Tutorial Modul 4

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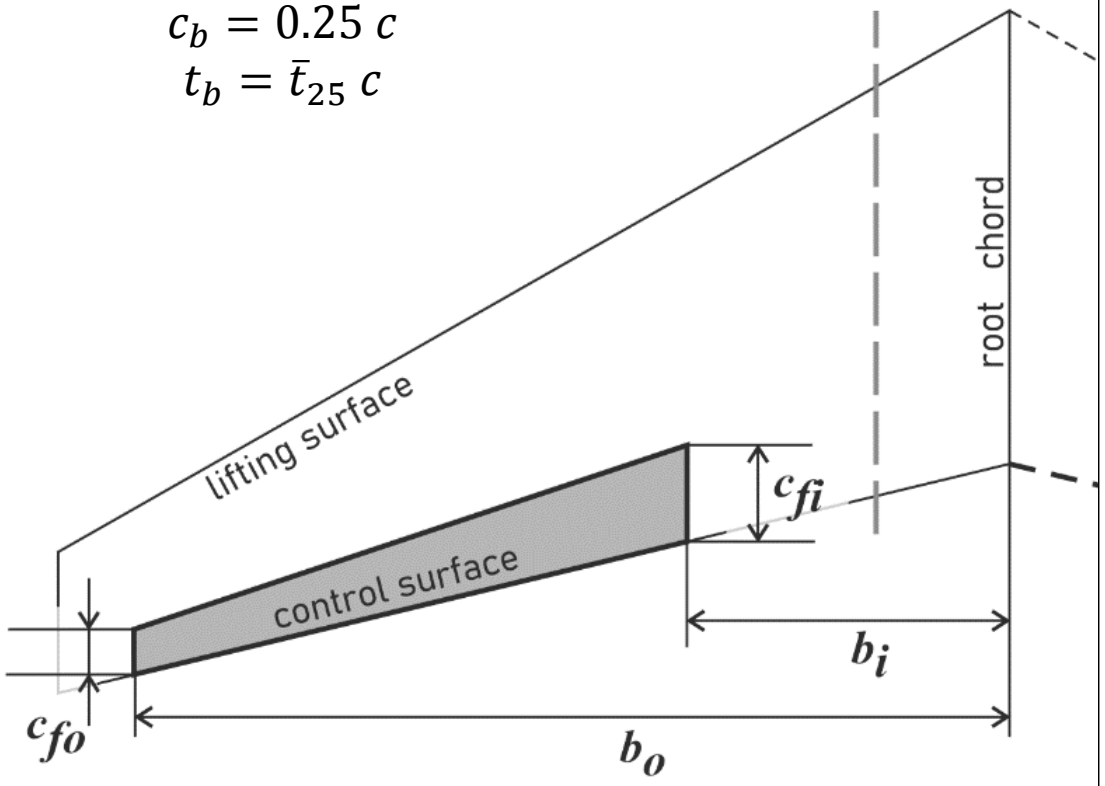
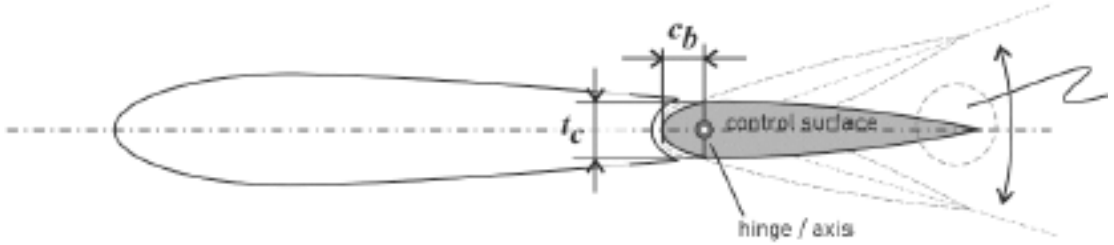
Parameter Konfigurasi Bidang-bidang Kendali

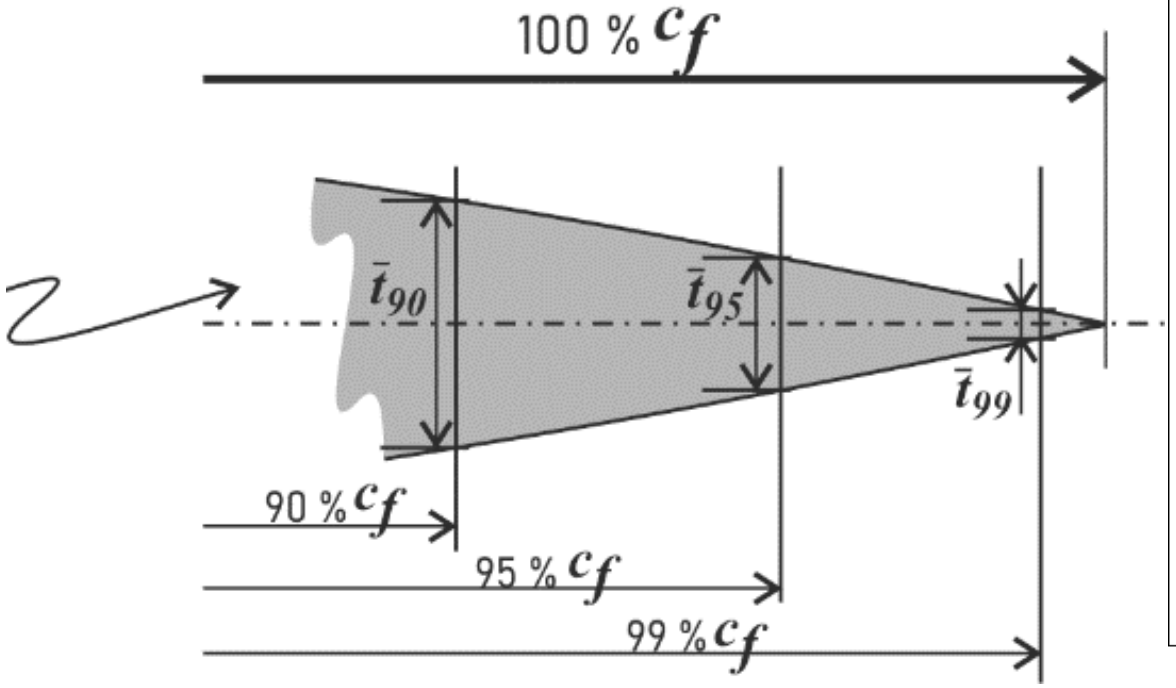
$$c_b = 0.25\ c$$
$$t_b = \bar{t}_{25}\ c$$



AILERON		RUDDER	
Chord Inboard (c_{fi}):	[m]	Chord Inboard (c_{fi}):	[m]
Chord Outboard (c_{fo}):	[m]	Chord Outboard (c_{fo}):	[m]
Chord rata-rata (c):	[m]	Chord rata-rata (c):	[m]
Semispan Inboard (b_{fi}):	[m]	Semispan Inboard (b_{fi}):	[m]
Semispan Outboard (b_{fo}):	[m]	Semispan Outboard (b_{fo}):	[m]
Axis Hor-pos (c_b):	[m]	Axis Hor-pos (c_b):	[m]
Tebal airfoil pos. axis (t_b):	[m]	Tebal airfoil pos. axis (t_b):	[m]
Tebal airfoil 90% chord ($\bar{t}_{90}$):	[-]	Tebal airfoil 90% chord ($\bar{t}_{90}$):	[-]
Tebal airfoil 95% chord ($\bar{t}_{95}$):	[-]	Tebal airfoil 95% chord ($\bar{t}_{95}$):	[-]
Tebal airfoil 99% chord ($\bar{t}_{99}$):	[-]	Tebal airfoil 99% chord ($\bar{t}_{99}$):	[-]
Kemiringan profil airfoil antara 90% - 99% → $\tan\left(\phi_{TE}/2\right) = \frac{1}{2}\left[\frac{\bar{t}_{90} - \bar{t}_{99}}{0.09}\right]$:		Kemiringan profil airfoil antara 90% - 99% → $\tan\left(\phi_{TE}/2\right) = \frac{1}{2}\left[\frac{\bar{t}_{90} - \bar{t}_{99}}{0.09}\right]$:	
Kemiringan profil airfoil antara 95% - 99% → $\tan\left(\phi_{TE}/2\right) = \frac{1}{2}\left[\frac{\bar{t}_{95} - \bar{t}_{99}}{0.04}\right]$:		Kemiringan profil airfoil antara 95% - 99% → $\tan\left(\phi_{TE}/2\right) = \frac{1}{2}\left[\frac{\bar{t}_{95} - \bar{t}_{99}}{0.04}\right]$:	

Parameter Konfigurasi Bidang-bidang Kendali





AILERON		RUDDER	
Chord Inboard (c_{fi}):	[m]	Chord Inboard (c_{fi}):	[m]
Chord Outboard (c_{fo}):	[m]	Chord Outboard (c_{fo}):	[m]
Chord rata-rata (c):	[m]	Chord rata-rata (c):	[m]
Semispan Inboard (b_{fi}):	[m]	Semispan Inboard (b_{fi}):	[m]
Semispan Outboard (b_{fo}):	[m]	Semispan Outboard (b_{fo}):	[m]
Axis Hor-pos (c_b):	[m]	Axis Hor-pos (c_b):	[m]
Tebal airfoil pos. axis (t_b):	[m]	Tebal airfoil pos. axis (t_b):	[m]
Tebal airfoil 90% chord ($\bar{t}_{90}$):	[-]	Tebal airfoil 90% chord ($\bar{t}_{90}$):	[-]
Tebal airfoil 95% chord ($\bar{t}_{95}$):	[-]	Tebal airfoil 95% chord ($\bar{t}_{95}$):	[-]
Tebal airfoil 99% chord ($\bar{t}_{99}$):	[-]	Tebal airfoil 99% chord ($\bar{t}_{99}$):	[-]
Kemiringan profil airfoil antara 90% - 99% → $\tan\left(\phi_{TE}/2\right)=\frac{1}{2}\left[\frac{\bar{t}_{90}-\bar{t}_{99}}{0.09}\right]$:		Kemiringan profil airfoil antara 90% - 99% → $\tan\left(\phi_{TE}/2\right)=\frac{1}{2}\left[\frac{\bar{t}_{90}-\bar{t}_{99}}{0.09}\right]$:	
Kemiringan profil airfoil antara 95% - 99% → $\tan\left(\phi_{TE}/2\right)=\frac{1}{2}\left[\frac{\bar{t}_{95}-\bar{t}_{99}}{0.04}\right]$:		Kemiringan profil airfoil antara 95% - 99% → $\tan\left(\phi_{TE}/2\right)=\frac{1}{2}\left[\frac{\bar{t}_{95}-\bar{t}_{99}}{0.04}\right]$:	

AILERON

Tipe aileron : plain flap (STYPE=4.0)

Hapus: namelist **HTPLNF**; variabel **XH, ZH, ALIH** pada namelist **SYNTHS**; serta control card **NACA-H-**; dan **SYMFLP**

Kode	Arti
… $ASYMFLP CHRDFI=1.17, CHRDFO=0.63, SPANFI=23.8, SPANFO=29.3, STYPE=4.0, NDELTA=9.0, DELTAL=-20.0,-15.0,-10.0,-5.0,0.0, 5.0,10.0,15.0,20.0, DELTAR=20.0,15.0,10.0,5.0,0.0, -5.0,-10.0,-15.0,-20.0$ …	➢ **Namelist** Asymmetric Flap ➢ Chord inboard bidang kendali aileron ➢ Chord outboard bidang kendali ➢ Semispan chord inboard bidang kendali ➢ Semispan chord outboard bidang kendali ➢ Tipe bidang kendali ➢ Jumlah sudut defleksi yang akan dihitung ➢ Sudut defleksi aileron kiri yang akan dihitung ➢ Sudut defleksi aileron kanan yang akan dihitung (sinkron dengan aileron kiri)

AILERON

$$\delta_a = \frac{\delta_{left}}{\left|\delta_{left}\right|}\left(\frac{\left|\delta_{left}\right| + \left|\delta_{right}\right|}{2}\right)$$

1 AUTOMATED STABILITY AND CONTROL METHODS PER APRIL 1976 VERSION OF DATCOM
CHARACTERISTICS OF HIGH LIFT AND CONTROL DEVICES
WING PLAIN TRAILING-EDGE FLAP CONFIGURATION
B777kw_13601011

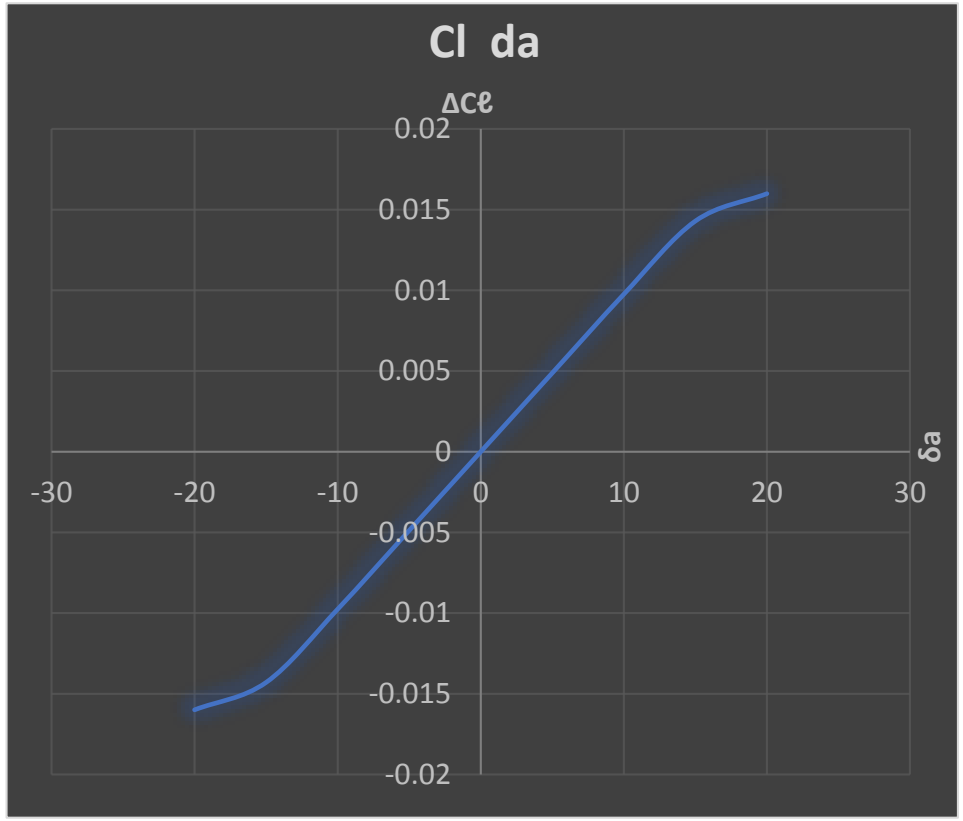
	FLIGHT CONDITIONS					REFERENCE DIM		
MACH NUMBER	ALTITUDE M	VELOCITY M/SEC	PRESSURE N/ M**2	TEMPERATURE DEG K	REYNOLDS NUMBER 1/ M	REF. AREA M**2	REFERENCE LENGTH LONG. M	LAT. M
0.700	11000.00	206.58	9.9016E+00	702.344	4.9004E+05	418.800	8.127	60.000

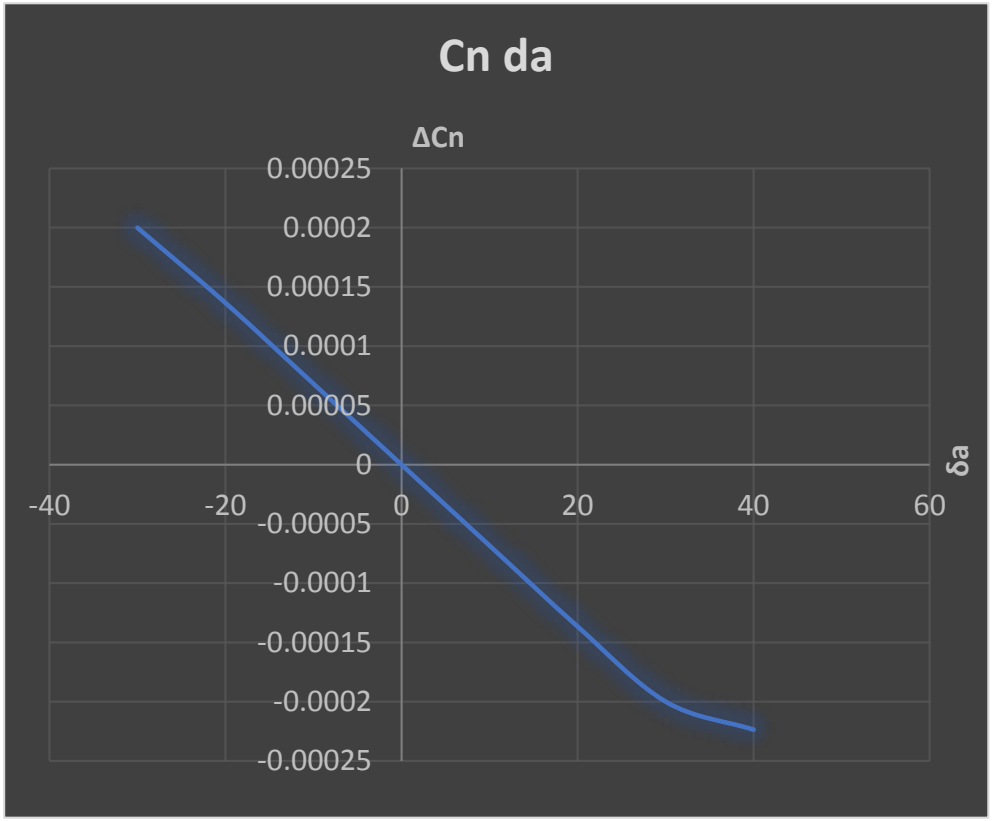
YAWING MOMENT COEFFICIENT,CN, DUE TO CONTROL DEFLECTION

(DELTAL-DELTAR)=	40.0	30.0	20.0	10.0	0.0	-10.0	-20.0	-30.0
ALPHA								
-4.0	3.582E-04	3.202E-04	2.186E-04	1.093E-04	0.000E+00	-1.093E-04	-2.186E-04	-3.202E-04
-2.0	6.803E-05	6.081E-05	4.152E-05	2.076E-05	0.000E+00	-2.076E-05	-4.152E-05	-6.081E-05
0.0	-2.236E-04	-1.999E-04	-1.365E-04	-6.825E-05	0.000E+00	6.825E-05	1.365E-04	1.999E-04
2.0	-5.131E-04	-4.587E-04	-3.132E-04	-1.566E-04	0.000E+00	1.566E-04	3.132E-04	4.587E-04
4.0	-7.978E-04	-7.132E-04	-4.869E-04	-2.435E-04	0.000E+00	2.435E-04	4.869E-04	7.132E-04
6.0	-1.075E-03	-9.613E-04	-6.563E-04	-3.282E-04	0.000E+00	3.282E-04	6.563E-04	9.613E-04
8.0	-1.343E-03	-1.200E-03	-8.197E-04	-4.098E-04	0.000E+00	4.098E-04	8.197E-04	1.200E-03
10.0	-1.555E-03	-1.390E-03	-9.491E-04	-4.746E-04	0.000E+00	4.746E-04	9.491E-04	1.390E-03
12.0	-1.719E-03	-1.536E-03	-1.049E-03	-5.244E-04	0.000E+00	5.244E-04	1.049E-03	1.536E-03
14.0	-1.825E-03	-1.631E-03	-1.114E-03	-5.570E-04	0.000E+00	5.570E-04	1.114E-03	1.631E-03
16.0	-1.902E-03	-1.701E-03	-1.161E-03	-5.806E-04	0.000E+00	5.806E-04	1.161E-03	1.701E-03
18.0	-1.961E-03	-1.753E-03	-1.197E-03	-5.984E-04	0.000E+00	5.984E-04	1.197E-03	1.753E-03
20.0	-1.919E-03	-1.715E-03	-1.171E-03	-5.855E-04	0.000E+00	5.855E-04	1.171E-03	1.715E-03

DELTAL	DELTAR	(CL)ROLL
20.0	-20.0	1.5990E-02
15.0	-15.0	1.4291E-02
10.0	-10.0	9.7577E-03

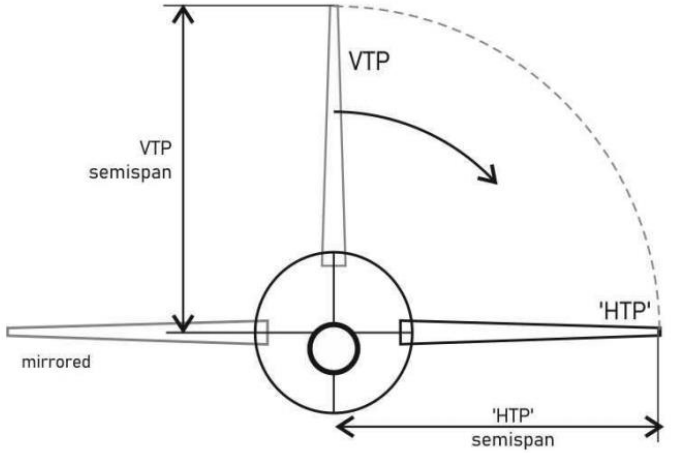
AILERON


Cl da
ΔCℓ
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-30
-20
-10
0
10
20
30
δa


Cn da
ΔCn
0.00025
0.0002
0.00015
0.0001
0.00005
0
-0.00005
-0.0001
-0.00015
-0.0002
-0.00025
-40
-20
0
20
40
60
δa

RUDDER

Tipe rudder : plain flap (STYPE=4.0)



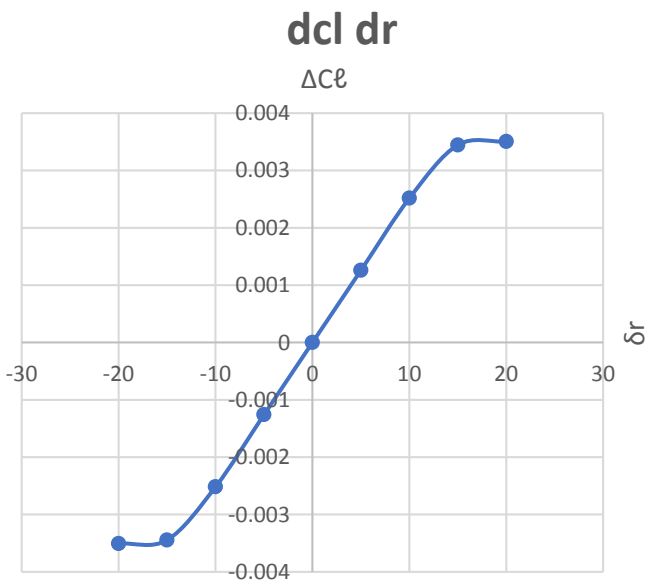
Hapus: namelist **HTPLNF** dan **WGPLNF** berikut variabel-variabel didalamnya; variabel **XW, ZW, ALIW, XH, ZH, ALIH pada namelist SYNTHS**; serta serta control card **NACA-H-**; dan **NACA-W-**;

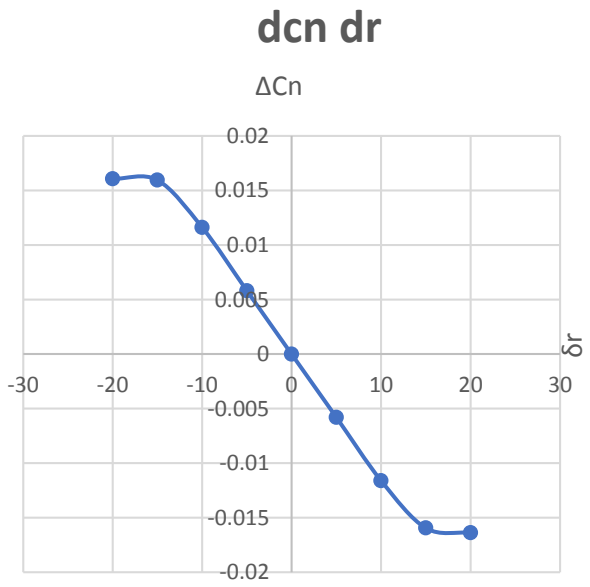
Ganti: **VTPLNF** menjadi **WGPLNF**; variabel **XV** dan **ZV** menjadi **XW** dan **ZW**; dan **NACA-V-** menjadi **NACA-W-**.

Kode	Arti
… $OPTINS SREF=418.8, CBARR=8.127, BLREF=60.0, $SYMFLP CHRDFI=2.77, CHRDFO=0.9, SPANFI=3.71, SPANFO=13.64, CB=0.33, TC=0.16, PHETE=0.13, PHETEP=0.14, FTYPE=1.0, NTYPE=1.0, NDELTA=9.0, DELTA=-20.0,-15.0,-10.0,-5.0,0.0, 5.0,10.0,15.0,20.0$ SAVE NEXT CASE $ASYFLP CHRDFI=2.77, CHRDFO=0.9, SPANFI=3.71, SPANFO=13.64, STYPE=4.0, NDELTA=9.0, DELTAR=-20.0,-15.0,-10.0,-5.0,0.0, 5.0,10.0,15.0,20.0, DELTAL=20.0,15.0,10.0,5.0,0.0, -5.0,-10.0,-15.0,-20.0$ …	➢ **Namelist** Options – referensi panjang dan luas ➢ Luas planform sayap referensi (S) ➢ Panjang chord mac sayap referensi (c) ➢ Panjang span sayap referensi (b) ➢ **Namelist** Symmetric Flap ➢ Chord inboard bidang kendali ➢ Chord outboard bidang kendali ➢ Semispan chord inboard bidang kendali ➢ Semispan chord outboard bidang kendali ➢ Posisi horizontal sumbu putar bidang kendali ➢ Tebal profil airfoil pada posisi sumbu putar ➢ Kemiringan profil airfoil (90% -99%) ➢ Kemiringan profil airfoil (95% -99%) ➢ Tipe bidang kendali ➢ Bentuk leading edge bidang kendali ➢ Jumlah sudut defleksi yang akan dihitung ➢ Sudut defleksi yang akan dihitung ➢ **ControlCard** SAVE – menyimpan data sebelumnya ➢ **ControlCard** NEXT – Memulai perhitungan baru ➢ **Namelist** Asymmetric Flap (SYMFLP tertimpa) ➢ Chord inboard bidang kendali aileron ➢ Chord outboard bidang kendali ➢ Semispan chord inboard bidang kendali ➢ Semispan chord outboard bidang kendali ➢ Tipe bidang kendali ➢ Jumlah sudut defleksi yang akan dihitung ➢ Sudut defleksi aileron kiri yang akan dihitung ➢ Sudut defleksi aileron kanan yang akan dihitung (sinkron dengan aileron kiri)

RUDDER

$$\Delta C_n = \frac{\Delta C_m^*}{2}\frac{\bar{c}}{b}, \qquad \Delta C_\ell = \frac{\Delta C_\ell^*}{2}$$





DELTA	D(CL)	D(CM)	D(CL MAX)	D(CD MIN)
		INCREMENTS DUE TO DEFLECTION		
-20.0	-0.063	0.2374	0.089	0.00752
-15.0	-0.062	0.2355	0.072	0.00485
-10.0	-0.045	0.1715	0.052	0.00269
-5.0	-0.023	0.0857	0.027	0.00134
0.0	0.000	-0.0002	0.000	0.00000
5.0	0.023	-0.0857	0.027	0.00134
10.0	0.045	-0.1715	0.052	0.00269
15.0	0.062	-0.2355	0.072	0.00485
20.0	0.063	-0.2420	0.089	0.00752

*** NOTE * HINGE MOMENT DERIVATIVES ARE BASED ON TWICE THE

DELTAL	DELTAR	(CL)ROLL
20.0	-20.0	7.0126E-03
15.0	-15.0	6.8905E-03