Ansys
2021 R2

Ansys Fluent Simulation Report

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Table of Contents

System Information

Application	Fluent
Settings	3d, double precision, pressure-based, standard k-epsilon
Version	21.2.0-10201
Source Revision	fcb749f05e
Build Time	May 28 2021 13:54:12 EDT
CPU	Intel(R) Core(TM) i7-10710U
OS	Windows

Geometry and Mesh

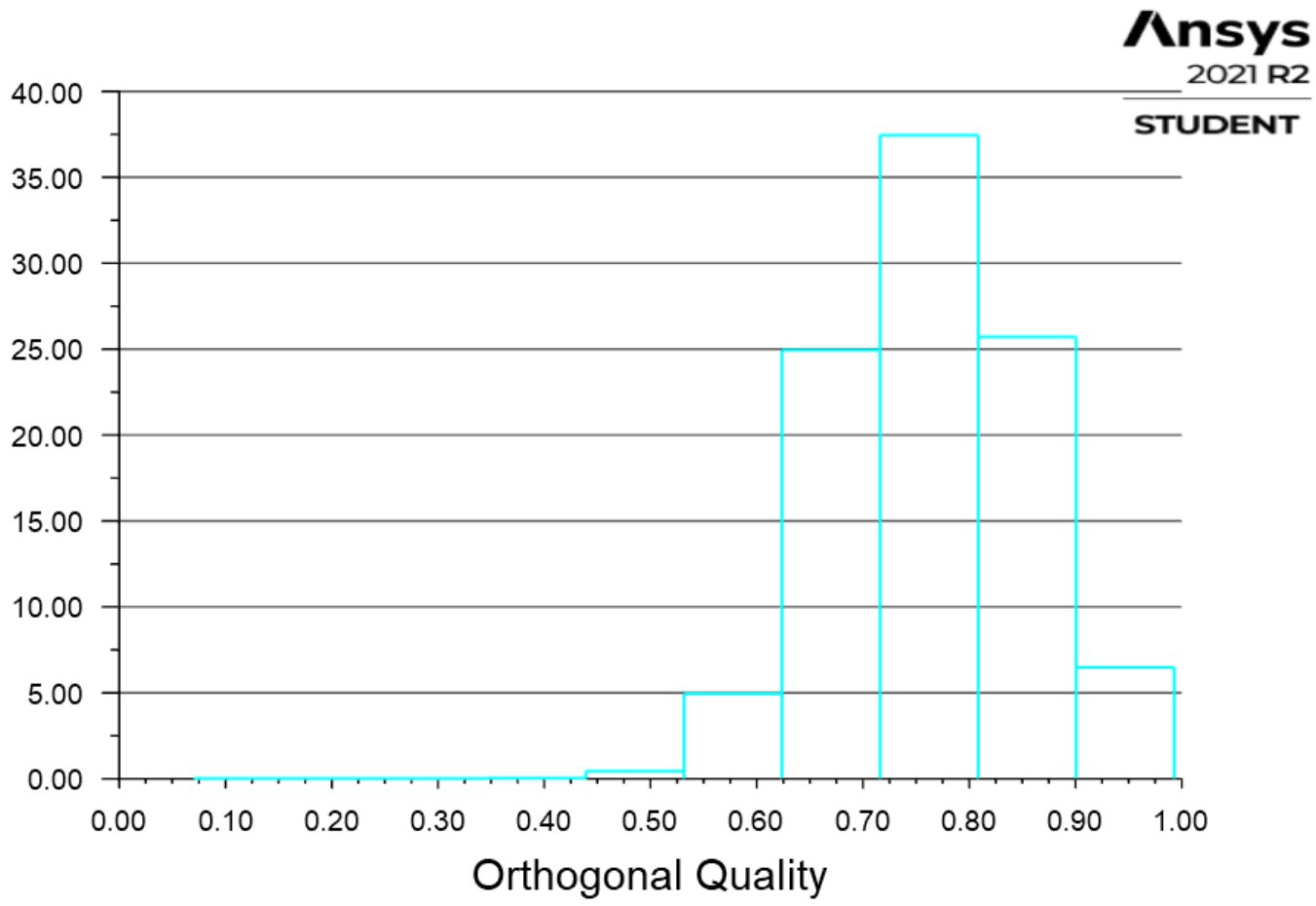
Mesh Size

Cells	Faces	Nodes
489033	989429	87656

Mesh Quality

Name	Type	Min Orthogonal Quality	Max Aspect Ratio
solid	Tet Cell	0.070025454	52.137383

Orthogonal Quality



Simulation Setup

Physics

Models

Model	Settings
Space	3D
Time	Steady
Viscous	Standard k-epsilon turbulence model
Wall Treatment	Standard Wall Functions
Heat Transfer	Enabled

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
Thermal Expansion Coefficient	0
Speed of Sound	none
− 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]	15
Supersonic/Initial Gauge Pressure [Pa]	0
Temperature [K]	300
Turbulent Specification Method	Intensity and Viscosity Ratio
Turbulent Intensity [%]	5
Turbulent Viscosity Ratio	10
− Outlet	
− outlet	
Backflow Reference Frame	Absolute
Gauge Pressure [Pa]	0
Pressure Profile Multiplier	1
Backflow Total Temperature [K]	300
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_left	
Wall Thickness [m]	0
Heat Generation Rate [W/m^3]	0
Material Name	aluminum
Thermal BC Type	Heat Flux
Heat Flux [W/m^2]	0
Enable shell conduction?	no
Wall Motion	Stationary Wall
Shear Boundary Condition	No Slip
Wall Roughness Height [m]	0
Wall Roughness Constant	0.5
Convective Augmentation Factor	1
━ wall_up	
Wall Thickness [m]	0
Heat Generation Rate [W/m^3]	0
Material Name	aluminum
Thermal BC Type	Heat Flux
Heat Flux [W/m^2]	0
Enable shell conduction?	no
Wall Motion	Stationary Wall
Shear Boundary Condition	No Slip
Wall Roughness Height [m]	0
Wall Roughness Constant	0.5
Convective Augmentation Factor	1
━ wall_right	
Wall Thickness [m]	0
Heat Generation Rate [W/m^3]	0
Material Name	aluminum
Thermal BC Type	Heat Flux
Heat Flux [W/m^2]	0
Enable shell conduction?	no
Wall Motion	Stationary Wall
Shear Boundary Condition	No Slip
Wall Roughness Height [m]	0
Wall Roughness Constant	0.5
Convective Augmentation Factor	1
━ wall_down	

Wall Thickness [m]	0
Heat Generation Rate [W/m^3]	0
Material Name	aluminum
Thermal BC Type	Heat Flux
Heat Flux [W/m^2]	0
Enable shell conduction?	no
Wall Motion	Stationary Wall
Shear Boundary Condition	No Slip
Wall Roughness Height [m]	0
Wall Roughness Constant	0.5
Convective Augmentation Factor	1
━ aircraft	
Wall Thickness [m]	0
Heat Generation Rate [W/m^3]	0
Material Name	aluminum
Thermal BC Type	Heat Flux
Heat Flux [W/m^2]	0
Enable shell conduction?	no
Wall Motion	Stationary Wall
Shear Boundary Condition	No Slip
Wall Roughness Height [m]	0
Wall Roughness Constant	0.5
Convective Augmentation Factor	1

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
Energy	True
━ Numerics	

Absolute Velocity Formulation	True
— Pseudo Transient Explicit Relaxation Factors	
Density	1
Body Forces	1
Turbulent Kinetic Energy	0.75
Turbulent Dissipation Rate	0.75
Turbulent Viscosity	1
Energy	0.75
Explicit Momentum	0.5
Explicit Pressure	0.5
— Pressure-Velocity Coupling	
Type	Coupled
Pseudo Transient	True
— Discretization Scheme	
Pressure	Second Order
Momentum	Second Order Upwind
Turbulent Kinetic Energy	First Order Upwind
Turbulent Dissipation Rate	First Order Upwind
Energy	Second Order Upwind
— Solution Limits	
Minimum Absolute Pressure [Pa]	1
Maximum Absolute Pressure [Pa]	5e+10
Minimum Temperature [K]	1
Maximum Temperature [K]	5000
Minimum Turb. Kinetic Energy [m^2/s^2]	1e-14
Minimum Turb. Dissipation Rate [m^2/s^3]	1e-20
Maximum Turb. Viscosity Ratio	100000

Run Information

Number of Machines	1
Number of Cores	2
Case Read	10.889 seconds
Iteration	3610.58 seconds
AMG	2647.79 seconds
Virtual Current Memory	1.53482 GB
Virtual Peak Memory	1.80626 GB
Memory Per M Cell	2.87674

Solution Status

Iterations: 1000

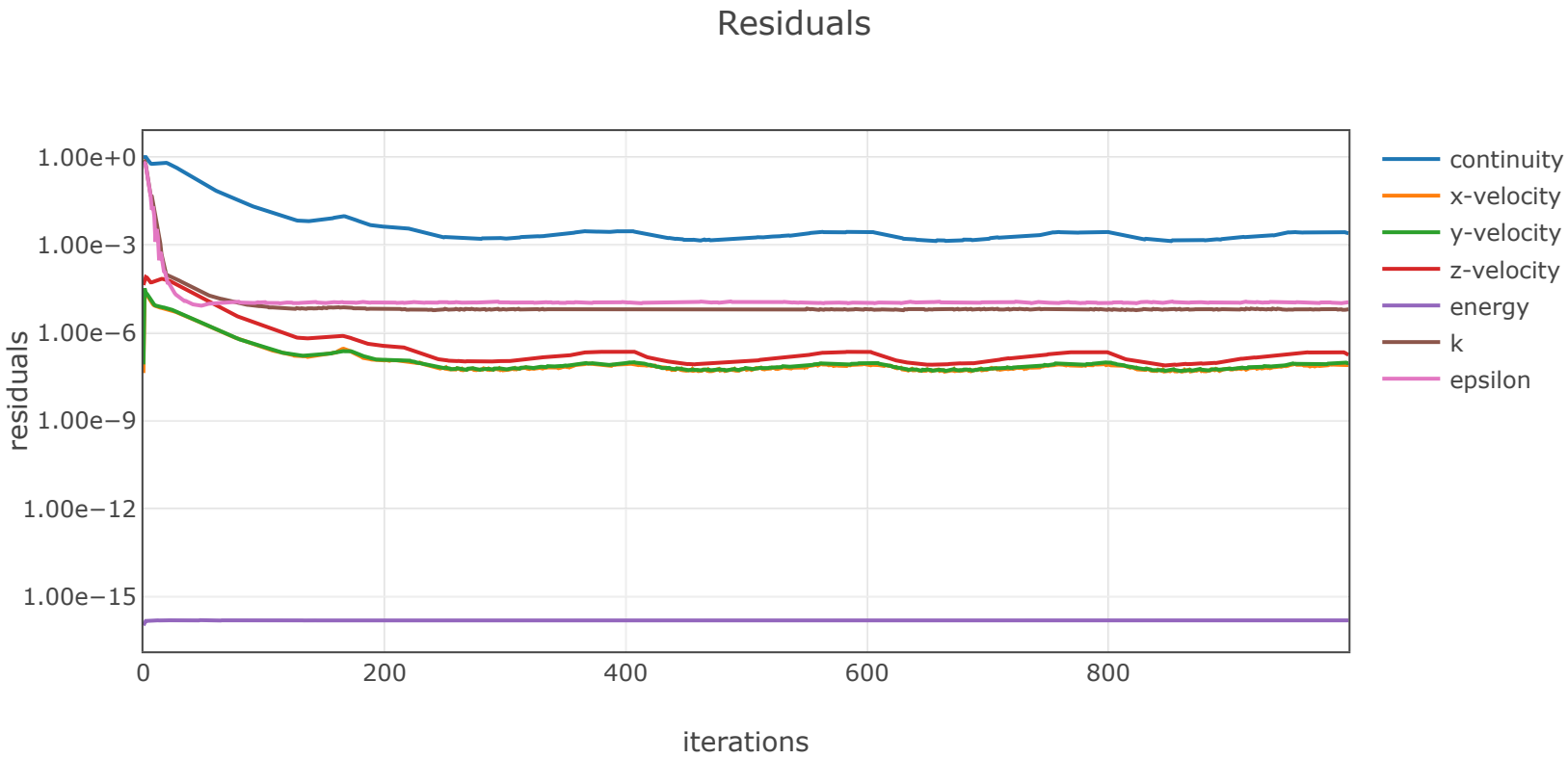
	Value	Absolute Criteria	Convergence Status
continuity	0.002537266	0.001	Not Converged
x-velocity	7.971406e-08	0.001	Converged
y-velocity	9.478898e-08	0.001	Converged
z-velocity	1.786453e-07	0.001	Converged
energy	1.553887e-16	1e-06	Converged
k	6.428137e-06	0.001	Converged
epsilon	1.119027e-05	0.001	Converged

Report Definitions

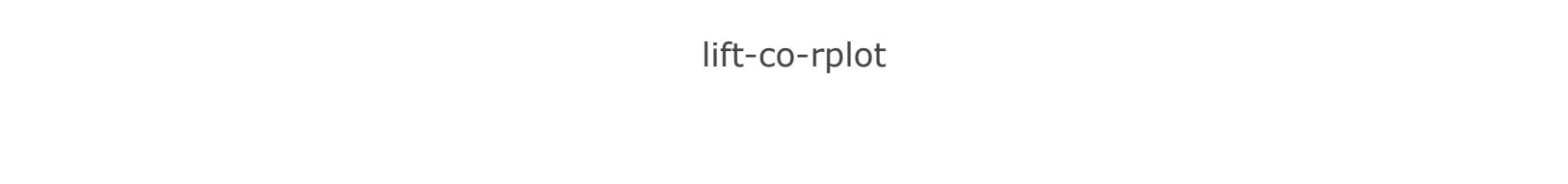
lift-co	-13.65841
drag-co	0.009688326
drag-force	0.0059341 N
lift-force	-8.365779 N

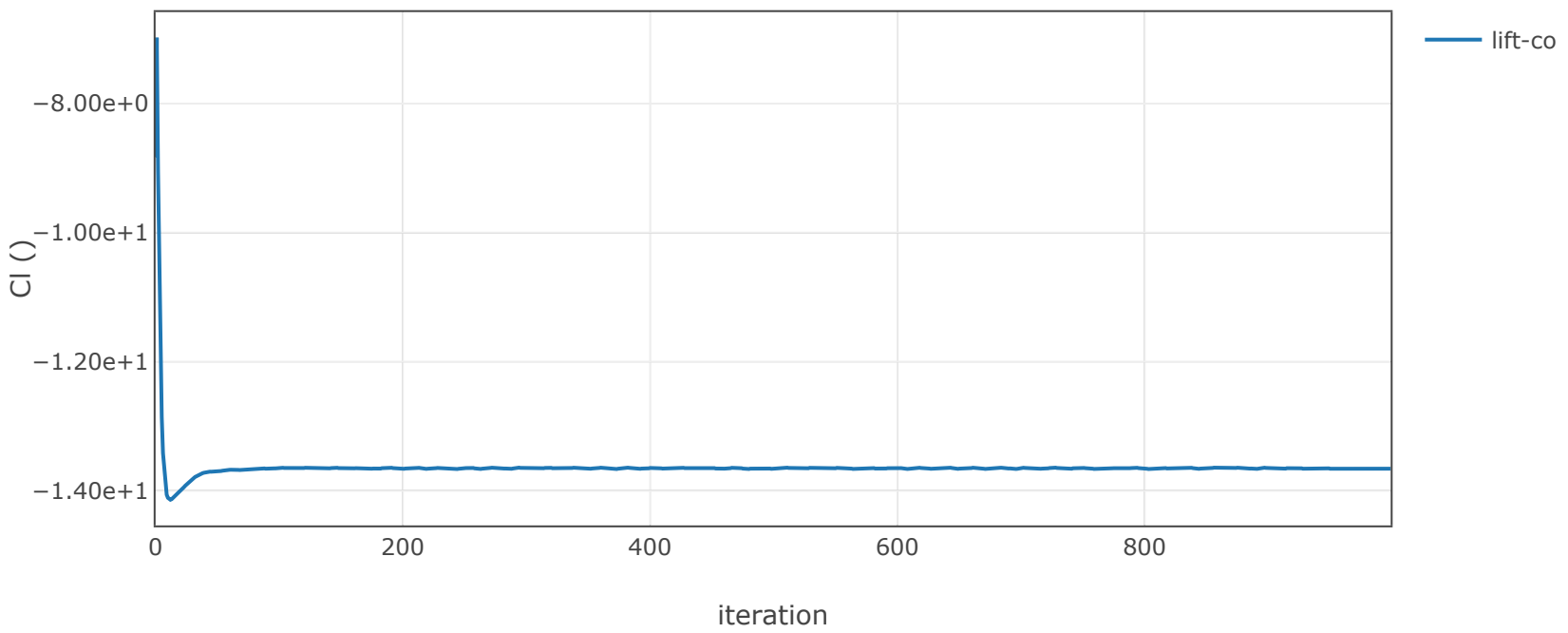
Plots

Residuals

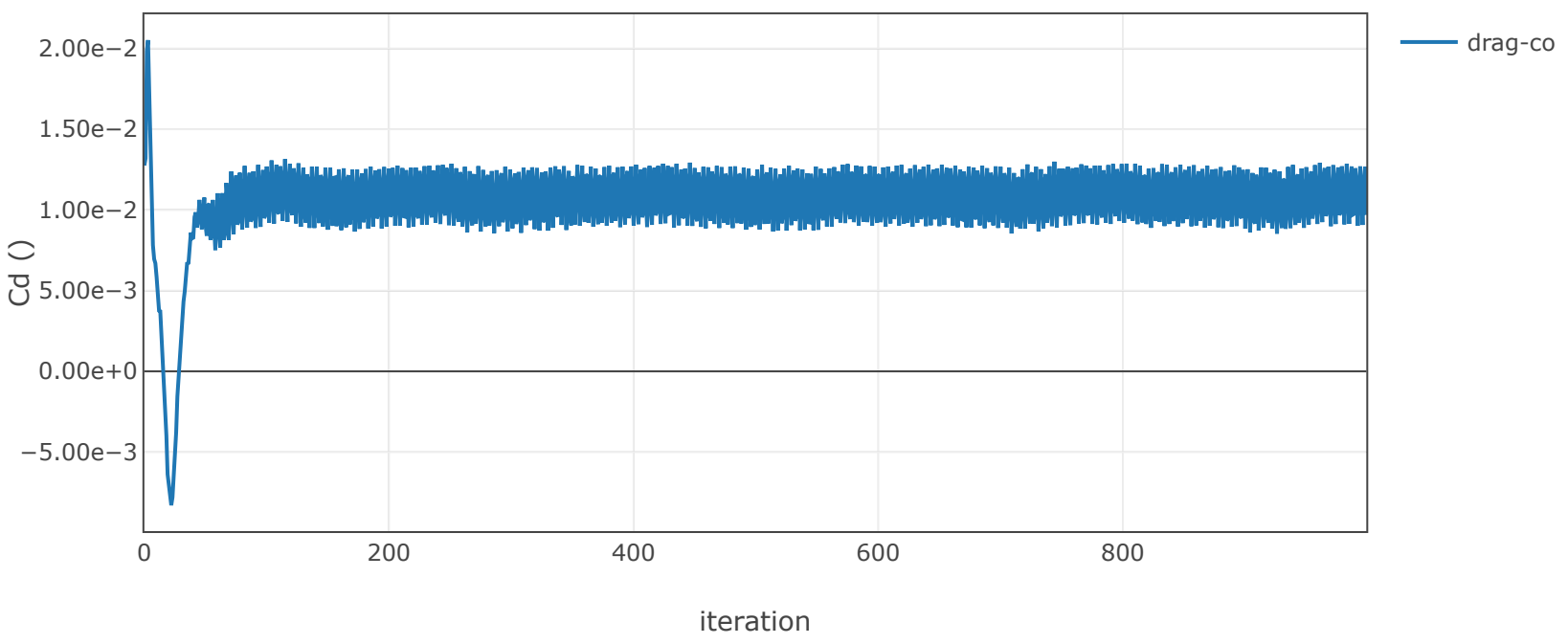


lift-co-rplot

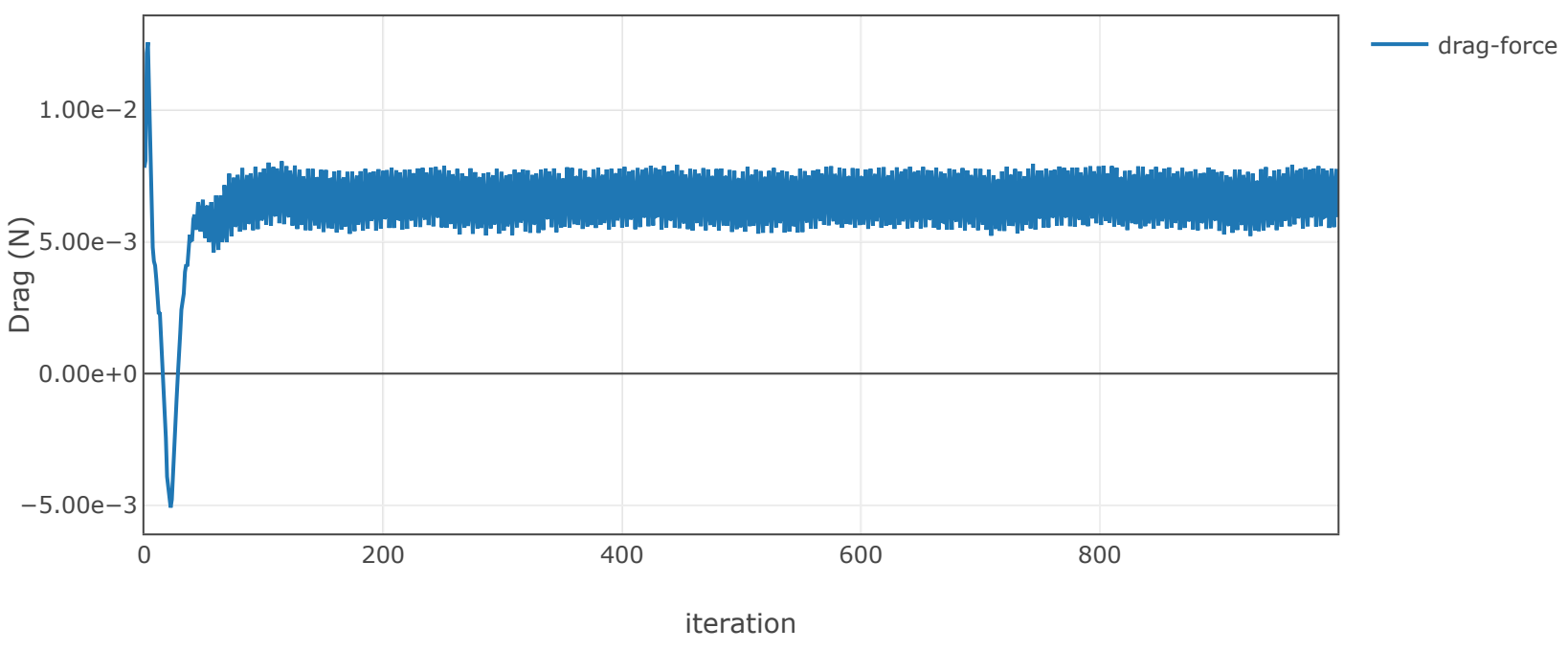




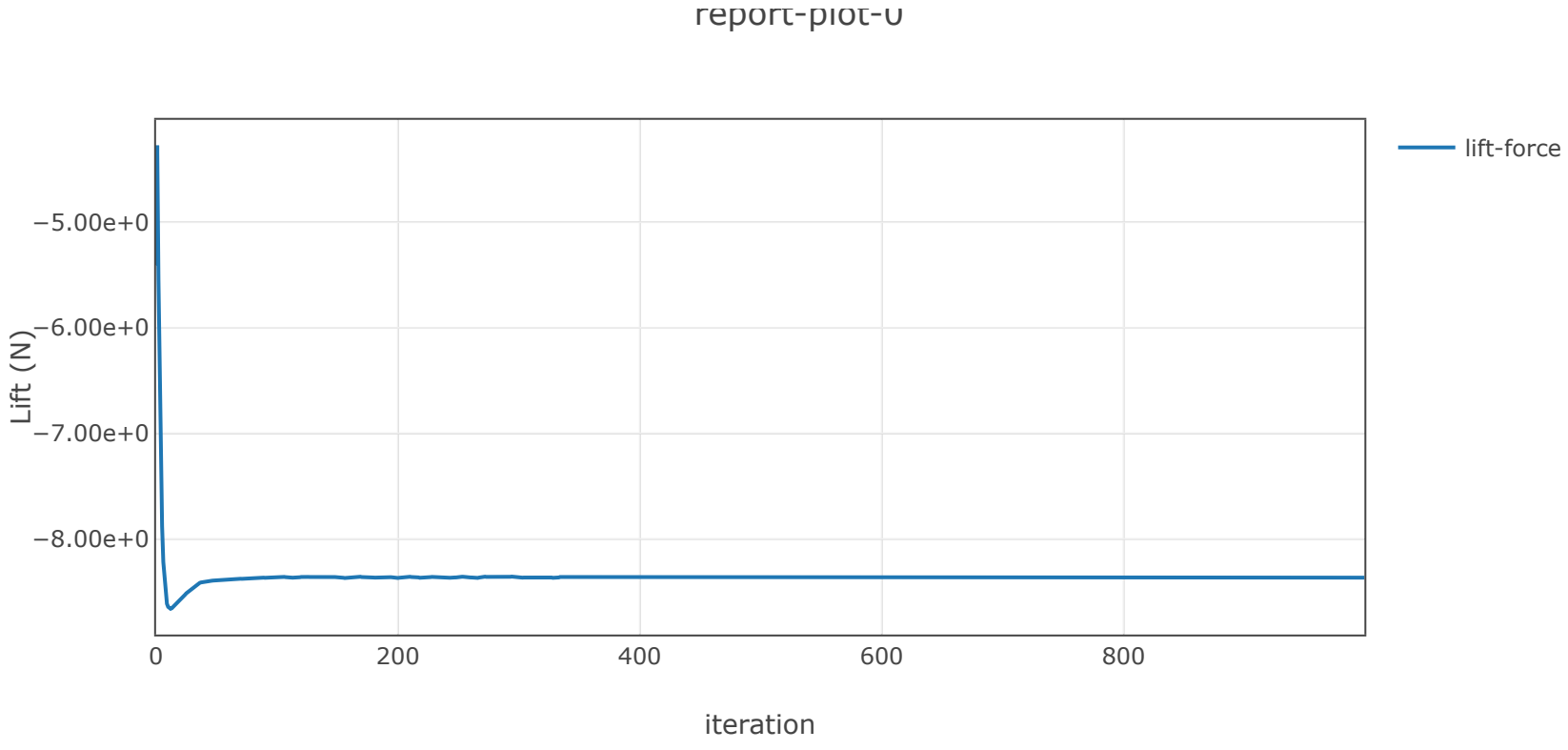
drag-co-rplot



drag-force-rplot



report-plot-0


report-plot-0
lift-force
−5.00e+0
−6.00e+0
−7.00e+0
−8.00e+0
Lift (N)
0
200
400
600
800
iteration