Includi << ..\Default_Functions.mcdx

LONGITUDINAL PARAMETERS INITIALIZATION

Hidden Area --> Import of Excel INPUT Data

Hidden Area --> Preliminary Mapping of imported Data

Hidden Area --> Import and preliminary mapping of OTHER Excel Data

Other input parameters to be defined here

$$\alpha_{dot} := 0.375 \cdot \frac{rad}{s} = 21.4859 \ \frac{deg}{s}$$

$$q := 0.0445 \cdot \frac{rad}{s} = 2.5497 \ \frac{deg}{s}$$

$$\alpha_{dot\_bar} := \frac{\alpha_{dot} \cdot MAC_W}{2 \cdot V_1} = 0.003277$$

$$\alpha_{dot\_bar} = 0.187735 \ deg$$

$$q_{bar} := \frac{q \cdot MAC_W}{2 \cdot V_1} = 0.000389$$

$$q_{bar} = 0.022278 \ deg$$

LONGITUDINAL PARAMETERS

Input parameters

$mass = (4.5 \cdot 10^4)$ **kg**

$C_{D0} = 0.027$

$\xi_{CG} = 0.275$

$\Delta X\_W_{LE}\_Nose = 11.1252$ **m**

$\Delta X\_HT_{LE}\_Nose = 27.8587$ **m**

$N_{eng\_1} = 2$

$\Delta X\_CG\_eng_1 = -5.3523$ **m**

$Y_{eng\_1} = 2.7767$ **m**

$\Delta Z\_eng_1\_CG = -1.1278$ **m**

$N_{eng\_2} = 0$

$\Delta X\_CG\_eng_2 = 0$ **m**

$Y_{eng\_2} = 0$ **m**

$\Delta Z\_eng_2\_CG = 0$ **m**

$D_{eng} = 1.207$ **m**

$\varepsilon_{\alpha\_eng} = 0.22$

$C_{N\alpha'\_eng} = 0.137$

Imported parameters

$M_1 = 0.696$

$V_1 = 208.41 \ \frac{m}{s}$

$p_{dyn} = (8.9612 \cdot 10^3)$ **Pa**

$d_B = 2.79$ **m**

$C_{M0\_B} = -0.1009$

$\xi_{ac\_WB} = 0.107$

$X_{MAC\_LE\_H} = 1.66$ **m**

$MAC_H = 2.433$ **m**

$\xi_{ac\_H} = 0.264$

$C_{L\alpha\_H} = 0.0809$ **deg**$^{-1}$

$\tau_e = 0.5$

$i_H = -1.9996$ **deg**

$\alpha_{0L\_H} = 0$ **deg**

$S_H = 25.47$ **m**^{2}

$\eta_H = 0.95$

$C_{h\_\alpha\_e} = -0.0001$ **deg**$^{-1}$

$C_{h\_\delta\_e} = -0.0002$ **deg**$^{-1}$

$C_{M\_ac\_H} = -0.07$

$MAC_W = 3.642$ **m**

$X_{MAC\_LE\_W} = 2.861$ **m**

$b_W = 27.249$ **m**

$C_{L\alpha\_W} = 0.1087$ **deg**$^{-1}$

$i_W = 1.9996$ **deg**

$\alpha_{0L\_W} = -1.9079$ **deg**

$C_{M\_ac\_W} = -0.057$

$\varepsilon_{0\_W} = 0.6417$ **deg**

$\varepsilon_{\alpha\_W} = 0.164$

$\Lambda_{W\_c4\_eqv} = 28.0176$ **deg**

$\xi_{ac\_W} = 16.7877$ **deg**

$S_W = 87.62$ **m**^{2}

$AR_W = 8.474$

$e_W = 0.918$

FUNDAMENTAL COEFFICIENTS AND DISTANCES

Aircraft Lift, Drag, Pitch moment coefficients

$$C_L := \frac{mass \cdot g}{p_{dyn} \cdot S_W} = 0.562$$

$$C_L = 0.562$$

$$C_M := 0$$

$$C_M = 0$$

$$C_D := C_{D0} + \frac{C_L^{\,2}}{\pi \cdot AR_W \cdot e_W} = 0.0399$$

$$C_D = 0.0399$$

$$L := p_{dyn} \cdot C_L \cdot S_W = \left(4.413 \cdot 10^5\right)\ \boldsymbol{N}$$

$$L = \left(4.5 \cdot 10^4\right)\ \boldsymbol{kgf}$$

$$D := p_{dyn} \cdot C_D \cdot S_W = \left(3.1349 \cdot 10^4\right)\ \boldsymbol{N}$$

$$D = \left(3.1967 \cdot 10^3\right)\ \boldsymbol{kgf}$$

Center of gravity, aerodynamic centers and volume ratios

$$x_{CG} := \xi_{CG} \cdot MAC_W = 1.0016\ \boldsymbol{m}$$

$$x_{CG} = 1.0016\ \boldsymbol{m}$$

$$\Delta X\_CG\_Nose := x_{CG} + X_{MAC\_LE\_W} + \Delta X\_W_{LE}\_Nose = 14.9878\ \boldsymbol{m}$$

$$\Delta X\_CG\_Nose = 14.9878\ \boldsymbol{m}$$

$$\Delta \xi\_HT_{ac}\_W_{MAC\_LE} := \frac{\left(\Delta X\_HT_{LE}\_Nose - \Delta X\_W_{LE}\_Nose\right) - X_{MAC\_LE\_W} + X_{MAC\_LE\_H} + \xi_{ac\_H} \cdot MAC_H}{MAC_W} = 4.4412$$

$$\Delta \xi\_HT_{ac}\_W_{MAC\_LE} = 4.4412$$

$$\Delta X\_HT_{ac}\_CG := \left(\Delta X\_HT_{LE}\_Nose - \Delta X\_W_{LE}\_Nose\right) - X_{MAC\_LE\_W} + X_{MAC\_LE\_H} + \xi_{ac\_H} \cdot MAC_H - x_{CG} = 15.1733\ \boldsymbol{m}$$

$$\Delta X\_HT_{ac}\_CG = 15.1733\ \boldsymbol{m}$$

$$VolumeRatio_H := \frac{S_H \cdot \Delta X\_HT_{ac}\_CG}{S_W \cdot MAC_W} = 1.2111$$

$$VolumeRatio_H = 1.2111$$

STICK FIXED AERODYNAMIC COEFFICIENTS

Wing-Body-HTail Lift coefficient curve slopes and basic values

$$K_{WB} := 1 + 0.025 \cdot \left| \frac{d_B}{b_W} \right| - 0.25 \cdot \left| \frac{d_B}{b_W} \right|^2 = 0.9999 \qquad K_{WB} = 0.9999$$

$$C_{L\alpha\_WB} := K_{WB} \cdot C_{L\alpha\_W} = 6.2266 \qquad C_{L\alpha\_WB} = 0.1087\ deg^{-1}$$

$$C_{L\alpha} := C_{L\alpha\_WB} + \eta_H \cdot \frac{S_H}{S_W} \cdot C_{L\alpha\_H} \cdot \langle 1 - \varepsilon_{\alpha\_W} \rangle = 7.2964 \qquad C_{L\alpha} = 0.1273\ deg^{-1}$$

$$C_{LiH} := \eta_H \cdot \frac{S_H}{S_W} \cdot C_{L\alpha\_H} = 1.2797 \qquad C_{LiH} = 0.02233\ deg^{-1}$$

$$C_{L\delta e} := \eta_H \cdot \frac{S_H}{S_W} \cdot C_{L\alpha\_H} \cdot \tau_e = 0.6398 \qquad C_{L\delta e} = 0.01117\ deg^{-1}$$

$$C_{L0\_WB} := C_{L\alpha\_WB} \cdot i_W = 0.2173 \qquad C_{L0\_WB} = 0.2173$$

$$C_{L0} := C_{L0\_WB} - \eta_H \cdot \frac{S_H}{S_W} \cdot C_{L\alpha\_H} \cdot \varepsilon_{0\_W} = 0.203 \qquad C_{L0} = 0.203$$

$$C_{D\alpha} := \frac{2 \cdot C_L \cdot C_{L\alpha}}{\pi \cdot AR_W \cdot e_W} = 0.3356 \qquad C_{D\alpha} = 0.0059\ deg^{-1}$$

Wing-Body-HTail Pitch momentum coefficient curve slopes and basic values

$$C_{M\alpha} := C_{L\alpha\_WB} \cdot \langle \xi_{CG} - \xi_{ac\_WB} \rangle - \eta_H \cdot C_{L\alpha\_H} \cdot VolumeRatio_H \cdot \langle 1 - \varepsilon_{\alpha\_W} \rangle = -3.411 \qquad C_{M\alpha} = -0.05953\ deg^{-1}$$

$$C_{MiH} := -\eta_H \cdot C_{L\alpha\_H} \cdot VolumeRatio_H = -5.3314 \qquad C_{MiH} = -0.09305\ deg^{-1}$$

$$C_{M\delta e} := -\eta_H \cdot C_{L\alpha\_H} \cdot VolumeRatio_H \cdot \tau_e = -2.6657 \qquad C_{M\delta e} = -0.04653\ deg^{-1}$$

$$C_{M0\_WB} := C_{M\_ac\_W} + C_{M0\_B} + C_{L0\_WB} \cdot \langle \xi_{CG} - \xi_{ac\_WB} \rangle = -0.1214 \qquad C_{M0\_WB} = -0.1214$$

$$C_{M0} := C_{M0\_WB} + \eta_H \cdot \frac{S_H}{S_W} \cdot \frac{MAC_H}{MAC_W} \cdot C_{M\_ac\_H} + \eta_H \cdot C_{L\alpha\_H} \cdot VolumeRatio_H \cdot \varepsilon_{0\_W} = -0.0746 \qquad C_{M0} = -0.0746$$

Unsteady flight coefficients

$C_{L\alpha\_dot} := 2 \cdot C_{L\alpha\_H} \cdot \eta_H \cdot VolumeRatio_H \quad \varepsilon_{\alpha\_W} = 1.7487$

$C_{L\alpha\_dot} = 0.0305 \ deg^{-1}$

$C_{M\alpha\_dot} := -C_{L\alpha\_dot} \cdot (\Delta\xi\_HT_{ac}\_W_{MAC\_LE} - \xi_{CG}) = -7.2855$

$C_{M\alpha\_dot} = -0.1272 \ deg^{-1}$

$$C_{Lq\_part1} := \left| \frac{AR_W + 2\cos(\Lambda_{W\_c4\_eqv})}{AR_W \cdot \left(\sqrt{1 - M_1^2 \cdot (\cos(\Lambda_{W\_c4\_eqv}))^2}\right) + 2 \cdot \cos(\Lambda_{W\_c4\_eqv})} \right| \cdot \left| \frac{1}{2} + 2 \cdot |\xi_{ac\_W} - \xi_{CG}| \right| \cdot C_{L\alpha\_W} = 4.0439$$

$C_{Lq\_part2} := 2 \cdot C_{L\alpha\_H} \cdot \eta_H \cdot VolumeRatio_H = 10.6629$

$C_{Lq} := C_{Lq\_part1} + C_{Lq\_part2} = 14.7068$

$C_{Lq} = 0.2567 \ deg^{-1}$

$K_q = 0.8255$

$$C_{Mq\_part1} := \left| \frac{\left| \frac{AR_W^3 \cdot (\tan(\Lambda_{W\_c4\_eqv}))^2}{AR_W + 6 \cdot \cos(\Lambda_{W\_c4\_eqv})} \right| + \frac{3}{\sqrt{1 - M_1^2 \cdot (\cos(\Lambda_{W\_c4\_eqv}))^2}}}{\left| \frac{AR_W^3 \cdot (\tan(\Lambda_{W\_c4\_eqv}))^2}{AR_W + 6 \cdot \cos(\Lambda_{W\_c4\_eqv})} \right| + 3} \right| \cdot (-K_q \cdot C_{L\alpha\_W} \cdot \cos(\Lambda_{W\_c4\_eqv})) = -0.0833 \ deg^{-1}$$

$$C_{Mq\_part2} := \left| \frac{AR_W \cdot \left(0.5 \cdot |\xi_{ac\_W} - \xi_{CG}| + 2 \cdot |\xi_{ac\_W} - \xi_{CG}|^2\right)}{AR_W + 2 \cdot \cos(\Lambda_{W\_c4\_eqv})} + \frac{1}{24} \cdot \left| \frac{AR_W^3 \cdot (\tan(\Lambda_{W\_c4\_eqv}))^2}{AR_W + 6 \cdot \cos(\Lambda_{W\_c4\_eqv})} \right| + \frac{1}{8} \right| = 0.0114 \ deg^{-1}$$

$$C_{Mq} := C_{Mq\_part1} \cdot C_{Mq\_part2} - 2 \cdot C_{L\alpha\_H} \cdot \eta_H \cdot VolumeRatio_H \cdot \left| \frac{\Delta X\_HT_{ac}\_CG}{MAC_W} \right| = -47.5464$$

$C_{Mq} = -0.8298 \ deg^{-1}$

Neutral point and Static Stability Margin

$$\xi_N := \frac{\xi_{ac\_WB} + \frac{C_{L\alpha\_H}}{C_{L\alpha\_WB}} \cdot \eta_H \cdot \frac{S_H}{S_W} \cdot (1 - \varepsilon_{\alpha\_W}) \cdot \Delta\xi\_HT_{ac}\_W_{MAC\_LE}}{1 + \frac{C_{L\alpha\_H}}{C_{L\alpha\_WB}} \cdot \eta_H \cdot \frac{S_H}{S_W} \cdot (1 - \varepsilon_{\alpha\_W})} = 0.7425$$

$\xi_N = 0.7425$

$x_N := \xi_N \cdot MAC_W = 2.7041 \ m$

$x_N = 2.7041 \ m$

$\Delta X\_N\_Nose := x_N + X_{MAC\_LE\_W} + \Delta X\_W_{LE}\_Nose = 16.6903 \ m$

$\Delta X\_N\_Nose = 16.6903 \ m$

$SSM := \xi_{CG} - \xi_N = -0.4675$

$\frac{C_{M\alpha}}{C_{L\alpha}} = -0.4675$

ENGINES CONTRIBUTION

$T := D = \left(3.1349 \cdot 10^{4}\right)\ N$

$T = \left(3.1349 \cdot 10^{4}\right)\ N$

$T_c := \dfrac{T}{2 \cdot p_{dyn} \cdot D_{eng}^{\ 2}} = 1.2006$

$T_c = 1.2006$

$N_{eng} := N_{eng\_1} + N_{eng\_2} = 2$

$N_{eng} = 2$

$S_{eng} := \dfrac{\pi}{4} \cdot D_{eng}^{\ 2} = 1.1442\ m^2$

$S_{eng} = 1.1442\ m^2$

$C_{N\alpha\_eng} := N_{eng} \cdot C_{N\alpha'\_eng} \cdot \left(1 + \varepsilon_{\alpha\_eng}\right) = 0.3343$

$C_{N\alpha\_eng} = 0.0058\ deg^{-1}$

$C_{M0\_eng\_1} := 2 \cdot T_c \cdot \dfrac{D_{eng}^{\ 2}}{S_W} \cdot \dfrac{\Delta Z\_eng_1\_CG}{MAC_W} \cdot \dfrac{N_{eng\_1}}{N_{eng}} = -0.0124$

$C_{M0\_eng\_1} = -0.01236$

$C_{M\alpha\_eng\_1} := C_{N\alpha\_eng} \cdot \dfrac{S_{eng}}{S_W} \cdot \dfrac{\Delta X\_CG\_eng_1}{MAC_W} \cdot \dfrac{N_{eng\_1}}{N_{eng}} = -0.0064$

$C_{M\alpha\_eng\_1} = -0.00011\ deg^{-1}$

$C_{M0\_eng\_2} := 2 \cdot T_c \cdot \dfrac{D_{eng}^{\ 2}}{S_W} \cdot \dfrac{\Delta Z\_eng_2\_CG}{MAC_W} \cdot \dfrac{N_{eng\_2}}{N_{eng}} = 0$

$C_{M0\_eng\_2} = 0$

$C_{M\alpha\_eng\_2} := C_{N\alpha\_eng} \cdot \dfrac{S_{eng}}{S_W} \cdot \dfrac{\Delta X\_CG\_eng_2}{MAC_W} \cdot \dfrac{N_{eng\_2}}{N_{eng}} = 0$

$C_{M\alpha\_eng\_2} = 0\ deg^{-1}$

$\Delta\xi_{N\_eng\_1} := \dfrac{C_{M\alpha\_eng\_1}}{C_{L\alpha}} = -0.0009$

$\Delta\xi_{N\_eng\_1} = -0.0009$

$\Delta\xi_{N\_eng\_2} := \dfrac{C_{M\alpha\_eng\_2}}{C_{L\alpha}} = 0$

$\Delta\xi_{N\_eng\_2} = 0$

$\Delta\xi_{N\_eng} := \Delta\xi_{N\_eng\_1} + \Delta\xi_{N\_eng\_2}$

$\Delta\xi_{N\_eng} = -0.0009$

$\xi_{N\_eng} := \xi_N + \Delta\xi_{N\_eng}$

$\xi_{N\_eng} = 0.7416$

$x_{N\_eng} := \xi_{N\_eng} \cdot MAC_W = 2.7009\ m$

$x_{N\_eng} = 2.7009\ m$

$\Delta X\_N_{eng}\_Nose := x_{N\_eng} + X_{MAC\_LE\_W} + \Delta X\_W_{LE}\_Nose = 16.6871\ m$

$\Delta X\_N_{eng}\_Nose = 16.6871\ m$

$SSM_{eng} := \xi_{CG} - \xi_{N\_eng} = -0.4666$

$SSM_{eng} = -0.4666$

Equilibrium system solution and results

$\alpha_{WB} = 3.1856\ \textbf{deg}$ $\delta_e = -2.8643\ \textbf{deg}$

$\alpha_H := \alpha_{WB} \cdot (1 - \varepsilon_{\alpha\_W}) + i_H + \tau_e \cdot \delta_e - \varepsilon_{0\_W}$ $\alpha_H = -1.4103\ \textbf{deg}$

$C_{LWB} := C_{L\alpha\_WB} \cdot (\alpha_{WB} + i_W)$ $C_{LWB} = 0.5635$

$C_{LH} := C_{L\alpha\_H} \cdot \alpha_H$ $C_{LH} = -0.1141$

$L_{WB} := p_{dyn} \cdot S_W \cdot C_{LWB}$ $L_{WB} = (4.4245 \cdot 10^5)\ \textbf{N}$

$L_H := \eta_H \cdot p_{dyn} \cdot S_H \cdot C_{LH}$ $L_H = -2.4733 \cdot 10^4\ \textbf{N}$ $\frac{L_H}{L_{WB}} = -0.0559$

STICK FREE AERODYNAMIC COEFFICIENTS

$$F := 1 - \tau_e \frac{C_{h\_\alpha\_e}}{C_{h\_\delta\_e}} = 0.7362 \qquad F = 0.7362$$

$$C_{M0\_free} := C_{M0\_WB} + \eta_H \cdot \frac{S_H}{S_W} \cdot \frac{MAC_H}{MAC_W} \cdot C_{M\_ac\_H} + \eta_H \cdot C_{L\alpha\_H} \cdot VolumeRatio_H \cdot \varepsilon_{0\_W} \cdot F = -0.0904 \qquad C_{M0\_free} = -0.0904$$

$$C_{M\alpha\_free} := C_{L\alpha\_WB} \cdot \langle \xi_{CG} - \xi_{ac\_WB} \rangle - \eta_H \cdot C_{L\alpha\_H} \cdot VolumeRatio_H \cdot \langle 1 - \varepsilon_{\alpha\_W} \rangle \cdot F = -2.2353 \qquad C_{M\alpha\_free} = -0.039 \ deg^{-1}$$

$$C_{MiH\_free} := -\eta_H \cdot C_{L\alpha\_H} \cdot VolumeRatio_H \cdot F = -3.9251 \qquad C_{MiH\_free} = -0.0685 \ deg^{-1}$$

$$\alpha_{free} := -\frac{C_{M0\_eng\_1} + C_{M0\_eng\_2} + C_{M0\_free} + C_{MiH\_free} \cdot i_H}{C_{M\alpha\_free} + C_{M\alpha\_eng\_1} + C_{M\alpha\_eng\_2}} = 0.8759 \ deg \qquad \alpha_{free} = 0.8759 \ deg$$

$$\alpha_{H\_free} := \alpha_{free} \cdot \langle 1 - \varepsilon_{\alpha\_W} \rangle - \varepsilon_{0\_W} + i_H = -1.9091 \ deg \qquad \alpha_{H\_free} = -1.9091 \ deg$$

$$\delta_{e\_free} := -\frac{C_{h\_\alpha\_e}}{C_{h\_\delta\_e}} \alpha_{H\_free} = 1.0072 \ deg \qquad \delta_{e\_free} = 1.0072 \ deg$$

$$C_{L0\_free} := C_{L0\_WB} - \eta_H \cdot \frac{S_H}{S_W} \cdot C_{L\alpha\_H} \cdot \varepsilon_{0\_W} \cdot F = 0.2068 \qquad C_{L0\_free} = 0.2068$$

$$C_{L\alpha\_free} := C_{L\alpha\_WB} + \eta_H \cdot \frac{S_H}{S_W} \cdot C_{L\alpha\_H} \cdot \langle 1 - \varepsilon_{\alpha\_W} \rangle \cdot F = 7.0142 \qquad C_{L\alpha\_free} = 0.1224 \ deg^{-1}$$

$$C_{LiH\_free} := \eta_H \cdot C_{L\alpha\_H} \cdot \frac{S_H}{S_W} \cdot F = 0.9421 \qquad C_{LiH\_free} = 0.0164 \ deg^{-1}$$

$$C_{L\_free} := C_{L0\_free} + \langle C_{L\alpha\_free} + C_{N\alpha\_eng} \rangle \cdot \alpha_{free} + C_{LiH\_free} \cdot i_H = 0.2862 \qquad C_{L\_free} = 0.2862$$

$$C_{D\alpha\_free} := \frac{2 \cdot C_{L\_free} \cdot C_{L\alpha\_free}}{\pi \cdot AR_W \cdot e_W} = 0.1643 \qquad C_{D\alpha\_free} = 0.0029 \ deg^{-1}$$

$$C_{D\_free} := C_{D0} + \frac{C_{L\_free}^{\ 2}}{\pi \cdot AR_W \cdot e_W} = 0.0304 \qquad C_{D\_free} = 0.0304$$

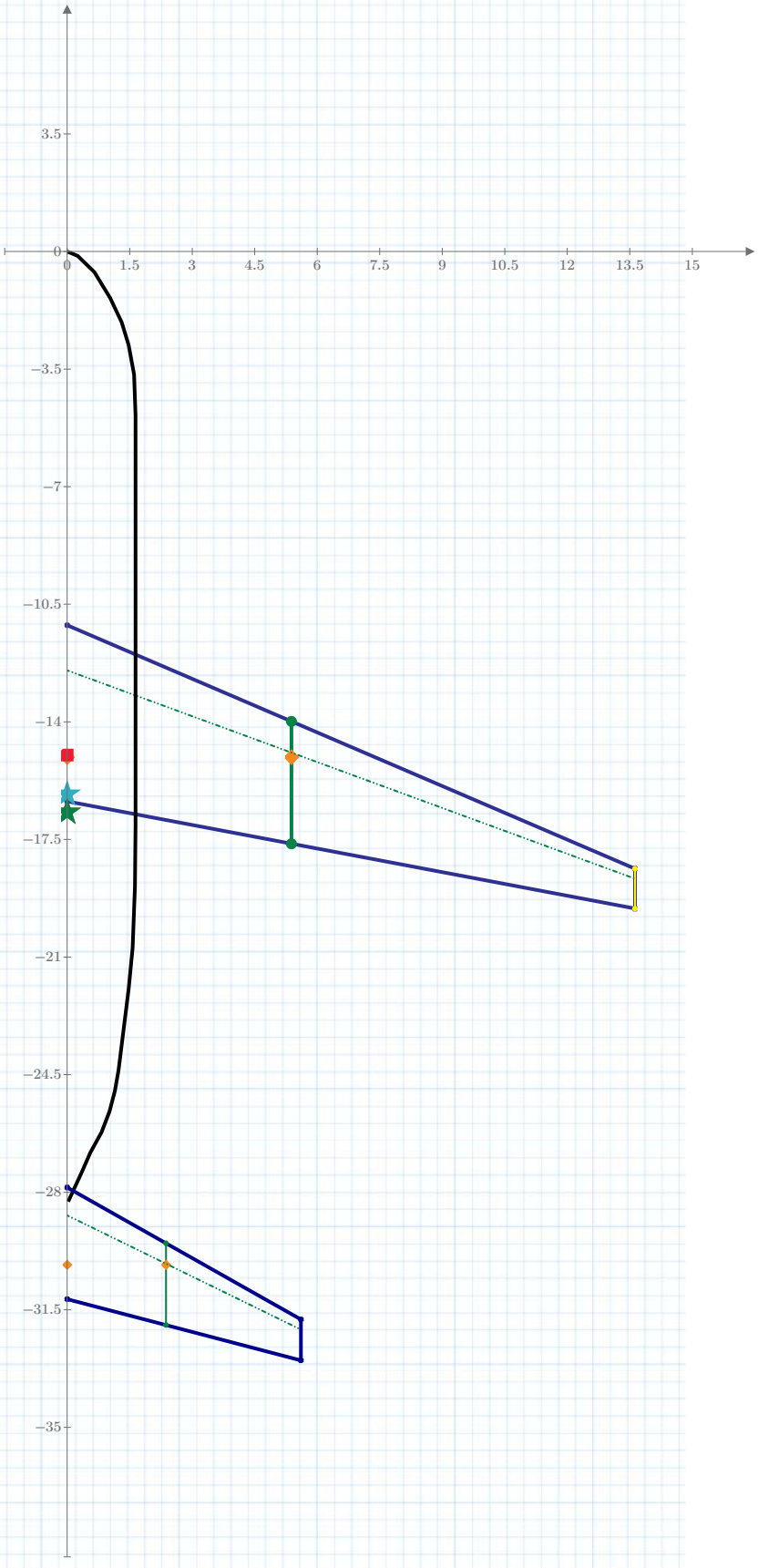
$$\xi_{N\_free} := \frac{\xi_{ac\_WB} + \frac{C_{L\alpha\_H}}{C_{L\alpha\_WB}} \cdot \eta_H \cdot \frac{S_H}{S_W} \cdot \langle 1 - \varepsilon_{\alpha\_W} \rangle \cdot \Delta\xi\_HT_{ac}\_W_{MAC\_LE} \cdot F}{1 + \frac{C_{L\alpha\_H}}{C_{L\alpha\_WB}} \cdot \eta_H \cdot \frac{S_H}{S_W} \cdot \langle 1 - \varepsilon_{\alpha\_W} \rangle \cdot F} = 0.5937$$

$$x_{N\_free} := \xi_{N\_free} \cdot MAC_W = 2.1622 \ m \qquad x_{N\_free} = 2.1622 \ m$$

$$\Delta X\_N_{free}\_Nose := x_{N\_free} + X_{MAC\_LE\_W} + \Delta X\_W_{LE}\_Nose = 16.1484 \ m \qquad \Delta X\_N_{free}\_Nose = 16.1484 \ m$$

$$SSM_{free} := \xi_{CG} - \xi_{N\_free} = -0.3187 \qquad SSM_{free} = -0.3187$$

WING-BODY-HTAIL PLANFORM WITH NEUTRAL POINTS



MAPPING AND OUTPUT CREATION

Includi << ../Default_Map_Longitudinal.mcdx

Excel Writing

$n_{sheet} := 6$

$First\_Row_{L\_1} := 4$

$Block_{L\_1} := {}_{f}\text{map\_matrix\_transform}\left({}_{m}Longit\_Data\_Map_{imported}\right)$

$Excel\_Output_{L\_1} := {}_{f}\text{write\_full\_output}\left({}_{s}Output\_Excel\_File, Block_{L\_1}, n_{sheet}, First\_Row_{L\_1}\right)$

$First\_Row_{L\_2} := First\_Row_{L\_1} + \text{rows}\left(Block_{L\_1}\right) + 2$

$Block_{L\_2} := {}_{f}\text{map\_matrix\_transform}\left({}_{m}Longit\_Data\_Map_{inpput}\right)$

$Excel\_Output_{L\_2} := {}_{f}\text{write\_full\_output}\left({}_{s}Output\_Excel\_File, Block_{L\_2}, n_{sheet}, First\_Row_{L\_2}\right)$

$First\_Row_{L\_3} := First\_Row_{L\_2} + \text{rows}\left(Block_{L\_2}\right) + 2$

$Block_{L\_3} := {}_{f}\text{map\_matrix\_transform}\left({}_{m}Longit\_Data\_Map\right)$

$Excel\_Output_{L\_3} := {}_{f}\text{write\_full\_output}\left({}_{s}Output\_Excel\_File, Block_{L\_3}, n_{sheet}, First\_Row_{L\_3}\right)$

TeX Macro writing on .tex

${}_{v}complete\_macros_{L} := \text{stack}\left(Block_{L\_1}^{\langle 2\rangle}, Block_{L\_2}^{\langle 2\rangle}, Block_{L\_3}^{\langle 2\rangle}\right)$

${}_{v}tex_{L} := {}_{f}\text{write\_matrix}\left(\text{“.\Output\LONGITUDINAL\_TeX\_Macros.tex”}, {}_{v}complete\_macros_{L}, \text{“ ”}\right)$