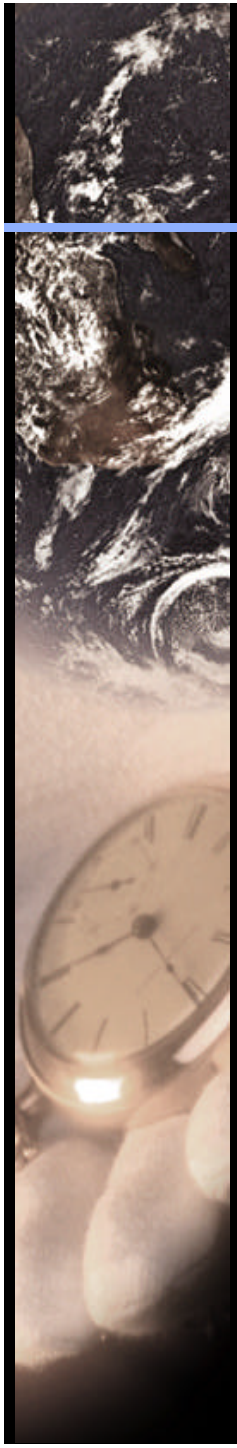
May 1999

Time for World Class Solutions

National Renewable Energy Laboratory

Robert B. Farrington Ph.D., P.E

CENTER FOR TRANSPORTATION TECHNOLOGIES AND SYSTEMS

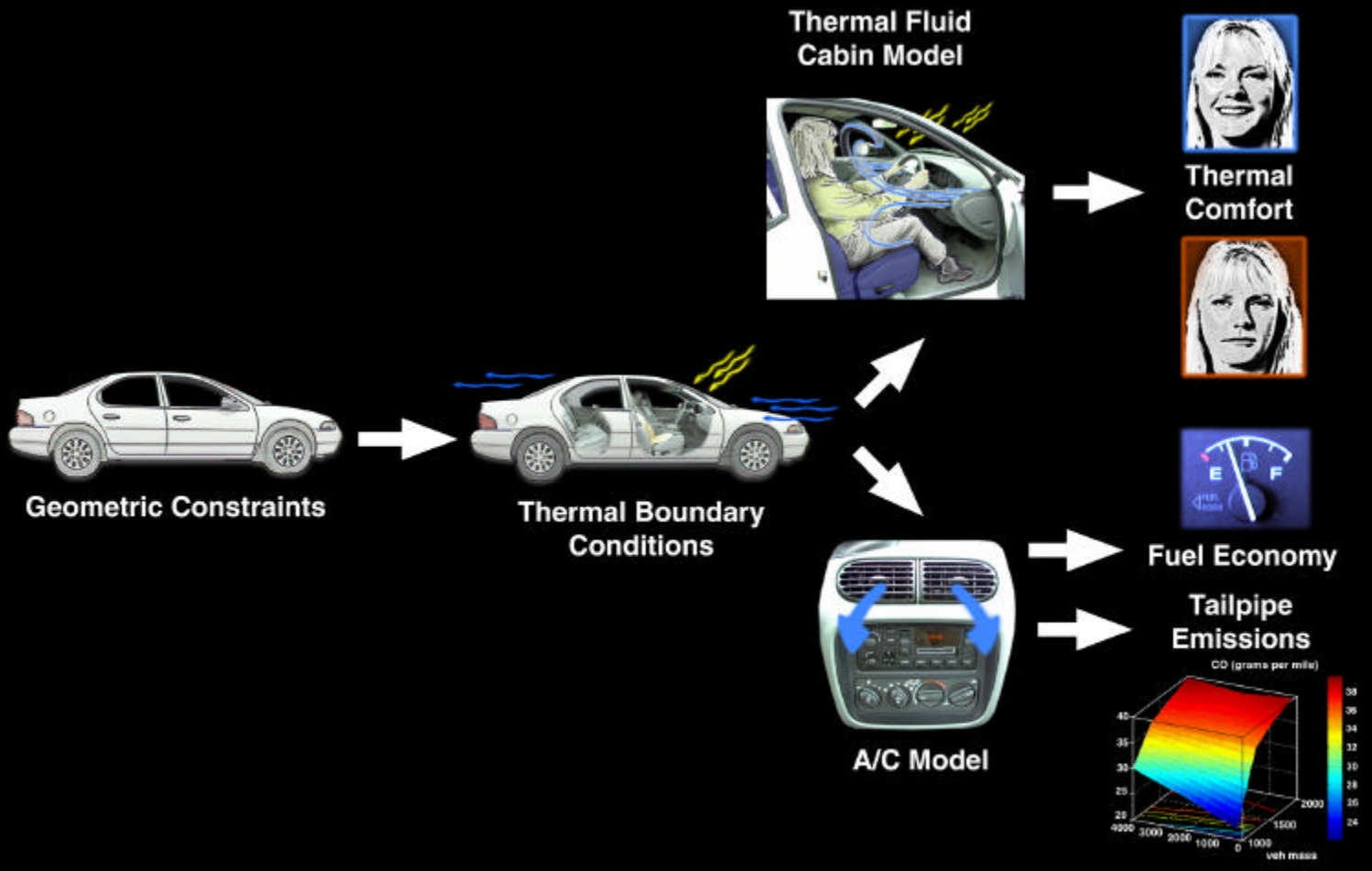


Integrated Vehicle Climate Control Modeling

- Objective:

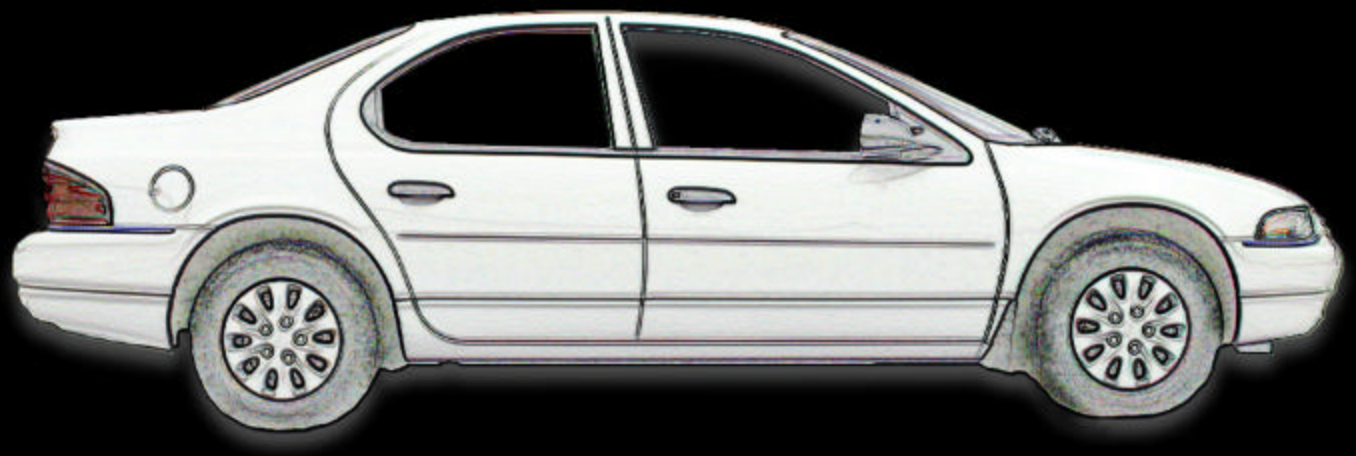
  To meet thermal comfort, fuel economy, and emissions targets by using an integrated modeling approach composed of CAE, CFD, thermal comfort, and vehicle simulation tools.

The Modeling Process



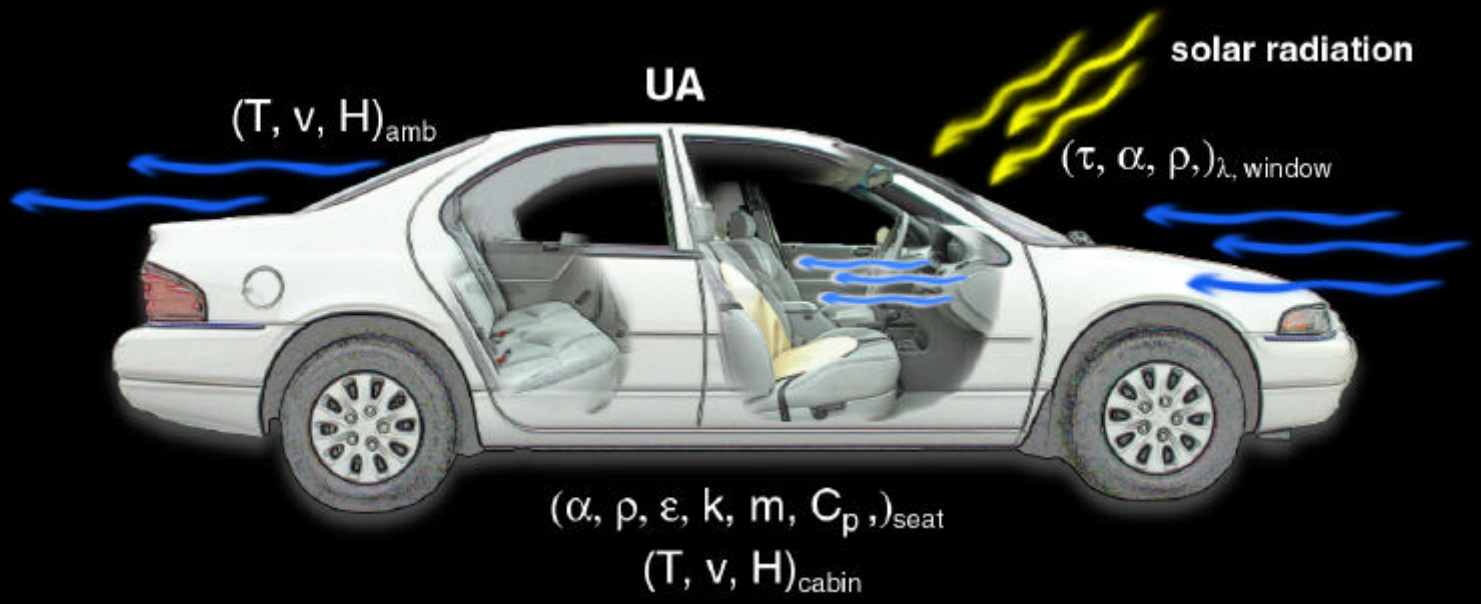
Vehicle Geometry

- **Objective:** To specify the cabin geometric components.



Thermal Boundary Conditions

- **Objective:** To specify the cabin thermal properties and boundary conditions.

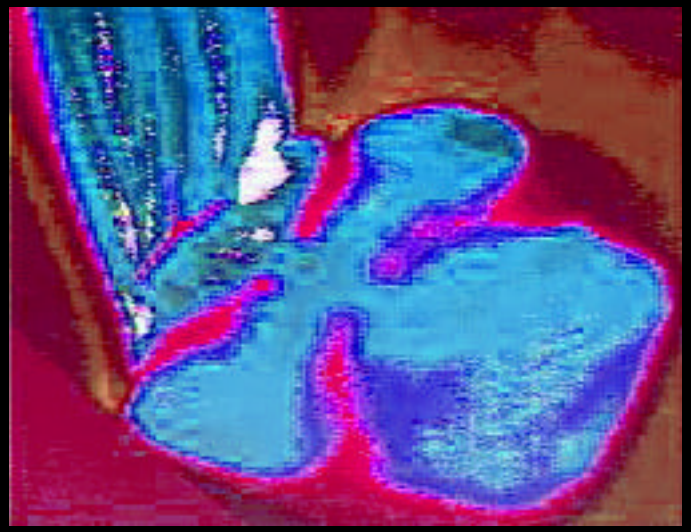


Thermal/Fluid Cabin Model

- **Objective:** To predict thermal environmental conditions.

Air-Conditioning Model

- **Objective:** To design the A/C system based on environmental conditions and thermal comfort feedback.

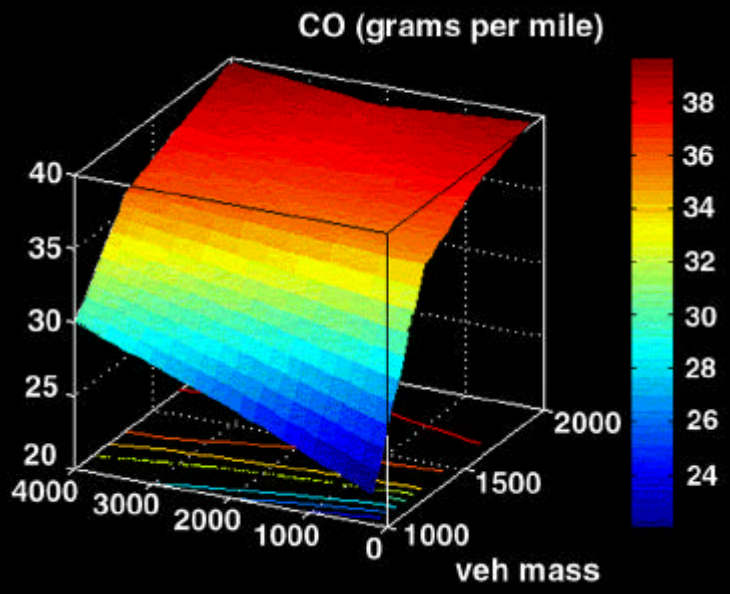


Thermal Comfort Model

- **Objective:** To predict occupant thermal comfort based on environmental conditions and A/C design.

Vehicle Model

- **Objective:** To predict vehicle fuel economy and tailpipe emissions with A/C use.



Feedback Loop

- **Objective:** To meet thermal comfort, fuel economy, and emissions goals by iterating the modeling processes.