

UNITED AIRLINES

ADVANCED MANEUVERS DEMONSTRATION

(27-A)

ENGINE FAIL AT LOW ALTITUDE AND LOW AIRSPEED (AFTER T/O OR DURING G/A)

DISCUSS EFFECT OF SURPRISE, AND DIFFERENCES WITH V1 CUT (NO RUDDER FIRST)
DISCUSS EFFECT OF PREVIOUS TRAINING FOR V1 CUTS ON PILOT'S IMMEDIATE REACTION
STRESS CORRECT ORDER OF IMMEDIATE INPUTS FOR RECOVERY

1. IMMEDIATE NOSE DOWN TO 12-1/2 DEGREES (READ THROUGH F/D)
 2. WINGS LEVEL USING AILERON ONLY (AVOIDING WRONG RUDDER INPUTS)
 3. APPLY CORRECT RUDDER (YOKE AS INDICATOR TO COORD WITH AILERON)
 4. STOP CLIMB (READ THROUGH F/D, USE IVSI)
 5. CALL FOR "HEADING SELECT" TO STEER TO PROPER HEADING
- IP BACK TO RWY AND REPEAT AS NECESSARY

SINGLE-ENGINE MINIMUM CONTROL SPEED (ON A/P) DEMONSTRATION

(27-A)

DISCUSS IMPORTANCE OF AIRSPEED AND TRIM AWARENESS WITH SINGLE ENGINE
AT 7500, FLAPS 5, TRIM RUDDER FOR MANEUVERING SPEED
REDUCE THRUST TO ALLOW AIRSPEED TO DECAY
DEMO INABILITY OF A/P TO HOLD ADVERSE YAW WITH HIGH THRUST AND SLOW SPEED
DEMO DIFFICULTY IN RECOVERING AIRSPEED WITHOUT LOSS OF ALTITUDE

SINGLE-ENGINE, AUTOCOUPLED, ILS APPROACH AND MISS (WX 300-1)

DISCUSS PAST TRAINING AND CHECKING PRACTICES
DISCUSS IMPORTANCE OF USING ONLY ONE AUTOPILOT AND TRIMMING RUDDER
DISCUSS IMPORTANCE OF AIRSPEED AWARENESS (NO AUTO THROTTLE)
DISCUSS IMPORTANCE OF FOLLOWING A/P THROUGH ON FLIGHT CONTROLS
DISCUSS BEING READY TO HAND FLY
DEMO MISSED APPROACH TECHNIQUE
DISCUSS WHEN TO DISENGAGE AUTOPILOT
DISCUSS HOW TO EXECUTE



27-B

B-737-300/-300/-500 INSTRUCTOR MANUAL
BULLETIN #94-01
NOVEMBER 21/94
FROM: AQP/8737-300/500 FLEET

8737-300/500 WAKE TURBULENCE AVOIDANCE AND UPSET RECOVERY.

PART I - BRIEFING

1. PURPOSE.

Since December 1992, there have been five reported accidents/incidents in which an airplane on approach to landing encountered wake turbulence. Thirteen occupants died in two of the accidents. In the two incidents involving Air Carrier aircraft, there was significant but recoverable loss of control. Both upsets required immediate and aggressive flight control input by the flight crew. (Refer to Table 1.)

The FAA, in response to NTSB recommendations, is implementing additional ATC controller training concerning wake turbulence and increasing separation between certain aircraft types. Furthermore, the FAA is working with ATA, NTSB, aircraft manufacturers, and pilot unions to develop a Wake Turbulence Training Aid, expected to be available early 1995.

United Airlines, consistently a leader in training innovations, has created a wake turbulence avoidance and upset recovery training program to enhance the 737 curricula.

2. OVERVIEW.

Training for Wake Turbulence Avoidance and Upset Recovery will be accomplished along with windshear training after the LOE in the 737-300, or after the certification ride in the 737-200. The goal is to revisit wake turbulence avoidance and provide the pilots with the ability to correctly recognize an upset/unusual attitude and apply the appropriate recovery technique if an upset is encountered. Upset recovery success criteria is as follows: recognize and confirm the upset attitude, apply the proper recovery procedures in a timely manner, and return to a stabilized flight condition without damaging the aircraft or injuring the passengers or crew.

3. DEFINITIONS.

- **Wake turbulence:** Phenomena resulting from the passage of an aircraft through the atmosphere. The term includes vortices, thrust stream turbulence, jet blast, propeller and rotor wash both on the ground and in the air.
- **Vortices:** Circular patterns of air created by the movement of an airfoil through the air when generating lift. As an airfoil moves through the atmosphere in sustained flight, an area of low pressure is created above it. The air flowing from the high pressure area to the low pressure area around and about the tips of the airfoil tends to roll up into two rapidly rotating vortices, cylindrical in shape. These vortices are the most predominant parts of aircraft wake turbulence and their rotational force is dependent upon the wing loading, gross weight, and speed of the generating aircraft.
- **Heavy aircraft:** ATC phraseology used to identify aircraft with a gross weight of 300,000 LBS or more.
- **Sky Pointer:** The triangular shaped bank indicator below the bank scale on the ADI. This indicator always points up or towards the sky, hence the term "Sky Pointer."



- Recognition And Confirmation Of An Unusual Attitude.
It is *critical* to correctly interpret the attitude of the aircraft.
 - Use the ADI as the primary instrument for determining the attitude of the aircraft.
 - a. Anytime outside visual references become unreliable: i.e., marginal VFR conditions, the crew must immediately transition to instrument references to prevent spatial disorientation.
 - b. Confirm the unusual attitude by cross checking the other attitude indicators and the performance instruments: i.e., airspeed, IVSI, etc.
 - c. Color coding of the ADI (blue is up—brown is down) facilitates easy interpretation of pitch attitude.
 - d. The bank indicator or "sky pointer" at the top of the ADI, always points up. Rolling the aircraft towards the "sky pointer" to place it in the upper half of the ADI, will correct attitudes of extreme bank.
- Callouts.
 - Upon confirmation of an upset condition, the pilot confirming the upset will call out "Upset."
- Autopilot and Autothrottles
 - After confirming the upset attitude, press the autopilot and autothrottle disconnect buttons to ensure they are disengaged.
 - a. The control wheel steering mode of the autopilot will complicate the recovery process if the autopilot is not disengaged.
- Recovery Procedures.
 - Techniques. Certain aerodynamic principles will aid the recovery from severe upsets/unusual attitudes.
 - a. The use of bank (not to exceed 90 degrees) will assist with reducing the pitch with extreme *nose high* attitudes.
 - b. The reduction of bank aids in pitch control with a *nose low* attitude.
 - c. Adjusting thrust and the timely use of drag devices aids in airspeed control.
 - d. The use of coordinated rudder and aileron will significantly increase the roll rate when compared to aileron input only, therefore the use of coordinated rudder is *VERY IMPORTANT* when recovering from extreme bank angles (control input should be smooth, not violent). ←