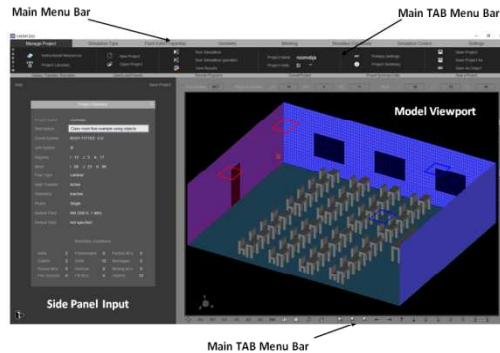

CAESIM

Computational Fluid Dynamics Platform

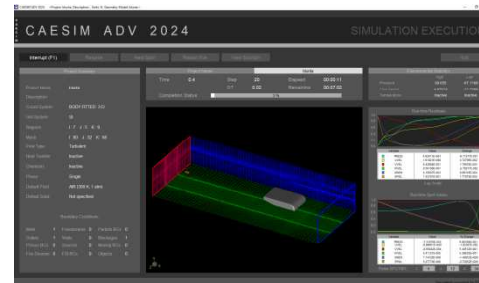
Overview

CAESIM User Interface



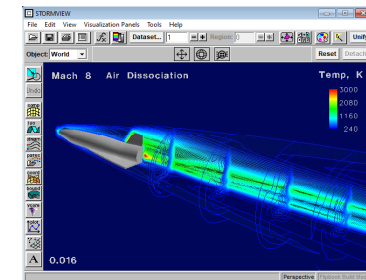
- Geometry creation/import
- Grid generation/optimization
- Grid Sequencing/Adaptive grids
- Fluid/solid properties
- Boundary condition setup
- Field Initialization
- Solver control
- Solution Monitoring
- Residuals

STORM Solver



- 3D RANS Solver
- Subsonic, Transonic and Supersonic Flows
- CYL/Cartesian/BFC Geometries
- Turbulence
- Chemically Reacting Flows
- Heat Transfer (CHT & Radiation)
- Lagrangian Particle Tracking(LPT)
- Free Surface
- Customizable Physical Models
- Fluid Structure Interaction (FSI)

Solution Analysis



- Point-Probes
- ISO-Surfaces
- Streamlines
- Contours
- Vectors
- Particle Trajectories
- Animation Capabilities
- 2D line plotting
- Time series plots
- Various Outputs

- Windows “Start->Programs->CAESIM Administration”
 - “Create Project Directory”
 - Choose directory with enough HD memory
 - Create directory for each major project

- Manual approach
 - Create directory using Windows Explorer
 - Copy files from “model” installation directory (*.bat)
 - Launch CAESIM, STORM, Visualization from Windows Explorer

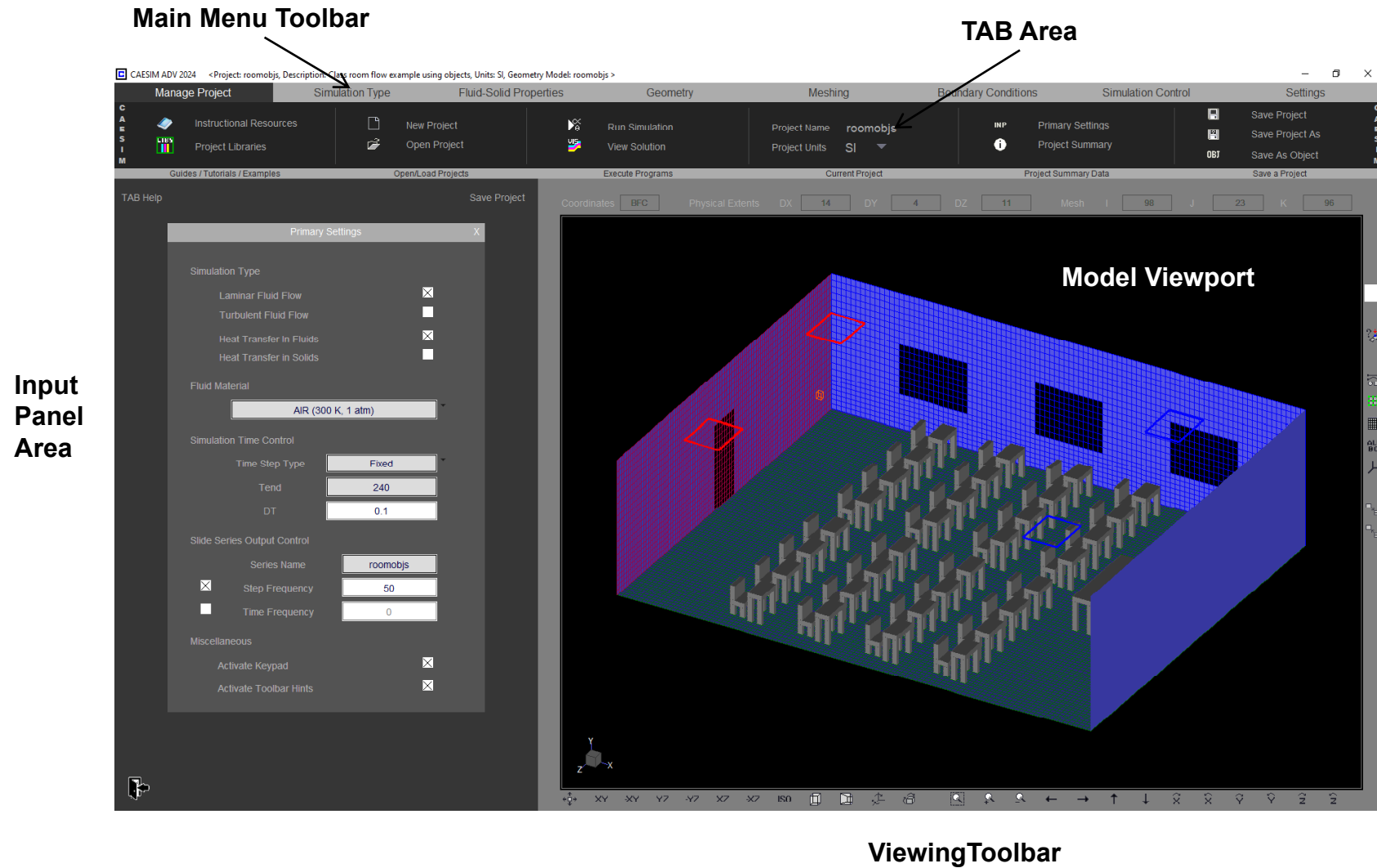
- Key project files
 - *.usr - contains all project setting related to physical models and fluid/solid properties
 - *.bc - contains all boundary condition model settings
 - *.mfg - contains all geometry related information
 - *.ggd - contains grid data (can be re-generated from *.mfg)

- Other important files
 - *.flu/*.sol - contains fluid/solid properties
 - react*.lib - contains chemical reaction(s) data/information

- Mouse
 - Viewing (L-RX, M-RY, R-RZ, LR-pan, LM-zoom)
 - Selection (UI buttons/objects, text input fields, geometry objects)
- Keyboard
 - Text input fields (numerical and character)

CAESIM Overview

Graphical User Interface



1. **Manage Project**

Project creation, archiving, and execution

2. **Simulation Type**

Laminar/Turbulent, Heat Transfer, Chemistry, etc.

3. **Fluid-Solid Properties**

Ideal Gas Law, thermal conductivity, viscosity, etc.

4. **Geometry**

Geometric model creation and CAD tools

5. **Meshing**

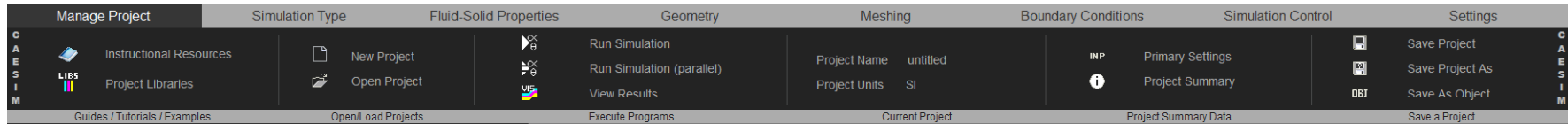
Computational grid generation, optimization, and control

6. **Boundary Conditions**

Inlets, outlets, walls, blockages, free-stream, etc.

7. **Simulation Control Settings**

Linear eq. solver, time-step, output control, etc.



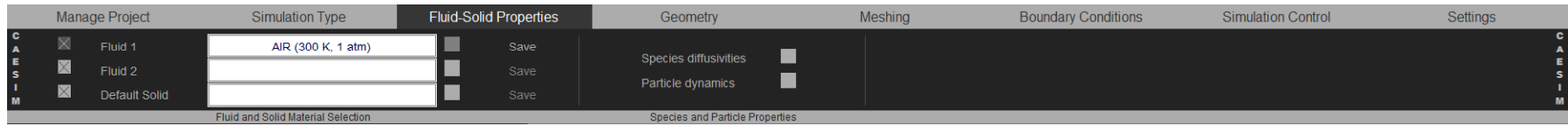
The **Manage Project** tab area consists of six tab sub-areas designed to facilitate easier management of CFD projects

1. Current Project
2. Open/Load Projects
3. Save a CFD Project
4. Project Summary Data
5. Execute Programs
6. Guides and Tutorials

Manage Project	Simulation Type	Fluid-Solid Properties	Geometry	Meshing	Boundary Conditions	Simulation Control	Settings
CAESIM	Laminar Fluid Flow <input checked="" type="checkbox"/>	Heat Transfer In Fluids <input type="checkbox"/>	Compressible flow <input type="checkbox"/>	Free surface <input type="checkbox"/>	No reactions <input checked="" type="checkbox"/>	Equilibrium <input type="checkbox"/>	CVD <input type="checkbox"/>
	Turbulent Fluid Flow <input type="checkbox"/>	Heat Transfer in Solids <input type="checkbox"/>	Unsteady flow <input type="checkbox"/>	Particle flow <input type="checkbox"/>	Frozen Chemistry <input type="checkbox"/>	Mixture Fraction <input type="checkbox"/>	Surface <input type="checkbox"/>
		Radiation <input type="checkbox"/>	Orthogonal Mesh <input type="checkbox"/>	Plant Transpiration <input type="checkbox"/>	Instantaneous <input type="checkbox"/>	Finite Rate <input type="checkbox"/>	
Fluid Flow Type		Heat Energy	Special Conditions	Multi-Phase Flow	Chemical Reactions		

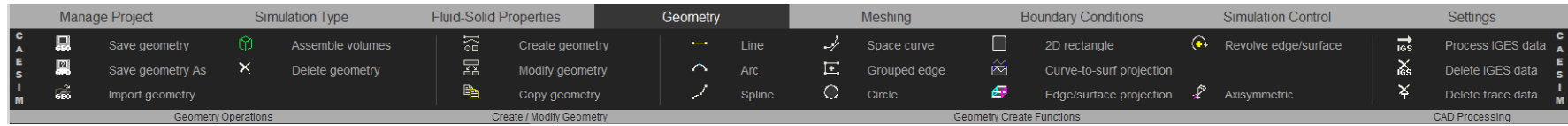
The **Simulation Type** tab area consists of five tab sub-areas allowing for direct specification of the physics required for a CFD project Simulation

1. Fluid flow type
2. Heat energy
3. Special conditions
4. Multi-phase flow
5. Chemical reactions



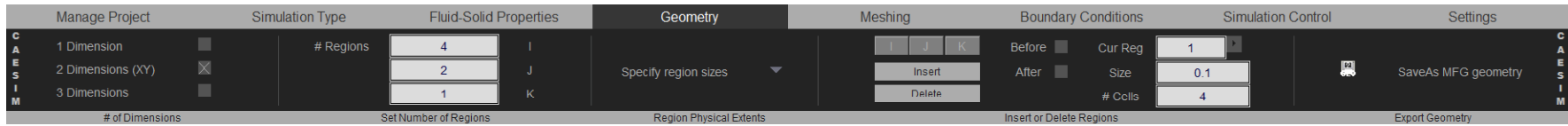
The ***Fluid-Solid Properties*** tab area consists of two tab sub-areas that allow the specification of all default material properties for a CFD model

1. Fluid and solid material selection
2. Species and particle properties



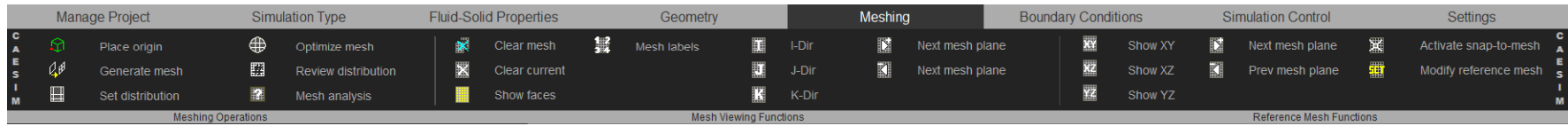
The **Geometry** tab area for BFC geometric models consists of four tab sub-areas providing access to all geometric modeling functions

1. Geometry operations
2. Create / modify geometry
3. Geometry create functions
4. CAD data processing



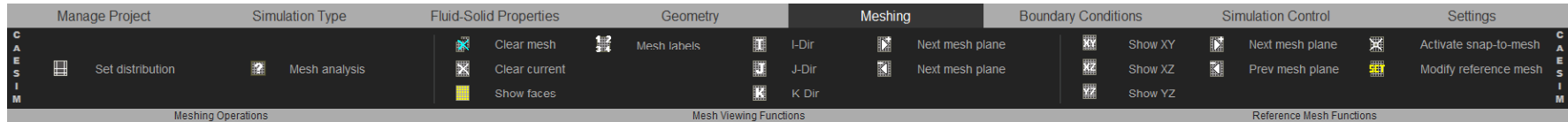
The **Geometry** tab area for Cartesian/Cylindrical geometric models consists of five tab sub-areas providing access to all geometric modeling functions

1. # of dimensions
2. Set number of regions
3. Region physical extents
4. Insert or delete regions
5. CAD data processing

















The **Meshing** tab area for BFC geometric models consists of three tab sub-areas providing access to all computational mesh functions

1. Meshing operations
2. Mesh viewing functions
3. Reference mesh functions



The **Meshing** tab area for Cartesian/Cylindrical geometric models consists of three tab sub-areas providing access to all computational mesh functions

1. Meshing operations
2. Mesh viewing functions
3. Reference mesh functions

Manage Project		Simulation Type		Fluid-Solid Properties		Geometry		Meshing		Boundary Conditions		Simulation Control		Settings	
CAESIM	 Inlets 0	 Walls 0	 Sources 0	 Moving grids 0	 Objects 0	 Particle injection 0	 Body forces 0	CAESIM							
	 Free streams 0	 Blockages 0	 Fire sources 0	 Rigid-body FSI 0			 Cyclic BC								
	 Outlets 0	 Porous media 0													
Flow BCs		Obstructive BCs		Source BCs		Moving BCs		Compound BCs		Particle BCs		Other			

The **Boundary Conditions** tab area for all CFD models consists of seven tab sub-areas providing access to all boundary condition definition functions

1. Flow BCs
2. Obstructive BCs
3. Source BCs
4. Moving BCs
5. Compound BCs
6. Particle BCs
7. Other

Add/Delete BC item buttons

BC placement control

BC value specification

X
ADD
DUPLICATE
DELETE
DELETE ALL

Name 1 of 5

WALL001

Placement By First Last

Region	I	1	1
Position	J	1	3
West	K	1	4

Interactive

Color

Visibility

Friction

Values Table for Face ALL

Wall Type Smooth Roughness Value 1

Particle Impact Reflect Reflection Factor

Surface Reaction

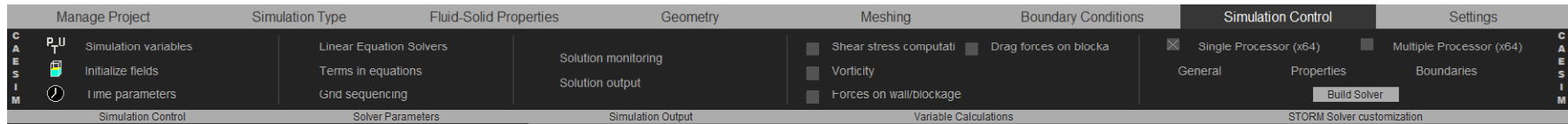
None

Radiating Wall Radiation Direction

VOF Contact Angle Direction

Dependent Variables Table

Name	Type	Description
UVEL	Value	0
VVEL	Value	0
WVEL	Value	0
TEMP	Flux	0



The ***Simulation Control*** tab area consists of five tab sub-areas allowing for specification of CFD simulation control parameters

1. Simulation control
2. Solver parameters
3. Simulation output
4. Variable calculations
5. CFD solver customization

Model Execution Summary

Main
Function
toolbar

CAESIM ADV 2024 <Project: blunta, Description: Units SI, Geometry Model: blunta>

CAESIM ADV 2024 SIMULATION EXECUTION

Interrupt (F1) Resume Next Spot Restart File View Solution Exit

Project Summary

Project Name: blunta

Description:

Coord System: BODY FITTED 3-D

Unit System: SI

Regions: I: 7 J: 5 K: 9

Mesh: I: 80 J: 32 K: 68

Flow Type: Turbulent

Heat Transfer: Inactive

Chemistry: Inactive

Phase: Single

Default Fluid: AIR (300 K, 1 atm)

Default Solid: Not specified

Boundary Conditions

Inlets: 1 Freestreams: 0 Particle BCs: 0

Outlets: 1 Walls: 0 Blockages: 1

Porous BCs: 0 Sources: 0 Moving BCs: 0

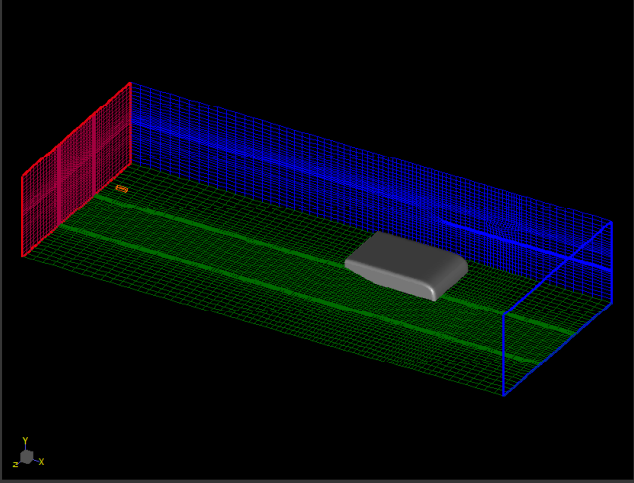
Fire Sources: 0 FSI BCs: 0 Objects: 0

Project Name: blunta

Time: 0.4 Step: 20 Elapsed: 00:00:11

DT: 0.02 Remaining: 00:07:02

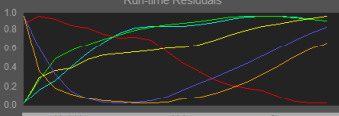
Completion Status: 3%



Environmental Statistics

	High	Low
Pressure	59.655	-67.1168
Flow Speed	4.97613	-11.7368
Temperature	Inactive	Inactive

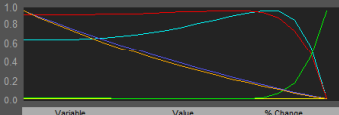
Run-time Residuals



Variable	Value	Change
PRESS	4.92411E+001	-6.71577E-001
UVEL	1.61021E+000	4.72795E-002
VVEL	6.42084E-001	1.79553E-003
WVEL	8.50156E-001	-2.78277E-002
KINEN	4.19567E-003	6.86316E-004
EPSL	1.03781E-001	1.77075E-002

Log Scale

Run-time Spot-Values



Variable	Value	% Change
PRESS	-7.31670E-003	8.06189E+001
UVEL	-9.99601E+000	-1.93387E-002
VVEL	-8.65042E-004	5.40512E-001
WVEL	5.41121E-005	5.36653E+001
KINEN	7.14725E-006	-1.40653E+000
EPSL	5.27770E-006	-2.7282E+000

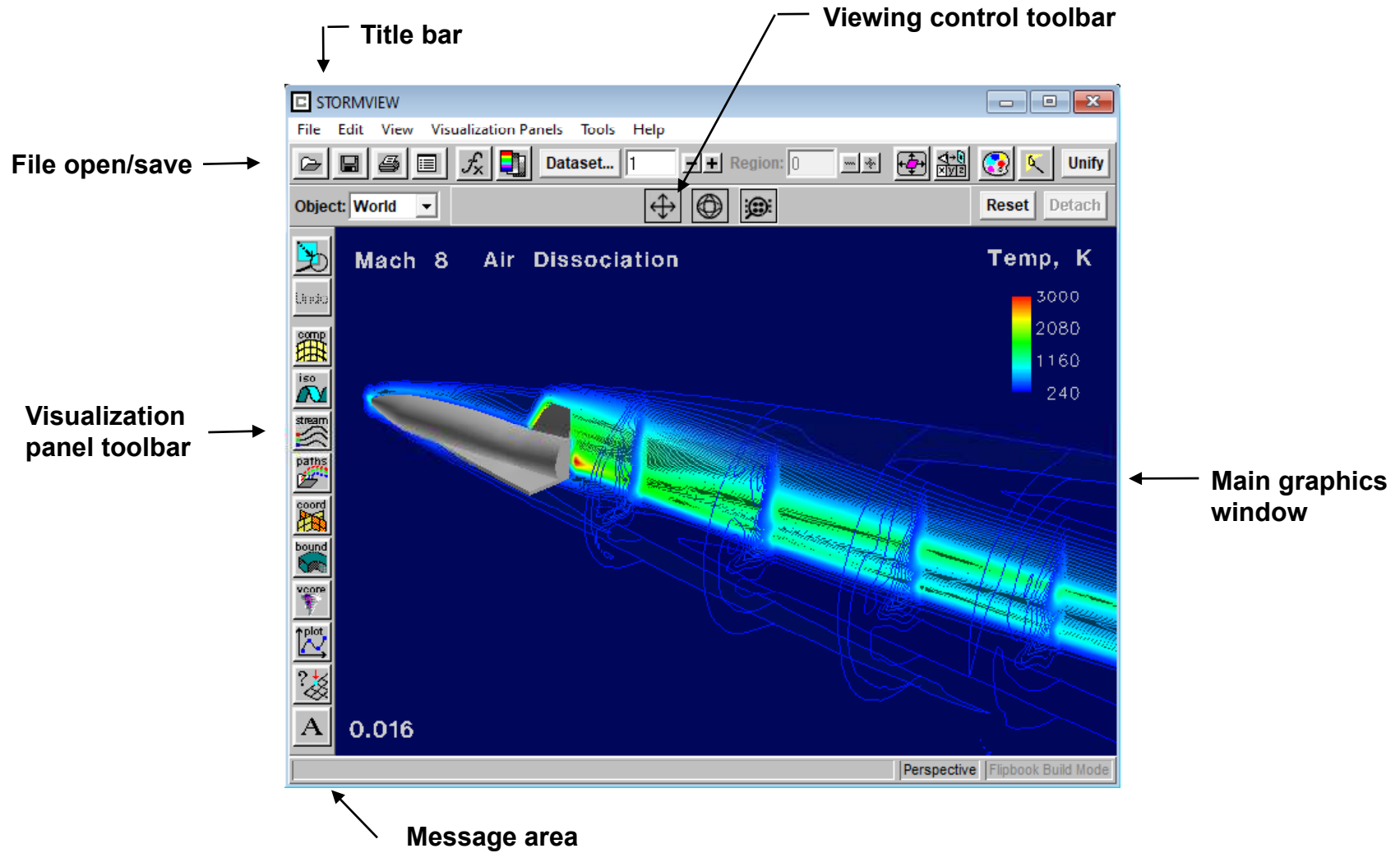
Probe SPU1001 I D J T2 K 34

Simulation powered by STORM

Probe
Monitor
Graph

Residual
graph

Message area





Zoom box

1. Iso-surfaces
2. Streamlines
3. Particle paths
4. Coordinate surfaces (cutting planes)
5. Boundary surfaces
6. 2D plotting
7. Solution probing
8. Plot annotation

The image shows a software interface titled "Boundary Surface" with several sections and controls. Annotations with arrows point to specific features:

- Surface ID**: Points to the "Surface ID: 1" input field and the "Total: 1" label.
- Surface Creation**: Points to the "Create", "Clear All", and "Delete" buttons.
- Coloring Control**: Points to the "COLORING" section with radio buttons for "Geometric" and "Scalar".
- Scalar Specification**: Points to the "Scalar Function" section with a text box containing "TEMP" and a "Select..." button.
- Display Type**: Points to the "DISPLAY TYPE" section with radio buttons for "Smooth" and "Vectors", and a "Smooth" dropdown menu.
- Vector Options**: Points to the "Options..." button under the "Vectors" radio button.
- Selection Control**: Points to the "BOUNDARY TYPES" list box and the "Select All", "Deselect All", and "OK" buttons below it.

Other visible controls include "Display Options...", "Visibility" (checked), and a "Close" button at the bottom.

The image shows a software interface window titled "Coordinate Surface". The window contains several sections: "Surface ID" with a text box containing "1" and a "Total: 1" label; a tabbed interface with "Surface", "Subset", "Colormap", and "Legend" tabs; a "Create" section with "Create", "Clear All", and "Delete" buttons; a "DISPLAY TYPE" section with radio buttons for "Contours" (selected) and "Vectors", and an "Options..." button; a "COLORING" section with radio buttons for "Geometric" and "Scalar" (selected); a "Scalar Function" section with a text box containing "TEMP" and a "Select..." button; a "COORD PLANE" section with radio buttons for "X", "Y", and "Z" (selected), and input fields for "Min" (0), "Current" (0.15), and "Max" (0.3); a "SWEEP CONTROL" section with a "Sweep" checkbox, a "Steps" input field (25), and navigation buttons; and a "Close" button at the bottom.

Annotations on the left side of the panel:

- Surface ID →
- Surface Creation →
- Coloring Control →
- Scalar Specification →

Annotations on the right side of the panel:

- ← Display Type
- ← Vector Options
- ← Plane Orientation
- ← Plane Position
- ← Sweeping/Animating Controls