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AIC B-01 / 03. Use of Rudder on Large Transport Aeroplanes:

Introduction.

As a result of the A300-600 accident at New York on 12 November 2001, the National Transportation Safety Board (NTSB) of the USA recommended further guidance for pilots on the use of rudder and the structural implications of inappropriate use of controls.

The engineering design and airworthiness requirements ensure that the aircraft is capable of withstanding the rapid application of full rudder from the neutral position in one direction and the return to neutral from a large sideslip angel. A further safety factor over and above the design load is then applied. However, aircraft are not designed to withstand application of large rudder angels opposite to that required to sustain the sideslip. This may occur when, for example, full rudder is applied in one direction followed by full application in opposite direction. Such a manoeuvre may result in structural failure.

Pilots should be aware that the pedal force required to obtain rudder deflection will vary according to airspeed and the design of any rudder limiter system. The effect of this may be that full rudder application is obtainable at relatively low pedal force at high speed. It is also important to use the rudder in a manner that avoids unintended large sideswipe angels and resulting excessive roll rates. The amount of roll that is generated is typically proportional to the amount of sideslip, and to the amount of rudder input.

Handling Considerations.

The rudder is suitable for use in event of an engine failure and for crosswind take-offs and landings. The use of full rudder in these situations is well within structural limitations and pilots should not be inhibited from applying the necessary rudder input for satisfactory control of the aircraft. The aircraft will have been designed to accommodate a rapid and immediate pedal input in one direction from zero to full input, e.g. during an engine failure during take-off. There has been no known catastrophic failure due to pilot control input in these situations.

With the possible exception of wake turbulence encounters and an upset recovery, the use of rudder in other situations, including stall recovery is not necessary and should not be used unless specifically recommended in the Aircraft Flight Manual. Recovery from dutch roll, which normally occurs at high level, should be in accordance with the manufacturers guidance, typically using aileron as the primary control surface. Due regard should be taken of any limitation or operational restrictions contained in the Minimum Equipment List (MEL) in the event of yaw dampers being inoperative.

As the aircraft flies faster, less rudder authority is required. Pilots should ensure that they are familiar with rudder limiting system fitted to the aircraft.

Conclusion.

Whilst pilots should not be inhibited from using the necessary rudder input for asymmetric and crosswind control, sudden reversals of rudder should be avoided.

Training

The Danish CAA recommends the operators of transport-category airplanes to establish and implement pilot training programs that: (1) explain the structural certification requirements for the rudder and vertical stabilizer on transport category airplanes; (2) explain that a full or nearly full rudder deflection in one direction followed by a full or nearly full rudder deflection in opposite direction, or certain combinations of sideslip angels and opposite rudder deflection can result in potentially dangerous loads on the vertical stabilizer, even at speeds below the designed manoeuvering speed; and (3) explain that, on some aircraft, as speed increases, the maximum available rudder deflection can be obtained with comparatively light pedal forces and small pedal deflexions. In addition the operator should ensure that this training does not compromise the substance or effectiveness of existing training regarding proper rudder use, such as during engine failure shortly after takeoff or during strong or gusty crosswind takeoffs or landings.

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