

Glossary of

Aeronautical and astronautical terms —

Section 4: Aerodynamics

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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(Notes on the arrangement and scope of the glossary are contained in the Foreword to Section 1.)

Section 4. Aerodynamics

BS M 31, “*Symbols for flight dynamics*”, lists the recommended terms, with explanatory text and symbols, to be used in mathematical analysis and is designed to meet a more specialized need than is this glossary. However, care has been taken to ensure that, as far as is possible, there is no conflict between the glossary and the other standard.

Subsection 41. General

No.	Term	Definition
4101	aerodynamic centre	The point about which the rate of change of pitching moment with incidence is zero.
4102	aerodynamic twist	Variation of the zero-lift line along the span of a wing or other aerofoil. (Cf. 5228.)
4103	airspeed	The speed of an object relative to the ambient undisturbed air.
	angles	
4104	<i>angle of attack</i> ANGLE OF INCIDENCE	The angle between a reference line in a body (for an aerofoil the chord is usually used) and the projection of the velocity relative to the ambient undisturbed air on to the plane of symmetry. NOTE Not to be confused with rigging angle of incidence, 5236.
4105	<i>effective angle of attack</i>	The angle between a reference line on a body and the mean direction of a non-uniform disturbed airstream ahead of the body.
4106	<i>angle of downwash/upwash</i>	The angle between the projections on to the plane of symmetry of the local and undisturbed flow directions.
4107	<i>angle of sideslip</i>	The angle between the direction of the undisturbed flow and the plane of symmetry.
4108	<i>angle of sidewash</i>	The angle between the projections of the local and undisturbed flow directions on to a plane perpendicular to the plane of symmetry and parallel to the undisturbed flow.
4109	area rule, sonic	The approximation that the wave drag at the speed of sound is the same for all bodies with the same longitudinal distribution of cross-sectional area. In particular, it is equal to that of a body of revolution of that area distribution.
4110	area rule, supersonic	A method of estimating the wave drag in inviscid supersonic flow for smooth bodies in terms of the areas of sections taken obliquely at the Mach angle.
4111	autorotation	Continuous rotation of a body resulting from the action of air forces and not sustained by control inputs. (See also 5728.)
	axes	
4112	<i>body axes</i>	A system of rectangular co-ordinate axes fixed in the aircraft, usually with the origin at the centre of gravity. The <i>x</i> -axis is usually forward of and in (or parallel to) the plane of symmetry, the <i>y</i> -axis is to starboard, and the <i>z</i> -axis perpendicular to these so as to form a righthanded system.
4113	<i>aerodynamic-body axes</i> WIND-BODY AXES	Body axes in which the <i>x</i> -axis coincides with (or is parallel to) the projection on to the plane of symmetry of some datum velocity of the origin relative to the ambient undisturbed air.
4114	<i>principal body axes</i>	Body axes that coincide with the principal axes of inertia through the centre of gravity.
4115	<i>longitudinal axes</i>	The <i>x</i> -axis of a system of body axes in which the <i>xz</i> -plane is the plane of symmetry.

No.	Term	Definition
4116	<i>normal axis</i>	The <i>z</i> -axis of a system of body axes in which the <i>xz</i> -plane is the plane of symmetry.
4117	<i>transverse axis</i> LATERAL AXIS	The <i>y</i> -axis of a system of body axes in which the <i>xz</i> -plane is the plane of symmetry.
4118	<i>cross-wind axis</i>	The straight line through the centre of gravity perpendicular to the lift and drag axes. The positive direction is to port.
4119	<i>drag axis</i>	The straight line through the centre of gravity parallel to the direction of the undisturbed flow. The positive direction is downstream.
4120	<i>lift axis</i>	The straight line through the centre of gravity in the plane of symmetry and perpendicular to the drag axis. The positive sense is in the dorsal direction.
4121	<i>centre of pressure</i>	The point on some reference line (e.g. the chord of an aerofoil) about which the pitching moment is zero.
	drag^a	
4122	<i>cooling drag</i>	Drag associated with the cooling of the power plant, etc.
4123	<i>form drag</i>	For shock-free flow, the normal-pressure drag less the vortex drag.
4124	<i>lift-dependent drag</i>	The difference between the drag at a given lift coefficient and the drag at some specified datum lift coefficient.
4125	<i>normal-pressure drag</i>	Drag arising from the resolved components of the pressures normal to the surface.
4126	<i>post-exit drag</i>	The force in the drag direction deduced from the resolved components of the normal pressures on the outside of the equivalent post-exit streamtube.
4127	<i>pre-entry drag</i>	The force in the drag direction deduced from the resolved components of the normal pressures on the outside of the pre-entry streamtube.
4128	<i>profile drag</i> BOUNDARY-LAYER DRAG	Drag associated with losses in total pressure and total temperature in the boundary layers. It is the sum of the form drag and the skin-friction drag.
4129	<i>ram drag</i>	The force, acting in the downstream direction, which would arise if the momentum of the internal flow at infinity of a body were destroyed. It is the effective sink drag of an air intake.
4130	<i>sink drag</i>	Drag arising from the removal of fluid from the flow.
4131	<i>spillage drag</i>	The difference between the drag at a given intake flow and the drag at some specified intake flow.
4132	<i>skin-friction drag</i> SURFACE-FRICTION DRAG	Drag arising from the resolved components of the tangential forces on the surface of a body.
4133	<i>wave drag</i> SHOCK-WAVE DRAG	Drag arising from the formation of shock waves.
4134	<i>vortex drag</i> TRAILING-VORTEX DRAG	Drag arising from the formation of trailing vortices. Formerly called induced drag .
4135	<i>external surface flows</i>	A surface that forms a boundary of the external flow.
4136	<i>datum intake flow</i>	The intake flow that would occur if the boundary of the pre-entry streamtube were unaffected by the presence of the intake.
4137	<i>external flow</i>	The flow of fluid which passes around a body.

^a See also 4141.

No.	Term	Definition
4138	<i>full intake flow</i>	The intake flow that occurs when, with a pre-entry compression body in position, the boundary of the pre-entry streamtube is unaffected by the presence of the remainder of the intake. If there is no pre-entry compression body, then full intake flow is the same as datum intake flow.
4139	<i>internal flow forces</i>	The flow of fluid which passes through a duct of a body.
4140	<i>cross-wind force</i>	The component of the total aerodynamic force in the direction of the cross-wind axis.
4141	<i>drag^a</i>	The component of the total aerodynamic force in the direction of the undisturbed flow. In powered flight, contributions to this component arising from thrust are excluded.
4142	<i>lift</i>	The component of the total aerodynamic force in the direction of the lift axis.
4143	<i>longitudinal force</i> AXIAL FORCE	The component of the total aerodynamic force along the <i>x</i> -axis (or longitudinal axis).
4144	<i>normal force</i>	The component of the total aerodynamic force along the <i>z</i> -axis (or normal axis).
4145	<i>transverse force</i> LATERAL FORCE SIDE FORCE	The component of the total aerodynamic force along the <i>y</i> -axis (or transverse axis).
4146	<i>thrust</i>	The aerodynamic force attributed to the propulsive system.
4147	<i>post-exit thrust</i>	The force in the direction of motion deduced from the resolved components of the normal pressures on the inside of the post-exit streamtube.
4148	<i>pre-entry thrust</i>	The force in the direction of motion deduced from the resolved components of the normal pressures on the inside of the pre-entry streamtube.
4149	<i>ground effect</i>	The effect of the proximity of the ground or other surface on the aerodynamic qualities of an aircraft.
4150	<i>hinge moment</i>	The moment about the hinge axis of a control or other hinged surface due to aerodynamic forces.
4151	<i>industrial aerodynamics</i>	Aerodynamics of non-aeronautical engineering applications, such as buildings, bridges, stacks, vehicles, duct flows, fans, ventilation, combustion.
4152	<i>interference</i>	The aerodynamic influence of bodies on one another.
4153	<i>internal surface</i>	A surface that forms a boundary of the internal flow.
4154	<i>limiting velocity</i>	The steady velocity attainable by an aircraft along a straight flight path at any specified angle to the horizontal under given atmospheric and propulsive conditions.
4155	<i>post-exit streamtube</i>	The hypothetical streamtube, extending from the body to infinity downstream, that is assumed to separate the internal flow from the external flow in the absence of mixing.
4156	<i>pre-entry streamtube</i>	The streamtube extending to the entry of a ducted body from infinity upstream and separating the internal flow from the external flow.
4157	<i>scale effect</i>	The effect upon any non-dimensional aerodynamic coefficient of a change in the size of a body, other conditions remaining unchanged. More generally, the effect of a change in the Reynolds number.

^a See also 4122 to 4134.