

# Model Documentation of the 'Transport Aircraft model Boeing 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:

$$x \in \mathbb{R}^9 \quad u \in \mathbb{R}^1 \quad w \in \mathbb{R}^4 \quad z \in \mathbb{R}^1 \quad y \in \mathbb{R}^2$$

System Equations:

$$\dot{x}(t) = Ax(t) + B_1w(t) + Bu(t) \quad (1a)$$

$$z(t) = C_1x(t) + D_{11}w(t) + D_{12}u(t) \quad (1b)$$

$$y(t) = Cx(t) + D_{21}w(t) \quad (1c)$$

Outputs:  $z$

## 2.1 Exemplary parameter values

Symbol	Value			
$A$	$\begin{bmatrix} -0.06254 & 0.01888 & 0 & -0.56141 & -0.02751 & 0 & 0.06254 & -0.00123 & 0 \\ 0.01089 & -0.9928 & 0.99795 & 0.00097 & -0.07057 & 0 & -0.01089 & 0.06449 & 0 \\ 0.07743 & 1.6754 & -1.31111 & -0.0003 & -4.2503 & 0 & -0.07743 & -0.10883 & 0 \\ 0 & 0 & 1.0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -20.0 & 20.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -30.0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -0.88206 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -0.88206 & 0.0088 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & -0.00882 & -0.882 \end{bmatrix}$			
	$B$	$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 30.0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$		
		$B_1$	$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 30.0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$	
			$C_1$	$\begin{bmatrix} -0.00366988419 & 0.336611112 & 0.000692964646 & -0.000219203102 & 0.0238860671 & 0 & 0.0036 \end{bmatrix}$
			$C$	$\begin{bmatrix} -0.00519 & 0.47604 & 0.00098 & -0.00031 & 0.03378 & 0 & 0.00519 & -0.03086 & 0 \\ 0 & 0 & 1.0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
			$D_{11}$	$\begin{bmatrix} 0 & 0 & 0 & 0 \end{bmatrix}$
			$D_{12}$	$\begin{bmatrix} 0.70710678 \end{bmatrix}$
			$D_{21}$	$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1.0 \end{bmatrix}$

## 3 Derivation and Explanation

This model is part of the "COMpleib" - library and was automatically imported into ACKREP.

The original description was:

AC7 Transport Aircraft model Boeing flight condition VMIN 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 2

## 4 Simulation

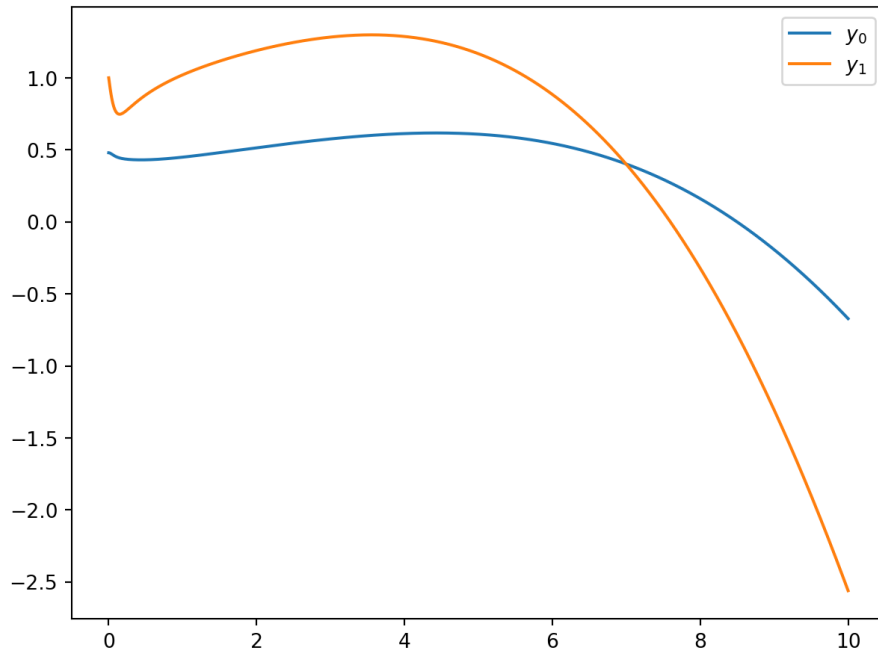


Figure 1: Simulation of the Transport Aircraft model Boeing flight condition VMIN.

## 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