$W := 6360 lbf$ $W = 2884.847 \cdot kgf$ $CD0 := 0.03$ $etot := 0.8$ $\rho := 1.225 \frac{kg}{m^3}$

ALA

$b := 33.8 ft$ $b = 10.302\, m$ $Cr := 5.47 ft$ $Cr = 1.667 m$ $\lambda := 1$

$ew := 0.9$ $CL\alpha w := 5 rad^{-1}$

$\eta_i := 0.7$ $\eta_f := 1$ $\tau_{alett} := 0.45$ $\Gamma := 5 deg$

FUSOLIERA

$C_{N\beta f} := -0.003 deg^{-1}$

PIANO VERTICALE

$Sv := 4.5 m^2$ $Sv = 48.438 \cdot ft^2$ $lv := 6m$ $lv = 19.685 \cdot ft$ $CL\alpha 3Dv := 4 rad^{-1}$ $\eta v := 1$

$\tau_{timon} := 0.45$ $d\sigma d\beta := 0.11$ $hv := 1.0m$ $hv = 3.281 \cdot ft$

$V := 100 knot$ $V = 51.444 \frac{m}{s}$ $V = 185.2 \cdot \frac{km}{hr}$

$\delta r := 20 deg$

Assumendo che il velivolo atterri con una velocità V=100 kn e supponendo che la massima deflessione ammessa sia ± 20° per il timone e ± 15° per gli alettoni determinare la massima raffica laterale ammissibile affinché il velivolo atterri con la fusoliera allineata alla pista

SOLUZIONE

$S := \frac{(Cr + \lambda \cdot Cr) \cdot b}{2}$ $S = 17.176\, m^2$ $S = 184.886 \cdot ft^2$ $CL := \frac{W}{\frac{1}{2} \cdot \rho \cdot V^2 \cdot S}$ $CL = 1.016$

$AR := \frac{b^2}{S}$

$bc := Cr$ $ac := \frac{\lambda \cdot Cr - bc}{\frac{b}{2}}$ $C(y) := ac \cdot y + bc$

Equilibrio all'imbardata

$C_N := C_{N\beta}\cdot\beta + C_{N}\cdot\delta r$

$C_{N\beta v} := CL\alpha3Dv\cdot\frac{lv}{b}\cdot(1 - d\sigma d\beta)\cdot\eta v\cdot\frac{Sv}{S}$ $\quad C_{N\beta v} = 0.543\cdot rad^{-1}$ $\quad C_{N\beta v} = 0.0095\cdot deg^{-1}$

$C_{N\beta} := C_{N\beta v} + C_{N\beta f}$ $\quad C_{N\beta} = 0.371\cdot rad^{-1}$ $\quad C_{N\beta} = 0.0065\cdot deg^{-1}$

$C_{N\delta r} := -CL\alpha3Dv\cdot\frac{lv}{b}\cdot\eta v\cdot\frac{Sv}{S}\cdot\tau_{timon}$ $\quad C_{N\delta r} = -0.275\cdot rad^{-1}$ $\quad C_{N\delta r} = -0.0048\cdot deg^{-1}$

$\delta r = 20\cdot deg$

$\beta := \frac{-C_{N\delta r}\cdot\delta r}{C_{N\beta}}$ $\quad \beta = 14.794\cdot deg$

Equilibrio al rollio

$C_{roll} := C_{roll\beta}\cdot\beta + C_{roll\delta a}\cdot\delta a + C_{roll\delta r}\cdot\delta r$

$C_{roll\beta v} := -CL\alpha3Dv\cdot\frac{hv}{b}\cdot(1 - d\sigma d\beta)\cdot\eta v\cdot\frac{Sv}{S}$ $\quad C_{roll\beta v} = -0.091\cdot rad^{-1}$ $\quad C_{roll\beta v} = -0.0016\cdot deg^{-1}$

$C_{roll\beta\Gamma} := -2\cdot\frac{CL\alpha w\cdot\Gamma}{S\cdot b}\cdot\int_0^{\frac{b}{2}} C(y)\cdot y\, dy$ $\quad C_{roll\beta\Gamma} = -0.109\cdot rad^{-1}$ $\quad C_{roll\beta\Gamma} = -0.0019\cdot deg^{-1}$

$C_{roll\beta} := C_{roll\beta v} + C_{roll\beta\Gamma}$ $\quad C_{roll\beta} = -0.2\cdot rad^{-1}$

$C_{roll\delta a} := -2\cdot\frac{CL\alpha w\cdot\tau_{alett}}{S\cdot b}\cdot\int_{\eta_i\cdot\frac{b}{2}}^{\eta_f\cdot\frac{b}{2}} C(y)\cdot y\, dy$ $\quad C_{roll\delta a} = -0.287\cdot rad^{-1}$ $\quad C_{roll\delta a} = -0.00501\cdot deg^{-}$

$C_{roll\delta r} := CL\alpha3Dv\cdot\frac{hv}{b}\cdot\eta v\cdot\frac{Sv}{S}\cdot\tau_{timon}$ $\quad C_{roll\delta r} = 0.046\cdot rad^{-1}$ $\quad C_{roll\delta r} = 0.0008\cdot deg^{-1}$

$\delta a := \frac{-C_{roll\delta r}\cdot\delta r - C_{roll\beta}\cdot\beta}{C_{roll\delta a}}$ $\quad \delta a = -7.103\cdot deg$

$Vraff := V\cdot\tan(\beta)$ $\quad Vraff = 13.586\,\frac{m}{s}$ $\quad Vraff = 26.409\cdot knot$

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