Ansys Fluent Simulation Report

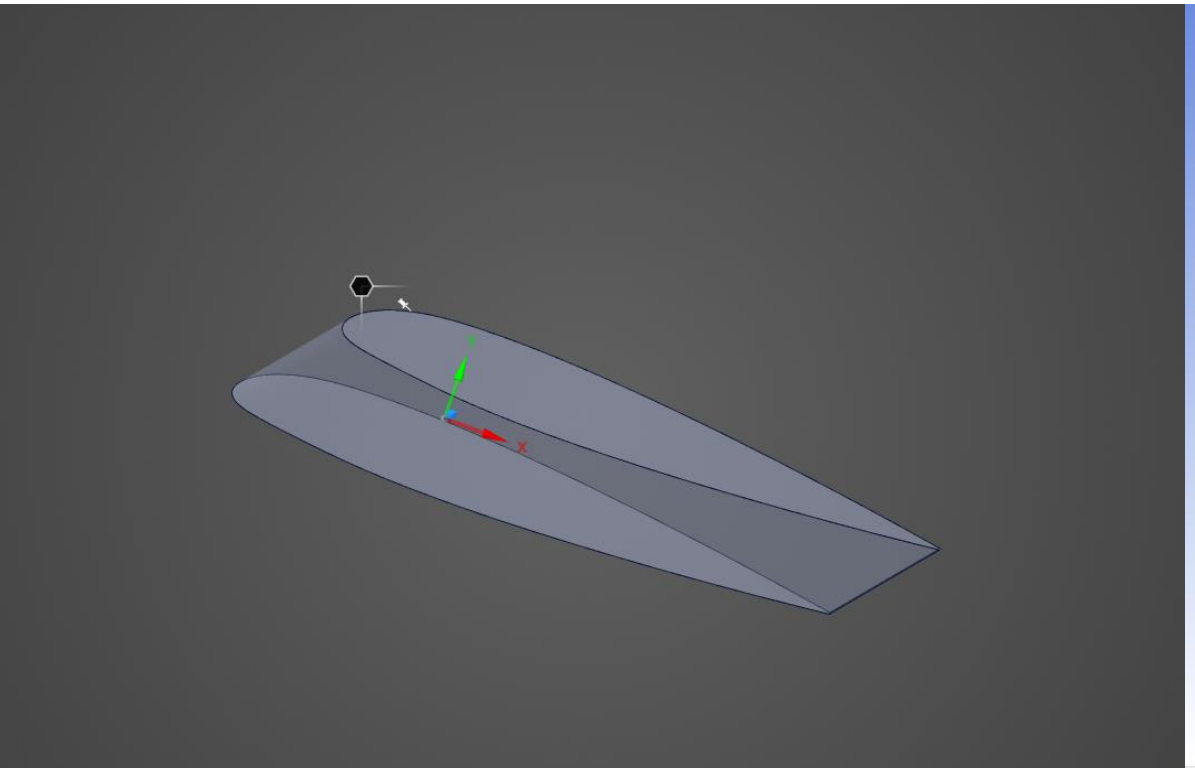
Airfoil Aerodynamics Analysis

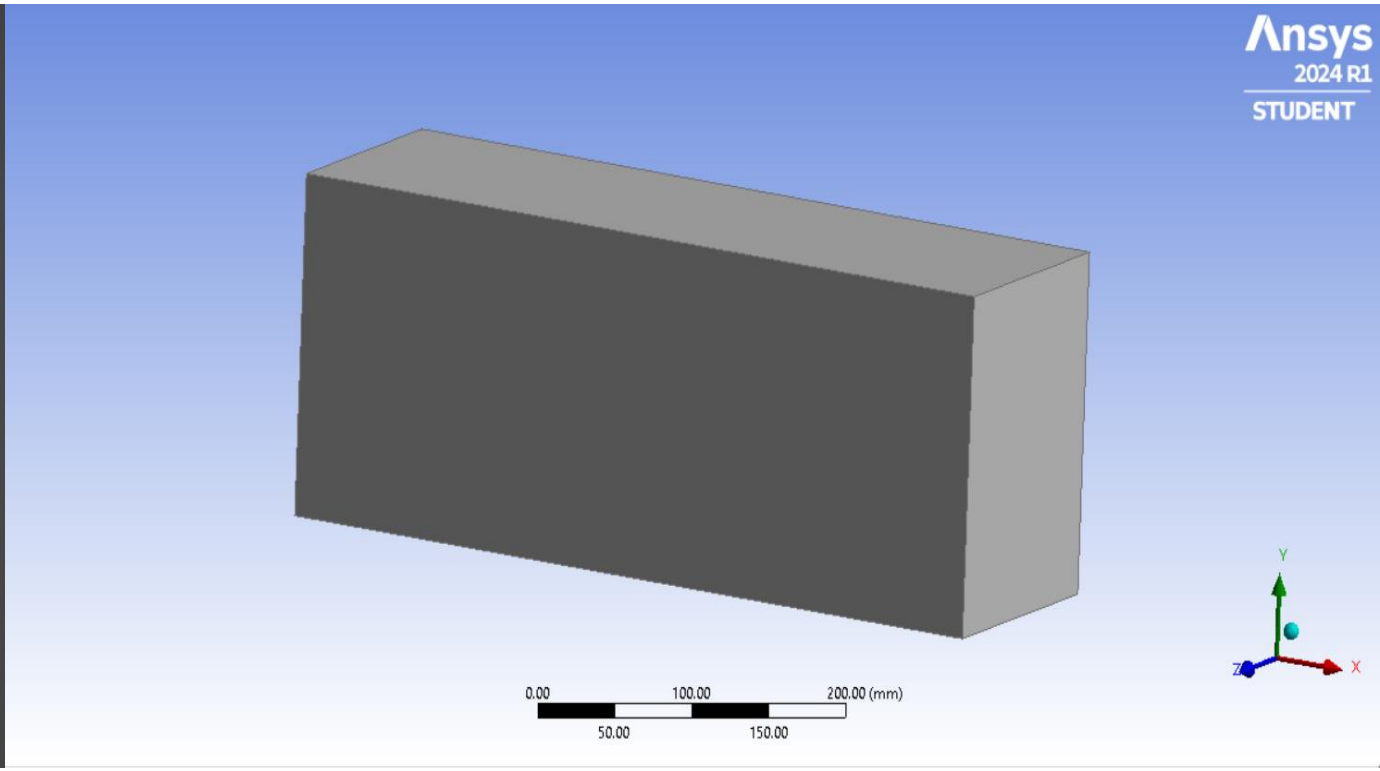
Table of Contents

System Information

Application	Fluent
Settings	3d, double precision, pressure-based, SST k-omega
Version	24.1.0-10184
Source Revision	5b3f9fb3c8
Build Time	Nov 22 2023 10:32:41 EST
CPU	AMD Ryzen 5 7520U with Radeon Graphics
OS	Windows

Geometry





Airfoil Model

Fluid Domain

- Dimensions:

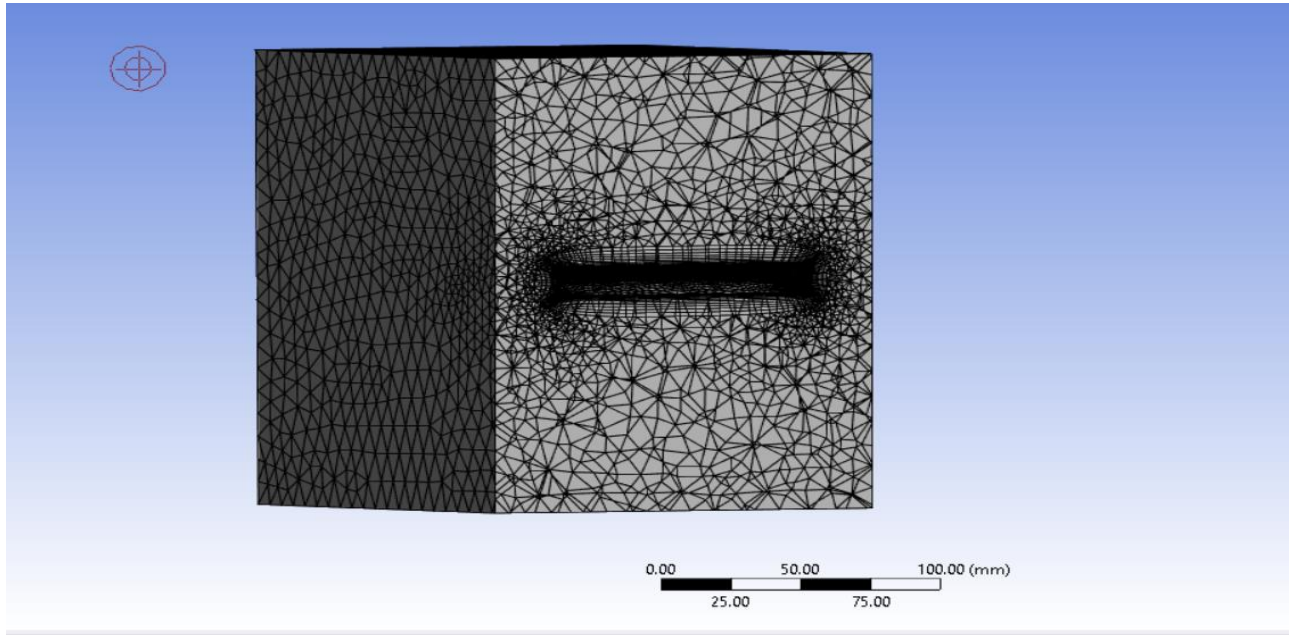
Area	20403.4237mm²
Perimeter	608.0687mm

- Dimensions:

Volume	14917941.8991mm³
Center of mass	(50.1894, 0.0083, 4e-05)mm
Total surface area	432082.7823mm²

Mesh Size

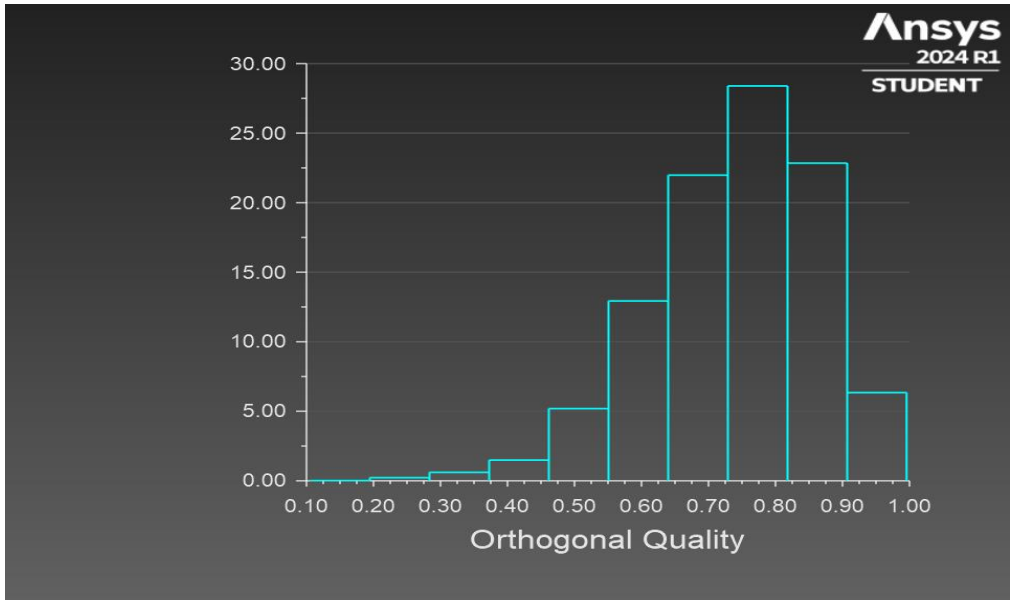
Cells	Faces	Nodes
969528	2096388	261154



Sectional View

Mesh Quality

Name	Type	Min Orthogonal Quality	Max Aspect Ratio
solid	Mixed Cell	0.10560898	43.563546



Models

Model	Settings
Space	3D
Time	Steady
Viscous	SST k-omega turbulence model

Material Properties

- Fluid	
- air	
Density	1.225 kg/m^3
Cp (Specific Heat)	1006.43 J/(kg K)
Thermal Conductivity	0.0242 W/(m K)
Viscosity	1.7894e-05 kg/(m s)
Molecular Weight	28.966 kg/kmol
- Solid	
- aluminum	
Density	2719 kg/m^3
Cp (Specific Heat)	871 J/(kg K)
Thermal Conductivity	202.4 W/(m K)

Cell Zone Conditions

- Fluid	
- solid	
Material Name	air
Specify source terms?	no
Specify fixed values?	no
Frame Motion?	no
Laminar zone?	no
Porous zone?	no
3D Fan Zone?	no

Boundary Conditions

- Inlet	
- inlet	
Velocity Specification Method	Magnitude, Normal to Boundary
Reference Frame	Absolute
Velocity Magnitude [m/s]	48
Supersonic/Initial Gauge Pressure [Pa]	0
Turbulent Specification Method	Intensity and Viscosity Ratio
Turbulent Intensity [%]	5
Turbulent Viscosity Ratio	10
- Outlet	
- outlet	
Backflow Reference Frame	Absolute
Gauge Pressure [Pa]	0

Boundary Conditions

Pressure Profile Multiplier	1
Backflow Direction Specification Method	Normal to Boundary
Turbulent Specification Method	Intensity and Viscosity Ratio
Backflow Turbulent Intensity [%]	5
Backflow Turbulent Viscosity Ratio	10
Backflow Pressure Specification	Total Pressure
Build artificial walls to prevent reverse flow?	no
Radial Equilibrium Pressure Distribution	no
Average Pressure Specification?	no
Specify targeted mass flow rate	no
- Wall	
- wall-solid	
Wall Motion	Stationary Wall

Boundary Conditions

Shear Boundary Condition	No Slip
Wall Surface Roughness	rough bc standard
Wall Roughness Height [m]	0
Wall Roughness Constant	0.5
- airfoil	
Wall Motion	Stationary Wall
Shear Boundary Condition	No Slip
Wall Surface Roughness	rough bc standard
Wall Roughness Height [m]	0
Wall Roughness Constant	0.5

Reference Values

Area	1 m^2
Density	1.225 kg/m^3
Enthalpy	0 J/kg
Length	1 m
Pressure	0 Pa
Temperature	288.16 K
Velocity	1 m/s
Viscosity	1.7894e-05 kg/(m s)
Ratio of Specific Heats	1.4
Yplus for Heat Tran. Coef.	300
Reference Zone	solid

Solver Settings

- Equations	
Flow	True
Turbulence	True
- Numerics	
Absolute Velocity Formulation	True
- Pseudo Time Explicit Relaxation Factors	
Density	1
Body Forces	1
Turbulent Kinetic Energy	0.75
Specific Dissipation Rate	0.75
Turbulent Viscosity	1
Explicit Momentum	0.5
Explicit Pressure	0.5

Solver Settings

- Pressure-Velocity Coupling	
Type	Coupled
Pseudo Time Method (Global Time Step)	True
- Discretization Scheme	
Pressure	Second Order
Momentum	Second Order Upwind
Turbulent Kinetic Energy	Second Order Upwind
Specific Dissipation Rate	Second Order Upwind
- Solution Limits	
Minimum Absolute Pressure [Pa]	1
Maximum Absolute Pressure [Pa]	5e+10
Minimum Static Temperature [K]	1
Maximum Static Temperature [K]	5000
Minimum Turb. Kinetic Energy [m^2/s^2]	1e-14
Minimum Spec. Dissipation Rate [s^-1]	1e-20
Maximum Turb. Viscosity Ratio	100000

Run Information

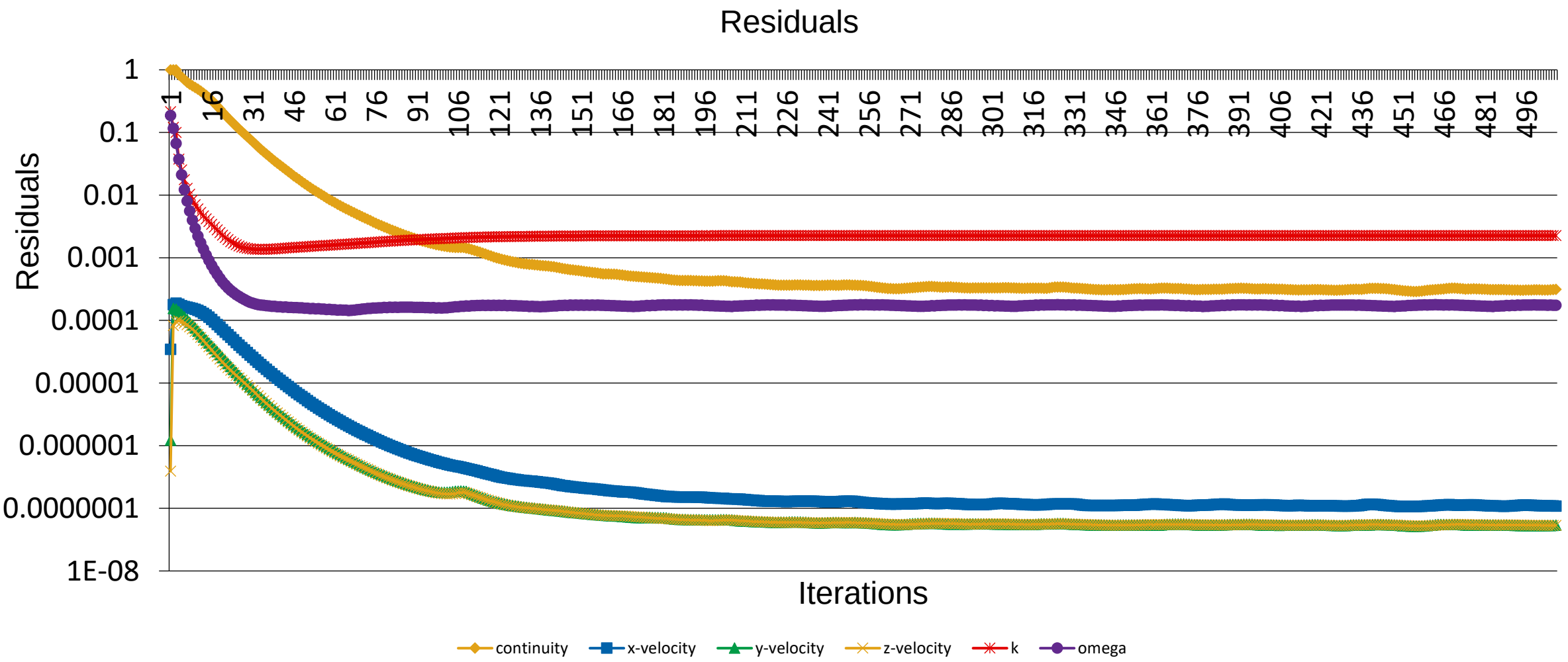
Number of Machines	1
Number of Cores	4
Case Read	17.465 seconds
Iteration	2565.67 seconds
AMG	1698.54 seconds
Virtual Current Memory	1.28721 GB
Virtual Peak Memory	4.57854 GB
Memory Per M Cell	1.21546

Solution Status

Iterations: 507

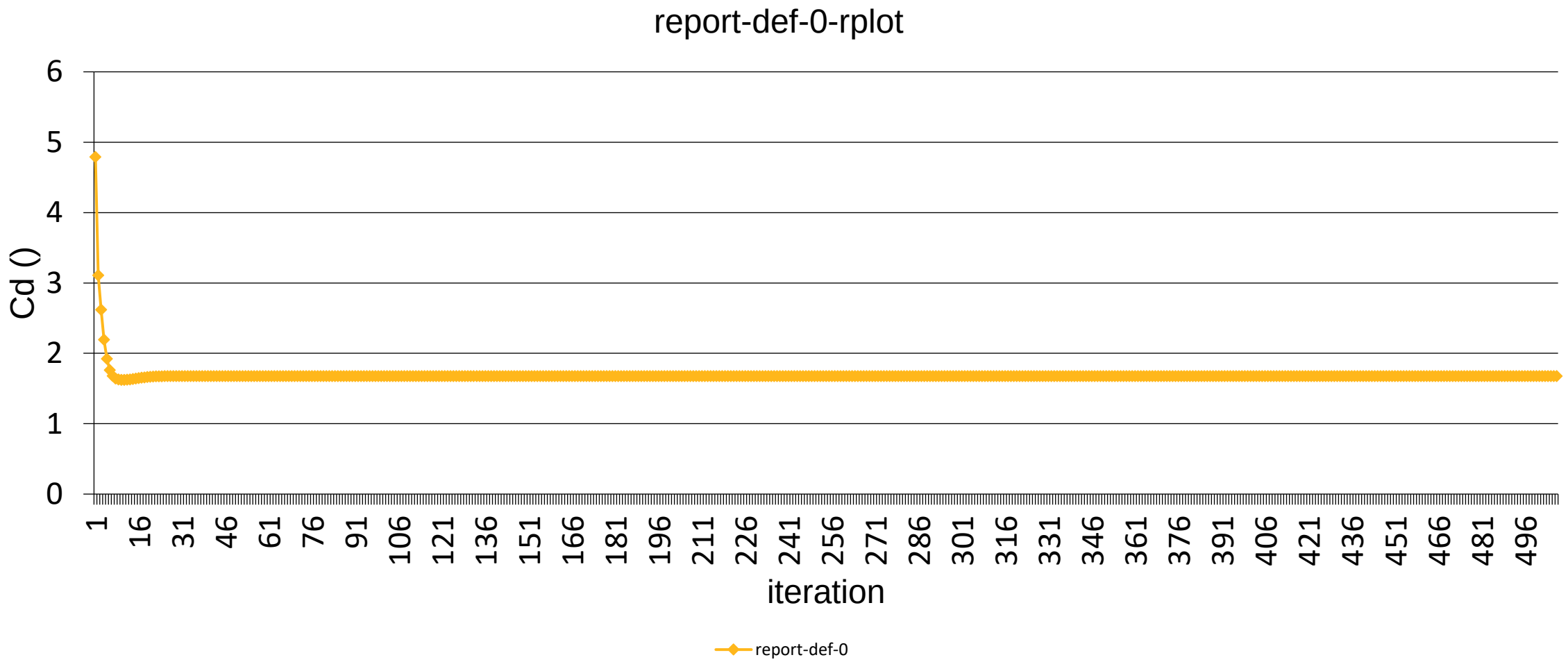
	Value	Absolute Criteria	Convergence Status
continuity	0.0003123511	0.001	Converged
x-velocity	1.087598e-07	0.001	Converged
y-velocity	5.378792e-08	0.001	Converged
z-velocity	5.352545e-08	0.001	Converged
k	0.002257392	0.001	Converged
omega	0.0001742238	0.001	Converged

Residuals


Residuals
Residuals
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
0.0000001
1E-08
1
16
31
46
61
76
91
106
121
136
151
166
181
196
211
226
241
256
271
286
301
316
331
346
361
376
391
406
421
436
451
466
481
496
Iterations
continuity
x-velocity
y-velocity
z-velocity
k
omega

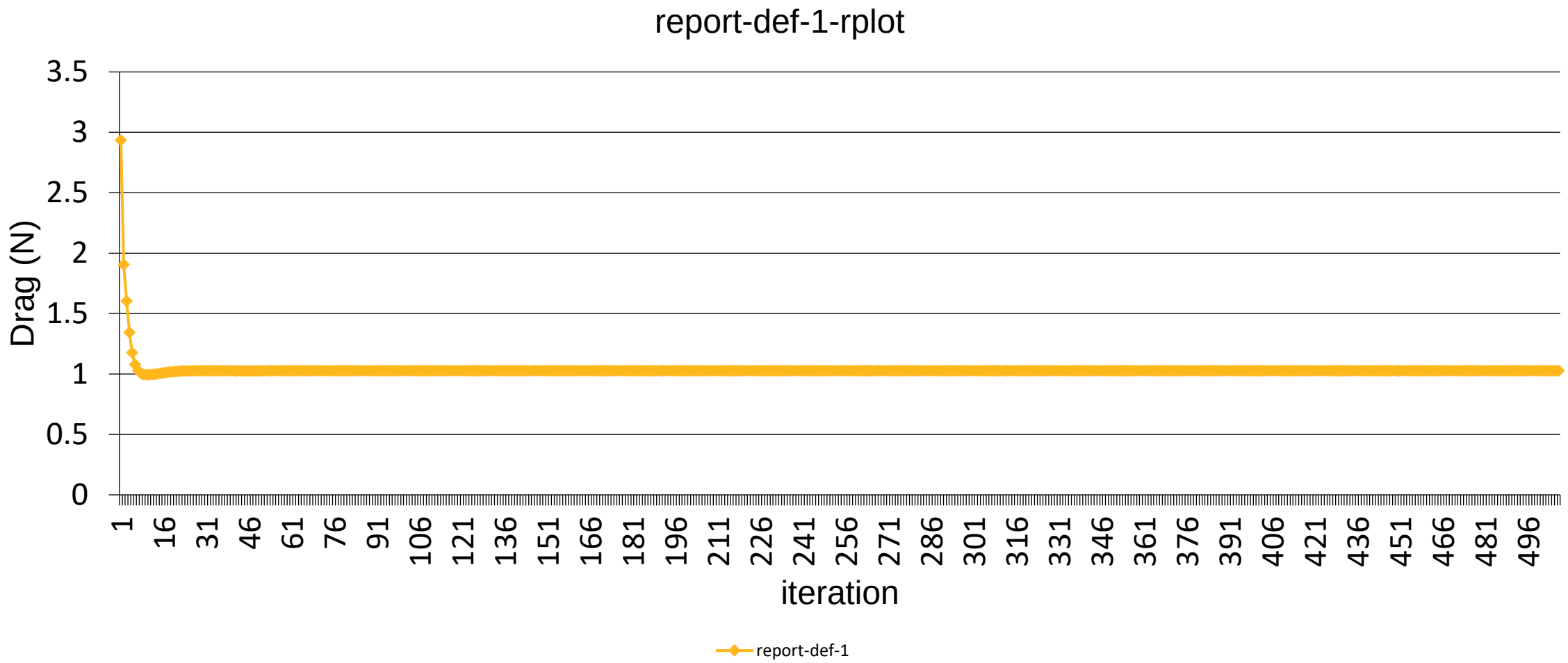
Coefficient of Drag

Value: 1.676294



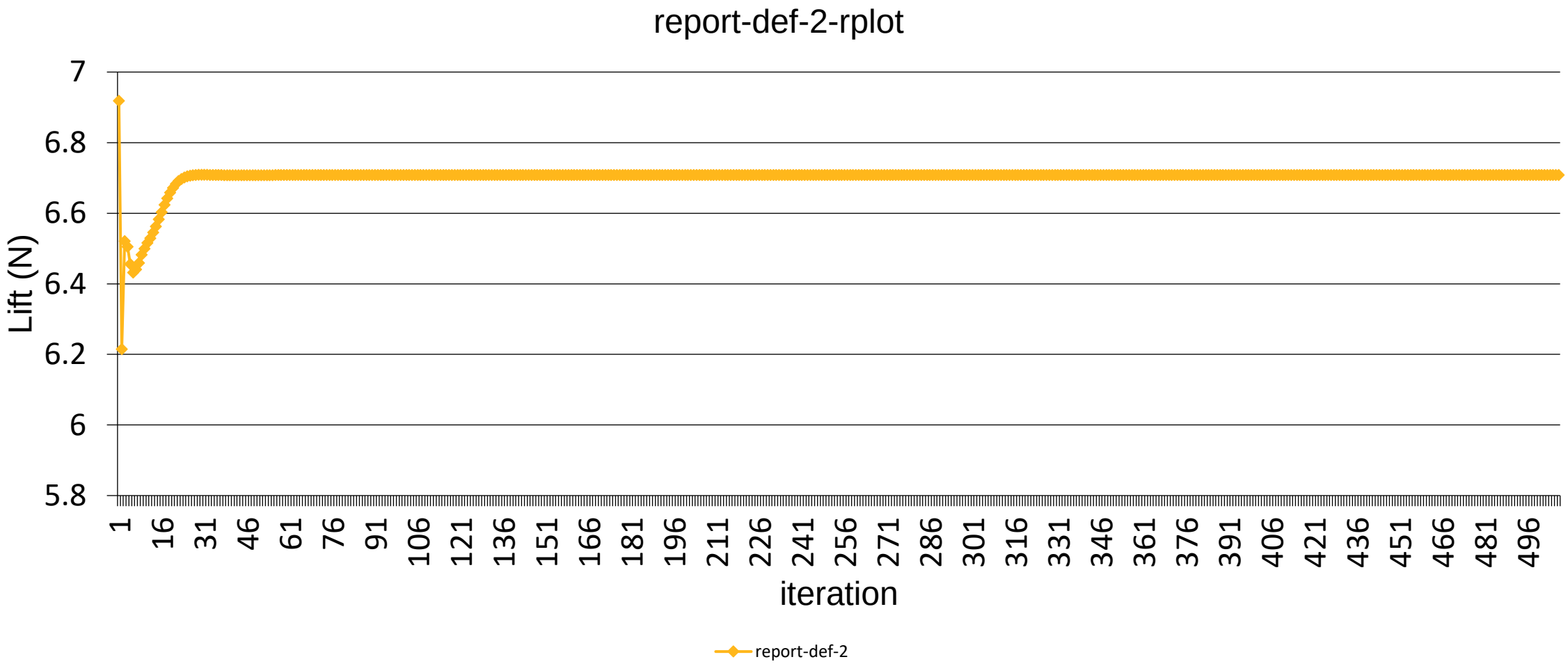
Drag Force

Value: 1.02673 N



Lift Force

Value: 6.708154 N



Pressure & Velocity Contour