

## Comments Concerning Unusual Attitude Recovery Techniques.

The conclusions in the Aircraft Performance Group Report concerning recovery techniques are consistent with Airbus Industrie recommended training practices, which are supported by flight test results on all Airbus Industrie aircraft. Furthermore, all major aircraft manufacturers and the FAA support the use of these techniques. Boeing (including Douglas) and Airbus Industrie have joined their efforts to produce a common document "Aerodynamic Principles of Large Airplane Upsets). A copy of this brochure is given in annex.

In Unusual Attitude Recovery training, it is important to initially stress unloading the wing through (up to) full down elevator, and down stabilizer trim as necessary. Roll inputs will only be efficient when angle of attack has been reduced. Roll should be introduced only after exhausting the use of the pitch axis controls and after considering the reduction of engine thrust (on airplanes with wing mounted engine). Accident and incident data indicate that many nose high, high angle of attack events are because of inappropriate stabilizer trim. The initial use of elevator and down stabilizer trim will normally be adequate in establishing a nose-down pitch rate. In combination with thrust reduction few failures can be conceived for which these measures would not be sufficient.

As with all proposed scenarios, the use of roll to assist pitch attitude reduction cannot be ruled out, but if the airplane is at high angles of attack, the sideslip introduced by rapid roll may result in departure from controlled flight.

Although a simple rule about rudder usage cannot be stated, an appropriate standard is to first use full aileron control. Then, if the aircraft is not responding, use rudder as necessary to obtain the desired airplane response. Momentary actuation of spoilers during roll input does not significantly increase drag.

Sideslip angle is a crucial parameter during a recovery maneuver. This is probably not well understood by many line pilots, but it has a significant impact on an airplane's stability and control. Large or abrupt rudder usage at high angles of attack can rapidly create large sideslip angles and can lead to rapid loss of controlled flight. Rudder reversals such as those that might be involved in dynamic maneuvers created by using too much rudder in a recovery attempt can lead to structural loads that exceed the design strength of the fin and other associated airframe components. The hazards of inappropriate rudder use during a windshear encounter, wake turbulence recovery, or recovery from low airspeed at high angle of attack (e.g., stick shaker) should also be included in any Unusual Attitude Recovery discussion.