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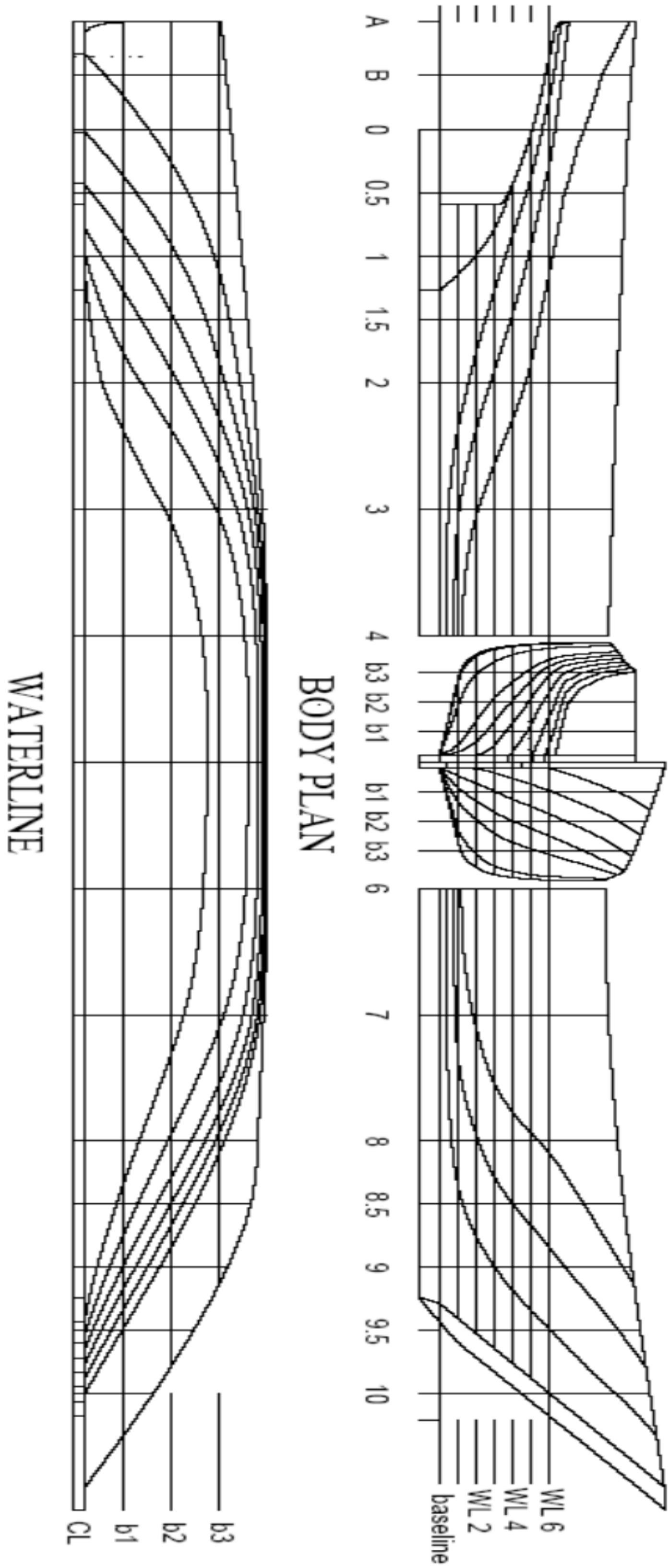
lampiran 1. Gambar lines plan kapal KM. INKA MINA 759



Gambar L1. *lines plan* kapal KM. INKA MINA 759

Lampiran 2. Data tahanan pada *software* Maxsurf

Tabel L2. Data tahanan pada *software* Maxsurf

	Speed (m/s)	Froude No. LWL	Froude No. Vol.	Holtrop Resist. (kN)
1	4,4750	0,292	0,715	5,6
2	4,5264	0,295	0,723	5,8
3	4,5779	0,298	0,731	6,0
4	4,6293	0,302	0,739	6,2
5	4,6808	0,305	0,748	6,3
6	4,7322	0,309	0,756	6,5
7	4,7837	0,312	0,764	6,7
8	4,8351	0,315	0,772	6,9
9	4,8866	0,319	0,781	7,1
10	4,9380	0,322	0,789	7,2
11	4,9895	0,325	0,797	7,4
12	5,0409	0,329	0,805	7,6
13	5,0924	0,332	0,813	7,8
14	5,1438	0,335	0,822	8,1
15	5,1953	0,339	0,830	8,3
16	5,2467	0,342	0,838	8,5
17	5,2982	0,345	0,846	8,8
18	5,3496	0,349	0,855	9,1
19	5,4011	0,352	0,863	9,4
20	5,4526	0,355	0,871	9,7
21	5,5040	0,359	0,879	10,1
22	5,5555	0,362	0,887	10,5
23	5,6069	0,366	0,896	10,9
24	5,6584	0,369	0,904	11,3
25	5,7098	0,372	0,912	11,7
26	5,7613	0,376	0,920	12,2
27	5,8127	0,379	0,929	12,7
28	5,8642	0,382	0,937	13,3
29	5,9156	0,386	0,945	13,9
30	5,9671	0,389	0,953	14,5
31	6,0185	0,392	0,961	15,1
32	6,0700	0,396	0,970	15,8
33	6,1214	0,399	0,978	16,5
34	6,1729	0,402	0,986	17,3
35	6,2243	0,406	0,994	18,0
36	6,2758	0,409	1,002	18,8
37	6,3272	0,412	1,011	19,5
38	6,3787	0,416	1,019	20,2
39	6,4301	0,419	1,027	21,0
40	6,4816	0,423	1,035	21,7
41	6,5330	0,426	1,044	22,5

Ready

Lampiran 3. perhitungan Nilai Tahanan Kapal

Salah satu komponen penting yang harus diketahui pada saat melakukan simulasi yaitu Tahanan kapal. Hal ini dilakukan untuk melihat keakuratan dari model lambung yang dibuat.

Tabel L3. Nilai tahanan dan *thrust* pendekatan Maxsurf dan Ansys CFX.

Kecepatan (m/s)	***Resistance* (kN)**		***Thrust* (kN)**
	Maxsurf	CFD	CFD
4,475	5.600	5,267	9,220
4,990	7.600	7,284	12,846
5,504	10.100	10,438	15,102
6,018	15.100	15,475	23,006
6,533	22.500	21,633	33,498

Perhitungan *Thrust* dan *Torque propeller*

Ehp = Bhp x η propeller

Dimana :

Bhp = break horse power

= Bhp mesin x 85%

= 127 kW x 85%

= 107,97 kW

η prop = 0.7

Sehingga,

Ehp = 107,97 kW x 0,7

= 75,579 kW

Ehp = RT x V

ı :

= kecepatan kapal

$= 5.504$ m/s

RT = Tahanan total

Sehingga,

$RT = \frac{Ehp}{V}$

$= \frac{75,579 \text{ kW}}{5.504\ m/s}$

= 13,731 kN

T = *Thrust Propeller*

$= \frac{RT}{(1-t)}$

Dimana :

t = *thrust deduction*

= k x w

k = 0,5

w = 0,5 x Cb

= 0.5 x 0,45

= 0.225

Sehingga,

t = 0,5 x 0,225

= 0,112

1-t = 1 - 0,112

= 0,888

T $= \frac{13,731\ kN}{0.888}$

= 15,462 kN

ngan *Torque propeller*

$$Q = \frac{Bhp}{2\,x\,\pi\,x\,n}$$

$$= \frac{107{,}97\ kW}{2\ x\ 3{,}14\ x\ 13{,}29\ s^{-1}}$$

$$= \frac{107{,}97\ kW}{83{,}461\ S^{-1}}$$

= 1294 N m

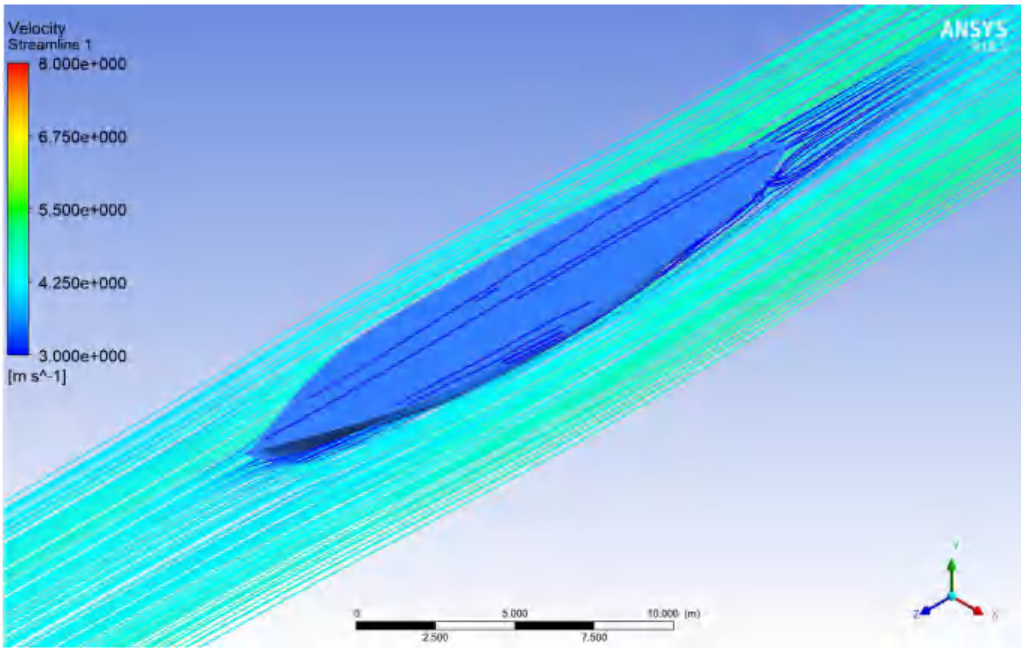
= 1,294 kN m

Tabel L3. Validasi hasil simulasi

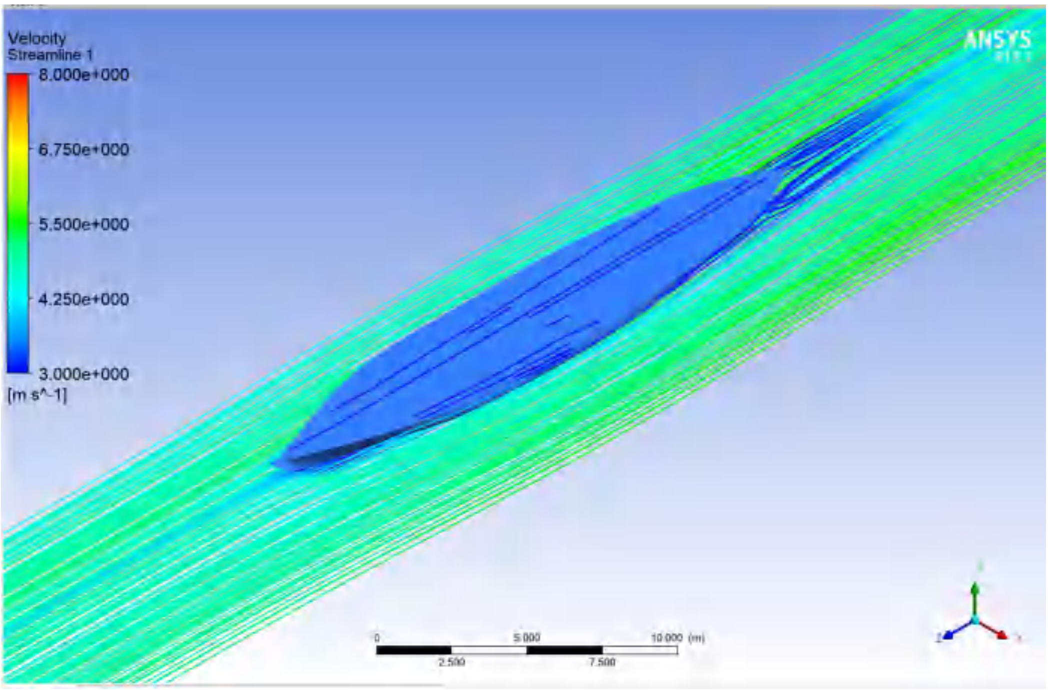
Kecepatan rotasi (rps)	***Thrust* (kN)**		***Torque* (kN m)**		**Selisih (%)**	
	Perhitungan	Simulasi CFD	Perhitungan	Simulasi CFD	*Thrust*	*Torque*
13.29	15,462	16,447	1,294	1,356	4,1	2,3

Tabel diatas menunjukkan hasil perhitungan dan hasil simulasi yang telah dilakukan dengan selisih 2,3% untuk *thrust* dan 4,1% untuk *torque*. Maka dinyatakan bahwa hasil simulasi yang di dapatkan valid terhadap hasil perhitungan karena nilai selisih tidak melebihi 5%.

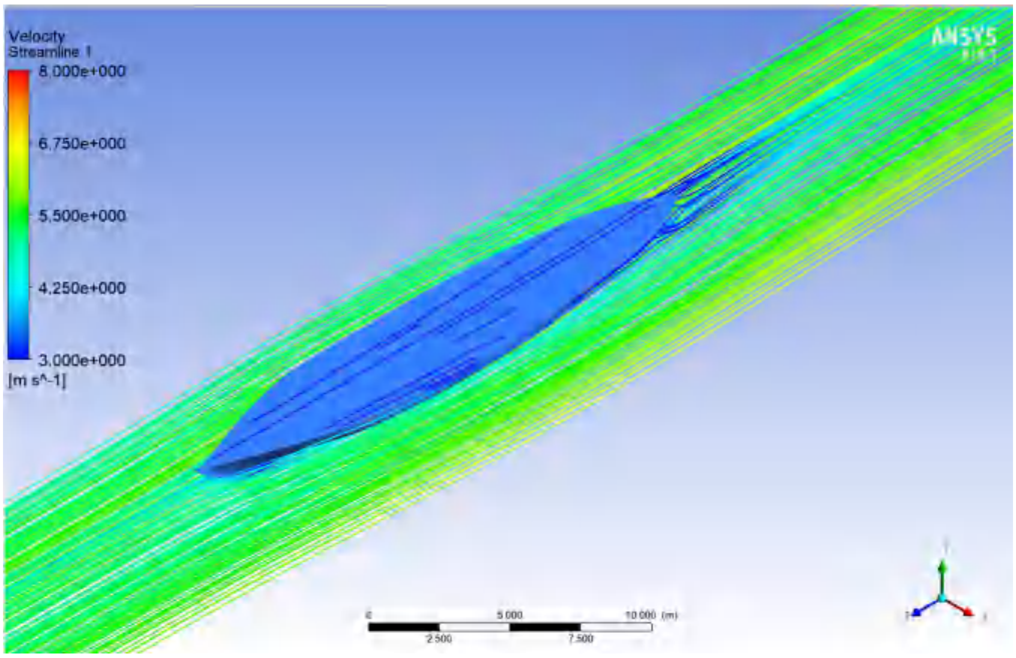
Lampiran 4. Hasil simulasi tahanan pada Ansys CFX 18.1



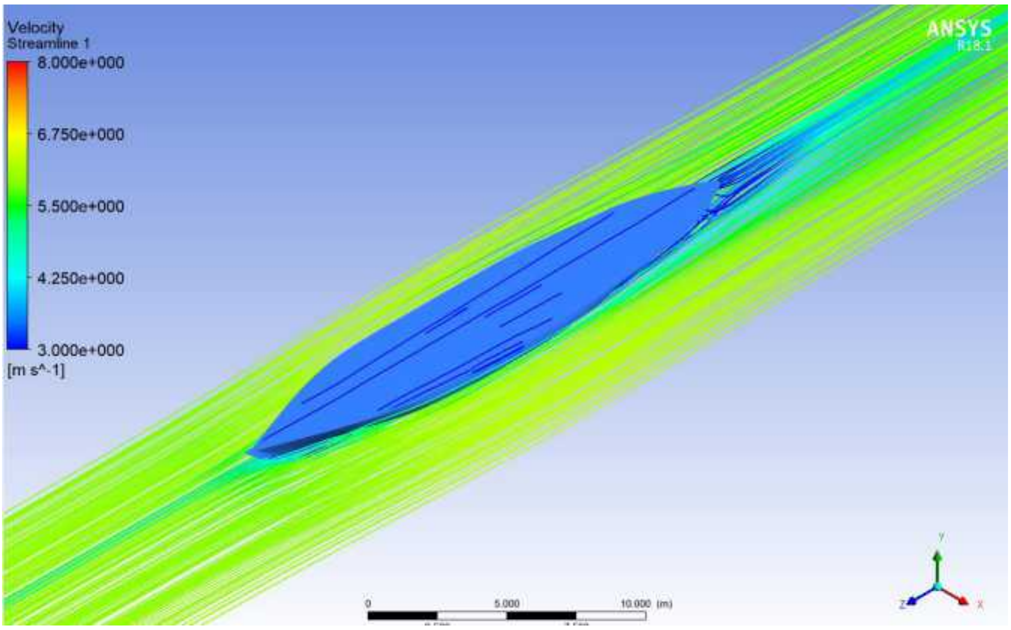
Gambar L4.1. Visualisasi tahanan pada kecepatan 4.475m/s



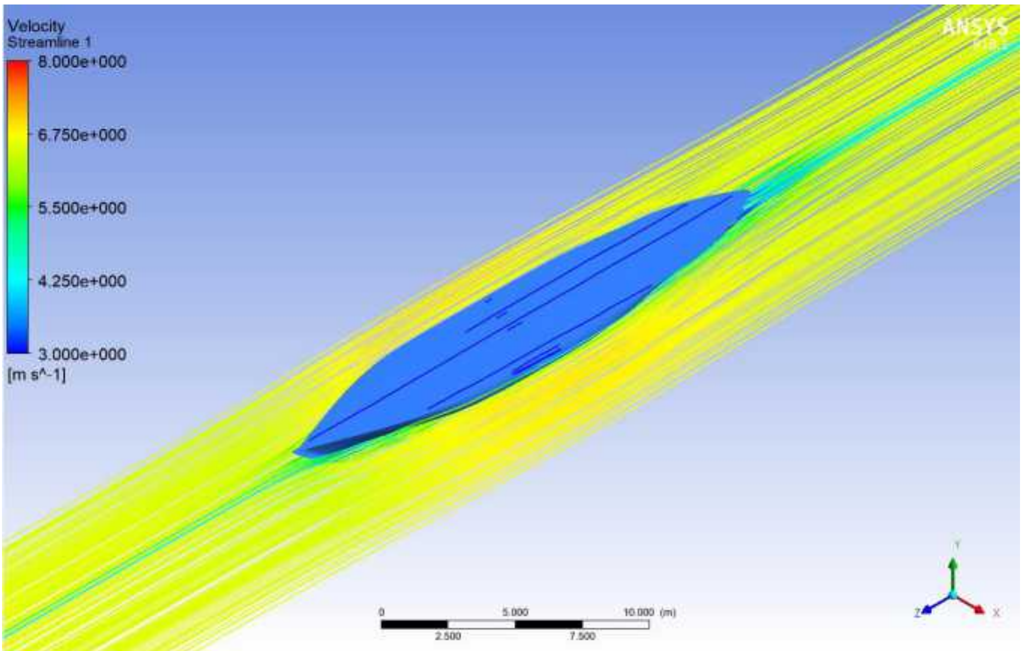
Gambar L4.2. Visualisasi tahanan pada kecepatan 4.990m/s



Gambar L4.3. Visualisasi tahanan pada kecepatan 5.504m/s

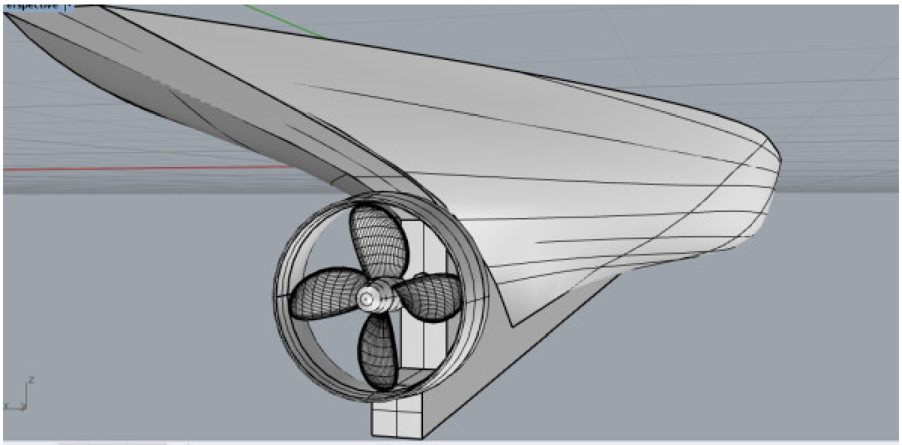


Gambar L4.4. Visualisasi tahanan pada kecepatan 6.018m/s

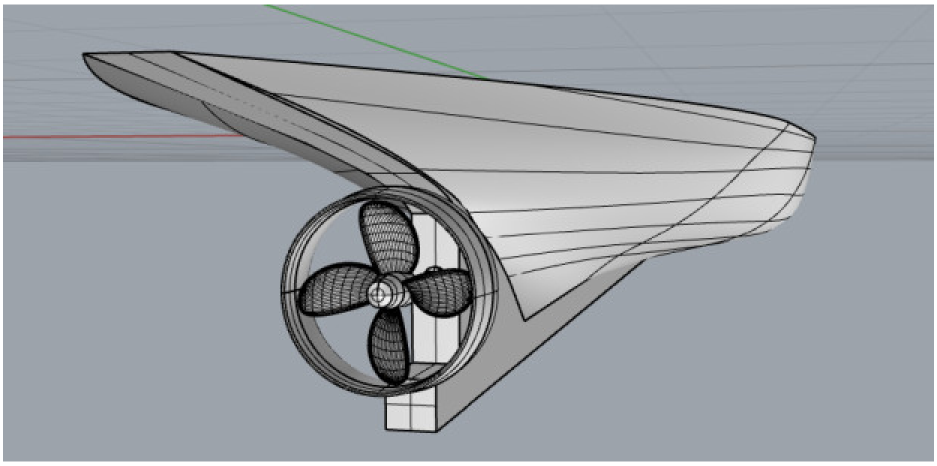


Gambar L4.5. Visualisasi tahanan pada kecepatan 6.533m/s

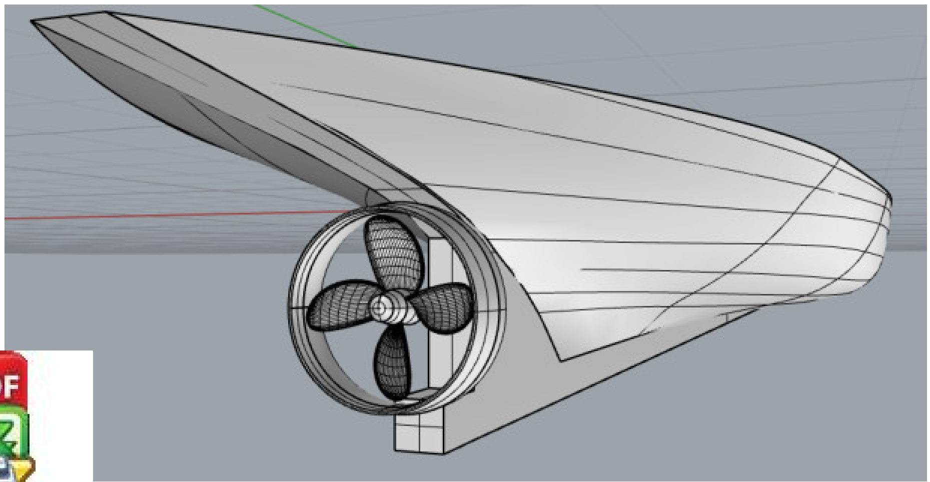
Lampiran 5. Desain kapal perikanan KM Inka Mina 759 dengan diameter *duct* pada Rhinoceros 0.6



Gambar L5.1. Visualisai desain *duct* dengan diameter 0,78 m

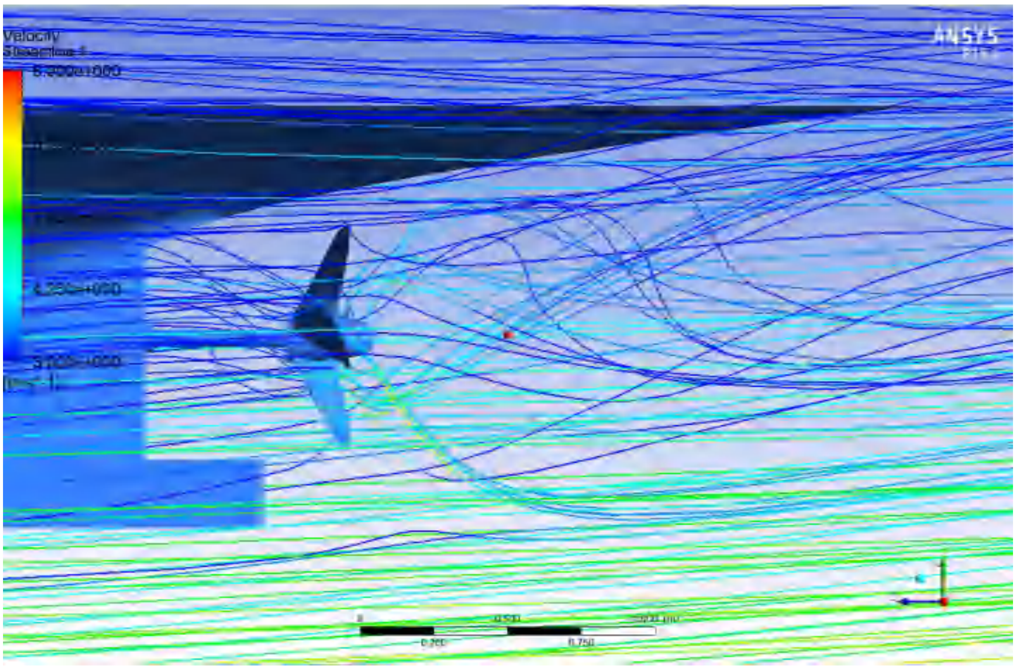


Gambar L5.2. Visualisai desain *duct* dengan diameter 0,80 m

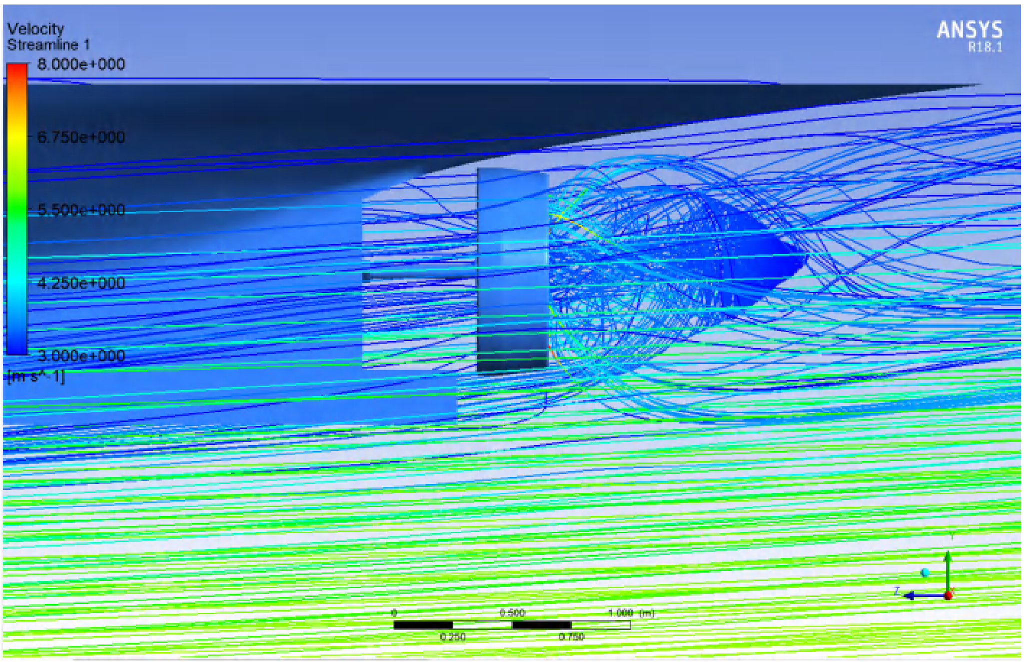


ambar L5.3. Visualisai desain *duct* dengan diameter 0,82 m

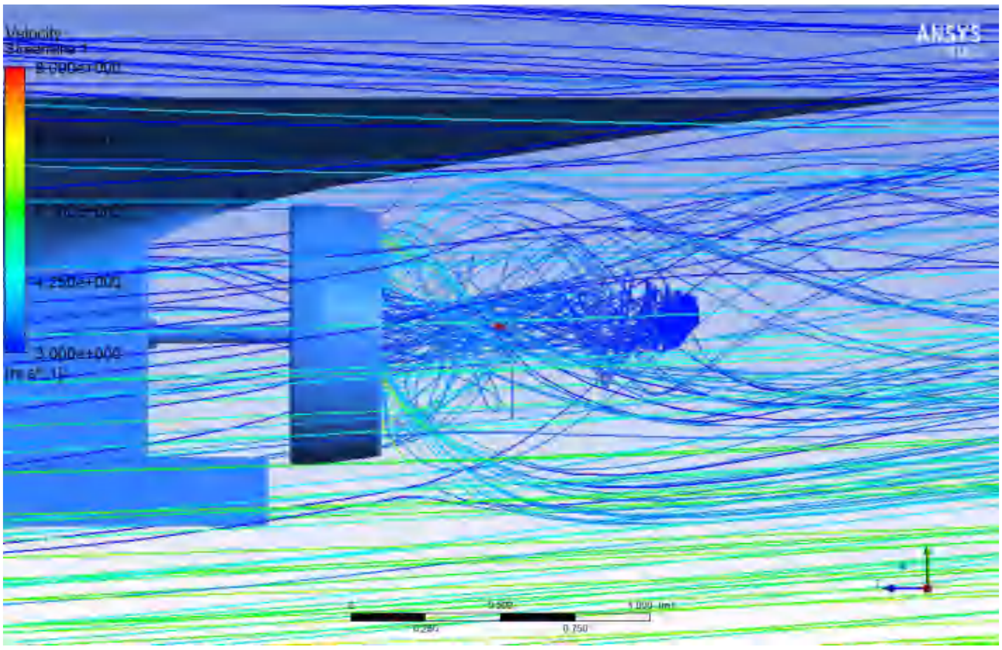
Lampiran 6. Hasil simulasi dengan Ansys CFX R18.1



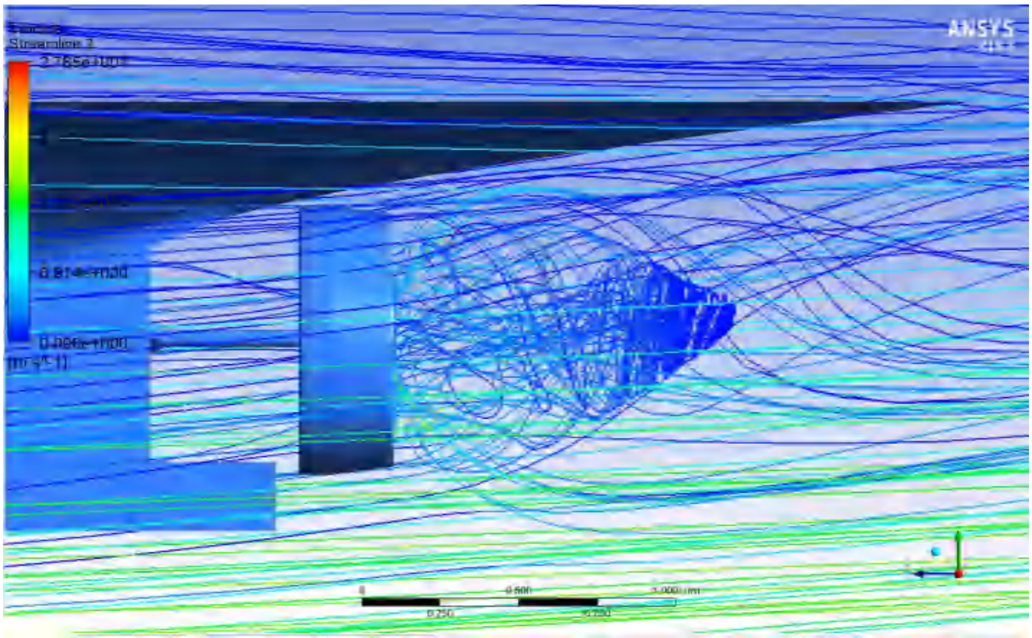
Gambar L6.1. Visualisasi simulasi lambung dan propeller tanpa *Ducted propeller* pada Ansys CFX R18.1



Gambar L6.2. Visualisasi simulasi lambung dan *Ducted propeller* (Dd = 0,78m) pada Ansys CFX R18.1



Gambar L6.3. Visualisasi simulasi lambung dan *Ducted propeller* (Dd = 0,80m) pada Ansys CFX R18.1

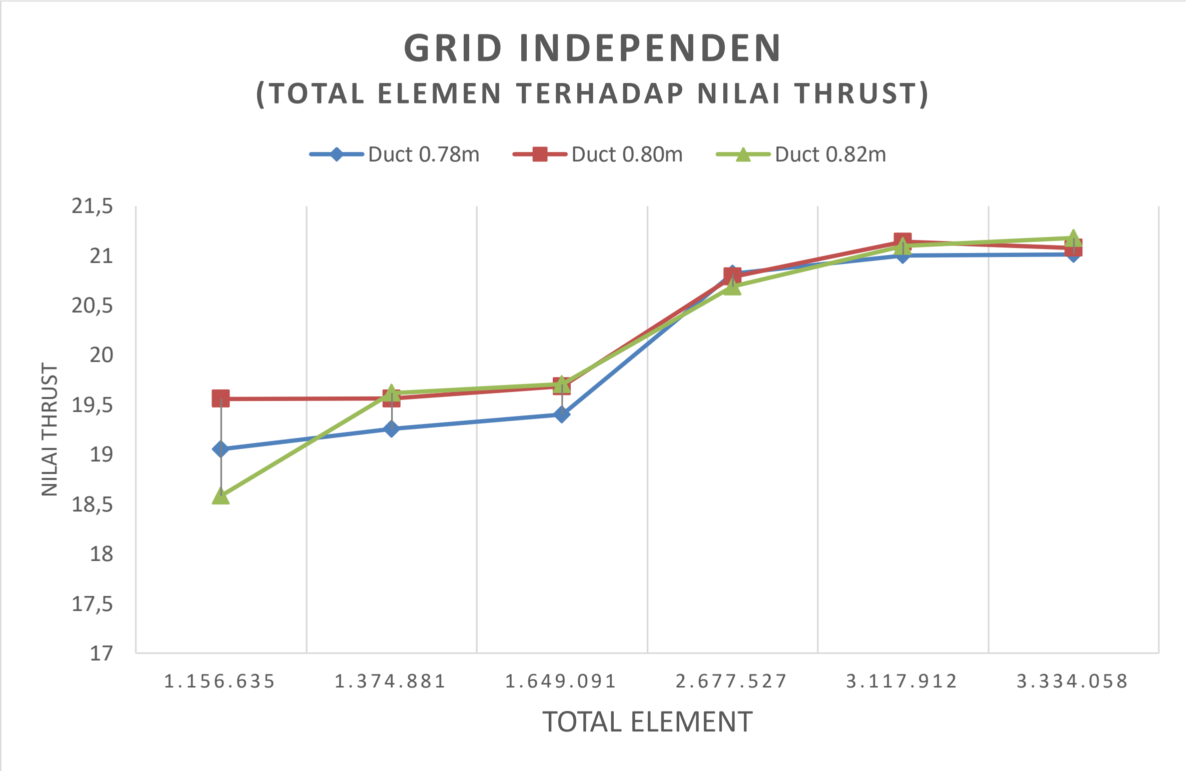


Gambar L6.4. Visualisasi simulasi lambung dan *Ducted propeller* (Dd = 0,82m) pada Ansys CFX R18.1

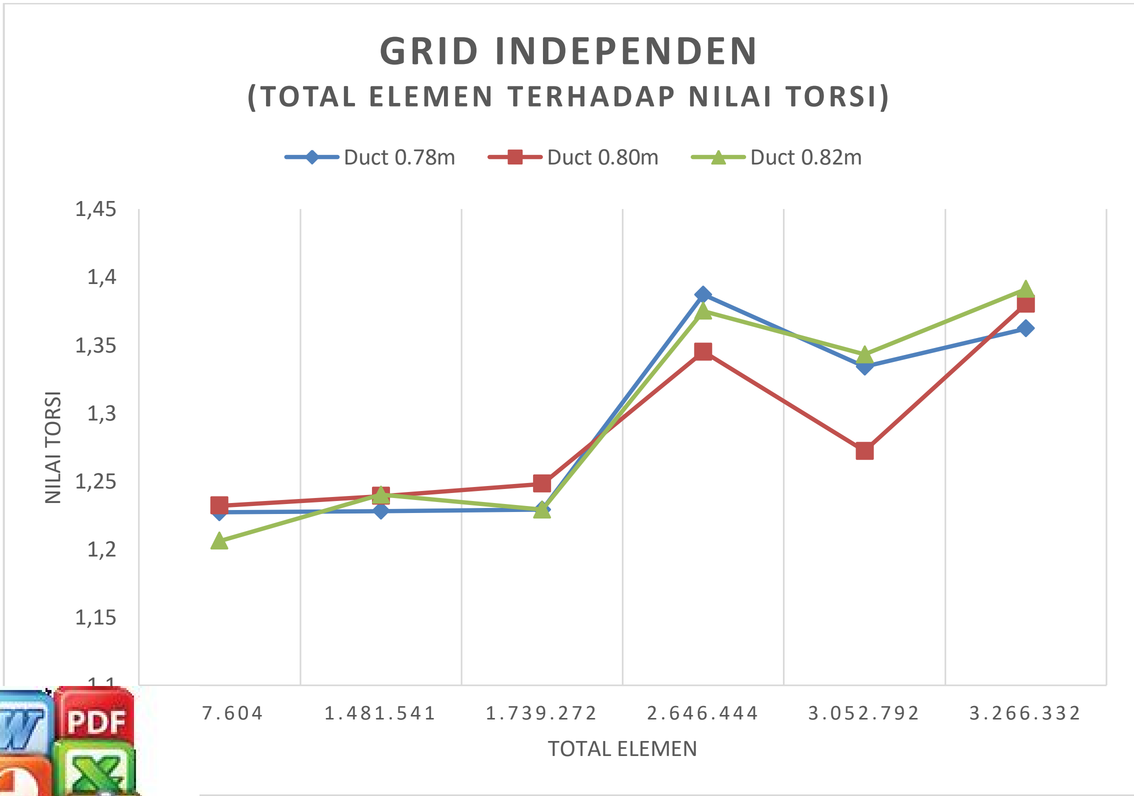
Lampiran 7. *Grid independen* atau jumlah elemen mesh pada setiap variasi duct

Tabel L7. *Grid independen* pada setiap variasi *duct*

Variasi	Total Element	*Thrust* (kN)	*Torque* (kNm)
Tanpa *Duct*	784.334	14,451	1,262
	824.404	14,892	1,378
	911.044	15,892	1,278
	1.289.005	15,102	1,042
	1.464.057	16,069	1,38
	2.192.888	16,447	1,356
Duct 0.78m	957.604	19,053	1,227
	1.481.541	19,258	1,228
	1.739.272	19,401	1,229
	2.646.444	20,818	1,387
	3.052.792	21,005	1,334
	3.266.332	21,015	1,362
Duct 0.80m	1.352.765	19,559	1,232
	1.622.643	19,563	1,239
	1.636.976	19,686	1,248
	2.603.818	20,79	1,345
	3.080.590	21,14	1,272
	3.301.051	21,079	1,38
Duct 0.82m	1.156.635	18,587	1,206
	1.374.881	19,619	1,24
	1.649.091	19,707	1,229
	2.677.527	20,689	1,375
	3.117.912	21,097	1,343
	3.334.058	21,179	1,391



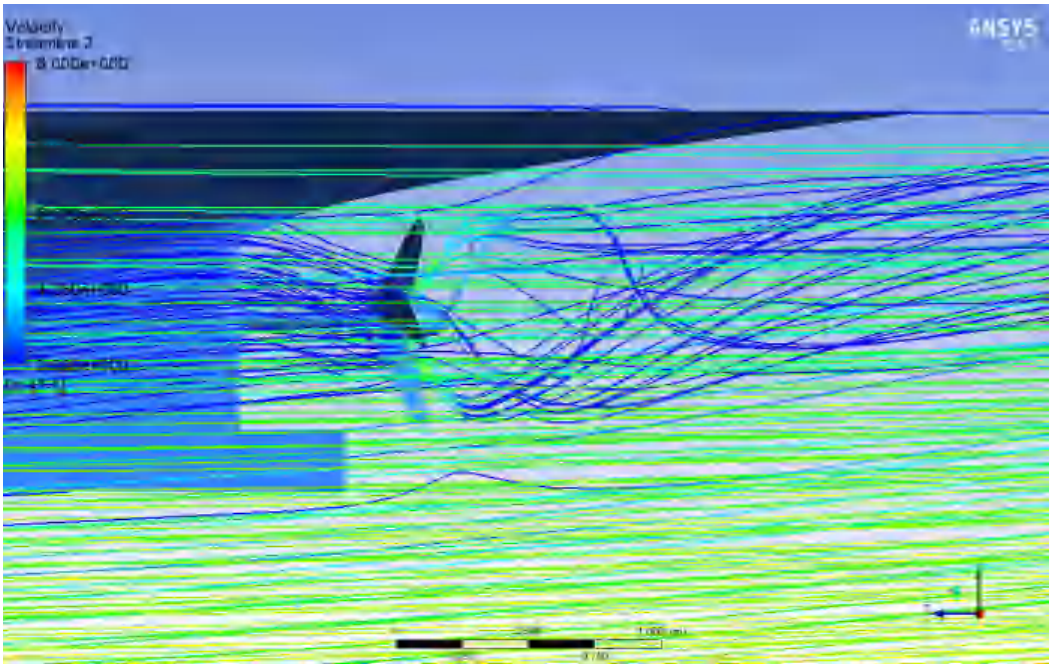
Gambar L7.1. *Grid Independen* (Total Elemen terhadap Nilai *Thrust*)



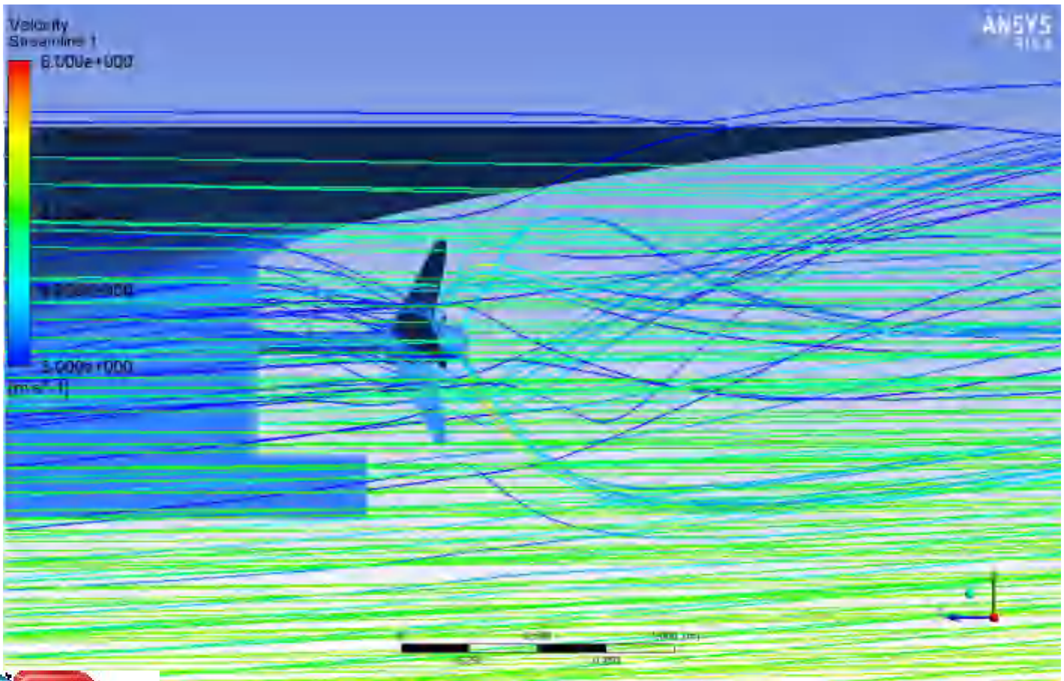
ar L7.2. *Grid Independen* (Total Elemen terhadap Nilai *Torque*)

Lampiran 8. Hasil simulasi setiap total elemen grid independen pada Ansys CFX R18.1

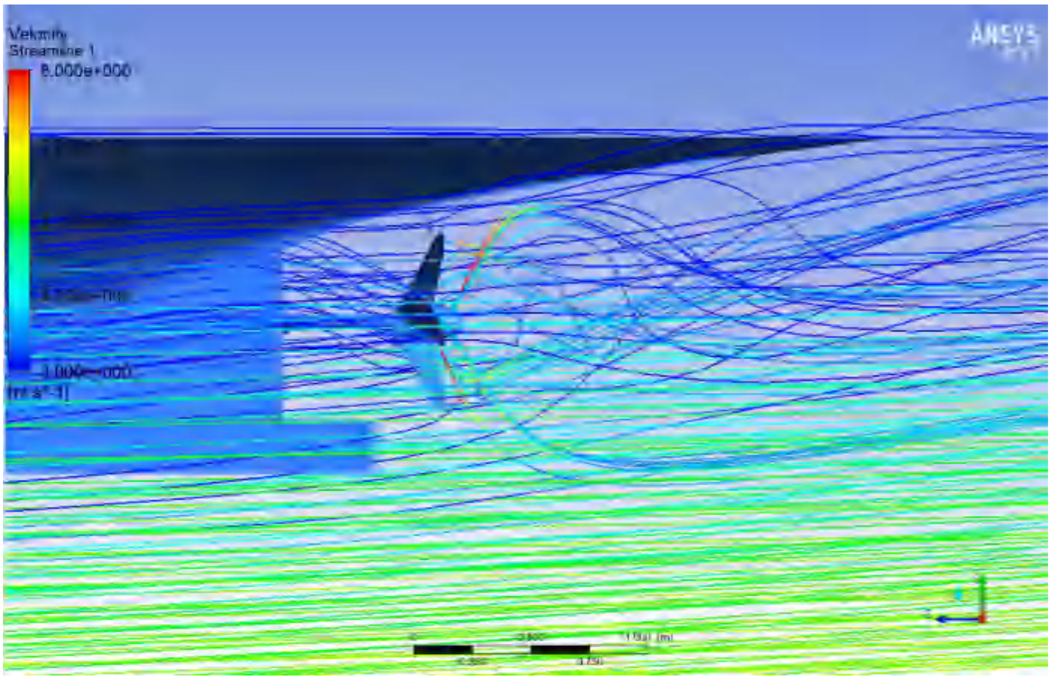
- Tanpa Duct



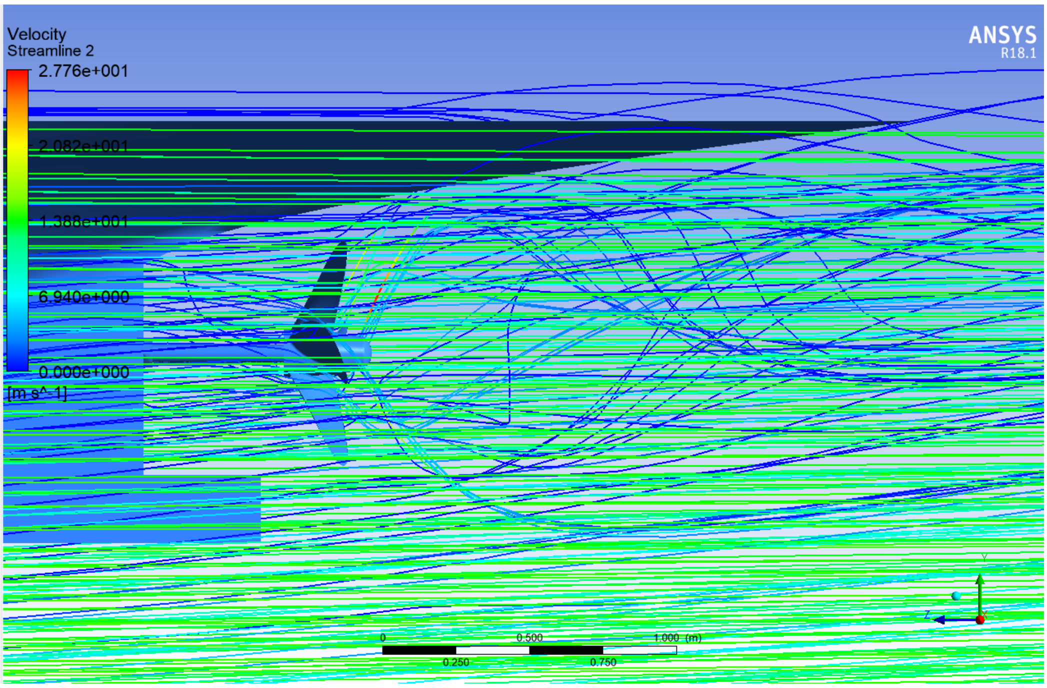
Gambar L8.1. Visualisasi simulasi lambung dan propeller tanpa *Ducted propeller* pada total elemen 784.334



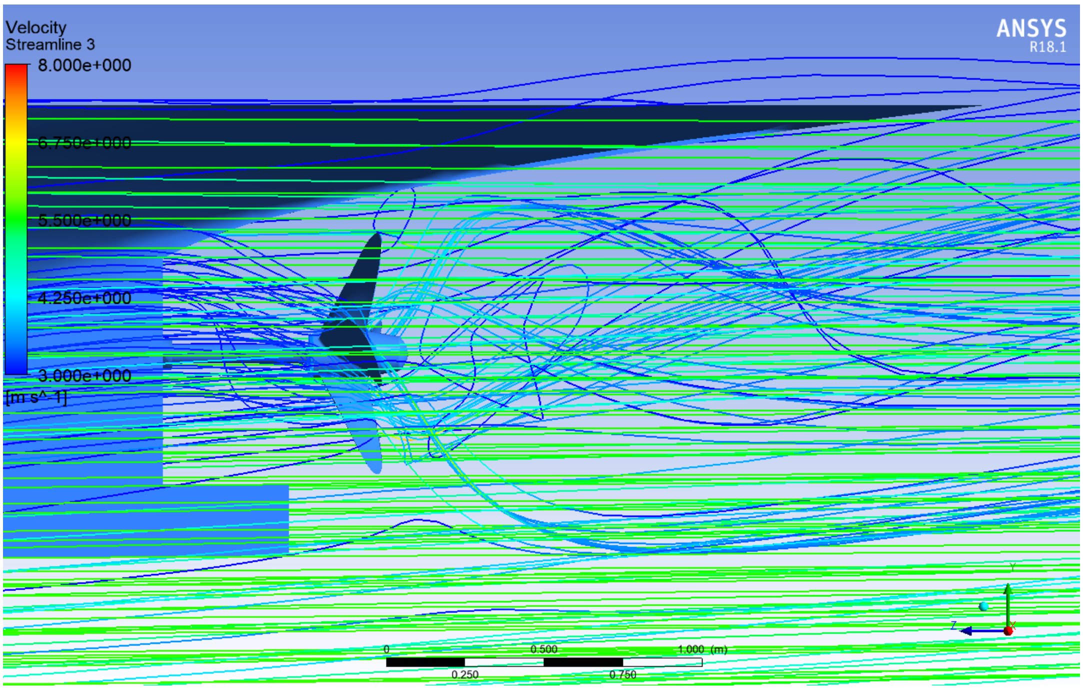
sualisasi simulasi lambung dan propeller tanpa *Ducted propeller* pada total elemen 824.404



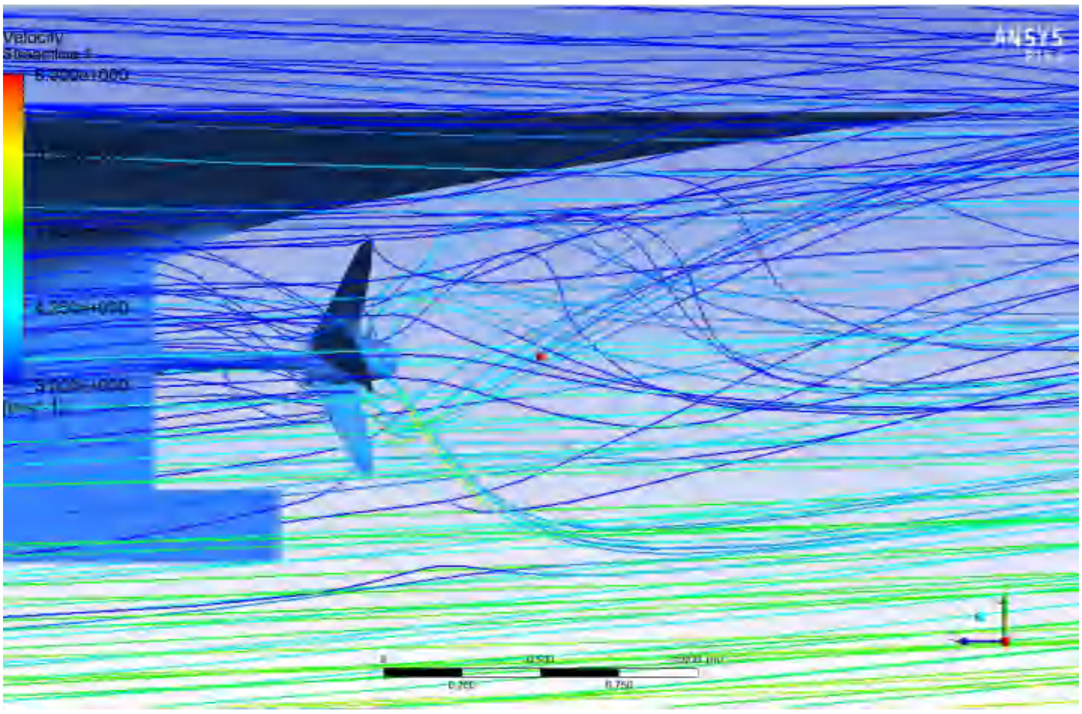
Gambar L7.3. Visualisasi simulasi lambung dan propeller tanpa *Ducted propeller* pada total elemen 911.044



Gambar L7.4. Visualisasi simulasi lambung dan propeller tanpa *Ducted propeller* pada total elemen 1.289.005

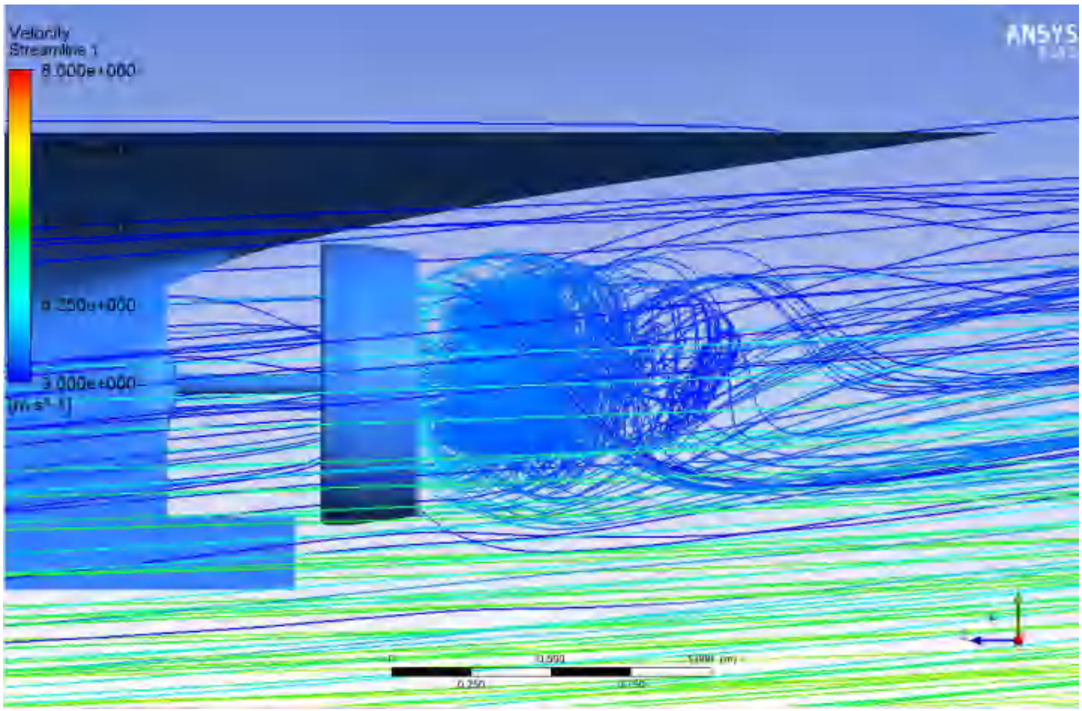


Gambar L7.5. Visualisasi simulasi lambung dan propeller tanpa *Ducted propeller* pada total elemen 1.464.057

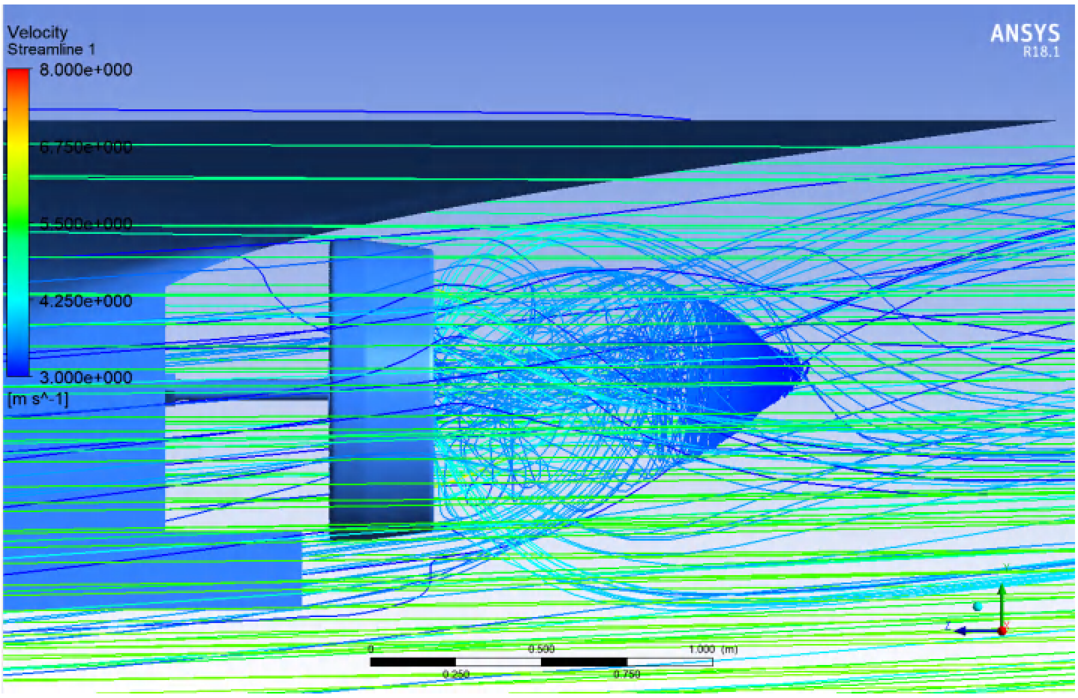


Gambar L7.6. Visualisasi simulasi lambung dan propeller tanpa *Ducted propeller* pada total elemen 2.192.888

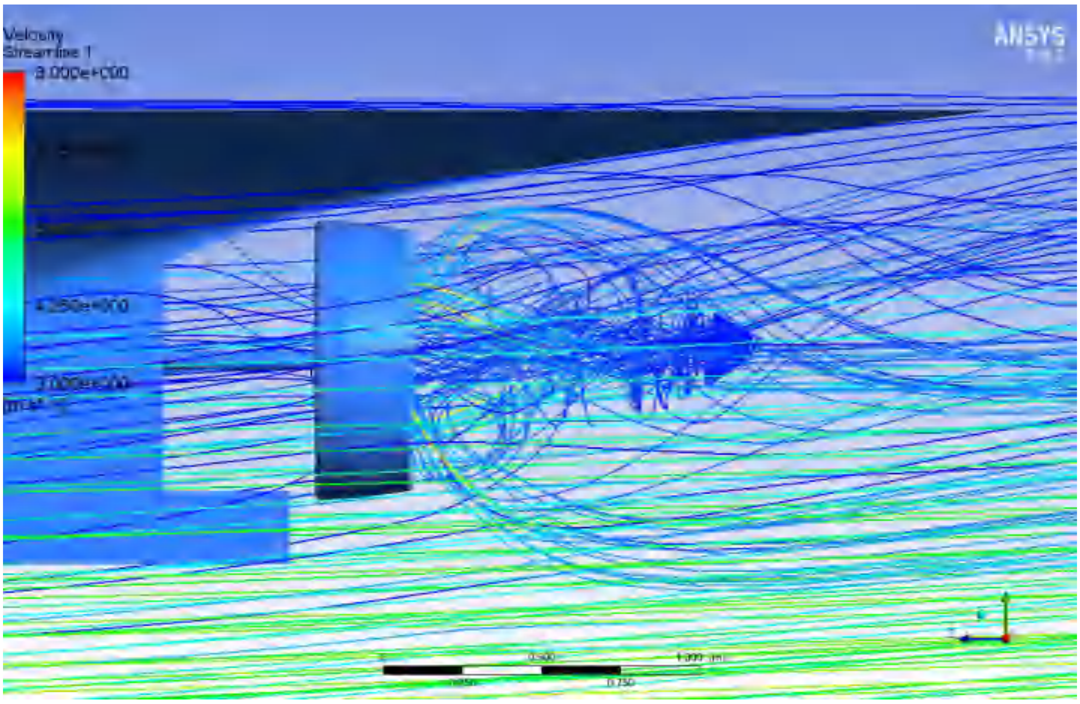
- Duct 0,78m



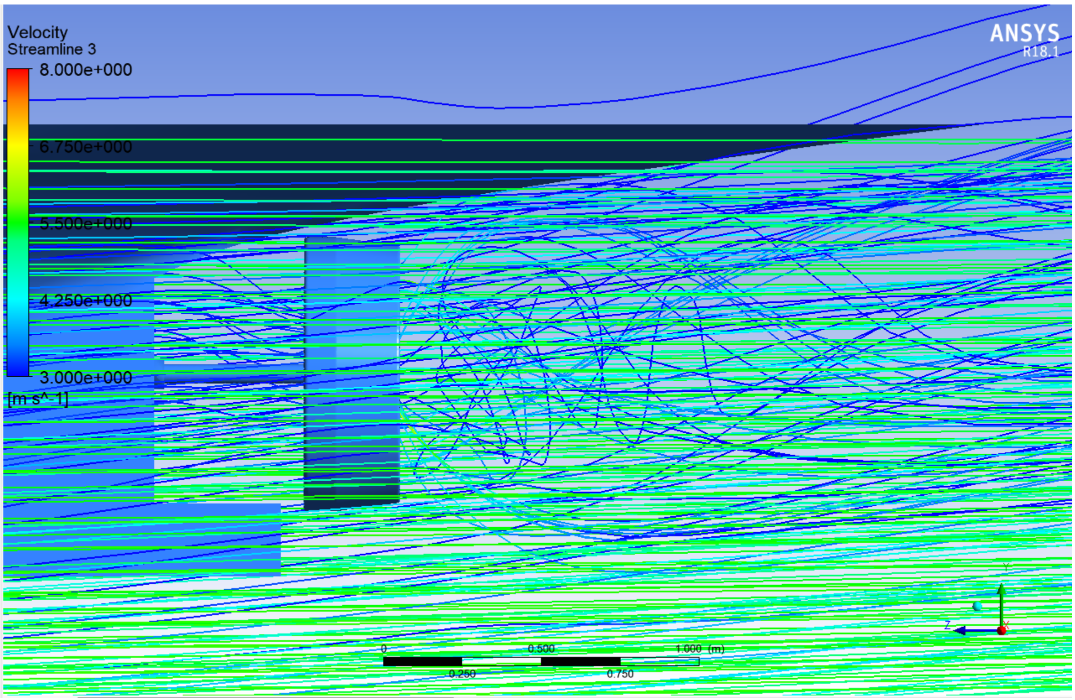
Gambar L7.7. Visualisasi simulasi lambung dengan *Ducted propeller* pada total elemen 957.604



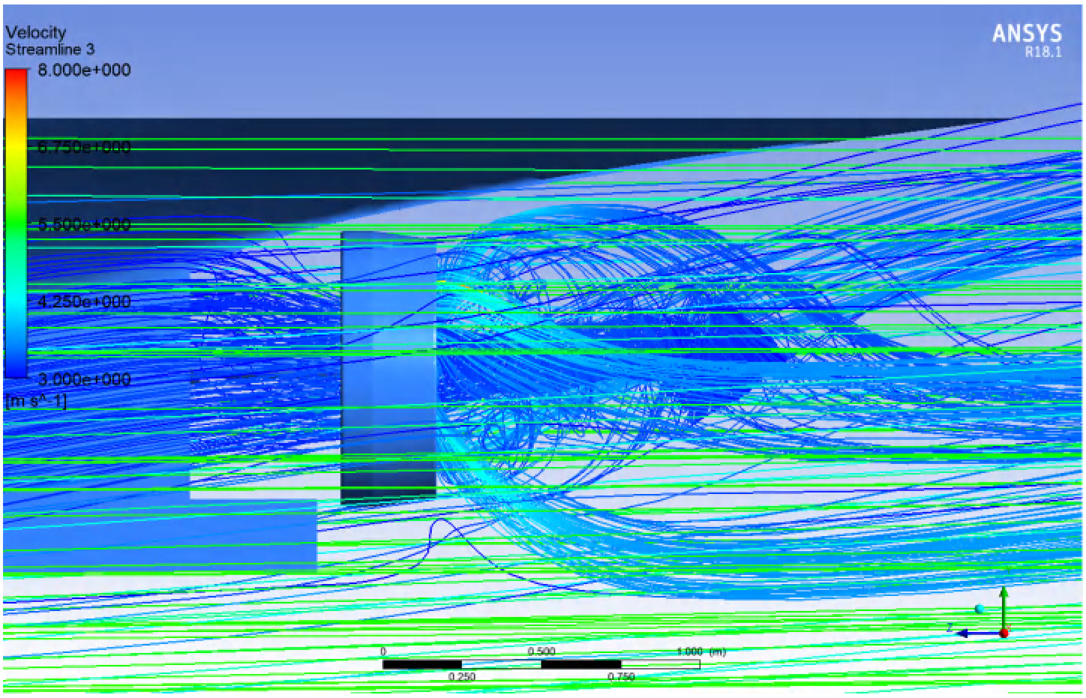
Gambar L7.8. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 1.481.541



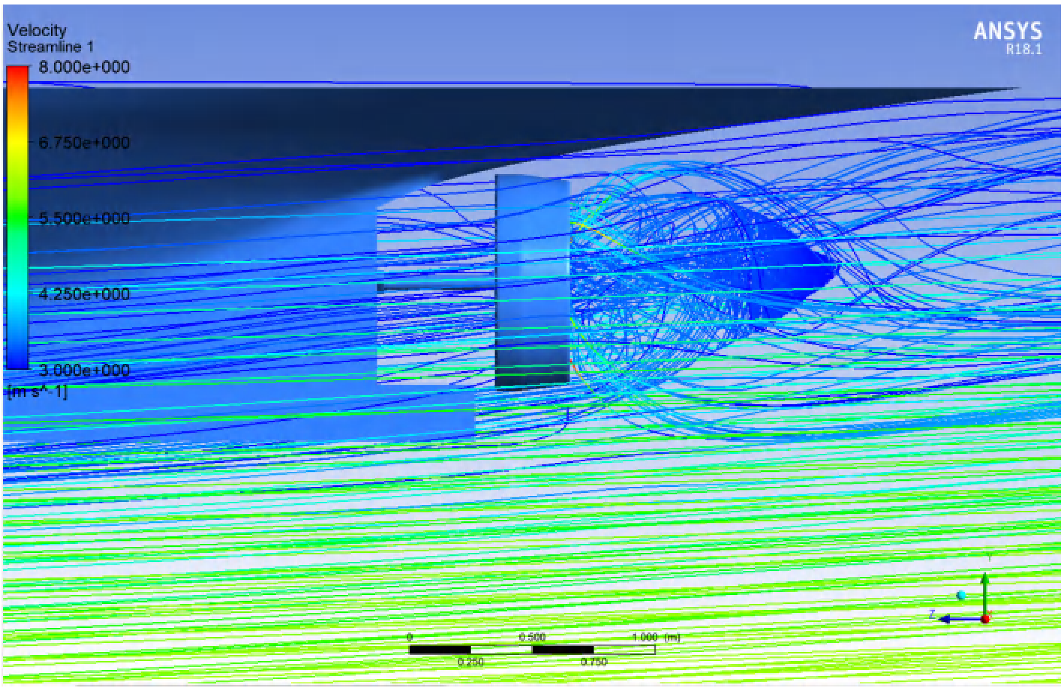
Gambar L7.9. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 1.739.272



Gambar L7.10. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 2.646.444

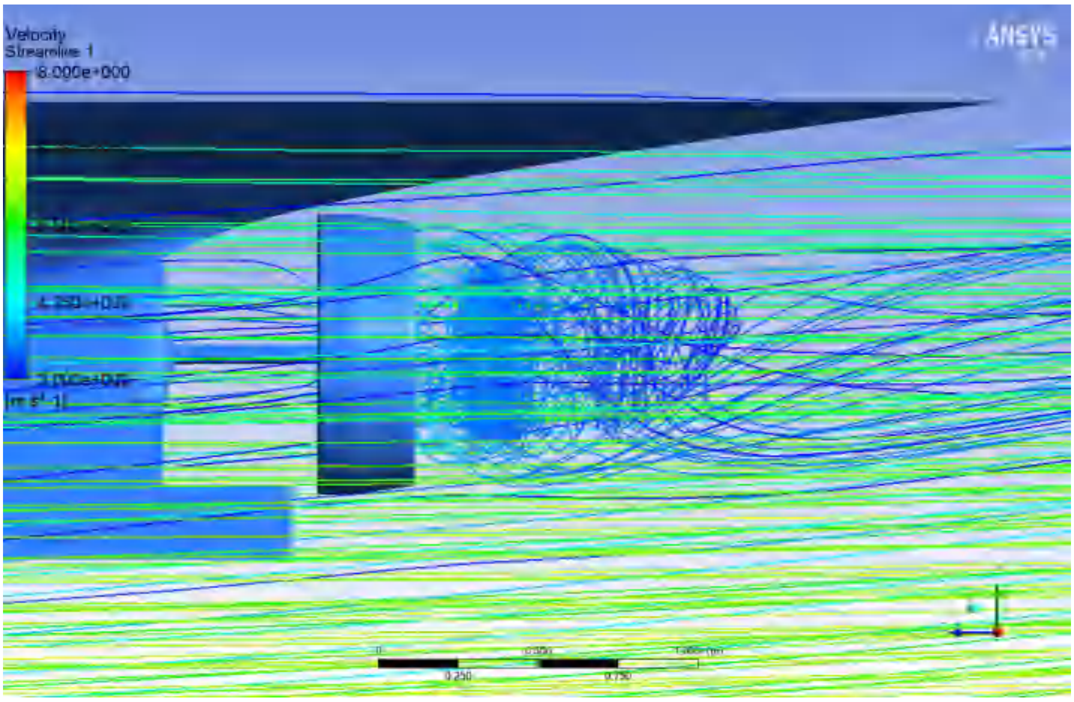


Gambar L7.11. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 3.052.792

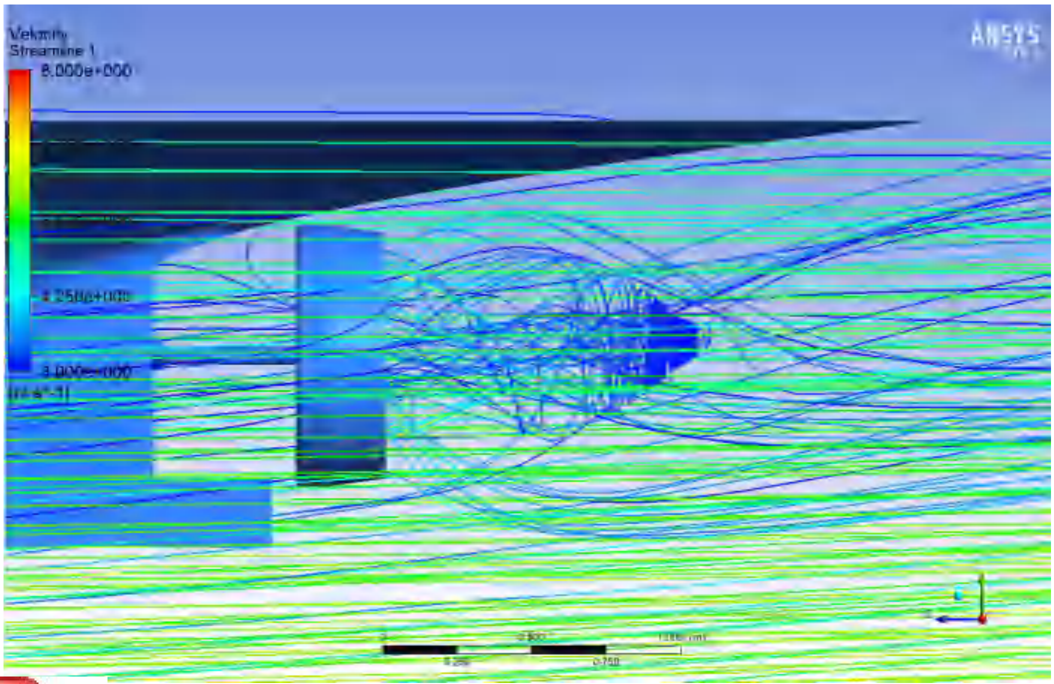


Gambar L7.12. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 3.266.332

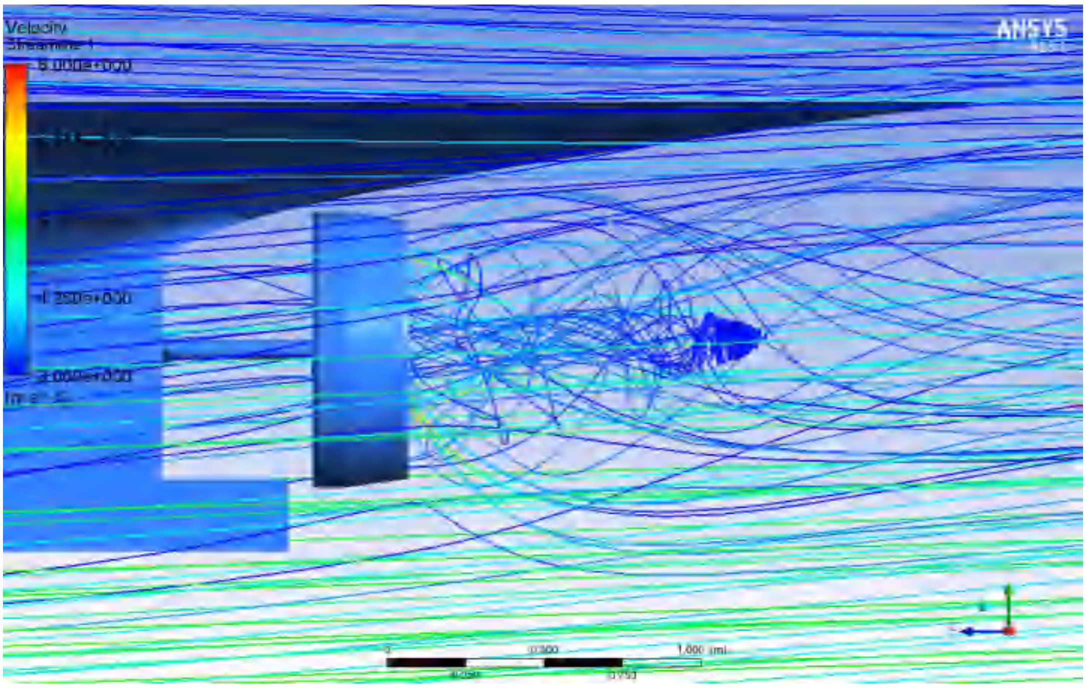
- Duct 0,80m



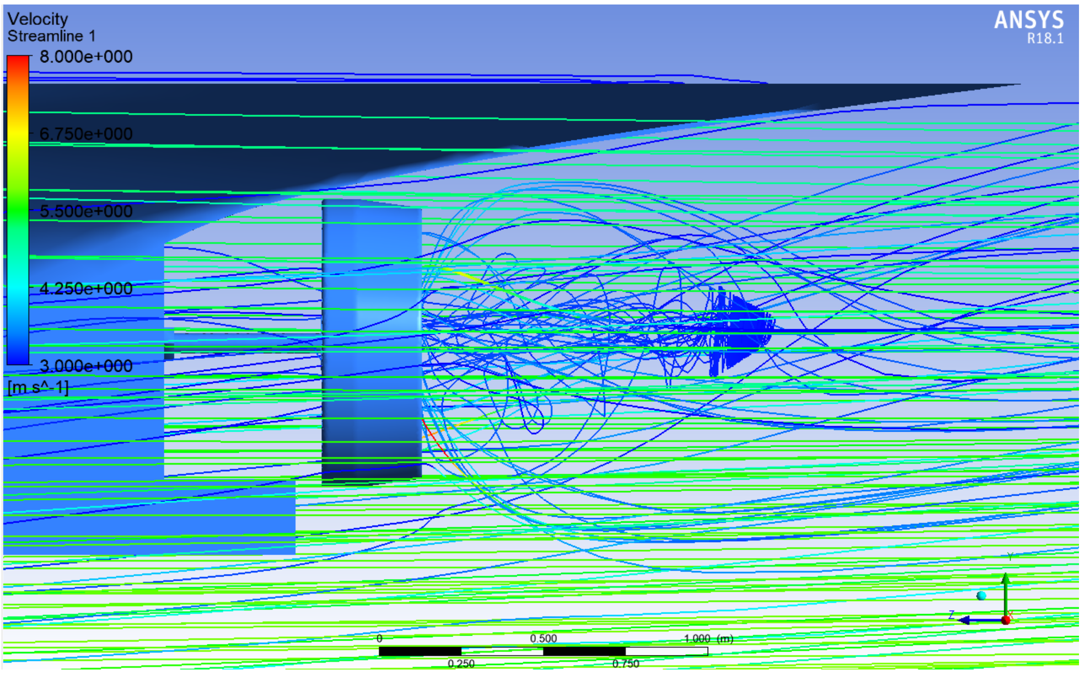
Gambar L7.13. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 1.352.765



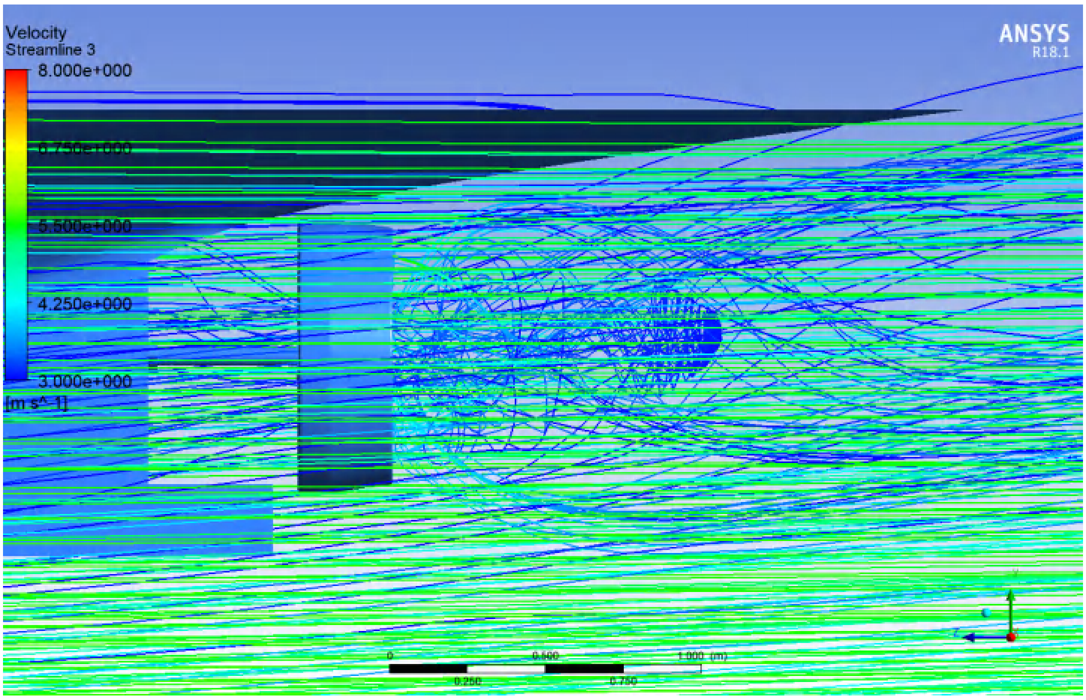
.7.14. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 1.622.643



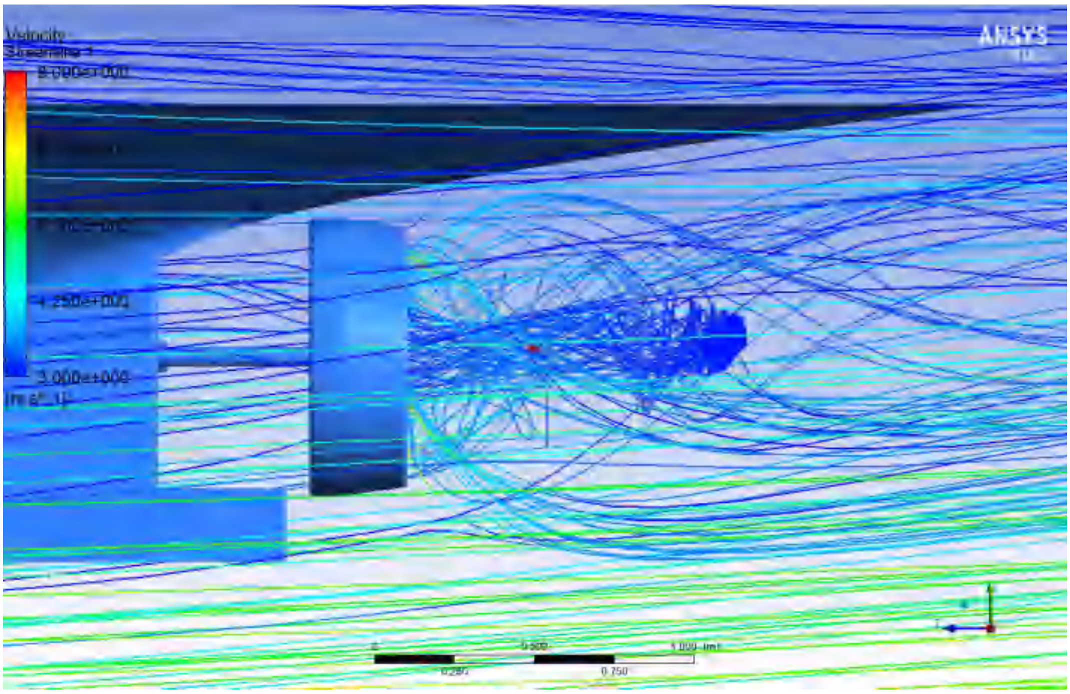
Gambar L7.15. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 1.636.976



Gambar L7.16. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 2.603.818

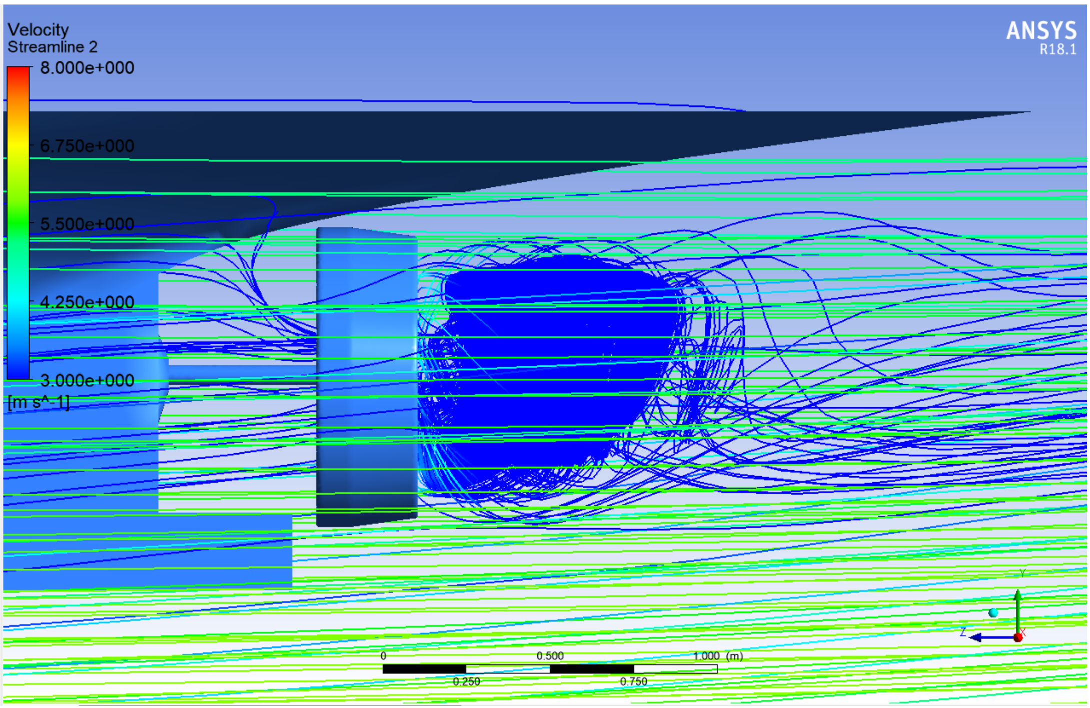


Gambar L7.17. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 3.080.590

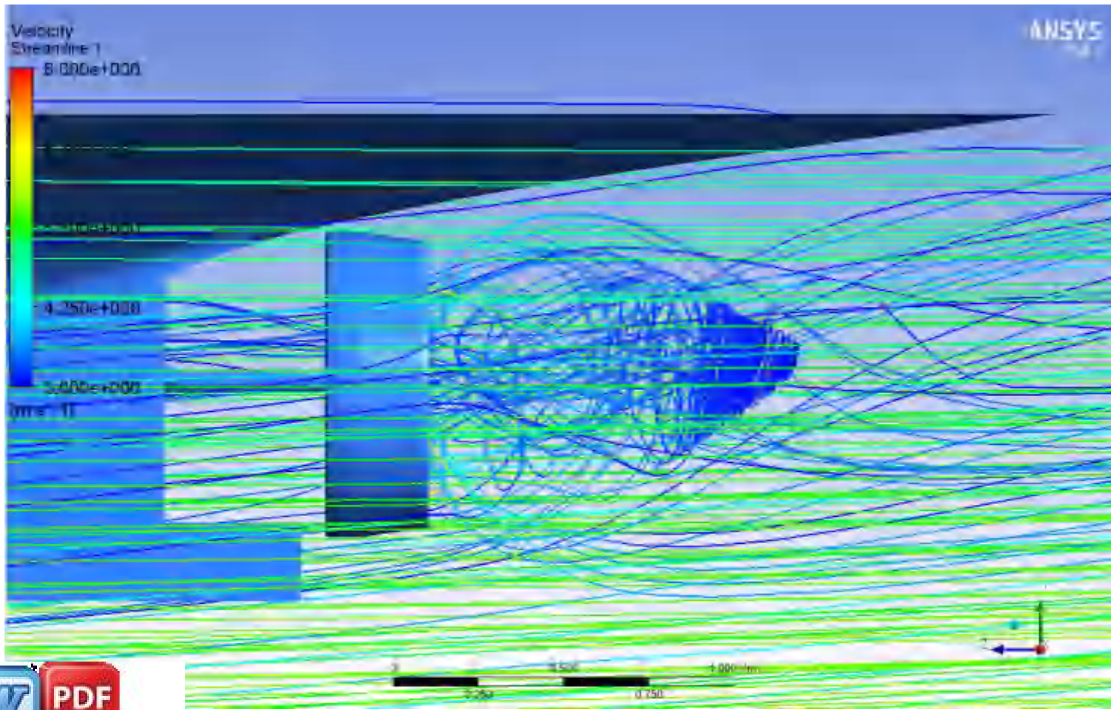


Gambar L7.18. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 3.301.051

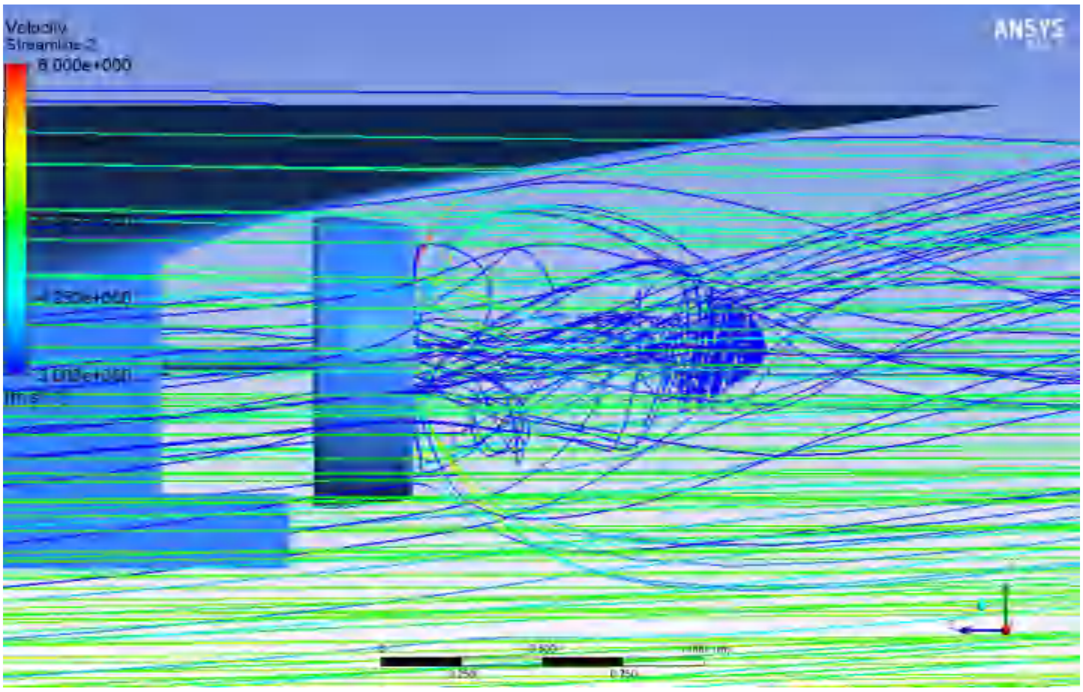
- Duct 0,82m



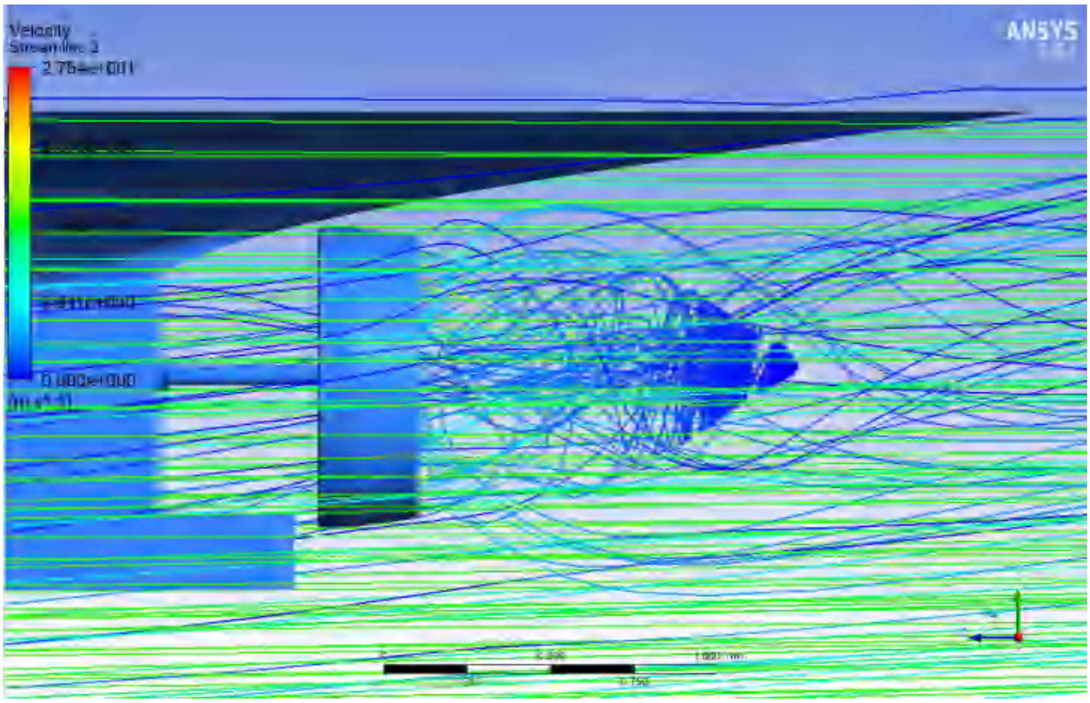
Gambar L7.19. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 1.156.635



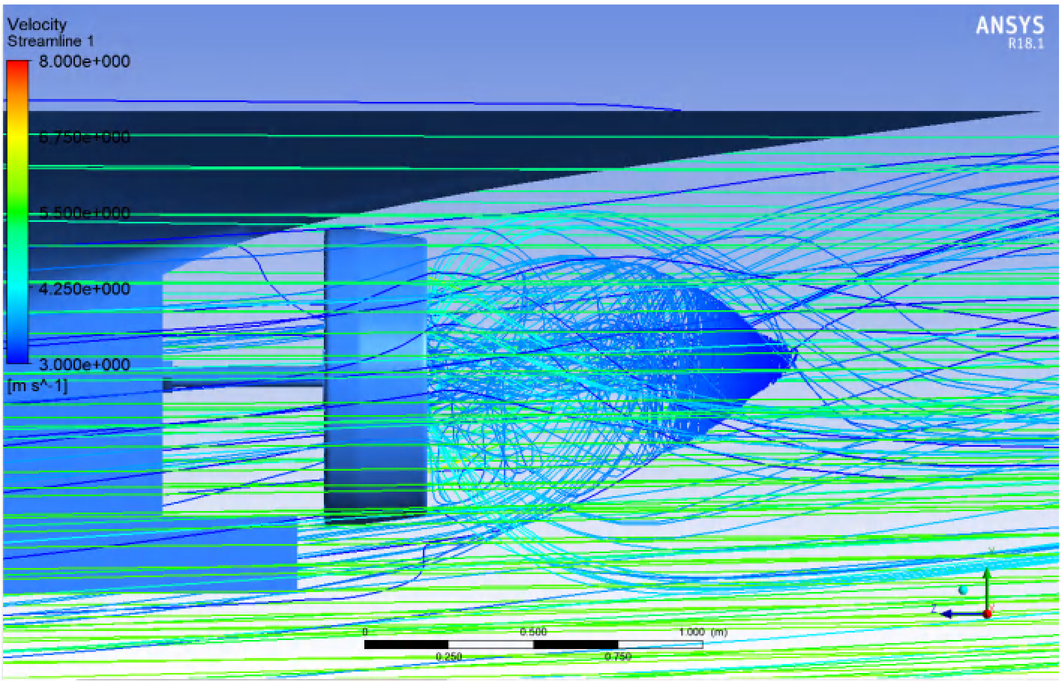
0. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 1.374.881



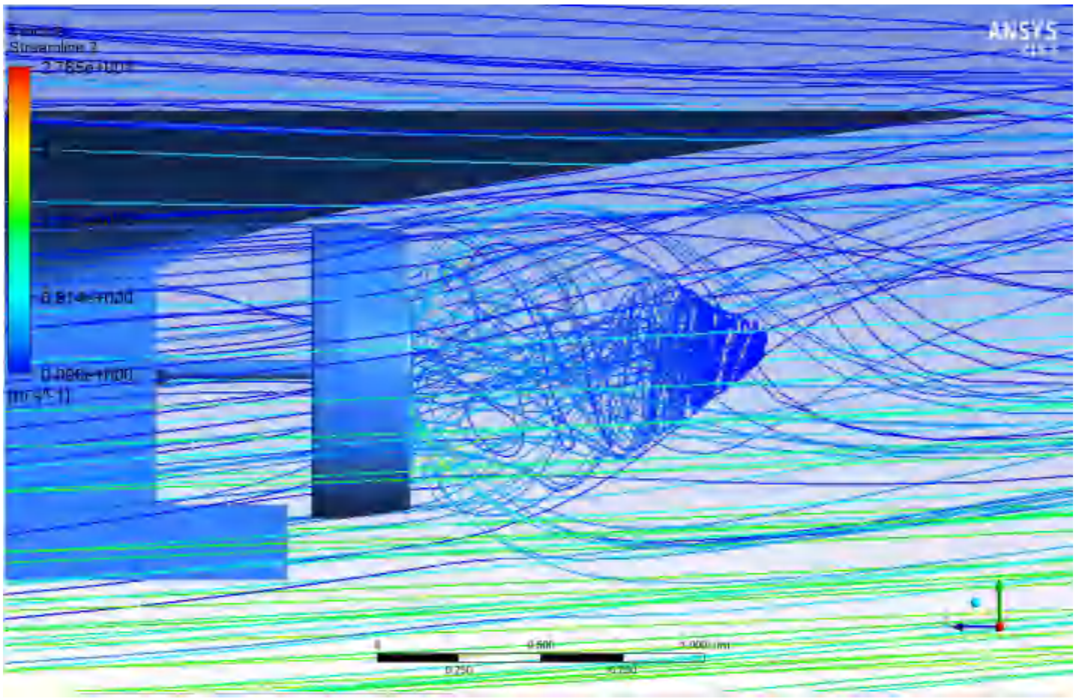
Gambar L7.21. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 1.649.091



Gambar L7.22. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 2.677.527



Gambar L7.23. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 3.117.912



Gambar L7.24. Visualisasi simulasi lambung dan *Ducted propeller* pada total elemen 3.334.058

Lampiran 9. Data *wageningen propeller*

- Data propeller

  D = 0.76

  P = 0.23

  Cb = 0,45

  Z = 4

  N = 13,29 rps

- Pergitungan *effisiency* propulsi

  Vs = 5,504 m/s

  w = 0,5Cb – 0,05

  = 0,175

  t = k x w

  k = 0,7

  t = 0,1225

  $\eta H = (1\text{-}t)/(1\text{-}w)$

  = 1,063

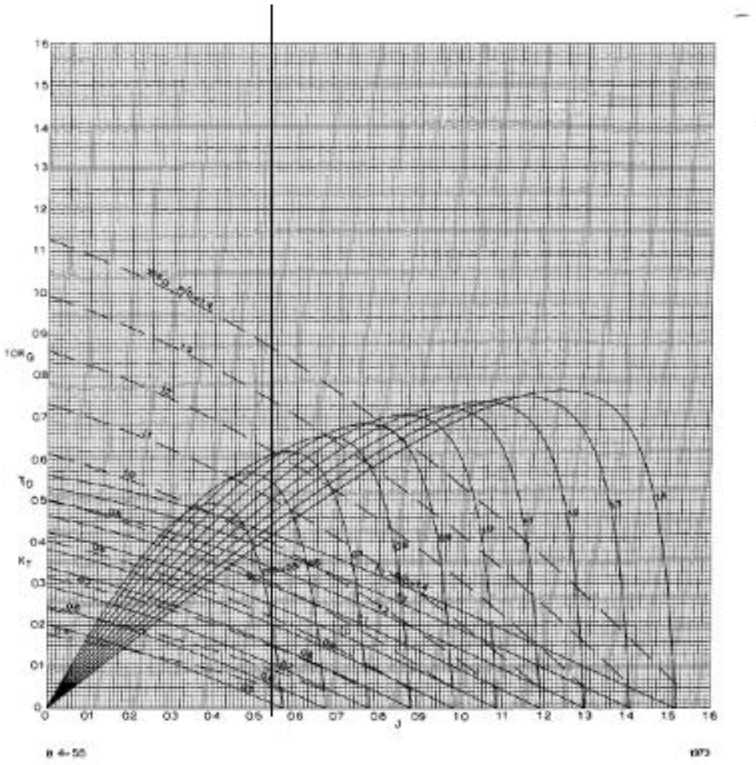
  Va = Vs x (1-w)

  = 4,541 m/s

  $J = \frac{V_a}{n \times D}$

  $= \frac{4.541\ m/s}{13.29\ rps \times 0.76\ m}$

  = 0.544



Gambar. Grafik Wageningen

Sehingga nilai KT dan KQ sebagai berikut :

KT = 0.27

KQ = 0,041

Lampiran 10. Salinan perhitungan pada tahap *solution*

This run of the CFX Release 18.1 Solver started at 13:28:38 on 19 Jan (0,82m)

2024 by user ASUS on LAPTOP-D0JVFS82 (amd_opteron.sse2_winnt) using the

command:

"C:\Program Files\ANSYS Inc\v181\CFX\bin\perllib\cfx5solve.pl" -batch

-ccl runInput.ccl -fullname 082m_001

Release 18.1

Point Releases and Patches installed:

ANSYS, Inc. Products Release 18.1

ANSYS Mechanical Products Release 18.1

ANSYS Autodyn Release 18.1

ANSYS LS-DYNA Release 18.1

ANSYS AIM Release 18.1

ANSYS CFX (includes ANSYS CFD-Post) Release 18.1

ANSYS Fluent (includes ANSYS CFD-Post) Release 18.1

ANSYS TurboGrid Release 18.1

ANSYS FENSAP-ICE Release 18.1

ANSYS Polyflow (includes ANSYS CFD-Post) Release 18.1

ANSYS Forte Release 18.1

ANSYS Chemkin Release 18.1

ANSYS ICEM CFD Release 18.1

ANSYS Aqwa Release 18.1

ANSYS Icepak (includes ANSYS CFD-Post) Release 18.1

18.1

elease 18.1

Catia, Version 6 Release 18.1

Creo Elements/Direct Modeling Release 18.1

Inventor Release 18.1

JTOpen Release 18.1

NX Release 18.1

Parasolid Release 18.1

Creo Parametric Release 18.1

Solid Edge Release 18.1

SolidWorks Release 18.1

ANSYS, Inc. License Manager Release 18.1

Setting up CFX Solver run ...

```
+--------------------------------------------------------------------+
|                                                                    |
|                    CFX Command Language for Run                    |
|                                                                    |
+--------------------------------------------------------------------+
```

LIBRARY:

MATERIAL: Water

Material Description = Water (liquid)

Material Group = Water Data, Constant Property Liquids

Option = Pure Substance

Thermodynamic State = Liquid

PROPERTIES:

al Material

STATE:

Density = 997.0 [kg m^-3]

Molar Mass = 18.02 [kg kmol^-1]

Option = Value

END

SPECIFIC HEAT CAPACITY:

Option = Value

Specific Heat Capacity = 4181.7 [J kg^-1 K^-1]

Specific Heat Type = Constant Pressure

END

REFERENCE STATE:

Option = Specified Point

Reference Pressure = 1 [atm]

Reference Specific Enthalpy = 0.0 [J/kg]

Reference Specific Entropy = 0.0 [J/kg/K]

Reference Temperature = 25 [C]

END

DYNAMIC VISCOSITY:

Dynamic Viscosity = 8.899E-4 [kg m^-1 s^-1]

Option = Value

END

THERMAL CONDUCTIVITY:

Option = Value

Thermal Conductivity = 0.6069 [W m^-1 K^-1]

END

ABSORPTION COEFFICIENT:

Absorption Coefficient = 1.0 [m^-1]

Option = Value

EFFICIENT:

```
      Option = Value
      Scattering Coefficient = 0.0 [m^-1]
    END
    REFRACTIVE INDEX:
      Option = Value
      Refractive Index = 1.0 [m m^-1]
    END
    THERMAL EXPANSIVITY:
      Option = Value
      Thermal Expansivity = 2.57E-04 [K^-1]
    END
  END
 END
END
FLOW: Flow Analysis 1
 SOLUTION UNITS:
  Angle Units = [rad]
  Length Units = [m]
  Mass Units = [kg]
  Solid Angle Units = [sr]
  Temperature Units = [K]
  Time Units = [s]
 END
 ANALYSIS TYPE:
  Option = Transient
  EXTERNAL SOLVER COUPLING:
   Option = None
```

```
    Option = Automatic with Value
    Time = 0 [s]
  END
  TIME DURATION:
    Option = Total Time
    Total Time = 7.524454477 [s]
  END
  TIME STEPS:
    Option = Timesteps
    Timesteps = 0.0752445 [s]
  END
END
DOMAIN: duct
  Coord Frame = Coord 0
  Domain Type = Immersed Solid
  Location = B156
  BOUNDARY: duct Default
    Boundary Type = WALL
    Location = \
      F157.156,F158.156,F159.156,F160.156,F161.156,F162.156,F163.156,F164.1\
      56
  END
  DOMAIN MODELS:
    DOMAIN MOTION:
      Option = Stationary
    END
  END
                er
```

```
  Coord Frame = Coord 0
  Domain Type = Immersed Solid
  Location = B72
  BOUNDARY: propeller Default
   Boundary Type = WALL
   Location = \
    F73.72,F74.72,F75.72,F76.72,F77.72,F78.72,F80.72,F81.72,F82.72,F83.72\
    ,F84.72,F85.72,F86.72,F87.72,F88.72,F89.72,F90.72,F91.72,F94.72,F95.7\
    2,F96.72,F97.72
  END
  DOMAIN MODELS:
   DOMAIN MOTION:
    Angular Velocity = -13.29 [rev s^-1]
    Option = Rotating
    AXIS DEFINITION:
     Option = Two Points
     Rotation Axis From = 0.0196915 [m], 0.642806 [m], -10.1676 [m]
     Rotation Axis To = 0.0196915 [m], 0.642806 [m], -9.42083 [m]
    END
   END
  END
 END
 DOMAIN: ship
  Coord Frame = Coord 0
  Domain Type = Immersed Solid
  Location = B222
  BOUNDARY: ship Default
   Boundary Type = WALL
```

```
    F215.222,F216.222,F217.222,F218.222,F219.222,F220.222,F221.222,F223.2\
    22,F224.222,F225.222,F226.222,F227.222,F228.222,F229.222,F230.222,F23\
    1.222,F232.222
  END
  DOMAIN MODELS:
   DOMAIN MOTION:
    Option = Stationary
   END
  END
END
DOMAIN: water
  Coord Frame = Coord 0
  Domain Type = Fluid
  Location = B396
  BOUNDARY: in
   Boundary Type = INLET
   Location = inlet
   BOUNDARY CONDITIONS:
    FLOW REGIME:
     Option = Subsonic
    END
    MASS AND MOMENTUM:
     Normal Speed = 0 [m s^-1]
     Option = Normal Speed
    END
    TURBULENCE:
     Option = Medium Intensity and Eddy Viscosity Ratio
```

```
END
BOUNDARY: out
 Boundary Type = OPENING
 Location = outlet
 BOUNDARY CONDITIONS:
  FLOW DIRECTION:
   Option = Normal to Boundary Condition
  END
  FLOW REGIME:
   Option = Subsonic
  END
  MASS AND MOMENTUM:
   Option = Opening Pressure and Direction
   Relative Pressure = 1 [atm]
  END
  TURBULENCE:
   Option = Medium Intensity and Eddy Viscosity Ratio
  END
 END
END
BOUNDARY: wall
 Boundary Type = WALL
 Location = wall
 BOUNDARY CONDITIONS:
  MASS AND MOMENTUM:
   Option = No Slip Wall
  END
  NESS:
   oth Wall
```

```
    END
  END
END
BOUNDARY: water Default
  Boundary Type = WALL
  Location = \
    F403.396,F404.396,F405.396,F406.396,F407.396,F408.396,F410.396,F411.3\
    96,F412.396,F413.396,F414.396,F415.396,F416.396,F417.396,F418.396,F41\
    9.396,F420.396,F423.396,F424.396,F425.396,F426.396,F428.396,F429.396,\
    F430.396,F431.396,F432.396,F433.396,F434.396,F435.396,F436.396,F437.3\
    96,F438.396,F439.396,F440.396,F441.396,F442.396,F443.396,F444.396,F44\
    5.396,F446.396,F447.396,F448.396,F449.396,F450.396,F451.396,F452.396
  BOUNDARY CONDITIONS:
    MASS AND MOMENTUM:
      Option = No Slip Wall
    END
    WALL ROUGHNESS:
      Option = Smooth Wall
    END
  END
END
DOMAIN MODELS:
  BUOYANCY MODEL:
    Option = Non Buoyant
  END
  DOMAIN MOTION:
    Option = Stationary

          ATION:
```

```
    Option = None
  END
  REFERENCE PRESSURE:
    Reference Pressure = 1 [atm]
  END
END
FLUID DEFINITION: Fluid 1
  Material = Water
  Option = Material Library
  MORPHOLOGY:
    Option = Continuous Fluid
  END
END
FLUID MODELS:
  COMBUSTION MODEL:
    Option = None
  END
  HEAT TRANSFER MODEL:
    Option = None
  END
  THERMAL RADIATION MODEL:
    Option = None
  END
  TURBULENCE MODEL:
    Option = SST
  END
  TURBULENT WALL FUNCTIONS:
              matic
```

```
 END
 INITIALISATION:
  Option = Automatic
  INITIAL CONDITIONS:
   Velocity Type = Cartesian
   CARTESIAN VELOCITY COMPONENTS:
    Option = Automatic with Value
    U = 0 [m s^-1]
    V = 0 [m s^-1]
    W = 0 [m s^-1]
   END
   STATIC PRESSURE:
    Option = Automatic with Value
    Relative Pressure = 1 [atm]
   END
   TURBULENCE INITIAL CONDITIONS:
    Option = Medium Intensity and Eddy Viscosity Ratio
   END
  END
 END
END
OUTPUT CONTROL:
 RESULTS:
  File Compression Level = Default
  Option = Standard
 END
 TRANSIENT RESULTS: Transient Results 1
              n Level = Default
               No
```

```
    Option = Selected Variables
    Output Boundary Flows = All
    Output Variables List = Velocity,Total Pressure,Specific Volume,Solver \
     Yplus,Shear Strain Rate,Rotation Velocity,Real Partition \
     Number,Pressure,Yplus,Vorticity,Absolute Pressure,Boundary \
     Distance,Density,Dynamic Viscosity,Boundary Scale
    OUTPUT FREQUENCY:
     Option = Every Timestep
    END
  END
END
SOLVER CONTROL:
  Turbulence Numerics = First Order
  ADVECTION SCHEME:
    Option = High Resolution
  END
  CONVERGENCE CONTROL:
    Maximum Number of Coefficient Loops = 3
    Minimum Number of Coefficient Loops = 1
    Timescale Control = Coefficient Loops
  END
  CONVERGENCE CRITERIA:
    Residual Target = 1.E-4
    Residual Type = RMS
  END
  IMMERSED SOLID CONTROL:
    BOUNDARY MODEL:
```

```
      END
      TRANSIENT SCHEME:
        Option = Second Order Backward Euler
        TIMESTEP INITIALISATION:
          Option = Automatic
        END
      END
    END
  END
  COMMAND FILE:
    Version = 18.1
    Results Version = 18.1
  END
  SIMULATION CONTROL:
    EXECUTION CONTROL:
      EXECUTABLE SELECTION:
        Double Precision = Yes
        Large Problem = No
      END
      INTERPOLATOR STEP CONTROL:
        Runtime Priority = Standard
        MEMORY CONTROL:
          Memory Allocation Factor = 1.0
        END
      END
      PARALLEL HOST LIBRARY:
        HOST DEFINITION: laptopd0jvfs82
          Name = LAPTOP-D0JVFS82
          ure String = winnt-amd64
```

```
    Installation Root = C:\Program Files\ANSYS Inc\v%v\CFX
  END
END
PARTITIONER STEP CONTROL:
  Multidomain Option = Automatic
  Runtime Priority = Standard
  MEMORY CONTROL:
    Memory Allocation Factor = 1.0
  END
  PARTITION SMOOTHING:
    Maximum Partition Smoothing Sweeps = 100
    Option = Smooth
  END
  PARTITIONING TYPE:
    MeTiS Type = k-way
    Option = MeTiS
    Partition Size Rule = Automatic
  END
END
RUN DEFINITION:
  Run Mode = Full
  Solver Input File = 082m.def
  Solver Results File = E:/one \
    more_pending/dp0_CFX_10_Solution_10/082m_001.res
END
SOLVER STEP CONTROL:
  Runtime Priority = Standard
  ROL:
    ation Factor = 1.0
```

```
    END
    PARALLEL ENVIRONMENT:
      Number of Processes = 1
      Start Method = Serial
    END
  END
 END
END


+--------------------------------------------------------------------+
|                                                                    |
|                             Solver                                 |
|                                                                    |
+--------------------------------------------------------------------+



+--------------------------------------------------------------------+
|                                                                    |
|                     ANSYS(R) CFX(R) Solver                         |
|                                                                    |
| Release 18.1                                                       |
| Build 18.1 2017-04-03T19:35:12.126000                              |
| Mon Apr  3 20:07:25 GMTDT 2017                                     |
|                                                                    |
                         utable Attributes                           |
                                                                     |
```

| double-64bit-int32-archfort-optimised-noprof-lcomp |

| |

+--+

+--+

| Job Information at Start of Run |

+--+

Run mode: serial run

Host computer: LAPTOP-D0JVFS82 (PID:7936)

Job started: Fri Jan 19 13:28:48 2024

+--+

| License Information |

+--+

License Cap... ANSYS CFX Solver (> 512K Nodes)

OP-D0JVFS82-ASUS-11912-012998

```
+------------------------------------------------------------------+
|     Memory Allocated for Run  (Actual usage may be less)         |
+------------------------------------------------------------------+

        | Real       | Integer    | Character | Logical  | Double
----------+------------+------------+-----------+----------+----------
Mwords    |     200.10 |     106.75 |      7.38 |     0.12 |     0.01
Mbytes    |    1526.61 |     407.22 |      7.04 |     0.46 |     0.06
----------+------------+------------+-----------+----------+----------


+------------------------------------------------------------------+
|              Host Memory Information (Mbytes)                    |
+------------------------------------------------------------------+
|        Host           |     System     |   Allocated    |   %    |
+-------------------------+----------------+----------------+--------+
| LAPTOP-D0JVFS82         |     3534.22    |     1941.38    |  54.93 |
+-------------------------+----------------+----------------+--------+

+------------------------------------------------------------------+
|                  Topology Simplification                         |
+------------------------------------------------------------------+

+------------------------------------------------------------------+
|                   ****** Warning ******                          |
|                                                                  |
                   cation is activated with the following          |
                                                                   |
```

```
|                                                  |
| - Mesh regions referenced only within User Fortran and NOT       |
|   in the command file will cause the solver to stop.             |
| - The solver will stop during any "Edit Run in Progress" step     |
|   if new 2D regions are referenced.                         |
+--------------------------------------------------------------------+


+--------------------------------------------------------------------+
|                       Mesh Statistics                       |
+--------------------------------------------------------------------+
| Domain Name          | Orthog. Angle | Exp. Factor  | Aspect Ratio |
+----------------------+---------------+--------------+--------------+
|                      | Minimum [deg] |   Maximum    |    Maximum   |
+----------------------+---------------+--------------+--------------+
| water                |      29.7 ok |        53  ! |        25 OK |
| duct                 |      43.1 ok |        16 ok |         7 OK |
| propeller            |      21.9 ok |        10 ok |         8 OK |
| ship                 |      13.9  ! |        83  ! |        17 OK |
| Global               |      13.9  ! |        83  ! |        25 OK |
+----------------------+---------------+--------------+--------------+
|                      |  %!  %ok  %OK |  %!  %ok  %OK |  %!  %ok  %OK |
+----------------------+---------------+--------------+--------------+
| water                |   0   <1  100 | <1    4   96 |  0    0  100 |
| duct                 |   0   <1  100 |  0   <1  100 |  0    0  100 |
| propeller            |   0   <1  100 |  0   <1  100 |  0    0  100 |
| ship                 |  <1   <1  100 | <1   <1  100 |  0    0  100 |
| Global               |  <1   <1  100 | <1    1   99 |  0    0  100 |
+----------------------+---------------+--------------+--------------+
```

Domain Name : water

Total Number of Nodes = 66089

Total Number of Elements = 355525

Total Number of Tetrahedrons = 355525

Total Number of Faces = 26928

Domain Name : duct

Total Number of Nodes = 337479

Total Number of Elements = 1806275

Total Number of Tetrahedrons = 1806275

Total Number of Faces = 141600

Domain Name : propeller

Total Number of Nodes = 118985

Total Number of Elements = 613542

Total Number of Tetrahedrons = 613542

Total Number of Faces = 64288

p

Total Number of Nodes = 103279

Total Number of Elements = 558716

Total Number of Tetrahedrons = 558716

Total Number of Faces = 38746

Global Statistics :

Global Number of Nodes = 625832

Global Number of Elements = 3334058

Total Number of Tetrahedrons = 3334058

Global Number of Faces = 271562

+--+

| Average Scale Information |

+--+

Domain Name : water

Global Length = 5.1708E+01

Minimum Extent = 2.5431E+01

Maximum Extent = 1.4399E+02

Density = 9.9700E+02

Dynamic Viscosity = 8.8990E-04

Velocity = 0.0000E+00

ct

Global Length = 2.9518E-01

Minimum Extent = 3.0413E-01

Maximum Extent = 8.9798E-01

Domain Name : propeller

Global Length = 2.0559E-01

Minimum Extent = 7.4676E-01

Maximum Extent = 7.6305E-01

Domain Name : ship

Global Length = 3.9984E+00

Minimum Extent = 1.4307E+00

Maximum Extent = 2.3986E+01

+--+

| Checking for Isolated Fluid Regions |

+--+

No isolated fluid regions were found.

+--+

| The Equations Solved in This Calculation |

+--+

Equations are given two labels: the individual name and a combined name used for combining residuals together. Residuals for multidomain problems are combined provided the domains are connected together and ... main type (solid or fluid/porous). If there are ... the same domain type, then the group residual is identified by the name of the first domain in the connected group.

The individual and combined equation names are given below.

Subsystem : Wall Scale

Wallscale-water --> Wallscale

Subsystem : Momentum and Mass

U-Mom-water --> U-Mom

V-Mom-water --> V-Mom

W-Mom-water --> W-Mom

P-Mass-water --> P-Mass

Subsystem : TurbKE and TurbFreq

K-TurbKE-water --> K-TurbKE

O-TurbFreq-water --> O-TurbFreq

CFD Solver started: Fri Jan 19 13:29:33 2024

```
+--------------------------------------------------------------------+
|                    Convergence History                     |
+--------------------------------------------------------------------+
```