

instruments while searching outside of the airplane for visual confirmation of the information provided by those instruments results in inadequate airplane control. This may be followed by spatial disorientation and complete control loss.

The most important point to be stressed is that the pilot must not panic. The task at hand may seem overwhelming, and the situation may be compounded by extreme apprehension. The pilot therefore must make a conscious effort to relax. The pilot must understand the most important concern—in fact the only concern at this point—is to keep the wings level. An uncontrolled turn or bank usually leads to difficulty in achieving the objectives of any desired flight condition. The pilot finds that good bank control has the effect of making pitch control much easier.

The pilot should remember that a person cannot feel control pressures with a tight grip on the controls. Relaxing and learning to “control with the eyes and the brain,” instead of only the muscles usually takes considerable conscious effort.

The pilot must believe what the flight instruments show about the airplane’s attitude regardless of what the natural senses tell. The vestibular sense (motion sensing by the inner ear) can and will confuse the pilot. Because of inertia, the sensory areas of the inner ear cannot detect slight changes in airplane attitude, nor can they accurately sense attitude changes that occur at a uniform rate over a period of time. On the other hand, false sensations are often generated, leading the pilot to believe the attitude of the airplane has changed when, in fact, it has not. These false sensations result in the pilot experiencing spatial disorientation.

Attitude Control

An airplane is, by design, an inherently stable platform and, except in turbulent air, maintains approximately straight-and-level flight if properly trimmed and left alone. It is designed to maintain a state of equilibrium in pitch, roll, and yaw. The pilot must be aware, however, that a change about one axis affects the stability of the others. The typical light airplane exhibits a good deal of stability in the yaw axis, slightly less in the pitch axis, and even lesser still in the roll axis. The key to emergency airplane attitude control, therefore, is to:

- Trim the airplane with the elevator trim so that it maintains hands-off level flight at cruise airspeed.
- Resist the tendency to overcontrol the airplane. Fly the attitude indicator with fingertip control. No attitude changes should be made unless the flight instruments indicate a definite need for a change.
- Make all attitude changes smooth and small, yet with positive pressure. Remember that a small change

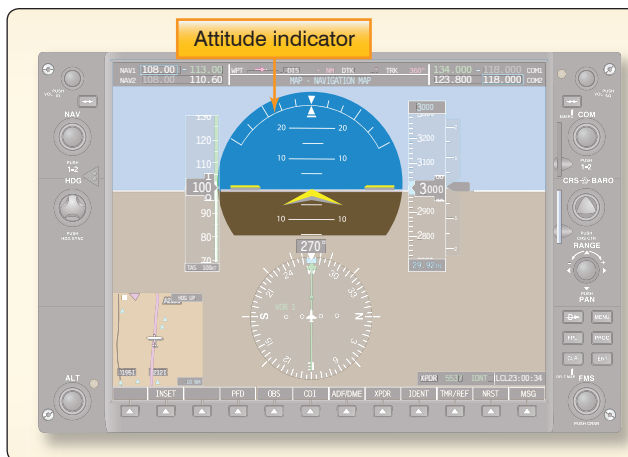


Figure 17-12. Attitude indicator.

as indicated on the horizon bar corresponds to a proportionately much larger change in actual airplane attitude.

- Make use of any available aid in attitude control, such as autopilot or wing leveler.

The primary instrument for attitude control is the attitude indicator. [Figure 17-12] Once the airplane is trimmed so that it maintains hands-off level flight at cruise airspeed, that airspeed need not vary until the airplane must be slowed for landing. All turns, climbs, and descents can and should be made at this airspeed. Straight flight is maintained by keeping the wings level using “fingertip pressure” on the control wheel. Any pitch attitude change should be made by using no more than one bar width up or down.

Turns

Turns are perhaps the most potentially dangerous maneuver for the untrained instrument pilot for two reasons:

- The normal tendency of the pilot to overcontrol, leading to steep banks and the possibility of a “graveyard spiral.”
- The inability of the pilot to cope with the instability resulting from the turn.

When a turn must be made, the pilot must anticipate and cope with the relative instability of the roll axis. The smallest practical bank angle should be used—in any case no more than 10° bank angle. [Figure 17-13] A shallow bank takes very little vertical lift from the wings resulting in little if any deviation in altitude. It may be helpful to turn a few degrees and then return to level flight if a large change in heading must be made. Repeat the process until the desired heading is reached. This process may relieve the progressive overbanking that often results from prolonged turns.