

SEMINAR TUGAS AKHIR

ANALISA PERFORMANSI *FLAP* PESAWAT N-2XX TERHADAP PERUBAHAN *GAP* DAN *OVERLAP* DI PT. DIRGANTARA INDONESIA

TRIAWAN RAMADHAN

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JURUSAN TEKNIK FISIKA
FAKULTAS TEKNOLOGI INDUSTRI
INSTITUT TEKNOLOGI SEPULUH NOPEMBER
SURABAYA**

2016

LATAR BELAKANG

- ▶ Saat ini sebesar 72% atau 715 lapangan terbang di Indonesia masih memiliki panjang landas pacu kurang dari 800 meter.
- ▶ 41 diantaranya yang tercatat memiliki landasan kurang dari 800 meter berada di Papua dan Papua Barat.
- ▶ Sebanyak 70% atau 60 pesawat perintis dengan kapasitas 9 sampai 20 penumpang sudah berumur di atas 20 tahun.

(Sumber: Peraturan Menteri Perhubungan No. 31/2013 tentang Tatanan Kebandarudaraan Nasional)



Ninia, Kabupaten Yahukimo. Runaway: 450meter



Pogapa, Kabupaten Intan Jaya. Runaway: 439meter

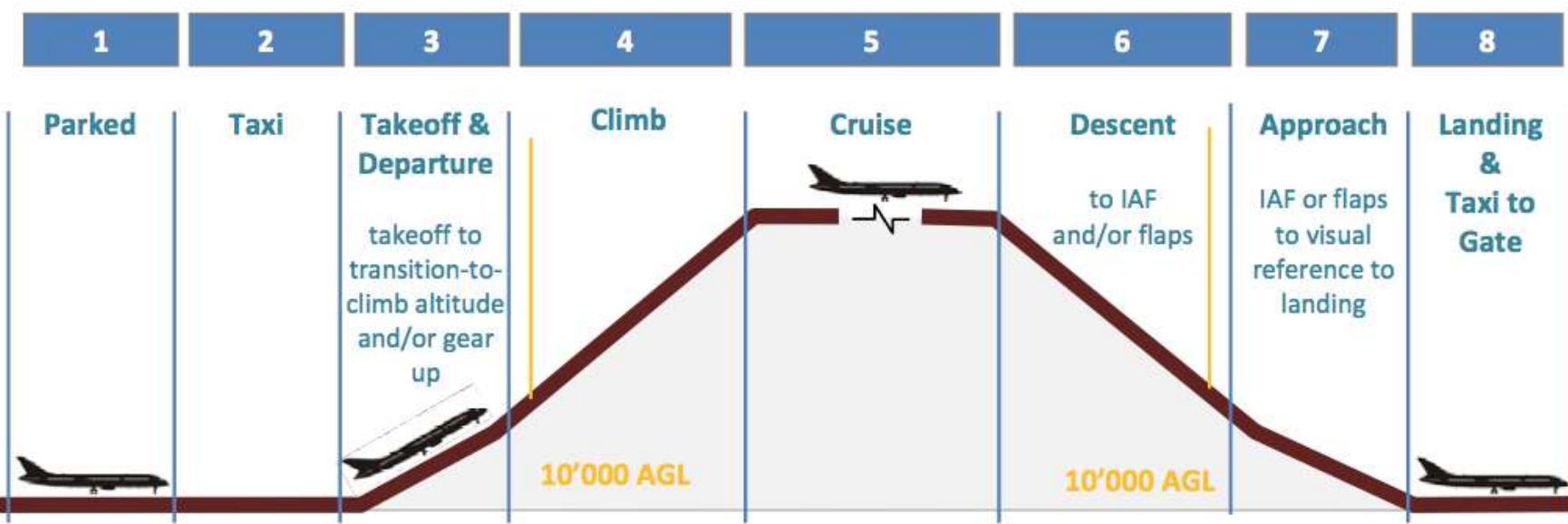
Roll Out N-2XX



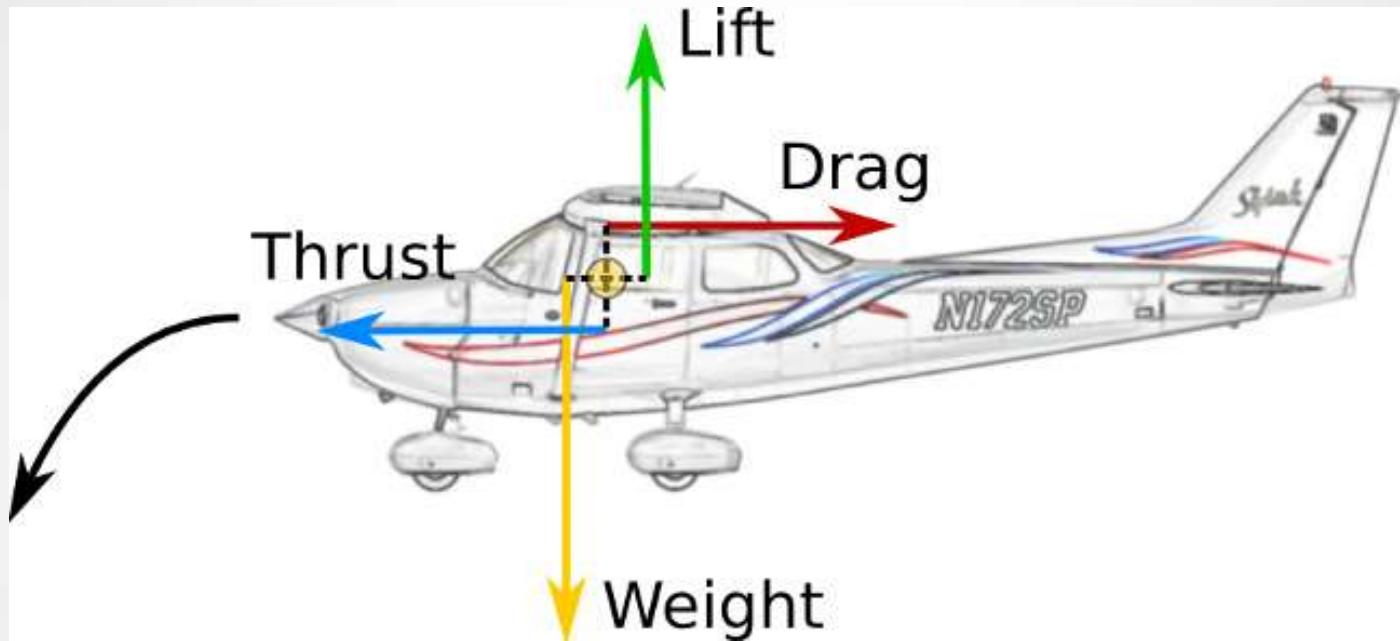


Take-off run	: 393 m
Landing Distance	: 493 m
Max. Cruise Speed	: 210 knots
Take-off Landing Speed	: 66 knots

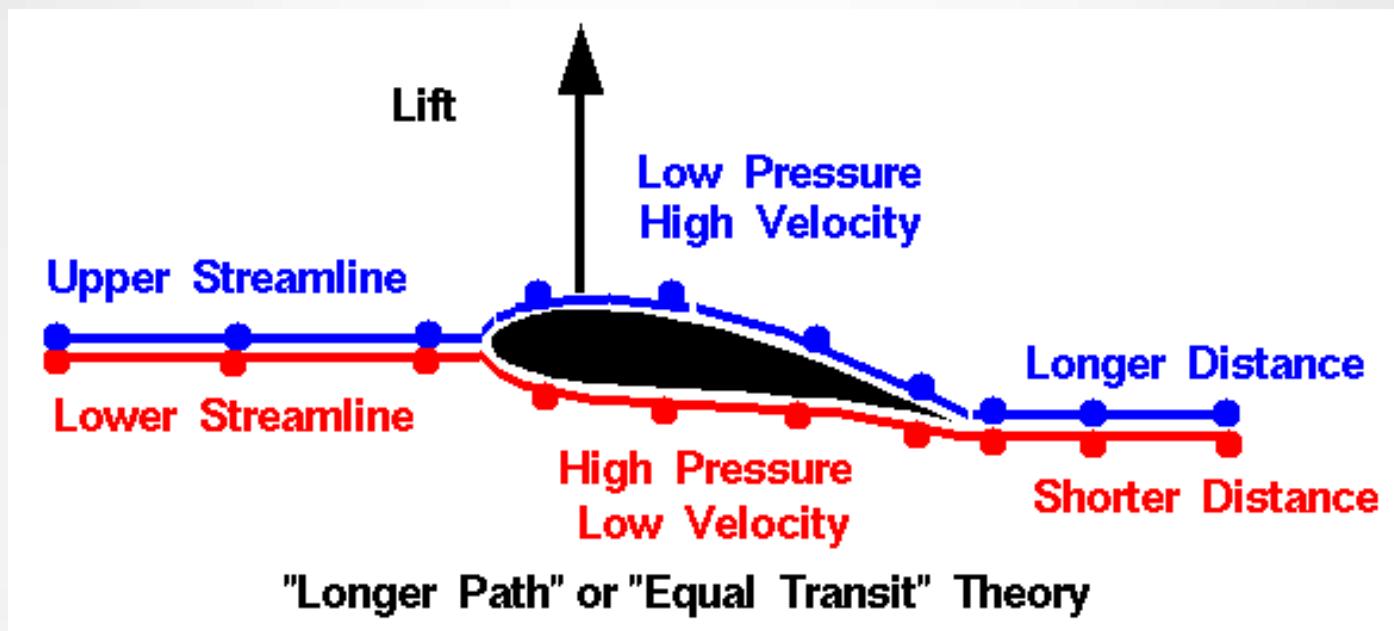
FASE TERBANG



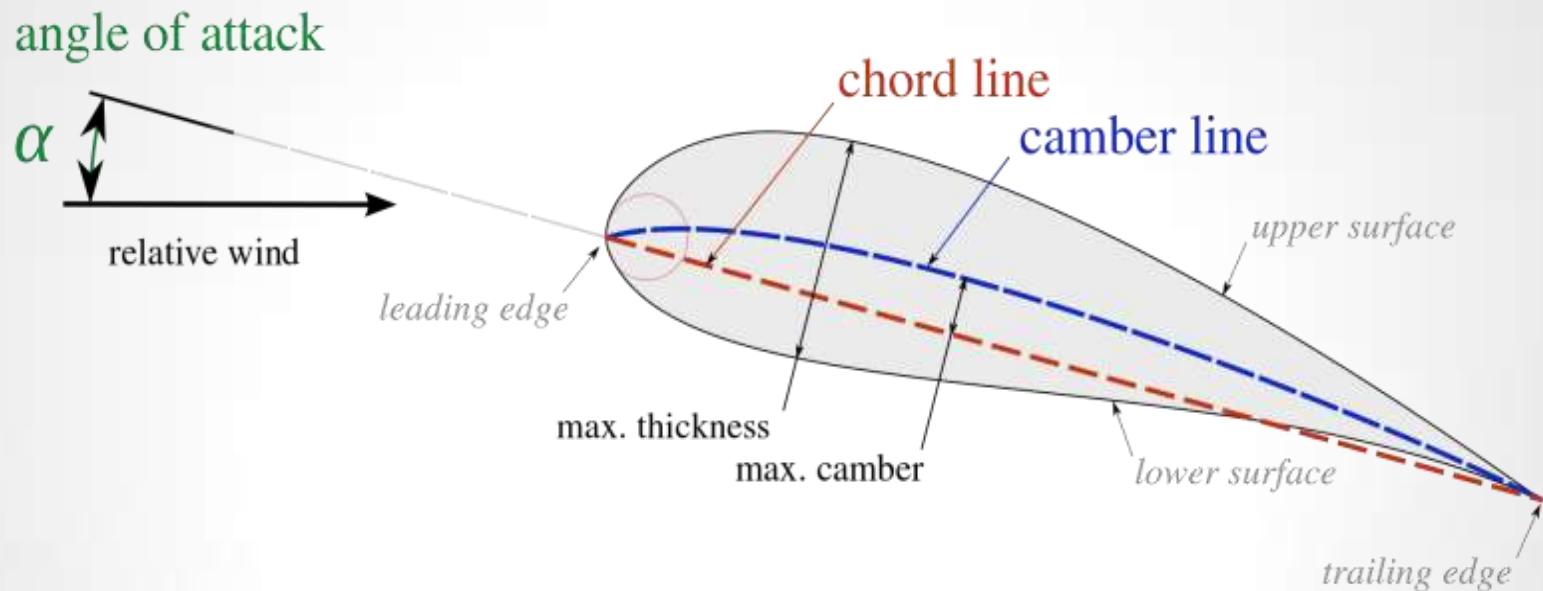
GAYA PESAWAT TERBANG



AIRFOIL



AIRFOIL



FLAP



BERDASARKAN RUMUS:

$$C_L = \frac{2 L}{\rho V^2 c}$$

Dimana:

C_L : Koefisien Gaya Angkat

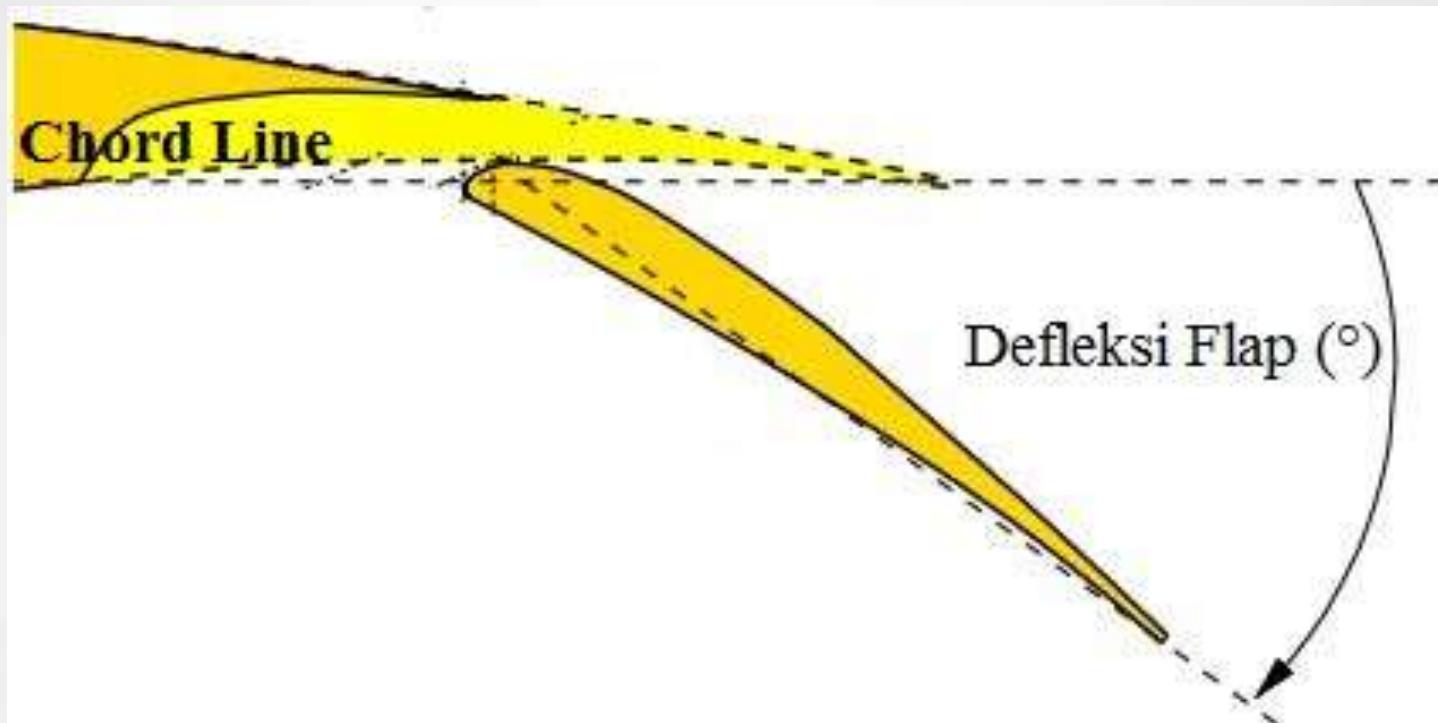
L : Gaya Angkat (N)

ρ : Densitas (kg/m^3)

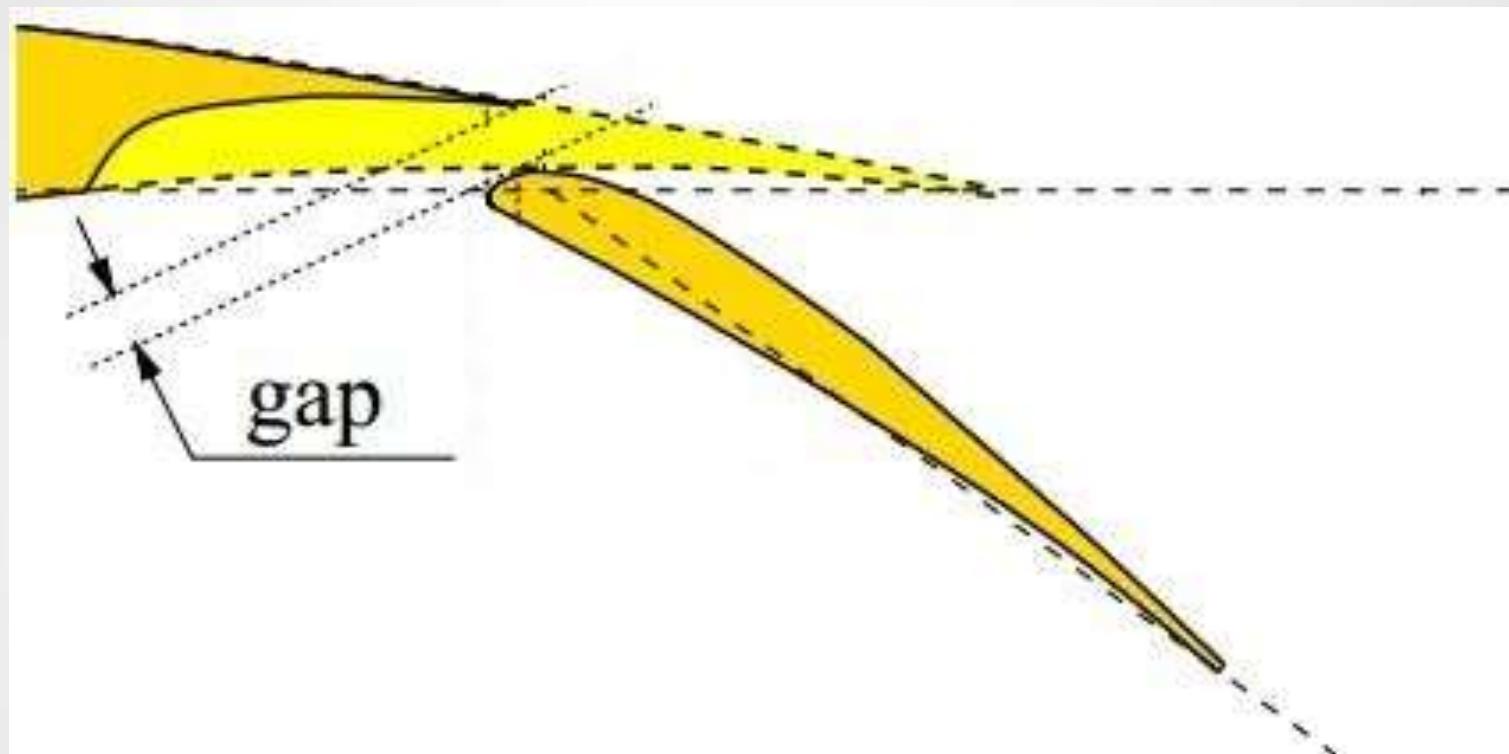
V : Kecepatan Pesawat (m/s)

c : Chord

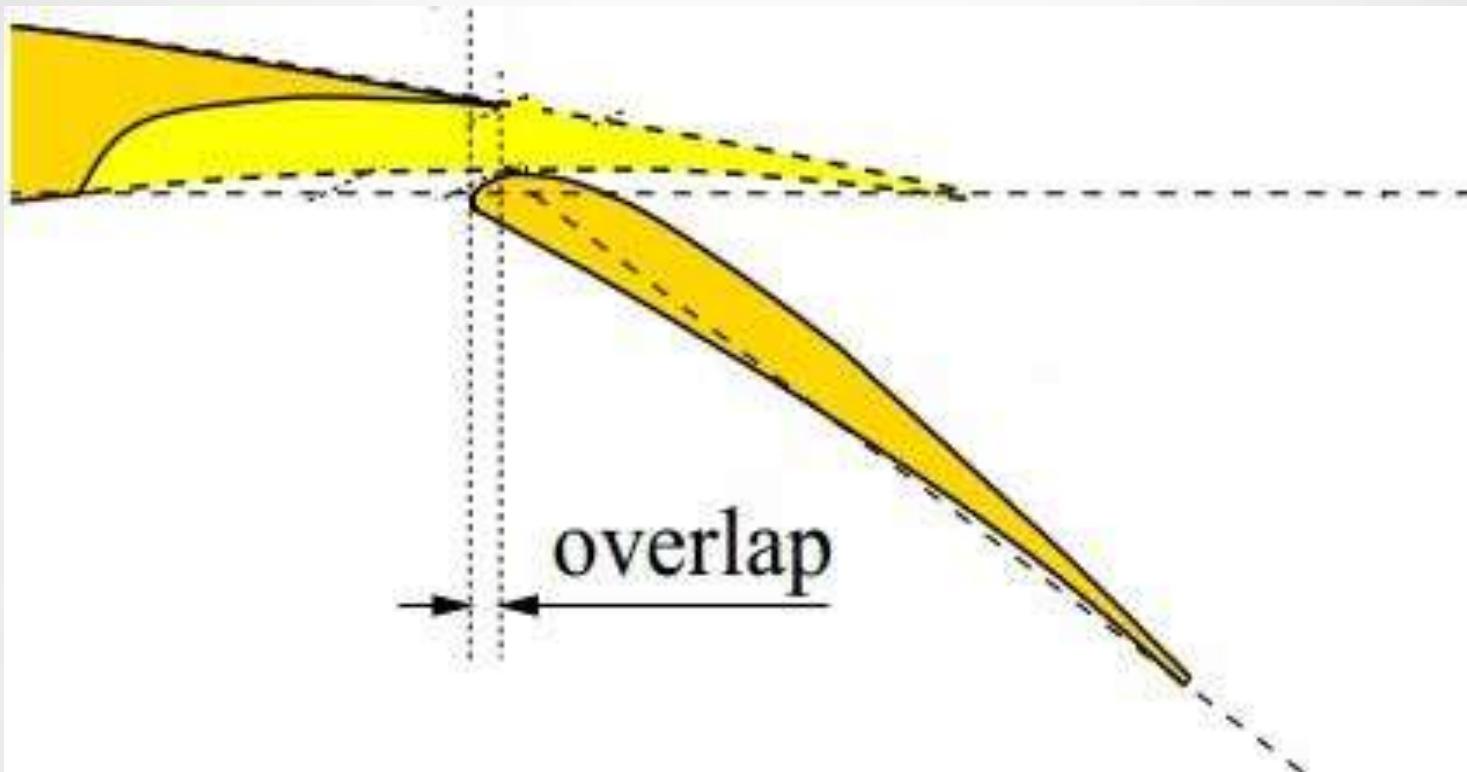
FLAP



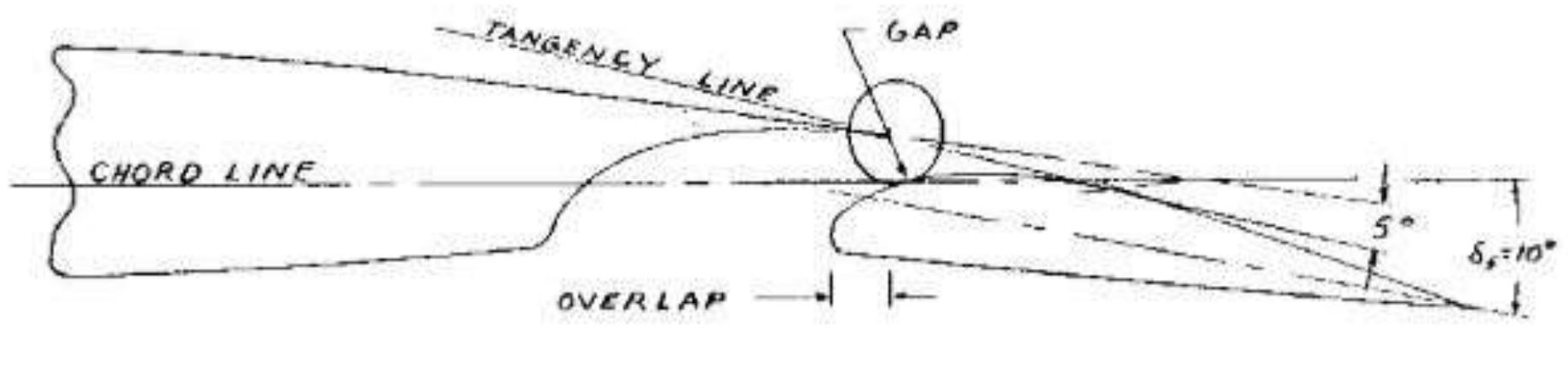
GAP



OVERLAP



GAP & OVERLAP



TUJUAN

Tujuan dilakukannya tugas akhir ini adalah sebagai berikut:

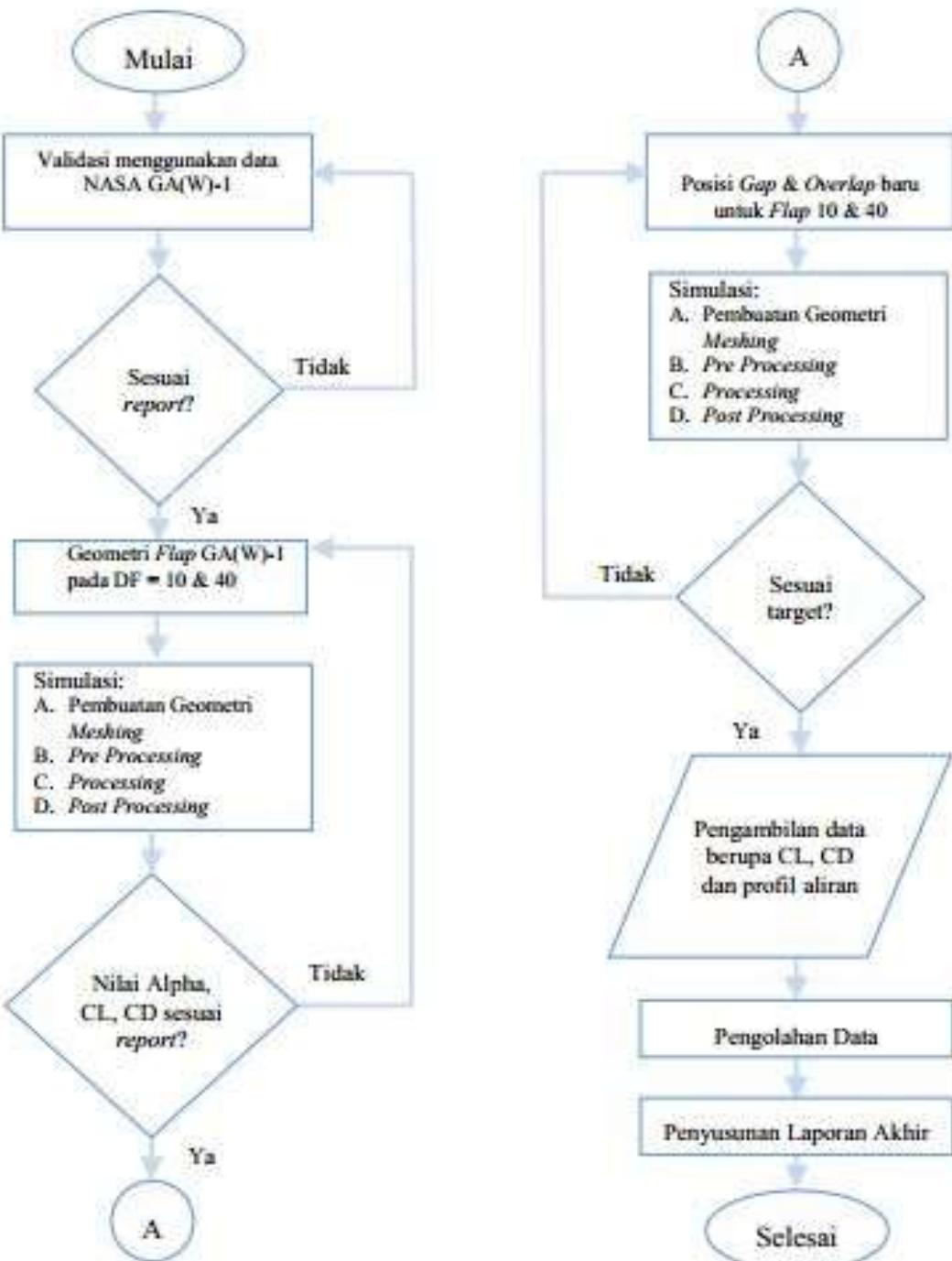
- Mengetahui karakteristik aerodinamika desain *flap* saat ini.
- Mendapatkan desain *flap* baru dengan modifikasi *gap* dan *overlap* terhadap desain *flap* saat ini untuk mencapai kinerja terbaik.

BATASAN MASALAH

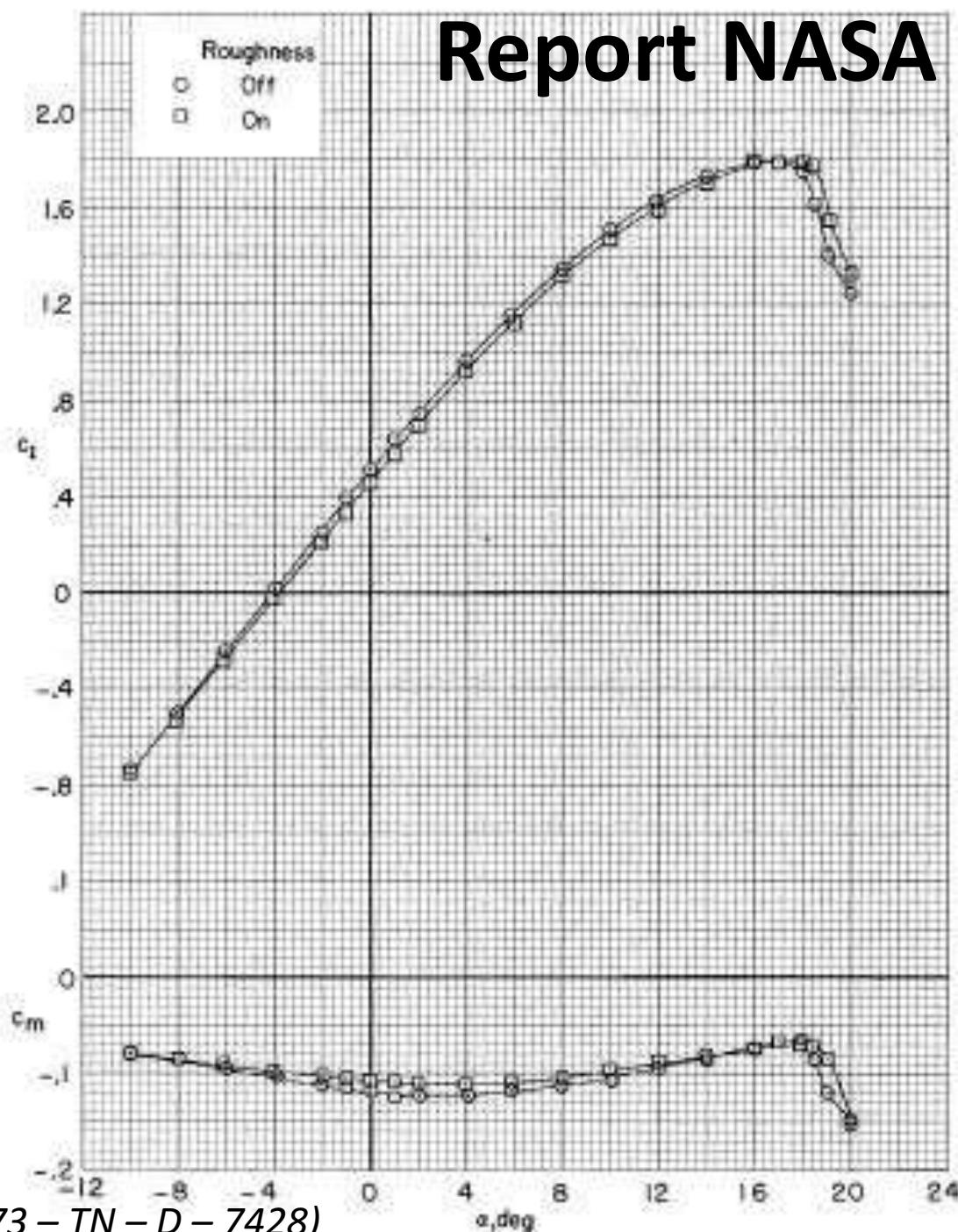
Adapun batasan masalah dalam tugas akhir ini adalah sebagai berikut:

- *Airfoil* yang digunakan adalah LS(1)-0417MOD.
- Sudut *flap* pada *take-off* 10° dan *landing* 40° .
- Pesawat Terbang pada ketinggian *sea level* dengan kecepatan *take-off* dan *landing* 66 knot.

METODE PENELITIAN



Report NASA

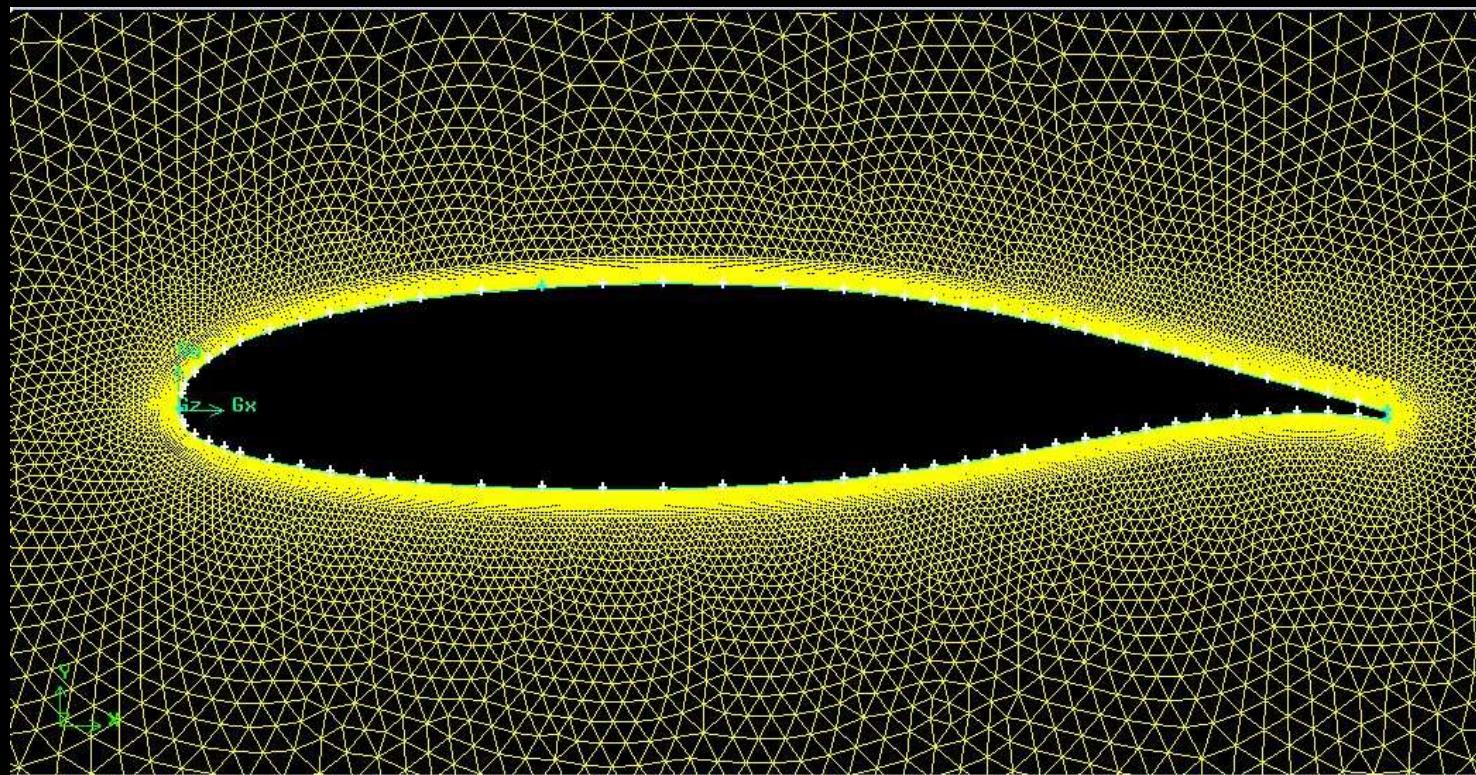


(Sumber: NASA – 1973 – TN – D – 7428)

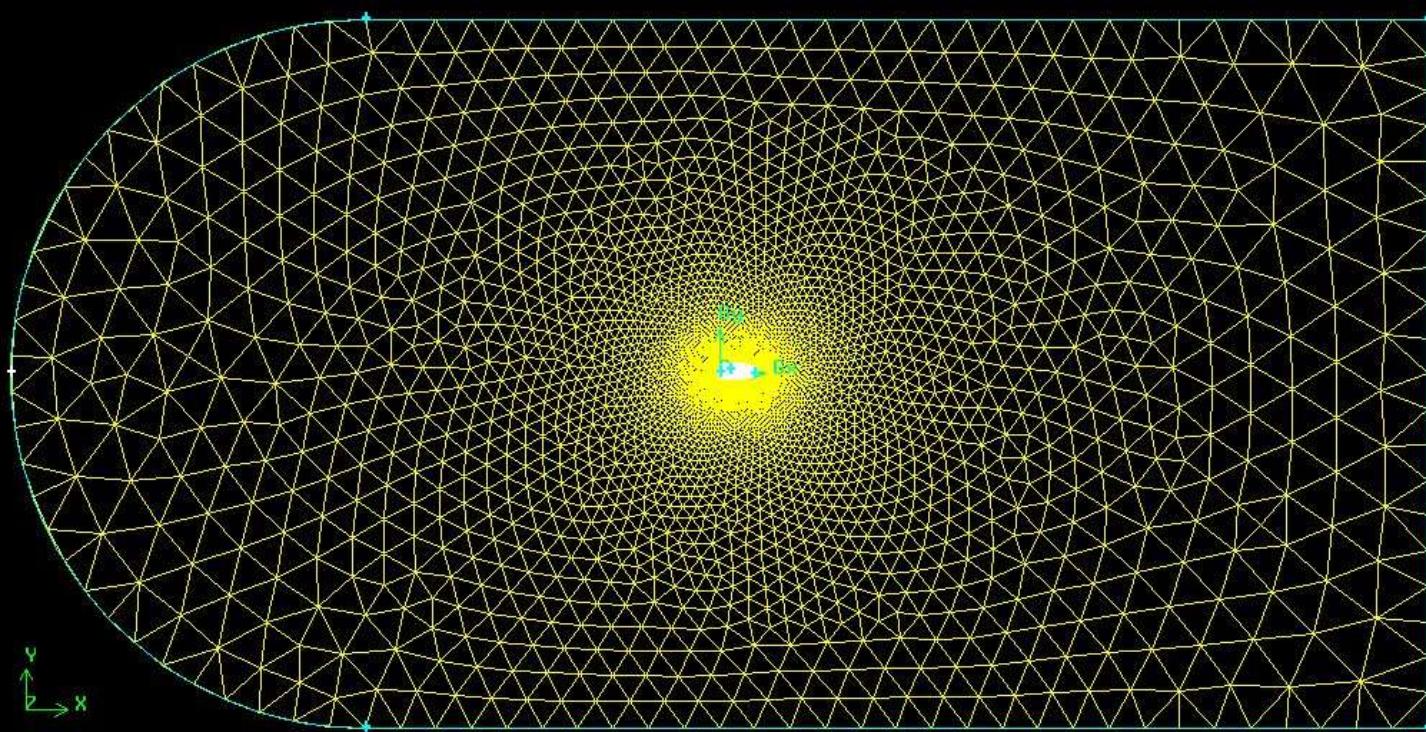
Airfoil NASA GA(W)-1



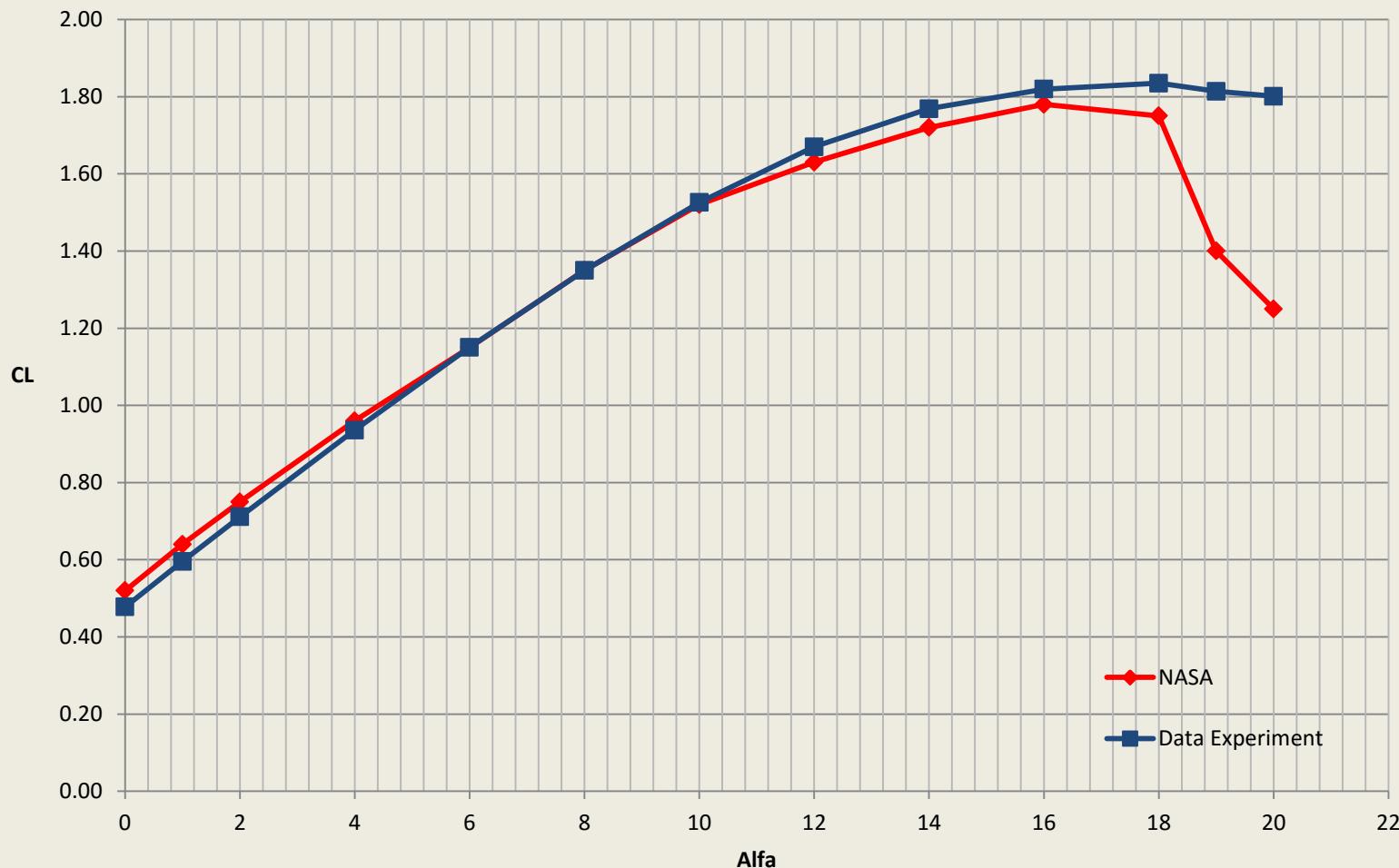
Hasil Mesh Airfoil



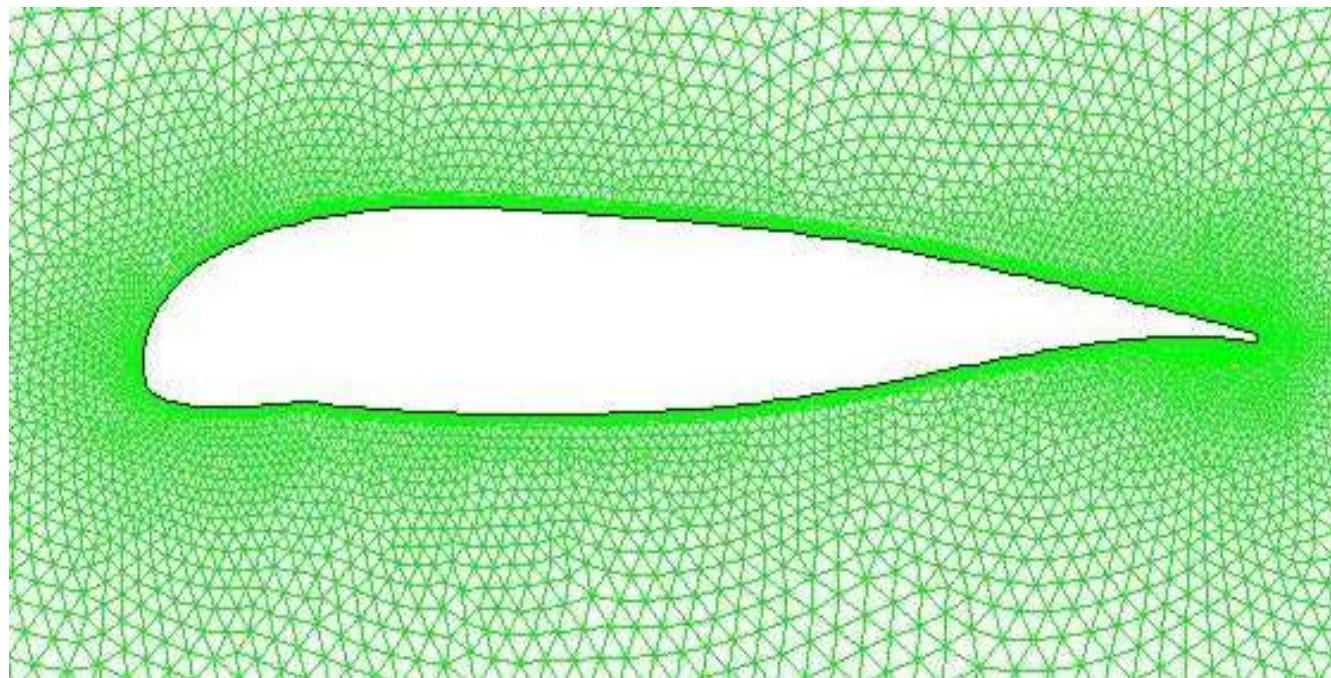
Mesh pada domain farfield

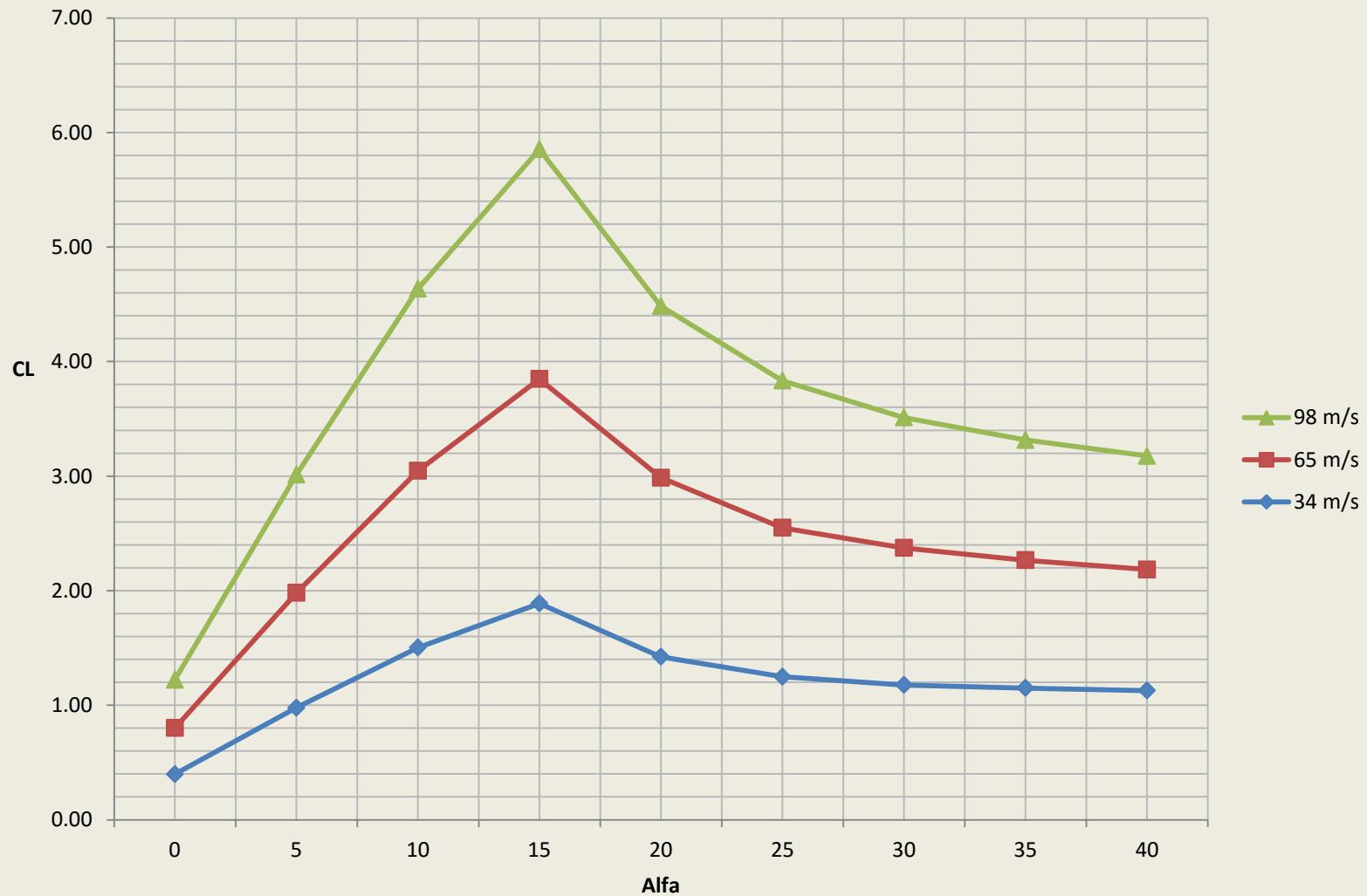


Validasi

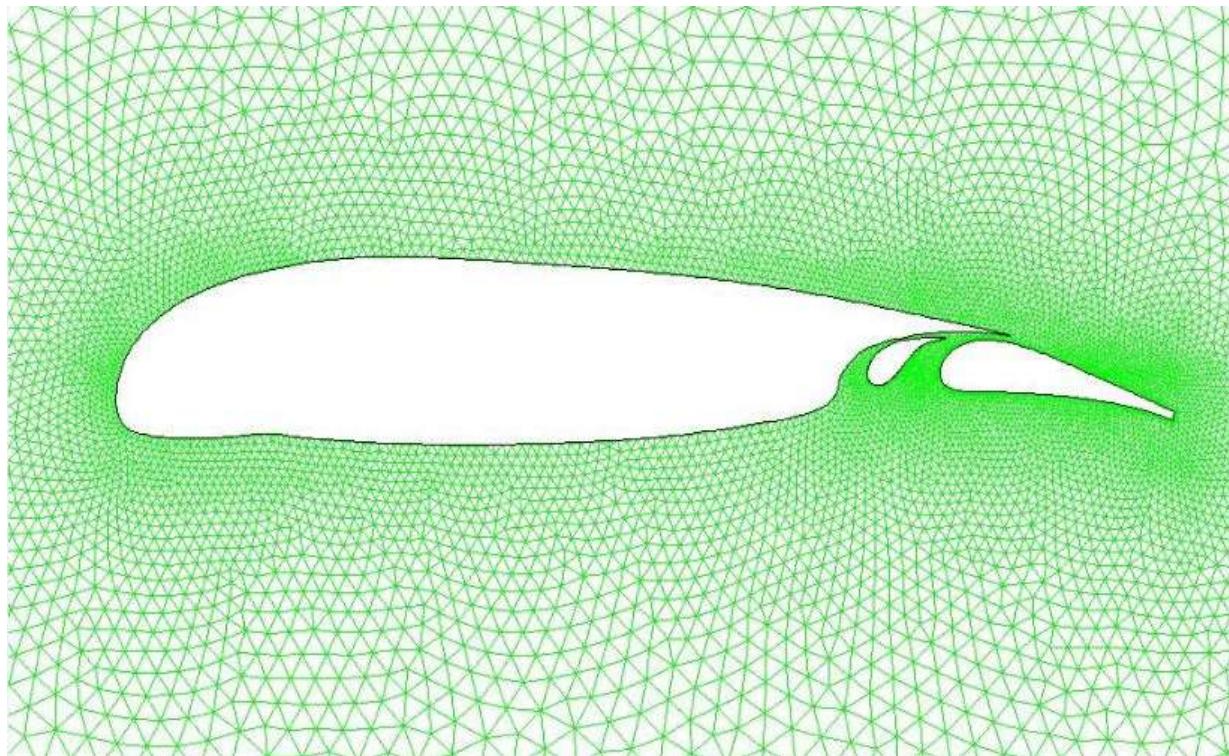


BASIC AIRFOIL N-2XX





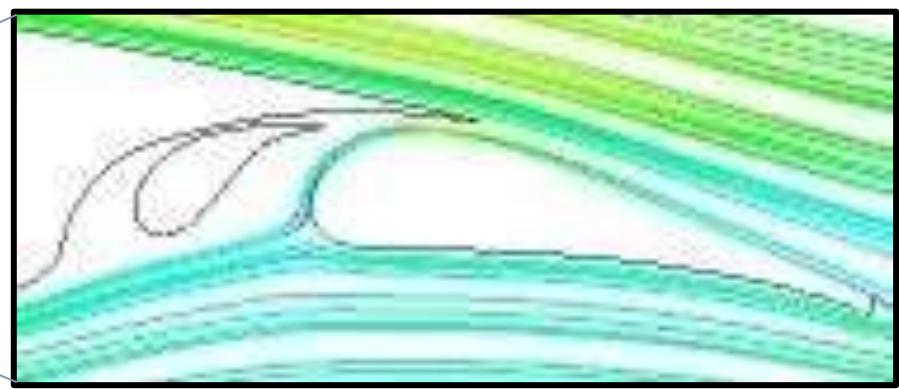
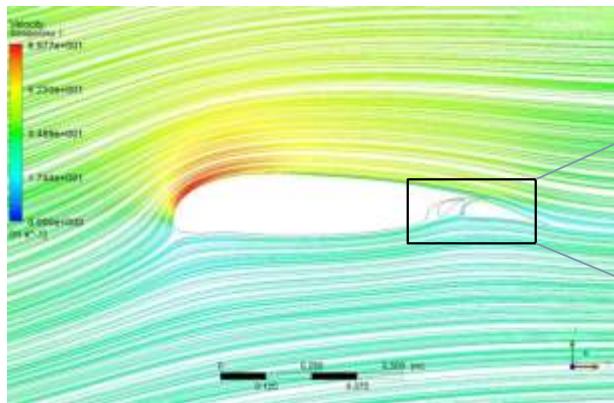
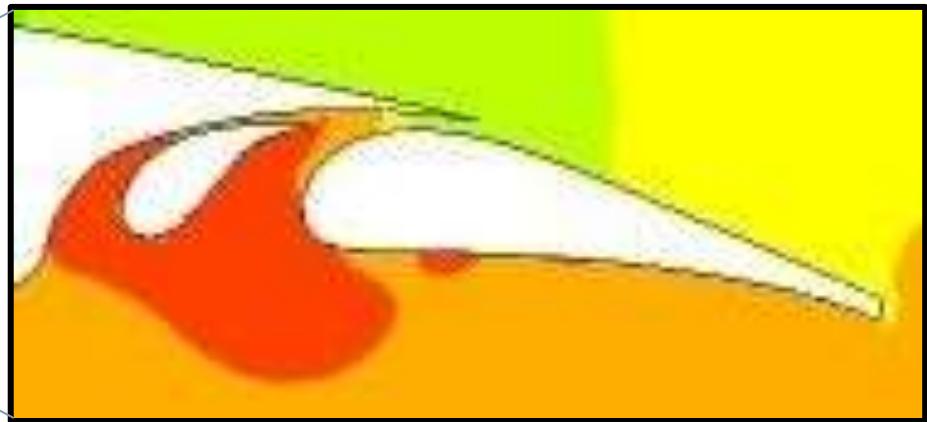
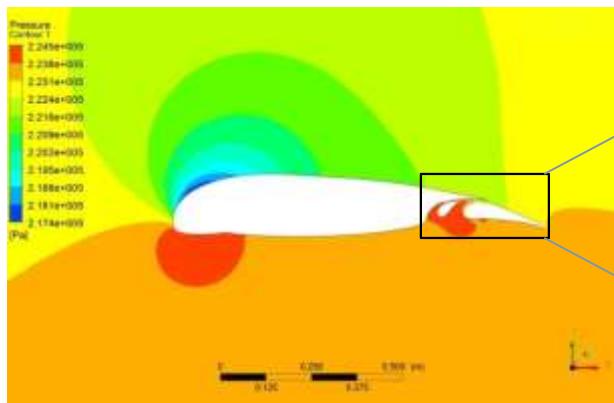
DEFLEKSI FLAP 10°



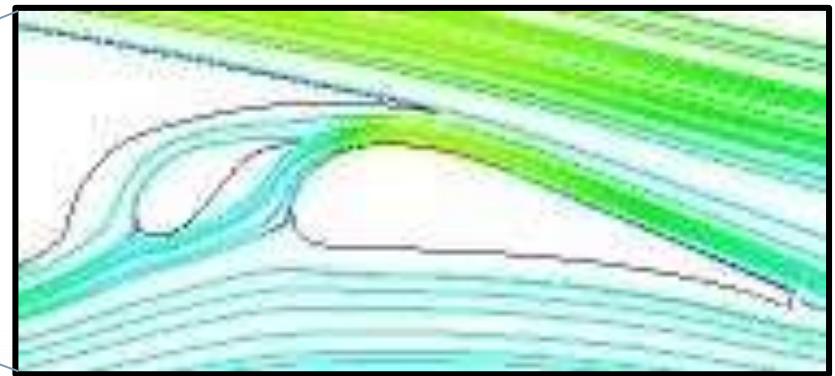
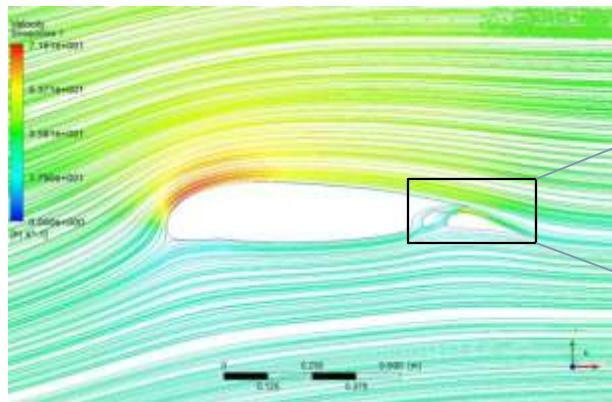
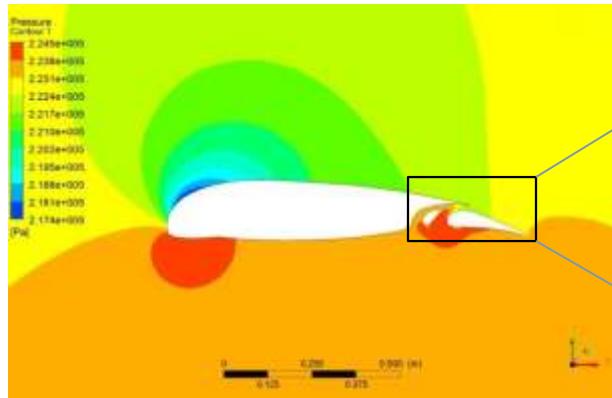
Variasi Take-off

YC	-0.130	-0.140	-0.150
XC			
0.792	Basic	MOD 1	MOD 2
0.762	MOD 3	MOD 4	MOD 5
0.732	MOD 6	MOD 7	MOD 8
0.702	MOD 9	MOD 10	MOD 11

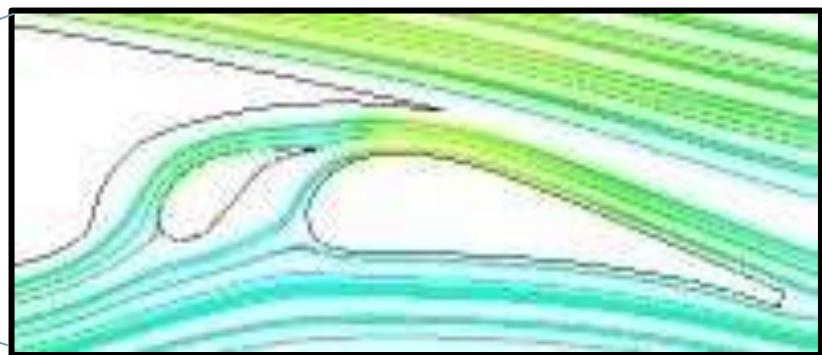
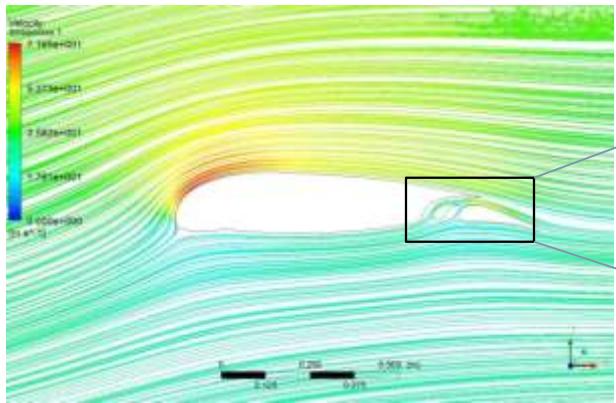
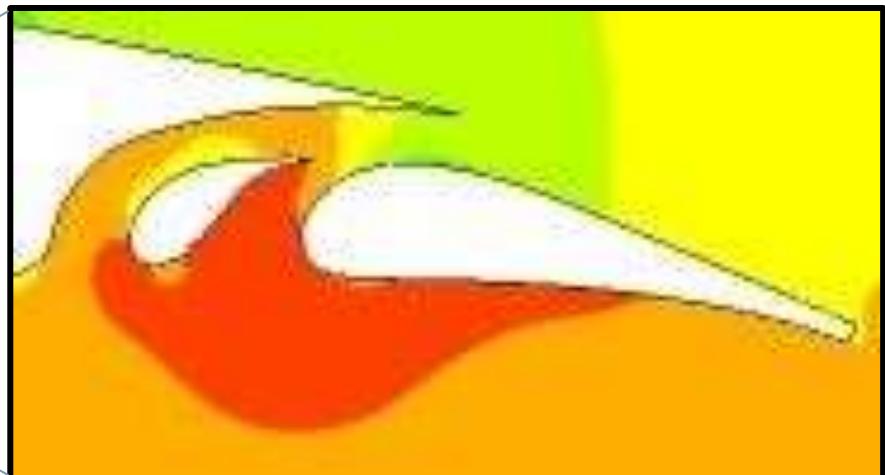
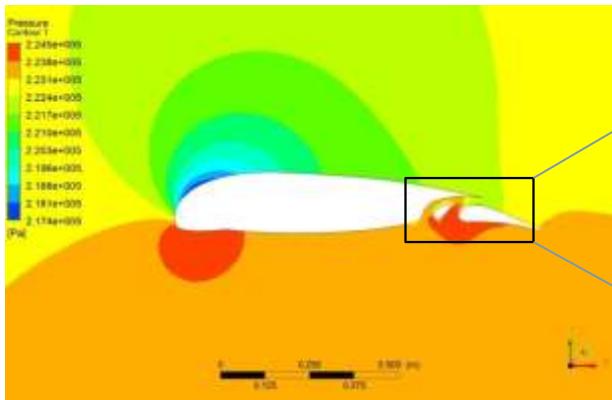
MODEL BASIC

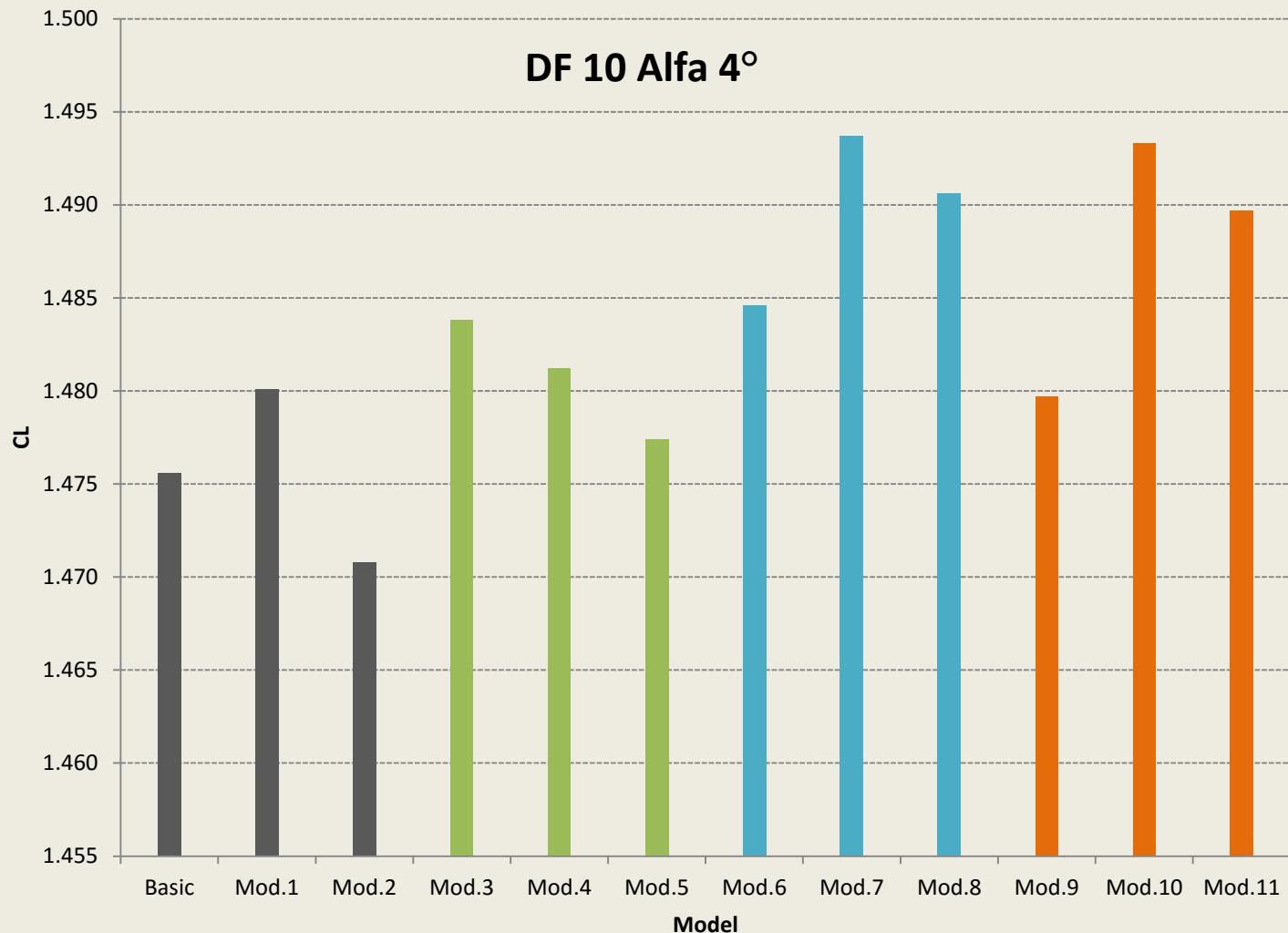


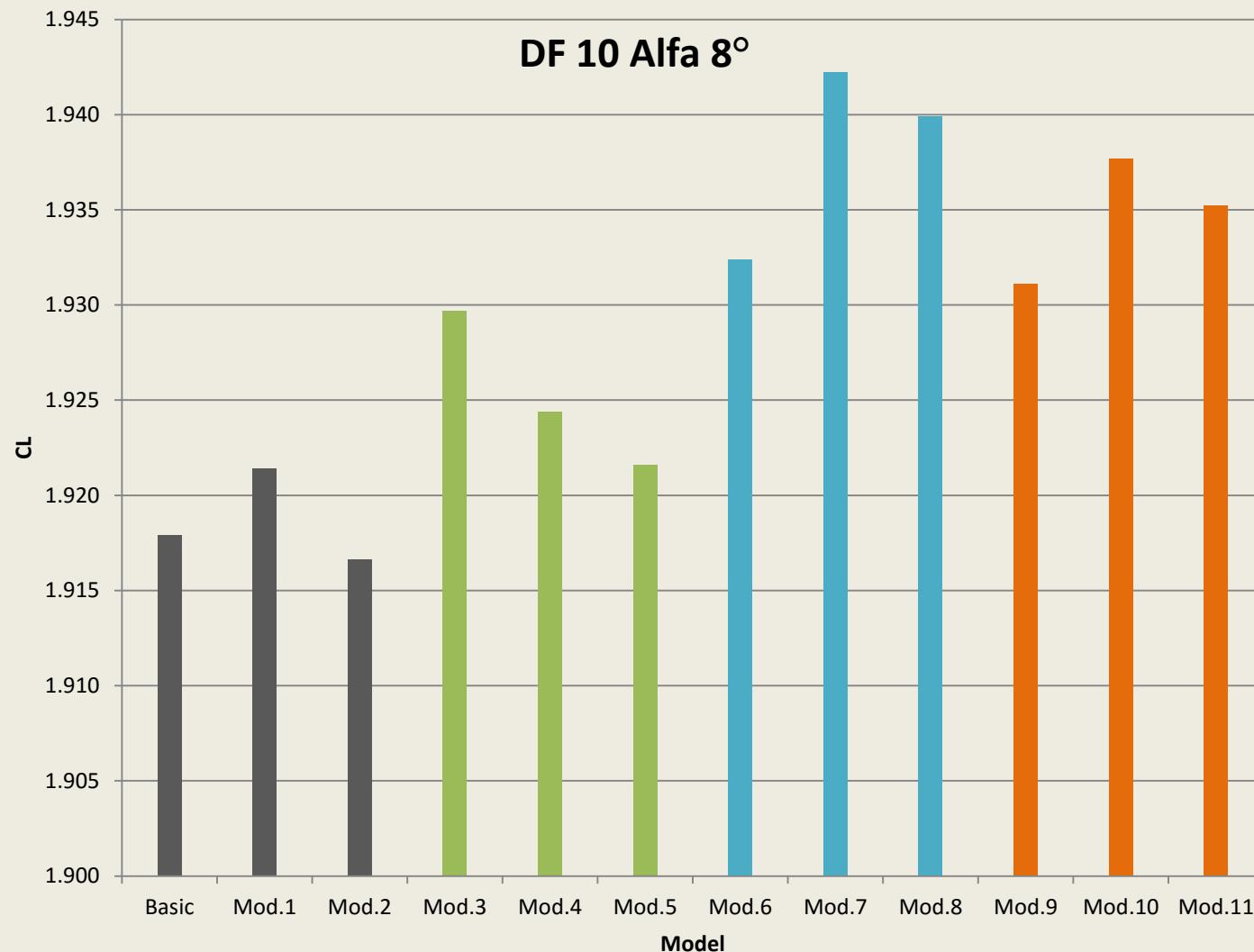
MODEL 7



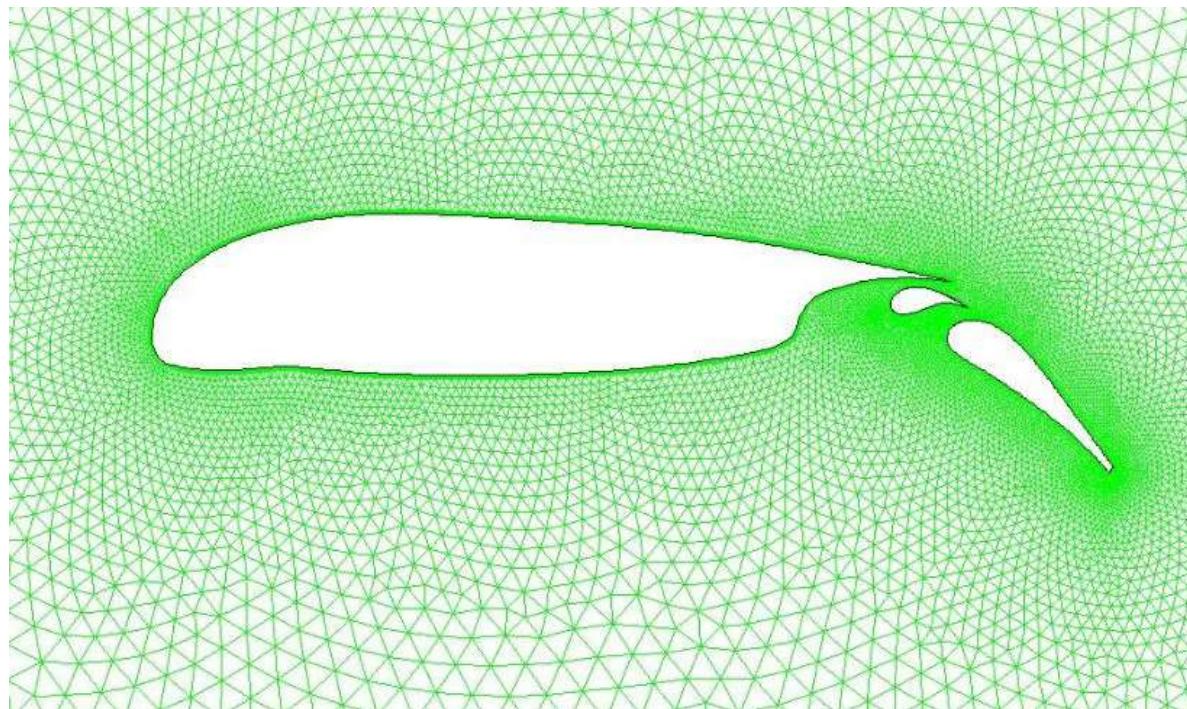
MODEL 11







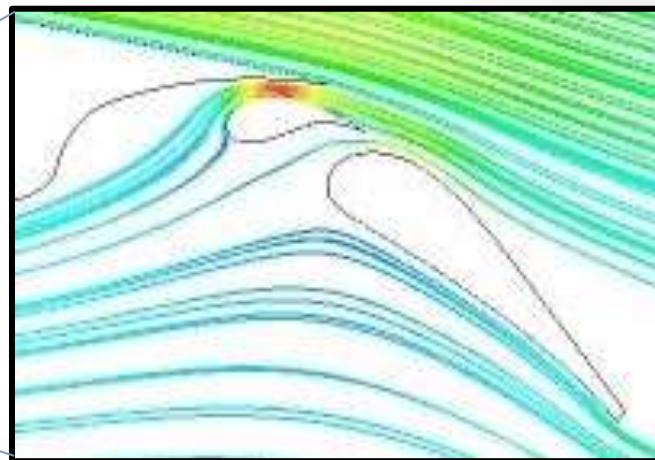
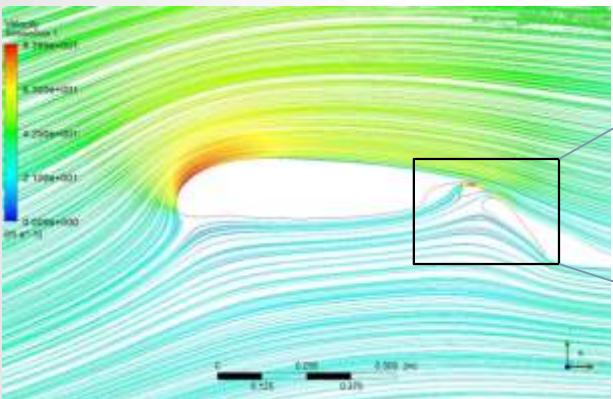
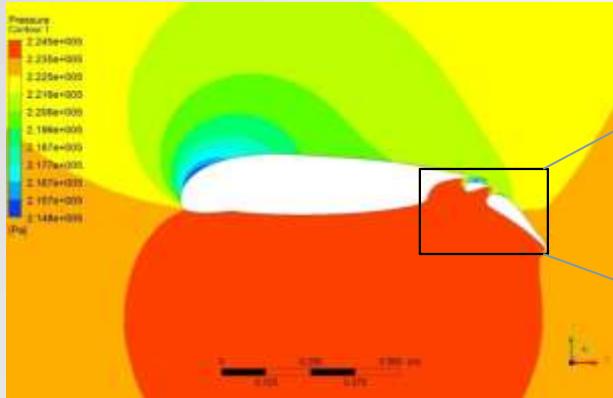
DEFLEKSI FLAP 40°



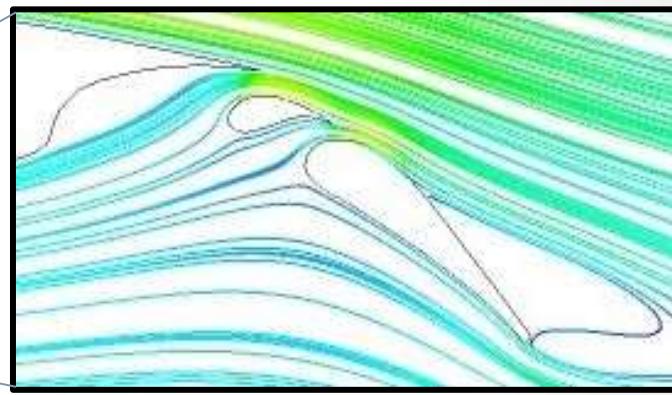
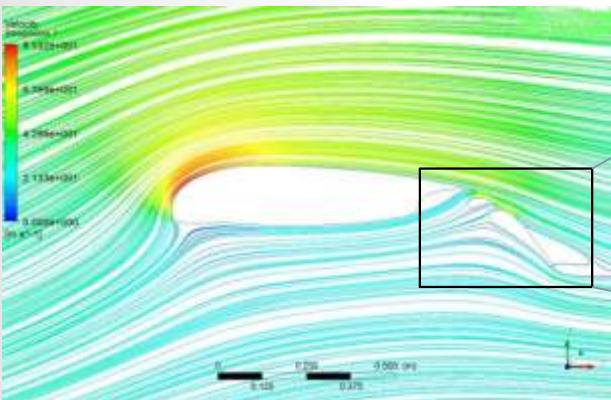
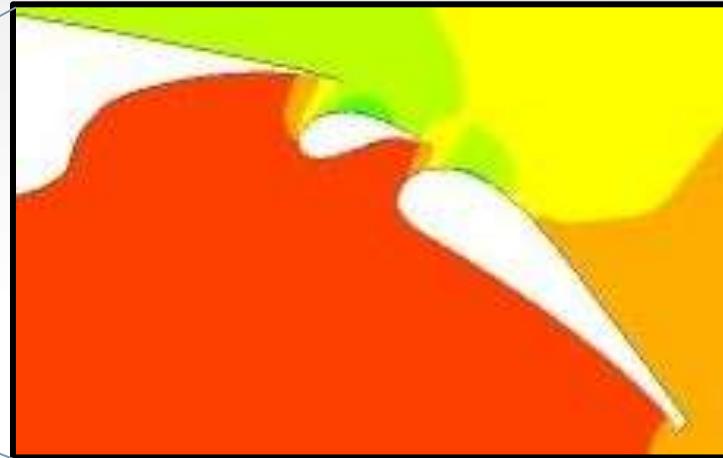
Variasi Landing

YC	-0.130	-0.160	-0.190	-0.210
XC				
0.792	Basic	Mod 3	Mod 6	Mod 9
0.782	Mod 1	Mod 4	Mod 7	Mod 10
0.772	Mod 2	Mod 5	Mod 8	Mod 11

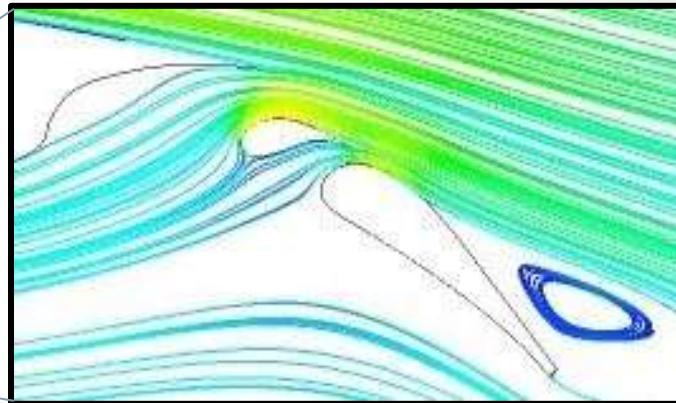
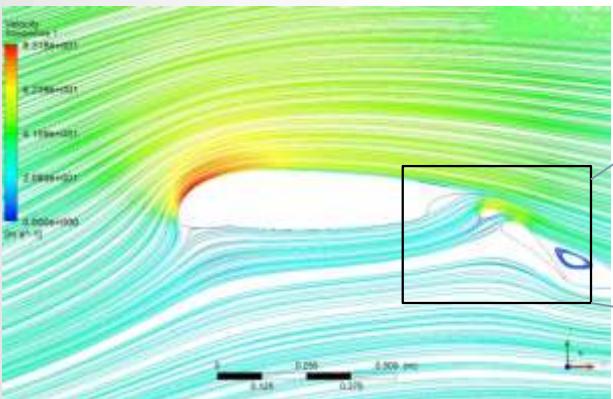
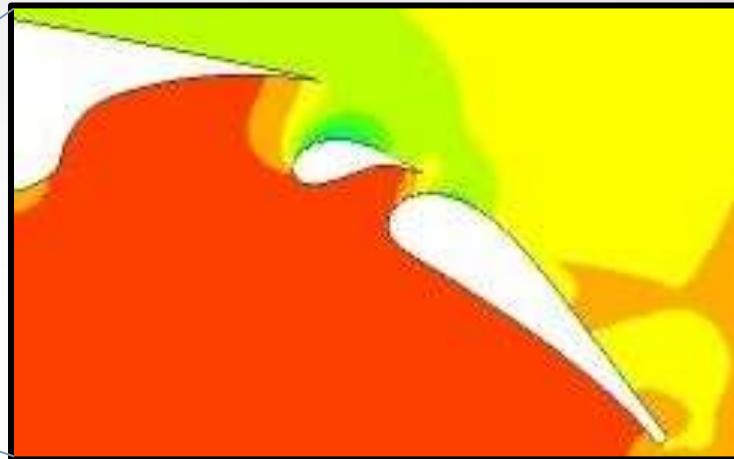
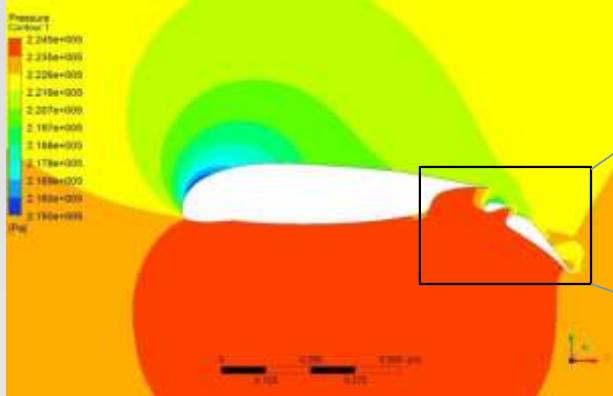
MODEL BASIC

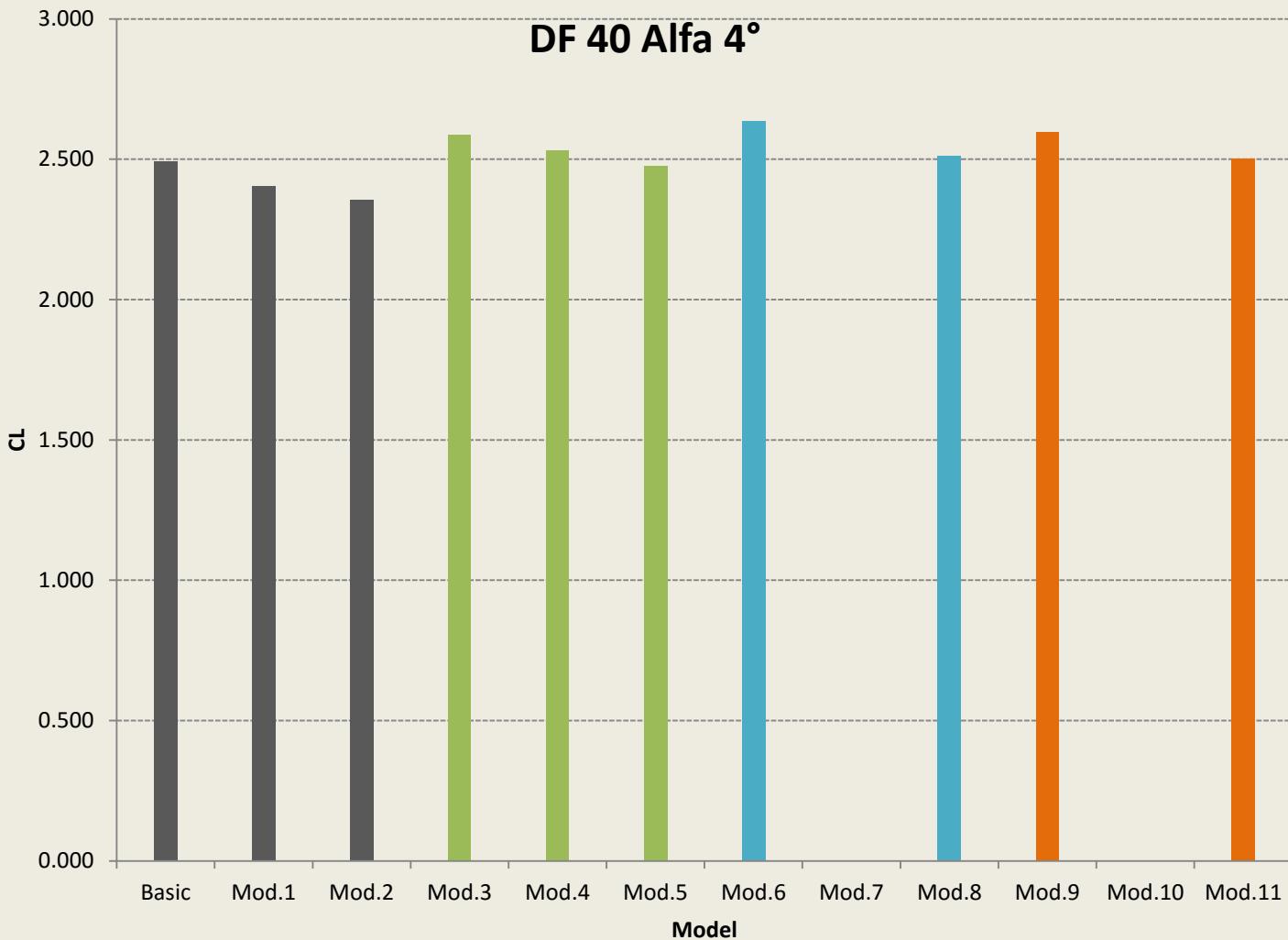


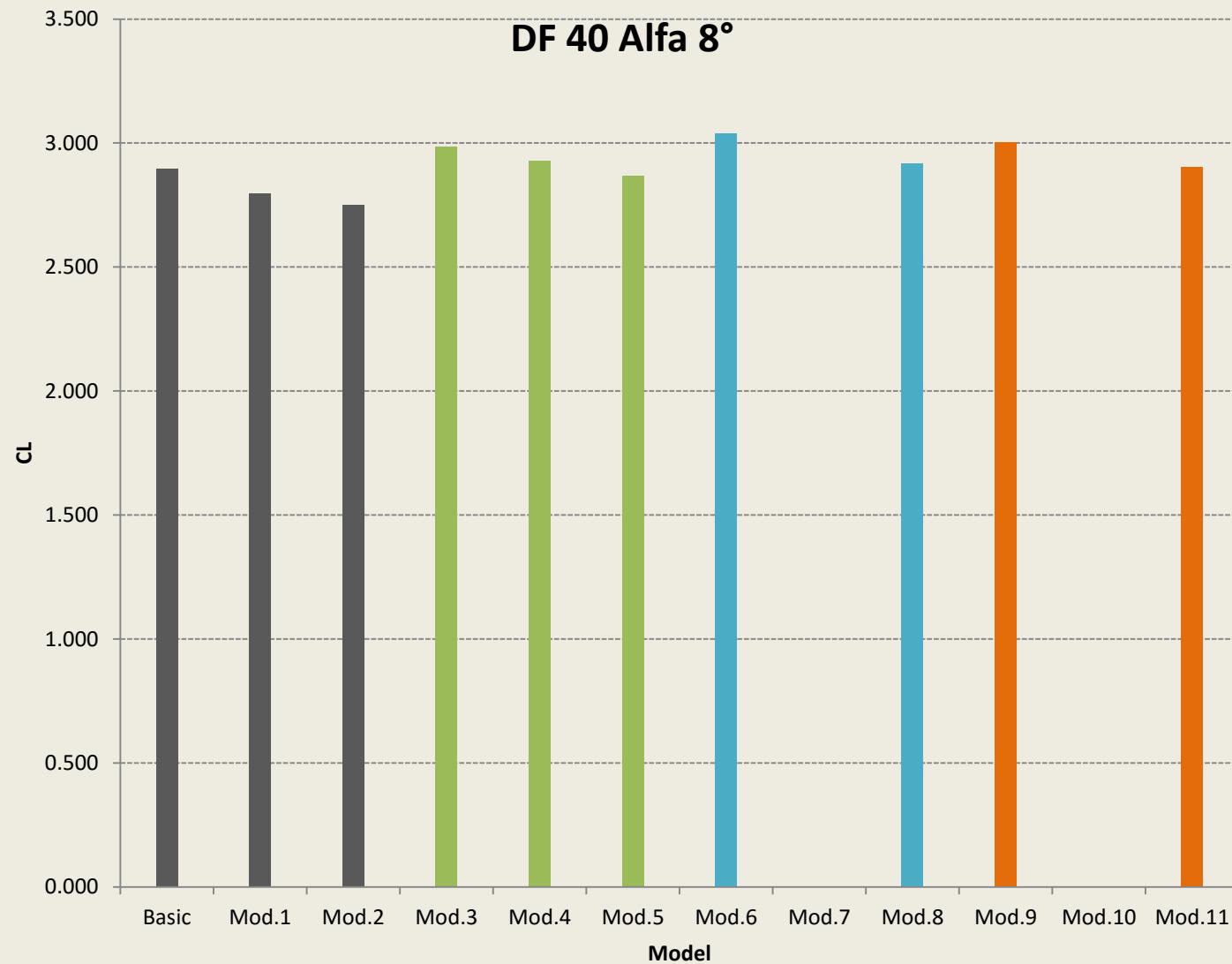
MODEL 6



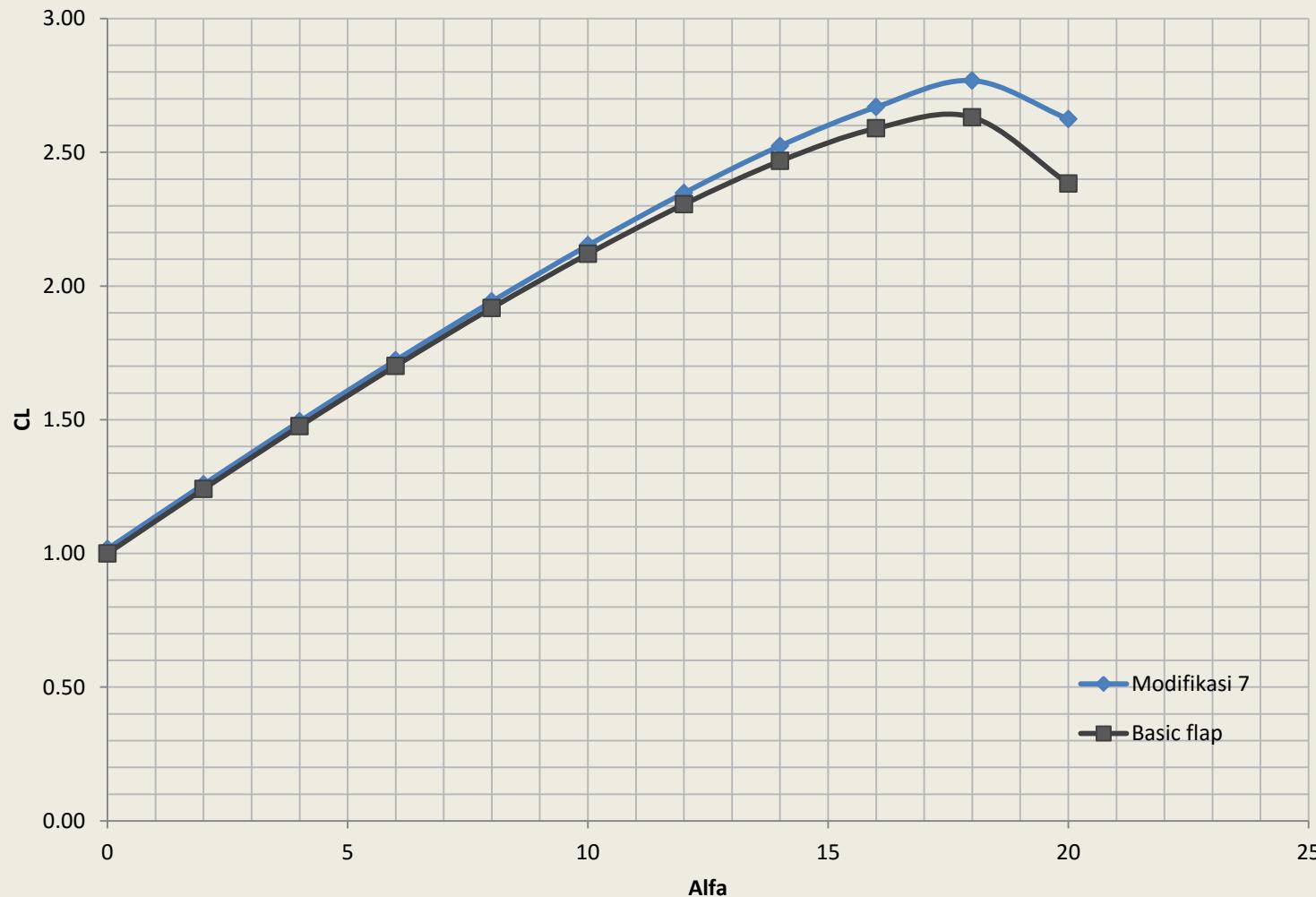
MODEL 11



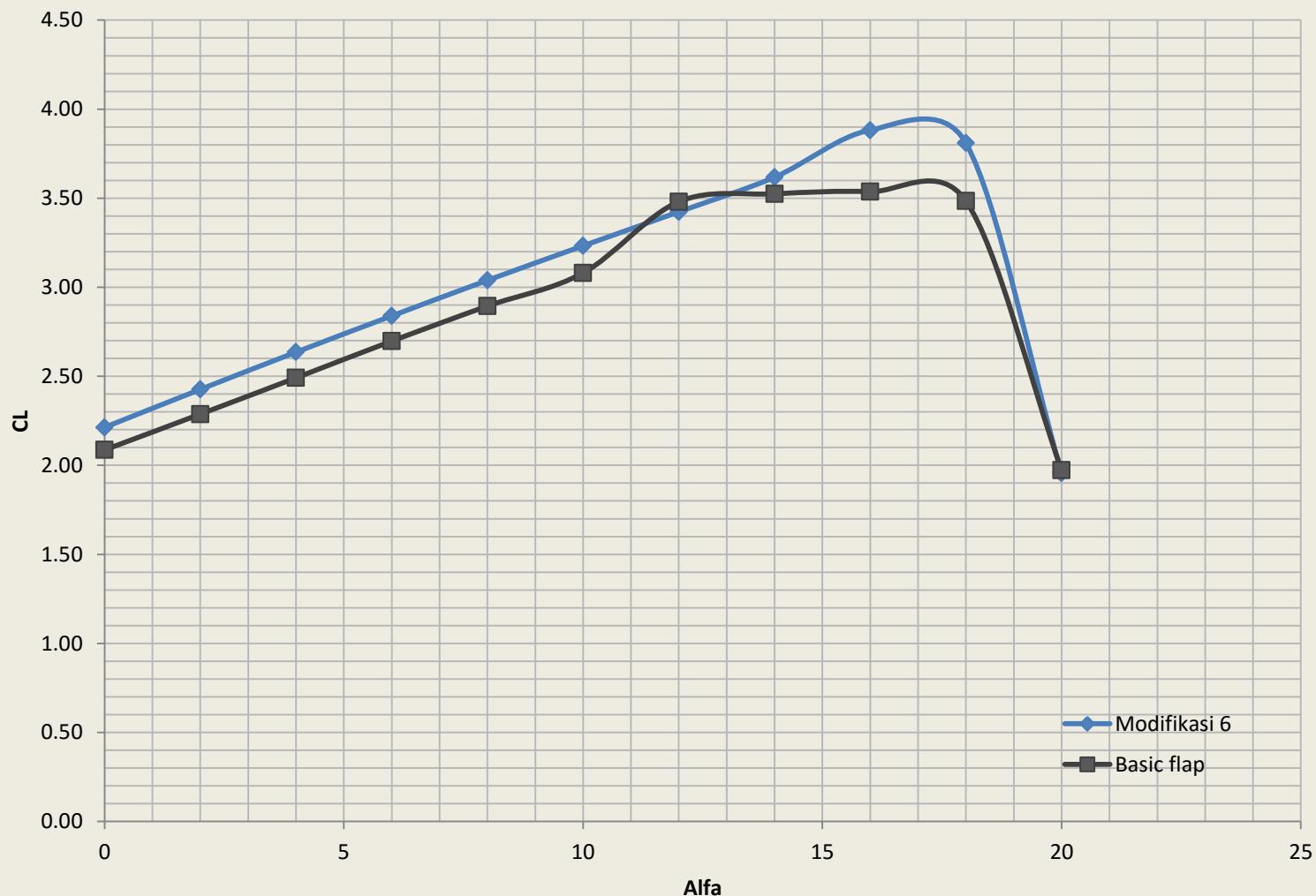




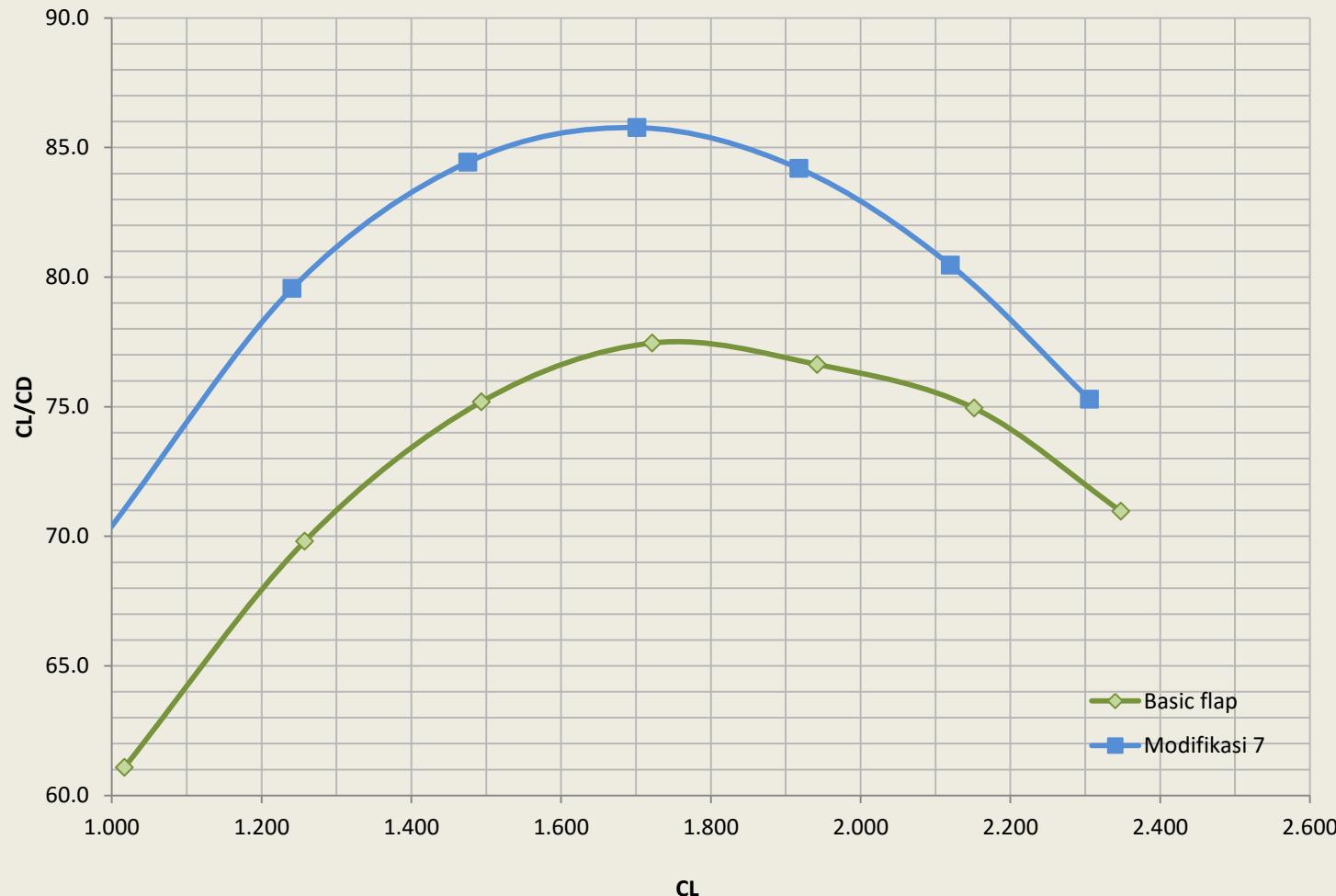
Defleksi Flap 10°



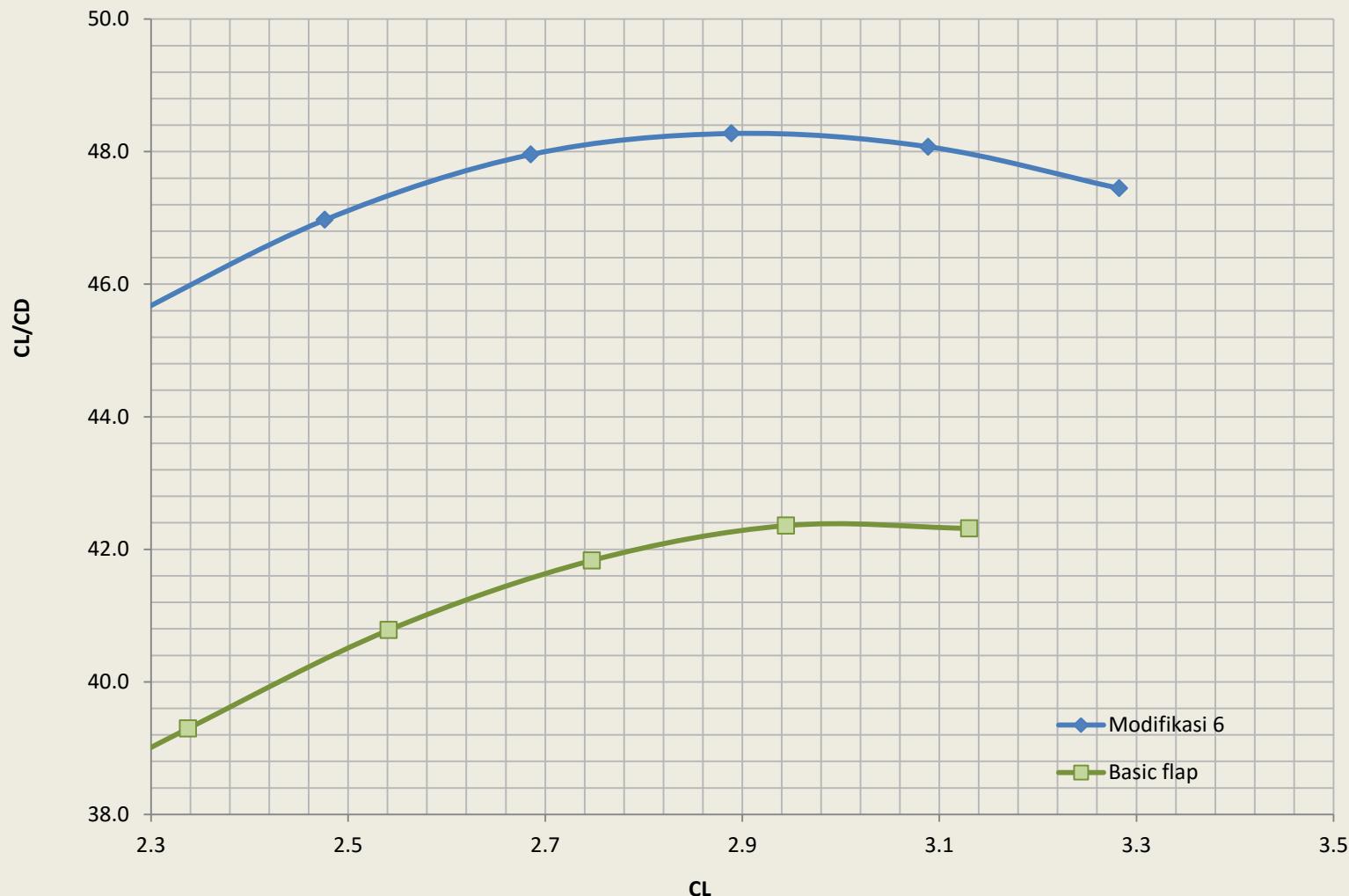
Defleksi Flap 40°



CL Terhadap CL/CD Pada DF 10°



CL Terhadap CL/CD Pada DF 40°



KESIMPULAN

1. Karakteristik aerodinamika *flap* jenis LS1-0417MOD yang dipakai pesawat N-2XX saat ini memiliki nilai CLmax sebesar 2.6309 di sudut serang 18° dengan koefisien gaya hambat sebesar 0.5363 untuk kondisi *take-off* dan nilai CLmax sebesar 3.5367 di sudut serang 16° dengan koefisien gaya hambat sebesar 0.10387 untuk kondisi *landing*.
2. Desain terbaik didapatkan model VII pada konfigurasi *gap* 6.27% c dan *overlap* 13.69% c dari konfigurasi sebelumnya 6.23% c *gap* dan 13.77% c *overlap* dengan nilai CLmax mencapai 2.7681 dan nilai CD 0.05565 sehingga mengalami peningkatan CL sebesar 4.95% dan CD 3.62% pada kondisi *take-off*. Pada model VI didapatkan konfigurasi *gap* 1.99% c dan *overlap* 2.61% c dari konfigurasi sebelumnya 1.50% c dan 6.47% c dengan nilai CLmax mencapai 3.8820 dan nilai CD 0.09740 sehingga mengalami peningkatan CL sebesar 8.89% tetapi mengalami penurunan CD sebesar 6.64% pada kondisi *landing*.

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TERIMA KASIH

DF 10 alfa 4

YC	-0.130	-0.140	-0.150
XC			
0.792	1.4756	1.4801	1.4708
0.762	1.4838	1.4812	1.4774
0.732	1.4846	1.4937	1.4906
0.702	1.4797	1.4933	1.4897

DF 10 alfa 8

YC	-0.130	-0.140	-0.150
XC			
0.792	1.9179	1.9214	1.9166
0.762	1.9297	1.9244	1.9216
0.732	1.9324	1.9422	1.9399
0.702	1.9311	1.9377	1.9352

DF 40 alfa 4

YC	-0.130	-0.160	-0.190	-0.210
XC				
0.792	2.4913	2.5853	2.6353	2.5963
0.782	2.4037	2.5309	Divergence	Divergence
0.772	2.3553	2.4745	2.5125	2.5002

DF 40 alfa 8

YC	-0.130	-0.160	-0.190	-0.210
XC				
0.792	2.8944	2.9859	3.0388	3.0028
0.782	2.7957	2.9267	Divergence	Divergence
0.772	2.7489	2.8671	2.9168	2.9032

Basic Airfoil N-2XX

Alpha	Kecepatan 34 m/s		Kecepatan 65 m/s		Kecepatan 98 m/s	
	CL	CD	CL	CD	CL	CD
0	0.3979	0.0109	0.4035	0.0101	0.4209	-0.0100
5	0.9784	0.0133	1.0023	0.0130	1.0316	0.0134
10	1.5031	0.0195	1.5436	0.0197	1.5883	0.0216
15	1.8886	0.0336	1.9597	0.0333	2.0062	0.0375
20	1.4224	0.1513	1.5639	0.1324	1.4973	0.1522
25	1.2491	0.2840	1.2996	0.2751	1.2845	0.2824
30	1.1771	0.4238	1.1964	0.4132	1.1379	0.3995
35	1.1495	0.5629	1.1170	0.5347	1.0495	0.5066
40	1.1279	0.6967	1.0561	0.6424	0.9932	0.6089

Validasi GA(W)-1

Alpha	Report NASA	CL	CD	error
0	0.52	0.48	0.011	8.1
1	0.64	0.60	0.012	6.9
2	0.75	0.71	0.012	5.2
4	0.96	0.94	0.014	2.5
6	1.15	1.15	0.016	0.0
8	1.35	1.35	0.019	0.0
10	1.52	1.53	0.023	0.4
12	1.63	1.67	0.029	2.5
14	1.72	1.77	0.038	2.8
16	1.78	1.82	0.051	2.2
18	1.75	1.83	0.069	4.9
19	1.40	1.81	0.083	29.5
20	1.25	1.80	0.095	44.1
				3.2

DF 10

Alpha	X	Y	CFX	CFY	CFM	CL	CD	CL/CD	CM	CLbasicflap	Cdbasicflap	CL/CD
0	1	0	0.01665	1.0169	0.23277	1.017	0.017	61.0861	-0.233	1.000	0.014	70.3760
2	0.99939	0.03490	-0.02589	1.2577	0.23513	1.258	0.018	69.8106	-0.235	1.241	0.016	79.5625
4	0.99756	0.06976	-0.08438	1.4914	0.23645	1.494	0.020	75.1889	-0.236	1.476	0.017	84.4368
6	0.99452	0.10453	-0.15788	1.7148	0.23641	1.722	0.022	77.4578	-0.236	1.701	0.020	85.7657
8	0.99027	0.13917	-0.24520	1.9268	0.2351	1.942	0.025	76.6295	-0.235	1.918	0.023	84.1883
10	0.98481	0.17365	-0.34538	2.1241	0.23219	2.152	0.029	74.9413	-0.232	2.120	0.026	80.4645
12	0.97815	0.20791	-0.45576	2.3033	0.22729	2.348	0.033	70.9659	-0.227	2.306	0.031	75.2881
14	0.97030	0.24192	-0.57327	2.4582	0.21987	2.524	0.038	65.6386	-0.220	2.467	0.036	68.9554
16	0.96126	0.27564	-0.69192	2.5781	0.20879	2.669	0.046	58.6524	-0.209	2.589	0.043	60.8714
18	0.95106	0.30902	-0.80246	2.6498	0.19421	2.768	0.056	49.7424	-0.194	2.631	0.054	49.0605
20	0.93969	0.34202	-0.81658	2.4956	0.16913	2.624	0.086	30.4413	-0.169	2.382	0.091	26.1158

DF 40

Alpha	X	Y	CFX	CFY	CFM	CL	CD	CL/CD	CM	CLbasicflap	Cdbasicflap	CL/CD
0	1	0	0.04875	2.2132	0.52676	2.213	0.049	45.40	-0.527	2.086	0.0553	37.7424
2	0.99939	0.03490	-0.03305	2.4267	0.52271	2.426	0.052	46.97	-0.523	2.287	0.0582	39.2955
4	0.99756	0.06976	-0.12901	2.6327	0.51772	2.635	0.055	47.96	-0.518	2.491	0.0611	40.7815
6	0.99452	0.10453	-0.23826	2.8295	0.51156	2.839	0.059	48.27	-0.512	2.697	0.0645	41.8323
8	0.99027	0.13917	-0.36032	3.0180	0.50489	3.039	0.063	48.07	-0.505	2.894	0.0683	42.3574
10	0.98481	0.17365	-0.49425	3.1954	0.49712	3.233	0.068	47.45	-0.497	3.080	0.0728	42.3159
12	0.97815	0.20791	-0.63942	3.3640	0.48974	3.423	0.074	46.28	-0.490	3.480	0.0785	44.3530
14	0.97030	0.24192	-0.79609	3.5302	0.48527	3.618	0.082	44.34	-0.485	3.524	0.0893	39.4492
16	0.96126	0.27564	-0.97641	3.7585	0.50350	3.882	0.097	39.86	-0.504	3.537	0.1039	34.0480
18	0.95106	0.30902	-1.06270	3.6607	0.45280	3.810	0.121	31.61	-0.453	3.484	0.1252	27.8406
20	0.93969	0.34202	-0.18801	2.0123	0.46177	1.955	0.512	3.82	-0.462	1.973	0.4386	4.4973