



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

December 12, 2019

Attachment 9 – Delta Air Lines Operations Manuals Volumes 1 & 2 [Excerpts]

OPERATIONAL FACTORS

DCA19CA091



737-732/ -832/ -932
Operations Manual
Volume 1
Delta Air Lines, Inc.

Revision Number: 50
Revision Date: December 10, 2018
Copyright 2018: Delta Air Lines, Inc.

Approach Checklist

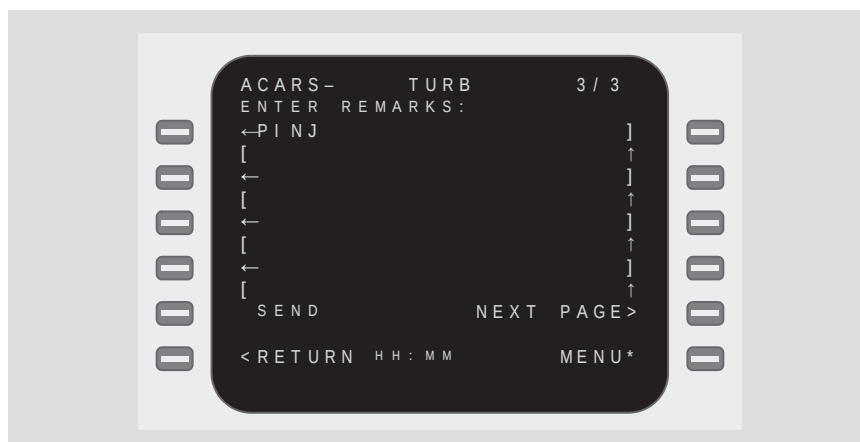
- Flight & nav instrumentsverified C&F
 - Ensure correct arrival and approach procedures are entered.
 - Ensure the proper frequency and course/radial are set as appropriate.
- Cabin notification complete C
 - Ensure that the cabin chime signal has been sounded twice.
 - If turbulence is anticipated on the arrival, consider an early cabin chime signal so that flight attendants can be seated.
- Altimeters ____, xckd C&F
 - Ensure the captain, first officer, and standby altimeter barometric settings and barometric reference (IN or HPA) are correctly set.
 - Verbalize the local altimeter setting.

ACARS Turbulence Report Due to Injury

Crews should submit an ACARS turbulence report when notified by flight attendants of a potential injury due to turbulence. DAL meteorology is an active participant in this injury mitigation effort.

Crews should complete all fields of the turbulence report during a non-critical phase of flight and must include “PINJ” in the misc text section of the report (page 3/3). This allows meteorology to collect data for analysis.

Continue to file an ASR/ASAP when any crew member reports potential injury.



Turbulence

During flight in light to moderate turbulence, the autopilot and/or autothrottle may remain engaged unless airspeed, altitude or attitude deviations require use of manual control. Increased thrust lever activity can be expected when encountering wind, temperature changes and large pressure changes. Short-time airspeed excursions of 10 to 15 knots can be expected.

The turbulent air penetration speed provides ample protection from stall and high speed buffet, while also providing protection from exceeding the structural limit. Refer to the Limitations section for the turbulent air penetration speed.

Passenger signs ON

Advise passengers to fasten seat belts prior to entering areas of reported or anticipated turbulence. Instruct flight attendants to check that all passengers' seat belts are fastened.

Severe Turbulence

Yaw Damper switch ON

Autothrottle Disconnect

AUTOPILOT CWS

A/P status annunciators display CWS for pitch and roll.

Note: If sustained trimming occurs, disengage the autopilot.

ENGINE START switches FLT

Thrust Set

Set thrust as needed for the phase of flight. Change thrust setting only if needed to modify an unacceptable speed trend.

PHASE OF FLIGHT	AIRSPEED
CLIMB	280 knots or .76 Mach
CRUISE	Use FMC CRUISE page, TURB N1 thrust settings.
DESCENT	.76 Mach/280/250 knots. If severe turbulence is encountered at altitudes below 15,000 feet and the airplane gross weight is less than the maximum landing weight, the airplane may be slowed to 250 knots in the clean configuration.

Note: If an approach must be made into an area of severe turbulence, delay flap extension as long as possible. The airplane can withstand higher gust loads in the clean configuration. Diversion to another airfield is the best policy if severe turbulence persists in the area.

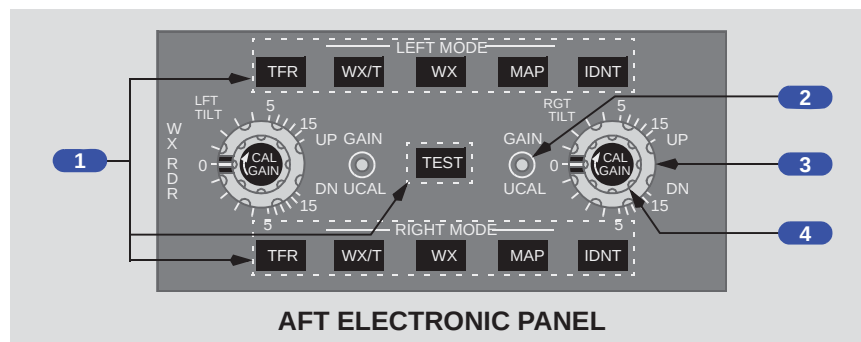


737-732/ -832/ -932
Operations Manual Volume 2
Delta Air Lines, Inc.

Revision Number: 14
Revision Date: May 11, 2018
Copyright 2018: Delta Air Lines, Inc.

Weather Radar Panel

3701-3771



1 Weather Radar Mode Switches

Push – selects mode. Left mode switches control the Captain’s radar display, right mode switches control the First Officer’s radar display.

- TFR (transfer) – transfers other map display selections to related map
- WX/T (turbulence) – shows weather radar returns and turbulence. Turbulence display is available on displays of 40 nm or less.
Note: Turbulence detection requires presence of detectable precipitation. Clear air turbulence cannot be detected by radar.
- WX – shows weather radar returns at selected gain level
- MAP – shows ground returns at selected gain level
- IDNT – suppresses ground return in WX and WX/T modes
- TEST –
 - tests weather radar system operation without transmitting
 - shows test pattern and any fault messages on navigation display MAP, center MAP, VOR, and APP modes, with WXR selected.

Note: If the airplane is on the ground and the thrust levers are not advanced for takeoff, WXR tests the predictive windshear system (PWS) indications. These include PWS caution, PWS FAIL, and PWS warning. Deactivating WXR on the EFIS control panel will not discontinue the test and can result in automatic WXR activation on both pilot displays. The PWS test lasts approximately 15 seconds.

2 Gain Uncalibrated (GAIN UCAL) Lights

Illuminated – related gain control is in an uncalibrated position.

3 TILT Control

Rotate clockwise – radar antenna tilts up to selected degrees from horizon.

Rotate counterclockwise – radar antenna tilts down to selected degrees from horizon.

4 CAL GAIN Control

Rotate – sets gain in WX, WX/T and MAP modes.

- CAL (calibrated) gain - is selected when the CAL GAIN knob is rotated full clockwise.
- MAX gain - is selected when the CAL GAIN knob is rotated counterclockwise one click from the CAL GAIN position.
- Reduced Gain - is selected when the CAL GAIN knob is rotated counterclockwise from the MAX GAIN position.

Weather Radar

The weather radar system detects and locates various types of precipitation bearing clouds along the flight path of the airplane and gives the pilot a visual indication in color of the clouds' intensity. The radar antenna sweeps a forward arc of 180 degrees.

The radar indicates a cloud's rainfall intensity by displaying colors contrasted against a black background. Areas of heaviest rainfall appear in red, the next level of rainfall in yellow, and the least rainfall in green.

In map mode, the radar displays surfaces in red, yellow, and green (most reflective to least reflective).

These displays enable identification of coastlines, hilly or mountainous regions, cities, or large structures. Ground mapping mode can be useful in areas where ground-based navigation aids are limited.

The radar system performs only the functions of weather detection and ground mapping. It should not be used or relied upon for proximity warning or anticollision protection.

The turbulence mode displays normal precipitation and precipitation associated with turbulence. When the radar detects a horizontal flow of precipitation with velocities of 5 or more meters per second toward or away from the radar antenna, that target display becomes magenta. This magenta area is associated with heavy turbulence. The detection of turbulence is automatically limited to a 40 nautical mile range, regardless of the selected range.

3701 - 3773

The weather radar also provides predictive windshear alerting below 1,200 feet RA. On the ground or in flight below 2,300 feet RA, radar antenna scan sweep is limited to 120 degrees with PWS enabled. Above 2,300 feet RA the radar sweep reverts to 180 degrees. (Refer to Chapter 15, Warnings.)

3701-3771

The IDNT position activates the ground clutter reduction feature. Signals that are determined to have a high probability of originating from ground returns will be automatically removed from the display. Some portions of weather targets may be removed as well. The IDNT position is provided for analysis by the pilot and is not for continuous use.

3601-3610, 3772, 3773, 3801 - 3930

Crews should use the automatic MultiScan feature in lieu of manual. AUTO is far superior in conveying comprehensive weather information with greater accuracy than using the manual mode.