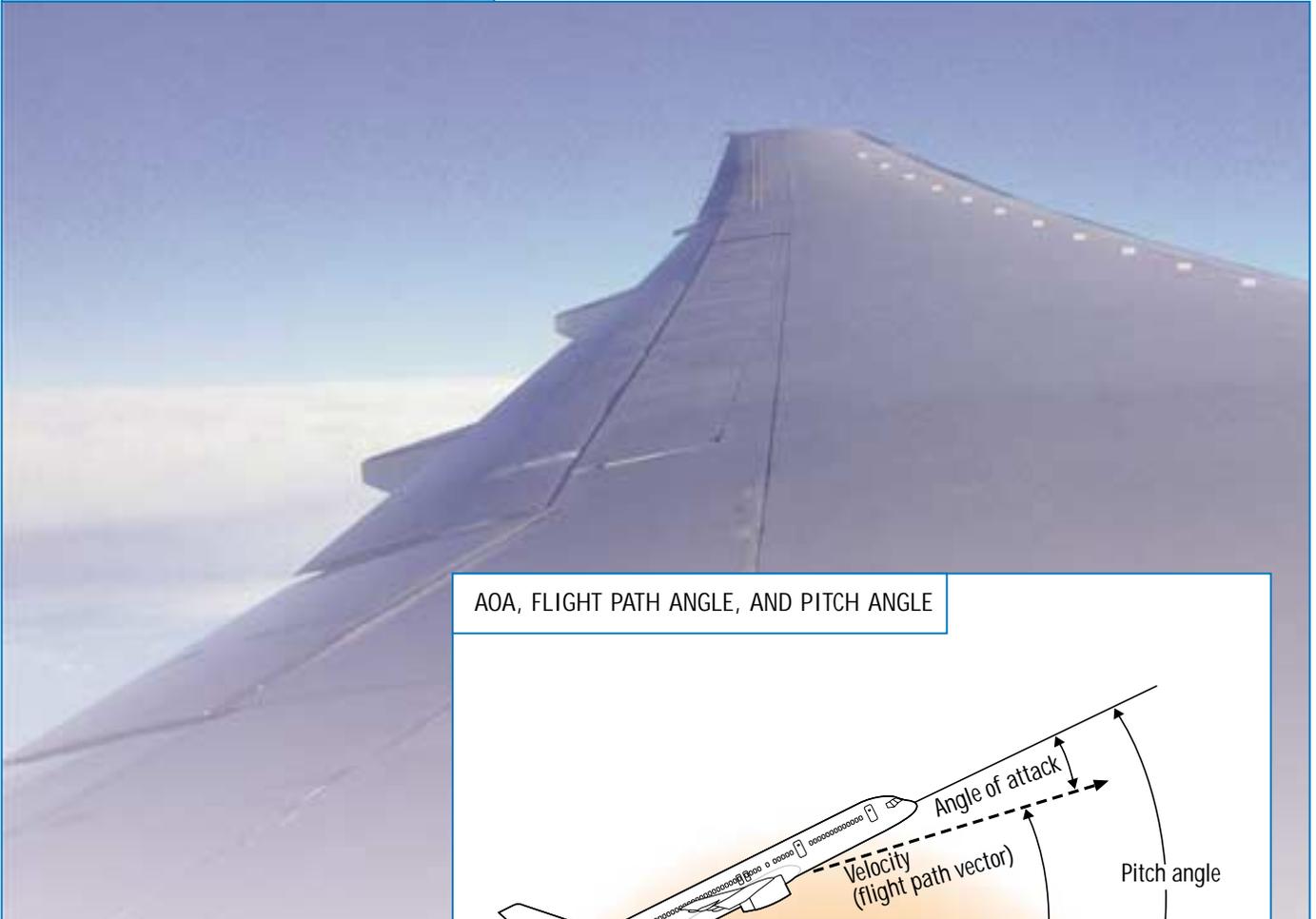
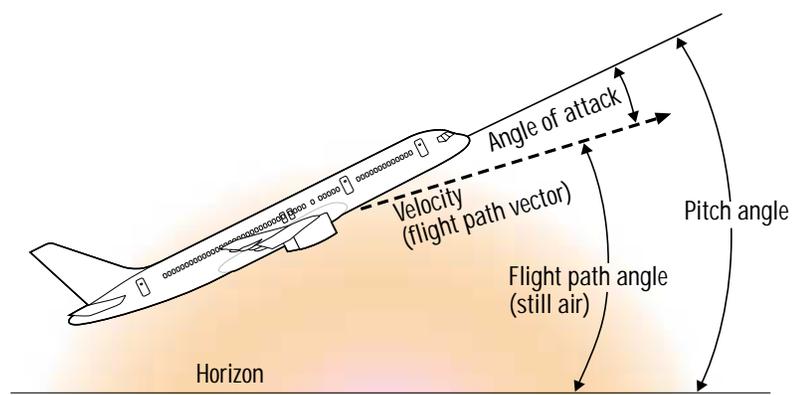


WHAT IS ANGLE OF ATTACK?



AOA, FLIGHT PATH ANGLE, AND PITCH ANGLE



Angle of attack (AOA) is the angle between the oncoming air or relative wind and a reference line on the airplane or wing. Sometimes, the reference line is a line connecting the leading edge and trailing edge at some average point on the wing. Most commercial jet airplanes use the fuselage centerline or longitudinal axis as the reference line. It makes no difference what the reference line is, as long as it is used consistently.

AOA is sometimes confused with pitch angle or flight path angle. Pitch angle (attitude) is the angle between the longitudinal axis (where the airplane is pointed) and the horizon. This angle is displayed on the attitude indicator or artificial horizon.

Flight path angle is defined in two different ways. To the aerodynamicist, it is the angle between the flight path vector (where the airplane is going) and the local atmosphere. To the flight crew, it is normally known as the angle between the flight path vector and the horizon, also known as the climb (or descent) angle. Airmass-referenced and inertial-referenced flight path angles are the same *only in still air* (i.e., when there is no wind or vertical air movement). For example, in a headwind or sinking air mass, the flight path angle

relative to the ground will be less than that referenced to the air. On the newest commercial jet airplanes, this angle can be displayed on the primary flight display and is calculated referenced to the ground (the inertial flight path angle).

AOA is the difference between pitch angle and flight path angle when the flight path angle is referenced to the atmosphere. Because of the relationship of pitch angle, AOA, and flight path angle, an airplane can reach a very high AOA even with the nose below the horizon, if the flight path angle is a steep descent.