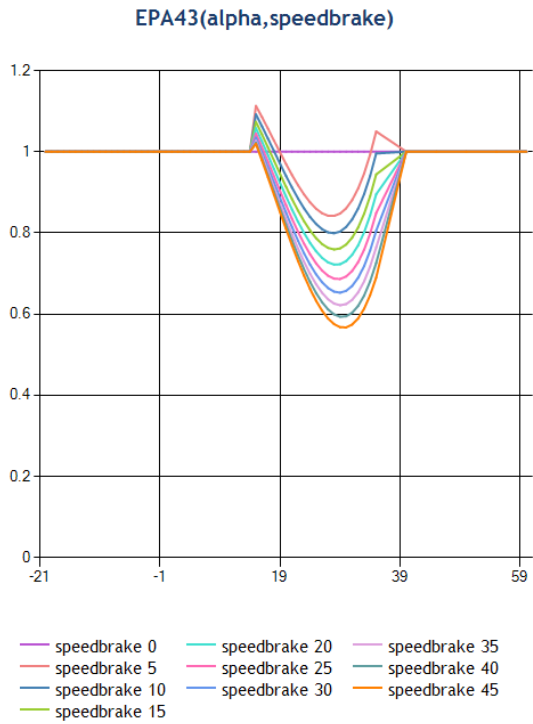
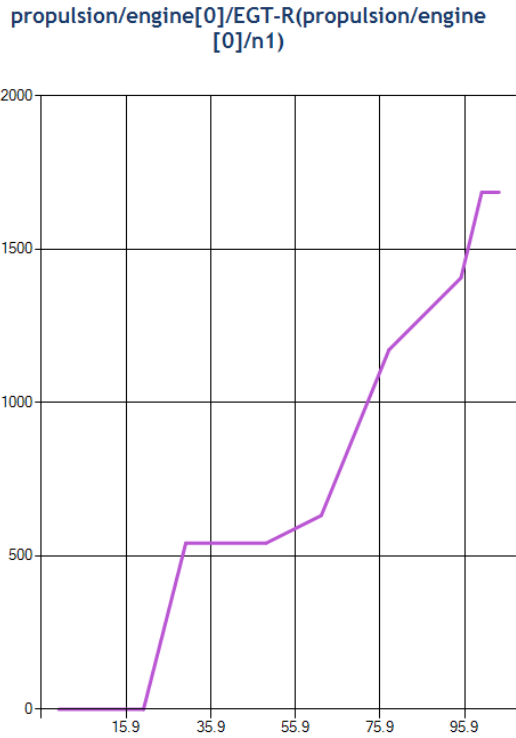


# F-15 Aerodynamic data from (AFIT/GAE/ENY/90D-16); CG 25.65%

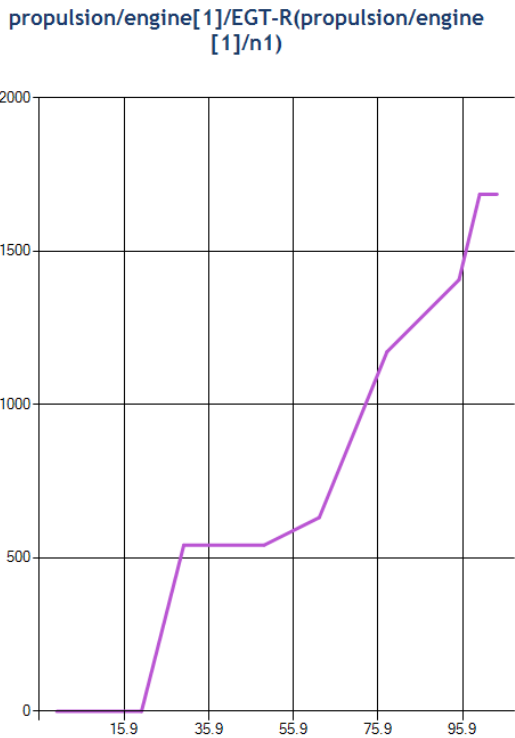
CNDR MULTIPLIER CLDR, CYDR DUE TO SPEEDBRAKE



Engine 0 EGT Rankine

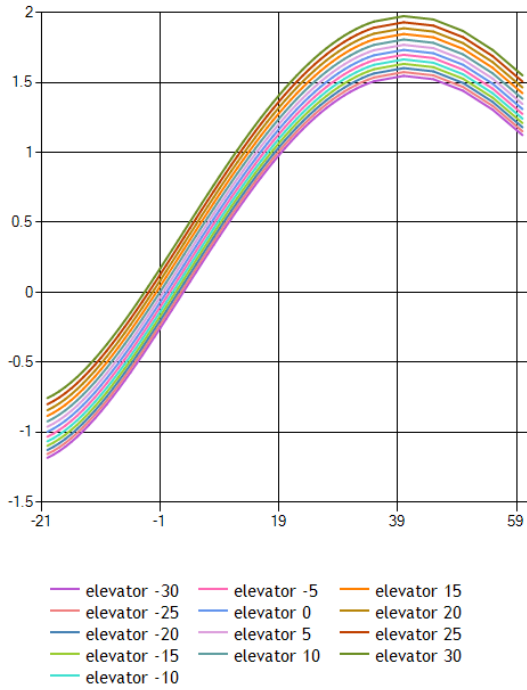


Engine 1 EGT Rankine

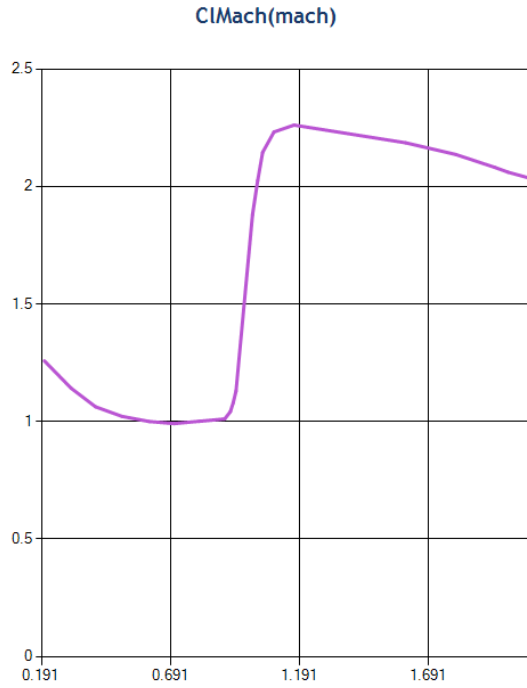


## LIFT

**BASIC LIFT**  
CFZB(alpha,elevator)

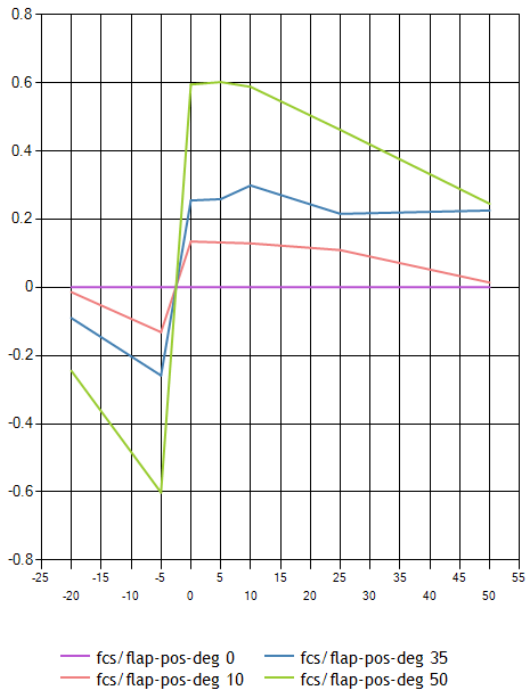


Lift Mach factor (NASA-TM-84643 Figure 3 Cl<sub>alpha</sub>) and values for AOA derived from NASA-aaia-2000-0900 Figure 4



Delta Cl due to mean flap position

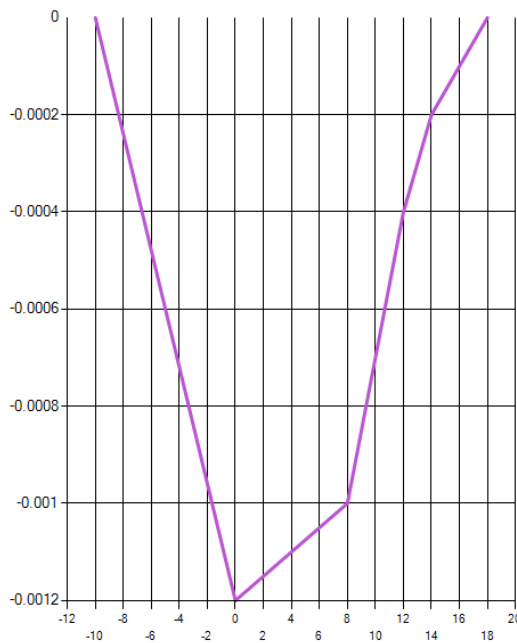
CIDFM(alpha,fcs/flap-pos-deg)



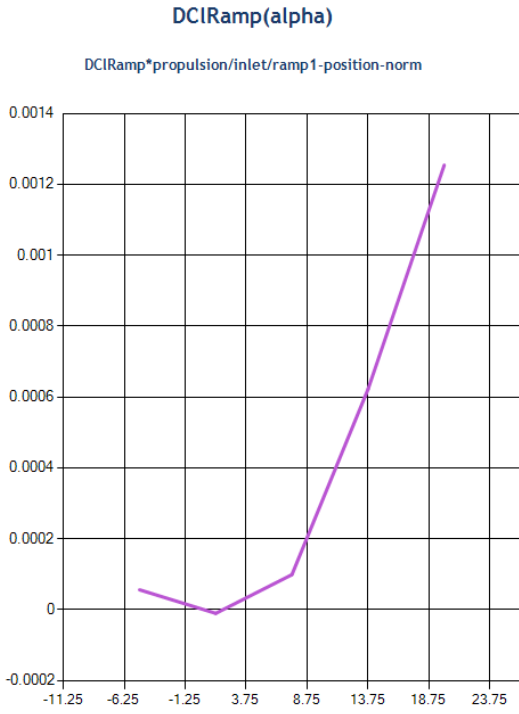
Cl increment due to gear

CIUC(alpha)

CIUC\*gear/gear-pos-norm

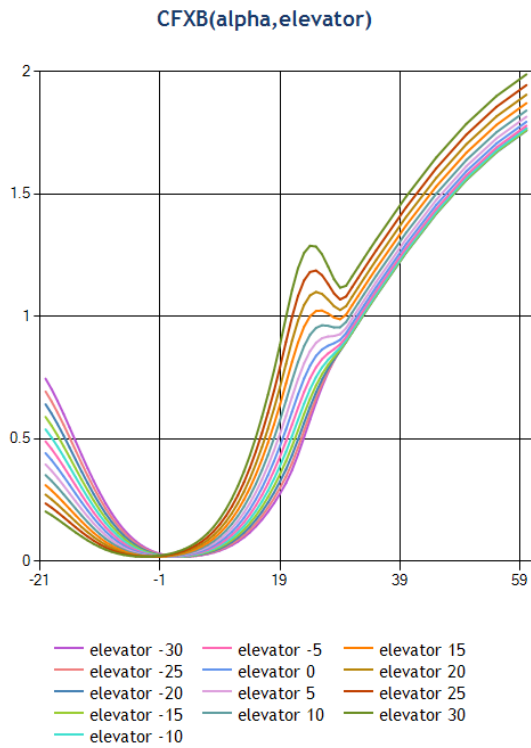


CI increment due to ramps, NASA TP-3627, p14  
Figure 10

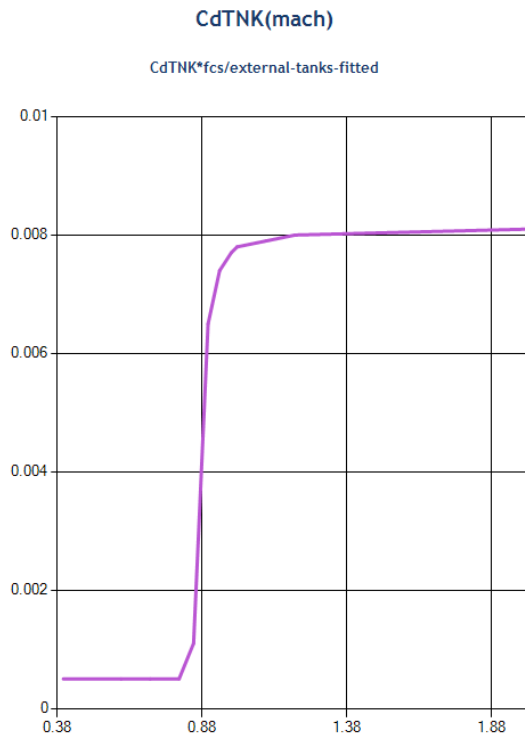


# DRAG

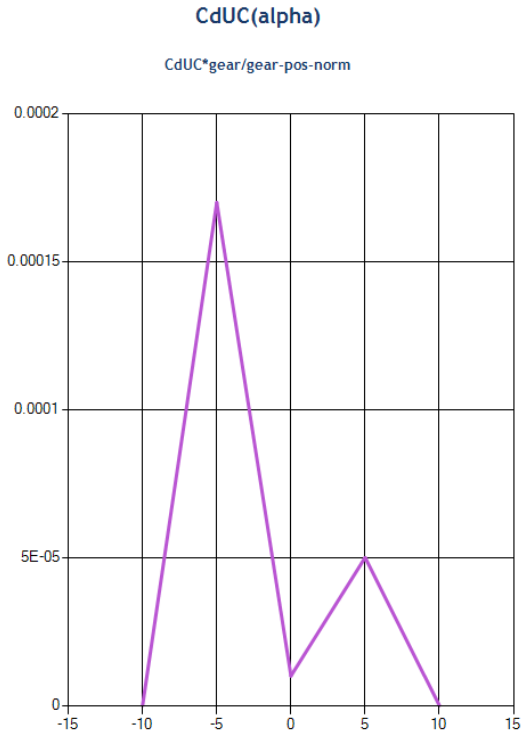
## BASIC DRAG



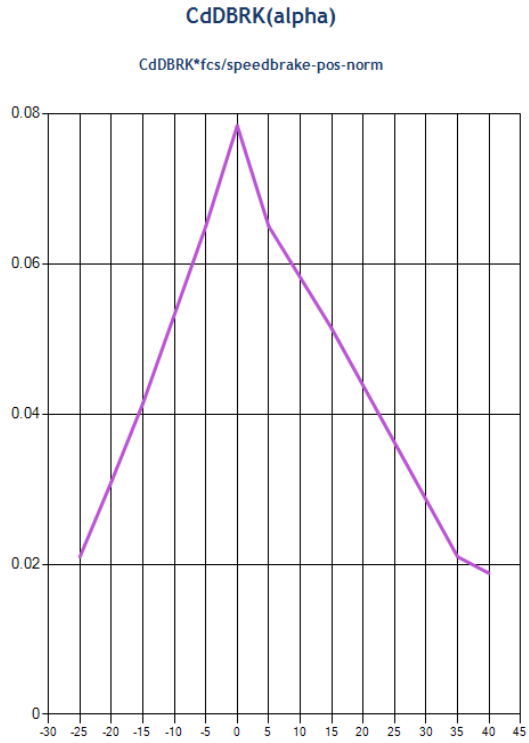
## Incremental Cd due to external tanks



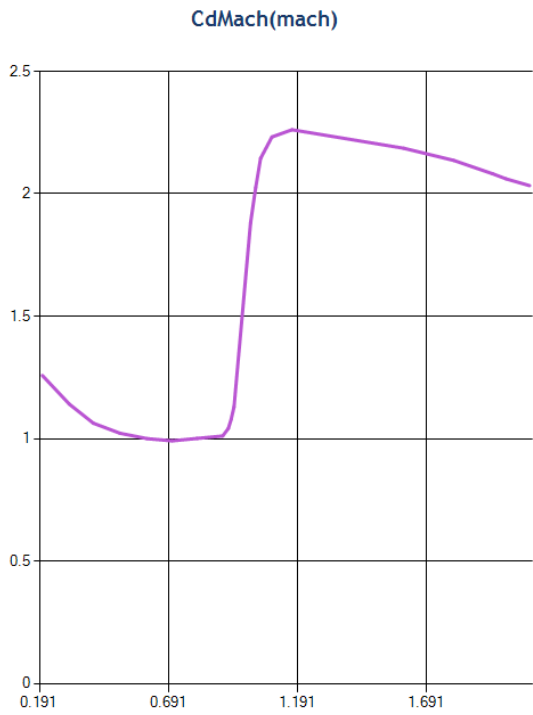
Cd increment due to gear



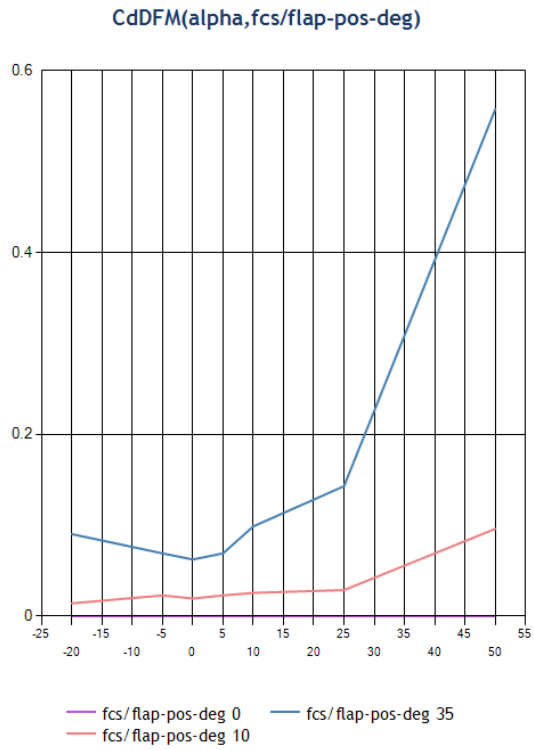
Drag due to speedbrakes



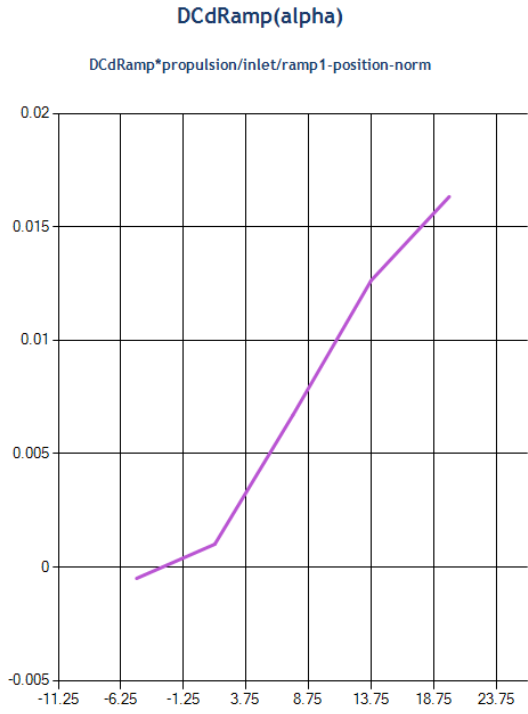
Drag mach factor (NASA CR-152391-VOL-1 Figure 3 -2 p54)



Delta Cd due to mean flap position



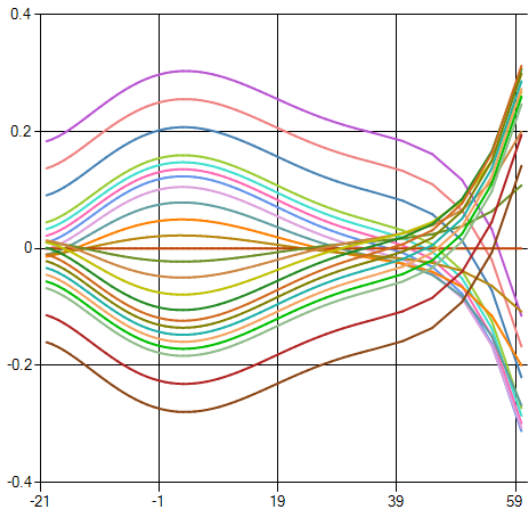
Cd increment due to ramps, NASA TP-3627, p14  
Figure 10



# SIDE

**BASIC SIDE FORCE**

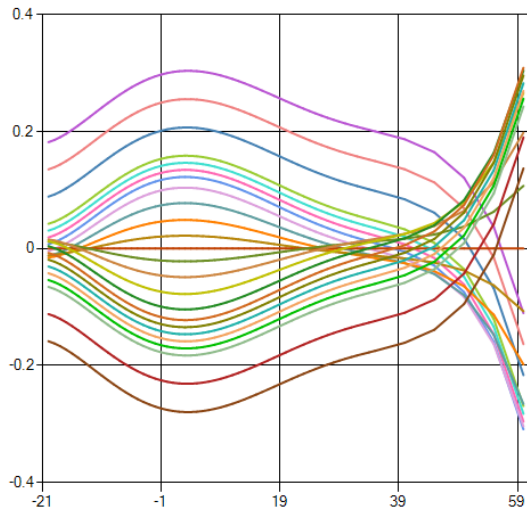
CFYB (alpha,beta,elevator[-30])



- beta -20    beta -5    beta 1    beta 7
- beta -16    beta -4    beta 2    beta 8
- beta -12    beta -3    beta 3    beta 9
- beta -8    beta -2    beta 4    beta 10
- beta -7    beta -1    beta 5    beta 14
- beta -6    beta 0    beta 6    beta 18

**BASIC SIDE FORCE**

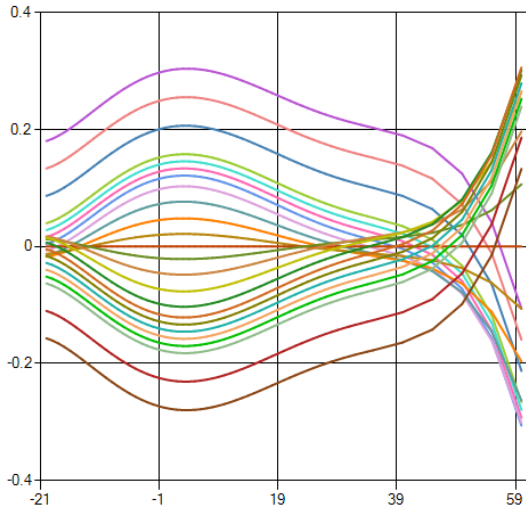
CFYB (alpha,beta,elevator[-25])



- beta -20    beta -5    beta 1    beta 7
- beta -16    beta -4    beta 2    beta 8
- beta -12    beta -3    beta 3    beta 9
- beta -8    beta -2    beta 4    beta 10
- beta -7    beta -1    beta 5    beta 14
- beta -6    beta 0    beta 6    beta 18

BASIC SIDE FORCE

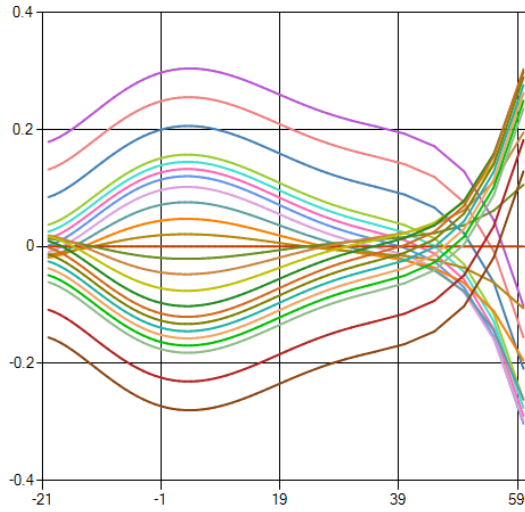
CFYB (alpha,beta,elevator[-20])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC SIDE FORCE

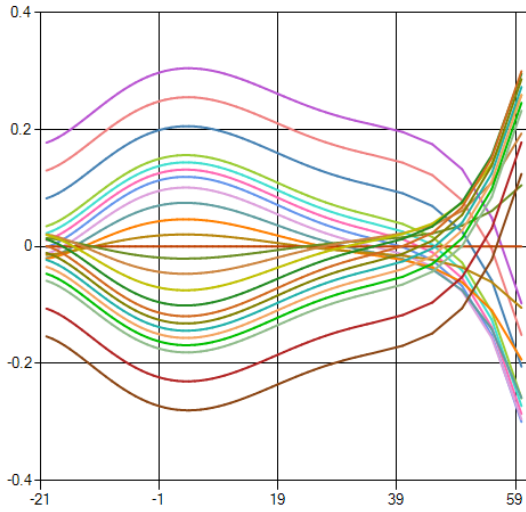
CFYB (alpha,beta,elevator[-15])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC SIDE FORCE

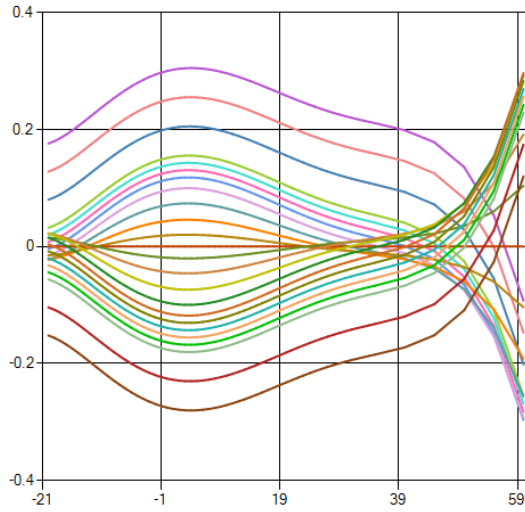
CFYB (alpha,beta,elevator[-10])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC SIDE FORCE

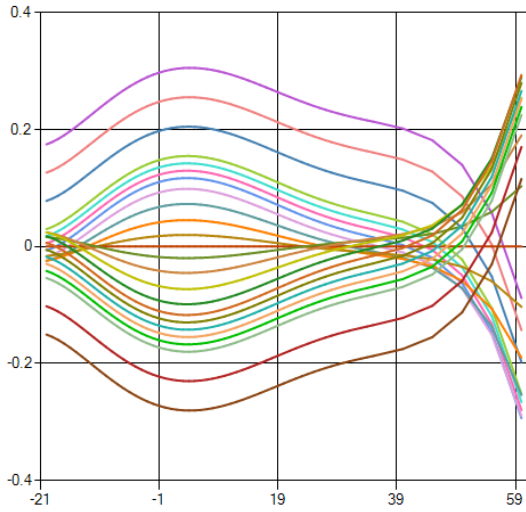
CFYB (alpha,beta,elevator[-5])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC SIDE FORCE

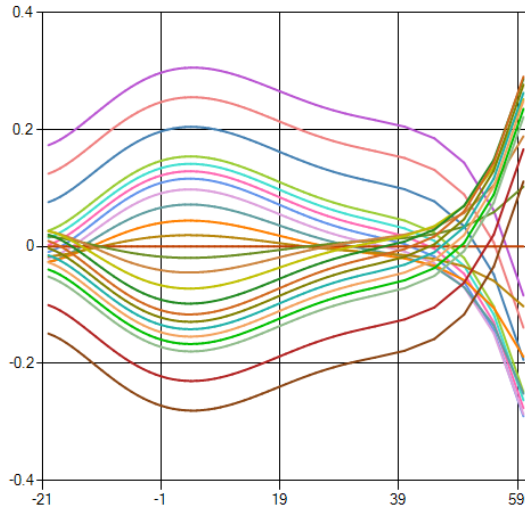
CFYB (alpha,beta,elevator[0])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC SIDE FORCE

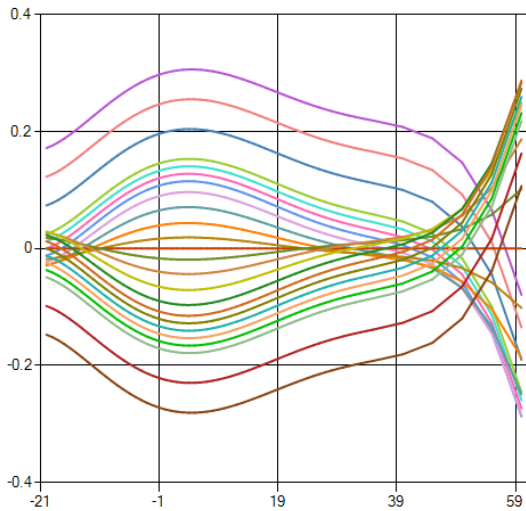
CFYB (alpha,beta,elevator[5])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC SIDE FORCE

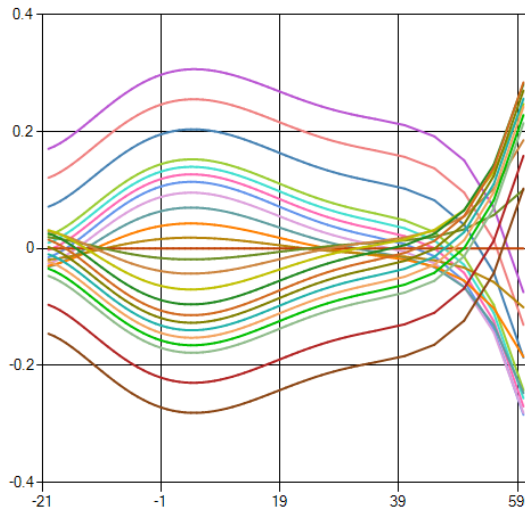
CFYB (alpha,beta,elevator[10])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC SIDE FORCE

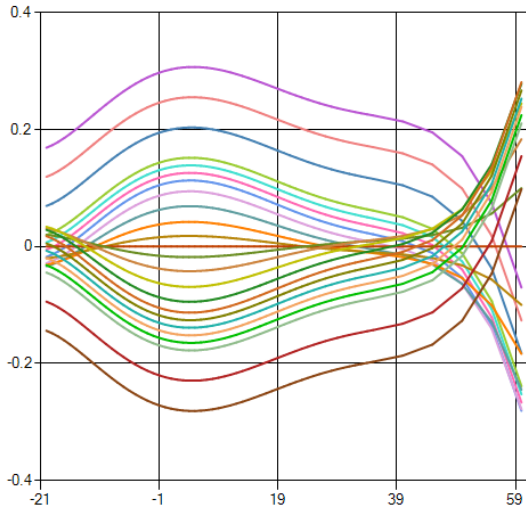
CFYB (alpha,beta,elevator[15])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC SIDE FORCE

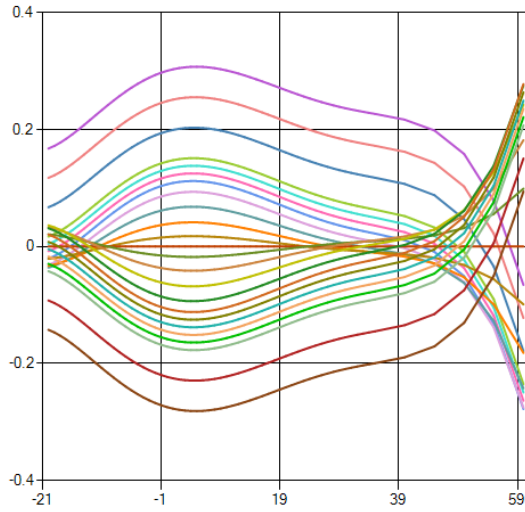
CFYB (alpha,beta,elevator[20])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC SIDE FORCE

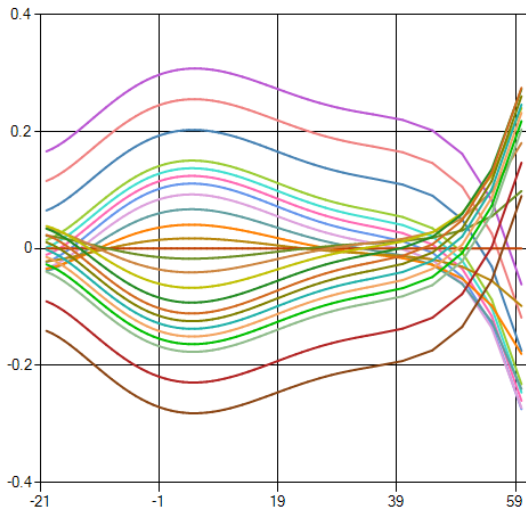
CFYB (alpha,beta,elevator[25])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC SIDE FORCE

CFYB (alpha,beta,elevator[30])

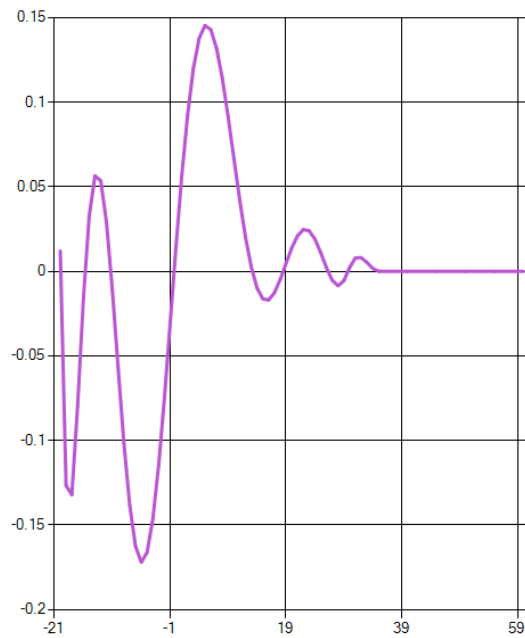


- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

SIDE FORCE DUE TO ROLL RATE (CYP)

CFYP(alpha)

CFYP\*PB

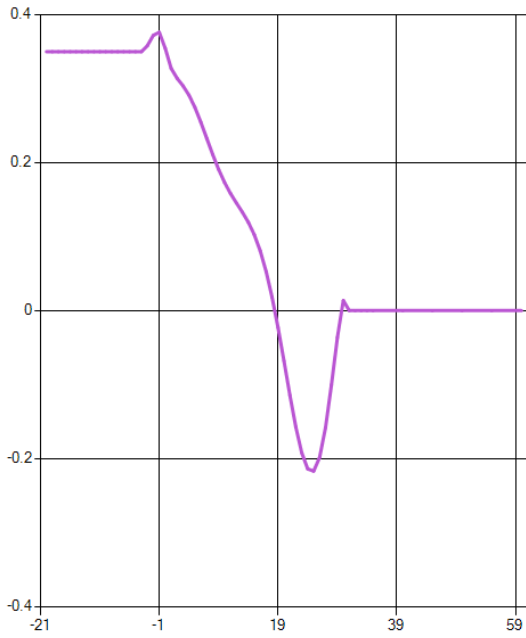




SIDE FORCE DUE TO YAW RATE (CYR)

CFYR(alpha)

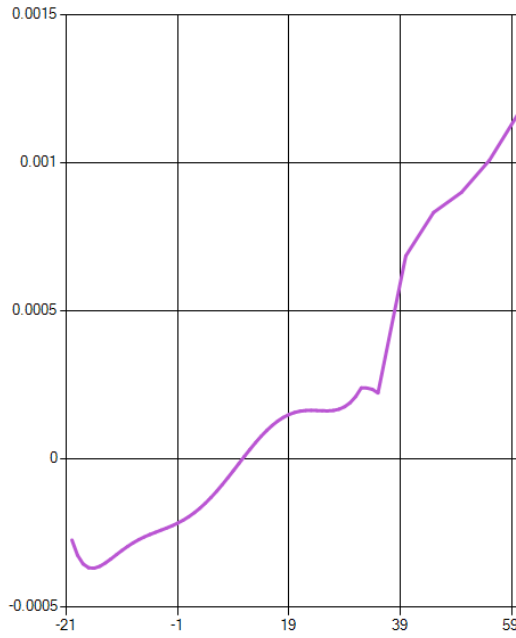
CFYR\*RB



SIDE FORCE DUE TO AILERON DEFLECTION

CYDAD(alpha)

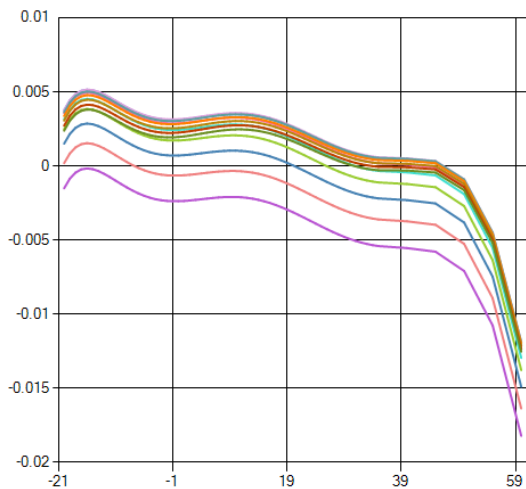
CYDAD\*DDA



SIDE FORCE DUE TO RUDDER DEFLECTION

CYDRD(alpha,rudder)

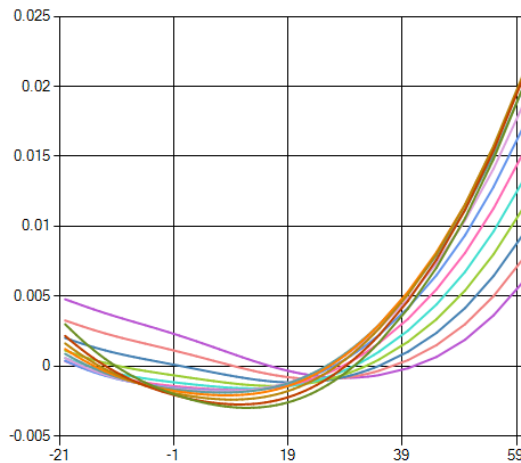
CYDRD\*DRUDD\*DRFLX5\*EPA43



SIDE FORCE DUE TO DIFFERENTIAL TAIL DEFLECTION - CYDTD

CYDTD(alpha,elevator)

CYDTD\*DTFLX5\*0.3\*DTALD

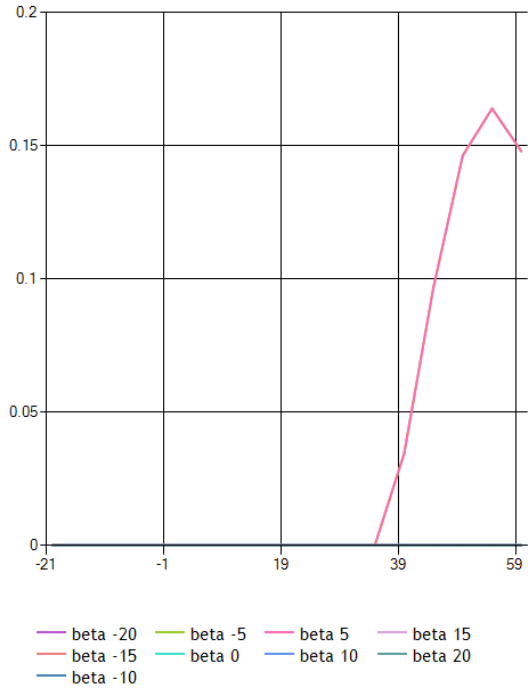


- rudder -30
- rudder -25
- rudder -20
- rudder -15
- rudder -10
- rudder -5
- rudder 0
- rudder 5
- rudder 10
- rudder 15
- rudder 20
- rudder 25
- rudder 30

- elevator -30
- elevator -25
- elevator -20
- elevator -15
- elevator -10
- elevator -5
- elevator 0
- elevator 5
- elevator 10
- elevator 15
- elevator 20
- elevator 25
- elevator 30

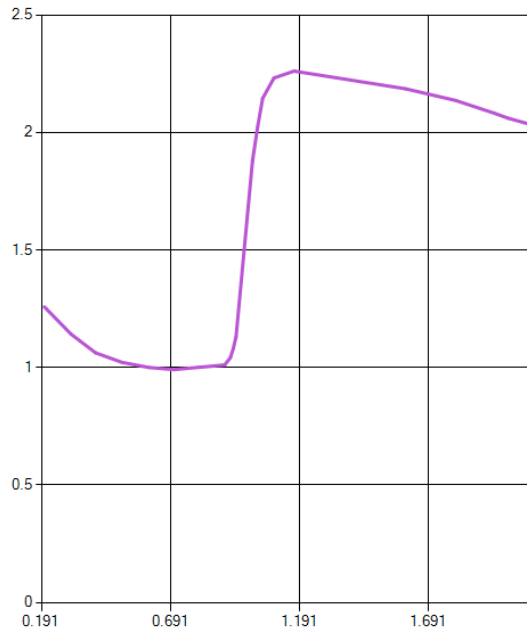
ASYMMETRIC CY AT HIGH ALPHA

CYRB(alpha,beta)



Yaw factor (NASA-TM-84643 Figure 3 Clalpha) and values for AOA derived from NASA-aaia-2000-0900 Figure 4

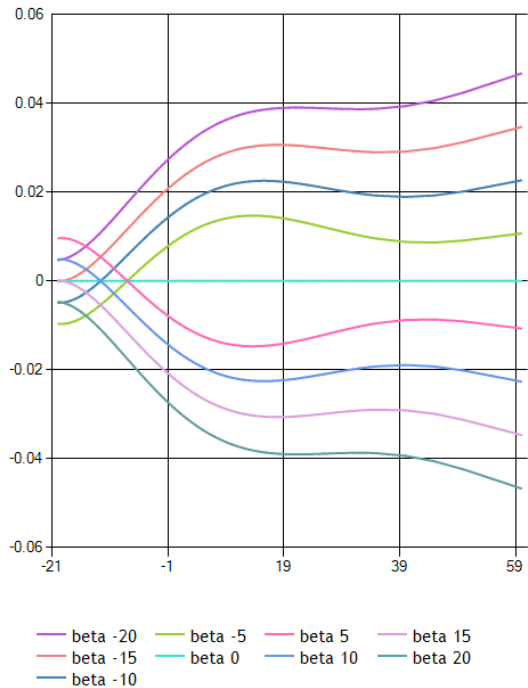
CyMach(mach)



ROLL

BASIC ROLLING MOMENT - CL(BETA)

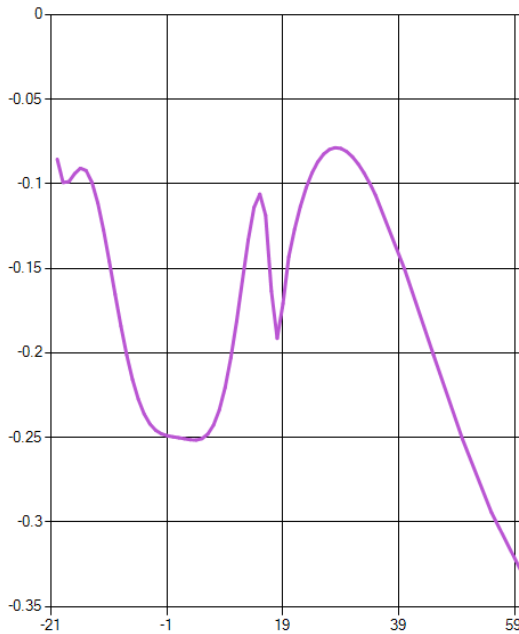
CML1(alpha,beta)



ROLL DAMPING DERIVATIVE - CLP

CMLP(alpha)

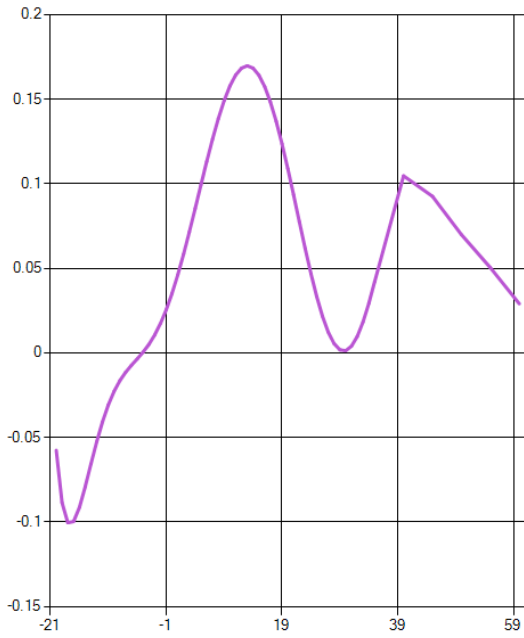
CMLP\*PB



ROLLING MOMENT DUE TO YAW RATE - CLR

CMLR(alpha)

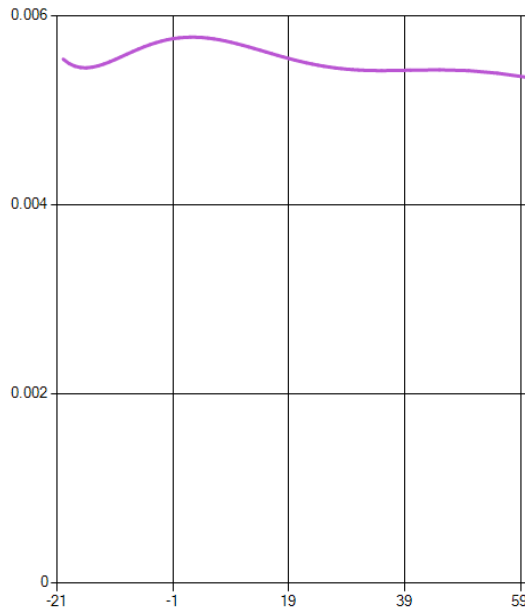
CMLR\*RB



ROLLING MOMENT DUE TO AILERON DEFLECTION (CLDA)

CMLDAD(alpha)

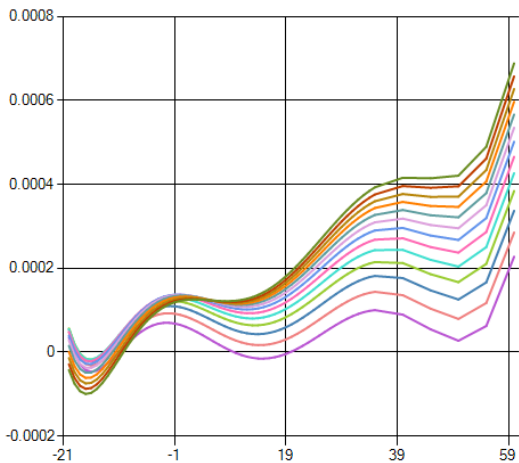
CMLDAD\*DDA



ROLLING MOMENT DUE TO RUDDER DEFLECTION - (CLD)

CMLDRD(alpha,rudder)

CMLDRD\*DRUDD\*DRFLX1\*EPA43

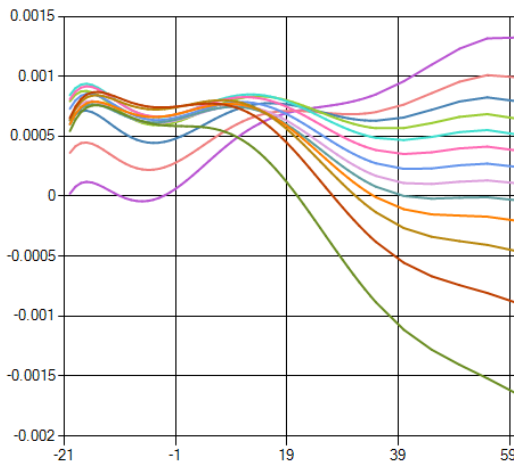


- rudder -30    rudder -5    rudder 15
- rudder -25    rudder 0    rudder 20
- rudder -20    rudder 5    rudder 25
- rudder -15    rudder 10    rudder 30
- rudder -10

ROLLING MOMENT DUE TO DIFFERENTIAL TAIL DEFLECTION - CLDD

CMLDTD(alpha,elevator)

CMLDTD\*DTFLX1\*0.3\*DTALD

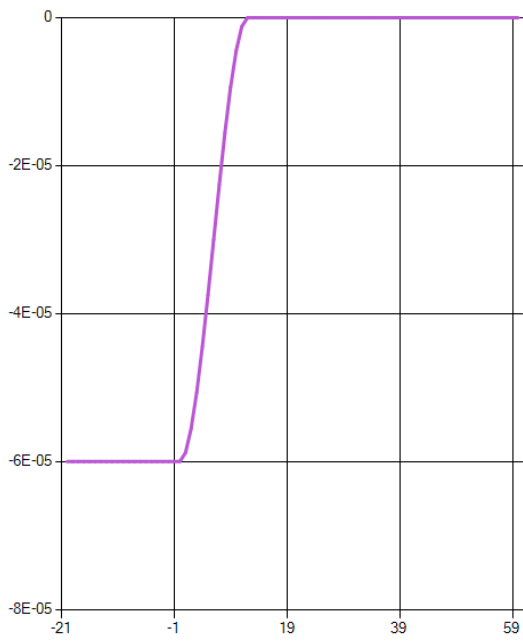


- elevator -30    elevator -5    elevator 15
- elevator -25    elevator 0    elevator 20
- elevator -20    elevator 5    elevator 25
- elevator -15    elevator 10    elevator 30
- elevator -10

DELTA CLB DUE TO 2-PLACE CANOPY

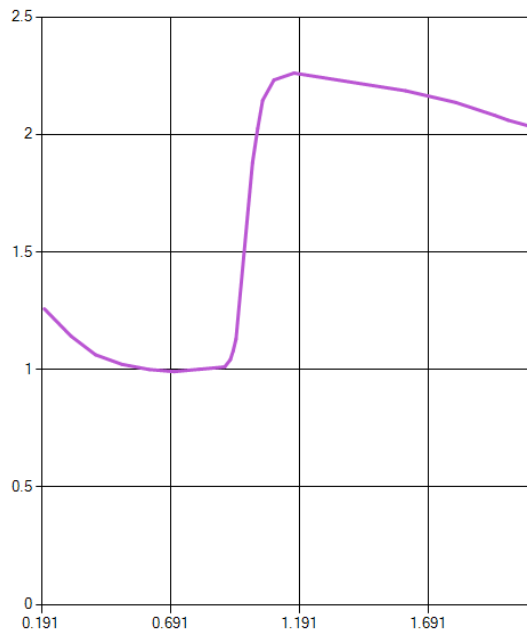
CMLDCLB(alpha)

CMLDCLB\*BETA\*metrics/two-place-canopy



Roll Mach factor (NASA-TM-84643 Figure 3 Clalpha) and values for AOA derived from NASA-aaia-2000-0900 Figure 4

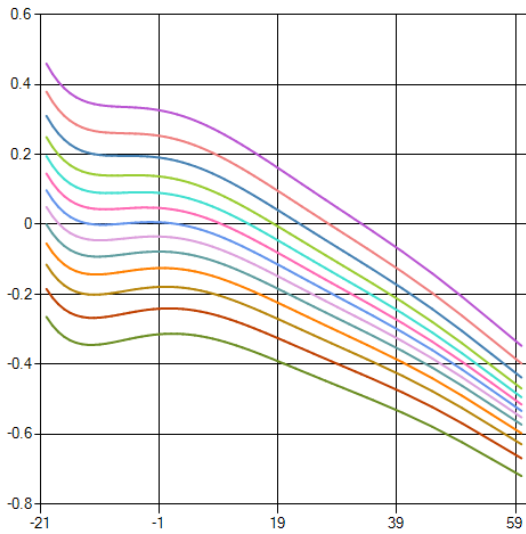
CLMach(mach)



# PITCH

BASIC PITCHING MOMENT - CM

CMM1(alpha,elevator)

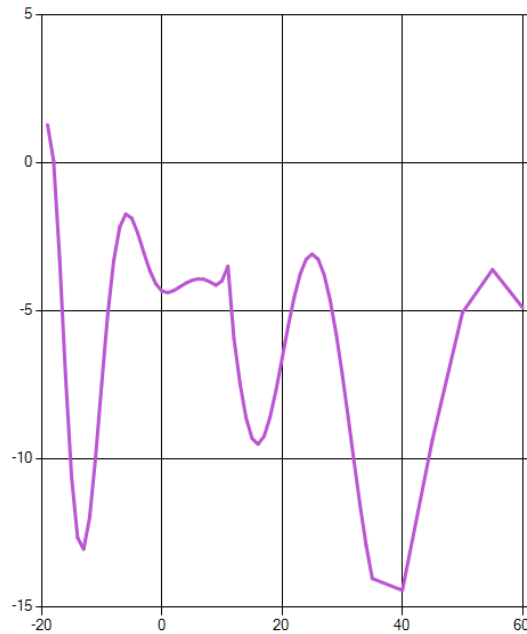


- elevator -30
- elevator -25
- elevator -20
- elevator -15
- elevator -10
- elevator -5
- elevator 0
- elevator 5
- elevator 10
- elevator 15
- elevator 20
- elevator 25
- elevator 30

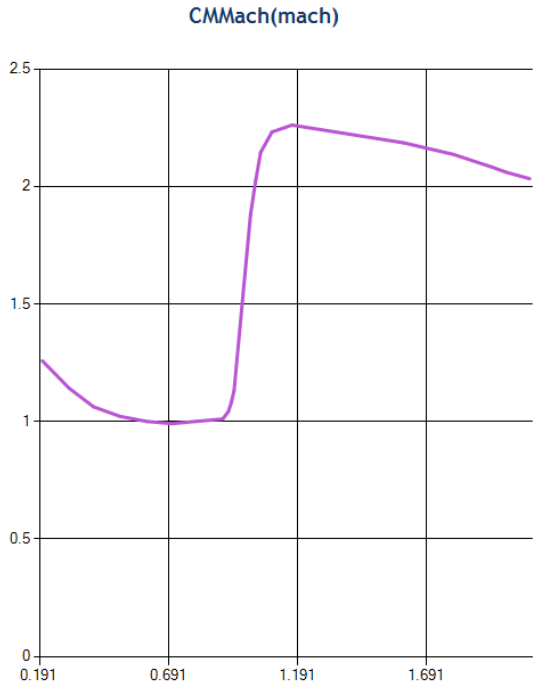
PITCH DAMPING DERIVATIVE - CMQ

CMMQ(alpha)

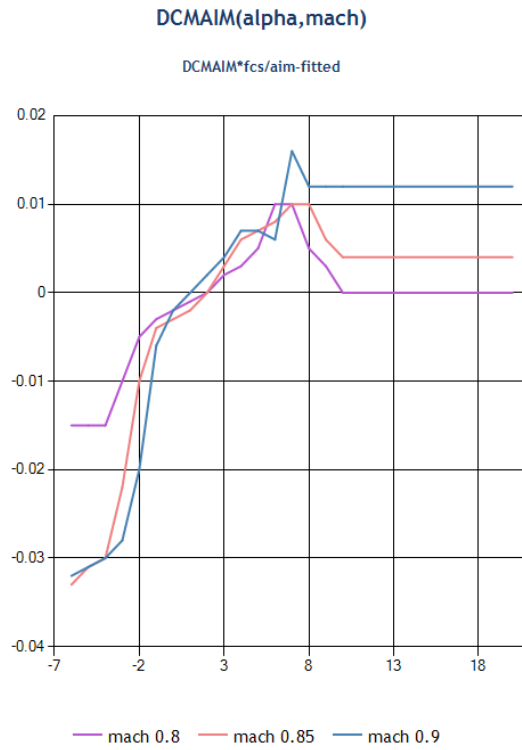
CMMQ\*QB



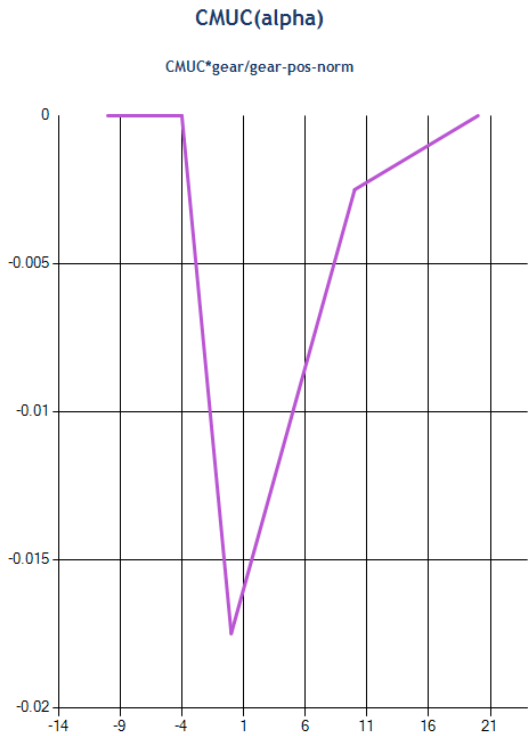
Pitch Mach factor (NASA-TM-84643 Figure 3 C1alpha) and values for AOA derived from NASA-aaia-2000-0900 Figure 4



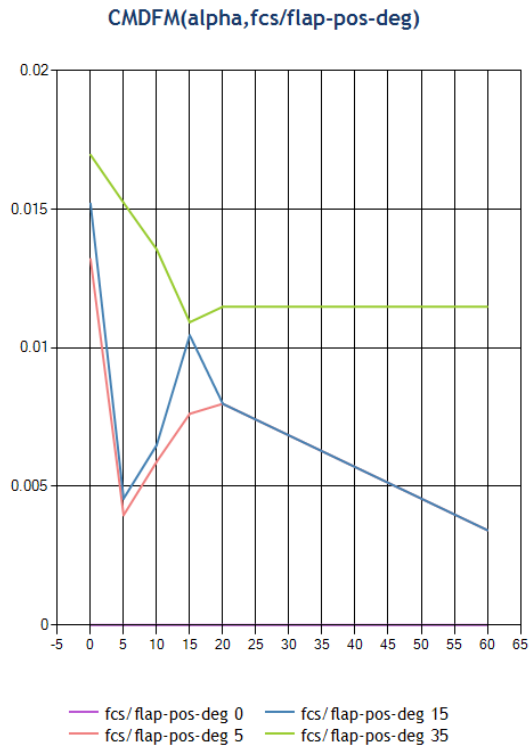
Pitch moment increment due to aim missiles



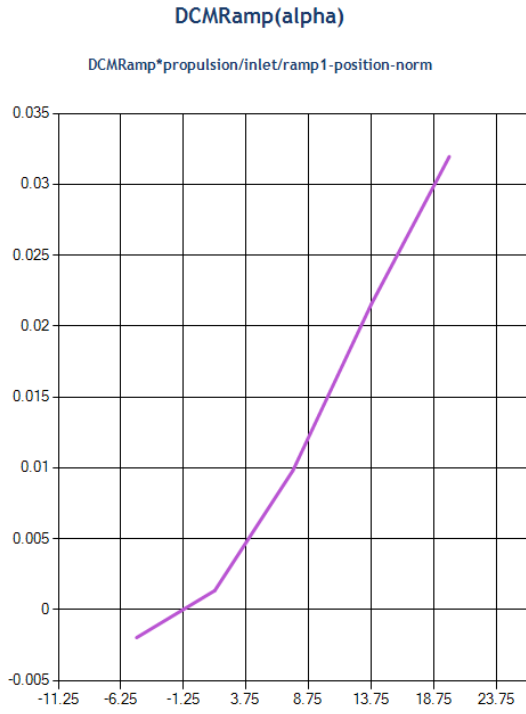
CM increment due to gear



CM increment due to flap mean position



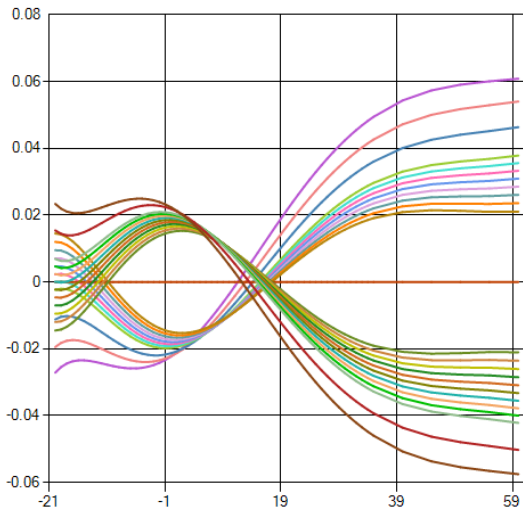
CM increment due to ramps, NASA TP-3627, p14  
Figure 10



# YAW

**BASIC YAWING MOMENT - CN (BETA)**

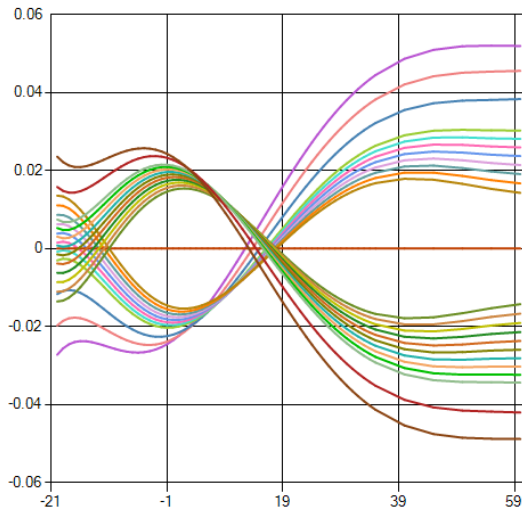
CMN1 (alpha,beta,elevator[-30])



- beta -20    beta -5    beta 1    beta 7
- beta -16    beta -4    beta 2    beta 8
- beta -12    beta -3    beta 3    beta 9
- beta -8    beta -2    beta 4    beta 10
- beta -7    beta -1    beta 5    beta 14
- beta -6    beta 0    beta 6    beta 18

**BASIC YAWING MOMENT - CN (BETA)**

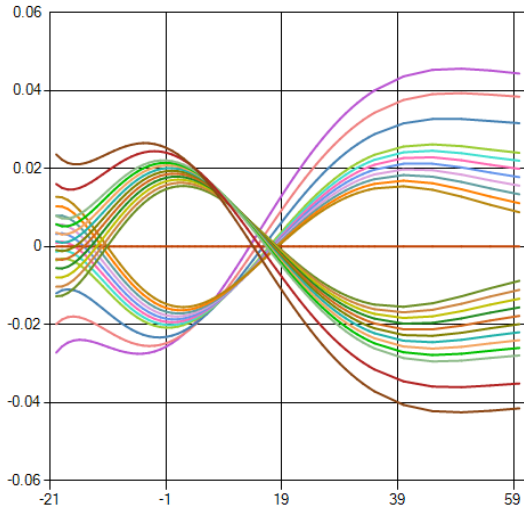
CMN1 (alpha,beta,elevator[-25])



- beta -20    beta -5    beta 1    beta 7
- beta -16    beta -4    beta 2    beta 8
- beta -12    beta -3    beta 3    beta 9
- beta -8    beta -2    beta 4    beta 10
- beta -7    beta -1    beta 5    beta 14
- beta -6    beta 0    beta 6    beta 18

BASIC YAWING MOMENT - CN (BETA)

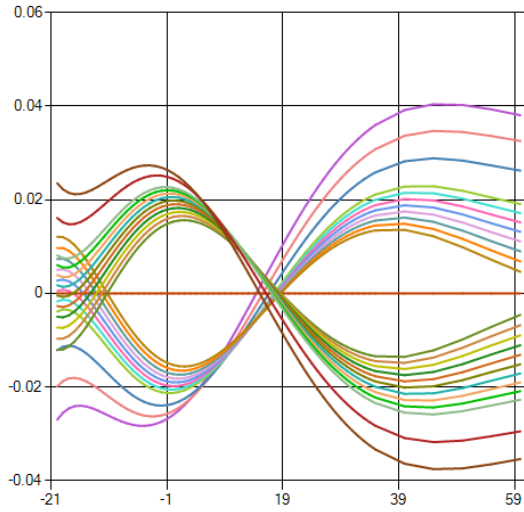
CMN1 (alpha,beta,elevator[-20])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC YAWING MOMENT - CN (BETA)

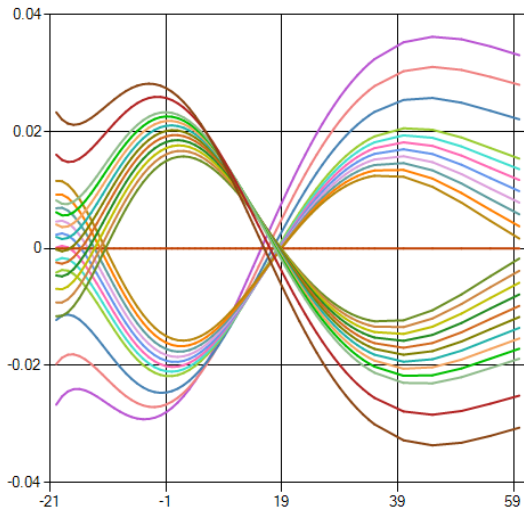
CMN1 (alpha,beta,elevator[-15])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC YAWING MOMENT - CN (BETA)

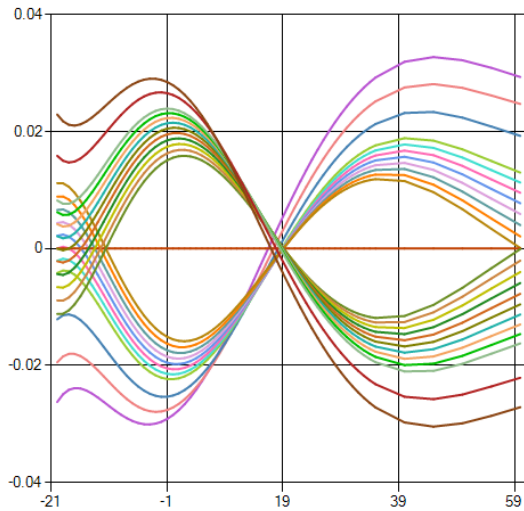
CMN1 (alpha,beta,elevator[-10])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC YAWING MOMENT - CN (BETA)

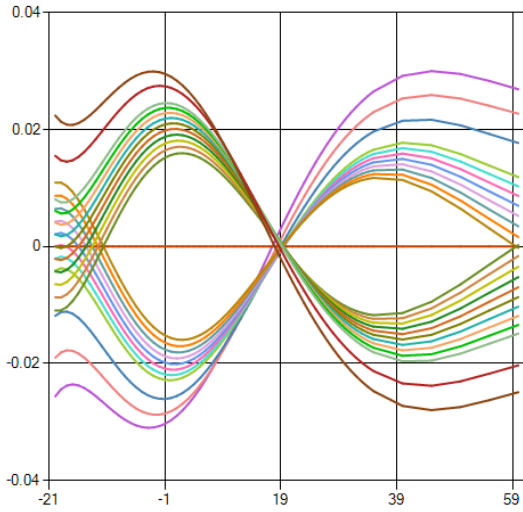
CMN1 (alpha,beta,elevator[-5])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC YAWING MOMENT - CN (BETA)

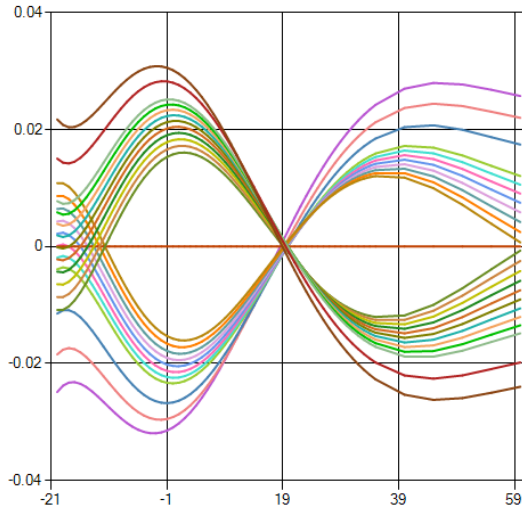
CMN1 (alpha,beta,elevator[0])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC YAWING MOMENT - CN (BETA)

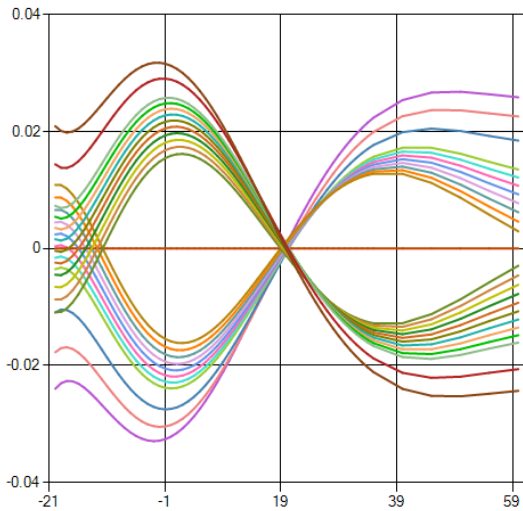
CMN1 (alpha,beta,elevator[5])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC YAWING MOMENT - CN (BETA)

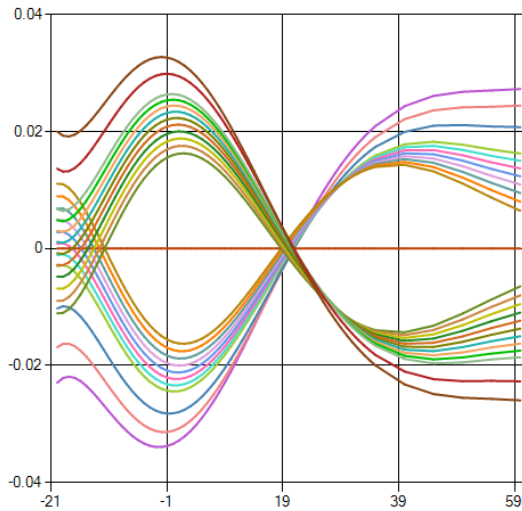
CMN1 (alpha,beta,elevator[10])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC YAWING MOMENT - CN (BETA)

CMN1 (alpha,beta,elevator[15])

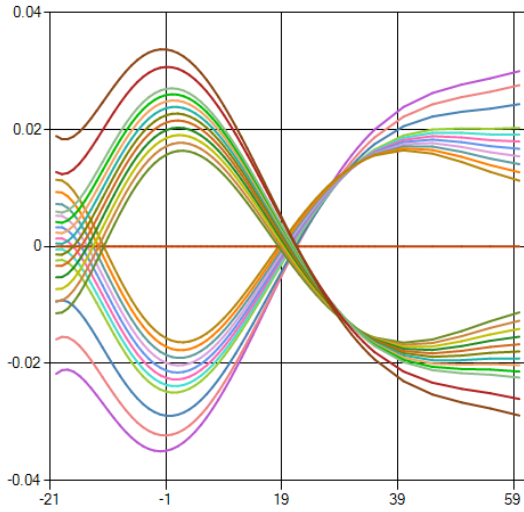


- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18



BASIC YAWING MOMENT - CN (BETA)

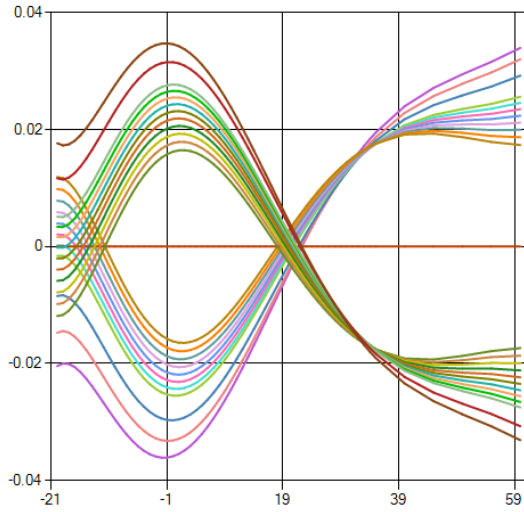
CMN1 (alpha,beta,elevator[20])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC YAWING MOMENT - CN (BETA)

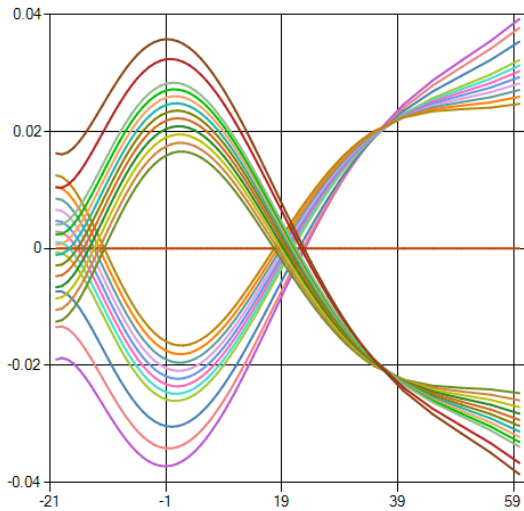
CMN1 (alpha,beta,elevator[25])



- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

BASIC YAWING MOMENT - CN (BETA)

CMN1 (alpha,beta,elevator[30])

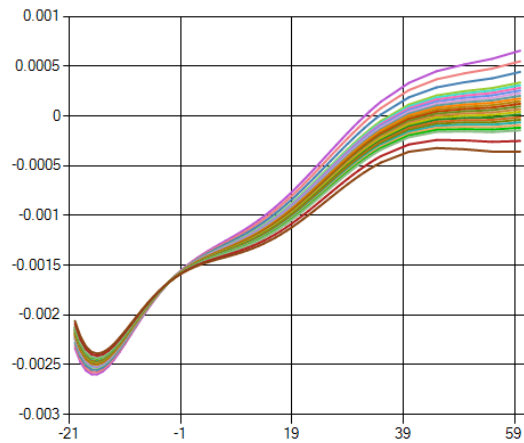


- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

YAWING MOMENT DUE TO RUDDER DEFLECTION - CNDR

CMNDRDr(alpha,beta)

CMNDRDr\*DRUDD\*DRFLX3\*EPA43

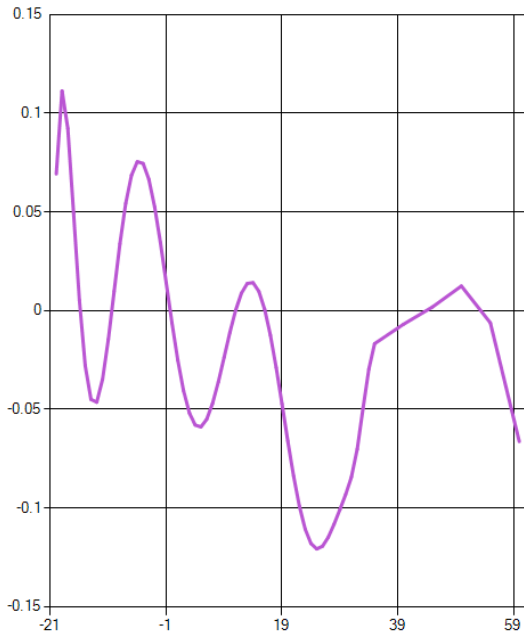


- beta -20
- beta -16
- beta -12
- beta -8
- beta -7
- beta -6
- beta -5
- beta -4
- beta -3
- beta -2
- beta -1
- beta 0
- beta 1
- beta 2
- beta 3
- beta 4
- beta 5
- beta 6
- beta 7
- beta 8
- beta 9
- beta 10
- beta 14
- beta 18

YAWING MOMENT DUE TO ROLL RATE - CNP

CMNP(alpha)

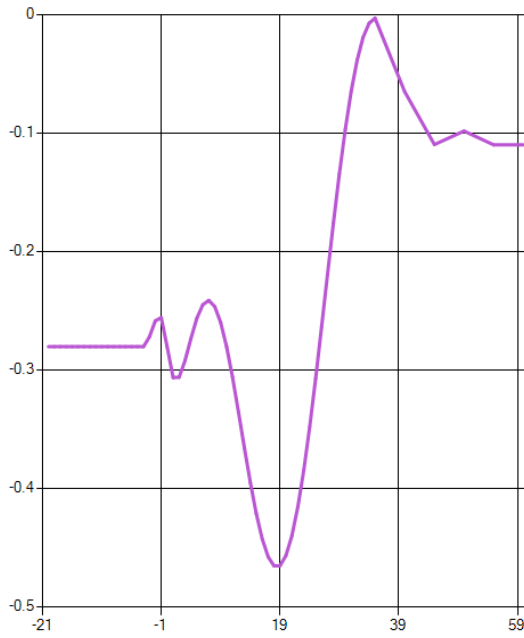
CMNP\*PB



YAW DAMPING DERIVATIVE - CMNR

CMNR(alpha)

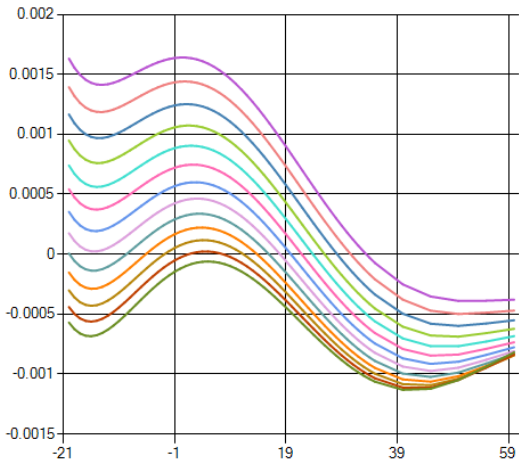
CMNR\*RB



YAWING MOMENT DUE TO DIFFERENTIAL TAIL DEFLECTION - CNDDT

CMNDDT(alpha,elevator)

CMNDDT\*DTFLX3\*0.3\*DTALD

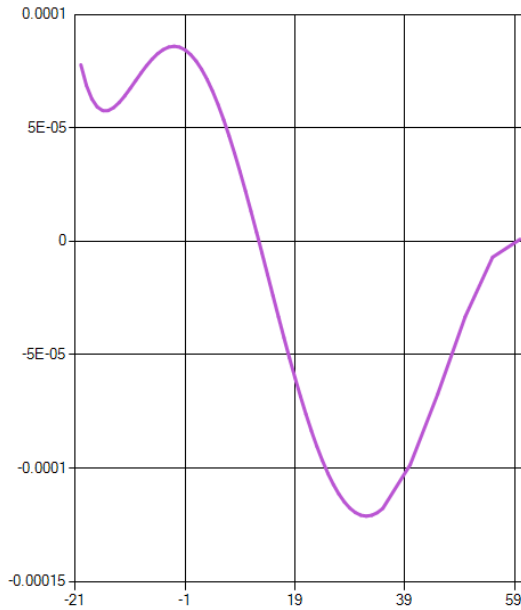


- elevator -30
- elevator -25
- elevator -20
- elevator -15
- elevator -10
- elevator -5
- elevator 0
- elevator 5
- elevator 10
- elevator 15
- elevator 20
- elevator 25
- elevator 30

YAWING MOMENT DUE TO AILERON DEFLECTION - CNDA

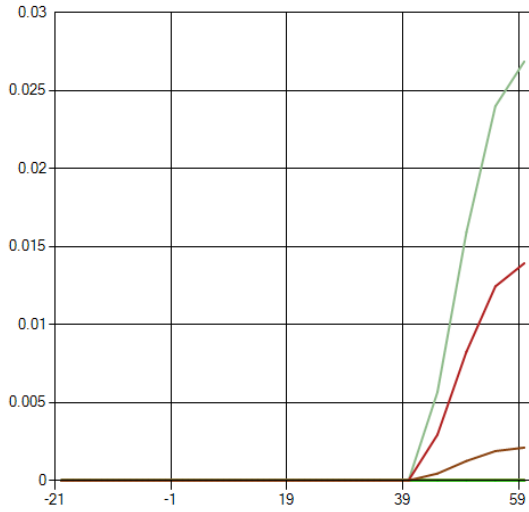
CMNDAD(alpha)

CMNDAD\*DDA



ASYMMETRIC CN AT HIGH ALPHA

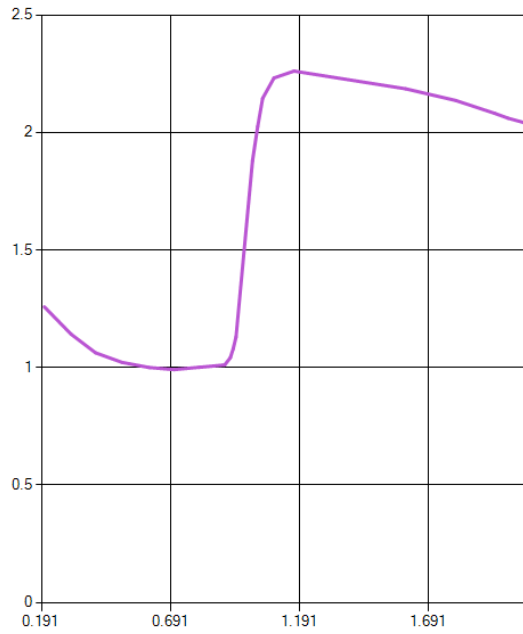
CMNRB(alpha,beta)



- beta -20    beta -5    beta 1    beta 7
- beta -16    beta -4    beta 2    beta 8
- beta -12    beta -3    beta 3    beta 9
- beta -8    beta -2    beta 4    beta 10
- beta -7    beta -1    beta 5    beta 14
- beta -6    beta 0    beta 6    beta 18

Yaw Mach factor (NASA-TM-84643 Figure 3 Clalpha) and values for AOA derived from NASA-aaia-2000-0900 Figure 4

CNMach(mach)



### Lift Coefficient Buildup

$$LIFT=CFZB+CIUC*gear/gear-pos-norm+CIDFM+DCIRamp*propulsion/inlet/ramp1-position-norm *CIMach$$

### Drag Coefficient Buildup

$$DRAG=CFXB+CdUC*gear/gear-pos-norm+CdDBRK*fcs/speedbrake-pos-norm+CdDFM+CdTNK*fcs/external-tanks-fitted+DCdRamp*propulsion/inlet/ramp1-position-norm *CdMach$$

### Side Coefficient Buildup

$$SIDE=CFYB+CYDAD*DDA+CYDRD*DRUDD*DRFLX5*EPA43+CYDTD*DTFLX5*0.3*DTALD+CYRB+CFYP*PB+CFYR*RB *CyMach$$

### Roll Coefficient Buildup

$$ROLL=CML1+CMLDAD*DDA+CMLDRD*DRUDD*DRFLX1*EPA43+CMLDTD*DTFLX1*0.3*DTALD+CMLP*PB+CMLR*RB+CMLDCLB*BETA*metrics/two-place-canopy *CLMach + (DLNB*BETA)$$

### Pitch Coefficient Buildup

$$PITCH=CMM1+CMMQ*QB+DCMAIM*fcs/aim-fitted+CMUC*gear/gear-pos-norm+CMDFM+DCMRamp*propulsion/inlet/ramp1-position-norm *CMMach$$

### Yaw Coefficient Buildup

$$YAW=CMN1+CMNDAD*DDA+CMNDRD*DRUDD*DRFLX3*EPA43+CMNDTD*DTFLX3*0.3*DTALD+CMNP*PB+CMNR*RB+CMNRB *CNMach + (DCNB*BETA)$$

## References

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2. Robert J. McDonnell, B.S., Captain, USAF: INVESTIGATION OF THE HIGH ANGLE OF ATTACK DYNAMICS OF THE F-15B USING BIFURCATION ANALYSIS, AFIT/GAE/ENY/90D-16, December 1990: <http://www.zaretto.com/sites/zaretto.com/files/F-15-data/ADA230462.pdf> (<http://www.zaretto.com/sites/zaretto.com/files/F-15-data/ADA230462.pdf>)
3. Richard L. Bennet, Major, USAF: ANALYSIS OF THE EFFECTS OF REMOVING NOSE BALLAST FROM THE F-15 EAGLE, AFIT/GA/ENY/91D-1, December 1991: <http://www.zaretto.com/sites/zaretto.com/files/F-15-data/ADA244044.pdf> (<http://www.zaretto.com/sites/zaretto.com/files/F-15-data/ADA244044.pdf>)
4. DR. J. R. LUMMUS, G. T. JOYCE, O C. D. O MALLEY: ANALYSIS OF WIND TUNNEL TEST RESULTS FOR A 9.39-PER CENT SCALE MODEL OF A VSTOL FIGHTER/ATTACK AIRCRAFT : VOLUME I - STUDY OVERVIEW, NASA CR-152391-VOL-1 Figure 3-2 p54, October 1980: <http://www.zaretto.com/sites/zaretto.com/files/F-15-data/19810014497.pdf> (<http://www.zaretto.com/sites/zaretto.com/files/F-15-data/19810014497.pdf>)

data/19810014497.pdf)

5. Frank W. Burcham, Jr., Trindel A. Maine, C. Gordon Fullerton, and Lannie Dean Webb: Development and Flight Evaluation of an Emergency Digital Flight Control System Using Only Engine Thrust on an F-15 Airplane, NASA TP-3627, September 1996:

[http://www.zaretto.com/sites/zaretto.com/files/F-15-data/88414main\\_H-2048.pdf](http://www.zaretto.com/sites/zaretto.com/files/F-15-data/88414main_H-2048.pdf) ([http://www.zaretto.com/sites/zaretto.com/files/F-15-data/88414main\\_H-2048.pdf](http://www.zaretto.com/sites/zaretto.com/files/F-15-data/88414main_H-2048.pdf))

## Mass and balance

Element	X	Y	Z	Unit
Aerodynamic Reference Point (CoP)	457.07	0.00	0.00	IN
Aircraft CG	408.00	0.00	0.00	IN

## Ground Reactions

Element	X	Y	Z	Unit
NOSE_LG	197.00	0.00	-77.65	IN
LEFT_MLG	451.00	-98.00	-84.34	IN
RIGHT_MLG	451.00	98.00	-84.34	IN
LEFT_WING_TIP	472.00	-256.80	13.00	IN
RIGHT_WING_TIP	472.00	256.80	13.00	IN
CANOPY	214.00	0.00	10.00	IN
RADOME_FRONT	20.00	0.00	-18.00	IN
LEFT_VERTICAL_TAIL	744.00	-98.00	60.00	IN
RIGHT_VERTICAL_TAIL	744.00	98.00	60.00	IN
REAR_BODY_LEFT	669.00	-58.00	-12.00	IN
REAR_BODY_RIGHT	669.00	58.00	-12.00	IN
NOSE_CONE	0.00	0.00	-15.00	IN

## Propulsion

Element	X	Y	Z	Unit	Feed
F100-PW-229	682.00	-12.00	0.00	IN	External Tank [0], Tank 1 [1], Left Wing Tank [2], Left Engine Feed [4], Left External Wing Tank [6], Left Feed line [8]
F100-PW-229	682.00	12.00	0.00	IN	External Tank [0], Tank 1 [1], Right Wing Tank [3], Right Engine Feed [5], Right External Wing Tank [7], Right Feed line [9]

## Tanks

Element	X	Y	Z	Unit	Capacity	Id	Priority
External Tank	450.00	0.00	-7.83	IN	3950 LBS	0	1
Tank 1	422.00	0.00	-5.77	IN	3300 LBS	1	2
Left Wing Tank	450.00	0.00	-7.83	IN	2750 LBS	2	3

Right Wing Tank	450.00	0.00	-7.83	IN	2750 LBS	3	3
Left Engine Feed	430.00	0.00	-7.83	IN	1200 LBS	4	4
Right Engine Feed	430.00	0.00	-7.83	IN	1500 LBS	5	4
Left External Wing Tank	450.00	0.00	-7.83	IN	3950 LBS	6	5
Right External Wing Tank	450.00	0.00	-7.83	IN	3950 LBS	7	5
Left Feed line	454.00	-38.00	-47.00	IN	10 LBS	8	6
Right Feed line	454.00	38.00	-47.00	IN	10 LBS	9	6