# Model Documentation of the 'Transport Aircraft model Boing flight condition VFC/MFC'

## 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:

$$x \in \mathbb{R}^1 0u \qquad \in \mathbb{R}^2 w \in \mathbb{R}^4 z \qquad \in \mathbb{R}^1 y \in \mathbb{R}^3$$

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 |
|---|---|
| $A$ | $\begin{bmatrix} -0.00702 & 0.06339 & 0.00518 & -0.55566 & -0.06112 & 0 & 0.00712 & -0.00566 & 0 \\ -0.01654 & -0.38892 & 1.0057 & 0.00591 & -0.04632 & 0 & 0.01654 & 0.04018 & 0 \\ 0.00061 & 0.3521 & -0.47381 & 0 & 1.7862 & 0 & -0.00061 & -0.03638 & 0 \\ 0 & 0 & 1.0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -20.0 & 20.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -30.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -0.55454 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -0.55454 & 0.005 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -0.00555 & -0.55 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| $B$ | $\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 30.0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 1.0 & 0 \end{bmatrix}$ |
| $B_1$ | $\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 30.0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 1.0 & 0 \end{bmatrix}$ |
| $C_1$ | $\begin{bmatrix} 0.00353553 & 0.082583 & -0.00121622 & 0 & -0.00999142 & 0 & -0.00353553 & -0.00853478 & 0 & 0 \end{bmatrix}$ |
| $C$ | $\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1.0 \\ 0.005 & 0.11679 & -0.00172 & 0 & -0.01413 & 0 & -0.005 & -0.01207 & 0 & 0 \\ 0 & 0 & 1.0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ |
| $D_{11}$ | $\begin{bmatrix} 0 & 0 & 0 & 0 \end{bmatrix}$ |
| $D_{12}$ | $\begin{bmatrix} 0 & 0.70710678 \end{bmatrix}$ |
| $D_{21}$ | $\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1.0 \end{bmatrix}$ |

# 3 Derivation and Explanation

This model is part of the "'COMPleib"' - library and wasautomatically imported into ACKREP.
The original description was:
ROC2 Transport Aircraft model Boing flight condition VFC/MFC D. 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 1, nc=1

# 4 Simulation

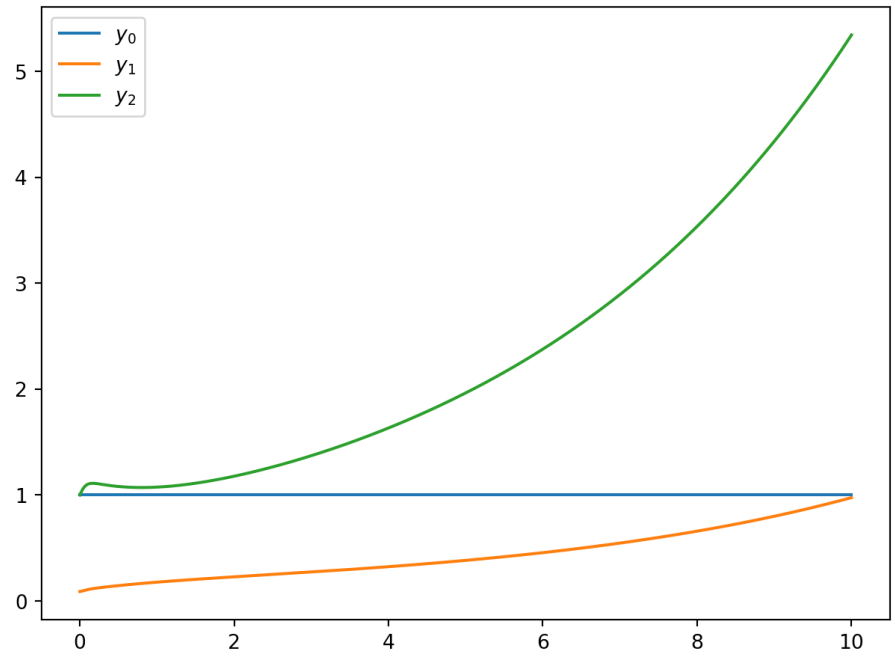


Figure 1: Simulation of the Transport Aircraft model Boing flight condition VFC/MFC.

# 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 1, nc=1