Model Documentation of the 'Transport Aircraft model Boing flight condition VMIN'

1 Nomenclature

1.1 Nomenclature for Model Equations

x	state vector
u	control input vector
w	noise vector
z	regulated output vector
y	measurement vector

2 Model Equations

State Vector and Input Vector:

$$x \in \mathbb{R}^9 u \qquad \in \mathbb{R}^1 w \in \mathbb{R}^1 0 z \qquad \in \mathbb{R}^2 y \in \mathbb{R}^5$$

System Equations:

$$\dot{x}(t) = Ax(t) + B_1 w(t) + Bu(t) \tag{1a}$$
$$z(t) = C_1 x(t) + D_{11} w(t) + D12u(t) \tag{1b}$$
$$y(t) = Cx(t) + D21w(t) \tag{1c}$$

Outputs: z

2.1 Exemplary parameter values

Symbol	Value
A	$\begin{bmatrix} -0.01365 & 0.178 & 0.00017 & -0.561 & -0.03726 & 0 & 0.01365 & -0.01311 & 0 \\ -0.01516 & -0.752 & 1.001 & 0.00127 & -0.06311 & 0 & 0.01516 & 0.05536 & 0 \\ 0.00107 & 0.07896 & -0.8725 & 0 & -3.399 & 0 & -0.00107 & -0.00581 & 0 \\ 0 & 0 & 1.0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -20.0 & 10.72 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -50.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -0.4447 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -0.4447 & 0.0044 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -0.0044 & -0.4447 \end{bmatrix}$
B	$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 50.0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$
B_1	$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 50.0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$
C_1	$\begin{bmatrix} 0.00323 & 0.16015 & -0.01679 & 0 & -0.0516 & 0 & -0.00323 & -0.01179 & 0 \\ 0.5 & 0 & 0 & 0 & 0 & 0 & -0.5 & 0 & 0 \end{bmatrix}$
C	$\begin{bmatrix} 0.00646 & 0.3203 & -0.03358 & 0 & -0.1032 & 0 & -0.00646 & -0.02358 & 0 \\ 1.0 & 0 & 0 & 0 & 0 & 0 & -1.0 & 0 & 0 \\ -0.01365 & 0.178 & 0.00017 & -0.561 & -0.03726 & 0 & 0.01365 & -0.01311 & 0 \\ 0 & -13.58 & 0 & 13.58 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1.0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
D_{11}	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
D_{12}	$\begin{bmatrix} 0.5 \\ 0.5 \end{bmatrix}$
D_{21}	$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1.0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1.0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1.0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1.0 & 0 \end{bmatrix}$

3 Derivation and Explanation

This model is part of the "'COMPleib"' - library and wasautomatically imported into ACKREP.
The original description was:
AC8 Transport Aircraft model Boing flight condition CRUISE see AC7! Case study II, p.1001/1012

4 Simulation

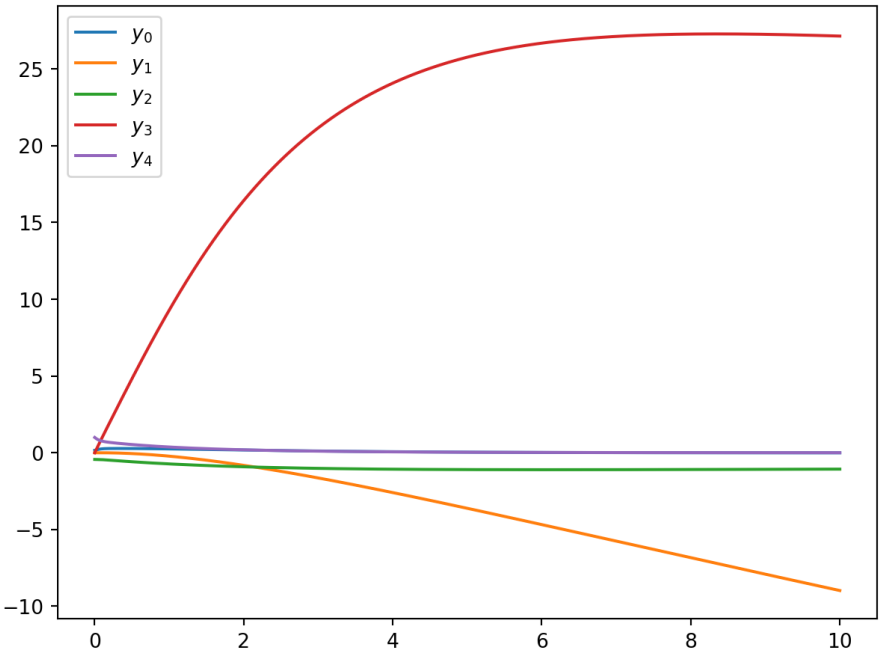

Figure 1: Simulation of the Transport Aircraft model Boing flight condition VMIN.

References

[1] . Gangsaas, K. R. Bruce, J. D. Blight and U.-L. Ly, "Application of Modern Synthesis to Aircraft Control Three Case Studies", TOAC, Vol.31, Nr.11, pp.995-1014, 1986 Case study III 2