

Notation for aircraft dynamics

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THE PREPARATION OF THIS DATA ITEM

The work on this particular Data Item was monitored and guided by the Dynamics Committee. This Committee first met in 1962 and has the following membership:

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NOTATION FOR AIRCRAFT DYNAMICS

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NOTATION FOR AIRCRAFT DYNAMICS

1. INTRODUCTION

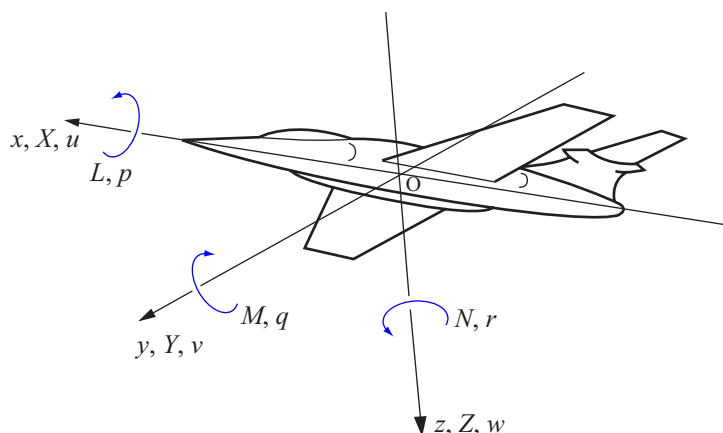
Certain symbols occur so frequently within the Dynamics Series that it is felt worthwhile to collect them together in a single Data Item. Accordingly, the notation that it is anticipated will be generally required throughout the Series is listed here; other notation applicable to each individual Data Item is given in the Notation section of that Item. Data Item No. 67001^[1] presents an introduction to the notation for aircraft dynamics.

All axis systems used are of the right-handed orthogonal Cartesian type. The origin is denoted by O and the axes designated x, y, z . A particular choice of origin or axes is indicated by a suffix, apart from those systems in which either or both of these are fixed relative to the aircraft. Forces and linear velocities are positive in the directions of the axes. Angular velocities are positive if, when looking along the appropriate axis in the positive sense, the aircraft is seen to be rotating clockwise. Moments are positive if they tend to rotate the aircraft in the positive angular velocity direction.

Alphabetical trios are used to denote components of force, moment, linear displacement and velocity, and angular velocity. They are listed in Table 1.1. Sketch 1.1 shows a body axis system $Oxyz$ and indicates positive directions. Further details on the choice of particular axis systems are given in Item No. 67003^[2].

TABLE 1.1

<i>Quantity</i>	<i>Components</i>	<i>Resultant</i>
Force	$X \ Y \ Z$	R
Moment	$L \ M \ N$	
Linear displacement	$x \ y \ z$	
Linear velocity	$u \ v \ w$	V
Angular velocity	$p \ q \ r$	Ω



Sketch 1.1 Axis system

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2. LIST OF SYMBOLS

A	aspect ratio ($= b^2/S$)
A	longitudinal force
a	speed of sound
a_1	lift curve slope ($= \partial C_L / \partial \alpha$)
B	hinge moment
b	wing span
$b_x; b_y; b_z$	constant-of-inertia ratios ($= -(I_y - I_z)/I_x; -(I_z - I_x)/I_y; -(I_x - I_y)/I_z$)
C_A	longitudinal force coefficient ($= A / \frac{1}{2} \rho V^2 S$)
C_D	drag coefficient ($= D / \frac{1}{2} \rho V^2 S$)
C_L	lift coefficient ($= L / \frac{1}{2} \rho V^2 S$)
C_N	normal force coefficient ($= N / \frac{1}{2} \rho V^2 S$)
$C_X; C_Y; C_Z$	force coefficients ($= X / \frac{1}{2} \rho V^2 S; Y / \frac{1}{2} \rho V^2 S; Z / \frac{1}{2} \rho V^2 S$)
$C_l; C_m; C_n$	moment coefficients ($= L / \frac{1}{2} \rho V^2 S l; = M / \frac{1}{2} \rho V^2 S l; = N / \frac{1}{2} \rho V^2 S l$)
c	local chord
$\bar{c}$	standard mean (or first mean) chord (see Item No. 76003 ^[3])
$\bar{\bar{c}}$	mean aerodynamic (or second mean) chord (see Item No. 76003 ^[3])
$c_{zx}, c_{yx}; c_{xy}, c_{zy}; c_{yz}, c_{xz}$	engine momentum parameters ($= J_z/I_x, J_y/I_x; J_x/I_y, J_z/I_y; J_y/I_z, J_x/I_z$)
D	drag
D	differential operator given by $Du = du/dt$ in ordinary units or $\hat{D}\hat{u} = d\hat{u}/d\hat{t}$ when dynamic-normalised
$d_x; d_y; d_z$	constant-of-inertia ratios ($= -I_{yz}/I_x; = -I_{yz}/I_y; = -I_{yz}/I_z$)