



# REPORT

학과: 항공기계공학과  
과목: 전산유체해석실습  
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제출날짜: 11/20 (목)



CHEONGJU UNIVERSITY

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# Caradonna & Tung rotor

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# Caradonna & Tung rotor

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 rot\_caradonna\_tung.cfg

```
FREESTREAM_PRESSURE= 101325.0
FREESTREAM_TEMPERATURE= 288.15
GRID_MOVEMENT= ROTATING_FRAME
GRID_MOVEMENT= ROTATING_FRAME
MACH_MOTION= 0.877 %공기를 돌리는 속도. 최대 tip MACH%
MOTION_ORIGIN= 0.0 0.0 0.0
ROTATION_RATE = 261.79938779914943 0.0 0.0 %x축을 기준으로 회전. 격자를 보고 로터 회전축에 따라 수정

% ----- BOUNDARY CONDITION DEFINITION -----%
%
MARKER_EULER= ( blade_1, blade_2 )
MARKER_FAR= ( farfield )
MARKER_PLOTTING= ( blade_1, blade_2 )
MARKER_MONITORING= ( blade_1, blade_2 )

% ----- COMMON PARAMETERS DEFINING THE NUMERICAL METHOD -----%
%
NUM_METHOD_GRAD= GREEN_GAUSS
CFL_NUMBER= 1e3
CFL_ADAPT= NO
CFL_ADAPT_PARAM= ( 0.1, 2.0, 15, 1e6 )
RK_ALPHA_COEFF= ( 0.66667, 0.66667, 1.000000 )
ITER= 99999
```

# Caradonna & Tung rotor

```
mpiexec -n 4 SU2_CFD.exe rot_caradonna_tung.cfg
```

```

1150| 2.1227e+00| -11.958457| -0.000006| -0.025577| 1.0000e+03|
1151| 2.1230e+00| -11.963489| -0.000006| -0.025577| 1.0000e+03|
1152| 2.1234e+00| -11.969808| -0.000006| -0.025577| 1.0000e+03|
1153| 2.1238e+00| -11.977524| -0.000006| -0.025577| 1.0000e+03|
1154| 2.1238e+00| -11.986624| -0.000006| -0.025577| 1.0000e+03|
1155| 2.1240e+00| -11.996909| -0.000006| -0.025577| 1.0000e+03|
1156| 2.1241e+00| -12.008388| -0.000006| -0.025577| 1.0000e+03|

----- Solver Exit -----
All convergence criteria satisfied.

+-----+-----+-----+-----+
| Convergence Field | Value | Criterion | Converged |
+-----+-----+-----+-----+
| rms[Rho] | -12.0084 | < -12 | Yes |
+-----+-----+-----+-----+

+-----+-----+
| File Writing Summary | Filename |
+-----+-----+
| SU2 binary restart | restart_flow.dat |
| Paraview | flow.vtu |
| Paraview surface | surface_flow.vtu |
+-----+-----+

```

TABLE 25.- LOCAL PRESSURE COEFFICIENT

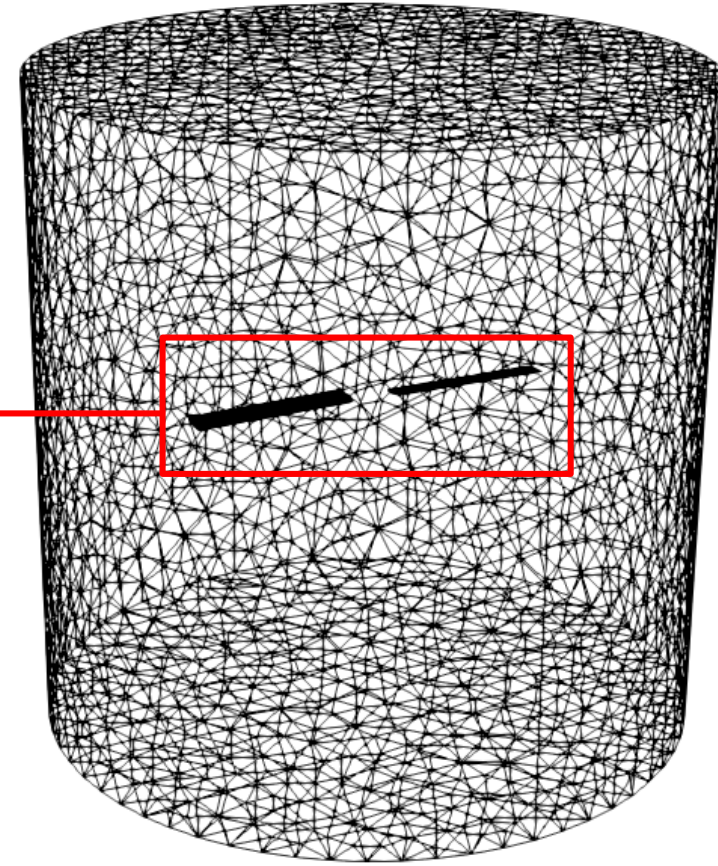
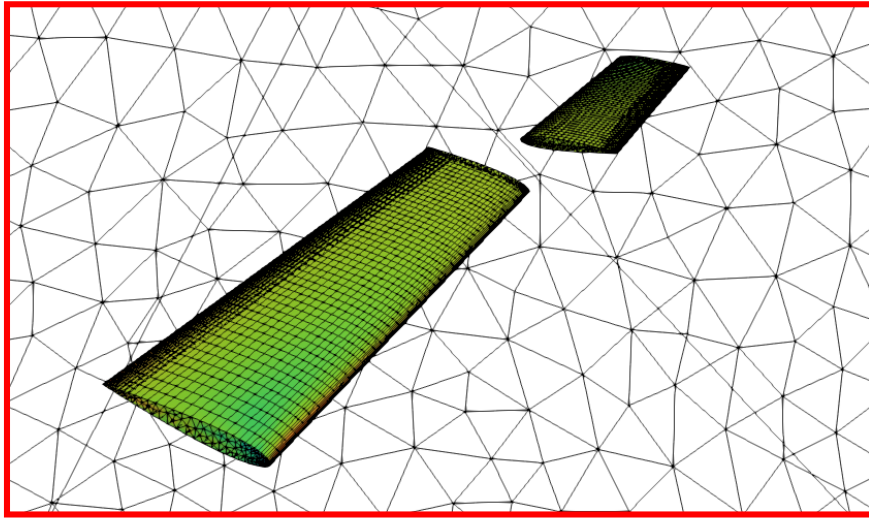
$\theta_c = 8^\circ$   $\Omega = 2500$  rpm  $M_{tip} = 0.877$

Upper surface ( $-C_{pu}$ )									
x/c	r/R = 0.5	x/c	r/R = 0.68	x/c	r/R = 0.80	x/c	r/R = 0.89	x/c	r/R = 0.96
0.00	-0.9138E+00	0.02	0.9416E+00	0.00	-0.1853E+00	0.01	0.4445E+00	0.00	-0.1092E+01
0.03	0.8691E+00	0.06	0.9399E+00	0.01	0.4832E+00	0.03	0.8531E+00	0.02	0.4984E+00
0.12	0.7173E+00	0.10	0.9083E+00	0.04	0.1152E+01	0.04	0.9171E+00	0.07	0.8911E+00
0.26	0.5317E+00	0.15	0.8169E+00	0.07	0.1091E+01	0.06	0.9325E+00	0.12	0.9721E+00
0.47	0.3517E+00	0.19	0.7256E+00	0.09	0.1095E+01	0.10	0.1046E+01	0.15	0.1062E+01
0.69	0.2055E+00	0.23	0.6448E+00	0.13	0.1166E+01	0.13	0.1108E+01	0.19	0.1090E+01
0.83	0.8736E-01	0.29	0.5834E+00	0.17	0.1170E+01	0.17	0.1166E+01	0.23	0.1028E+01
		0.33	0.5307E+00	0.21	0.1061E+01	0.21	0.1208E+01	0.29	0.9676E+00
		0.39	0.4183E+00	0.24	0.7839E+00	0.26	0.1172E+01	0.33	0.6605E+00
		0.44	0.3937E+00	0.30	0.4320E+00	0.30	0.1076E+01	0.39	0.2239E+00
		0.52	0.3235E+00	0.35	0.4990E+00	0.35	0.5771E+00	0.44	0.1947E+00
		0.61	0.2251E+00	0.42	0.4162E+00	0.42	0.2751E+00	0.50	0.1902E+00
		0.73	0.1338E+00	0.50	0.3230E+00	0.47	0.2111E+00	0.61	0.1474E+00
		0.80	0.6530E-01	0.56	0.2586E+00	0.52	0.1673E+00	0.69	0.1103E+00
				0.65	0.1746E+00	0.65	0.9980E-01	0.76	0.6527E-01
				0.76	0.7476E-01	0.73	0.5006E-01	0.90	-0.6074E-01
				0.90	-0.8021E-01	0.80	-0.6794E-02		
						0.87	-0.7194E-01		
Lower surface ( $-C_{pl}$ )									
x/c	r/R = 0.5	x/c	r/R = 0.68	x/c	r/R = 0.80	x/c	r/R = 0.89	x/c	r/R = 0.96
0.04	-0.5606E-01	0.00	-0.9269E+00	0.01	-0.5175E+00	0.01	-0.7021E+00	0.00	-0.1141E+01
0.20	0.2758E+00	0.07	-0.2059E-01	0.02	-0.3691E+00	0.04	-0.2745E+00	0.07	-0.8774E-01
0.45	0.2195E+00	0.18	0.2523E+00	0.11	0.1601E+00	0.14	0.1886E+00	0.16	0.2487E+00
0.69	0.9861E-01	0.28	0.2804E+00	0.14	0.2534E+00	0.28	0.3035E+00	0.24	0.3263E+00
0.85	0.3674E-01	0.38	0.2335E+00	0.24	0.3020E+00	0.45	0.2514E+00	0.39	0.2588E+00
		0.51	0.1679E+00	0.34	0.2862E+00	0.57	0.1543E+00	0.51	0.1755E+00
		0.57	0.1364E+00	0.57	0.1601E+00	0.69	0.9980E-01	0.63	0.1227E+00
		0.79	0.2036E-01	0.74	0.6557E-01	0.79	0.2163E-01	0.74	0.6640E-01
				0.90	-0.6445E-01	0.90	-0.7312E-01	0.85	0.1127E-01
$C_L$	0.2298	0.2842		0.2736		0.2989		0.3175	

[ NASA\_Cp\_Caradonna Data ]

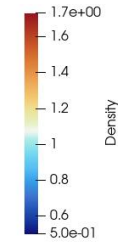
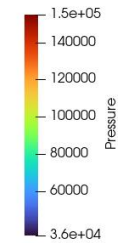
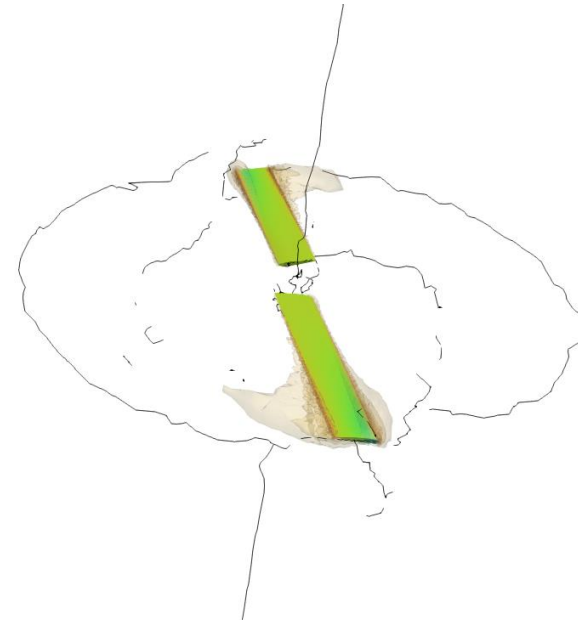
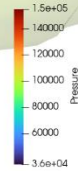
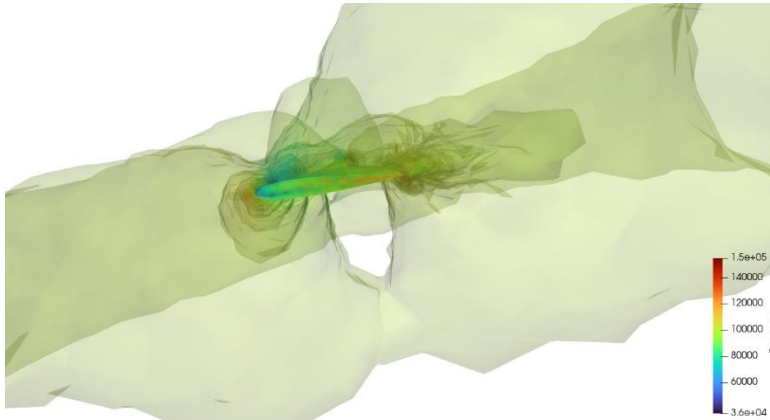
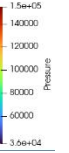
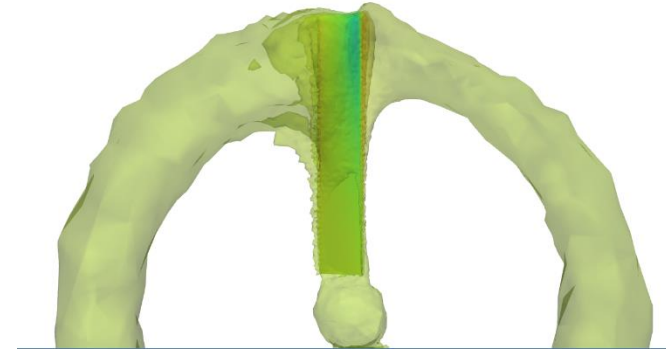
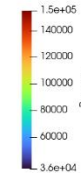
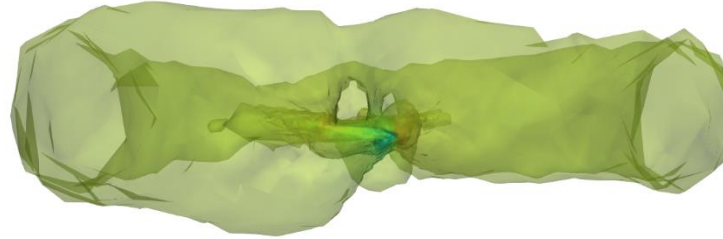
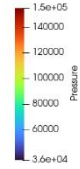
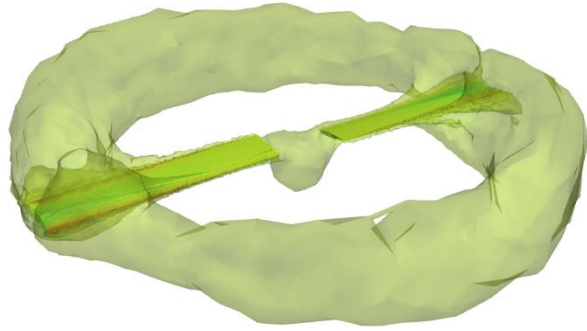
# Caradonna & Tung rotor

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# Caradonna & Tung rotor



# Caradonna & Tung rotor

<공식>

$$C_p = \frac{P - P_{\infty}}{\frac{1}{2} \rho V^2}$$

·  $P$  = Pressure

·  $P_{\infty} = 101325$

·  $\rho = 1.225$

·  $V = \gamma W$

·  $\gamma = 0.143 + ( )$

$\Rightarrow ( ) : 0.5, 0.68, 0.8, 0.89, 0.96$

$$W = \frac{2\pi n}{60} = \frac{2\pi \times 2500}{60}$$

· 가중치 : Point\_1 , 시정확 :  $C_p$

Points_1	Pressure	P-P inf	density	r	omega	v	q	Cp
0.118344	108343	7018	1.225	0.5715	261.7994	149.6184	13711.21	0.511844
0.120108	102567	1242						0.090583
0.11623	102530	1205						0.087884
0.113707	102686	1361						0.099262

Points_1	Cp			Points_1_n	Cp
2 0.122784	1.136369		0.123784	0.9939419	1.136369
2 0.121572	0.582662		-0.04128	0.9865994	0.582662
2 0.120108	0.090583		0.165067	0.9777303	0.090583
2 0.118344	0.511844			0.9670437	0.511844
2 0.11623	0.087884			0.9542368	0.087884
2 0.113707	0.099262			0.9389521	0.099262
2 0.110713	0.142584			0.920814	0.142584
2 0.107186	0.036394			0.8994469	0.036394

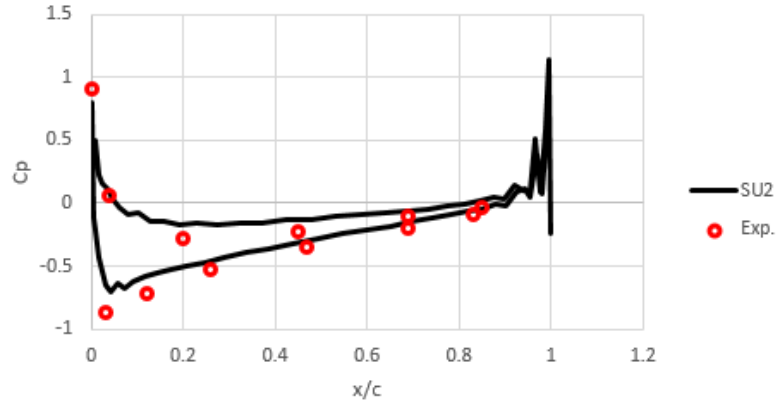
0	-0.9138	0.9138
0.03	0.8691	-0.8691
0.12	0.7173	-0.7173
0.26	0.5317	-0.5317
0.47	0.3517	-0.3517
0.69	0.2055	-0.2055
0.83	0.08736	-0.08736
0.04	-0.05606	0.05606
0.2	0.2758	-0.2758
0.45	0.2195	-0.2195
0.69	0.09861	-0.09861
0.85	0.03674	-0.03674

비교

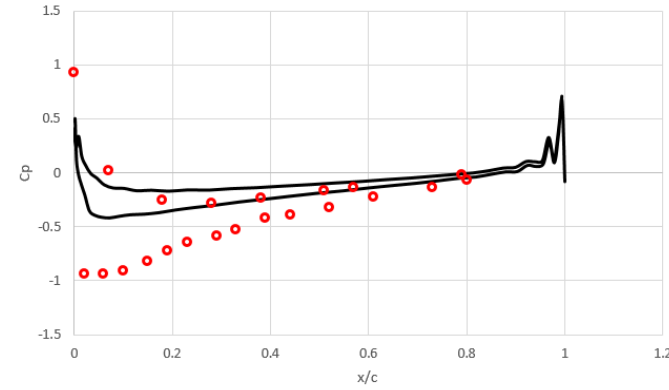
[ NASA\_Cp\_Caradonna Data ]

# Caradonna & Tung rotor

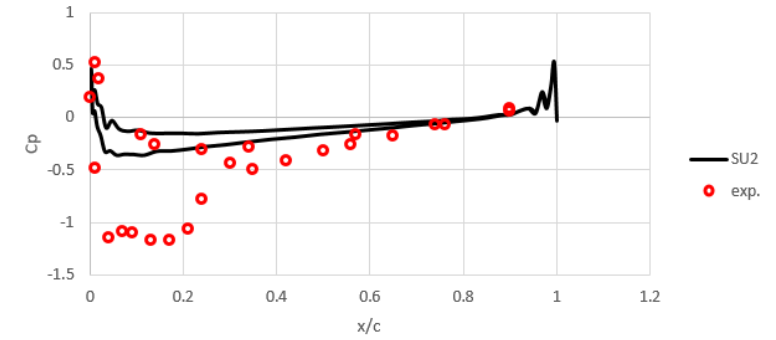
Section 50%



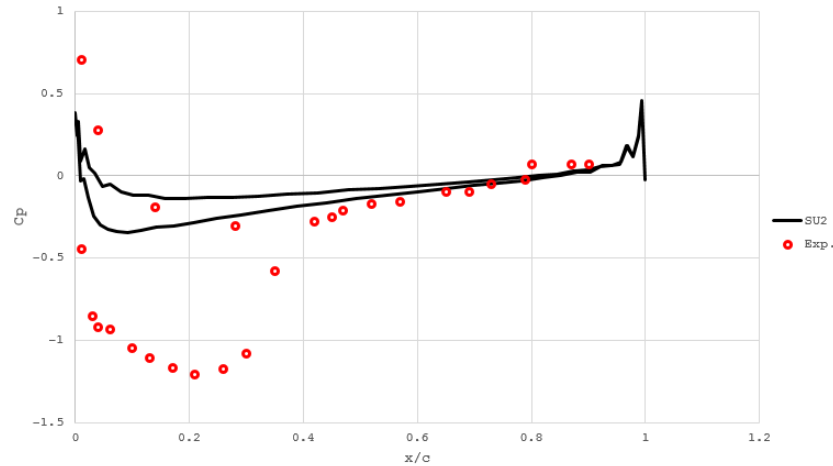
Section 68%



Section 80%



Section 89%



Section 96%

