CAESIM Training - How-To Guide

Subject	Physical Modeling
Category	Computing lift and drag forces on a solid 3D object
Description	This tutorial describes the modeling steps for determining lift and drag coefficients for a specified 3D blockage.

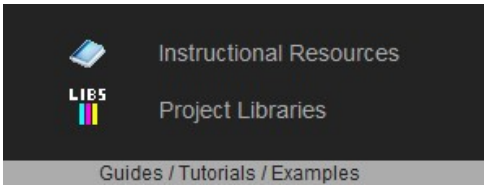
CAESIM provides a feature for computing lift and drag forces on arbitrarily shaped 3D block objects. Once a single blockage BC has been specified and the function activated, the CAESIM software automatically computes pressure and viscous forces. These forces are in turn used to compute coefficients of lift and drag based on user specified data (i.e., characteristics of the 3D shape).

The following example demonstrates the following modeling

- loading 3D CFD project with solid blockage
- activating the lift/drag module
- specifying variables for Cd and Cl computation
- reviewing the simulation results

Loading a CFD Model

Load the "blunta" CFD example library project into CAESIM by first selecting the **Project Libraries** button located on the **Manage Project** TAB area.



Next, load the "blunta" project from the *Application Areas -> Aerodynamics* category.

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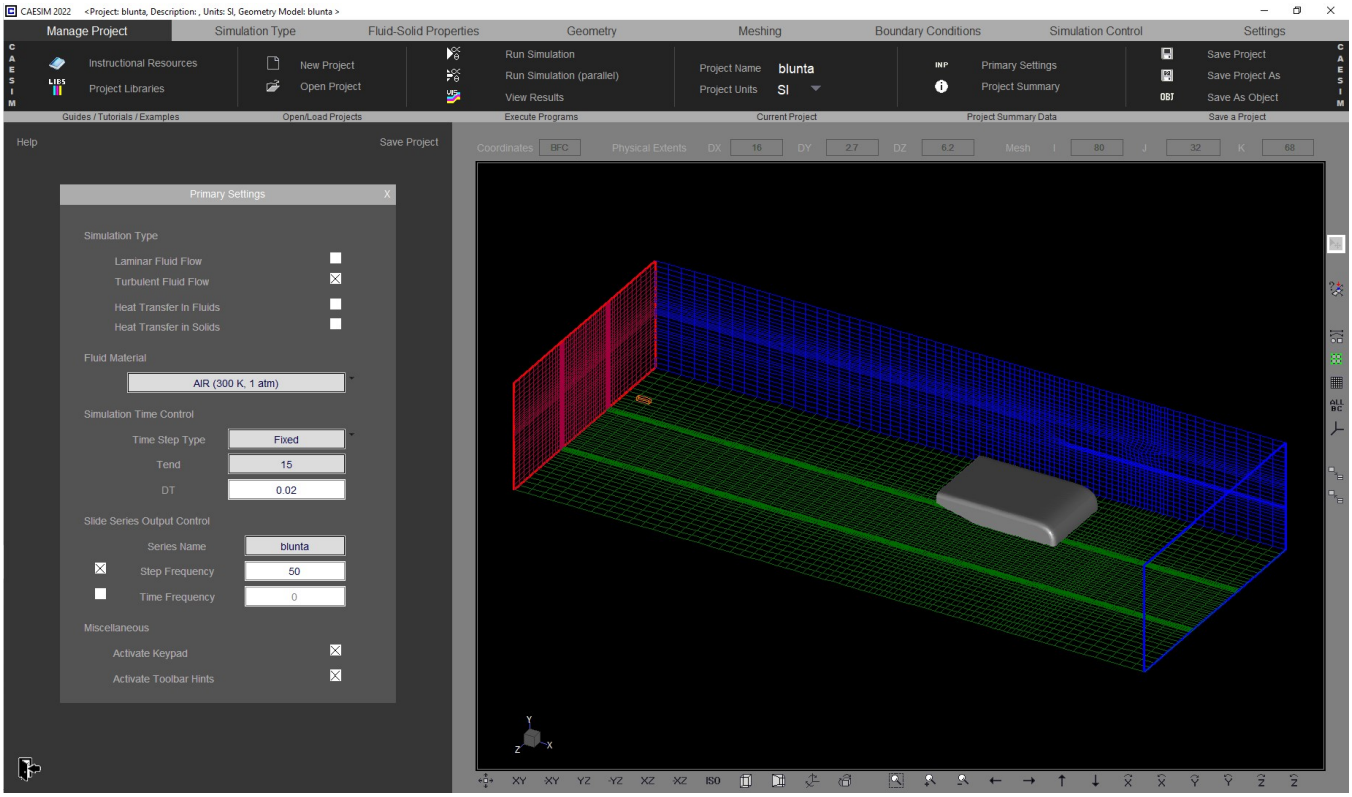
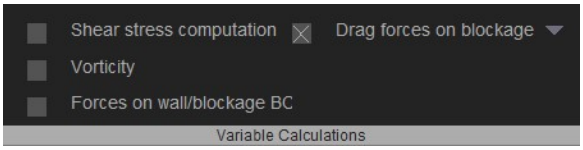
"blunta" Example Project



Activating the Lift and Drag Module

The parameters used for computing lift and drag coefficients are specified through the CAESIM interface by clicking the down arrow next to the "*Lift/drag force on blockage*" label (on the **Simulation Control** TAB area).



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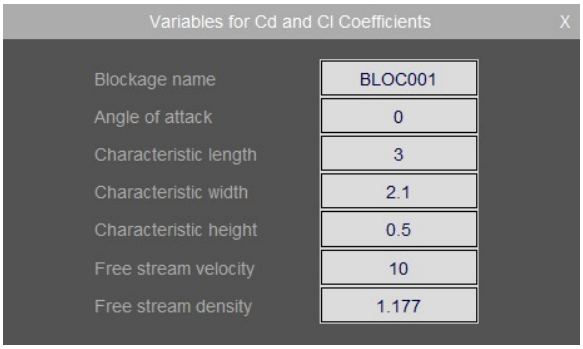
Coefficients of lift and drag are computed as follows:



$$Cl = 2.0 * L / (RHO * Ay * VEL**2)$$

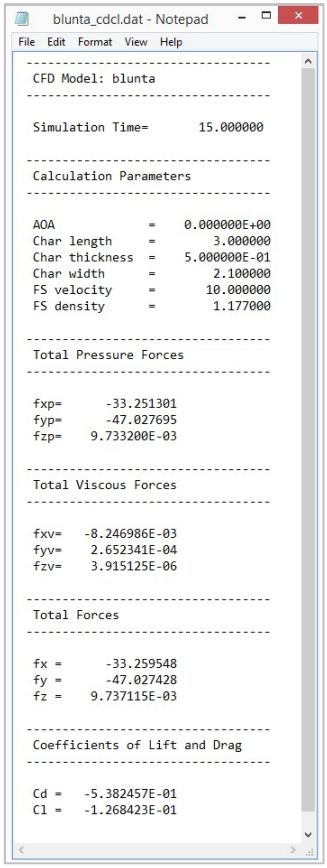
$$Cd = 2.0 * D / (RHO * Ax * VEL**2)$$

where,

L	=	computed lift force (Y direction)
D	=	computed drag force (X direction)
RHO	=	free stream density of air
VEL	=	free stream velocity
Ay	=	projected lower area (Chord * Z depth * AOA)
Ax	=	projected frontal area (thickness * Z depth * AOA)

Simulation Results

At the completion of a CFD simulation, an ASCII output file with the name "**<model>_cdcl.dat"** is generated in the local working directory.



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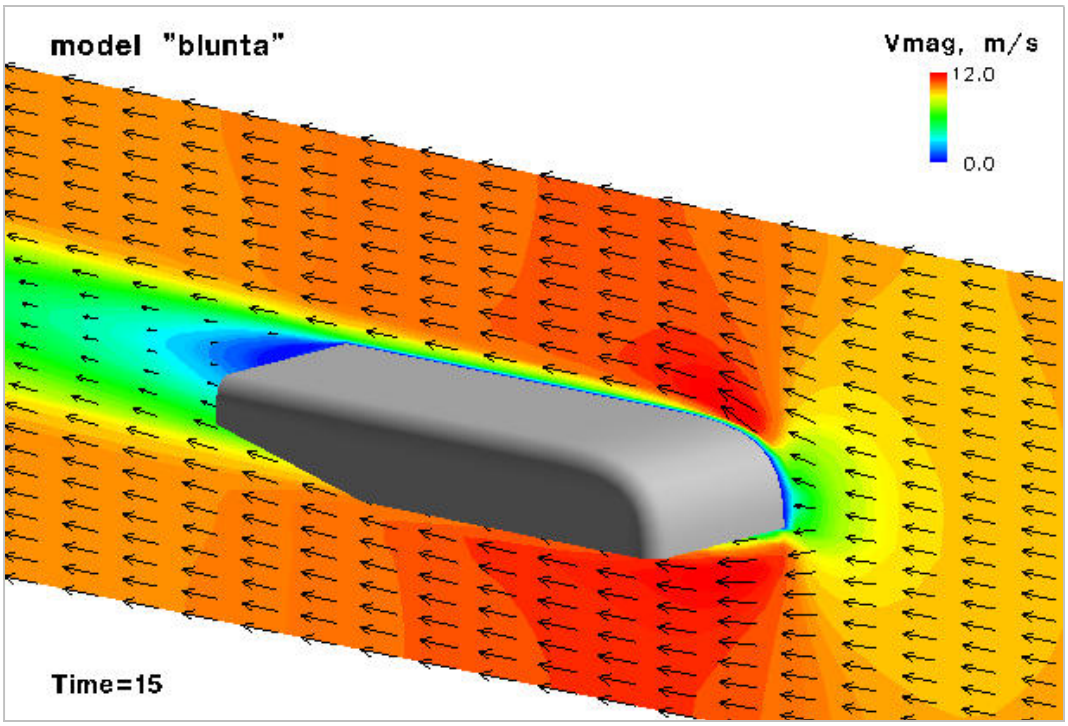

Comments	Any CAESIM 3D geometric model containing solid blockages can be used. Currently Cd and Cl coefficients are computed for a singular blockage.
Related Topics	Physical modeling, pressure forces.

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